



S-130 Unit 5: Risk Management

Summary:

The intent of this unit is to serve as an introduction to the 10 Standard Firefighting Orders, 18 Watch Out Situations, Common Denominators of Fire Behavior on Tragedy Fires, and their connectivity to Lookouts, Communications, Escape Routes, and Safety zones (LCES).

Incident Position Description (IPD) Alignment:

This unit aligns with the following FFT2 IPD specific duties

(<https://www.nwcg.gov/positions/fft2/position-ipd>):

- Establish Lookouts, Communications, Escape Routes, and Safety Zones (LCES) before they are needed, according to IRPG guidance.
- Apply the Standard Firefighting Orders and Watch Out Situations to your assignment, as stated in the IRPG.
- Use Look Up, Down and Around in the IRPG to help maintain situational awareness. Adjust actions accordingly.

Unit Objectives:

- Describe the 10 Standard Firefighting Order and provide examples of their application.
- Describe the 18 Watch Out Situations and provide examples of their application.
- Identify the Common Denominators of Fire Behavior on Tragedy Fires.
- Define Lookouts, Communications, Escape Routes, and Safety Zones (LCES) and describe factors that influence escape time and safety zone size.
- Describe how LCES is related to the 10 Standard Firefighting Orders and 18 Watch Out Situations.
- Identify elements of Risk Management in the Point Fire Case Study.

Unit 5: Risk Management

Unit at a Glance:

Topics	Method	Duration
10 Standard Firefighting Orders	Presentation	20 Minutes
18 Watch Out Situations	Presentation	30 Minutes
Common Denominators	Presentation	15 Minutes
LCES	Presentation	15 Minutes
Safety Zone and Escape Time	Presentation	15 Minutes
Point Fire Case Study	Presentation	30 Minutes
Total Unit Duration		2 Hours, 5 Minutes

Materials:

- *Incident Response Pocket Guide* (IRPG), PMS 461, <https://www.nwcg.gov/publications/461>.
- NWCG RT-130, Wildland Fire Safety Training Annual Refresher, <https://www.nwcg.gov/publications/training-courses/rt-130/operations/op820>.
- Notebook for participants
- Student Reference Tool
- S-130 Student Evaluation Task Sheet
- Ability to display images and video on large screen
- White board or easel access for group breakouts

Unit 5: Risk Management

Slide 1



Slide 2

Objectives

Students will be able to:

- Describe the 10 Standard Firefighting Orders and provide examples of their application.
- Describe the 18 Watch Out Situations and provide examples of their application.
- Identify the common denominators of fire behavior on tragedy fires.

S-130 Unit 5: Risk Management 2

- Review unit objectives.

Slide 3

Objectives

Students will be able to:

- Define Lookouts, Communication, Escape Routes, and Safety Zones (LCES) and describe factors that influence escape time and safety zone size.
- Describe how LCES is related to the 10 Standard Firefighting Orders and 18 Watch Out Situations.
- Identify elements of risk management in the Point Fire case study.

S-130 Unit 5: Risk Management 3

Review unit objectives.

Slide 4



Pre-Video Discussion

- The 10 Standard Firefighting Orders are very useful tools to ensure minimized risk of injury during firefighting activities.
- Some home units may require firefighters to memorize the 10 fire orders. You do not need to memorize them for this class.
- They are on the cover of your IRPG, so you can reference them quickly when needed. Always keep your IRPG on your person.
- As your wildland fire career progresses, these orders should become muscle memory instinctively kicking in every time you engage a wildfire.

Play Video

Title Standard Firefighting Orders

Summary Introduction to the history and intent of the 10 Standard Firefighting Orders.

Time (04:18)

Audio

Slide 5



- ❑ Reference Standard Firefighting Orders in *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Discuss fire behavior group:
 - When arriving at an incident, you need to know what the fire is doing and what it might do before establishing safety zones and escape routes:
 - #1. Keep informed on fire weather conditions and forecasts.
 - #2. Know what your fire is doing at all times.
 - #3. Base all action on current and expected fire behavior.

Note to Instructor

- This photo was likely taken in the morning. Note the drift smoke.
- Note the puff of smoke above the thermal belt on the left side of the image.
- Thermal belt/inversion can effect fire behavior as the burn period progresses.

Slide 6



- ❑ Reference Standard Firefighting Orders in *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Discuss fireline safety group:
 - Once you know what the fire is doing, you have the information you need to establish your fireline safety.
 - The fireline safety group comes next:
 - #4. Identify escape routes and safety zones and make them known.
 - #5. Post lookouts when there is possible danger.
 - #6. Be alert. Keep calm. Think clearly. Act decisively.

Note to Instructor

- The firefighters in the image have a more than adequate size safety zone. Vehicles could fit in this safety zone.
- Firefighters appear calm and alert.

