

# Improving Wildland Fire Situation Analysis (WFSA) Implementation Practices<sup>1</sup>

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## Abstract

*Federal fire management agencies are required by policy to conduct a Wildland Fire Situation Analysis (WFSA) for all fire incidents that have not been suppressed by initial attack efforts. A survey-based study of senior fire and natural resource managers revealed that while the process is generally regarded as a valuable one in fire management decision making, contextual factors can compromise the quality of its implementation. The frequency of WFSA fires is relatively low in most National Forests, often less than once or twice a year, thereby leading to a decline in the quality of WFSA skills. Lack of WFSA training, lack of fire experience and limited availability of information needed for the WFSA, among other factors, also contribute to poor quality WFSA's. More training as well as reinforced training are needed to maintain line officer and fire staff WFSA fluency.*

## Introduction

Management and suppression of wildland fires that have escaped initial attack pose significant challenges to the decision-making skills of land management administrators, such as district rangers and forest supervisors. Good decision making in managing wildland fire requires, at a minimum, the development of strategic options, identification of criteria for evaluating options, and assessment of costs and potential damages to the natural resource base. In addition, trade-offs must be made between costs and effectiveness of alternative suppression strategies, varying in likelihood of success or failure. Finally, decisions must be communicated to others and justified prospectively in terms of their logic and soundness, and retrospectively on the basis of actual outcomes.

A process that provides a key support component for wildland fire decision making is the USDA Forest Service's Wildland Fire Situation Analysis (WFSA, previously known as the Escaped Fire Situation Analysis [EFSA]). After a fire has been declared escaped, the line officer is mandated by agency policy to organize and implement an appropriate suppression response based on a WFSA. A WFSA must be completed for all escaped fires that continue into the next burning period.

According to policy stated in Forest Service Manual 5132, the WFSA is a multi-step, decision support process that requires identification of evaluation criteria, development of suppression strategies, and analysis of suppression alternatives. The alternative with the minimum suppression costs plus resource damages, consistent with the best expected probability of success/ failure, is identified and implemented. In essence, the WFSA provides a framework based on a combination of principles and guidance from the decision sciences, including decision analysis, multiattribute decision making, and natural resource valuation.

Although agency policy is relatively clear about the conditions required for the completion of a WFSA, the context in which a WFSA is done is complex and demanding. The WFSA is conducted only if initial attack efforts have failed to achieve suppression goals, often after 1 or 2 (or perhaps more) days of continued suppression efforts. As the initial attack phase of an incident continues, greater local resources are often dedicated to the fire. By the time a decision is made that local suppression resources are insufficient to control the incident, many of the fire management personnel of the land management unit are already in the field and have been working diligently for long hours. Thus, the WFSA is often

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conducted in an atmosphere of defeat. Since fires often exceed initial attack efforts late in the afternoon, the decision to declare the fire escaped occurs late in the day. Very often, the WFSA is prepared either late at night or in the early hours of the morning. By that time, most of the personnel needed to do the WFSA are either on the fire site and/or are severely fatigued. According to policy, the WFSA is prepared by a team under the direction of the local line officer. The team includes both fire and natural resource specialists whose goal it is to complete the portions of the WFSA relevant to their areas of expertise. Ultimate responsibility for conducting the WFSA rests with the local line officer. However, the success of the WFSA process rests in part on the ability to bring together the required expertise in the time and place required. Often, this is difficult (or even impossible) to do when many of the staff required are on the incident scene. Thus, the WFSA process itself places significant demands on local human resources at a time when they are both reduced and minimally available.

Reactions from the field regarding the WFSA process have been critical: the process is cumbersome, and takes too long to perform under the time-pressure conditions of an ongoing large wildfire. However, we have to date no systematic study of how the WFSA process is perceived and what its shortcomings might be in the context of actual fire management situations.

The purpose of this study was to examine the experiences of senior fire management and natural resource management personnel with the WFSA process, to gain insights regarding how the WFSA has been used as a support for decision making in fire management, and to understand better the causes of poor quality WFSA's and possibilities to improve the WFSA process.

### Methodology

The study was conducted by using a combination of interview and survey research methodologies. Structure for the interviews was provided by a set of key questioning points based on the WFSA process, including its perceived value in fire management, availability of natural resource values, usability of land management plans for the WFSA process, level of precision of probability assessments, factors contributing to poor quality WFSA's, and potential improvements to the WFSA process. About 2 to 3 weeks after the interview, each informant received a follow-up survey that probed key variables based on the interviews.

