

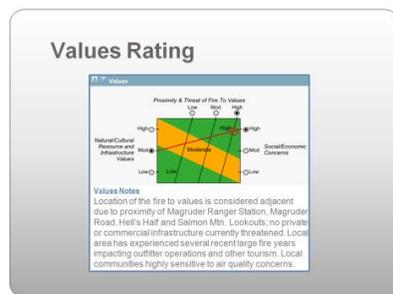
STRATEGIC-LEVEL RISK ASSESSMENT FOR FIRE BEHAVIOR SPECIALISTS

Video Series Reference Supplement

Introduction

This Reference Supplement for the “Strategic-Level Risk Assessment for Fire Behavior Specialists” program contains additional notes and material to supplement the recorded presentation. Slide “numbers” remain in this supplement but are not evident in the videos, only in a PowerPoint version of the slideshow. The Reference Supplement may also be useful as a “field guide” to completing the Relative Risk Assessment and Extended Risk Assessment.

Slide 24:



Brief Description of Values Rating

The values rating is determined by these three factors: natural/cultural resource and infrastructure concerns, proximity and threat of fire to values, and social and political concerns.

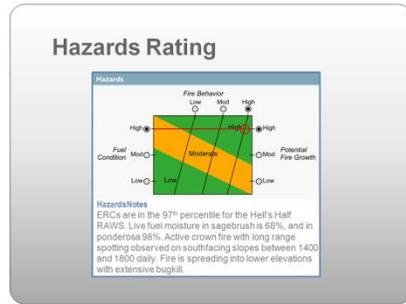
Natural Resource concerns would include air quality, water quality, and endangered species, while **Cultural Resource** concerns might include historic buildings and Native American sacred sites; **Infrastructure** concerns may include powerlines and buildings.

Proximity and Threat of the Fire to Values assesses how close the fire is to the values and the likelihood that the fire will reach the values; this element can be rated as distant, moderate, or adjacent.

Social and Political Concerns evaluates the possible social and economic effects, for example: impacts to social or economic concerns of an individual, business, community or other stakeholders; other fire management jurisdictions; tribal subsistence or gathering of natural resources; air quality regulatory requirements; public tolerance of smoke; and restrictions and closures in effect or being considered.

See Appendix A for a complete description of each rating for these three factors.

Slide 25:



Brief Description of Hazards Rating

The **Hazards** rating is determined by three factors:

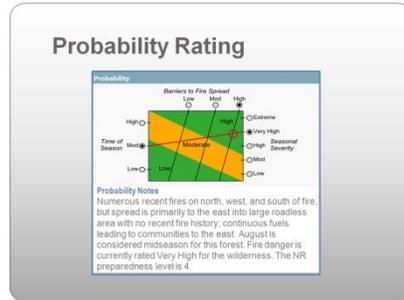
The **Fire Behavior** portion of the Hazard Rating is used to assess the current fire behavior or the most recently observed behavior. It can be rated as low, for example: a short-duration flaming front; or moderate, for example: short-range spotting; or high, for example: long-range spotting.

The **Fuel Condition** portion of the rating is used to evaluate fuel moistures and fuel conditions (loading, continuity) that exhibit high rate of spread and intensity for the area, such as those caused by invasive species or insect/disease outbreaks.

The **Potential Fire Growth** portion of the rating is used to evaluate the continued fire growth, considering the potential for extreme fire growth (terrain, winds, fuel continuity, etc.) and resistance to control.

See Appendix A for a complete description of each rating for these three factors.

Slide 27:



Brief Description of Probability Rating

The probability rating is comprised of three factors:

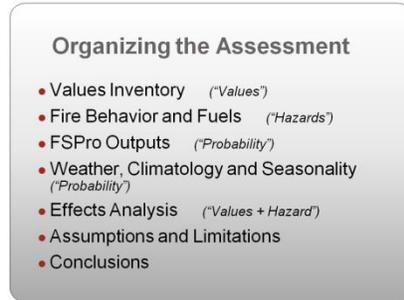
Time of Season indicates when in the fire season the fire is occurring compared to historical fire seasons. These ratings include Low, when the current date is in the first third of the historic fire season locally; Moderate, when the current date is approximately in the middle third of the historic fire season locally; and High, when the current date is in the latter third of the historic fire season locally.

