OPERATIONAL RISK MANAGEMENT GUIDE

U.S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

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RISK MANAGEMENT COUNCIL
IN COOPERATION WITH
THE OFFICE OF SAFETY & OCCUPATIONAL HEALTH
and
THE NATIONAL AVIATION SAFETY COUNCIL

Contents

Executive Summary

To accomplish the mission of the U.S. Department of Agriculture Forest Service, we expose employees, volunteers, and contractors to a wide variety of environments ranging from secure office settings to extremes of weather, terrain, fires, and floods. All these workplace situations have hazards that present some degree of risk of harm to employees. Fortunately, most of the risk our employees face is manageable through deliberate, collaborative, and thoughtful risk management. This guide exists to help managers and employees identify and communicate value and objectives, identify risks, evaluate how to mitigate them to the lowest practicable level, and then decide if the value or attempting to achieve the objectives is worth accepting the residual risks.

The Operational Risk Management (ORM) process can be used to assist agency leaders, supervisors, and employees with identifying and mitigating risk associated with the work we perform. This guide provides a format for employees to conduct a thorough discussion of the various levels where ORM can be applied, illustrates uses of the tools, and contains reproducible forms in the Appendix.

Essentially, all Forest Service actions seek to meet multiple objectives, not just safety-related objectives. This guide is written to be inclusive of managing the risks associated with meeting any objective, especially the objective of no harm to employees. The ORM process and the newly developed risk assessment worksheet, when signed by a line officer or other approved authority, can replace the Job Hazard Analysis (JHA) form.

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Introduction

The U.S. Department of Agriculture Forest Service is embracing development of an Operational Risk Management (ORM) process to better plan for and address the inherent risks that our employees face. Adoption and implementation of ORM will allow the Forest Service to enhance employee capacity to identify, evaluate, and mitigate risks across the full spectrum of work activities and improve the ability to make risk informed decisions and ultimately accomplish objectives as safely and efficiently as possible.

The ORM Guide has been developed to describe and clarify an ORM process to be used in project, incident, and work activity decision making. (This guide will use the term "project" to represent all incidents, projects, or work activities from here on out.) The intent of this guide is to:

- Clearly define four principles that guide a five-step ORM process.
- Describe how to apply ORM in all Forest Service activities.
- Provide a sound foundation for creating a greater understanding of the importance of ORM through education, training, and application.
- Guide the incorporation of ORM into the full spectrum of Forest Service project/incident/work activities.

What is Operational Risk Management?

ORM is a continuous, systematic process of identifying and controlling hazards to increase the certainty of outcomes. This process includes detecting hazards, assessing risks, implementing controls, and monitoring risk controls to support effective risk-based decision making. "Risk management is essentially decision making under uncertainty" (Thompson et al, 2016). ORM involves identifying, assessing, decision making, implementing controls, and supervising. Furthermore, ORM seeks to harness feedback and input from all organizational levels to make the most informed decisions possible while reducing unintended outcomes.

ORM has a specific goal:

> ***Enhance employee's ability to anticipate hazards and reduce the potential for loss, thereby increasing the probability of a successful outcome***.

The Terminology of ORM

A clear understanding of ORM terminology is a prerequisite to effective communication of risk, decisions, and controls.

Risk: Risk is "the effect of uncertainty on objectives" as defined by the International Organization for Standardization (ISO 31000). It is typically expressed as an estimate of the probability and severity of consequence of uncertain future events.

In situations where outcomes and consequences are known, calculations of risk are possible. For example, the probability of the dealer winning a single hand of blackjack is approximately 51%. The consequence is the win or the loss.

This ORM guide is designed for use where absolute calculations are not possible, such as the risks of working in the wildland environment. Here the odds of various outcomes are estimated based on experience and the context of the situation, using tools discussed later in the guide.

Risk is characterized by different types. These are:

- ***Identified risk:*** Risk that has been determined to exist. Simply stated, identified risk is the risk that we recognize as existing that could reduce the likelihood of achieving our objective.
- ***Unidentified risk:*** Risk that has not been identified but has some effect on the likelihood of achieving our objective. Some risk is not identifiable or measurable but is no less important.
- ***Total risk:*** Total risk is the combination of both identified and unidentified risk. Ideally, identified risk will comprise the much larger proportion.
- ***Residual risk:*** The portion of total risk that remains after mitigation measures have been employed. Residual risk comprises acceptable risk and unidentified risk.
- ***Acceptable risk:*** The risks that are acceptable in order to meet objectives. Acceptable risk includes the residual and unidentified risks determined to be acceptable based on the importance of meeting objectives.
- ***Unacceptable risk*****:** That portion of identified risk that cannot be tolerated and must be either controlled or avoided.

Probability: The likelihood or the chance of an event occurring.

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

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

Severity/ Consequence: Both terms are used interchangeably. Both refer to the impact that a hazard could have on the objective. Therefore, in this guide, both are defined and used together where referenced.

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

Threat: An event, individual, entity, or action that has the potential to harm life, information, operations, the environment, or property, or a combination thereof. Often the words ‘Hazard’ and ‘Threat’ are used interchangeably.

Exposure: A term used to assess the amount of time a resource or a value is proximally in a position to be harmed by a hazard. Exposure is a tool used by risk managers to manage the risks to meeting objectives. In other words, risk managers use the tool of exposure to decrease the overall risks of the project. On a wildland fire, for example, risk managers deliberately expose employees to many hazards in order to meet incident objectives including the objective of no harm to employees.

Safety/ Safe**:** The term ‘safe’ is often used to describe a situation free from danger, risk or injury, or when there is certainty that objectives can be met with positive outcomes. As previously stated in this guide, most work performed by Forest Service employees involves some form of risk. ORM seeks to reduce risk to manageable levels and recognizes that in most cases, there is some residual risk. Therefore, most operations are never ‘risk free’ or totally ‘safe’. Also stated in this guide, ORM is not a guarantee that we won’t experience negative outcomes, such as serious injuries or property damage. We can also experience positive outcomes when risk management decisions were poor, yet we often conclude the project or operation was ‘safe’ simply because we did not experience a negative outcome. When working through

the risk assessment process it is important to focus on the process itself, which includes identifying the potential gains of the work versus the potential costs, or losses, and then making informed decisions on *relative* risk. It is best not to confuse the Risk Management process with subjective concepts such as 'safe'.

Values at risk: Those ecologic, social, economic assets, and resources that could be impacted by a hazard or threat.

Risk assessment: Process or product 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 decision making.

Risk control: A strategy or deliberate action taken to reduce the potential for loss, maintain risk at acceptable levels, or enhance the potential for benefits, in a manner consistent with objectives, desired outcomes, and the management context. Some types of controls include engineering controls, administrative controls, and personal protective equipment (PPE).

Risk management: The deliberate action taken by an organization or individuals to manage risk. This is achieved by the identification of opportunities and threats and the allocation and use of resources to increase the odds of success, avoid hazards, minimize consequences and provide for recovery. Risk management seeks to reduce risks to acceptable levels. In most endeavors, we will not be able to reduce risk to zero.