Informants for the study were senior fire management personnel, resource specialists, and agency administrators drawn from all five Federal fire management agencies: USDA Forest Service (USFS), USDI Bureau of Land Management (BLM), USDI National Park Service (NPS), USDI Bureau of Indian Affairs (BIA), and USDI Fish and Wildlife Service (FWS). The geographic area of the study included the six western USDA Forest Service Regions (Regions 1 through 6) in the contiguous United States.

All informants were directly involved in fire management for most (if not all) of their careers. Although many of the informants held (or had held) line officer positions, and were therefore directly responsible for conducting a WFSA, others had never held a line position, but had been involved in WFSA as part of, for example, a fire staff or as a member of an incident management team.

A total of 71 informants were included in the study; all five Federal fire management agencies were represented:

Agency	Number of Informants
USFS	52
USFS/BLM (jointly)	4
BLM	5
BIA	4
NPS	3
FWS	3

The set of informants represented a broad base of experience and resource management situations. In addition, line officer positions were also represented, including both forest supervisors and district rangers. All of the informants were experienced in WFSA and had been responsible for or participated in at least three to four WFSA's in their career. Some informants had participated in more than 25 to 30 WFSA's, most often in their role as a line officer or as a member of an incident team.

## Results

### ***Fire and WFSA Frequency***

Study informants were asked to estimate the yearly average fire frequency in their land management unit, as well as the yearly average frequency of escaped fires requiring a WFSA. Both estimates were made as "best guesses" based on each informant's experience in their respective land management unit. Because the study was conducted in a wide range of land management regions, it was expected that there would be considerable variability in fire frequency. At the USFS forest level, estimated yearly mean fire frequency ranged from a low of about 25 for some National Forests in the Rocky Mountain Region (Region 2) to a high of 500 or more for some National Forests in the Southwestern Region (Region 3). For other Federal fire management agency informants (i.e., USDI BLM, BIA, NPS, and FWS), estimates were generally lower, primarily because their respective land management units were either in less volatile fuel types, less susceptible to ignition events (e.g., lightning), or the land management units were considerably smaller. In making yearly average fire frequency estimates, all informants noted the tremendous variability in the number of fires from year to year.

Informants were also asked to estimate the yearly average number of WFSA fires on their land management unit. This proved to be a much more difficult estimation task, primarily because WFSA fires occur very infrequently and year-to-year variability is quite high. Informants typically estimated WFSA fires to be 1 or 2 percent of the total fires each year. However, when probed to recall specific WFSA fires on their land management unit in the past 3 to 5 years, the number of WFSA fires recalled was typically less than 1 percent of their estimates of yearly average fire frequency. Estimates of the actual number of WFSA fires on a yearly average basis *at the forest level* ranged from a low of 0.1 (one WFSA fire every 10 years) to a high of 7. More typically, however, the range was from two to three WFSA fires per year. Again, informants noted the high level of variability in WFSA fires. Indeed, in many of the land management units contacted in the course of the study, WFSA fires had not occurred for 2 to 3 years. One informant, who had been in the same Ranger District for more than 20 years, noted that a WFSA fire had not occurred in his district until 1994, and that only two project fires had occurred in the district in 20 years. Although other land management units had experienced more frequent WFSA fires, it appears that the frequency of fires requiring that a WFSA be conducted is typically very low (often less than one per year on average) at the National Forest level, and there are many years in which there are no WFSA fires. Concomitantly, at the Ranger District level the frequency is even less. Thus, for many land management units, line officers (particularly at the District level) may encounter the need to conduct a WFSA on a less-than yearly basis and frequently only once or twice over a 5- (or more) year period. Currently, fire reports (Form FS 5100-29) submitted to the National Interagency Fire Management Integrated Database (NIFMMID) do not include an indication of whether a WFSA was performed for a fire incident. Thus, estimates of WFSA frequency for a given land management unit can only be obtained locally.