Seasonal Severity indicates what the levels of fire danger are compared to seasonal averages for the local unit. These ratings include low, moderate, high, very high, and extreme. Factors to consider include fire danger indices, drought status, adjective fire danger rating, and preparedness levels.

Barriers to Fire Spread indicates whether or not the presence of natural barriers and fuel breaks will help limit fire spread. The ratings include a rating of LOW when numerous barriers are present; Moderate representing some barriers that are limiting fire spread, and High, when few or no barriers are limiting fire spread.

See Appendix A for a complete description of each rating for these three factors.

Slide 38:



Suggested Outline for Organizing the Extended Risk Assessment

- I. Values Inventory
- II. Fire Behavior and Fuels
- III. FSPro Outputs
- IV. Weather, Climatology and Seasonality
- V. Effects Analysis
- VI. Assumptions and Limitations
- VII. Conclusions

WFDSS References for Including the Extended Risk Assessment in the Incident Decision

Further information and technical instruction for uploading the Extended Risk Assessment into WFDSS can be found in the following WFDSS resources:

- Incorporating Long-Term Assessment Information into WFDSS
http://wfdss.usgs.gov/wfdss/pdfs/Incorp_LongTerm_Assessment.pdf
- Quantifying a Relative Risk Assessment
http://wfdss.usgs.gov/wfdss/pdfs/Quantifying_a_Qualitative_Relative_Risk_Assessment.pdf
- Wildland Fire Decision Support Tools
<http://www.wfmrda.nwgc.gov/docs/WildlandfireDecisionSupportTools.pdf>

Many of the products and analyses used in the Extended Risk Assessment may also be useful to include in the *Fire Behavior Narrative* for the incident [see S-590 (Advanced Fire Behavior Interpretation) curriculum for description of the Fire Behavior Narrative].

Slide 41:



Sources of Detailed Information on "Fire Behavior and Fuels"

- WFDSS fire behavior analyses
 - STFB (*and/or* FlamMap <http://www.firelab.org/project/flammap>)
 - NTFB (*and/or* FARSITE <http://www.firelab.org/project/farsite>)
 - Past incidents in WFDSS
- Predictive Services
(National portal: <http://www.predictiveservices.nifc.gov/predictive.htm>)
(Use "Links" on lefthand menu for individual Geographic Area Predictive Services)
- National Fuel Moisture Database (<http://www.wfas.net/index.php/national-fuel-moisture-database-moisture-drought-103>)
- Local Sources
 - Observations and Field Reports
 - Local Expertise
 - Planning Documents
 - Preplanning Analyses
 - Past Wildfire Incidents

Slide 44:

Sources of Information on “Weather, Climatology and Seasonality”

- WFDSS
- FireFamily+ analyses
- WindNinja/WindWizard
- NWCG Predictive Services
- Wildland Fire Assessment System
- National Weather Service/NOAA/CPC
- Incident Meteorologist (IMET)
- Local experts
- Local planning documents

Sources of Detailed Information on “Weather, Climatology and Seasonality”

- WFDSS
- FireFamily+ analyses (<http://www.firelab.org/project/firefamilyplus>)
- WindNinja/WindWizard (<http://www.firelab.org/project/windninja>)
- NWCG Predictive Services
(National portal: <http://www.predictiveservices.nifc.gov/predictive.htm>)
(Use “Links” on lefthand menu for individual Geographic Area Predictive Services)
- Wildland Fire Assessment System (<http://www.wfas.net/>)
- NOAA/National Weather Service/Climate Prediction Center
<http://www.srh.noaa.gov/ridge2/fire/>
<http://www.cpc.ncep.noaa.gov/>
- Incident Meteorologist (IMET)
- Local experts
- Local planning documents

Slide 52:



Smoke and Air Quality Resources for Extended Risk Assessments

WFDSS Air Quality Tools: <http://firesmoke.us/wfdss/>

EPA AirNow website: <http://www.airnow.gov/>

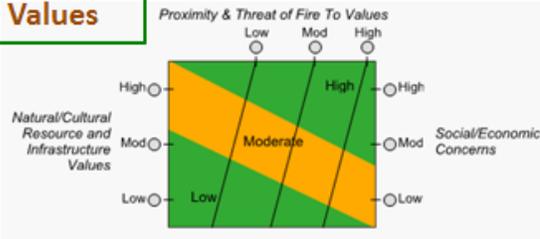
Slide 60: Principles for Extended Risk Assessments

- ✓ Clear and concise organization with focused content
- ✓ Appropriate scope and audience
- ✓ Quantified to the extent possible given tools and time
- ✓ States limitations, assumptions and uncertainties
- ✓ Consistent with Relative Risk Assessment
- ✓ Updated as conditions change and products expire
- ✓ Conclusions supported by data, analyses, and local input

Appendix A: Relative Risk Assessment Instructions

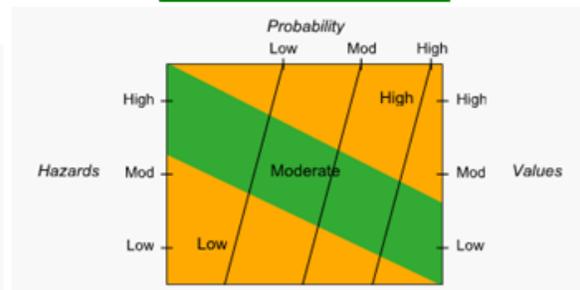
Instruction for completing the RRA chart:

1 - Values

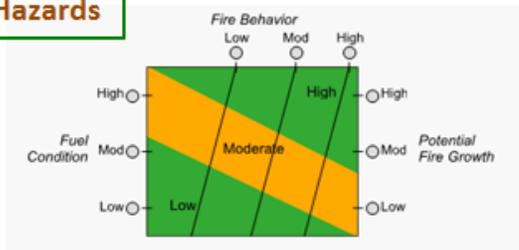


Wildland Fire Relative Risk Assessment

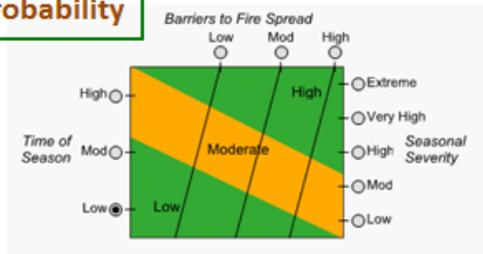
4 - Relative Risk



2 - Hazards



3 - Probability



Complete Steps 1-3: Connect the left and right variables with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right variables. Take results as inputs to Step 4.

Complete Step 4: Read the relative risk from the background areas where the intersection occurs.

Note: This process is completed automatically in WFDSS when variable ratings are chosen.

Definitions for RRA Variables:

Value Assessment

Values are those ecologic, social, and economic resources that could be lost or damaged because of a fire.

Ecologic values consist of the following:

- vegetation
- wildlife species and their habitat
- air and water quality
- soil productivity
- other ecologic functions

Social effects can include the following:

- life, cultural and historical resources
- natural resources
- artifacts
- sacred sites

Economic values can include the following:

- property and infrastructure
- economically valuable natural and cultural resources
- recreation
- tourism opportunities

The values assessment allows opportunity for the local Agency Administrator to identify particular local concerns. These concerns may be identified in the fire management plan or other planning documents.

Natural/Cultural Resource Concerns

Based on the number and kinds of values to be protected, and the difficulty to protect them, rank this element Low, Moderate, or High. Considerations include, but are not limited to; key resources potentially affected by the fire such as urban interface, structures, critical municipal watershed, commercial timber, developments, recreational facilities, power/pipelines, communication sites, highways, unique natural resources, special designated areas (i.e. wilderness), T&E species habitat, and cultural sites.

