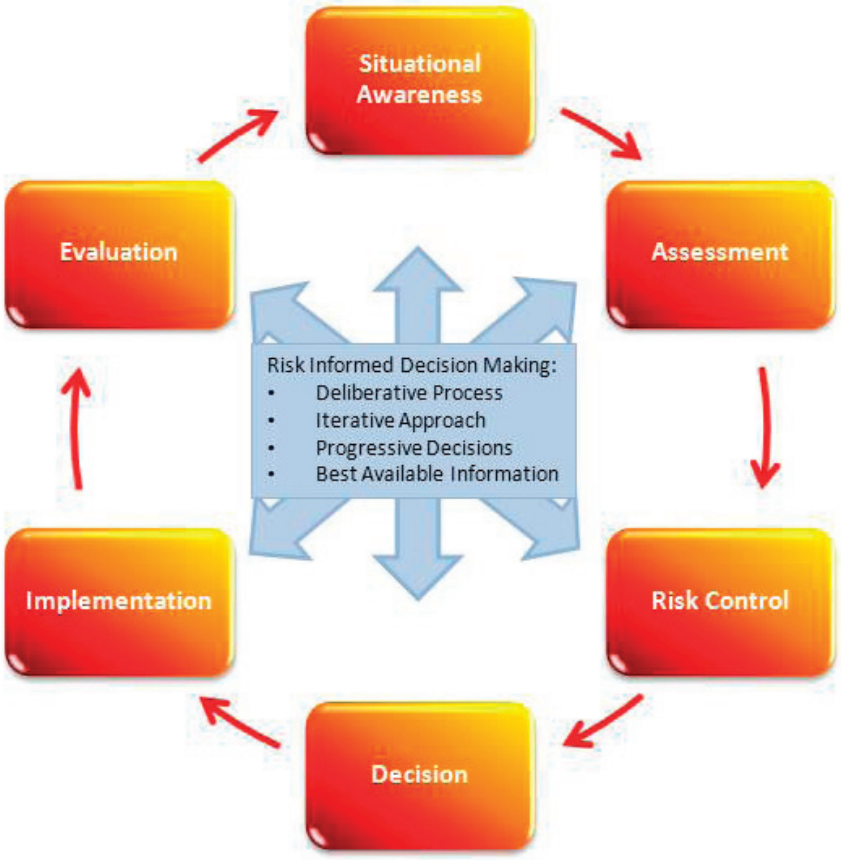
Decision Making for Wildfires:

A Guide for Applying a Risk Management Process at the Incident Level



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Abstract

This publication focuses on the thought processes and considerations surrounding a risk management process for decision making on wildfires. The publication introduces a six element risk management cycle designed to encourage sound risk-informed decision making in accordance with Federal wildland fire policy, although the process is equally applicable to non-Federal fire managers and partners. The process describes the assessment and control of identified risks, the analysis of benefits and costs, and the risk decision at multiple scales. Decision makers can apply principles from this publication to specific decision documentation structures such as the Wildland Fire Decision Support System (WFDSS) or other wildland fire decision documentation systems.

Keywords: risk management, risk assessment, risk-informed decision making, wildland fire management policy, land management objectives.

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Acknowledgments

This publication resulted from dialog that was initiated within the NWCG Fire Use subcommittee regarding wildland fire decision making and risk management. The document represents the work of several groups of fire professionals who developed content, integrated existing references, and sought feedback from other fire professionals with experience in wildfire decision making, risk management, and long-term incident planning. The draft version was distributed for use and comment during the 2012 wildfire season; the final document represents a "crowd-sourced" effort to gather and organize useful guidance for today's fire managers and decision makers in all agencies and organizations involved in wildfire management.

In addition to those listed as authors, the following people provided substantial contributions to this document:

Stu Hoyt (USFS) and Dick Bahr (NPS) were contributing members of the initial efforts to develop an outline for the document and identification of items to address. Dick Bahr was instrumental in coordinating the funding for early development of the document.

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NWCG Committees: The Fuels Management Committee provided a sounding board as the document was developed. The Risk Management and Interagency Fire Planning Committees reviewed the draft and provided comments and spirited dialogue in the development of the final content.

Individual Contributions: Tim Sexton (USFS) provided program sponsorship and support, and made substantial comments and suggestions to each version of the document. Michael Hand (USFS) and Sarah Fisher (USFS) provided the content on the Stratified Cost Index.

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Introduction

In 2009, the Fire Executive Council approved the *Guidance for Implementation of Federal Wildland Fire Management Policy* (the 2009 *Guidance*), replacing in whole the direction provided by the 2003 *Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy* (the 2003 *Strategy*). The 2009 *Guidance* also negated the National Wildfire Coordinating Group's (NWCG) 2005 Memorandum, Three Kinds of Wildland Fire, narrowing the classification of wildland fires to two kinds, Wildfires and Prescribed Fires.

Federal Fire Policy

Wildland fire is a general term describing any non-structure fire that occurs in the wildland. Wildland fires are categorized into two distinct types:

a. Wildfires – Unplanned ignitions or prescribed fires that are declared wildfires

b. Prescribed Fires – Planned ignitions

— 2009 Guidance for Implementation of Federal Wildland Fire Management Policy

With the 2009 *Guidance*, the distinction between wildfires as *unplanned, unwanted wildland fire…where the objective is to put the fire out*, and "wildland fire use" fires as *…naturally ignited wildland fires…[managed] to accomplish specific resource objectives* was eliminated—all unplanned ignitions are termed "wildfires." The directives from the 2003 *Strategy* that limited a wildfire to a single, "suppression or resource benefit" objective, and prohibited a suppressed wildfire from being managed for resource benefit objectives at a later time were also overridden.

The evolution from the 2003 *Strategy* to the 2009 *Guidance* removed constraints that limited the decision space of fire managers and agency administrators, and gave them greater flexibility to do the right thing at the right place at the right time. In some places, fire will be suppressed at the smallest size possible; in others, fire will be managed to achieve land management objectives. And, in many places, fire management will include both capturing benefits to natural resources as well as focusing fire management efforts on protecting values (human-made or natural) that may be harmed by fire.

This greater flexibility and larger decision space increases responsibility for determining the most appropriate management response to every unplanned ignition.

- There is more responsibility for continuously reevaluating decisions to ensure that they are still the most effective responses under changing conditions.
- Widespread drought, fuels accumulation, cost containment, and resource availability limit the probability of success even in those situations where full suppression may be the desired strategy. This creates long-duration incidents in spite of the best efforts of fire managers.

- Skillfully managing firefighter safety, costs, community impacts, ecological consequences, and political pressures in these incidents requires sound, defensible decisions based on reliable information and analyses as well as detailed documentation of the bases for the decisions in a clear, comprehensible format.

The process described in this publication is intended to offer assistance in addressing these expectations.

Purpose

The purpose of this publication is to assist fire managers, resource specialists, and agency administrators in developing and communicating timely and sound risk management-based decisions for managing wildfires. The process described in this publication is consistent with the Federal fire policy for the U.S. Department of Agriculture (USDA), Forest Service; and the U.S. Department of the Interior (USDOI), Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (FWS), National Park Service (NPS), and Bureau of Land Management (BLM). Other agencies (state, local, and nongovernmental) may find this publication useful in applying the risk management process to wildfire decision making within the requirements and framework of their own agency policies and procedures. This publication can also aid in decision making with their Federal partners.

This publication provides guidance on the risk assessment and risk management process, flow, and documents points to consider in making informed, sound risk-based decisions. It emphasizes the thought process behind sound fire management decision making using a risk management process, without tying the process to a specific decision documentation structure (for example, the Wildland Fire Decision Support System [WFDSS] or Wildland Fire Situation Analysis [WFSA]). WFDSS users will find tips on integrating the risk management products into the system in outtake boxes at the end of each section of the Applying the Risk Management Cycle chapter. Users of other decision documentation systems are encouraged to develop crosswalks between the risk management process described in this publication and their specific decision documentation structure. These crosswalks could prove particularly useful on incidents managed under Unified Command involving multiple agencies that use different decision document systems or requirements.

This publication assists in determining methods to make fire management decisions consistent with the policy directives and to base those activities on sound risk management. **Nothing herein establishes, alters, or substitutes for policy, nor does it establish any additional requirements or standard practices for Federal agencies.**

Federal Fire Policy

Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity. Net gains to the public benefit will be an important component of decisions.

Policy Basis

This publication tiers specifically to the 2001 *Review and Update of the 1995 Federal Fire Management Policy* (the "2001 *Review and Update"*) and the 2009 *Guidance*. Colored boxes throughout this each section include outtakes from specific policy statements to review and implement. Except where otherwise noted, the Federal Fire Policy statements are available in both the 2001 *Review and Update* and the 2009 *Guidance* documents.

The process detailed in this publication represents a legitimate way to interpret and comply with Federal Fire Policy in fire management decision making. However, it does not represent the ONLY decision-making process acceptable under Federal Fire Policy. The risk management process described herein is also generic enough to be applicable to the policies of other fire management agencies and organizations.

Using This Publication

This publication begins with an introduction to risk and risk management at multiple levels of fire management decision making. The six subsequent main sections describe in greater detail each of the six components of the risk management cycle described in this process for decision making at the strategic level.

The main text also contains bordered boxes, as shown below, which contain supplemental material that relates to the subject matter in that section of the publication. The boxes are classified by color to assist the reader in applying the supplemental material.

Federal Fire Policy boxes refer to quotes from Federal fire policy documents that relate to the material in that section, but may be applicable to Federal agencies and tribes only.

Definitions boxes contain definitions or examples of terms used in this publication. The definitions given assist in understanding and interpreting the processes described in this publication, but they do not establish "official" terminology for Federal agencies.

Clarifying Questions boxes suggest useful questions for decision-makers to gain insight to the incident and the decision.

How Does This Fit into WFDSS? Risk Management is the foundational basis for the Wildland Fire Decision Support System (WFDSS). For those agencies that use WFDSS, each step of the process described in this document can be incorporated into the WFDSS decision. These boxes will highlight specifically where the information, analyses and documentation are located in WFDSS (some information is auto-populated; other information, analyses and documentation are user-added or user-created within the application). Links for more detailed technical instruction for the use of the WFDSS application are also provided.

The Concept of Risk and Risk Management in Wildfire Decision Making

The wildfire decisions made by agency administrators can affect human life, private property, and values far outside the boundaries of their administrative unit in addition to the land base they manage. These decisions may well be the most critical (and criticized) decisions agency administrators make in the course of their careers. Consequentially, the decisions must be made based on sound risk management and the best information available to support the decisions.

Definitions of Risk

Risk science offers up multiple definitions of risk and its components and processes. Even within the fire management profession, definitions of risk vary significantly (Hardy 2005; Bachmann and Allgower 2000), and yet all risk and risk management practitioners can cite legitimate supporting evidence for their definitions. This publication does not attempt to establish a definitive lexicon for the discipline of risk management in wildland fire, but instead offers definitions for the purpose of understanding the processes described herein.

Definitions of Risk Used in *Decision Making for Wildfires*

Risk: The likelihood or possibility of hazardous consequences in terms of severity or probability. In wildland fire decision making, risk is a function of values, hazards, and probability.

> **Values**: Those ecologic, social, and economic effects that could be lost or damaged because of a fire. Examples include property, structures, natural and cultural resources, community infrastructure, public support, economic opportunities such as tourism, and air quality.
>
> **Hazard:** A condition or situation capable of causing physical harm, injury, or damage to values.
>
> **Probability:** The likelihood of a hazard to adversely affect values.

Risk Management: The process whereby management decisions are made and actions taken concerning control of risk and acceptance of remaining risk. It involves the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events. (Hubbard 2009 in *A Comparative Risk Assessment Framework for Wildland Fire Management 2011*)

Risk Management Cycle: A continuous, multi-step process that provides a systematic method for identifying and managing the risks associated with any operation. The six components used in wildfire decision making are:

1. Situational Awareness
2. Assessment
3. Risk Control
4. Decision
5. Implementation
6. Evaluation

Risk Assessment: A focused collection of products, processes and analyses which organizes information and assigns values (relative, qualitative or quantitative) to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decision making.

Risk Control: The mitigation of the hazards, threats, and causes identified by the risk assessment and implementation of actions to improve outcomes and minimize negative consequences.

A Multilevel Approach to Risk Management on Wildfires

Risk management is applied at all levels of wildfire decision making, from the individual firefighter on the ground facing changing environmental conditions, to the national office leaders of the fire management agencies weighing limited budgets against increasingly active fire seasons. The tools and processes used at each level differ in order to address variations in focus and scope, but the overarching processes and results reflect a unified approach to controlling and accepting risk for the purpose of meeting stated objectives.

Emerging direction in the human safety community of wildland fire management describes risk management processes applicable at the tactical implementation (or Time-Sensitive) level through an Operational level, reflecting the incident organization and supervisory levels, up to the Planning level, which occurs during the daily incident planning cycle. This publication primarily describes the Strategic level, which covers decisions about strategic direction for a wildfire incident (figure 1).

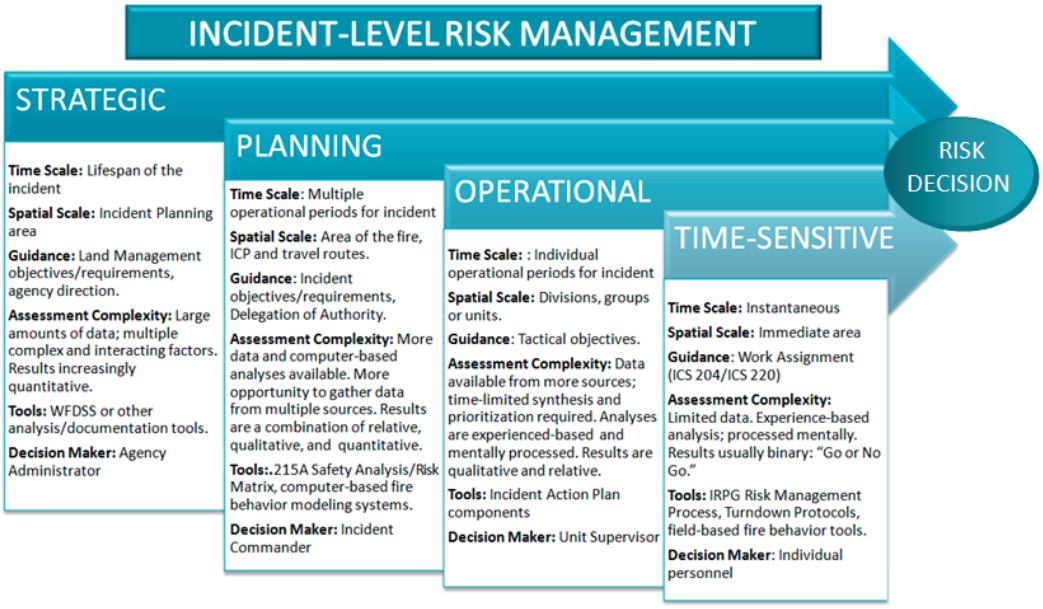

Figure 1. Risk Management at the Incident Level: Strategic to Time-Sensitive

The Strategic level risk management involves a broad, coarse-scale analysis that evaluates specific:

- Concerns, including communities, sensitive resources, water and air quality, wildlife habitat, and other economic, social and ecological values.
- The fire environment, including weather, fuels, and topography as they relate to hazards.
- The probability of negative impacts, and opportunities to use fire to meet resource objectives.

Examples of decision making at this level involve developing a strategic alternative and objectives for a wildfire incident; consider a range of values, hazards and probabilities and focus on longer time periods. They are usually completed at least once, but may require revision, adjustment or a completely new decision as the incident evolves and conditions change. The decision is usually documented in the incident-specific document and approved by an agency administrator.