### ***Perceived Value and Utility of the WFSA Process***

A major determinant of the quality with which a decision making process is implemented is the perceived value of the process by those who use it. The interviews and follow-up survey included four items that asked informants to indicate their perception of value or usefulness of the WFSA process. These

**Table 1-**Perceived value of WFSA as a decision making.

	Percentages
In you experience, how useful have you found WFSA as a decision making tool in fire management?	
Not useful	0.0
Slightly useful	9.3
Somewhat useful	55.6
Very useful	35.2
In your experience does WFSA generally lead to the best fire suppression strategy?	
Rarely	0.0
Sometimes	46.3
Most of the time	51.9
Always	1.9

included usefulness of WFSA as a decision making tool; the ability of WFSA to identify the best fire suppression strategy; the ability of WFSA to consider land management objectives and final outcomes of a wildfire action; and the ability of WFSA to control large-fire suppression costs.

Two questions asked informants about the general utility of WFSA, including whether it leads to the best fire management strategy (*table 1*). A large majority of the informants indicated that they found the WFSA process to be "somewhat" or "very" useful as a decision making tool in fire management, although only about one-third found it very useful. None of the informants indicated that they found it not at all useful.

The intended purpose of the WFSA process is to aid in the selection of the best fire management strategy for dealing with an escaped or wildfire incident. However, when asked whether WFSA generally leads to the selection of the best fire management strategy, only slightly more than half indicated that it does so "always or most of the time." Although none of the informants indicated that it rarely leads to the best strategy, a sizable portion indicated that it "sometimes" leads to the best strategy. In general, informants were positive about the usefulness of WFSA as a decision making tool, but slightly less so about its ability to aid strategy selection.

The general perception of the usefulness of WFSA was unrelated to its perceived ability to lead to the best fire management strategy ( $\chi^2 = 3.78$ ;  $df = 4$ ;  $p > 0.20$ ), suggesting that the perceived value of the WFSA process very likely includes factors not specifically identified in the WFSA policy. Indeed, the interviews revealed that the WFSA process has dimensions of value that go beyond its usefulness as a decision making aid or tool. For example, one senior fire management officer (FMO) stated "[The WFSA] forces you to sit down and think about what you're doing... it makes you be consistent." Another resource staff officer noted "[WFSA] provides a mechanism to manage from... [it] provides a focus.... We have to make some forecasts, work with other agencies, and estimate some things." The communication value of the WFSA was frequently mentioned, in comments such as "WFSA draws management into the decision making process... [it's] a good communication tool"; or, "[WFSA] is a communication tool between the agency administrator and the incident management team."

**Value of WFSA in Considering Outcomes and Controlling Wildfire Costs**

Although the WFSA process is intended to assist decision making in selecting a fire management strategy, the process also includes a careful consideration of land management objectives and the impact of fire on those objectives. Thus, a successful WFSA is, in part, one that selects a fire management strategy that is

**Table 2-** Perceived value of WFSA in meeting land management objectives and controlling suppression costs.

	Percentages
How well does WFSA consider land management objectives and final outcomes of the wildfire action?	
Not well	7.7
Slightly	21.2
Moderately	65.4
Very well	5.8
With regard to the costs of large-fire suppression, how much do you think the WFSA process, if done properly, can help control such costs?	
Not at all	0.0
Very small amount	22.2
Some control	46.3
Substantial control	31.5

consistent with land management objectives and that achieves suppression outcomes consistent with land management plans. In addition, the WFSA policy identifies cost of suppression efforts as a criteria against which alternative strategies should be compared. Given the escalating costs of suppressing wildfires, a reasonable question to ask of WFSA is the degree to which it can, if appropriately applied, help control such costs. Responses to two probes related to these issues were analyzed (*table 2*).

With regard to consideration of land management objectives and final outcomes of fire suppression actions, the majority of informants indicated that the WFSA does this "moderately" well. Very few informants indicated that WFSA accomplished this objective "very well" or "not well." A modest relationship existed between perceived usefulness of WFSA and its perceived ability to consider fire suppression outcomes in light of land management objectives; those who judged WFSA better at considering outcomes also tended to view WFSA as more useful ( $\chi^2 = 12.22$ ;  $df = 6$ ;  $p < 0.06$ ). A much stronger relationship existed between WFSA's ability to select the best fire management strategy and its consideration of outcomes; those who tended to judge WFSA as better at considering outcomes were also more likely to see WFSA as leading to the best fire management strategy ( $\chi^2 = 15.23$ ;  $df = 6$ ;  $p < 0.01$ ). It appears from these results that the perceived quality of WFSA as a decision making process is related, at least in part, to judgments about its ability to consider outcomes of fire suppression actions in light of land management objectives.