The risk management process operates on four connected and affiliated levels: enterprise, strategic, deliberate (operational), and real-time (time-critical). Although the concepts at all levels are similar, the scope varies from the agency mission to a single tree. While it may be desirable to apply risk management in depth for every operation, time and resources may not always be available. The objective of risk management is to develop sufficient proficiency in applying the process, so risk management becomes an automatic part of the decision-making methodology on and off duty. Leaders must employ the risk management process to make sound, timely decisions. The tools in this guide can be helpful when conducting strategic risk assessments during project and fire operational planning, but this guide is not intended to cover Enterprise (ERM) or Strategic Risk Management (SRM), as those are above the project level.

Enterprise Risk Management (ERM): Begins with clearly defining agency mission and then identifies national and agency-wide influencers affecting ability to attain mission objectives. ERM involves an assessment of system level fundamentals that affect how strategic, operational and time-critical risk management choices are made. System-level fundamentals include:

- The mission itself and how success is defined.
- Explicit and implied agency doctrine defining how decisions and choices are made beyond rules, and prescriptions.
- Agency governance, or the quality of leadership and effectiveness of rules and policies towards meeting the objective.
- The culture of the agency that regulates risk acceptability decisions made by both teams and individuals. E.g., Life First and the Chief's support for Facilitated Learning Analysis were culture-shapers that influence risk management decisions at all levels.

ERM detects and identifies the systemic nature of some risks and mitigates these through cultural prompts, policy/ doctrine, and/ or budget allocations. For example, every spring, the Chief of the U.S.

Department of Agriculture Forest Service establishes our definition of success in wildland fire and in doing so, guides decisions and actions expected to improve risk informed decision making and reduce long-term health and safety risks to communities and firefighters.

ERM decisions are generally made at the Executive Leadership Team (ELT) level, department level or higher.

Strategic Risk Management (SRM): Provides a risk management process to a long-term project or plan where resources are available to invest in significant analysis and researching available data. It is used in the long-term planning of complex operations, such as for introducing new equipment, new procedures or new policies. Examples of projects where SRM is applicable include Forest Land Management Planning, a watershed restoration project, or a long-term fire event. SRM tracks and calibrates risks associated with operations over the project term and adjusts strategy accordingly. An important component of the SRM process is to define and articulate the objectives and end-state used in Operational Risk Management. SRM decisions are generally made at the Agency Administrator, Director Level or higher.

Operational (Deliberate) Risk Management (ORM): Applies the process displayed in this guide and is completed when there is ample time. ORM relies on clear objectives, and each step should be documented. It primarily uses experience and brainstorming to identify hazards and develop controls, and therefore is most effective when done in a group. Examples of ORM applications include planning upcoming projects to implement the Land Management Plan, developing an incident management plan, a prescribed burning plan etc. ORM is also applicable for reviewing a standard operating procedure, maintenance, or training. ORM decisions are generally made at the Agency Administrator, Project Manager or Incident Commander Level.

***Real-Time (Time-Critical) Risk Management*:** An "on the run" mental or verbal review of the situation using the risk management process, with or without recording the information.

Employees implement the real-time process to consider risk when making intuitive decisions in a time-compressed situation. This level of risk management is used in the implementation phase of projects such as fire operations. It also is the most easily applied level of risk management in off-duty situations. It is particularly helpful in choosing the appropriate course of action when an unplanned event occurs. Real-Time risk management decisions are made by the crew or individual undertaking the action.

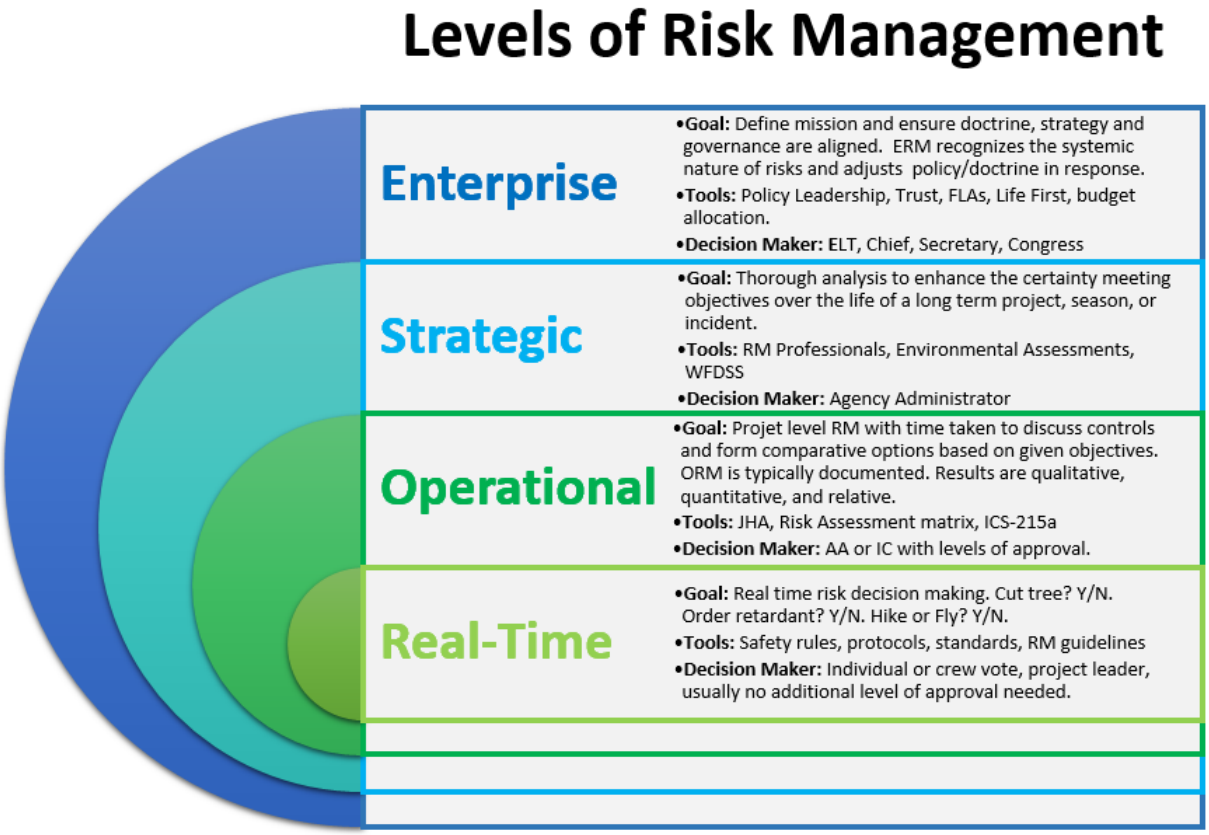


Figure 1: The four levels of risk management.

Principles of ORM Application

Four principles guide all actions associated with the application of ORM. These principles should be continuously considered and are applicable before, during and after all tasks and operations by individuals at all levels of responsibility. As a project and evolves, personnel should continuously employ risk management principles during the decision-making process. The four principles are described in Table 1:

Table 1: The four principles of Risk Management

Principle	Meaning
Accept No Unnecessary Risk	All Forest Service operations and daily routines include risk. Unnecessary risk is any risk that, if taken, will not contribute meaningfully to the mission or task accomplishment or will needlessly jeopardize personnel or equipment. The most logical courses of action for accomplishing a project are those that meet objectives while exposing personnel and resources to the lowest reasonable level of risk. ORM provides tools to determine which risk or what degree of risk is unnecessary.
Accept Risk When Benefits Outweigh Costs	Even high-risk endeavors may be undertaken when decision-makers clearly acknowledge the sum of the benefits exceeds the sum of the costs. Balancing costs and benefits may be a subjective process open to interpretation. Ultimately, the appropriate decision authority may have to determine the balance; therefore personnel with knowledge and experience of the project must be involved in risk based decisions.
Make Risk Decisions at the Appropriate Level	Depending on the situation, anyone can make a risk decision. However, the appropriate level to make those decisions is that which most effectively understands the risk, allocates the resources to reduce the risk, eliminates the hazard, and implements controls. Leaders at all levels must ensure subordinates are aware of how much risk their subordinates are accepting. If subordinates determine that the available controls will not reduce risk to an acceptable level, the decision must be elevated to the next level in the chain of command.
Anticipate and Manage Risk by Planning	Thorough planning identifies associated hazards and the steps necessary to complete the project. ORM is critically important in an operation's planning stages, and risk can change dramatically during an actual project. Therefore, supervisors and senior leadership should remain flexible and integrate ORM in executing tasks as much as in planning for them.

