USDA
United States Department of Agriculture

Risk Terminology Primer: Basic Principles and a Glossary for the Wildland Fire Management Community

Matthew P. Thompson, Tom Zimmerman, Dan Mindar, and Mary Taber

Forest Service
Rocky Mountain Research Station
General Technical Report RMRS-GTR-349
May 2016

Thompson, Matthew P.; Zimmerman, Tom; Mindar, Dan; Taber, Mary. 2016. **Risk terminology primer: Basic principles and a glossary for the wildland fire management community.** Gen. Tech. Rep. RMRS-GTR-349. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 13 p.

Abstract

Risk management is being increasingly promoted as an appropriate method for addressing wildland fire management challenges. However, a lack of a common understanding of risk concepts and terminology is hindering effective application. In response, this General Technical Report provides a set of clear, consistent, understandable, and usable definitions for terms associated with wildland fire risk management. The material presented herein is not brand-new or innovative per se, but rather synthesizes the extant science so that readers can readily make a crosswalk to the professional literature. The broad objectives of this effort are to provide context and information to support application of risk terminology across all levels of risk management, and to facilitate clear exchange of data, information, and ideas among fire management officers, staff, and scientists.

Keywords: risk, risk assessment, risk management, risk communication, uncertainty

Authors

Matthew P. Thompson is a Research Forester with the Human Dimensions Program of the Rocky Mountain Research Station, Missoula, Montana. He completed a B.S. degree in systems engineering at the University of Virginia, an M.S. degree in industrial engineering and operations research at the University of California, Berkeley, an M.S. degree in forest management at Oregon State University, and a Ph.D. in forest engineering at Oregon State University. Contact: mpthompson02@fs.fed.us.

Tom Zimmerman is a Senior Wildland Fire Consultant with Tom Zimmerman Consulting in Boise, Idaho. He completed a B.S. degree in forestry at the University of Montana, an M.S. degree in forestry/fire ecology at the University of Idaho, and a Ph.D. in forest resources/fire ecology at Colorado State University.

Dan Mindar is a Fire Application Specialist with the interagency Wildland Fire Management Research Development and Application unit and is based out of Luna, New Mexico. Dan has 25 years of experience in wildland fire and has worked in both operations and fuels management, including more than 15 years working with incident management teams. He also has experience in developing fire management plans and revising forest plans under the National Environment Policy Act. He is a qualified Long Term Fire Analyst, Fire Behavior Analyst, and Strategic Operations Planner.

Mary Taber has a B.S. degree in park and recreation resources from Michigan State University and a Masters of Natural Science from the University of Idaho. She retired in 2012 after 24 years with the National Park Service in Yellowstone National Park and 6 years with the Bureau of Indian Affairs at the National Interagency Fire Center.

Acknowledgments

Thanks to Donald MacGregor, John Prendergast, and Ingrid Sather for their detailed and helpful reviews. Thanks also to Greg Morris, Frankie Romero, Buddy Bird, Craig Trulock, David Gomez, Bill Aney, Ilene Wadkins, Yolanda Saldana, Mark McFall, and Tim Sexton for their useful feedback at the Wildland Fire Risk Summit 2015.

Contents

Risk Terminology Primer: Basic Principles and a Glossary for the Wildland Fire Management Community

Matthew P. Thompson, Tom Zimmerman, Dan Mindar, and Mary Taber

The "Why": Defining the Problem

Wildland fire presents risks to fire responders and the public, to resources and assets on the landscapes that the Forest Service, U.S. Department of Agriculture manages and responds on, and even to the Forest Service's fiscal health and ability to achieve core missions. It is important for the Forest Service and other members of the fire management community to have a common understanding of these risks so that we can collectively manage fire as safely, effectively, and efficiently as possible. However, there is not a common use or understanding of the word "risk" as applied in the wildland fire management context. Terminology is used differently or inconsistently across the wildland fire management community. In some cases, we may be using different terms or phrases but conveying the same underlying meaning. More problematic is that we may be using the same terms or phrases but conveying different meanings. Developing a common understanding is a prerequisite for the fire management community to move to incorporate risk management principles and practices as a foundational component of business operations. Simply put, to make truly risk-informed decisions as a standard practice, we must truly understand and effectively communicate risks through common terminology.