Slide 7



- ❑ Reference Standard Firefighting Orders in *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Discuss organizational control group:
 - You know what the fire is doing and what it might do, escape routes have been identified, and lookouts posted.
 - You are calm and alert.
 - When prompt communication is established, clear instructions are given, and control is maintained:
 - #7. Maintain prompt communications with your forces, your supervisor, and adjoining forces.
 - #8. Give clear instructions and ensure they are understood.
 - #9. Maintain control of your forces at all times.

Slide 8



- ❑ Reference Standard Firefighting Orders in *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Review overall fire order intent:
 - First, know what the fire is doing and what it might do (fire behavior group – orders 1 to 3).
 - Second, escape routes have been identified and lookouts posted (fireline safety group – orders 3 to 6).
 - Third, communication is established, and clear instructions have been given (organizational control group – orders 7 to 9).
 - What's left:
 - #10. Fight fire aggressively having provided for safety first.
- ❑ Discuss that although in a list format, the intended use of the orders is not to check off 1 through 10 as you would a checklist, but to act as reminders of conditions that need to be continuously maintained and assessed throughout each operational period.

Slide 9



Pre-Video Discussion

- The original Watch Out Situations were introduced less than ten years after the 10 Standard Fire Orders were developed.
- Discuss that the Watch Out Situations are indications to personnel that if positive action is not immediately taken, you could endanger yourself or your crewmembers.

Play Video

Title Watch Out Situations

Summary This video is an introduction to the history and intent of the Watch Out Situations and a review of the watch outs.

Time (06:10)

Audio

Note to Instructor

Discuss that the intended use of the Watch Out Situations is to continually re-assess situational awareness in an operational setting. is not to check off 1 through 10 as you would a checklist, but to act as reminders of conditions that need to be continuously maintained and assessed throughout each operational period.

Unit 5: Risk Management

Slide 10



Note to Instructor

This slide is intended as an opportunity to introduce students to the Firefighting Orders and Watch Out Situations Immersive Activity available on the NWCG RT-130, Wildland Fire Safety Training Annual Refresher (WFSTAR) website: <https://www.nwcg.gov/publications/training-courses/rt-130/operations/op820>.

The Immersive activity is designed as an opportunity for students to apply the 10 Standard Firefighting Orders and 18 Watch Out Situations in simulated fire scenarios.

The activity does require internet access. If that is not an option in the location the course is being facilitated., it is recommended that this slide serves as a time to advise the students about them and how to access them, as an optional activity to conduct outside of class.

If internet access is not an issue in the classroom. Directions on how to facilitate this activity is provided under Module Tools on the activity link provided.

Unit 5: Risk Management

Slide 11

Common Denominators

1977, The International Fire Chief 42(9): 9-10, 12-15.

Forest Fires

Fatal and Near-Fatal Forest Fires: The Common Denominators

by Carl C. Wilson

...fighting large forest fires often is compared to military operations. Each involves a highly trained and coordinated team of personnel on the front lines... support and long periods of combat and stress and the enemy usually is unexpected. Yet there is one major difference between military and firefighting strategy in supporting large fires on the front line: the individual risk that firefighters face in forest fires in the United States... The contrast is with the difference and the separation between those fires in which someone dies and those in which someone has a very narrow escape. As this article will show, the line is not always clear and depends on many factors, the most vital and most uncertain being that of human behavior.

A review of the U.S. Forest Service records between 1926 and 1976 shows that 187 firefighters died in forest fires... The largest losses in single fires occurred on the Blackwater fire in Wyoming in 1976 and on the Rayden fire in California in 1954 (Table 1). In each case, 12 firefighters died. A similar analysis of single large fires... country and private agencies reveals 77 forest-related fatalities on fires. The vast majority of the largest number of fire lines was the 2011 Griffith Park fire in California, which accounted for 25 fatalities and 28 minor injuries (Table 2).

The data in these tables and in the two additional tables... these related fire types. It is possible to identify some common denominators of fire behavior in both fatal and near-fatal fires. It should be noted at the very beginning, however, that all fires differ and the change of their work... through the fire tables should convince any reader of the... variability between the circumstances of fatal and near-fatal fires often involve so-called "reactive fire behavior" and occur under emergency response conditions. Usually, we need to examine the potential for future tragedy: fire fatalities, near-fatal incidents and injuries to the fire crew who... to be met there on the fire-line tomorrow.