The Five-Step ORM Process

The Forest Service's five-step ORM process is illustrated in Figure 2. All steps are equally important and presume there is a clear objective to be met. The following section thoroughly describes each step in the process and provides tools used in risk assessments. **(Field use refer to the IRPG, page 1).**

Figure 2: The 5 step ORM process to be used by the Forest Service

Before You Begin:

How important is accomplishing the objective? List the values and/or objectives that result in risk to employees and/or agency interests. This represents the "Benefits" in Principle 2: *"Accept Risk When Benefits Outweigh Costs"* and thorough assessment is required to make an informed risk decision in step 4. Clear communication of values and/or objectives and their relative importance to all levels is critical. Consistent with ISO 31000, "The purpose of risk management is the creation and protection of value."

Without value and/or clear objectives, there is no reason to accept risk. The relative importance of the values and/or objectives is how we will determine whether to accept the residual risk.

Step 1: Identify Hazards

List the hazards associated with each phase of the project. Potential failures, i.e., things that could go wrong, encompass equipment or operational problems both internal and external to the project.

The key to successfully analyzing risk is to carefully define the hazards and identify and evaluate safeguards. In brainstorming sessions, asking the question "What if?" is an excellent tool to help identify as many potential hazards as possible. It is important to remember that risk management is not foolproof, nor is it a guarantee that we might not experience catastrophic outcomes, but it does improve the odds of mission success. Specific hazard identification is important since it leads to assessing risk more accurately and subsequently developing risk control options or safeguards more thoroughly. Looking at the three main categories of equipment, environment and personnel are helpful in hazard identification.

When identifying a hazard, state what it is, and further, describe the cause of potential exposure to that hazard, since that will help identify risk controls or safeguards later in the process.

Step 2: Assess Hazards

Consider risk applicable to the project, and specifically, risk applicable to meeting the objective. Determine individual risk levels for each hazard identified. Assess risk by evaluating specific elements or factors that, when combined, define risk. Begin by identifying the potential consequences associated with the given task. Then determine the probability or likelihood of experiencing that outcome based on experienced persons, such as subject matter experts. This is subjective and will vary among individuals.

Two tools that assess risk for these hazards are the Risk Assessment Matrix (Figure 3) and the Risk Assessment Tool (Figure 9 and Appendix 1). These tools differ in how they look at the hazards identified in Step 2 of the ORM process and can be used at different risk levels. Though both tools can be used at all risk levels, the Risk Assessment Matrix is most useful at the strategic and operational levels while the Risk Assessment Tool is principally used at the time-critical level.

Tools Used to Assess Hazards:

- Risk Assessment Matrix – used to determine the risk level.
- Risk Assessment Tool – documents hazard identification, hazard assessment, Risk Assessment Code, and control actions.

Risk Assessment Matrix

The Risk Assessment Matrix (Figure 3) is used to assign Risk Assessment Codes to each hazard that may be experienced while completing an objective. This matrix is based on the concept that *Risk = Probability x Severity*. It consists of three areas:

- Probability categories.
- Severity/consequences categories; and
- Risk assessment codes.

Risk Assessment Matrix		Probability *Likelihood of Mishap if Hazard is Present*				
		Almost Certain (Continuously experienced)	**Likely** (Will occur frequently)	**Possible** (Will occur several times)	**Unlikely** (Remotely possible but not probable)	**Rare** (Improbable; but has occurred in the past)
Severity/ Consequences *Consequence if Mishap Occurs*	**Catastrophic** (Imminent and immediate danger of death or permanent disability; major property or facility damage; loss of critical system or equipment)	Extremely High	Extremely High	Extremely High	High	Moderate
	Critical (Permanent partial disability, temporary total disability; moderate environmental damage; extensive damage to equipment)	Extremely High	Extremely High	High	Moderate	Moderate
	Moderate (Hospitalized minor injury, reversible illness; minor damage to equipment, property or the environment)	High	High	Moderate	Low	Low
	Negligible (First aid or minor medical treatment; little or no property or environmental damage)	Moderate	Moderate	Low	Low	Low

Figure 3: Risk Assessment Matrix

Probability: The likelihood that the potential consequences will occur, is found on the top axis of the matrix, and is calculated using five categories.

Almost Certain: Continuously experienced

Likely: Will occur frequently

Possible: Will occur several times

Unlikely: Remotely possible but not probable

Rare: Improbable but has occurred in the past

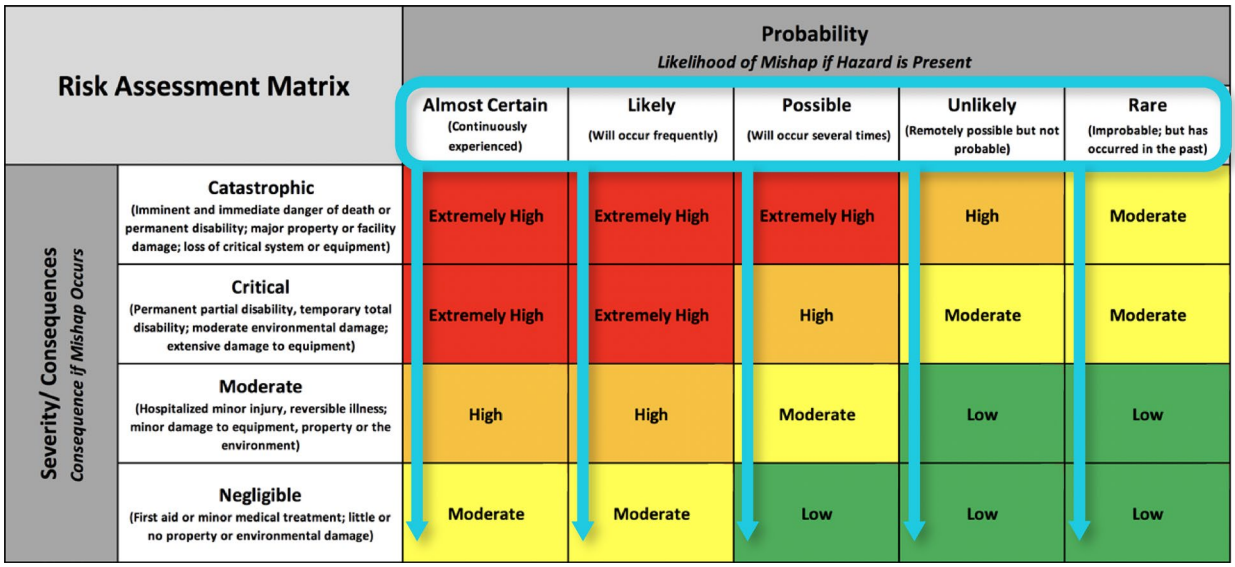


Figure 4: Understanding Probability on the Risk Assessment Matrix

Severity/ Consequences: This category is defined as an event's potential consequences related to meeting objectives. In safety-related assessments it refers to the degree of damage or injury to a human. In project-related assessments it refers to the impact on a project. Should something go wrong, the results are likely to occur in one of these areas: Failure to meet objective, injury or death, equipment damage, project degradation, adverse publicity, environmental damage, property damage, etc. Severity/Consequences categories are shown in the left-hand side of the matrix and are ranked by using four categories:

Catastrophic: Impact to objective Imminent and immediate danger of death or permanent disability; major property or facility damage; loss of critical system or equipment.