This report aims to help resolve these issues, by providing a set of clear, consistent, understandable, and usable definitions for terms associated with wildland fire risk management. Nothing in this report is brand-new; we did not set out to "reinvent the wheel." We simply summarized and distilled, as best we could, existing science-based definitions into one concise and relevant document. That is, we attempted to bring a synthesis of the extant science to the glossary without focusing on organization-specific or incident-specific terms, so that readers can readily make a crosswalk to the professional literature. This report is not intended to be exhaustive, and we provide a list of useful references for readers wishing to dig in deeper. Broadly speaking, the objectives of this effort are to:

- Provide content and information to support application of risk terminology across management and planning contexts;
- Present information that applies to all levels of risk management, from tactical fire response to national strategy development; and
- Facilitate clear exchange of data, information, and ideas among fire management officers, staff, and scientists.

Starting With the Basics: What is "Risk"? How Can We Understand it, and What Can We Do About it?

Before we begin, it is important to recognize that there is no single, universally agreed upon set of risk terminology definitions. Different disciplines have found it useful

to define terms differently in ways most relevant to their specific context, and terms have been added and definitions updated as the field expands. There is much more agreement on the underlying principles and concepts of risk than on the terms themselves. It is therefore important to establish a basic conceptual understanding of risk and clear definitions of the various terms used to describe risk, risk assessment, and risk management, while maintaining relevance to wildland fire management.

Risk

Risk can be succinctly defined as a "**measure of the probability and consequence of uncertain future events**" (Yoe 2011). We can be even more succinct:

Risk = Probability and Consequences

We use probability to capture the uncertainty surrounding the occurrence of an event. How we think about and attempt to quantify probability will depend on the spatial and temporal scope of the event in question. For instance, we may consider the probability of a given suppression action achieving its stated objectives in the next burning period, the probability of a given ignition growing to threaten a community in the next 7 to 14 days, or the probability of experiencing fire of a given intensity in a given location in the next fire season.

We use consequences to describe the potential losses or benefits associated with the event. Describing consequences requires that we first identify what it is we value that may be affected by fire. This could be the lives of fire responders and the public, or homes and other built infrastructure, or natural resources such as wildlife habitat and timber. These elements have variously been referred to simply as "values," or "values-at-risk," or in more recent landscape assessments, "highly valued resources and assets" (HVRAs).

Second, we must identify what the effects of fire might be on those things we value. Providing specificity on the potential consequences of fire is necessary to clearly and comprehensively describe risk. The relative susceptibility of HVRAs to fire, or to actions taken while managing fire, dictates consequences. Some things we value, such as wooden structures, may be highly susceptible to loss from exposure to fire. In contrast, structures built with concrete and metal may have low susceptibility to loss, and others, like fire-dependent wildlife, may actually benefit from fire. Estimating susceptibility allows us to estimate the potential severity, or magnitude, of fire effects and consequences. How we choose to mitigate risks will depend on the relationship between potential fire consequences and objectives.

Note that the idea of incorporating benefits is consistent with the definition of risk as "probability and consequence" as opposed to "probability and loss." As it applies to wildland fire, this framing allows that today's fire can provide a benefit by reducing tomorrow's risk, and further that fire can result in substantial ecological benefit (e.g., stimulating regeneration or seed release, mineralizing nutrients, reducing encroachment, creating suitable habitat conditions). Admittedly, there is no universally agreed-upon standard in the broader risk literature on the question of whether to include benefits; some instead consider risks and opportunities. But this framing is consistent with the fire economics and fire risk literature, where benefits and losses are considered together with

the "net value change" approach. As we will reiterate later, however, context is critical. There is no benefit to fire responders from exposure to the fireline, or to the public from exposure to smoke and particulate matter. Ultimately managers can decide for themselves how to approach this issue as long as they are clear and consistent in how they use the term "risk," and are in some form considering fire benefits where appropriate.

The take-home point:
If there is no uncertainty, or there are no consequences to speak of,
there is no risk.