Each level of risk management tiers to the levels above and below it (figure 1). Decisions made at the Strategic level affect the actions proposed at the lower levels, which are subject to a risk management process at that spatial and temporal scale. The outcomes at the lower levels are also evaluated at the higher levels to assess the degree to which actions on the ground support the objectives and anticipated risk acceptance. For instance, the risk management process at the Strategic level may result in a selected course of action to implement a point protection strategy to protect a series of backcountry cabins scattered across a wilderness area that are predicted to be impacted by the wildfire. Initial efforts to implement this strategy on the ground proved successful when the cabins were located in grass or timber fuels types, but were unsuccessful in two cases where the cabins were located in a brush fuel type. The course of action was reevaluated and altered to implement a suppression strategy on the portion of the fire where several cabins were situated adjacent to brush fuels.

Acceptance of risk at one level may also be altered by rejection of risk at a different level. The evaluation of risk at the national Programmatic level may result in an agency choosing to limit the range of allowable strategies at the Strategic level, or even certain tactics at the Operational level. A chosen strategy at the Strategic level is reassessed at each level as it moves toward implementation on the ground. Unanticipated conditions at a lower level may result in a refusal of the remaining risk, which may push the decision to implement back to a higher level for reconsideration if the risks cannot be mitigated to an acceptable level within the framework of the existing decision. Each level is interconnected and linked to the processes at higher and lower levels.

The Strategic, Planning, Operational, and Time-Sensitive levels comprise "Incident Level" risk management. Additional levels of implementing the Risk Management Process in wildland fire management exist above the Incident level (for example, the Unit, Agency, and Programmatic levels, among others), but these levels are not detailed in this publication. This publication focuses primarily on the Strategic level of incident management decision making, with reference to instances where it ties into the Planning, Operational, and Time-Sensitive levels.

Principles of Risk-Informed Decision Making

Managers must actively frame their decision space based on relevant information, remove as much uncertainty as possible from the situation, and reach an informed and effective decision. Decisions commit resources and define risk mitigation strategies to protect community, cultural and natural resources from damage, and/or contribute to meeting land management objectives. Adequately informed

decisions support better use of resources, reductions in firefighter exposure, and potentially, decreases in firefighting costs. Applying the Risk Management Cycle (as discussed in the next section), at the strategic level rests on four core principles of risk-informed decision making:

- Using a Deliberative Process
- Applying an Iterative Approach
- Making Progressive Decisions
- Applying and Documenting the Best Available Information.

The Deliberative Process

Deliberation is the discussion, reflection, and persuasion to communicate, raise and collectively consider issues, increase understanding, and facilitate substantive decisions (Zimmerman 2011). The root of the word, *deliberate,* also implies intentionality and a carefully considered weighing of the consequences of proposed actions (NRC 1996). In the wildfire decision making process, deliberation involves discovering and evaluating management objectives, concerns, and constraints from various perspectives and disciplines in order to frame the analyses of the risk assessment and gain support for the decision.

Federal Fire Policy

Implementation Actions:

- Ensure that fire management program actions are implemented in collaboration with cooperators and affected partners with due consideration of all management objectives.
- Agencies will engage cooperators and affected partners at the strategic, and program planning levels, as well as the tactical, program implementation level.

Wildfire decisions are inherently complex, and decisions made from a single perspective and single base of knowledge without supplemental input cannot hope to capture and address that complexity. Decision makers should involve those people who provide the best information about:

- Fire behavior and fuel condition,
- Fire effects and resource impacts or benefits,
- Cooperative relationships,
- Firefighter capabilities,
- Any other areas of expertise relevant to the situation.

Deliberation ensures that the perspectives and knowledge of both technical experts and stakeholders are incorporated and addressed in the decision. Deliberation deepens the understanding of participants, captures knowledge from a variety of perspectives, and helps ensure that decisions are successful by reducing blind spots and errors in interpretation.

Deliberation implies an ongoing, iterative process of involvement by key partners in the decision, including scientific and technical experts, agency administrators, and public officials, and other affected parties. It is conceptually the scientific and political peer review of the decision prior to approval by the decision maker(s). The process of deliberation is the primary principle that helps ensure that wildfire decisions are truly and comprehensively risk-informed.

An Iterative Non-Linear Approach to a Linear Process

During the course of an incident, decision makers gather and analyze small pieces of information in order to develop parts of the decision to be incorporated into the whole decision. During this process, decision makers process information back and forth between the first three components of the Risk Management Cycle, leading to the decision. Individual parts of the course of action are proposed, analyzed, accepted or rejected, and, if accepted, added to the proposed course of action. Information and analysis is an ongoing process that affects the decision and its evaluation throughout the life of the incident. The process is dynamic, and although the various phases appear linear, new information can be entered at any phase (GAO 2005). In fact, the only place where the Risk Management Cycle is linear is in the documentation; the information gathered, the analyses, and the course of action is grouped together sequentially in the decision documentation as an organizing framework, although the process leading up to the decision is anything but linear.

The iterative process is a cycle of continuous improvement where the process in being reevaluated as more information becomes available and uncertainty is reduced. The process continually builds upon existing information in an effort to reduce uncertainties and cohesively develop the most effective management response throughout the life of the incident.

Progressive Decision Making

Decisions are scalable over time based on the incident size and complexity. The initial decision may be time-constrained but must consider the breadth of possibilities available for managing the incident. Additionally, the length of time before a new decision with a more detailed course of action or a potentially larger planning area is needed must be balanced with the ability to gather and analyze the information to support the decision within that timeframe.

The length of time before a new decision is needed should be based on predictions or changes in fire activity, and/or obtaining new information that will change the expected outcome of the current decision. As values and risks are identified over time, the fire environment changes or further analysis is completed, mitigations should be identified or other strategies considered to best achieve the incident objectives. Often this may require identifying a progressively larger planning area and approving the course of action and decision multiple times over the life of the incident. This series of decisions is a normal occurrence in the decision making process and should not be viewed as a failure of the earlier versions of the decision.

Progressive decision making is the continual process of staying ahead of the fire, by anticipating where the incident may burn within the decision timeframe, prioritizing the values at risk within that timeframe, and making the best decision based on the information available at the time. As the more immediate incident concerns and threats are addressed and mitigated within the current decision and the fire behavior predictions indicate continued growth, the planning area can be expanded to incorporate larger areas in the subsequent decision.

Applying the Best Available Information

Often wildfire decision making occurs under time-constrained and dynamic circumstances where decision makers must rely on incomplete information and varying degrees of uncertainty. Although the decision and its supporting information may be very simple initially, as progressive decision making and deliberation take place, the supporting information and analyses become more complex and should be commensurate with the scale and complexity of the incident. Timely documentation of the analyses and the decision rationale ensures that decisions are not later evaluated solely from the perspective of outcomes or more complete information that was not available at the time of the decision. Conversely, as decision making progresses, additional information must be continually considered. Information and analyses that informed earlier decisions are likely inadequate to inform later decisions as situations change and analyses become outdated. Documentation of the best available information at the time of the decision and ongoing efforts to validate and complete the situational information are central to the defensibility of the decision and its acceptance by key stakeholders.

The Risk Management Cycle

The broad process of risk management is similar at each of the levels described above; however, the individual components of risk management processes are lumped and split in different ways to address variations in focus and complexity. The risk management processes used at the Planning, Operational and Time-Sensitive levels is found in the *Interagency Standards for Fire and Fire Aviation Operations* (Red Book) (DOI and USDA), the *Wildland Fire and Aviation Program Management and Operations Guide* (Blue Book) (DOI) and in the *Incident Response Pocket Guide* (IRPG) (NWCG). The Red Book describes a five-component Risk Management Process that provides a systematic method for identifying and managing the risks associated with fire operations:

- Establishing situation awareness.
- Identifying hazards and assessing the risk.
- Controlling or eliminating hazards.
- Making decisions based on acceptability of remaining risk.
- Evaluating effectiveness of hazard controls and continuously reevaluating the situation.

For the purposes of the Strategic Level risk management and this publication, we use a six-component process entitled the Risk Management Cycle to define a similar process (figure 2). Again—the Risk Management Process described in the Red Book, the Risk Management Cycle described in this publication for the Strategic level, and other risk management procedures used within and outside the fire management profession share nearly identical concepts, but the individual components (and even the number of components) can vary across users and applications.

Figure 2. Six-Component Risk Management Cycle.

The six components of the Risk Management Cycle are:

- **Situational Awareness**—Collecting information to build an understanding of the situation, the context of the incident, and the decision space for the incident.
- **Assessment**—Analyzing the collected information to identify potential risks and opportunities. The purpose of this step is to use the information collected and analyses performed to generate predictions about short-, near-, and long-term fire spread, intensity, and severity, and associated risks to human health and safety, values of concern, and costs, as well as to identify potential benefits and opportunities.
- **Risk Control**—Developing controls to address identified risks, and opportunities to reduce risk and meet incident objectives. The purpose of this step is to identify potential fire management strategies, tactics, and contingencies to mitigate identified risks and meet incident objectives.
- **Decision**—Validating the effectiveness of the decision and articulating the rationale supporting or rejecting the proposals and alternatives. This step includes acknowledging and accepting the residual risk that remains after all reasonable mitigations have been implemented or planned. Fundamental to the Decision step is the careful weighing of the risk of potential losses against the probability of positive outcomes.

- **Implementation**—Providing direction to carry out the chosen course of action. The direction should include the intent of the chosen course of action, priorities, and specific and achievable objectives, requirements, and expectations.
- **Evaluation**—Periodically reassessing the situation and revising the decision and course of action as needed. This step recognizes the dynamic nature of wildland fire and encourages the decision maker to periodically update their understanding of and response to the fire. This involves reviewing information and analyses, testing assumptions, and validating the course of action in terms of whether the approved course of action meets and will continue to meet the incident objectives.

Each of these components is further explained in Applying the Risk Management Cycle at the Strategic Level.

Federal Fire Policy

Managers will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risk, define implementation actions, and document decisions and rationale for those decisions.

Applying the Risk Management Cycle at the Strategic Level

The next six sections detail the activities and thought processes that occur at each of the six components in the Risk Management Cycle at the Strategic Level. Each component incorporates the four principles of deliberation, iteration, progression, and application of the best available information. The first component, Situational Awareness, starts the Risk Management Cycle at the Strategic Level. The remaining five components generally occur in the order shown in figure 2 (and as described in this publication), however, they may occur concurrently depending on the fire event.

Situational Awareness

Informed, sound risk management decisions require accurate and timely assessment of the fire situation. Accurate assessment depends on gathering, utilizing, and documenting information pertinent and appropriate for the fire and fire area. The Situational Awareness component involves collecting existing information to build an understanding of the situation and the decision space for the incident. It is a size-up of the incident for decision-making purposes based on existing and readily available information about the current situation, and minimal analyses of potential outcomes. The information gathered during this component informs early responses to wildfire, and frames the questions and concerns that form the basis of the next component—assessment—throughout the life of the incident.

Situational Awareness: Collecting existing information to build an understanding of the situation and the decision space for the incident.

The amount of information and degree of detail considered and included in the decision should reflect the complexity, expected duration, and projected size of the fire event. A key consideration in determining the amount of detail to include is the time available to gather the information before a decision must be made and approved by the agency administrator. In applying the Iterative Approach, a minimal amount of information may be available as the basis for the initial decision, but after the initial decision is made and is being implemented, additional information is gathered to validate and reinforce the decision. During this process, information and further analysis may reveal additional opportunities or pitfalls that may indicate that a different response to managing the fire would be more effective. A revised response is planned and approved, and the process continues as more detailed information is evaluated and used to inform the decision. Documentation of the most reliable information available within the timeframe allowed is imperative to provide and support the decision maker's intent for the incident and ensure fire personnel have aligned their actions to support that intent. Information readily available to inform the initial decision and subsequent updates of the situation includes:

- **Basic Incident Information**—Start date and time, map of the start's location, size, cause (if known), and administrative unit is available from the initial report or sizeup.

- **Context**—Jurisdictions, protection responsibilities, and boundaries are available in Fire Management Plans (FMPs) and local GIS offices. The Fire Management Units (FMUs) have defined the opportunities available for responding to wildfire.
- **Values** (national and local data)—Values to be protected should be identified in the Land/Resource Management Plan and/or the local Fire Management Plan(s) for the Fire Management Units affected. This work should be completed pre-season with cooperators.
- **Resource Availability**—National and regional planning levels can be quickly accessed at Geographic Coordination Centers (GACC) websites.
- **Predictive Services Products**—Information is provided at the GACC's websites including products such as the Significant 7-Day Fire Potential, a readily available analysis of fuel dryness and weather conditions indicative of significant fire growth.
- **Zone Weather Forecast**—Zone forecasts and spot weather forecast requests can also be obtained readily and can support decision making.
- **ERC Graphs** –Pocket Cards—readily available to compare the current season to previous years.
- **Fire Behavior Observations**—Responders have useful fire behavior and fuels conditions observations.
- **Fire Behavior Outputs**—Initial fire behavior analysis can provide rough predictions on what can be expected near term, even if calibration and corrections may require more time.
- **Smoke Dispersion**—If smoke is a concern, smoke dispersion websites can be consulted to determine the extent of potential air quality effects.
- **Potential Fire Size**—A review of fire history in the area, (which should be readily available to the unit given postseason assessments and preseason planning), are useful in predicting where the fire may burn, the potential size, and possible fire effects. A comparison of this fire season to others can also be useful in determining relative potential.

Planning Area

The planning area is the geographical area, where analysis and planning take place to manage a wildfire. It is delineated by drawing a polygon on a map of the area where the fire is anticipated to grow. At its most basic, the planning area is the area for which a plan of action is being developed or has been made. It is different from the Maximum Manageable Area (MMA) of the Wildland Fire Implementation Plan in that a planning area is an estimation of where the fire might burn if no action is taken, and not the area within which no action is taken to stop the spread of the fire. The planning area also differs from the Wildland Fire Situation Analysis (WFSA) boundary, as it is not a proposed containment boundary. The planning area simply delineates areas where the fire might burn within the lifespan of the decision, and therefore a plan is made to take the most effective action to meet the objectives of the incident. It is the boundary within which managers prioritize actions based on values, proximity to the fire, and expected resource needs.

The planning area should encompass all proposed management actions. Planning management actions, even contingency actions, outside the planning area exposes the decision makers to the risk of inadvertently devising strategies and actions that are inconsistent with the jurisdictional objectives and constraints applicable to the piece of ground where the action is planned.

There is no set process for developing a planning area. Information that may be considered during the development of the planning area includes:

- Fire behavior and potential fire spread given the time of season, current and expected weather, and seasonal severity. Planning area size should be based on likelihood of fire reaching any point on the planning area perimeter. Fire spread analyses can predict the extent and likelihood a fire may reach points on the landscape. In most cases, a planning area may be overly large when it extends beyond the low probability areas for an extended timeframe (7 to 14 days).
- Values of high concern – Although the probability of the fire reaching the value may be low, the consequences are significant and justify planning an action to address that possibility.
- Time available to develop the plan within the planning area – An overly large planning area may result in the need to bring many more stakeholders and cooperators into the decision process and assess potential consequences to many more values. A planning area that is too small results in a decision with a very short lifespan that may not adequately plan for the rare event of extreme fire growth.
- Other jurisdictions and stakeholders – The potential for early decisions to affect the probability of the fire spreading to other jurisdictions with different management direction and concerns may be grounds for an extended planning area. When conditions and analyses indicate a reasonable likelihood of these jurisdictions being impacted by the fire, it may be useful to include these perspectives and concerns early on in the deliberative process of developing the decision.

Decision makers should strive to draw the planning area well ahead of the fire. This allows for adequate planning and deliberation rather than crisis-driven decision making. If the fire breaches the planning area boundary, the planning area is no longer valid, and decision makers run the risk of taking actions that are not adequately informed or even approved by the appropriate jurisdictions.