Critical: Impact to objective Permanent partial disability, temporary total disability; moderate environmental damage; extensive damage to equipment.

Moderate: Impact to objective Hospitalized minor injury, reversible illness; minor damage to equipment, property or the environment.

Negligible: Impact to objective First aid or minor medical treatment; little or no property or environmental damage.

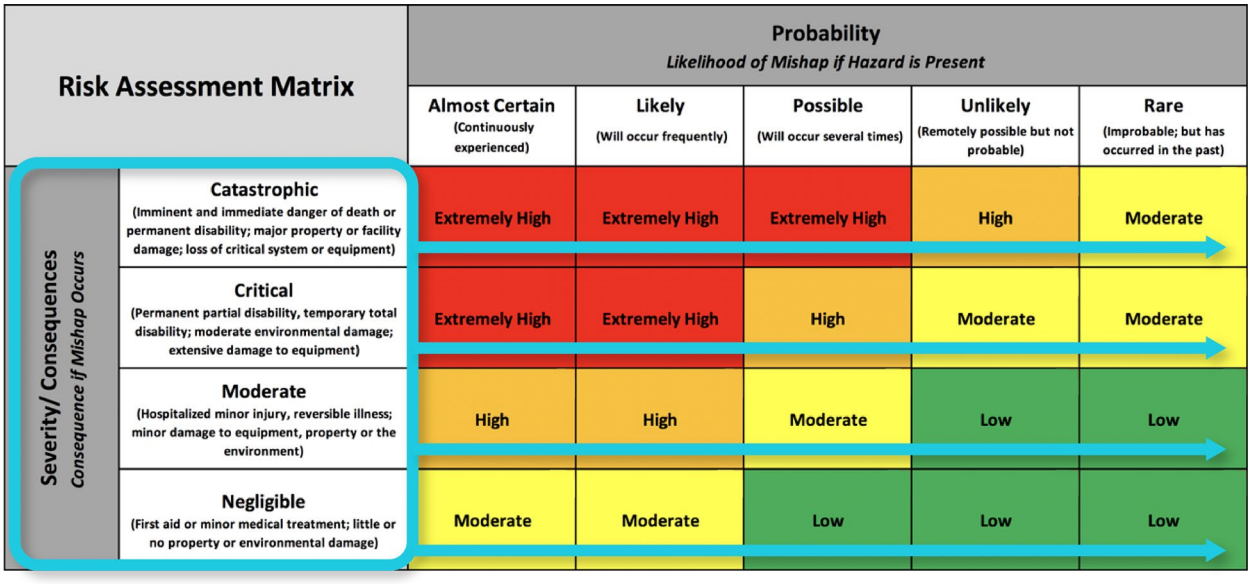


Figure 5: Understanding Severity and Consequences on the Risk Assessment Matrix

Risk Assessment Codes (RAC): The RAC are produced in the matrix through the combination of Probability with Severity/ Consequences. These codes reflect risk decisions.

The RAC Matrix is a tool that can be used to determine how risky an identified hazard is in terms of probability and severity. First assess the severity of consequence associated with the hazard. Severity is expressed in terms of degree of injury or illness, loss of or damage to equipment or property, or environmental damage. Then assess the probability of experiencing that consequence. Finally, probability and severity are translated into a risk level that must be either accepted or rejected.

Risk Assessment Codes are situated in the lower center of the matrix.

Colors are associated with the four RAC categories:

Extremely High = **red**
High = **orange**
Moderate = **yellow**
Low = **green**

Risk Assessment Matrix		Probability *Likelihood of Mishap if Hazard is Present*				
		Almost Certain (Continuously experienced)	**Likely** (Will occur frequently)	**Possible** (Will occur several times)	**Unlikely** (Remotely possible but not probable)	**Rare** (Improbable; but has occurred in the past)
Severity/ Consequences *Consequence if Mishap Occurs*	**Catastrophic** (Imminent and immediate danger of death or permanent disability; major property or facility damage; loss of critical system or equipment)	Extremely High	Extremely High	Extremely High	High	Moderate
	Critical (Permanent partial disability, temporary total disability; moderate environmental damage; extensive damage to equipment)	Extremely High	Extremely High	High	Moderate	Moderate
	Moderate (Hospitalized minor injury, reversible illness; minor damage to equipment, property or the environment)	High	High	Moderate	Low	Low
	Negligible (First aid or minor medical treatment; little or no property or environmental damage)	Moderate	Moderate	Low	Low	Low

Figure 6: Risk Assessment Matrix

Table 2: Risk Assessment Codes and Descriptions for the Risk Assessment Matrix

Risk Assessment Code	Severity of Consequences
Extremely High	• Complete or near complete failure to meet objective • Major property or facility damage • Death or permanent total disability • Severe environmental damage • Loss of major or critical system or equipment
High	• Significantly degraded capability for meeting the objective or accomplishing the project/incident/work activity • Injury that results in permanent partial disability, or temporary total disability lasting more than three months • Serious environmental damage
Moderate	• Degraded capability for meeting objective or accomplishment of the project/fire operation • Lost days due to injury or illness not exceeding three months • Moderate damage to property or the environment
Low	• No adverse impact to meeting objective or accomplishment of the project/fire operation • Little or no medical treatment required • Little or no damage to equipment, systems, property or environment

Risk Assessment Tool

General risk concerns involving planning operations or reassessing risks can be evaluated using a Risk Assessment Tool (RAT). This worksheet represents a valuable companion tool when used with the "Stop, Think, Talk, and then Act" protocol. It enhances the dialog with a set of questions that form a risk assessment. A RAT is also a great tool for real-time risk assessments. Elements identified as contributing to a large portion of risk on projects are supervision, planning, leader's intent, team fitness, environment, duration/complexity. A RAT addresses these elements. Their descriptions are shown in Table 3.