Risk Assessment

Risk assessment is a way to better understand the type and nature of the risks we face. It helps us to better characterize probabilities and consequences, as well as underlying factors influencing these components. Risk assessment is a "**product or process that collects information and assigns values (relative, qualitative, or quantitative) to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decisionmaking."**

Note the direct connection to evaluating options and making decisions: Assessing risk is a critical component of managing risk. We want to better understand the risks presented by fire as well as the risks presented when we manage fire, and ensure our chosen course of action is informed by balancing risk-risk tradeoffs. For example, most actions that fire responders take entail some acceptance of risk in order to reduce the risk that the fire presents to resources and assets (e.g., fire responders may incur risk by entering a stand to take actions that reduce risk to a timber plantation). Assessing the risks that fire presents can help us answer questions such as "Why are we taking this action with its associated risks to fire responders?"

In table 1, we briefly compare a select set of existing risk assessments in use by the wildland fire management community. There are many others (e.g., the Safety Management System Guide's Risk Assessment Matrix); our presentation is intended to be illustrative rather than exhaustive. Each of the representations we present frames a risk assessment in a specific way that emphasizes some things and deemphasizes others, and that makes some aspects explicit and leaves other aspects implicit. These assessments differ in the types of hazards and values-at-risk considered, the spatial and temporal scales of analysis, the terminology used, and whether risks are characterized qualitatively or quantitatively. For example, in the Safety Analysis, the principal value-at-risk is human health and safety, and consequences are qualitatively measured in terms of severity. The Relative Risk Assessment within the Wildland Fire Decision Support System is designed for a different decision context and considers a broader suite of values-at-risk, although it does not always explicitly characterize potential consequences. In the Landscape Risk Assessment framework (Scott et al. 2013), multiple values-at-risk are considered in similar fashion, with direct quantification of potential consequences and explicit consideration of ecological benefits. The common thread is that all frameworks in some way share the same basic elements of *probability* and *consequences*, and as a result assist users in better understanding *risk*. The lack of a one-size-fits-all framework underscores the importance of aligning the assessment with the context, purpose, and needs of decisionmakers.

Table 1—Comparison of three existing risk assessment frameworks.

Risk assessment	Context	Risk elements
Incident Action Plan Safety Analysis	Identification, prioritization, and mitigation of hazards presented by fire response operations	Hazards, likelihood, and severity
Wildland Fire Decision Support System Relative Risk Assessment	Determine relative risk of fire growing to become high-consequence event, and facilitate assessment of organizational needs	Hazards, probability, and values
Landscape Risk Assessment (Scott et al. 2013)	Prefire assessment, typically across large landscapes, to support preparedness, fuels, and response planning	Intensity, likelihood, and susceptibility

Risk Management

Addressing the types of questions asked during risk assessment is an essential element of risk management, defined as a "set of coordinated processes and activities that identify, monitor, assess, prioritize, and control risks that an organization faces." Risk management is iterative, is responsive to change, incorporates learning and feedbacks, is intentional about processes and practices, explicitly addresses uncertainty, and focuses on decision quality and corresponding outcomes. Three ideas associated with this definition of risk management are worth noting. First, risk management is not something that happens only after a decision has been made and a chosen course of action is implemented. Rather, risk management entails identifying whether and what types of decisions need to be made, when they are to be made, how they should be made, and who should be involved. Additionally, factors such as stakeholder values, costs, tradeoffs, and probability of success are integrated with risk into decision processes. Ultimately any fire management action is undertaken to achieve a set of (ideally) well-defined objectives, and management decisions must balance the gains of action (e.g., avoided loss) against the costs and risks that the action incurs.

Second, risk management is performed throughout an organization, and entails decisions and implementation at multiple scales or levels. As an example, the National Incident Management Organization typically identifies four levels of risk assessment and decisionmaking in the specific context of incident response: programmatic, strategic, deliberate/operational, and time critical/tactical. The Fire and Aviation Safety Management Systems Guide, in contrast, uses only three levels of risk management, combining the strategic and programmatic levels. Here, when we speak of organization-wide considerations, we adopt a broader perspective that includes a wide range of contexts and additional individuals. In terms of context this perspective encompasses, for instance, fuels, prevention, and preparedness budget allocations, project-level fuels treatment planning, and workforce capacity building. In terms of individuals this perspective includes, for instance, senior agency leadership, agency administrators, and resource specialists, in addition to fire and aviation leadership and incident management teams. Although the types of risks, relevant business practices, and decision support tools and processes may vary with management context, general risk management definitions and concepts remain consistent. That is to say, processes and decisions at all scales in some sense consider

probabilities and consequences, evaluate options, and weigh risk-risk and other tradeoffs, albeit with differing scopes and time pressures.