Clarifying Questions

Who are the key stakeholders that should be consulted prior to making the decision?

Is the fire predicted to reach other jurisdictions or other land management units?

How many agencies could potentially be involved?

Objectives and Requirements

Objectives represent the single most influential factor in land management program implementation. They are fundamental to successful management to achieve desired land use conditions (USDA Forest Service and USDOI 2005). In wildfire decision making there are multiple types of objectives, depending on the level at which the actions and decisions are taking place and the source of the objective. The following Definitions box defines the types of objectives, and figure 3 depicts their hierarchical relationship to one another. In distinguishing between objectives and requirements, it is helpful to remember that objectives are usually related to desired future conditions, whereas requirements typically define limitations (sideboards) or specifications in achieving those objectives.

The careful development of incident objectives based on the overarching objectives from the local Land/Resource Management Plan (L/RMP) is critical in crafting an effective course of action. The incident objectives represent the primary method of directing subsequent actions on a wildfire incident, and greatly influence the costs, duration, and outcomes of the incident. Effective incident objectives begin with the Land/Resource Management Plan. All land management actions, including wildfire management actions, should be tiered to the Land and Resource Management Plans. Decisions about managing wildfire flow from applicable Land and Resource Management Plans and Fire Management Plans (FMPs), and well-written objectives enable managers to report outcomes in terms of these objectives. Incident objectives should be well defined and articulated by the agency administrator to the incident management team/organization. This ensures that actions and decisions made during planning and implementation are consistent with the decision maker's intent and contribute to achieving the land unit's resource and protection objectives. These objectives should be specific, measurable, achievable, relevant, and trackable (SMART) (Zimmerman 2001).

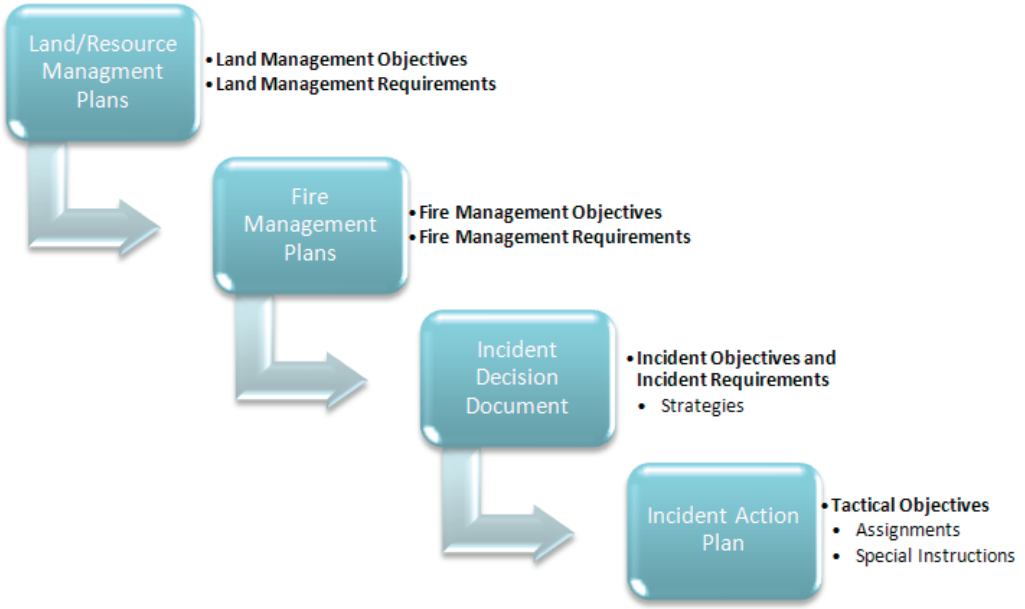

Figure 3. Hierarchical relationship of management objectives.

Definitions: Land Management Planning and Management Objectives

Land Management Plan: A document prepared with public participation and approved by an agency administrator that provides general guidance and direction for land and resource management activities for an administrative area. The L/RMP identifies the need for fire's role in a particular area and for a specific benefit. The objectives in the L/RMP provide the basis for the development of fire management objectives and the fire management program in the designated area.

Land Management Objectives: The objectives set forth in an approved Land Management Plan, Resource Management Plan, Fire Management Plan, or other guiding document that provide the basis for land and resource management in a designated area; often referred to as "Desired Future Conditions." These are broad statements that identify changes in water, soil, air, or vegetation from the present to proposed conditions but can also describe an existing resource condition that should be maintained. Land Management objectives deal with large areas over long time periods and project intended outcomes of management activities that contribute to the maintenance or achievement of desired conditions (Zimmerman 2001).

Land Management Requirements: The requirements set forth in an approved Land Management Plan, Resource Management Plan, Fire Management Plan, or other guiding document that provide the basis for land and resource management in a designated area. Requirements are directives, standards, specifications or constraints that must be complied with when implementing management actions.

Incident Objectives: Incident-specific statements of direction necessary for the selection of strategy(s) and tactical activities of resources on an incident. Incident objectives are derived from land management goals and must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives. Incident objectives reflect the agency administrator's intent in achieving desired outcomes and avoiding undesirable consequences.

There are two general categories of incident objectives:

> **Protection Objectives:** Incident objectives derived from land-management direction to achieve protection of sensitive natural and cultural resources, facilities, and values from negative effects of unwanted fire. These objectives often begin with the phrase, "Protect [insert value] from damage…"
>
> **Resource Benefit Objectives:** Incident objectives derived from land-management direction to achieve positive benefits from the presence of fire in a specific area. These objectives often begin with the phrase "Use fire to [enhance/maintain/promote] [insert resource and desired condition]…"

Incident Requirements: Incident-specific directives, standards, specifications, or constraints that need to be complied with when implementing management actions on a specific fire incident. Incident requirements derive from the Land Management Requirements, legal authorities, or other local influences (for example, county commissioners, air quality boards) that pertain to the incident or its associated actions; they often define the limitations or "sideboards" when implementing the Course of Action or define specifications in implementing actions.

Tactical Objectives: Statements of tactical direction for small, site-specific areas (for example, divisions or branches). Tactical objectives may be limited to short time periods, such as a single operational period (<24hours), but can be extended for multiple operational periods. Tactical objectives can serve as a means for tracking incident accomplishments and workload demand thresholds. Tactical objectives appear on the Incident Command System (ICS) 202 form under "Control Objectives" in the daily Incident Action Plan, and form the basis for daily work assignments on an incident.

Examples

Land Management Objective: Forest improvements such as ranger stations and work centers, patrol cabins, permanent research sites, backcountry barns and corrals, and established outfitter permittee camps are protected from unacceptable damage due to wildfire.

Land Management Requirement: Minimum impact management techniques should be used when managing fire within any of the designated special management areas (Jewel Lake and Sweet Lake Botanical Areas, Elk River Wilderness, and Grey Creek Research Area).

Incident Objective: Protect Sweet Lake Patrol Cabin from damage due to exposure to fire.

Incident Requirement: Use minimum impact management techniques when suppressing fires within the Sweet Lake Botanical Area. Consult with Forest botanist prior to any ground-disturbing activities on sites where unique or sensitive plants exist (riparian areas of Flat and Shallow Creeks).
If it contributes to achieving a desired future condition from the Land/Resource Management Plan or the Fire Management Plan, including the protection of values of concern, it's an objective. If it's something that limits or defines the methods to be employed in meeting the objectives, it's a requirement. Requirements may also be tied to external influences such as environmental laws or local constraints.

Based on their level of experience, decision makers may recognize the incident as similar to others they have encountered in the past, and can hone in on effective incident objectives relatively quickly. Other wildfire incidents may be outside the range of past experience, and further information gathering, consultation, and analysis of the initial incident objectives during the Assessment component may reveal that the incident objectives must be revised in light of more complete information.

Thus, the development of incident objectives is an iterative and deliberative process that may cycle back within the Risk Management Cycle before a final decision is reached. It may be useful to view the initial incident objectives based on the Situational Awareness component as preliminary incident objectives subject to the Assessment step and the development of an acceptable Course of Action. Once the incident objectives and requirements are established, it may be useful to prioritize the objectives as part of the decision to assist the incident management organization when unforeseen conflicts arise between objectives during implementation.

Framing the Decision Space

Agency policy, the unit Land and Resource Management Plans, and Fire Management Plans define what responses can or cannot be taken for a wildland fire start. The document that defines these responses is dependent upon the agency and how the National Environmental Policy Act (NEPA) process was completed. It is critical that these plans are consulted while making wildfire decisions to ensure compliance with unit guidance from the start of the incident. In some places, fire is suppressed at the smallest size possible; in others, fire is managed to achieve land management objectives. In many cases, a single fire may be managed to benefit natural resources as well as to protect values (human-made or natural) that may be harmed by fire. When a fire is burning on multiple jurisdictions, each jurisdiction's plans must be consulted, and the overall objectives of the fire must reflect **each** unit's guidance.

As managers gain situational awareness, and a planning area is identified, they must also consult the appropriate L/RMP(s) to determine the objectives/requirement and define the fire strategy. Figure 4 displays a planning area containing multiple jurisdictions (Agency A and B, and private and state lands). Each jurisdiction involved has specific objectives, requirements and available management strategies. In the example the incident objectives, requirements and strategies may be different for the private and state land than for Agencies A and B, and in this scenario there may even be difference between the two Fire Management Units of Agency A. The strategies chosen during the Risk Control component may be limited by the land management objectives and requirements of each individual unit within the planning area, and it may be necessary to segment the chosen strategies by jurisdiction.

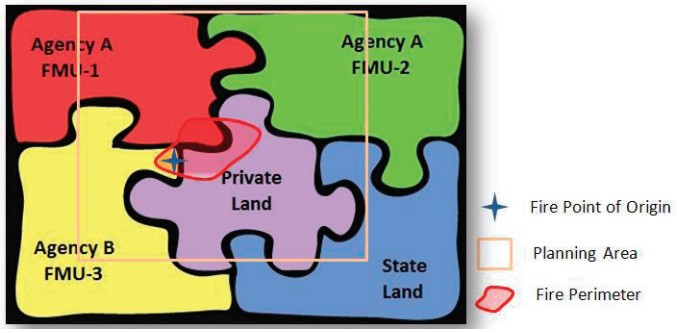

Figure 4. Multiple jurisdiction planning area.

It is critical to understand the decision space and objectives / requirements of each entity affected by the fire, and differentiate in the decision where objectives, requirements, and chosen strategies differ across the planning area.

The Situational Awareness component is not a one-time exercise, but a dynamic, ongoing process throughout the life of the incident. Managers should continually revisit the conditions affecting the incident, and review the situation during the Evaluation component of the Risk Management Process. Information obtained through the Situation Awareness component continues to be incorporated in each step of the wildfire decision making process from Assessment through the Decision and the Evaluation components.

Federal Fire Policy

Guidance for Implementation: A wildland fire may be concurrently managed for one or more objectives and objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance; and involvement of other governmental jurisdictions having different missions and objectives.

How Does the Situational Awareness Component Fit into WFDSS

On the Incidents tab there is access to the Information, Situation, and Objectives sub-tabs that contain information for the Situational Awareness component. **A thorough examination of the information available in conjunction with fireline observations and past experience will quickly provide Situational Awareness information. Information critical to the decision should be captured for documentation.**

Information with an asterisk (*) is auto-captured into the approved decision; all other information requires user action within WFDSS to document in approved decision if desired.

Information Sub-Tab

- Fire Location and Size*
- Cause*
- Jurisdictional Agency(s)*
- Responsible Unit*

Situation Sub-Tab

- Interactive Fire Area Map with selectable base layers (topography)
- Fire Point of Origin
- Incident Information –
  - planning area & values inventory *
  - objective shapes
  - fire perimeters
  - points of interest
  - management action points
- Analysis Information
  - Basic fire behavior
  - Near term fire behavior results
  - Short term fire behavior
  - FSPro results
- Fire Related Information
  - Active MODIS heat indicators
  - RAWS Stations
  - 7 Day Significant Fire Potential Outlook
  - Estimated Ground Evacuation Time
  - Fire Wx Zones
  - Retardant Avoidance Areas
- Disturbance History
  - Historical Wildfires
  - Fuel treatments
- Boundaries
  - Jurisdictional Agency
  - Responsible Agency
  - Federal Admin Areas
  - TNC Lands
  - Counties
  - Landscape Source
- Designated Areas
  - Wilderness
  - Potential Wilderness
  - Special designations
- Infrastructure
  - Facilities
  - Communications
  - Energy
  - Roads and Trails
- Natural & Cultural Resources
  - Air Quality
  - Critical Habitat (T&E)
  - Other Species
- Unit Fire Planning
  - Fire Management Units (FMUs)*
  - Strategic Objective Shapes
  - Unit Shapes
  - Management Requirement Shapes

Info Sub-Tab

- Feature Information
- Fire Danger Rating Graph (ERC Graph)
- Smoke Dispersion Forecast
- Strategic Objectives / Management Requirements
- Current Zone Weather Forecast *
- Predictive Services Significant Fire Potential

Objectives Sub-Tab

- Fire Management Units (FMU)*
- L/RMP Objectives and Requirements ("Strategic Objectives" and "Management Requirements" in WFDSS)*
- Current Incident Objectives and Incident Requirements

More detailed information with technical instruction for using the WFDSS application in the *Situational Awareness* component is available in the WFDSS online help, the WFDSS 101 material located inside the website Training tab, and at www.wfmrda.nwcg.gov/docs/GTR_WFDSS_Links.pdf

Assessment

The Assessment component of the Strategic level risk management is, at a minimum, comprised of a simple (relative) risk assessment. More complex and long duration incidents may require a more detailed (extended) risk assessment as well as a formal analysis of potential benefits of using fire to achieve resource objectives.

Assessment: Analyzing the collected information to identify potential risks and opportunities. The purpose of this component is to use the information collected and analyses performed to generate necessary predictions about short, near and long-term fire growth, and associated risks to human health and safety, values of concern, and costs, as well as identify potential benefits and opportunities.

A risk assessment is the process of identifying values and analyzing the probability that hazards may negatively impact them. In the wildfire decision making process, risk assessment is a summary of information and analyses used to evaluate each of the three components of risk: values, hazard, and probability. For incident-level decision making, the incident planning area defines the physical boundaries of the risk assessment, and the content is driven by the incident objectives and requirements, management concerns, and the time available to complete the analysis for the pending decision. Decisions requiring approval within a short timeframe have less risk information available to inform the decision.

The Relative Risk Assessment Process

Often the initial decision necessary to guide the response to an emerging wildfire is significantly time-constrained. It may be impossible to complete a detailed risk assessment with supporting analyses before resources responding to the fire arrive and are ready to take action. In most cases, the initial responders begin taking action on a fire based on Land Management Plan and Fire Management Plan guidance, as well as pre-season direction given them by the agency administrator. In the absence of agency administrator guidance for a specific fire, their initial actions should also consider fire behavior, fire danger conditions, firefighter and public safety, values that might be threatened, and benefits that could be obtained. Initial response decisions significantly affect decision space for subsequent decisions. For example, if initial response resources automatically suppress a fire that could have been considered for resource objectives, opportunities are lost before the risks and benefits can be evaluated. Conversely, if initial responders choose to monitor a fire rather than suppress in order to obtain resource benefits, and the fire behavior increases beyond beneficial levels, it may be very difficult to quickly shift to a protection-only strategy and avoid significant damages or threats to public safety.

When a wildfire escapes the initial preplanned response, additional assessment and direction from the agency administrator is needed. In the short run, the best available information in these circumstances is a qualitative risk assessment based on the decision makers and local specialists' professional judgment and experience, as well as any preexisting planning information applicable to the situation.