A critical concern in fire management is control of suppression costs. Informants were asked to indicate how much control the WFSA process can have over large-fire suppression costs, assuming the WFSA process was done properly (*table 2*). A wide range of responses to this question was exhibited; with 31.5 percent indicating "substantial control" was possible, while another 46.3 percent indicated only "some control" was possible. At the extreme, 22.2 percent indicated only a "very small amount" of control was possible.

Judgments about the ability of WFSA to control wildfire suppression costs were not related to either general perceptions about the usefulness of WFSA as a decision making tool ( $\chi^2 = 4.18$ ;  $df = 4$ ;  $p > 0.20$ ), or to judgments about WFSA's ability to lead to the best suppression strategy ( $\chi^2 = 2.56$ ;  $df = 4$ ;  $p > 0.20$ ).

In the interviews, informants exhibited similar variation in discussing the potential of the WFSA to control suppression costs. Indeed, of the many topics discussed in the course of the interviews, the issue of fire suppression cost control was one of the most volatile and evocative of differing opinions and views. Some informants indicated that some of the factors responsible for suppression costs, particularly social and political factors, cannot be sufficiently accounted for in the WFSA to permit their control.

**Table 3--Responses to items assessing quality of information for WFSA.**

	Percentages
Are natural resource values typically available in a form that can be used directly in an WFSA?	
Not available	1.9
Seldom available	60.4
Sometimes available	24.5
Usually available	13.2
Typically, how usable are land management plans for the needs of WFSA?	
Not usable	5.7
Slightly usable	32.1
Somewhat usable	45.3
Very usable	17.0

**Availability of Information for the WFSA**

The WFSA process requires a number of types of information, including natural resource management objectives and natural resource values, much of which comes from the land management planning process. The availability and usability of this information for the WFSA process was assessed by two questions (*table 3*).

**Availability of Natural Resource Values for WFSA**

Few of the informants indicated that natural resource values are "usually available" in a form that can be used directly in a WFSA (*table 3*), while the majority indicated that resource values are "seldom" available. Availability of natural resource values was weakly related to perceived usefulness of WFSA as a decision-making tool ( $\chi^2 = 8.68$ ;  $df = 6$ ;  $p < 0.20$ ) and was unrelated to judgments about the ability of WFSA to select the best fire management strategy ( $\chi^2 = 2.12$ ;  $df = 6$ ;  $p > 0.20$ ), suggesting that resource values are perceived as marginally important in aiding actual fire management decision making. This does not mean, however, that improvements in the availability of natural resource values are not or would not be viewed positively.

Informants typically indicated that timber values for their Forest were available and usable in the WFSA. However, other categories of natural resource values typically were not, such as for fish, recreation, air, and water. As one informant put it, "the toughest part (of the WFSA) is struggling with the resource values." Although not all informants would agree that this is the most difficult aspect of WFSA, most comments echoed those of one informant who noted that "obtaining good resource values has always been a problem."

Although some of the difficulties with resource values center around their availability, others may be more related to their meaningfulness and conceptual validity in fire management decision making. In commenting on the logic of WFSA, one informant noted that the "economic model is too narrow.... [We] can't trade off property." Informants also questioned the meaningfulness of attaching economic values to natural resources that have no commodity value. For example, one informant commented that "as far as resource values go, it's more the qualitative than the quantitative." Some of the objections to quantitative resource values may stem from a lack of understanding or awareness of how such values are obtained. Other objections can arise when natural resource values are inconsistent, or when the way in which they are consistent is not obvious. For example, one informant expressed his experience with quantitative natural resource values by asking: "Why is sagebrush valued at \$5.00 an acre in Burns (Oregon) and \$150 an acre in Winnemucca (Nevada)?"

For the most part, informants indicated that the only way they could incorporate non-commodity resource values into the WFSA was through their specification as evaluation criteria or as critical natural resource concerns. However, quantifying these values directly as a basis for calculation of a total

dollar value for damage to the natural resource base associated with each fire management strategy specified in the analysis was generally seen as not feasible given the current availability and usability of such values.