The following guidelines can help you determine the appropriate Low, Moderate, or High selection for the Natural/Cultural Resource and Infrastructure Values element:

Low	Moderate	High
<ul style="list-style-type: none">• Values generally are benefited or are not impacted by fire. Ecosystem is resilient. Mitigation measures are effective.	<ul style="list-style-type: none">• Concerns exist for impacts to resources or values but available mitigation measures are generally effective.• May require commitment of specialized resources.	<ul style="list-style-type: none">• Multiple values with concerns exist, and effectiveness of needed mitigation measures is not well established.• Severe damage likely without significant commitment of specialized resources.

Social/Economic Concerns

Evaluate the potential impacts (risk or effects) of the fire to social and/or economic concerns, and rank this element Low, Moderate, or High. Considerations include, but are not limited to: impacts to social or economic concerns of an individual, business, community or other stakeholder; other fire management jurisdictions; tribal subsistence or gathering of natural resources; air quality regulatory requirements; public tolerance of smoke, including health impacts; potential for evacuation and ingress/egress routes; and restrictions and/or closures in effect or being considered.

The following guidelines can help you determine the appropriate Low, Moderate, or High selection for the Social/Economic concerns element.

Low	Moderate	High
<ul style="list-style-type: none"> ● Local support for the use of wildland fire and its ecological role of fire is high. ● The fire should have limited temporary or no impact on subsistence or Tribal activities involving treaty rights. ● The fire is expected to remain within a single jurisdiction or agreements are in place to allow fire to move across several jurisdictions. ● Media coverage is favorable. ● Few structures or business ventures are potentially affected by the fire. ● There are few impacts to recreation and tourism. 	<ul style="list-style-type: none"> ● Local support of use of wildland fire and its ecological role is clearly divided between supporters and opponents. ● The fire will have some impacts on subsistence or Tribal activities involving treaty rights. ● The fire is expected to involve more than one jurisdiction, cooperator, or special interest group and agreements need to be developed. ● Media coverage tends to be a mix of favorable and unfavorable views. ● Structures may be threatened by the fire or some business ventures may be affected by the fire. 	<ul style="list-style-type: none"> ● Local support for use of wildland fire and its ecological role is low. ● The fire will have long-term impacts on subsistence activities or Tribal activities involving treaty rights. ● Smoke impacts may become a concern for higher level air quality regulatory agencies and people with health risks. ● The fire is expected to involve several jurisdictions, cooperators, and special interest groups and agreements requiring substantial negotiation need to be developed. ● Media coverage tends to be unfavorable. ● Many structures or private properties could be threatened.

Proximity and Threat of Fire to Values

Evaluate the potential threat to values based on their proximity to the fire, and rank this element Low, Moderate, or High.

The following guidelines can help you determine an appropriate selection for the Proximity and Threat of Fire to Values:

Low	Moderate	High
<p>Fire is located where it is highly unlikely that it would reach the values given fire activity and the fuels between it and the values.</p>	<p>Fire could potentially reach the values, but will take multiple burning periods and sustained fire activity in the adjacent fuels to reach the values.</p>	<p>Fire is close to values. Without mitigation actions, fire is expected to reach the values.</p>

Hazard Assessment

The hazard in wildland fire is composed of the following:

- conditions under which the fire occurs and exists;
- ability of the fire to spread and circulate;
- intensity and severity the fire may present; and
- spatial extent of the fire.

Fire Behavior

Evaluate the current and expected fire behavior and rank the element Low, Moderate or High. Considerations include intensity, rates of spread, crowning; and profuse or long-range spotting.

The following guidelines can help you determine an appropriate selection for Fire Behavior:

Low	Moderate	High
<ul style="list-style-type: none">• Short duration flaming front with occasional torching.• Fuels are uniform and fire behavior can be easily predicted and tactics implemented.	<ul style="list-style-type: none">• Short range spotting occurring.• Moderate rates of spread are expected with mainly surface fire and torching.• Fuels and terrain are varied, but don't pose significant problems in holding actions.	<ul style="list-style-type: none">• Long range spotting > ¼ mile.• Extreme rates of spread, and crown fire activity are possible.• Fuels, elevation, and topography vary throughout the fire area, creating high resistance to control.