Table 3: Risk Elements Found in the Risk Assessment Tool

Risk Elements	Description
Supervision	Supervisory control should consider a clear chain of command, how qualified a supervisor is, and whether that person is actually supervising. Even if a person is qualified to perform a task; supervision, even as simple as verifying the correctness of a task, serves to further minimize risk. The higher the risk, the more a supervisor needs to focus on observing and checking. This becomes increasingly more important as a person's qualifications decrease. A supervisor actively involved in a task (doing something) can be easily distracted and probably is not an effective safety observer in moderate to high-risk conditions.
Planning	Preparation and planning should consider adequate information and planning time, how much information is available, adequate communications, resources needed, resources available, and overall clarity of the plan with team input solicited.
Leader's Intent	Are the task, purpose, and end state of the project clear and understood by everyone? Does everyone know the level of risk to be accepted to accomplish the objectives of the project? Does the leader's intent leave any "gaps" in clear understanding, including potential conflicts in priorities?
Team Fitness	Team fitness should judge the team members' physical and mental state, generally a function of how much rest they have had. Quality of rest considerations include work/rest, potential sleep length, and any interruptions. Fatigue normally becomes a factor after 16 hours without rest; however, lack of quality sleep builds a deficit that worsens the effects of fatigue. Team selection should consider the experience of the persons performing the specific project, including the level of individual training and experience, and team cohesiveness. If individuals are replaced during the project, assess the new team members' experience.
Environment	Environment should consider all factors affecting personnel, unit, or resource performance, including time of day, seasonal period, weather conditions, proximity to other external and geographic hazards, type of terrain, among other factors.
Duration / Complexity	Duration/ Complexity considers both the time and resources required to conduct a project. Generally, the longer personnel are exposed to some particular hazards, i.e. felling trees, the greater the risk involved. However, each circumstance is unique. For example, more iterations of a task can increase the opportunity for a loss to occur, but on the positive side, may improve the proficiency of the team conducting the task, thus possibly decreasing the chance of error. Other factors to consider in this element include how long the environmental conditions will remain stable and the precision and level of coordination needed to conduct the task.

Using the Risk Assessment Tool

A RAT (Figure 7) provides a quick mechanism to assess risk, assign scores to risk elements, compile a total risk score, and equate that score to a relative evaluation of overall risk. This is then used in Step 3 to help make decisions. A RAT consists of two components: the risk element scoring section, and the RAT Evaluation Scale. The upper portion of the worksheet is the risk element scoring section while the lower colored portion of the worksheet is the RAT Evaluation Scale.

Risk Assessment Tool		
Risk Element		**Score**
Supervision - qualification, experience, organization		
Planning - details, clarity resource selection and condition, communications		
Leader's Intent - clear task, purpose, and end state		
Team Fitness - physical/mental fitness, good morale, mindful, maintain S.A.		
Environment - Temperature, elevations, terrain difficulty remoteness		
Duration Complexity - details, task, time needed, time afforded		
	Total Risk Score	
6 - 23	**24 - 44**	**45 - 60**
Green (Low Risk)	**Amber (Medium Risk)**	**Red (High Risk)**

Figure 7: Risk Assessment Tool

In the Risk Element Scoring section, assign the total degree of risk for each hazard previously identified. Values of 1 (nearly no risk) through 10 (maximum risk) are assigned to each of the six elements.

1. The discussion should start with the least experienced members first in each risk element category.
2. Consensus should be reached with the team to determine what the risk element score should be.
3. Once the scores have been assigned and filled into the score column, add all scores to come up with a total risk score.
4. In the risk evaluation scale section (Green, Amber, Red), the total scores are interpreted to provide an assessment of overall risk relative to the identified hazards. If the total risk score value falls in the green (score range 6 – 23), the risk is rated as low. A value in the

amber (score range 24 – 44) indicates medium risk. This risk level implies that adoption of additional procedures to minimize risk must be considered. If the total value falls in the red (score range 45 – 60), control measures must be implemented to reduce the risk before starting the task, or the decision should be re-evaluated.

A RAT evaluation scale provides a rapid process to assess risk for a task or operation. If the degree of risk appears unduly high in one or more of the elements, perform a second assessment using the Risk Assessment Matrix previously described for each element of concern. Rank-order all hazards assessed in the RAT evaluation scale from the highest to the lowest risk to target areas of greatest concern first.

Interpreting Risk from the RAT

The ability to assign numerical values or color codes to risk elements in either the risk assessment matrix or a RAT is not the most important part of risk assessments. *What is critical in the ORM steps is team discussion to understand the risks and how the team will manage them*. Different Forest Service functions or teams may interpret low, medium, and high risk differently for their own projects. For example, law enforcement personnel may define a "low" risk level a bit higher than personnel involved in recreation. Understanding these differences will improve communications among teams. However, a low/medium/high scale is generally understood and is the widely used standard in the safety industry for this type of assessment tool. Therefore, discussions of risk among various agency activities will use the terms low, medium, and high, but each team or functional area will define those terms meaningfully for its own personnel.

The RAT is a tool to focus a conversation and attention to hazards and risks encountered by Forest Service employees in their day to day work.

Step 3: Make Risk Decisions

There are three basic actions necessary for making informed risk decisions:

1. Identifying risk management strategies.
2. Determining the effect of these controls, or the residual risk, on the hazard.
3. Evaluating risk versus gain to inform a decision.

Identifying Risk Management Strategies

Control options involve the application of strategic options to manage the level of identified risk. These options include:

Transfer: The use of actions to manage risk by shifting some or all of the risk to another entity, asset, resource, or system. Transferring risk shifts uncertainty to another entity. For example, transferring risk to a contractor is sometimes an effective way to mitigate risk to employees because contractors can have more expertise and/or experience than Forest Service employees in some types of work and can do the work more efficiently with less risk.

Avoid: The use of actions or measures that effectively prevent or bypass exposure to a risk. Avoidance to one particular risk may increase the effects of other risks. For example, not putting personnel on a project or fire operation may reduce short-term safety-related risks but may do nothing to reduce other risks

associated with the project. However, it may be possible to avoid specific risks, e.g., avoid risks associated with a night operation by planning the operation for daytime.

Accept: Risk can be accepted when the benefits of meeting the objective clearly outweigh the risks involved, but only as much as necessary to meet the objective (accomplish the mission or task).

Control: The use of deliberate action taken to increase the likelihood of meeting objectives, reduce the potential for loss, maintain risk at acceptable levels, or enhance the potential for benefits in a manner consistent with objectives, desired outcomes, and the management context. 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 (lookouts, communications, escape routes, safety zones) procedures. Using protective devices, engineering controls, and personal protective equipment are some examples that usually help control severity. Training, situational awareness, attitude change, rest, and stress reduction are some examples that usually help control probability. In this guide, the term 'control' is essentially synonymous with 'mitigation' and 'abatement'.

For aviation, examples of risk control or mitigation might include waiting for weather to improve, utilizing aircraft/crew with increased capability, delaying or even cancelling flight operations.

A key element of the risk decision process is determining if the risk is necessary. This decision must be made at the appropriate level by the individual who can balance the risk against the potential benefit and value. This individual decides if controls are sufficient and acceptable and whether to accept the resulting residual risk. These risk-based decisions should not be made in a silo, but instead should be made in collaboration with employees and other stakeholders who are impacted by these decisions.

Ultimately, acceptance of residual safety-related risk is decided by the employees who are exposed to the hazards. If they are not comfortable with the risk remaining after controls are in place, further assessment needs to occur with their input. Acceptance of residual risks to other objectives outside of safety such as risks related to NEPA, relationships, political risks, etc., are decided by the Agency Administrator.

Evaluate Risk vs. Gain

Analyze the degree of risk with the proposed controls in place. Determine whether the benefits of meeting your objective now exceed the degree of risk that will entail. Be sure to consider the cumulative risk of all identified hazards and the decision's long-term consequences.

If the benefits outweigh the risks, with controls in place, determine if the current level in the chain of command can implement all the controls. If not, find assistance from the next level in the chain of command.