An established tool for this early assessment is available in the Relative Risk Assessment (RRA) process used by Federal agencies as a quick, but comprehensive assessment of the fire incident. The relative risk rating that results from this process is intended to characterize the general magnitude of risks associated with the fire itself at a specific point in time. A relative risk assessment does **not** result in a Go/NoGo output; decision makers must still decide what level of risk is appropriate based on the situation at the time of the decision. The RRA is a required element of Federal fire incident decisions, but may also be useful to non-Federal agencies for succinctly characterizing risks for wildfire incidents.

The Wildland Fire Relative Risk Assessment Chart is shown in figure 5. The process uses the three risk elements: values, hazard, and probability. Each of these components is assessed independently. Then the three outputs are evaluated in a final step to provide the relative risk rating for the fire. As shown in figure 5, each risk element is defined by three variables. One variable is located on the right, one on the left side of the box, and the third variable is defined by three interior lines extending from top to bottom.

> **Values:** Values are those ecologic, social, and economic resources that could be lost or damaged because of a fire. Ecologic values consist of vegetation, wildlife species and their habitat, air and water quality, soil productivity, and other ecologic functions. Social effects can include life, cultural and historical resources, natural resources, artifacts, and sacred sites. Economic values make up things like property and infrastructure, economically valuable natural and cultural resources, recreation, and tourism opportunities.
>
> **Hazard:** The hazard in wildland fire is made up of the conditions under which it occurs and exists, its ability to spread and circulate, the intensity and severity it may present, and its spatial extent.
>
> **Probability:** Probability refers to the likelihood of a fire becoming an active event with potential to adversely affect values.

A current version of the Wildland Fire Relative Risk Assessment and instruction are available in the WFDSS Online Help. Users should exercise their judgment in determining the ratings as the instructions provide both guidance in completion and flexibility in determining exactly what the descriptions mean. Local information can be prepared pre-season to better reflect site-specific situations. See Appendix A for further information.

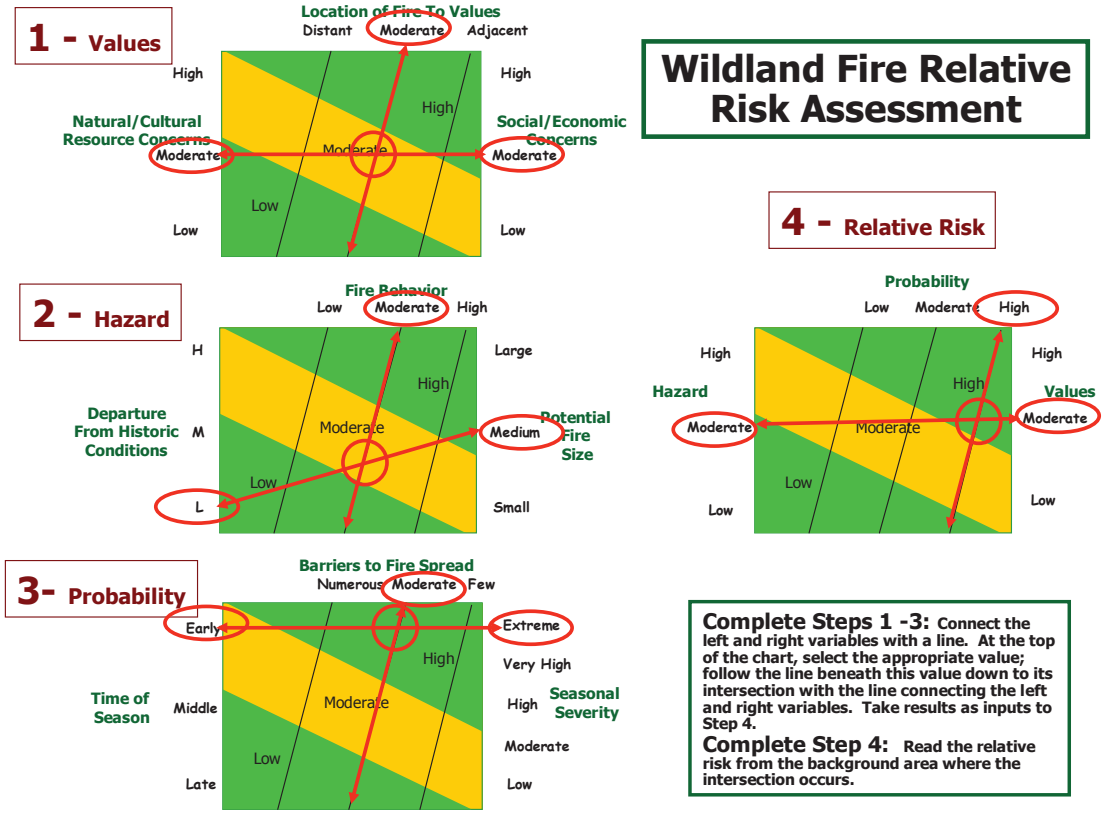

Figure 5. Relative risk assessment chart example.

A critical component in the use of the RRA charts is the documentation of the methods and considerations that led to each of the ratings. Annotations should be added to capture the logic and basis for choosing each qualitative rating in a concise format; more detailed information can be appended if necessary. If preplanning or ongoing planning efforts lead to the development of additional mechanisms for assessing risk, these criteria should be attached to the RRA documentation. The annotations and appended documentation should show careful and consistent application of the rating criteria given in the RRA instructions, or specify and explain intentional deviations from the descriptions and criteria.

The Extended Risk Assessment

During the life of the incident, the RRA is regularly reviewed and updated to ensure its continued validity. In keeping with the progressive decision making and best available information principles of risk-based decisions, the depth and detail of the supporting analyses should increase as the lifespan of the incident increases; the best available information expands and changes over time. An extended risk assessment is still based on the elements of values, hazards, and probabilities, but it provides more detailed and quantitative information derived from specific analyses. Information to consider includes but is not limited to:

- Historic weather data
- Long-term climatological data

- Fuel moisture data
- Fuel conditions
- Fire danger
- Seasonal severity
- Satellite imagery
- Simulation modeling.

While initial information may have adequately supported the initial response to the fire, changing conditions and more in-depth analyses may either validate the effectiveness of the initial direction or indicate that a more effective course of action exists.

There is no standard format for an extended risk assessment. The content of the assessment is framed by the time available to complete the assessment, the anticipated lifespan for the decision, the geographic area of interest surrounding the fire (planning area), and the management concerns and objectives within this area. Tradeoffs between the quality of information and the desired timeframes are often necessary. An assessment completed over 7 days yields more reliable and robust analyses than an assessment done in 1 day, but the assessment that will be available in 7 days is of little use in deciding what actions to take on the fire tomorrow. Assessments are most useful when they are able to:

- Reasonably anticipate risks and their predicted magnitude,
- Articulate a level of uncertainty associated with the limitations of the assessment in a timeframe that allows decision makers to act effectively in advance of the fire's impacts.

The elements of risk (values, hazards, and probability) are useful in organizing the extended assessment. In this process, values are those natural, cultural, and socioeconomic concerns identified within the incident planning area, and the hazards and probabilities refer to the fire and its anticipated effects. Hazards to fire personnel are evaluated separately as part of the selected course of action through daily incident planning as specific tactics are planned and assigned.

Values Inventory: A more detailed assessment of the values affected by the fire incident can be articulated in a Values Inventory. A Values Inventory consists of a listing of all known values to be protected, their ownership, quantity and unit of measure, and location (either as geocoordinates and/or on a map). Additional information might include the probability that the fire will reach the value within a given timeframe, and the predicted responses of the value to the exposure to fire. For example:

- A ponderosa pine stand identified as a timber sale may not incur substantive damage unless flame lengths are greater than 2 ft;
- A high-tension power line supported by metal power poles may be undamaged by flame lengths less than 8 ft;
- A riparian area with an endangered bird species may not withstand exposure to fire of any intensity during nesting season, etc.).

Local resource advisors and specialists can identify and locate values and evaluate consequences of exposure to fire. Potential mitigation strategies can be included, or added when evaluating risk control options during the development of the course of action. A table is useful to organize the values inventory; an example is provided in table 6.

Federal Fire Policy

Management Intent: Values to be protected from and/or enhanced by wildland fire are defined in the L/RMP and/or the Fire Management Plan.

Table 1. Example values inventory table.

Value Identifier	Value Type (Units)	Location	Ownership	Probability / Date	Response to Fire
Lazy Acres Ranch	Structures (11); 3 historic	47 13 06 x 114 50 03	Private	40-60% by 8/3/12	Historic structures susceptible to fire damage; newer structures well-protected by landscaping and resistant building materials
XY Harvest Unit	Commercial Timber (96 acres)	47 26 56 x 114 36 30	Forest Service	20-40% by 8/3/12	Flame lengths less than 2 ft acceptable

Weather and Fire Behavior Analyses: Risk assessment is based on the principles of assessing values, hazard, and probability. The previous section addressed the Values component of the risk assessment. This section covers the Hazard and Probability components in terms of weather and fire behavior. It asks the question - How severe is the hazard, and what is the probability that the value will be exposed to it or damaged by it during the life of this incident?

A discussion of current weather conditions and trends in comparison to historical records provides insight into the relative severity of the current situation, reinforces fire danger indicators, and supports decision making. Initial fire behavior predictions for a short-term assessment are based on short-range, deterministic weather forecasts encompassing 1 to 3 days of predicted weather which is the acknowledged limit of reliable weather forecasts. Longer range assessments of fire behavior must use a probabilistic approach based on climatological records to assess fire spread. This information is available from historical weather records, climatological reviews, research information, wildland fire assessment tools, and National Weather Service archives. Regional climatology summaries and drought assessment products are also readily available through regional Predictive Services websites to support

long-range assessments of fire potential. Examples of information useful for this discussion include, but are not limited to:

- Regional weather trends and patterns
- Area wind patterns
- Historical wind direction analyses
- Climatological probabilities
- Historical length of fire season
- Probability of a season-ending or fire-slowing weather event
- Probability of a large-spread weather event
- Severity of the current season and comparison with other significant fire years
- Seasonal drought outlook
- Precipitation probability over defined time periods
- Review of past precipitation history.

An array of decision making aids is available to support long-term fire behavior assessments; a description of the more common tools and modeling outputs and their uses is available at http://www.wfmrda.nwcg.gov/reference_&_guidance.php. The models range in complexity from the easily configured with readily accessible data usable by fire managers with limited backgrounds in fire behavior modeling, to complex, data-intensive models requiring advanced fire behavior modeling skills and access to high-end computer processors. The choice of technique depends on the information needed and the state of knowledge regarding that subject area. The level of modeling complexity and accuracy also varies with the amount of time available to run the analyses, and may be further limited by data and analyst availability. One of the primary responsibilities of the long-term fire behavior analyst is to determine the appropriate model based on:

- The management concerns to be addressed by the output,
- The time available for the analysis,
- The skill level needed to complete the analysis
- The availability of the necessary data.

Dependent upon the management questions or decision support needed, examples of information and analysis outputs useful in the long-term fire behavior assessment include, but are not limited to:

- Indications of how the fire may burn; predictions of intensity and severity
- Fuel conditions, moisture conditions, departures from average conditions
- Fuels complexes (horizontal/vertical)
- Fuel treatment polygons and recent fire perimeters
- Fire dynamics – indicators of potential rapid escalation in fire behavior
- Analysis and comparison of current fire danger indicators with historical data and trends

- Fire history reviews, records of past fires in terms of area burned and type of fires (i.e., low to moderate intensity, surface fire, stand replacement, etc.), and fire history atlases
- Probability of the fire reaching critical sites and areas of concern
- Indications of where the fire may spread or the total area that may be burned by the fire
- How fast the fire will spread
- How soon the fire may reach critical sites
- Probability of adverse smoke events and dispersal

Clarifying Questions

What are the critical values at risk?

What is the chance the critical values will be impacted, and if so what are the consequences?

What are the possible low probability/high consequence events?

What are the assumptions and limitations of the products supporting the risk assessment, and how do these affect the level of uncertainty in the situation?

These suggestions are neither prescriptive nor exhaustive; the products, analyses, and outputs should be carefully tied to the incident objectives and the specific wildfire situation. Some agencies have specific questions that are required to be addressed in the decision (firefighter exposure, probability of success, alternatives considered, and so forth.). These questions and the analyses used to address them could be included as part of the risk management cycle.

The intention of the risk assessment is to inform and support incident decision making with the best available information focused on specific management concerns and not to compile a comprehensive inventory of incident conditions and predictions. The extended risk assessment information is not a separate entity from the relative risk assessment, nor does it replace the RRA in its entirety. It enriches the information and analyses supporting the relative risk assessment. The Relative Risk Assessment can continue to be used throughout the incident as a summary and organizing framework for the more detailed assessment and to support other elements of the decision. **Users of this risk assessment information should ensure that the ratings applied in the RRA are consistent with the quantitative risk analyses and the criteria for each element defined in the RRA instructions.**

Benefits Analysis

Comprehensive risk management involves weighing the risk of potential losses against the probability of positive outcomes; the cost in terms of risk must be commensurate with the potential to realize benefits. In incident-level decision making, the positive outcomes can be defined in terms of opportunities to achieve land management objectives through the management of fire. Thus, a benefit analysis would analyze the potential effects of fire on values identified in the Land/Resource Management Plan in comparison with the desired future condition of those identified values. Land Management objectives that may be achieved through the use of fire include:

- Maintenance or reestablishment of natural processes and/or natural fire regime.
- Reduction of unnatural accumulations of fuels.
- Creation of plant establishment sites.
- Reestablishment of fire-dependent species (plant and/or animal).
- Enhancement or creation of wildlife habitat.
- Reduction of future fire management costs.
- Increased water yield.

Some of the categories of information and analysis that is useful in determining the potential to realize benefits in the management of a wildfire incident include but are not limited to:

- Historic and natural fire regimes and/or departure from historic range of variability.
- Predictions of the range of potential fire effects on natural and cultural resources.
- Definition of the range of acceptable effects on cultural and natural resources.

The resource benefits accrued by the management of the wildfire incident ultimately must tie to land management objectives through the incident objectives. The Benefit Analysis serves to support the development of the incident objectives. It identifies the conditions under which natural and cultural resources and other values delineated in the L/RMP are enhanced, maintained, or protected by the management of the fire. Benefits to resources not identified in the

Federal Fire Policy

Wildland fire may be used to accomplish a number of resource management purposes, from the reduction of fuel hazards to achieving specific responses from fire-dependent plant species. (1995)

Use of Wildland Fire: Wildland fire will be used to protect, maintain, and enhance resources and, as nearly as possible, be allowed to function in its natural ecological role. Use of fire will be based on L/RMP and associated Fire Management Plans and will follow specific prescriptions contained in operational plans.

Implementation Actions:

- Fire management strategies will consider current landscape conditions and spatial and temporal components of the fire regime.
- Incident objectives will identify resource objectives for wildfires managed to achieve resource objectives.
- Beneficial accomplishments will be measured through specific quantified objectives.

L/RMP may be tangentially accrued during the course of the incident. However, those benefits not identified in management plans may fall outside the scope of the incident's Benefit Analysis. The analysis may also identify conditions under which fire may prove detrimental to the identified values, in which case, a protection strategy is appropriate to prevent damage or loss due to fire.

In most cases there are potential benefits and potential damages associated with any wildfire. Some potential damages may greatly outweigh potential benefits (loss of homes versus improvement in habitat for fire-dependent species.) Careful consideration of risks versus benefits is central to sound risk management. When managing a fire to achieve benefits, managers must also establish protection objectives describing values which could be damaged and what specific action would be taken if conditions change and increase the likelihood that the fire would damage them. Decisions may alter the timing, size, and intensity of wildfire; therefore, sound and successful decision making must be based on knowledge of the area's fire ecology, long-term land management objectives, current fuels, and current fire weather conditions. These factors describe what is ecologically possible and assist in identifying ecological opportunities and risks. Short-term risks should also be weighed against long-term benefits to avoid the transference of risk to future generations of land managers and stakeholders.