Fuel Condition

Consider fuel conditions where fire is currently burning and where it will be burning and rank this element Low, Moderate or High. Evaluate fuel conditions that exhibit high ROS and intensity for your area, such as those caused by invasive species or insect/disease outbreaks; and/or continuity of fuels. 4047

The following guidelines can help you determine an appropriate selection for the Fuel Condition:

Low	Moderate	High
<ul style="list-style-type: none">● Fuel loading is low.● Large-scale fuel treatments have reduced continuous fuels.● No evidence of insect/disease outbreaks.● Changes resulting from insect and disease outbreaks are minimal.● Few if any fire return intervals have been missed and fuel complexes are similar to historic levels.● Invasive species do not contribute to increased fire spread or intensity.	<ul style="list-style-type: none">● Fuel load is moderate and supports active fire spread.● Past fuels treatments may no longer be effective, or recent treatments have temporarily increased dead fuel loading.● Evidence of insect/disease outbreaks (red needles, dead standing timber, etc.).● Some fire return intervals have been missed, fuel complexes have been altered and present potential for fires with severity and intensity levels in excess of historic levels.● Invasive species contribute to fire spread.	<ul style="list-style-type: none">● Fuels are continuous on the landscape and will readily support continued fire growth.● No fuels treatments have occurred.● Moderate to extensive insect/disease outbreaks and large stands of dead standing timber.● Significant vegetative changes from the historic situation have occurred.● The highly altered composition and structure of the vegetation predisposes the landscape to fire effects well outside the historic range of variability.● Invasive species greatly contribute to uncharacteristic fire spread and intensity.

Potential Fire Growth

Evaluate the potential fire growth, and rank this element Low, Moderate, or High. Considerations would include current and expected fire growth based on fire behavior analysis and the weather forecast and/or the ability to control the fire.

The following guidelines can help you determine an appropriate selection for Potential Fire Growth:

Small	Medium	Large
<ul style="list-style-type: none">● Little fire growth is expected.● Weather conditions (current and forecasted) are such that fire growth will be low.● Resistance to control, if implemented, for dominant fuel type is low.	<ul style="list-style-type: none">● Fire behavior leads to moderate fire growth.● Weather conditions are not forecasted to worsen.● Dominant fuel type is burning readily but is predictable and characteristic of the time of year and conditions.● Control efforts implemented are typically successful and resistance to control for dominant fuel type is moderate.	<ul style="list-style-type: none">● Fire growth is well beyond what is typical for the dominant fuel type.● Extreme fire behavior (torching, crowning, long range spotting, etc.) is occurring or predicted.● Weather conditions are predicted to worsen (hotter, drier, windier).● Dominant fuel type is burning more readily than usual and exhibiting greater than typical fire growth.● Resistance to control is high. Control efforts to date have been unsuccessful due to high rates of spread and rapid fire growth.

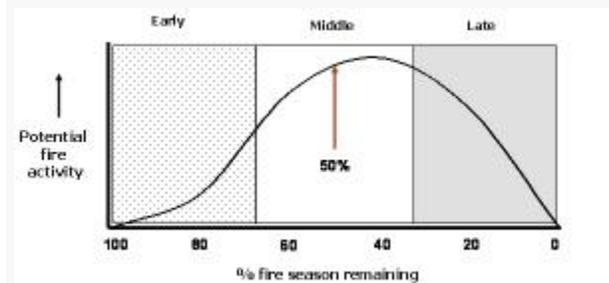
Probability Assessment

Probability refers to the likelihood of a fire becoming an active event with potential to adversely affect values.

Time of Season

Evaluate the potential for a long-duration fire and rank this element Low, Moderate or High. Time remaining until a season-ending event should be considered.