When notified of a situation whose risks outweighs the benefits, the next level in the chain of command should assist with implementing the required controls, modify or cancel the mission, or accept the identified risks.

The equation *Risk = Severity x Probability* defines what is called the "expected loss value". However, individuals can value the same loss differently because the loss may affect their overall satisfaction (their needs, issues, and concerns) differently. It is easy to overlook the issue of perceived value in typical risk management theories, but it may determine the kinds of actions decision-makers take in weighing risk vs. gain. Personnel should be aware the acceptability of risk can vary from person to person, because the perceived risk, affected by different values placed on the expected loss, also varies. Therefore, while

taking this "reality check" step in the risk management process, it is wise to consider a loss's perceived *and* expected value to avoid potential controversy when making risk decisions.

Risk management decisions are based on weighing the residual risk against the gain, which is valid only if the selected controls are implemented and remain effective.

Risk Decision Authority Chart

Risk decision authority defines who should approve projects at each risk level and ensure all personnel understand the approval process. If the Risk Assessment Worksheet is being used in lieu of a Job Hazard Analysis (JHA), then the levels of risk decision authorities are as indicated in the Risk Decision Authority chart (Figure 8).

Risk Decision Authority	
Risk Assessment Code	Project or Work Activity
Extremely High	USFS Line Officer
High	USFS Line Officer
Moderate	Supervisor or Lead
Low	Individual

Figure 8: Risk Decision Authority Chart

Step 4: Implement Controls

Once the risk decision is made, resources must be made available to implement the specific controls. Implementation requires that the plan is clearly communicated to all involved personnel.

Part of implementing control measures is having a dialog with the personnel in the system of the risk management process. If personnel disagree, the decision makers and personnel should work together to come to a mutual understanding and acceptance. Documenting the decision and all steps in the process can facilitate communications and clarify the rationale process behind risk management decisions.

If it is determined that the risk level is too high or the controls implemented in Step 4 are not as effective as thought, then the Step 3 decision must be revisited to either develop additional or alternate controls, make modifications, or reject the course of action. This two-way information flow is shown in the five step ORM process in Figure 2.

There are many tools to document this process. The Risk Assessment Worksheet (Figure 10) is a tool that meets the intent of ORM. This worksheet consolidates all information from the Risk Assessment Matrix and is then used with the Risk Decision Authority Chart. Each block in the worksheet is numbered and guidance for completing each block is shown in Table 4.

Table 4: Risk Assessment Worksheet Instructions

Risk Assessment Worksheet Instructions	
Block Number	**Type of Information**
Block 1	Name of project, incident or work activity
Block 2	Location of project, incident or work activity
Block 3	Specific Objective
Block 4	Name and title of person preparing the Risk Assessment Worksheet
Block 5	Date that the preparer filled out the Risk Assessment Worksheet
Block 6	Signature of the individual that has the authority to approve projects at the appropriate risk level. If block 15 is Moderate, Serious or Critical, use the Risk Decision Authority Matrix (fig.8) to determine the authorization required to sign in block 6. The intent is to brief the Risk Decision Authority on the Control Measures used to reduce the risk(s). Note: if the person preparing the form signs this block, the risk in block 15 must be Minor or Negligible.
Assess Hazards: Instructions for blocks 7-11	
Block 7	Task: task to be assessed (ex. Driving, tree felling,)
Block 8	Hazards: Identify hazards (ex. Low visibility, overhead hazard, uneven terrain)
Block 9	Hazard Probability: Probability a hazard will be encountered during the task. Select from drop down box.
Block 10	Severity/Consequence: Consequences on objective, should the event occur. Select from drop down box.
Block 11	Risk Assessment Code (RAC): When blocks 9 and 10 are populated, a RAC will be automatically assigned. See figure 6: Risk Assessment Matrix for RAC categories.
Identify Risk Mitigation Measures: Identify mitigation and abatement measures in Block 12	
Block 12	List all mitigation or abatement measures: What mitigation or abatement strategies will eliminate or minimize residual risk (ex. Engineering, PPE, avoidance)
Residual Risk: Instructions for blocks 13-17	
Block 13	Hazard Probability: Probability following mitigation or abatement actions. Select from drop down box.
Block 14	Severity/Consequence: Severity/consequence(s) following mitigation or abatement actions. Select from drop down box.
Block 15	Risk Assessment Code (RAC): When blocks 13 and 14 are populated, a RAC in Block 15 will be auto populated.
Block 16	Necessary: Is the risk necessary following mitigation or abatement actions? *Yes/No* If the answer is *No*, either develop additional or alternative mitigations, modifications or choose not to accept the risk.
Block 17	Person or operational area assigned the abatement actions. This is optional and can be left blank.

Step 5: Supervise

The final step in the ORM process is to monitor the situation to ensure the controls are effective and remain in place. Changes requiring further risk management must be identified and acted on. When necessary, actions must be taken to correct ineffective risk controls and reinitiate the risk management steps in response to new hazards. The ORM process in Figure 2 shows that the information flow includes going back from Step 5 to Step 4 as appropriate.

Communicate, Evaluate, Validate

It is important to remember that ***risk management is a continuous process,*** and that communication, evaluation, and validation are core elements to all of the steps in the ORM process. Throughout each step of the ORM process, individuals should consistently communicate, evaluate, and validate actions taken to manage risk. This will ensure they are meeting project objectives by ***enhancing employees' ability to anticipate hazards and reduce the potential for loss, thereby increasing the probability of a successful outcome.***

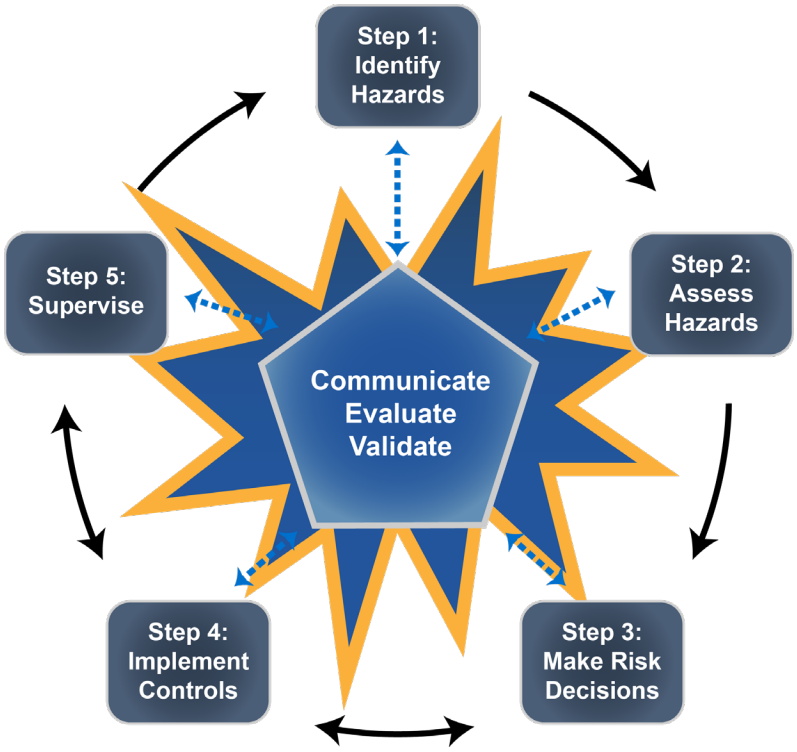


Figure 9: Communicate, Evaluate, Validate of the 5 Step Risk Management Process

ORM Process Examples

The following examples show a deliberative ORM process using the risk assessment matrix and worksheet, and a time critical process using the Risk Assessment Tool, both for a wildlife survey.