Third, principles of accountability and transparency require that we be realistic when talking about risk and risk management options. Managers are rarely presented with "zero risk" solutions, but rather face risk-risk tradeoffs across multiple dimensions. Zero risk is rarely attainable when considering the full spectrum of potential consequences, and when recognizing that choices intended to reduce risk today can also delay, transfer, or even exacerbate future risk. Consider the question of fire responder safety: The surest way to reduce risk to fire responders is to never respond to fire, at the expense of potentially great losses to homes, infrastructure, and resources. Conversely, attempting to extinguish every fire no matter how small would expose fire responders to a larger number of dangerous situations, and would in some areas foreclose opportunities for ecological benefit. Further, aggressively suppressing all fires in frequent-fire forests could lead to accumulation of understory fuels and increase the hazard of future fires. Fully fleshing out all the types of risk-risk tradeoffs is well beyond the scope of this report, but they are important to have in the back of our minds when we consider, evaluate, and discuss risks.

Readers interested in more detail on risk management and associated concepts are referred to Thompson et al. (2016).

Basic Principles of Terminology

Having refined our understanding of risk and its relevance to wildland fire management, we next briefly review some principles for use of risk terms. This will allow us to work our way through various frequently used terms to see where we are and are not actually talking about the same thing. Below we identify three key best practices to reduce ambiguity and confusion.

1. Clearly define how you use terms.

The intent of this report is to provide a foundation for risk concepts and terminology in wildland fire management that will facilitate clearer communication, even when different words or phrases are used. It is important to focus on the basic ideas people are expressing behind their terminology, and to understand which terms may be effectively used interchangeably (see Box 1). It is even more important to be clear up-front about how you are using terms.

2. Clarify your context.

There are many types of risks associated with the occurrence and management of wildland fire; these risks can be quite different in terms of who faces the consequences and who can best mitigate risk factors. Consider again our basic definition of risk. Begin by understanding the uncertain future event—its relevant spatial, temporal, and management scales, and its probability of occurrence. Next turn to the consequences should the event occur—the types of consequences (e.g., human health, ecological, financial) and

their respective magnitudes. Ensure you communicate these essential features when you are describing risk.

3. Tailor, adapt, and expand definitions and concepts to be relevant to wildland fire.

Risk terms and concepts will be most useful if they are directly relevant to wildland fire management. As an example, consider fire behavior characteristics, such as fire intensity. Information on fire intensity influences suppression decisions related to tactical operations, as well as potential consequences to values-at-risk.

Box 1: Terms We Use that Are (More or Less) Interchangeable

Things we value

Life, property, and resources

Values-at-risk

Highly valued resources and assets (HVRAs)

Probability

Likelihood

Chances

Odds

Consequences

Susceptibility

Fire effects

Severity

The "How": Creating the Glossary

We followed a four-step process for creating this glossary, largely modeled after the process that the Department of Homeland Security adopted for creating its own Risk Lexicon. We established the following guidelines for this process:

- Include risk terminology that is broadly relevant to wildland fire management.
- Rely on established and well-vetted definitions, and provide source documents.
- Tailor the glossary to capture specialized meaning in the wildland fire context.
- Retain independence to publish definitions that differ from currently used sources in the wildland fire management community, where necessary.

Step 1: Establish Sources

We first identified a set of sources from which to draw terms and definitions. We included general literature on risk as well as wildfire-specific literature. Sources included books, white papers, General Technical Reports, and peer-reviewed literature. The full list of sources is included at the end of this glossary.

Step 2: Establish Terms

We next identified a set of terms to include in the glossary. For this step we largely cross-referenced existing glossaries to select suitable terms, while also identifying terms from the aforementioned sources.

Step 3: "Harmonize" Terms

After reviewing all previously published definitions, we identified instances where multiple, often conflicting, definitions existed. We then sought to harmonize these various definitions to produce a single meaning for each term, grounded in the wildland fire management context.

Step 4: Review and Validate Terms

We performed internal and external reviews to ensure that the harmonized definitions were consistent with those used by the larger risk community while still having relevance to wildland fire management.

The "What": The Glossary

Asset A person or human-made entity (e.g., structure, information, material, or process) that has value.