Federal Fire Policy

Policy Statement: The full range of fire management activities will be used to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social components.

Management Intent: Decision support process encourages strategies to manage fire to restore and maintain the natural fire regime where safe and possible.

Management Intent: Local protection priorities are established in the L/RMP and/or FMP.

How Does the Assessment Component Fit into WFDSS?

The information and analyses used for the Assessment component is usually a combination of WFDSS-generated products and the products of sources and tools found outside of WFDSS. Information and analyses listed below with an asterisk (*) are auto-captured into the approved decision; all other information listed requires user action within WFDSS to document it in the approved decision if desired.

Relative Risk Assessment (left menu)*

More technical information about completing the RRA is available in the WFDSS online help and the WFDSS 101 material located inside the website Training tab. Or go to the link provided at www.wfmrda.nwcg.gov/docs/GTR_WFDSS_Links.pdf

Analysis Tab

Analyst-assisted Fire Behavior Tools

- Basic Fire Behavior
- Short-Term Fire Behavior (STFB)
- Near-Term Fire Behavior (NTFB)
- FSPro (Fire Spread Probability)
- Values at Risk (as determined by NTFB, FSPro)
-

Incident Tab/Situation Sub-Tab

- See layer information referenced in the Situational Awareness section of the WFDSS online help.
- Much of the information needed for initial completion of the relative risk is found in the situational awareness step.
- Planning Area
- Fire Danger Graph
- Predictive Services Significant Fire Potential
- Air Quality Information

Incident Tab/Decisions Sub-Tab

Additional information may be added to any of the following pages within the decision sub-tab to support the considerations and analysis associated with them.

- Fire Weather Forecast on the Assessment content page*
- Values Inventory (determined by Planning Area) on Assessment content page*
- Results of Relative Risk Assessment on the Validation content page*
- Documentation of what was considered and how risks were mitigated on the Rationale page.

Additional assessment products (for example, from FireFamilyPlus, FlamMap, Predictive Services) can be manually added to “Assessment Content” page of the pending Decision and links to many of those products are located in the left menu>Fire Related Links.

More detailed information with technical instruction for adding these external products to the WFDSS decision content pages can be reviewed in the WFDSS training documents or found on the link provided at www.wfmrda.nwcg.gov/docs/GTR_WFDSS_Links.pdf

Risk Control

Risk has been described throughout this publication as a function of hazards, values, and probabilities. Much as beginning firefighters are taught to control fire by affecting one or more of the three legs of the fire triangle (heat, oxygen, fuel), incident decision makers and planners can control or mitigate the incident-level risk by developing actions to reduce the *hazard*, reduce or accept the *probability* of the hazardous event occurring, and/or protect or remove the *value* of potential losses that could occur from the risk (USDA and USDOI 2005). For example, if an expensive automated sensing station used by a university to gather environmental data is within the planning area, actions to consider for protecting this value include:

Risk Control: Developing controls to address identified risks, and opportunities to reduce risk and meet incident objectives. The purpose of this component is to identify potential fire management strategies, tactics, and contingencies to mitigate identified risks and meet incident objectives.

- Building fireline to prevent the spread of the fire to the sensing station (reduce the probability of fire reaching the value).
- Removing heavy fuels in the area surround the station to limit the intensity to non-damaging levels (reducing the severity of the hazard).
- Wrapping the station with structure wrap (protecting the value), or packing up the station and temporarily relocating it until the fire has passed thereby removing the value at risk within the area impacted by the fire. If fire spread predictions indicate a low probability of the fire reaching the sensing station, managers may also choose to accept the probability, and take no action until conditions change.

Each of these options meets the incident objective to protect the remote sensing instrument station, but they vary in their cost, probability of success, and ability to address other, and often conflicting incident objectives and requirements. This involves developing a course of action comprised of one or more strategies directed at effectively controlling the risk of damage by fire to each of the values identified in the Values Inventory within the framework of the incident objectives and requirements.

Developing the Course of Action

A Course of Action is an overall plan describing the selected strategies and management actions intended to meet incident objectives and requirements based on current and expected conditions. In incident-level decision making, the course of action is comprised of selected strategies and specific actions to achieve the incident objectives while complying with incident requirements. The purpose of the course of action is to adequately mitigate or control the risk to values to be protected, and identify where fire may contribute to meeting land management objectives in those areas where risk can be mitigated to an acceptable level. The components of the course of action are:

- Strategies
- Management Action Points (M.A.P.s)

The course of action should clearly reflect the decision maker's intent, be consistent with the incident objectives and requirements, be cost effective and logistically supportable, and have a reasonable probability of success given the fire environment and resource availability.

Strategies: The nature of risk management involves anticipating and predicting where the fire may move, what it may impact, and designating a strategy or strategies to minimize or eliminate those impacts. Strategies broadly describe a general direction or method to meet incident objectives and requirements. Examples of strategies used on wildfire incidents include full perimeter control/suppression, point protection, confine/contain, and monitoring. These actions are defined below. Because land management objectives, fire environment conditions, and values vary across a landscape, it may be appropriate to select different strategies to apply at geographically distinct locations on a single wildfire incident. The selected strategies should clearly define which fire management strategies should be applied to specific areas of the planning area for the incident to best meet the incident objectives and requirements.

Strategies differ from tactics in that tactics are very specific directions assigned to a specified resource or resources to be implemented at a defined location. For example, Bitterroot Regulars #3 Handcrew will build handline along Hurricane Ridge from the Division A/B break south to the wilderness boundary. Incident-level decisions are most efficient when the decision focuses on strategies that support the decision maker's intent and the incident objectives, while tactical direction must remain flexible and responsive to shorter term changes on the fire that can be accommodated by the incident-level decision approval process and addressed in the Incident Action Plan. Incident management organizations can then respond effectively by implementing tactics that best meet the incident objectives and selected strategies given current conditions on the incident.

Definitions: Strategies and Tactics

Management by Objectives: In ICS, this is a top-down management activity which involves a three-component process to achieve the incident goal. The components are: establishing the incident objectives, selection of appropriate strategy(s) to achieve the objectives; and the tactical direction associated with the selected strategy. Tactical direction includes: selection of tactics, selection of resources, resource assignments and performance monitoring. (NWCG Glossary)

Strategy: The general plan or direction selected to accomplish incident objectives (NWCG Glossary). One or more strategies may be implemented on a single incident. Example strategies include (among others):

> **Monitor:** The systematic process of observing, collecting and recording of fire-related data, particularly with regards to fuels, topography, weather, fire behavior, fire effects, smoke, and fire location for the purpose of determining whether management objectives are being met. Monitoring may be done onsite, from a nearby or distant vantage point in person or using a sensor, or through remote sensing (aircraft or satellite).
>
> **Confine:** Restricting the spread of a wildfire to a defined area, using a combination of natural and constructed barriers that will stop the spread of the fire under the prevailing and forecasted weather conditions until the fire is out. This includes some actions (for example, line construction or bucket drops) to suppress portions of the fire perimeter.
>
> **Point or Zone Protection:** Protecting specific points or areas from the fire while not actively trying to line the entire fire edge. Points or areas being protected may include communities, individual structures, communication sites, areas of high resource or cultural value, etc.
>
> **Full Suppression:** A strategy to "put the fire out" as efficiently and effectively as possible, at the minimum possible acreage, while providing for firefighter and public safety. Synonymous with Full Perimeter Containment and Control. (209 User's Guide, NWCG)

Tactics: Deploying and directing resources on an incident to accomplish the objectives designated by strategy (NWCG Glossary).

Assignments: Tasks given to resources to perform within a given operational period, based upon tactical objectives in the incident action plan. (NWCG Glossary)

Strategies may also include non-fire tasks such as closures, evacuations, management actions to reduce impacts from smoke, or the development of plans to protect specific values such as a structure protection plan for a backcountry patrol cabin, or a public information plan to maintain public support for management direction on the incident. These strategies are the direction from the decision maker to the incident management organization to develop tactics or plans for these actions, rather than the specific tactics to be implemented. The decision maker can develop the most efficient direction by selecting strategies and where they will be applied. This includes specifying conditions when those strategies might have to be reconsidered, lining out any specific mitigations needed, and then letting the incident management organization implement the decision by selecting the appropriate tactics within the framework of the approved objectives, requirements, and strategies.

Clarifying Questions

Will the strategies meet the objectives and comply with the requirements?

Are the chosen strategies the only strategies that will meet the objectives? What other strategies were considered?

Of the strategies considered, which strategies have the best balance between probability of success, firefighter exposure, and desired outcomes?

What are the opportunities to manage the fire to meet land management plan objectives?

Strategies may have to be segmented across an incident if the planning area encompasses multiple jurisdictions with different land management objectives or requirements. For instance, a portion of the planning area may encompass a land management unit that limits responses to wildfire to suppression strategies; this segment of the planning area will have a suppression strategy assigned to it in the course of action. Another portion of this planning area in a different land management unit may be authorized to use wildfire to achieve resource objectives; this segment of the planning area may then have a chosen strategy that allows wildfire to spread into areas where it is predicted to meet resource objectives.

Management Action Points: Management Action Points (M.A.P.s) are dependent on specified conditions being met in the future. For example, whereas Strategies direct the Incident Management Organization (IMO) to take action upon approval of the decision, Management Action Points direct the Incident Management Organization to take an action or actions IF a specified condition occurs. The selected strategy for all or a segment of a wildfire may be to use a Monitoring strategy; a Management Action Point may direct the IMO to switch to a Full Suppression strategy IF monitoring data indicates that the Energy Release Component (ERC) threshold has been exceeded at a specified Remote Automatic Weather Station (RAWS).

In general, M.A.P.s should also focus on strategic direction rather than specific tactical direction. The primary purpose of M.A.P.s is to anticipate conditions that would lead to a reevaluation of strategies; the useful lifespan of the approved decision can be extended by anticipating likely incident scenarios and preplanning

the approved response. M.A.P.s may also be useful in reducing uncertainties in long-range planning. A M.A.P. that preplans the response to fire approaching a historic cabin can alleviate administrator and public concerns and allow incident management organizations ample time to take effective actions. M.A.P.s may also be of use in preplanning contingency actions. In the last two examples of using Management Action Points, the M.A.P.s may begin to incorporate tactical direction. However, these tactical M.A.P.s must be implemented with adequate consideration of existing conditions, which may differ substantially from anticipated conditions when the M.A.P.s were developed.

Management Action Points may be triggered by a spatial, temporal, or environmental condition. Spatial conditions usually define actions to be taken when the fire reaches a specific point or area on the ground (for example, If the fire crosses the Big River…), while temporal triggers define a time to take action (for example, If the fire is still active on August 1…). Environmental conditions may also activate a M.A.P. (for example, If the ERC calculated from the West Fork RAWS exceeds the 90^{th} percentile…). Other common conditions used to activate a M.A.P. include an undesirable fire effect, a sociopolitical issue, or a forecast for a significant change in weather.

Components of an effective M.A.P. include:

- **Intent**—What is the action intended to accomplish? Intent is usually tied to a specific value, and should be related to the incident objectives and/or requirements. Intent is critical to evaluating the recommended actions in the future to ensure that the objective can be met under the current conditions, which may be different than anticipated conditions.
- **Condition**—The spatial, temporal, and/or environmental situation that would activate the M.A.P.; the IF statement.
- **Action**—The planning, coordinating, and/or operational activities expected to be needed to accomplish the intent or objective, if the condition(s) are met. Examples include trail closures, re-evaluation of the selected strategies, ordering a higher level incident management organization, implementing a public information plan, notification of outfitters, cooperators, or administrators, wrapping a patrol cabin, or updating the components of the Risk Assessment.
- **Resources**—The personnel, equipment, and support needed to implement the action.
- **Time**—The amount of time required to implement the action. Time should be coordinated with fire behavior specialists to ensure that adequate time is allowed to implement the action given the predicted fire spread.
- **Cost**—Based on the Resources and Time required, the total cost of implementing the action.
- **Hazards and Mitigations**—Anticipated hazards to personnel in implementing the action with recommended mitigations to be re-evaluated if the proposed action is implemented.

Throughout the management of an incident, all Management Action Points should be updated as needed based on current and predicted fire behavior. When the Conditions of a M.A.P. are met, the Action should be reevaluated based on the current situation to ensure that the Intent will still be met by implementing the Action, and that the Hazards can be mitigated to an acceptable level through the Risk Management Process at the Operational level prior to implementation. Ensure that the Costs and Hazards incurred are commensurate with the Intent and the values protected.

Example Strategy and Management Action Point

Strategy: Keep the fire south of the Sweet Lake Botanical Area.

Management Action Point: If fire crosses north of Flat Creek and becomes established in the Sweet Lake Botanical Area, use point protection to protect Sweet Lake Patrol Cabin. (Intent and Condition; specific actions, resources, time, cost, and hazards associated with the actions would be added to complete the Management Action Point).

Clarifying Questions

Based on predicted fire behavior, does the temporal, spatial, or environmental condition triggering the action allow sufficient implementation time for the actions?

Will adequate resources be available to implement the action? If adequate resources cannot be assured, what will be the contingency action?

If the proposed action involves hazards to firefighters, are mitigations available? Are the costs of the proposed action (including the mitigation of hazards) commensurate with values protected?

Resource Availability and Organizational Needs for the Course of Action

Part of risk control is to determine the required level of support to implement the proposed course of action to meet the incident objectives. Managers must consider local and cooperator capabilities and planning levels when determining what support is needed for the incident. If additional resources are needed from outside the area to implement the course of action, regional and national preparedness must be considered during the decision making process. The best strategies and management actions can be defined, but if the organizational structure cannot implement the strategy, the course of action will not be effective.

The Organizational Needs Assessment (ONA) and/or the Complexity Analysis are used by some Federal agencies to provide guidance on the recommended type (level) of incident management organization based on the expected difficulty of implementing the course of action, the risk assessment, and management concerns. The ONA charts are used in the same manner as the Relative Risk Assessment; the individual elements are rated based on existing relevant information, which should be documented in annotations. The output is intended as a recommendation, and may be overridden by decision makers; the overriding factors should be documented.

Additional positions may also provide technical support for the incident-level Risk Management Cycle, particularly in long-duration incidents (greater than 3 days) that require a more complex risk assessment and course of action. These support positions include:

- Strategic Operational Planner (SOPL) – A SOPL is an NWCG position skilled in applying risk assessment products to the development of complex courses of action, employing the full spectrum of fire management strategies to achieve land management objectives. SOPLs are most effective when paired with a Long-Term Fire Behavior Analyst to produce the fire behavior, climatology, and fire effects components of the risk assessment and benefit analysis.
- Long-Term Fire Behavior Analyst (LTAN) – A LTAN is critical in predicting the potential area and extent of burning, assessing long-term risk, and validating the planning area. LTANs also predict the potential for a fire will reach certain values that may be threatened over the long term and the potential timing of a fire-ending event.

These positions enable robust analysis and evaluation of strategic alternatives and opportunities to best meet incident objectives with consideration of costs and firefighter exposure.

Federal Fire Policy

Implementation Actions: Agencies will exploit the full range of fire management options to sustain healthy ecosystems within acceptable risk levels as identified in the L/RMP, or Fire Management Plan.

Cost Estimation

Cost estimates developed for the course of action are projections of expenditures expected to be incurred during implementation over the predicted duration of the fire based on the course of action. These estimates include both costs expended-to-date and projections into the future. These estimated incident costs are developed from staff input, based on identified management actions and resources needed. The costs of all individual Management Action Points is not typically added into the cost estimate for the incident, as the implementation of the M.A.P.s is by definition conditional, and it is unlikely that all M.A.P.s would be activated. Cost estimates for the incident should be based on the most probable scenario which may include some M.A.P.s that are likely to be implemented and updated as necessary as the incident progresses.