Time of Season is the current time in relationship to the historical or peak fire season. The graph reinforces the importance of time of season. During the early part of the fire season, the peak of burning activity is still to come, thus the fire could present substantial variation in behavior and activity. In the middle of the season, the peak of burning activity may or may not have occurred, while in the late part of the season, the peak of fire activity generally has already occurred and managers can reasonably expect diminishing fire activity and behavior as time progresses.



The following guidelines can help you determine an appropriate selection for Time of Season:

Low (Late)	Moderate (Middle)	High (Early)
<ul style="list-style-type: none"> • The current date is in the latter part of the historic fire season. • At least 2/3 of the historic period has passed. • The peak burning activity period has occurred. • The probability of a season-ending or fire-ending event is increasing quickly. • Weather forecasts and seasonal outlooks do not indicate an extended fire season. 	<ul style="list-style-type: none"> • The current date is in the middle of the historic fire season. • At least 1/3 of that period has passed and no less than 1/3 remains. • The peak burning activity period either has occurred, is occurring now, or will occur very soon. 	<ul style="list-style-type: none"> • The current date is in the early portion of the historic fire season. • At least 2/3 of the established fire season remains. • The peak of burning activity is still to come.

Seasonal Severity

Evaluate fire danger indices and rank this element Low/Moderate, High or Very High/Extreme. Considerations include fire danger indices such as energy release component (ERC), drought status, live fuel moistures, adjective fire danger rating, and geographic area preparedness level.

Use the following table to help guide your selection for Seasonal Severity:

Low/Moderate	High	Very High/Extreme
<ul style="list-style-type: none">• Measures of fire danger are below or at seasonal averages.• Drought status is within seasonal norms with no long-term drought present.• Live and dead fuel moistures are at or higher than seasonal averages.	<ul style="list-style-type: none">• Measures of fire danger are above seasonal averages, but conditions are not present for large fire growth (measures are below the 90th percentile).• The area may be experiencing a short-term seasonal drought, but is not considered to be in long-term drought.• Live and dead fuel moistures are lower than seasonal averages.	<ul style="list-style-type: none">• Measures of fire danger are or are expected to become well above critical percentiles (typically 90th – 97th percentile) seasonal averages, or setting new records.• The area is considered in a drought situation for more than one year and as much as 3 or more years (long-term drought).• Live and dead fuel moistures are well below seasonal averages and have reached critical values.

Barriers to Fire Spread

Evaluate the barriers to fire spread as a measure of natural defensibility of the fire's location and an indication of the degree of potential mitigation actions needed and rank this element Low, Moderate or High.

Use the following table to help guide your selection for Barriers to Fire Spread:

Low (Many)	Moderate	High (Few)
<ul style="list-style-type: none">• Many natural and/or human-made barriers are present and limiting fire spread.• Ridges, rocky slopes, wide drainages, roads and other fuel breaks will contain the fire along much of its perimeter.	<ul style="list-style-type: none">• Some barriers are present and limiting fire spread.• Ridges, rocky slopes, wide drainages, roads, and other fuel breaks will slow or contain the fire along portions of the perimeter.	<ul style="list-style-type: none">• No barriers are present.• Few, if any, ridges, rocky slopes, wide drainages, roads and other fuel breaks are present.

Appendix B: References for Further Study (Joe to add/edit)

If you are interested in further study of some of the topics covered in this lesson, these references provide the opportunity to explore these subjects in greater depth.

Borchers, Jeffrey G. 2005. **Accepting uncertainty, assessing risk: Decision quality in managing wildfire, forest resource values, and new technology.** *Forest Ecology and Management*, Volume 211, Issues 1–2. Pages 36-46.

Evans, Dylan. 2012. **Risk Intelligence: How to live with uncertainty.** New York: Free Press. 288 p.

Fairbrother, Anne; Turnley, Jessica G. 2005. **Predicting risks of uncharacteristic wildfires: Application of the risk assessment process.** *Forest Ecology and Management*, Volume 211, Issues 1–2. Pages 28-35.

Finney, Mark A. 2005. **The challenge of quantitative risk analysis for wildland fire.** *Forest Ecology and Management*, Volume 211, Issues 1–2. Pages 97-108.

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. 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.