Burn probability The probability that a wildfire will burn a specified area during a specified period of time.

Consequence The outcome or effect of an event or incident, usually evaluated with respect to objectives.

Effects The anticipated benefits and losses associated with exposure to a hazard or an event, in this case fire.

NOTE: For resources and assets, effects are often quantified as a function of fire intensity or flame length.

NOTE: Effects analysis is a main step in landscape assessments to estimate a range of consequences to HVRAs.

Expected value The probability-weighted average outcome, calculated by summing the product of the probability and magnitude of an outcome over the range of all possible consequences.

NOTE: Expected value can be a useful measure of the central tendency of outcomes, but does not provide information on the range of potential outcomes.

NOTE: Consider a coin toss with two possible outcomes: If it lands heads, you win $10; if it lands tails, you lose $10. The expected value for this coin toss would be calculated as (0.5 × $10) + (0.5 × -$10) = $0.

Exposure The contact of an entity, asset, resource, system, or geographic area with a potential hazard.

NOTE: In landscape assessments, resource and asset exposure can be quantified by overlaying spatial fire likelihood and intensity outputs with maps of resources and assets.

NOTE: In incident response, fire responder exposure can be characterized by the type of activity (e.g., direct versus indirect, ground versus aerial), and quantified by multiplying assignment hours by historical accident rates.

Frequency The number of occurrences of an event per a specified period of time.

Hazard Any real or potential condition that can cause damage, loss, or harm to people, infrastructure, equipment, natural resources, or property.

NOTE: Hazards associated with fire typically include fireline intensity, flame length, and crown fire potential.

NOTE: Other hazards associated with the fire response environment may include snags, steep slopes, equipment malfunction, and smoke inhalation.

Hazard reduction Coordinated activities and methods directed to reduce or eliminate conditions that can cause damage, loss, or harm from real or potential hazards.

NOTE: Landscape hazard reduction is often accomplished through prescribed burning or mechanical fuels reduction or restoration treatments.

NOTE: Fire responder hazard can be reduced through practices such as creating safety zones and cutting snags in advance on line construction projects.

NOTE: These actions in and of themselves expose those engaged in the activity to the hazards inherent in such work.

Likelihood The chance of an event happening.

NOTE: Likelihood can be described by using probability or frequency over a specified time period, or with more general descriptive language.

NOTE: Likelihood can often be expressed in relative terms (e.g., event A is twice as likely as event B).

NOTE: In practice, this term can effectively be used interchangeably with probability.

Net value change The net effect of damaging and beneficial effects to the value of a resource or asset; negative values indicate net loss while positive numbers indicate net benefit.

NOTE: In landscape assessments the expected net value change is often calculated as a summary measure of the potential consequences of fire to resources and assets.

Probability A measure of the chance of event occurrence, quantified as a numerical value between zero and one.

NOTE: Zero reflects impossibility of occurrence; one reflects absolute certainty of occurrence.

NOTE: In practice, this term can effectively be used interchangeably with likelihood.

Residual risk Risk that remains after risk control measures have been implemented.

NOTE: As an example, aviation safety management system procedures can significantly reduce the probability of accidents, but do not reduce the risk of accidents to zero.

Resilience The ability to recover from undesirable outcomes, both individually and organizationally.

Return on investment Calculation of the value of measures intended to achieve specific objectives related to the cost of developing and implementing those measures.

NOTE: In the context of wildland fire, many investments (e.g., hazardous fuels reduction) may be made for the purpose of achieving risk reduction.

Risk A measure of the probability and consequence of uncertain future events.

NOTE: Risk has also been defined as "the effect of uncertainty on objectives," meaning that consequences are evaluated in light of objectives and desired conditions.

NOTE: The type of risk will depend on the type of uncertain future event in question.

NOTE: The nature of the consequences (good or bad) will depend on the context in which risks are being evaluated.

NOTE: Expected value is often used as a simple measure of risk, although expressing the full range of consequences and their respective probabilities is more informative.

Risk acceptance A strategy that involves an explicit or implicit decision not to take an action that would affect all or part of a particular risk.

NOTE: Any fire responder engaging the fireline has accepted some degree of risk; the evaluation of risk helps determine if the risks are worth the potential gains.

NOTE: As another example, a homeowner in the wildland-urban interface with a relatively low likelihood of experiencing fire might determine that the costs of managing the home ignition zone and becoming "Firewise" are not worth the benefits.