In the first example, the objective is that no employee will be harmed conducting this project. Six tasks with associated hazards were evaluated using the risk assessment matrix and worksheet. (This is not intended to be an all-inclusive list for this project, only for illustration of the process). This example is intended to demonstrate a wildlife biologist at a district conducting a risk assessment, using the risk assessment matrix, to thoroughly assess risks and controls for the project.

Using the Risk Assessment Worksheet, the biologist conducts a risk assessment for the District Wildlife Survey Project. First, blocks 1 – 5 are completed by the preparer to initiate the assessment. Then, the biologist will assess the hazards associated with each task and will use the Risk Assessment Matrix to complete blocks 7 – 11. It is important to remember that each task involved in the project requires a separate analysis and action and is then shown as a separate row in the worksheet. Next, the biologist identifies risk mitigation measures for each hazard or threat and documents those actions in block 12. Finally, the residual risk section, is completed (blocks 13 – 17). Blocks 13 – 15 include information from the Risk Assessment Matrix while block 16 represents a determination of whether the residual risk is necessary or not. Block 17 is used to identify who is accountable for the completion of each task.

At this point in the ORM process, the biologist would be on step three of the five step risk management process having identified and assessed risks. Making risk based decisions (ORM step 3) involves reassessing the risk by determining whether the controls and mitigations outlined in the worksheet and the resulting residual risk is necessary to complete the tasks, and whether the benefits of completing the tasks outweigh the risks involved. This risk decision should be made at the appropriate decision level found on the Risk Decision Authority Chart. That decision maker, and in this case the program supervisor or the project lead, is authorized to sign block 6 in the Risk Assessment Worksheet. After this is completed, the biologist is ready to move to implementing controls (ORM Step 4) and supervising the project (ORM Step 5).

This worksheet can be completed manually following the matrix and looking up the categories, or it can be done using the autofill worksheet attached in the Appendix. The completed worksheet for this example is shown in Figure 10. From block 13, it is apparent that several tasks have RACs of High. The Residual Risk RACs after controls are developed (block 15) show that for three of the tasks, the RACs have been lowered to Low. For the other three tasks, the RACs were either not changed or only changed to Moderate. At this point, the biologist should re-evaluate the controls and determine if changes are needed.

Risk Assessment Worksheet	1. Project/Incident/Work Activity	2. Location
	Wildlife Surveys	Region 3, Cibola NF, Magdalena RD
3. Specific Objective	4. Name and Title of Preparer	5. Date
Conduct field owl surveys across the district	Smokey Bear	Thursday, October 12, 2017

6. Risk Decision Authority: (Authority Signature Block) If block 15 is Moderate, High or Extremely High a higher level of authority needs to sign in this block.

Signature/Date:

Assess Hazards					Identify Risk Mitigation Measures	Residual Risk				
7. Task	8. Hazard	9. Severity/ Consequence	10. Hazard Probability	11. RAC	12. List all mitigation or abatement measures	13. Severity/ Consequences	14. Hazard Probability	15. RAC	16. Necessary (Yes/No)	17. Hazard Control Assigned to:
Travel	Drving & Traffic	Critical	Unlikely	Moderate	Wear seatbelts, drive defensively, keep up on preventative maintenance, follow traffic laws.	Critical	Rare	Moderate	Yes	Every person on project
Working on steep slopes	Rolling debris	Critical	Rare	Moderate	Wear proper work boots, carry radio, follow check in and check out policy, know and understand the medical protocol and have a copy in your pack.	Moderate	Rare	Low	Yes	Every person on project
Working on steep slopes	Slips, trips, falls	Catastrophic	Unlikely	High	Wear proper work boots, carry radio, follow check in and check out policy, know and understand the medical protocol and have a copy in your pack.	Moderate	Unlikely	Low	Yes	Every person on project
Night surveys	Getting lost / disoriented	Critical	Unlikely	Moderate	Use headlamp, have extra batteries, plan and know travel route and work area beforehand, work in pairs when possible, have radio on and ensure communication with supervisor or co-worker.	Moderate	Unlikely	Low	Yes	Every person on project
Night surveys	Lack of support system	Catastrophic	Unlikely	High	Ensure communication with supervisor or co-worker, plan and know travel route and work area beforehand and ensure supervisor or co-worker are aware, and work in pairs when possible.	Catastrophic	Rare	Moderate	Yes	Every person on project
Working in trees and snags	Tree strike	Catastrophic	Rare	Moderate	Size up your surroundings. Avoid areas with obvious snags or cat face trees, be aware or weather (especially strong forecasted winds.) Avoid the common habit of always looking down. Look up! Become familiar with hazard tree identification.	Catastrophic	Rare	Moderate	Yes	Every person on project

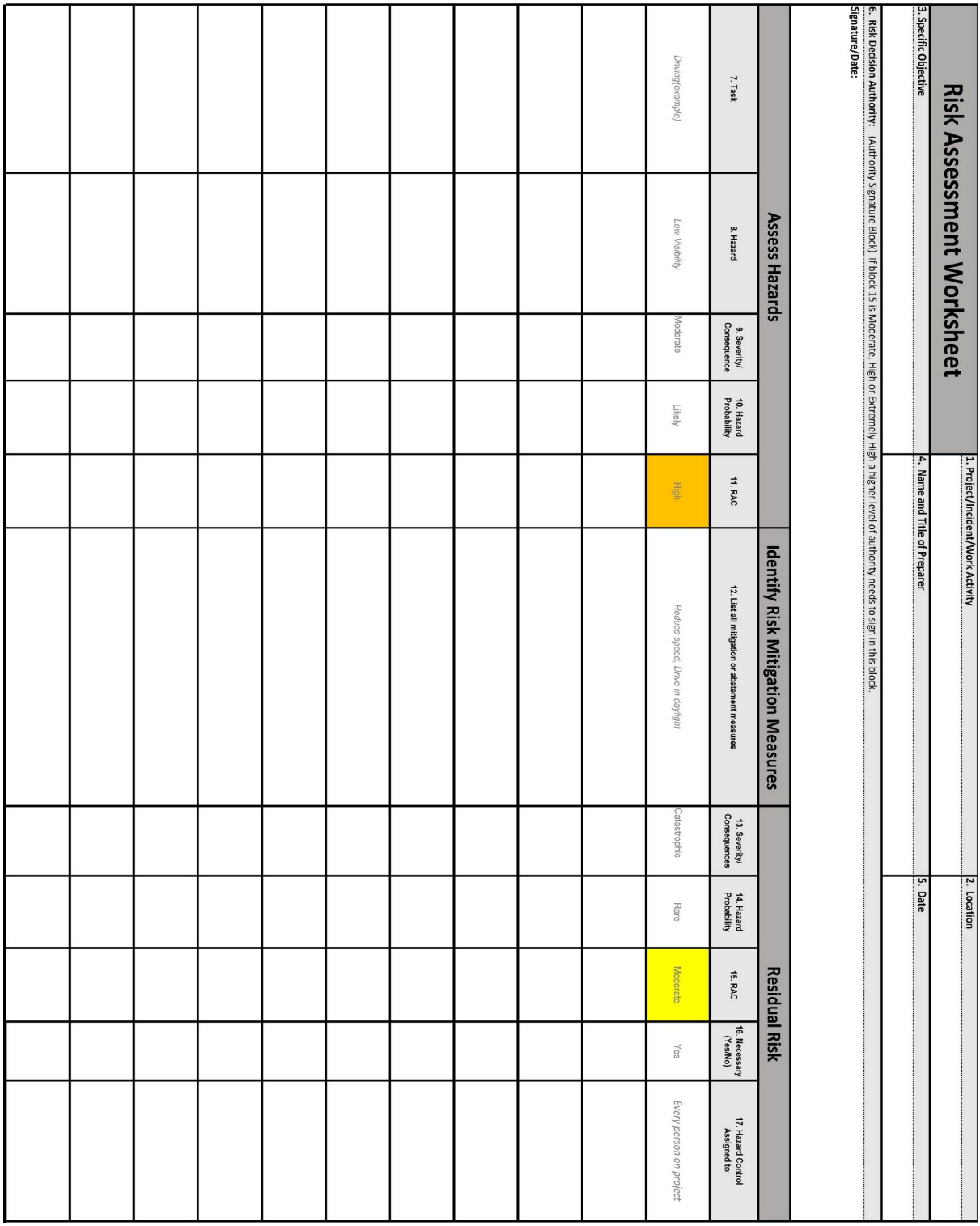
Figure 9: Completed Risk Assessment Worksheet for Wildlife Surveys