Common Denominators of Fatal Fires

Based on personal knowledge and information obtained from the literature, the following generalizations can be made about the fatal fires in Tables 1 and 2:

1. Most of the fatalities occurred on relatively small fires or isolated sections of large fires.
2. Most of the fires were innocent in appearance rather than the "fire-ups" or "blow-ups". In some cases, the fatalities occurred in the preparation for the attack.
3. Most fatalities occurred on relatively high fuel loads.
4. Fires can spill in directions, depths, or on steep slopes unexpected by firefighters.
5. Suppression tools, such as helicopters or air tanks, can adversely modify fire behavior. (Coffeyman and others have reported on this.)
6. A review of these tables shows that most of the generalizations made above from fire behavior apply to near-fatal fires as well as to fatal fires. The major difference between the two groups of fires is determined by the individual's reaction to his or her own critical situation. Changes may be made in the effort to back, communicate, advance planning, a person's ability to stay cool and not panic, or a combination of these factors. Whether the reaction, individual behavior and circumstances determine life and death for the individual fire fighter and crew, it becomes increasingly important to be able to identify those conditions under which so many fire crew calls and fatalities occur.

Surprising Factors

Many fire fighters are surprised to learn that fatal and near-fatal incidents occur on fairly light fuels, on small fires or isolated sections of large fires, and that behavior is unusual in light fuels under the incident. The greatest hazard is not likely to be large and tall forest fires. Yet, with few exceptions, such as the Shawnee hardwood fire (North Idaho, 1967), the Blackwater fire (Wyoming, 1977) and King Canyon fire (New Mexico, 1967), most of the fires in the tables were innocent-appearing just before the accident.

Other, such as those involving near-fatal fires occur while attacking "any" fire behavior conditions. Fire fire spread and intensity can change much more quickly in light fuels than in heavy fuels. This fact may lead to more responses to changes in atmospheric conditions than heavy fuels. Second, hot, dry weather or dusty atmosphere-type winds do not alter fuels with the weight that any change of wind, slope, or other environmental conditions would occur normally during the attack. For example, in some areas in the West, winds may occur normally during the attack, but the winds of following thunderstorms. In such cases, an "unexpected" wind can reverse fire behavior. It should be noted, however, that there are no real clues to warn of fire behavior changes, because dry fuels burn with little or

Carl C. Wilson

Stephen Rosen

S-130 Unit 5: Risk Management 11

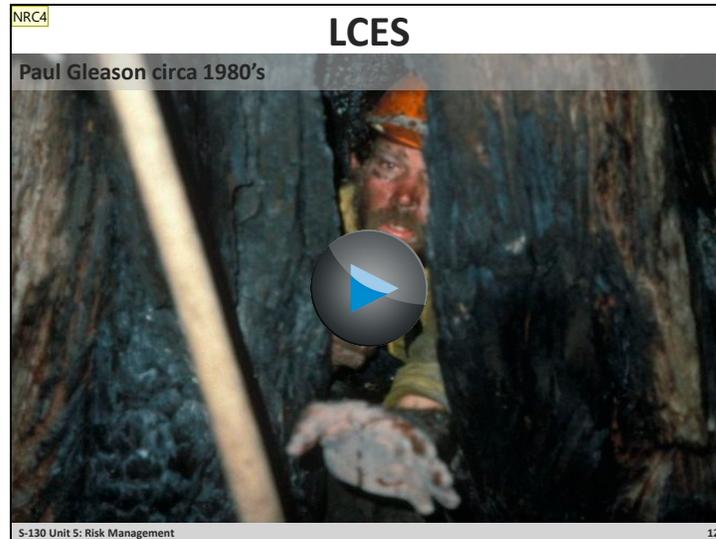
- ❑ Discuss background of Carl Wilson and the Common Denominators:
 - Started his career with the Forest Service in 1946.
 - From 1956 – 1972 he worked for the USFS Pacific Southwest Forest and Range Experiment Station as Chief of the Division of Forest Fire Research early on and then Assistant Director of the experiment station the last eleven years of his tenure.
 - Carl C. Wilson is thought to be one of the original wildland fire researchers.
 - In the late 1970's Carl C. Wilson studied 67 fires between 1926 – 1976 which resulted in the deaths of 222 firefighters.
 - He was looking for common themes contributing to these “fire-induced” fatalities.
 - These themes became the Common Denominators of Fire Behavior on Tragedy Fires.
 - The first four are Wilson’s originals and number five was added to the IRPG in 2018.
- ❑ Reference Common Denominators of Fire Behavior on Tragedy Fires in the *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Discuss the five Common Denominators of Fire Behavior on Tragedy Fires:
 - #1. On relatively small fires or deceptively quiet areas of large fires.
 - Fires can transition from small, low complexity fires and become complex fires that can catch firefighters off guard.
 - A fire in all phases, including Mop up, has the ability to rekindle and reignite, compromising the safety of the situation.
 - #2. In relatively light fuels, such as grass, herbs, and light brush:
 - The western US has become dominated by annual grasses (cheat grass and medusa head grass). These and other fine fuels are the first to dry out and become readily available.
 - Annual grasses contribute to fine dead fuel moisture, a primary indicator of expected fire