A tool to assist with cost estimation for large fires (greater than 300 acres) is Stratified Cost Index (SCI) module. The SCI uses expenditure data from past fires to estimate expected costs per acre based on fires with similar geospatial characteristics and final burned area. Managers can enter potential fire sizes to calibrate the cost estimates to current conditions. SCI estimates can be used to compare cost trajectories to historical norms, analyze the cost consequences of different fire growth scenarios, and aid in early detection of incidents that have the potential for high costs.

Federal Fire Policy

Guiding Principles: Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives. Federal agency administrators are adjusting and reorganizing programs to reduce costs and increase efficiencies. As part of this process, investments in fire management activities must be evaluated against other agency programs in order to effectively accomplish the overall mission, set short- and long-term priorities, and clarify management accountability.

Policy Statement (Suppression): Wildland fires are suppressed at minimum cost, considering firefighter and public safety, benefits, and values to be protected, consistent with resource objectives.

Management Intent: Notwithstanding protection of life, the cost of suppression, emergency stabilization and rehabilitation must be commensurate with values to be protected.

For many agencies, the cost estimate is an indicator of the level of approval required for the strategic decision. Therefore, the cost estimate should be updated as the incident progresses to ensure that the required level of approval has been documented for the decision. Escalations in fire behavior and/or complexity may significantly change cost estimates and require approval of a new decision at a higher organization level.

Clarifying Questions

Are the costs of the course of action commensurate with the values at risk?

Is the stratified cost index indicating this fire will cost more than the median fire cost for a similar fire?

Are there opportunities to control costs by choosing a different strategy?

How Does the Risk Control Component Fit into WFDSS?

The Risk Control component is incorporated primarily in the Course of Action sub-tab in WFDSS although documentation of considerations may be documented throughout WFDSS (see WFDSS Assessment). There are three components to the Course of Action: **Action Items**, **Management Action Points**, and **Estimated Costs**; at least one Action Item and an estimated cost is required for an approved decision. Management Action Points and the Organizational Needs Assessment are optional and located in the lefthand menu. Information listed below with an asterisk (*) is auto-captured into the approved decision; all other information requires user action within WFDSS to document in approved decision if desired.

Course of Action tab

- Action Items* - Action Items are statements that describe the strategy(s), priorities, and management actions for accomplishing incident objectives and requirements (see Strategies).
- Estimated Cost* - Costs may be estimated within WFDSS using the Stratified Cost Index (lefthand menu) or the downloadable spreadsheet, or outside of WFDSS using historic costs, the ICARS/ISUITE programs or other cost tools.

Management Action Points*

The Management Action Points entry screen is accessed from the left hand menu>Mgmt Action Points. Each M.A.P. is required to have the Condition and Action elements entered; other elements listed in the Management Action Point subsection can be entered into the existing text boxes as appropriate.

Organizational Needs Assessment*

The Organizational Needs Assessment is accessed from the left hand menu>Organizational Needs. Additional resource needs for the implementation of the Course of Action are determined outside of WFDSS; the National Preparedness Level is displayed in the WFDSS title bar as an aid in determining general resource availability.

Stratified Cost Index

The Stratified Cost Index is accessed from the left menu > Stratified Costs Index. The SCI tool provides two key features to aid in estimating costs. First, users can specify up to four different potential fire sizes to estimate a range of costs based on different fire growth scenarios. These fire sizes could encompass the current burned acreage (if more than 300 acres, the minimum size for SCI estimates to be valid), the most likely expected final fire size, and a worst case scenario of final fire size. If conditions change, a new SCI analysis can provide updated estimates of cost per acre based on a new range of expected final fire sizes.

A second feature is the range of estimated costs per acre reported for a given fire size, based on the historical likelihood of each estimate occurring. This range includes the costs per acre at the 25th percentile, 50th percentile (the median-cost fire), 75th percentile, and 90th percentile level. Each level represents the percent of past fires with similar characteristics that had costs per acre less than the reported estimate. For example, the 90th percentile estimate indicates that 90 percent of similar fires had lower costs per acre than the given SCI estimate. Selecting the appropriate cost per acre estimate depends on incident complexity and risk potential. A cost per acre estimate within the higher range of the SCI may be appropriate if a fire's high risk potential provides a clear justification for unusually high costs.

More detailed information with technical instruction for using the WFDSS application for the *Risk Control* component is available in the WFDSS online help, the WFDSS 101 material located inside the website Training tab, and at www.wfmrda.nwcg.gov/docs/GTR_WFDSS_Links.pdf

Decision

Upon completion of the analysis and deliberation process, a decision must be made and documented, defining the:

- Situation
- Assessment
- Objectives
- Course of action
- Cost for the incident
- Rationale.

Decision: Validating the effectiveness of the course of action and articulating the rationale supporting or rejecting the decision. This component includes acknowledging and accepting the residual risk that remains after all reasonable mitigations have been implemented or planned.

There are times when an initial decision must be made even though the information on the situation may be limited. When additional information can be obtained, the initial decision can be updated. Incident documentation on low complexity, short-duration fires is far less detailed than high complexity or longer duration fires. Documenting the thought process (how professional judgment was used based on information that was available at the time)is critical to justify incident responses.

Rationale for the Decision

Risk-informed decisions must tie the course of action to incident objectives and requirements by explaining why the proposed actions are likely to achieve strategic land management objectives and the fire-specific incident objectives. Decision rationale should illustrate the tradeoffs being made; for example, firefighter exposure against potential change in fire size, given the planned tactical actions. Identify stakeholders, cooperators, and neighbors who have a vested interest in the fire decision, their values at risk, and their support or lack thereof for the course of action.

Consider explaining if appropriate:

- Why were the incident objectives and course of action selected?
  - ✓ The cause of the fire and how this influenced the decision.
  - ✓ If alternatives were compared, what were they and why was this one selected?
  - ✓ The potential benefits of the fire versus risk of losses – ecological conditions of fire-dependent ecosystems
  - ✓ What opportunities exist to meet Land and Resource Management Plan objectives?
  - ✓ What is the likelihood of success associated with the incident objectives and course of action compared to alternatives?
- What are the causes and influences on the incident?
  - ✓ The social and political concerns and pressures
    - Public safety
    - Private property values at risk

- ✓ The stakeholders consulted before making a decision
- ✓ Smoke and air quality concerns

- What did the Relative Risk Assessment or extended relative risk assessment identify?
  - ✓ The likelihood a critical value will be impacted and the consequences
  - ✓ The possible low-probability and high-consequence events
  - ✓ Acceptance of residual risk – given the residual risks and the necessary mitigations, are the benefits worth the risk?
- What considerations were made to minimize exposure to responders?
  - ✓ Firefighter exposure versus achieving objectives
- What information was used to support the decision?
  - ✓ Fire danger, fire behavior models, assessment information, and so forth.
- How was the cost estimate completed?
  - ✓ What are the costs versus benefits for the fire?
  - ✓ What additional costs were incurred to mitigate risks to values and responders?
- What are the critical thresholds that will trigger reconsideration of the decision, and how will they be monitored?

The litmus test for a good rationale is whether someone can read it and clearly communicate what decisions were made and why to others such as agency personnel, fire personnel, and the public.

Approval

After the decision making process and documentation is complete, a determination must be made as to what level of approval is required and how to obtain that approval. Agency guidance dictates the level of scrutiny needed for the incident decision. Although agency guidance exists, the fire perimeter and planning area should be used as considerations in determining who should approve the decision document. Units affected or likely to be affected by the fire should formally approve the decision.

Communication of the approved decision is critical at all levels (leadership, cooperators, the public, internal audiences) to garner long-term support for the incident.

Clarifying Questions

What is my decision and how do I articulate the process and considerations in the rationale?

What information am I relying on in making this decision? How reliable is it? What are the uncertainties?

Given conflicting objectives and requirements, what were the priorities in making this decision, and are they articulated?

How Does the Decision Component Fit into WFDSS?

Every decision in WFDSS (original and updated) requires **Validation**, **Rationale** and **Approval** in order to be published. Following these steps sequentially for each decision assists in establishing an efficient decision approval process. The Decision Review step is optional, and occurs prior to the Approval, if needed.

Validation Sub-Tab

This section is used to verify that the proposed COA is achievable and meets the documented objectives. **Validation** comments can be as simple as a statement supporting the COA, or a paragraph describing the verification in more detail, depending on what is appropriate for the complexity of course of action. At least one validation is required for a decision, but multiple validation are permitted. For multiple agency decisions, it may be useful to have the Authors of the Course of Action validate it to indicate to their agency administrator that they have completed the process, and agree that all applicable aspects of the COA are consistent with their agency's interests and objectives.

Decision Sub-Tab

- **Rationale**
  The Rationale describes what information, analyses and factors were considered in the decision. The Rationale entered in narrative form on the Rationale content page of the pending decision; images may be added to support the narrative.
- **Decision Review** (optional)
  Approvers can designate one or more Decision Reviewers if desired. Reviewers are usually agency advisors or partners whose documented acceptance of the pending decision is desired by the approver(s).
- **Approval**
  Approval of the pending decision is required of all agency administrators legally responsible for the management of the fire. Comments from the Approver(s) are not allowed if the pending decision is "Approved, but are required if the pending decision is "Rejected." Rejection by any one of multiple approvers will automatically begin a new decision process.

More detailed information with technical instruction for developing decisions using the WFDSS application are found in the WFDSS 101 Lessons (16-19), located on the WFDSS website in the Training tab, in the WFDSS online help, and at www.wfmrda.nwcg.gov/docs/GTR_WFDSS_Links.pdf.

Implementation

Once the decision is approved, the course of action is implemented by the incident management organization. If additional support is needed to manage the incident, it is critical that the information contained in the approved decision be clearly relayed in written format to the incoming organization. Most fire management agencies use a Delegation of Authority as legal direction from an agency administrator to an incident commander to manage the incident and implement the course of action.

Implementation: Providing direction to carry out the chosen course of action. The direction should include the intent of the chosen course of action, priorities, and specific and achievable objectives, requirements, and expectations.

Delegation of Authority

Incident objectives, incident requirements, and the course of action from the Decision are used to frame the Delegation of Authority. This direction for implementation should contain the following to ensure that the results of the risk-informed decision process are clearly understood and implemented as approved:

- **Incident objectives**: The incident objectives should match those contained in the approved decision document. These objectives are tied to Land and Resource Management Plan objectives and should be flexible enough to allow for tactical alternatives to meet the objectives.
- **Incident requirements**: The incident requirements should match those contained in the approved decision document. These requirements define specific constraints and specifications which may affect tactical alternatives.
- **Approved course of action**: The course of action should match the course of action contained in the approved decision, and may be included by reference to allow for changes as the course of action is updated.
- **Priorities**: Explicit priorities assist the incident management organization in ranking the importance of objectives and values at risk in time-constrained situations when objectives may come into conflict or values must be triaged.
- **Expectations**: Expectations include more universal requirements that have no influence on the course of action or choice of tactics, such as the establishment of a non-discriminatory work environment, or participation in periodic during-action reviews.

Individual agencies may have additional requirements and direction for the Delegation of Authority.

Federal Fire Policy

Policy Statement: The protection of human life is the single, overriding priority. Setting priorities among protecting human communities and community infrastructure, other property and improvements, and natural and cultural resources will be done based on the values to be protected, human health and safety, and the costs of protection. Once people have been committed to an incident, these human resources become the highest value to be protected.

Implementation Actions: The Agency Administrator will convey protection priorities, based on the L/RMP and FMP, to the geographic and national groups through an incident status report and ensure that protection priorities are known and carried out by the incident commander(s).

Implementation of the Course of Action

The approved strategies become the basis for planning specific tactical direction and making assignments to incident resources. The planned actions are then progressively evaluated at the Planning, Operational, and Time-Sensitive levels of the risk management process. Hazards to firefighters associated with specific assignments are assessed and mitigated, and the residual risks are either accepted or rejected. If an acceptable tactical plan can be developed within the framework of the approved course of action, the decision is implemented. If at any time the incident management organization finds they can no longer adequately mitigate the risks involved in implementing the approved course of action, the risk management process is elevated back to the Strategic level, and a new decision with a revised course of action is developed.

During the implementation of the course of action, Management Action Points may be activated as the defined conditions are met. At this point, the actions associated with the M.A.P. are evaluated by the incident management organization. Evaluation ensures that the actions are viable, effective, and acceptable as conditions may have changed substantially from the predicted conditions when the M.A.P. was created. After evaluation the following may be considered:

- Accept and incorporate into the planned actions for the incident. For example, migrate to the Incident Action Plan.
- Revise as appropriate to conditions and incorporate into the planned actions.
- Reject under current conditions.

The date when the M.A.P. conditions were met; the decision to implement, revise, or reject the recommended actions; and the actions taken (if any) should be captured in incident documentation.

Based on incident objectives and requirements, the course of action and activities surrounding it should be monitored and evaluated. This process is part of the evaluation component of the risk management cycle.

How Does the *Implementation* Step Fit into WFDSS?

The Delegation of Authority is a stand-alone legal document and is not contained in the WFDSS decision; however, the DoA should be strongly tied to and consistent with the approved WFDSS decision.

- **Incident Objectives** and **Incident Requirements** should match in both the approved WFDSS decision and the Delegation of Authority
- The **Course of Action** in WFDSS may be included in the DoA by reference.
- WFDSS does not have a designated place for **Priorities**, but a statement of priorities can be documented as a separate Action Item in the Course of Action Sub-Tab.
- **Expectations** are critical components of the DoA, but do not affect the Course of Action or approved Decision, and are not generally contained in WFDSS.

The implementation of Management Action Points is documented in WFDSS. When an M.A.P. is reached, the incident management organization evaluates the current situation, and determines if the proposed actions will meet the objectives and intent; the actions are then implemented, revised or rejected. These decisions and actions can be documented in the "Annotation" section of the Management Action Point. [For technical instruction, search "Annotating a Management Action Point" in WFDSS Help].

Evaluation

After a decision is made and signed, periodic review of that decision is critical to the success of the incident. The timing and extent of that review will be dependent upon the activity and complexity of the incident.

Evaluation: Periodically reassess the situation, and revise the decision and course of action as needed. This component recognizes the dynamic nature of a wildland fire and encourages the decision maker to periodically update their understanding of, and response to, the fire. This involves reviewing information and analyses, testing assumptions, and validating the course of action in terms of whether the approved course of action meets and continues to meet the incident objectives.

Periodic Assessment

The Periodic Assessment is a process for recurring review of the current fire situation to evaluate the effectiveness of the chosen course of action in meeting the incident objectives. This process documents and ensures management accountability throughout the duration of the incident.

Establishing a timeframe for completing the Periodic Assessment should be determined based on the incident complexity and activity. Complex fire in which the environment is changing rapidly should be reassessed on a routine (daily) basis, whereas fires that are inactive would require documentation less frequently. Although this formal documentation may be taking place on a less frequent basis, managers should not be complacent about monitoring the fire and updating the documentation as needed.

An agency administrator or a delegated individual must periodically affirm the capability to continue managing a wildfire under the current course of action and to recognize any changed condition(s) that might require modifying or changing the original decision. This process ensures management accountability throughout the duration of the wildfire. Manager should take time to document what was considered in validating the decision by briefly explaining current conditions, issues, concerns, and progress made.

The Periodic Fire Assessment is completed on a set schedule. The agency administrator, through consultation with the fire management staff, establishes the criteria and timeframe for when a periodic assessment must occur. Such criteria might include:

- Current fire behavior such as a significant increase in fire activity (location, intensity, spread, acreage increase or fire effects.)
- Time of year.
- Expected fire behavior and fire growth.
- Presence of significant social or political issues.

Review of a decision or changes in the situation may warrant a new decision or reevaluation of information. Such criteria may include, but certainly is not limited to:

- Change in significant social or political issues.