References

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

International Organization for Standardizations. 2009. ISO 31000 – Risk Management. ISO 31000:2009 – Risk Management – Principles and Guidelines. https://www.iso.org/iso-31000-risk-management.html

Appendix 1: Risk Assessment Worksheet



Risk Assessment Worksheet

1. Project/Incident/Work Activity
2. Location
3. Specific Objective
4. Name and Title of Preparer
5. Date
6. Risk Decision Authority: (Authority Signature Block) If block 15 is Moderate, High or Extremely High a higher level of authority needs to sign in this block.

Signature/Date:

Assess Hazards					Identify Risk Mitigation Measures	Residual Risk				
7. Task	8. Hazard	9. Severity/ Consequence	10. Hazard Probability	11. RAC	12. List all mitigation or abatement measures	13. Severity/ Consequences	14. Hazard Probability	15. RAC	16. Necessary (Yes/No)	17. Hazard Control Assigned to:
Driving(example)	*Low Visibility*	Moderate	Likely	High	*Reduce speed, Drive in daylight*	Catastrophic	Rare	Moderate	Yes	*Every person on project*

This fillable worksheet is available on the Risk Management Website

Appendix 2: Risk Assessment Matrix

Risk Assessment Matrix		Probability *Likelihood of Mishap if Hazard is Present*				
		Almost Certain (Continuously experienced)	**Likely** (Will occur frequently)	**Possible** (Will occur several times)	**Unlikely** (Remotely possible but not probable)	**Rare** (Improbable; but has occurred in the past)
Severity/ Consequences *Consequence if Mishap Occurs*	**Catastrophic** (Imminent and immediate danger of death or permanent disability; major property or facility damage; loss of critical system or equipment)	Extremely High	Extremely High	Extremely High	High	Moderate
	Critical (Permanent partial disability, temporary total disability; moderate environmental damage; extensive damage to equipment)	Extremely High	Extremely High	High	Moderate	Moderate
	Moderate (Hospitalized minor injury, reversible illness; minor damage to equipment, property or the environment)	High	High	Moderate	Low	Low
	Negligible (First aid or minor medical treatment; little or no property or environmental damage)	Moderate	Moderate	Low	Low	Low

Appendix 3: Risk Assessment Codes

Risk Assessment Code	Severity of Consequences
Extremely High	• Complete or near complete failure to meet objective • Major property or facility damage • Death or permanent total disability • Severe environmental damage • Loss of major or critical system or equipment
High	• Significantly degraded capability for meeting the objective or accomplishing the project/incident/work activity • Injury that results in permanent partial disability, or temporary total disability lasting more than three months • Serious environmental damage
Moderate	• Degraded capability for meeting objective or accomplishment of the project/fire operation • Lost days due to injury or illness not exceeding three months • Moderate damage to property or the environment
Low	• No adverse impact to meeting objective or accomplishment of the project/fire operation • Little or no medical treatment required • Little or no damage to equipment, systems, property or environment

Appendix 4: Risk Assessment Tool

A Risk Assessment Tool (RAT) should be used in conjunction with a team discussion to understand and evaluate the risks associated with a project and how they will be managed. Risk management is what is important; not the ability to assign numerical values or colors to risk elements. This sheet and these questions are a great tool to be used with Stop, Think, Talk, and Then Act.

Assign a risk code of 1 (For Minimal Risk) through 10 (For Maximum Risk) to each of the six elements below. A RAT should be conducted individually by each member of the team. Individual scores can be compiled by supervisor or project leader and discussed by all members of the team. This should be completed prior to the operational period but must be reviewed and updated if the team or operation changes or if other project/incident specific information becomes available.

Supervision – qualifications/experience/organization	
Planning – details/clarity/resource selection and condition/communications	
Leader's Intent – clear task, purpose, end state	
Team Fitness – physical/mental state/qualifications/experience	
Environment – current temperature/wind/terrain/fire	
Duration Complexity – details/tasks/time needed – time afforded	
Total Risk Score	

6 23	24 44	45 60
GREEN (Low Risk)	AMBER (Medium Risk)	RED (High Risk)

If the total falls in the green zone (6 to 23) risk is rated low. If the total falls in the amber zone (24 to 44) risk is rated medium and you should consider adopting further control measures to minimize risk. See below.

IF THE TOTAL FALLS IN THE RED ZONE (45 to 60) YOU NEED TO IMPLEMENT FURTHER CONTROL MEASURES TO REDUCE THE RISK PRIOR TO STARTING THE TASK. *See below.*

If the assessment rates amber or red, further controls should, or need to be implemented. If time critical, these may include:

Transfer – If practical, locate a better suited resource to conduct the task.

Avoid – Circumvent the hazard or wait for the risk to subside (disengage).

Accept – In some cases the benefit might justify the assumption of the risk.

Control – Take deliberate action to reduce potential for loss and maintain risk at acceptable levels.

A RAT SHOULD BE USED AS PART OF PLANNING OPERATIONS AND SHOULD BE CONTINUALLY REASSESSED AS WE REACH MILESTONES WITHIN PLANS, OR AS ELEMENTS CHANGE.

Risk Assessment Tool			
Risk Element			**Score**
Supervision - qualification, experience, organization			
Planning - details, clarity resource selection and condition, communications			
Leader's Intent - clear task, purpose, and end state			
Team Fitness - physical/mental fitness, good morale, mindful, maintain S.A.			
Environment - Temperature, elevations, terrain difficulty remoteness			
Duration Complexity - details, task, time needed, time afforded			
		Total Risk Score	
6 - 23	**24 - 44**	**45 - 60**	
Green (Low Risk)	**Amber (Medium Risk)**	**Red (High Risk)**	

Appendix 5: Risk Decision Authority

Risk Decision Authority	
Risk Assessment Code	Project or Work Activity
Extremely High	USFS Line Officer
High	USFS Line Officer
Moderate	Supervisor or Lead
Low	Individual