Risk analysis A systematic, detailed process to examine the components and characteristics of risk and risk management options.

Risk assessment A product or process that collects information and assigns values (relative, qualitative, or quantitative) to risks for the purpose of informing priorities, developing or comparing courses of action, and informing decisionmaking.

As a product: A focused collection of data, information, results, and reports that characterize wildland fire risk relevant to the appropriate scale.

As a process: A set of activities that identify, analyze, and evaluate wildland fire risk across spatial, temporal, and management scales.

NOTE: Risk assessment results in some ultimate characterization of the risk, which can be quantitative (e.g., monetary loss estimates) or qualitative (e.g., categories).

NOTE: In landscape assessments, the processes typically consider the interaction of hazard, exposure, and effects to a given set of resources and assets in a given area.

NOTE: The same basic framework can be, and has been, used to assess opportunities that individuals or organizations face.

Risk avoidance A strategy that uses actions or measures to effectively remove exposure to a risk.

NOTE: Avoidance is possible only in certain circumstances and does not necessarily eliminate all risks; putting no fire responders on the fireline may reduce safety risks, but does nothing to reduce risks associated with the fire.

NOTE: In a forward-looking context, choices of where to build homes or other assets can incorporate risk-avoidance strategies.

Risk communication An exchange of information with the goal of improving the understanding of risk, affecting risk perception, or equipping people or groups to act appropriately in response to an identified risk.

Risk control A strategy that involves deliberate action taken to reduce potential for loss, maintain risk at acceptable levels, or enhance potential for benefits, in a manner consistent with objectives, desired outcomes, and the management context.

NOTE: Examples of risk control in the wildland fire context might be reducing hazardous fuel loads, constructing fireline to contain fire spread, and implementing standard LCES (lookout, communication, escape route, safety zone) procedures.

NOTE: Risk control is one of four commonly used risk management strategies, along with risk avoidance, risk acceptance, and risk transfer.

Risk criteria Terms of reference against which the significance of a risk is evaluated.

NOTE: Criteria are based on organizational objectives as well as stakeholder input, and are often derived from laws, policies, and regulations.

Risk evaluation The process of comparing the results of risk analysis with risk criteria and objectives to determine whether the risk or its magnitude, or both, is acceptable or tolerable.

NOTE: Evaluation of risk occurs after risks have been assessed and risk management options analyzed, to determine whether and what type of management options may be pursued. In other words, is the risk worth the gain?

Risk governance Actors, rules, practices, processes, and mechanisms concerned with how risk is analyzed, managed, and communicated.

NOTE: The National Cohesive Wildland Fire Management Strategy is an example of an effort to develop a risk governance structure.

Risk identification The process of finding, recognizing, and describing potential risks.

Risk management A comprehensive set of coordinated processes and activities that identify, monitor, assess, prioritize, and control risks that an organization faces.

NOTE: Risk management can support selection of strategies for accepting, avoiding, transferring, or controlling risks and decisionmaking to define mitigation actions.

NOTE: Risk management is intended to improve the quality of decisionmaking to achieve desired objectives.

Risk mitigation The application of measures to alter the likelihood of an event or its consequences.

NOTE: Risk mitigation measures may be implemented prior to, during, or after an event.

NOTE: Implementation of risk mitigation activities would fall under the strategy of "risk control."

Risk perception Subjective judgment about the characteristics and magnitude of consequences associated with a risk.

NOTE: Risk perception may be driven by sense, emotion, or personal experience.

Risk reduction A decrease in risk through risk avoidance, risk control, or risk transfer.

Risk tolerance The readiness or willingness of an organization or stakeholder to bear risks, considering potential tradeoffs and objectives.

NOTE: An Incident Commander may tolerate a higher risk strategy if the likelihood of success or the possible benefits of the strategy, or both, are sufficiently high.

Risk transfer A strategy that uses actions to manage risk by shifting some or all of the risk to another entity, asset, resource, system, or geographic area.

NOTE: Risk transfer is one of a set of four commonly used risk management strategies, along with risk control, risk acceptance, and risk avoidance.

NOTE: Risk transference occurs through time as well; an example is transferring risk to future generations by allowing fuels to accumulate through aggressive suppression.