- A weather forecast for increasing spread and intensity of the wildfire, changes in fuel conditions, fire effects, or seasonal ERC conditions.
- Changes in fire activity or anticipated changes in Geographic and National Planning levels; changes in Regional prioritizations, changes in Local or Regional resource capabilities.
- Updated Relative Risk Assessment may reveal any relative change in the risk that should be considered for possible modifications of the decision for the fire.
- Updating the Organizational Needs Assessment that indicates the current management organization is still viable or if ramping up or down the managerial oversight is required.

Clarifying Questions

Is the wildfire continuing to meet the strategic objectives, management requirements, incident objectives, and incident requirements?

Has the Relative Risk Assessment changed (higher or lower), which would alert the agency administrator to change or modify the current strategy or decision?

Is the risk still commensurate with the potential benefits?

Is the fire expected to burn outside the current Planning Area?

Is the fire behavior modeling completed consistent with the current fire behavior, spread, and intensity that is being observed on the wildfire? Have any of the fire behavior or weather prediction products expired?

Has the intensity and spread of the wildfire exceeded the original assumptions and risk assessment expectations?

Have any of the M.A.P.s been breached or threatened since the last Periodic Assessment? If so, were they implemented effectively and documented? Have new M.A.P.s been developed?

Is there other proximate fire activity that may influence the safety of firefighters and/or the public and/or influence the intensity and spread of the wildfire the agency administrator is assessing?

Are there any other factors or issues that may influence the original decision on the wildfire, which would change or require the decision to be modified?

Is the current management organization adequate or is span of control exceeded?

Is the estimated initial overall cost of the wildfire exceeded by current estimates due to an increase in wildfire activity and complexity?

Monitoring

Definitions: Monitoring

Monitoring is the systematic process of observing, collecting and recording of fire-related data, particularly with regards to fuels, topography, weather, fire behavior, fire effects, smoke, and fire location for the purpose of determining whether management objectives are being met.

The term monitoring is used both to refer to a specific defined strategy as well as an evaluation tactic employed by assigned resources. Monitoring as a strategy may not and should not be used on every fire incident. Monitoring as a strategy is tied to resource objectives, (which may or may not be used on a fire incident), depending upon the L/RMP, and/or the conditions of the fire environment. Monitoring as a tactic should occur on every fire incident; it forms the basis for evaluating whether any incident objective (protection or resource) is being achieved.

Whether used as a strategy or an evaluation tactic, the definition remains the same. Monitoring is the systematic process of observing, collecting and recording of fire-related data, particularly with regards to fuels, topography, weather, fire behavior, fire effects, smoke, and fire location for the purpose of determining whether management objectives are being met. By definition, monitoring must be tied to specific, measurable objectives or requirements. Used properly as a strategy, monitoring the fire should specify what objectives the incident is expected to achieve. As an evaluation tactic, monitoring data from resources assigned to monitor as well as other line resources, resource advisors, remote sensing, and other sources should be incorporated into the Periodic Assessment to determine whether incident objectives and requirements are being met or can be expected to be met. In either case, if objectives are not being met, the course of action must be reevaluated to determine its effectiveness in light of other alternative courses of action.

Monitoring is useful for documenting:

- Observed fire weather,
- Observed fire behavior,
- Fire movement toward Management Action Points,
- Fire effects,
- Smoke dispersal and volume,
- Validating fire behavior and weather forecasts.

Monitoring variables that are important can include, but are not limited to:

- Smoke dispersal
- Live and dead fuel moistures
- Daily weather observations
- Fire perimeter and progression mapping
- Observed fire behavior.

Monitoring frequency is based on fire activity and location. A written monitoring plan may be useful when monitoring is used as a long-term strategy to ensure that objectives continue to be achieved as conditions change. The monitoring plan should explicitly tie the monitoring to be accomplished to specific incident objectives and requirements. All monitoring information acquired should be analyzed, applied as needed, and archived as part of the final documentation package.

Clarifying Questions

What are the critical thresholds that will trigger reconsideration of the proposed actions, and how will they be monitored?

How Does the Evaluation Component Fit into WFDSS?

WFDSS incorporates the Evaluation component in the Periodic Assessment sub-tab for the incident. The decision approver(s) can select the minimum number of days between required Periodic Assessments, but the Periodic Assessments can take place as often as desired, regardless of the set interval, and multiple Periodic Assessments are allowed at any interval. The approver(s) (or their designees) have two inputs to the Periodic Assessment: the validation question and the Comments.

Periodic Assessment Sub-Tab

- Are the Incident and Strategic Objectives being satisfied with the current Course of Action? (Yes or No radio buttons)
- Comments

  The person completing the Periodic Assessment has the opportunity to enter information in the Comments box. The Comments will appear in the Incident History. A primary purpose for the comments is to source the basis for the validation (Why does the decision maker believe that the Course of Action is or is not meeting the objectives?) Monitoring data, fireline observation, fire behavior predictions, weather forecasts and other updates to the assessment products, as well as socio-political concerns and other factors can be cited. Comments are required if the validation question is answered "No," which will automatically begin a new decision process.

The Periodic Assessment process is an opportune time to revisit the Relative Risk Assessment, the Organizational Needs Assessment, and the risk assessment products to verify they are still current. Fire behavior and weather analyses expire quickly, and must be diligently updated to remain valid as a basis for decisions.

More detailed information and technical instruction for using the WFDSS application for the *Evaluation* component is available in the WFDSS online help help, the WFDSS 101 material located inside the website Training tab, and at www.wfmrda.nwcg.gov/docs/GTR_WFDSS_Links.pdf

Post-Incident Evaluation

Post-incident evaluation is important to ensure that changes brought about by a wildland fire, both beneficial effects and damage, are documented, quantified, mapped, and integrated into next season's planning efforts. Evaluating the response to a fire is critical to the unit's success in managing future fires and continually improving their wildland fire operations.

The process of collecting data and information to determine if goals and objectives are being met, both incident and programmatically, are used as an adaptive management process for planned and unplanned actions to improve overall program effectiveness.

Depending on the type of incident, information can be derived from aerial reconnaissance, photography, permanent or temporary data plots, onsite fire behavior assessment, weather and fuel assessment, burn severity mapping, and fuel loading calculations. Results from this evaluation can be shared with inter- and intra-agency partners.

Specific evaluation may include:

- Mapping fire severity to assist managers in documenting vegetation changes. Mapping is completed post-fire using satellite imagery and on the ground to determine the areas burned and severity.
- Reviewing impacts of fire exclusion on fuel loading and landscape diversity.
- Analyzing burn severity within previously treated areas to determine fuel treatment effectiveness and whether increased protection of wildland urban interface zones is warranted.
- Finalizing fire area maps for future planning and updating fire history layer. Based on the burn severity there may be a different map used to show vegetation changes versus the boundary of the fire.
- Evaluating the degree of accomplishment of stated objectives and desired fire effects.

Reviewing and evaluating the operational aspects of the fire from initial response through management of the incident should be conducted, as this self-evaluation reveals potential issues and assists the unit in continually improving the program.

Areas that may be evaluated include, but are not limited to:

- Initial dispatch and response
- Management and mitigation of safety
- Use of best available science to inform and support the decision (weather, fire history, fire behavior forecasts, risk assessment information, fire growth simulations)
- Monitoring fire effects where appropriate to inform actions
- Public and unit information dissemination and education

- Consistency with the land, resource, and fire management plans
- Attention to and mitigation of resource issues and concerns
- Performance of incident management organization and support positions

Though we often think of the Incident Management Team closeout as the ritual conclusion of an incident, all those who work on a host unit know that much of the significant work is just beginning. How we end an incident (the degree to which we assess and reflect on the incident objectives, planning, implementation, and communication activities), determines how much we learn and can carry forward into the next year, the next season, and the new social and ecological landscape created by the fire.

Conclusion

As noted in the Introduction, the skillful management of firefighter safety, costs, community impacts, ecological consequences, and political pressures in wildfire incidents requires sound, defensible decisions based on reliable information and analyses. It also requires detailed documentation of the bases for the decision in a clear, comprehensible format. Unfortunately, a good decision cannot guarantee a good outcome. The dynamic nature of the fire environment, the limits of prediction models, and the inherently hazardous nature of wildfire management activities can result in bad outcomes in spite of the best efforts of fire managers and decision makers. The quality of a decision can only be evaluated on the basis of the decision maker's alternatives, information, values, and logic at the time the decision was made. Using the principles of risk-based decision making (deliberation, iteration, progressive decisions, and best available information), as detailed in this publication will result in better informed, transparent decisions that reflect the intent and diligence of the decision maker.

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Appendix A: Preplanning for Wildland Decision Making

To reduce uncertainties in making decisions during an emerging wildfire, units should compile critical supporting information during pre-season planning efforts. Preplanning in advance of a wildfire allows agency administrators the opportunity to make informed, timely and sound risk management decisions using the best available information.

An emerging wildfire can change in complexity rapidly and requires rapid assimilation of a tremendous amount of information. The ability to quickly access relevant information allows decision makers to focus attention on assessing benefits / risks and management options, instead of trying to make decisions while information is still being acquired. Compiling critical decision-making information reduces stress, facilitates better decisions and reduces uncertainties.

Pre-season planning should include identifying and gathering information that agency administrators, fire managers, resource staff, think is important to consider in making informed wildfire decisions. Place this information in a readily accessible location and communicate its location to appropriate staff.

The information collected varies from unit to unit depending on the various issues, past fire history, and changing conditions on that unit. Examples of the types of information that can be collected and documented are numerous, but may include strategic direction, values assessment, requirement and management action points, and miscellaneous incident support information. Additionally interagency coordination, internal/external communication and pre-season exercises should be completed.

Objectives & Requirements

Strategic objectives for wildfires are derived from Land Management Plan/Resource Management Plans and implemented through operating or response guides. Agency administrator and fire managers use this to determine the impacts to other resource areas from wildfire in the development of incident management objectives and requirements as well as direction for the delegation of authority. Review the information in this guide about objectives and requirements at for more explanation.

Although wildfire specific incident objectives are typically completed at the time of the incident, in some cases, incident objectives or requirements can be pre-identified.

Values Assessment

Fire poses short and long-term opportunities and risks. At different intensities fire may have both positive and negative impacts and understanding these various conditions can be time consuming; therefore preseason assessment is invaluable. Develop a common understanding of values to be protected by answering three questions:

- What is important?
- Why is it important
- How important is it?

Review the information about values inventory in this document to determine what information to consider.

Describe those individual values at risk by category and the protection measures that would be used to protect them to reduce or eliminate the risk during the management of a wildfire. Some examples of values to identify are:

- Areas where fire naturally played a role in restoring and maintaining fire-adapted ecosystems, and can assist in meeting long-term LRMP objectives
- Sensitive sites and Areas of Special Interest such as; Research Natural Areas, Recreation Sites, Botanical areas, Threatened & Endangered species habitat, Sensitive Plant sites, anadromous fisheries etc
- Critical infrastructure and private property: private land and structures, communities & other populated places,
- Historic/Cultural sites, structures and trails, bridges, trailheads, boat launches, campgrounds, powerline/gas line, utility corridors
- State Lands (Timbered, State Wildlife Management Areas, and so forth.)
- Smoke sensitive areas
- Potential evacuation needs, routes and responsibilities
- Any other values that are not included in this list identified by the local unit

Management Action Points

After the objectives, requirements, and values information have been identified, the unit can begin to develop appropriate fire management measures to reduce the risk of loss and optimize resource benefit opportunities. These measures can be captured in management action points (M.A.P.s) that can be geospatially referenced.

Examples of requirements that will assist in meeting LRMP objectives may include:

- Defining the fuel moisture values, ERC's, etc. for meeting desired conditions
- Determining the time of year fire may be allowed
- Considering and communicating public tolerance of and mitigations for a wildfire or its smoke in proximity to a value

Pre-identifying M.A.P.s to either protect values or allow beneficial fire on the landscape can be advantageous to the agency administrator in considering options for managing a wildfire.

- Identify and document management action points that have previously been effective.
- Document M.A.P.s associated with values and discuss management options and protection responsibilities with cooperating agencies to ensure agreement and understanding.
- Develop Protection plans associated with these values, requirements and management actions points.

Miscellaneous Incident Support Materials

There is a variety of important incident support job-aid tools, templates, and information that can be compiled pre-season, to save time during an incident. This allows managers to better understand the fire situation and focus on time-sensitive issues. A description of fire decision making aids and their outputs and uses is available at http://www.wfmrda.nwcg.gov/reference_&_guidance.php. Listed below are other documents and analyses that also aid the decision making process.

Delegation of Authority Template: Develop a Delegation of Authority letter template preseason. During an incident the unit can focus on filling in the template to ensure communication of the leader's intent for example by inserting fire specific information such as the decision on how to manage the incident, the objectives and requirements rather than creating one from scratch.

Pre-season Risk Analysis: Develop locally specific definitions for each element of the Wildland Fire Relative Risk Assessment.

Historic Weather Analysis: Define the fire season, fire ending and fire slowing events, large fire growth factors and weather events for use when considering how long a fire may last on the landscape. This knowledge can help managers weigh the firefighter exposure risks of continuing to fight a fire or manage a fire.

Weather & Fire Danger: Evaluate local RAWS stations and data - in terms of reliability, usefulness for wind profiles, ERC's and other information.

ERC charts: Develop ERC charts showing critical thresholds for increased fire activity for specific landscape units to reflect the specific mix of fuels, weather and topography that influences wildfires within the area.

Pocket cards: Per agency standards, pocket cards should be updated regularly for use by personnel in understanding the current fire season's energy release component trends compared to historic averages.

Fire history: Documenting and displaying past fire history and associated weather and fuels information is very useful in determining where natural fuel breaks may be available for managing an incident, determining large fire growth potential, calibrating current fire behavior model runs, and understanding possible differences in fire spread and intensity. Identify landscape units where fire behavior might be similar due to fuels, weather patterns and topography.

Interagency (Federal, State & Local Government) Coordination

Most areas consist of multiple jurisdictions and ownerships therefore it is very important to establish and cultivate relationships and agree to expectations regarding fire management response prior to the fire season. Each agency must understand the abilities, limitations and concerns of their fire management partners. Interagency

and statewide agreements and associated local operating plans govern relationships amongst cooperating agencies and jurisdictions. It is critical to develop local operating plans based on interagency/intergovernmental agreements because cross-jurisdictional agreements must be in place to allow fires to move from one jurisdiction to another.

Build key stakeholder capacity to manage the uncertainties and inherent risks of fires by:

- Completing a risk analysis with interagency cooperators to predetermine the response strategies for protecting values at risk while considering LRMP goals (develop M.A.P.s where feasible).
- Engaging community leaders, local government officials, partners and other key stakeholders to understand agency policy and the unit's wildfire management program. Share the risk picture and enlist input pre-season.

Internal & External Communication / Coordination

Preseason contact should be made with special-use permittees (grazing, ski area operators, cabin owners, and outfitters), surrounding communities and public, as well as with internal staff members. All groups should understand the fire management policy, implementation plan, and how it may affect their permit, business, interests and work. Discuss resource management objectives, where fires may be suppressed because of values at risk and where fires may be managed to accomplish those identified resource objectives. Enlist resource specialists in defining objectives and describing how these objectives can be met. Discuss the "what if" scenarios to gain common understanding about what to expect and how to prepare to gain understanding of roles and responsibilities and how information is communicated.

Build a public information plan that identifies outreach plans to include both preseason activities as well as during an incident and post-season. Ensure the plan discusses the following:

- Federal Wildland Fire Policy key points;
- key strategic direction and desired conditions from the guiding land management directives
- local key messages that the Agency Administrator wants to communicate to other agencies and the public.
- social media considerations or actions
- how incident information will be communicated

Pre-Season Training Exercises

Build decision maker and key stakeholder capacity to manage uncertainties and inherent risks of fires by engaging them in tabletop exercises or other venues. Develop exercises that would give decision makers, support personnel, and cooperators an opportunity to test (and improve) their decision-making process.