### **Usability of Land Management Plans by WFSA**

With regard to the usability of land management plans in the WFSA process, about one-third of the informants indicated that land management plans are "slightly usable" for the needs of WFSA, while nearly half indicated that they are "somewhat usable" (table 3). There was no significant relationship between usability of land management plans and the value of WFSA as a decision making tool ( $\chi^2 = 6.52$ ;  $df = 6$ ;  $p > 0.20$ ). However, a very strong relationship did exist between usability of land management plans and the judged ability of WFSA to lead to the best fire management strategy; those who saw land management plans as more usable by the WFSA process also tended to judge WFSA as leading to the best suppression strategy ( $\chi^2 = 16.72$ ;  $df = 6$ ;  $p < 0.01$ ). Thus, it appears that better quality land management planning is a necessary precursor to improving fire management decision making and to improving the quality of implementation of the WFSA process.

Informants in the interviews frequently indicated that a problem with land management plans is their lack of a specific role for fire in the context of land management objectives in management areas that do not include wilderness. Some informants also noted that the economic costs associated with fire suppression are not adequately considered as part of the overall costs of land management and that the total costs of land management (including fire suppression costs) might be reduced by allowing fire to achieve resource management objectives.

Other informants noted that land management plans have not been updated in as much as nearly a decade and that in that time views about the role and value of fire in forest ecosystems have changed. However, land management plans have yet to incorporate these changes. As one informant noted regarding the usability of land management plans for WFSA, "Land management plans and fire management plans don't reflect changes (over time) in natural resource values." Other informants made similar comments, noting that the land management planning process does not keep pace with changes in the resource base and resource values.

However, in other land management situations, the usability of the land management plan for WFSA may be limited by the range of options for dealing with fire. As one informant from a southern California fire forest with high fire loading and complex urban interface problems commented, "Our land management plan calls for full suppression ... [We have] a very limited decision space." Thus, the usability of the land management plan by WFSA may (under some circumstances) be severely constrained by characteristics of the land management unit that limit the number and/or type of strategic options for dealing with fire. As a second informant in a similar type of forest with a complex urban wildland interface commented, "[We] already know what to do - full control. We have only one option."

### **Assessment of Probabilities of Success or Failure**

A key assessment in the WFSA process is the assignment of probability of success/failure to each alternative suppression strategy included in the analysis. Of all the judgments required in the WFSA, probability assessments appears from the interviews to be the most difficult. As one informant expressed it: "The weakest thing [in the WFSA] is going to be the probabilities." Informants tended to indicate that lack of fire experience leads to inadequate consideration of the national or regional availability of suppression resources and, therefore, to overly optimistic assessments of the likelihood that a given suppression strategy will accomplish its objectives (e.g., containment size, containment time, suppression costs).

In the survey, informants were asked to judge the level of precision with which probability assessments of success /failure can be made. Very few informants (3.8 percent) thought that probabilities could be assessed with high precision (i.e.,  $\pm 5$  percent). A slightly higher percentage (9.6 percent) thought that probabilities could only be assessed with a precision of  $\pm 40$  percent or more. The vast majority of informants thought probabilities could be assessed with moderate to limited, precision (i.e.,  $\pm 15$  percent to  $\pm 30$  percent).

### ***Perceived Causes of Poor Quality WFSA's***

Informants were asked to judge how often each of a number of factors were attributable as causes of poor quality WFSA's. Essentially, these probes assessed the experiences informants had with poor WFSA's and their views on the factors that contribute to them.

The highest rated causes of poor WFSA's were related to inadequacies in WFSA training and experience: over 74 percent of respondents indicated that poor WFSA's are "often" or "almost always" caused by lack of adequate WFSA training on the part of the line officer responsible for the WFSA. Nearly the same percentage (75.4 percent) indicated that poor WFSA's are "often" or "almost always" caused by lack of line officer WFSA experience.

Additional problems associated with implementing the WFSA process were related to the availability of fire management experience and WFSA expertise as well as the availability of time to conduct the WFSA. Regarding time availability, about 60 percent of the informants indicated that insufficient time to do the WFSA properly was "often" or "almost always" a cause of poor WFSA's. In addition, 20.4 percent of the respondents indicated that lack of fire management experience is "almost always" a cause of poor WFSA's, while 38.9 percent indicated it is "often" a cause.