Risk-based decisionmaking A decisionmaking process that relies on the identification, analysis, assessment, and communication of wildland fire risk as the principal factors in determining a course of action to improve the likelihood of achieving objectives.

NOTE: Risk-based decisionmaking has often been used interchangeably, but incorrectly, with risk-informed decisionmaking.

Risk-informed decisionmaking A decisionmaking process that relies on the identification, analysis, assessment, and communication of wildland fire risk, along with evaluation of a set of other relevant factors, in determining a course of action to improve the likelihood of achieving objectives.

NOTE: Risk-informed decisionmaking has more flexibility and decision space than risk-based decisionmaking.

NOTE: Risk-informed decisionmaking may take into account multiple sources of information not included specifically in the assessment of risk as inputs to the decision process in addition to risk information. Risk-based decisionmaking uses the assessment of risk as the primary decision driver.

Severity The magnitude of impacts or consequences stemming from an event.

NOTE: This is a more generalized definition than "burn severity" and "soil burn severity," which have specific meanings in the context of fire.

Susceptibility The propensity of an asset or resource to experience a positive or negative effect as a result of exposure to a hazard.

NOTE: Modifications to a building (e.g., changing to a fire-resistant roof covering and adding screens to vents) make it less susceptible to fire damage.

Threat An event, individual, entity, or action that has the potential to harm life, information, operations, the environment, or property, or a combination thereof.

Uncertainty A fundamental lack or limitation of knowledge.

NOTE: Uncertainty may stem from many causes, including lack of data or information, knowledge gaps, and the inherent variability and unpredictability of human and natural systems.

NOTE: Uncertainty is often indexed or quantified by using probability.

Values-at-risk Those ecologic, social, and economic assets and resources that could be impacted by fire or fire management actions.

NOTE: Examples include life, property, structures, natural and cultural resources, community infrastructure, public support, economic opportunities such as tourism, and air quality.

Vulnerability The physical feature or attribute that renders values susceptible to a given hazard.

References

Note that references marked with an asterisk served as the primary source documents for our concepts, terms, and definitions.

Calkin, David E.; Ager, Alan A.; Thompson, Matthew P., eds. 2011. A comparative risk assessment framework for wildland fire management: The 2010 Cohesive Strategy Science Report. Gen. Tech. Rep. RMRS-GTR-262. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 63 p.

*ISO. 2009. ISO guide 73:2009, Risk management—Vocabulary. Geneva, Switzerland: International Organization for Standardization. http://www.iso.org/iso/catalogue_detail?csnumber=44651 [Accessed March 30, 2016] (See also http://www.iso.org/iso/home/standards/iso31000.htm).

National Research Council. 2009. Science and decisions: Advancing risk assessment. Washington, DC: The National Academies Press. 424 p.

National Wildfire Coordinating Group. 2015. Glossary of wildland fire terminology. http://www.nwcg.gov/glossary-of-wildland-fire-terminology [Accessed March 30, 2016].

*Scott, Joe H.; Thompson, Matthew P.; Calkin, David E. 2013. A wildfire risk assessment framework for land and resource management. Gen. Tech. Rep. RMRS-GTR-315. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 83 p.

Taber, Mary A.; Elenz, Lisa M.; Langowski, Paul G. 2013. Decision making for wildfires: A guide for applying a risk management process at the incident level. Gen. Tech. Rep. RMRS-GTR-298WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.

Thompson, Matthew P.; MacGregor, Donald G.; Calkin, David E. 2016. Risk management: Core principles and practices, and their relevance to wildland fire. Gen. Tech. Rep. RMRS-GTR-350. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 29 p.

USDA Forest Service, Fire and Aviation Management. 2014. Aviation Safety Management System Guide. http://www.fs.fed.us/fire/av_safety/ [Accessed March 30, 2016].

*U.S. Department of Homeland Security. 2010. DHS Risk Lexicon. http://www.dhs.gov/dhs-risk-lexicon [Accessed March 30, 2016].

Yoe, Charles. 2011. Primer on risk analysis: Decision making under uncertainty. Boca Raton, FL: CRC Press. 251 p.

United States Department of Agriculture
Forest Service
Rocky Mountain Research Station

To learn more about RMRS publications or search our online titles:
www.fs.fed.us/rm/publications
www.treesearch.fs.fed.us/