Exercise participants should use information gathered preseason, review agency policy, annual direction, and current seasonal severity and issues. Such training helps re-familiarize everyone with the decision- making and the communication processes before actually performing on an active wildfire.

Critically assess this list or preseason planning ideas and adapt it to local needs and conditions. The goal of pre-season planning is to compile available information before an incident to allow decision makers to focus on the more time sensitive and site specific data collection and analysis needed to make the most informed decision.

Landscape Risk Assessment

There are several tools and processes being developed to accomplish landscape scale risk assessments that can be accomplished and considered prior to fire season. These assessments can often be used for both prescribed and wildfire scenarios. A brief description of the tools and a links are listed below for consideration.

- *ArcFuels – An ArcGIS Interface for Fuel Treatment Planning and Wildfire* Risk Assessment.
  http://arcfuels.org/

  ArcFuels integrated a number of fire behavior models and corporate spatial data within a GIS framework. The system vastly simplifies spatial data manipulations and wildfire behavior analyses for designing and testing fuel treatment alternatives.
- *FIRESEV: A Fire Severity Mapping System for Real-Time Fire Management Applications and Long-Term Planning*
  http://www.frames.gov/firesev

  The Fire Severity Mapping System project (FIRESEV) is geared toward providing fire managers across the western United States critical information about the potential ecological effects of wildland fire at multiple levels of thematic, spatial, and temporal detail. A major component of FIRESEV is a comprehensive map of the western U.S. depicting the potential for fires to burn with high severity if they should occur.

Many papers and articles have been written about processes used in evaluating landscape scale risk. Paper citations and abstracts are listed below:

- *Wildfire Risk and Hazard: Procedures for the First Approximation,* Gen Tech Rep RMRS-GTR-235, Calkin, David E.; Ager, Alan A.; Gilbertson-Day, Julie, 2010
  http://www.fs.fed.us/rm/pubs/rmrs_gtr235.pdf
- *Integrated national-scale assessment of wildfire risk to human and ecological values*, Stochastic Environmental Research and Risk Assessment. doi: 10.1007/s00477-011-0461-0. Thompson, Matthew P.; Calkin, David E.; Finney, Mark A.; Ager, Alan A.; Gilbertson-Day, Julie W., 2011,
  http://www.fs.fed.us/rm/pubs_other/rmrs_2011_thompson_m001.pdf

- *Advancing effects analysis for integrated, large-scale wildfire risk assessment,* Environmental Monitoring and Assessment. 179: 217-239. Thompson, Matthew P.; Calkin, David E.; Gilbertson-Day, Julie W.; Ager, Alan A., 2011
  http://www.fs.fed.us/rm/pubs_other/rmrs_2011_thompson_m003.pdf
- *A simulation of probabilistic wildfire risk components for the continental United States,* Stochastic Environmental Research and Risk Assessment. 25: 973-1000, *F*inney, Mark A.; McHugh, Charles W.; Grenfell, Isaac C.; Riley, Karin L.; Short, Karen C., 2011
  http://www.fs.fed.us/rm/pubs_other/rmrs_2011_finney_m002.pdf

Other products for consideration:

- West Wide Wildfire Risk Assessment
  http://www.westwideriskassessment.com/

  The WWA is a wildfire risk assessment to quantify the magnitude of the current wildland fire problem in the west and provide a baseline for quantifying mitigation activities and monitoring change over time. It can be used to facilitate national, regional and state level strategic planning and policy discussions.
- Southern Wildfire Risk Assessment
  http://southernwildfirerisk.com/

  The Southern Wildfire Risk Assessment project provides fire professionals and other stakeholders with a set of tools for evaluating wildland fire risk in a consistent manner across the region, with the ultimate goal of reducing the potential human, environmental, and property loss caused by wildland fires.

How Does Pre-Season Planning Fit into WFDSS?

WFDSS has significant national geospatial layers and real time risk assessment information available to support agency administrators through a deliberative risk process. Much of the information can be supplemented through additional pre-season planning efforts.

Objectives and Requirements -

Land and Resource Management Plan and Fire Management Plan information should be loaded into WFDSS before a fire starts for reference during the incident decision process. For federal agencies this information is loaded as Strategic Objectives and Management Requirements. Additionally incident objectives and requirements for certain areas can be pre-identified and kept available for use during an incident.

Objectives Sub-Tab

- Fire Management Units (FMU)*
- Land Management Plan Objectives and Requirements ("Strategic Objectives" and "Management Requirements" in WFDSS)*
- Incident Objectives and Incident Requirements

WFDSS has recently added the ability to represent LRMP information spatially which provides managers with more spatially relevant information at the time of the incident. (Spatial Fire Management Planning) This feature allows units to upload polygons preseason with strategic objective information to spatially represent response areas or FMUs. Additionally polygons with associated requirements can be uploaded by the unit. The table below describes common terms used and what how they may be referenced in WFDSS.

Risk Management for Wildfire Decision Making	WFDSS
Land Management Objective	Strategic Objective
Land Management Requirement	Management Requirement
Incident Objective	Incident Objectives
Incident Requirement	Incident Requirements
Strategy/Strategies	Action Item/Action Items: Each of the strategies selected for the course of action would be listed as a separate "Action Item." Define where each strategy should be applied to facilitate activation and deactivation of Selected Strategies.
Management Action Point	Management Action Point

Values

There are many national layers that are maintained in WFDSS that should be reviewed before adding redundant information. The national layers may not include all the values that might be identified at the local level.

- Points of interest can be added for planning purposes.
- Unit shapes can be added and will show up on the values inventory / values at risk inventory.

Management Action Points*

The Management Action Points entry screen is accessed from the left menu>Mgmt Action Points. Each M.A.P. is required to have the "Condition" and "Action" elements entered; other elements listed in the Management Action Point subsection can be entered into the existing text boxes as appropriate. For technical information on creating and editing Management Action Points, see the WFDSS Online Help.

How Does Pre-Season Planning Fit into WFDSS? - continued

Fire History

A fire history layer is included within the Situation tab in WFDSS and can be found in the Fire-Related section of the layer switcher. If a unit has updates to this information contact they should contact their agency representative

Incident Support Information Fire Danger/Smoke/Pre

There are several tools within WFDSS that can be used to support incident decisions. An energy release component (ERC) graphs, weather forecast are available for inserting in a decision. Additionally there are links to smoke products, weather forecasts, and predictive services information (Situation Tab > Info) as well as various other sources (Left Menu > Fire Related Links).

Communication/Collaboration

WFDSS allows multiple users with appropriate privileges to view and edit the decision document and supporting information. This ability to review information based on the same point of reference facilitates viewing and discussion when users are in multiple locations. Additionally WFDSS can be projected on a screen to be reviewed and edited in a collaborative group environment.

Pre-season Exercises

WFDSS has a training system that can be used for pre-season exercises. Units can build various scenarios to practice using the system and to gain a better understanding of the information available.

Landscape Risk Assessment

Landscape Risk assessment information can be used to support decision in WFDSS. The information can be incorporated into the decision document in the following folders: Assessment: (Weather or Values or Situation) or Decision: (Validation) or Decision: (Rationale). Where the information is placed would be based on what context or portion of the decision is being supported by it.

Clarifying Questions

Do local fire chiefs, ranchers, adjacent landowners, and special-use permittees, neighbors, cooperators, and staffs understand you plan to manage fire this season and how policy will be implemented?

Has information been preloaded in the Wildland Fire Decision Support System (WFDSS) or made readily available to the staffs supporting the agency administrator in making wildfire decisions?

Do you have a common understanding of values to be protected:

- What is important?
- Why is it important?
- How important is it?
- Have you defined what type of fire is beneficial or detrimental to the identified values?
- Have you identified where fire is beneficial or detrimental on the landscape?

Appendix B: WFDSS Crosswalk for Federal Agencies

WFDSS's framework is based on the deliberative risk decision process which is only slightly different than the risk management cycle focused on in this publication. This table provides a crosswalk between the components of the cycle (left red), the activities or process (green), the tools and information used to support the components (blue), and the WFDSS specific elements (gray).

	Activity	Information or Tool	Use	WFDSS Sub Tabs or Process	WFDSS Decision Content**
Situational Awareness	▪ Obtain situational and contextual information (fire situation, topography, weather, fuels, natural barriers, values). ▪ Frame the decision space. ▪ Consolidate program history and current status. ▪ Develop shared vision. ▪ Obtain L/RMP & FMP information (strategic objectives & management requirements)	Fire Danger	Establish fire danger trend information, provide managers with indications of relative fire danger, and provide input to Relative Risk Assessments.	**WFDSS Tab – Information** Information & Tools Available ▪ Basic fire-related information	**Decision Editor** **Assessment – Incident Information – Content** – Auto-populated with info from information page in WFDSS and a fire perimeter map. **Assessment – Weather – Content** – Auto-populated with the weather forecast for the day the decision is published. **Assessment – Values – Content –** Values inventory is auto-populated with values as identified by the planning area. Users should add information about priorities, probability of the fire affecting the value, modeled values at risk and so forth.
		Fire Economics & Values	Critical Infrastructure – Natural & Cultural Resources ▪ Values Inventory – Immediate estimates of values as a qualitative inventory based on the planning area, short-term fire behavior or near-term fire behavior predictions. ▪ Values At Risk – Values inventory summarized by probability zones as well as the expected quantity of each threatened value based on Fire Spread Probability (FSPro) predictions.	**WFDSS Tab – Situation** Information & Tools Available ▪ Fire area map ○ Incident ○ Planning area * ○ Analysis ○ Fire-related info ○ Boundaries ○ Designated areas ○ Infrastructure ○ Natural & cultural resources ▪ Zone weather ▪ Fire danger (ERC Graph) ▪ Values inventory ▪ Fire behavior outputs* ○ Values at risk ▪ Significant 7-day fire potential ▪ Firefighter Evacuation ▪ Smoke dispersion ▪ Relative Risk Assessment (left menu)	
	Activity	**Information or Tool**	**Use**	**WFDSS Sub Tabs or Process**	**WFDSS Decision Content****
Assessment	▪ Evaluate each of the three risk elements: values, hazards, and probability. ▪ Use best analytical tools to analyze available information. ▪ Examine past performance. ▪ Evaluate fire, fuels, weather, topographic, safety, and risk assessment information to support decision making.	Fire Weather	Create fire danger products, provide weather data for fire behavior analyses, and provide data for air quality analyses.	**WFDSS Tab – Situation** Information & Tools Available ▪ As listed above	**Decision Editor** **Assessment – Values – Content -** Values inventory is auto-populated with values as identified by the planning area. Users should add information about priorities, probability of the fire affecting the value, modeled values at risk and so forth. **Assessment – Situation* -** Users can add information about the current situation **Validation – Content** – Relative Risk Assessment is auto-populated with information the user put in the RRA.
		Fire Behavior ▪ Basic ▪ Short-term ▪ Near-term ▪ Long-term (FSPro)	Project fire size probabilities; forecast fire progression; predict fire behavior characteristics such as rate of spread, crown or surface fire occurrence, fire intensity, and spotting distances from torching trees.	**WFDSS Tab - Objectives** Information & Tools Available ▪ Strategic objectives ▪ Management requirements	
		Fire Economics & Values	(see above)		
		Smoke – Air Quality and Emissions	Provides access to historic, real-time, and forecasted air quality information using a stand-alone web portal.		

Continued on Next Page…..

	Activity	Information or Tool	Use	WFDSS Sub Tabs or Process	WFDSS Decision Content**
Risk Control	▪ Apply knowledge, processes, technology, and proven practices. ▪ Mitigate risks to an acceptable level. ▪ Apply new knowledge and technological applications to reduce hazards and risk. ▪ Incorporate best knowledge and technology into practice. ▪ Communicate risks at all levels to ensure mitigation.	WFDSS – Incident Objectives	Defined incident objectives & requirements and course of action commensurate with L/RMP & FMPs.	**WFDSS Tab – Objectives** ▪ Incident objectives* ▪ Incident requirements*	**Decision Editor** **Objectives – Content** – Auto-populated with the FMU list and acres, strategic objectives and requirements, and incident objectives and requirements as defined by the user on the Objectives Tab.
		WFDSS – Course of Action	Defined course of action and cost are commensurate with L/RMP & FMPs, incident objectives, and tactics to support those objectives.	**WFDSS Tab – Course of Action** Information & Tools Available ▪ Action Items ▪ Management Action Points (left menu) ▪ Cost ○ Stratified Cost Index (SCI) (left menu) ▪ Organizational Needs Assessment (left menu)	**Course of Action – Content** – Auto-populated with the action items, costs, and Management Action Points as defined by the user. **Left Menu Items** Relative Risk Assessment Organizational Needs Assessment Stratified Cost Management Action Point
		Fire Economics & Values	Stratified Cost Index – Provides a historical comparison of the costs of a current fire to ones with similar characteristics and potential.		
Decision	▪ Document what the decision is, why it was made, and how it supports the LRMP objectives and requirements. ▪ Document overall processes and results. ▪ Document practices and organizational needs. ▪ Ensure the retention of critical information.	WFDSS – Decision Content	Documentation of decisions and analysis.	**WFDSS Tab – Validation** Used to validate whether the course of action meets the defined incident objectives and requirement. **WFDSS Tab – Decision** See notes in the Decision Content column describing how the decision editor can be used to document a decision. **WFDSS Tab – Report** Used to capture information from the decision editor for printing or reporting out.	**Decision Editor** **Decision Summary** – Auto-populated with summary information such as incident owners, costs, decision history. **Objectives – Content** –above **Course of Action – Content** – above Stratified Cost – (Left Menu Item) Management Action Points – (Left Menu Item) **Validation Content Page –** Relative Risk Assessment – (Left Menu Item) **Rationale – Content** – Document considerations and decisions made that are guiding the response to the fire. **Left Menu Items** Organizational Needs Assessment – can be added to the decision information
Implementation	▪ Base specific tactical actions on the approved course of action. ▪ Write the delegation of authority based on the Incident objectives, requirements, and course of action.	WFDSS – Management Action Points	▪ Evaluate M.A.P.s to ensure they are viable, effective, and acceptable given current conditions.	**WFDSS Tab – Objectives** **WFDSS Tab – Course of Action** ▪ Used to frame the delegation of authority. ▪ Used as the basis for specific tactical direction and making assignments. **WFDSS Left Menu – Management Action Points** ▪ Validate, activate, deactivate as necessary.	**Periodic Assessment –** Note pertinent information regarding progress, coordination with stakeholders and cooperators, significant events.
Evaluation	▪ Continually evaluate whether the incident objectives are met. ▪ Review and revise the course of action (decision) as needed. ▪ Evaluate new analysis and information.	WFDSS – Periodic Assessment	▪ Recurring review of the current fire situation to evaluate effectiveness of the chosen course of action in meeting the incident objectives. ▪ Document new information relevant to the situation.	**WFDSS Tab – Periodic Assessment** ▪ Used to periodically revalidate that the decision and course of action. Validate that actions are meeting the strategic objectives/requirements, and incident objectives/requirements.	**Incident History – Left Menu** – Provides incident information such as decision dates, acreage changes, privileges, periodic assessment documentation, and so forth.
				*User added information.	**Users can add information to any section.

Rocky Mountain Research Station








The Rocky Mountain Research Station develops scientific information and technology to improve management, protection, and use of the forests and rangelands. Research is designed to meet the needs of the National Forest managers, Federal and State agencies, public and private organizations, academic institutions, industry, and individuals. Studies accelerate solutions to problems involving ecosystems, range, forests, water, recreation, fire, resource inventory, land reclamation, community sustainability, forest engineering technology, multiple use economics, wildlife and fish habitat, and forest insects and diseases. Studies are conducted cooperatively, and applications may be found worldwide. For more information, please visit the RMRS web site at: www.fs.fed.us/rmrs.

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