### ***Perceived Improvements to the WFSA Process***

As part of conducting the interviews, informants were encouraged to offer suggestions or ideas for improving the implementation of the WFSA process. A number of suggestions most commonly mentioned were included in the follow-up survey, along with others that are currently being implemented in some Regions or Forests. Informants were asked to evaluate, based on their experience, how much improvement in WFSA would result from each one (*table 4*). A four-category response scale was provided: no, slight, moderate or large improvement. The categories "no" and "slight" are collapsed into a single category, as are the categories "moderate" and "large."

The single measure viewed as yielding the greatest improvement in the WFSA process was "better natural resource values": over 85 percent of the follow-up survey respondents indicated that this would lead to a "moderate or large" improvement in the WFSA. Such an overwhelming endorsement of better natural resource values appears somewhat inconsistent with informants views regarding the need for economic analysis in the initial WFSA. Indeed, the interviews generally revealed that the economic analysis portion of the WFSA is not the part of the WFSA that figures into judgments of the WFSA's overall quality. The explanation for this apparent inconsistency lies in understanding the difficulty of the informants to deal with the economic analysis portion of the WFSA. Virtually all of the informants noted that they perceive the WFSA process to acquire greater importance than in the past and that fire management decisions today require stronger economic justification. Although the WFSA has always had an economic analysis, this aspect of the WFSA has been dealt with historically by using subjective ratings. Greater emphasis on the WFSA process signals the need for a more complete documentation and specificity in its components. Given the very limited availability and usability of natural resource values at present, much improvement is impossible.

**Table 4-**Responses to the follow-up survey probe: "Listed below are a number of possible changes to WFSA. In your opinion, and based on your experience, how much improvement in WFSA would result from each one?"

Potential WFSA Improvements	No/slight improvement	Moderate/large improvement
	Percentages	
Better natural resource values	13.2	86.8
Better training in how to analyze alternative fire suppression strategies	25.9	74.1
Better definition of the role of fire in land management plans	25.9	74.1
More fire management experience for line officers	20.4	79.6
Better methods for estimating suppression costs	35.2	64.8
Preplanning of WFSA's based on, for example, management areas in forest plans	30.2	69.8
A computerized version of the WFSA	30.7	69.3

Informants were also genuinely concerned about doing a good job of conducting the WFSA and, as many informants put it, "preparing a quality document." A number of the informants who had been incident team commanders noted that the overall neatness and thoroughness of the WFSA document itself contributed to their confidence in the local agency administrator and signaled to them the administrator's awareness and understanding of their own natural resource management objectives. From this perspective, better natural resource values in the WFSA provide an improvement in the overall implementation of the process, although these may not be a critical element of an initial WFSA.

Almost equally high percentages of respondents indicated a moderate or large improvement in WFSA's would result from better training in how to analyze alternative fire suppression strategies (74.1 percent); better definition of the role of fire in land management plans (74.1 percent); and, more fire management experience for line officers (79.6 percent).

Informants were also positive about changes to some of the procedural aspects of the WFSA. More than half (69.8 percent) indicated that preplanning of WFSA's would improve their quality. A high percentage (64.8 percent) indicated that better methods for estimating suppression costs would also improve WFSA's.

## Conclusions

The WFSA procedure is one of the more intensive decision making processes implemented in U.S. Federal fire management. The experiences of senior fire and natural resource management personnel reported in this study suggest that though the process is a valued one, a number of factors potentially compromise the quality of its implementation. The frequency of WFSA fires is relatively low, thereby requiring the process to be undertaken somewhat rarely, perhaps less than once per year in some Forests or Ranger Districts. Although the WFSA is a conceptually sound procedure, based on principles from the decision sciences, the complexity of the process coupled with the highly stressed circumstances under which it must be conducted can lead to poorly done WFSA's. Lack of training in WFSA, limited availability of relevant WFSA and fire management expertise, a limited time-frame within which to conduct the analysis, lack of

connectivity between land management planning and the WFSA, and lack of usable natural resource values are some of the factors that interact to degrade WFSA's done on fire incidents.

It appears from the experiences and perceptions of senior fire and natural resource managers that the WFSA process would be improved if more training was provided in WFSA and if the WFSA process was integrated more closely with the land management planning process. In some forests, pre-planning of WFSA has already begun and is facilitated by the implementation of the WFSA process on a PC-computer platform. We foresee that this extension and refinement of WFSA will provide an opportunity for WFSA to become a high-quality decision support tool in both fire incident and land management decision making.

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