Unit 5: Risk Management

- behavior as well as the primary carrier of the fire.
- #3. When there is an unexpected shift in wind direction or in wind speed:
 - Frontal passage, thunderstorm out flows, foehn winds, and diurnal wind shifts all cause change in wind direction or wind speed.
 - #4. When fire responds to topographic conditions and runs uphill:
 - On average, when slopes reach 30 percent the fire rate of spread will double.
 - The rate of spread will double again when slope reaches 55 percent.
 - Canyons and steep drainages act like a chimney, funneling the fire up hill, drying and preheating available fuel making vegetation more readily available for volatile fire consumption.
 - #5. Critical burn period between 1400 and 1700:
 - 2014 WFSTAR report: 19 of 26 separate fatality burnover incidents have occurred in this time period.
 - An average time from increased fire behavior to entrapment is 24 minutes.
 - Be within 10-15 minutes of an approved safety zone (adequate for number of people, expected fire behavior, surrounding fuels, etc.) during this critical burn period.

Unit 5: Risk Management

Slide 12



Pre-Video Discussion

- At the heart of the 10 Standard Fire Orders is Lookouts, Communications, Escape Routes, and Safety Zones (LCES).
- Paul Gleason produced the concept of LCES following his involvement on the Dude Fire near the Mogillon Rim in Arizona in 1990 where six members of an inmate crew lost their lives.
- Paul Gleason's fire career spanned five decades. He coined the phrase "Be a student of fire".

Play Video

Title LCES

Summary An introduction to the history and intent of LCES.

Time (03:19)

Audio

Post-Video Discussion

- Reference LCES in *Incident Response Pocket Guide (IRPG)*, PMS 461, <https://www.nwcg.gov/publications/461>.
- Discuss each element of LCES following bulleted items in the IRPG.
 - "Lookouts need to be in a position to see both the objective hazard and the firefighters" lookouts are used for tree falling activities, steep terrain with rolling rocks and debris, air-tanker or helicopter drops, etc.
 - LCES is not meant to replace the 10 Standard Fire Orders but work with them as a quick safety reminder of the essential Fire Order safety elements for crews progressing in the fire environment throughout each burn period.

Unit 5: Risk Management

Slide 13



- ❑ Reference Safety Zones in Incident Response Pocket Guide (IRPG), PMS 461, <https://www.nwcg.gov/publications/461>.
- ❑ Discuss factors that influence safety zone size:
 - Survival does not depend on deploying a fire shelter.
 - Surrounding fuel type and vegetation height.
 - Radius equal to at least four times the flame length present.
 - Wind speed and topography influencing radiant heat.
 - Need to accommodate vehicles and equipment.
 - The IRPG's specific distance recommendations assume there is no slope and no convective heat transfer from wind.
- ❑ Discuss variables that influence escape time:
 - Based on the time needed for the slowest person to reach the safety zone.
 - Fatigue and temperature factors as the shift/day progresses.
 - Barriers that may increase travel time, such as topography, loose soils, rocks, and vegetation.
 - Length of route as the crew progresses further along the fire perimeter and away from safety zone.
 - Escape time versus the fire's rate of spread (ROS)
 - Proximity of vehicles to crew.

Note to Instructor

- Not all firefighters are created equal. Some travel on foot faster than others.
- Always consider escape time, the time it takes for all crew members to make it to a safety zone, when selecting escape routes.

Unit 5: Risk Management

- Determining when to seek refuge in a primary or secondary safety zone might not always be obvious. Reassess safety zone location as progressing along the fireline.

Unit 5: Risk Management

Slide 14



Note to Instructor

- Josh Oliver, one of the victims of the Point Fire, was in his first season. He represents the intended audience of this course.
- Encourage these first-year firefighters to be empowered not only to commit these topics to their mental slide show from the very beginning of their fire career but speak up or ask questions when they perceive something might be amiss.

Pre-Video Discussion

- Burnovers account for about 20 percent of fatalities during wildland firefighting operations.
- Firefighter fatalities are also attributed to factors not related to fire behavior. Factors such as aviation incidents, vehicle crashes, falling trees, rolling rocks, and heart attacks or other medical causes make up the majority of firefighter fatalities.
- Risk management applies to every aspect of our job even when we are not actively suppressing fires.

Play Video

Title Point Fire Revisited

Summary A case study of the Point Fire (Idaho, 1995).

Time (15:38)

Audio

Post-Video Discussion

- Ask the students, if they were Josh Oliver, what would they do in this situation? How would they handle this?
- Discuss that the Point Fire accident investigation identified communications as one of the contributing factors to the fatalities.
- Discuss why communication is identified in numerous places in fire education:
 - Fire Order #7
 - Watch Out Situation #7

Unit 5: Risk Management

- 'C' in LCES

Slide 15

Objectives

Students will be able to:

- Describe the 10 Standard Firefighting Orders and provide examples of their application.
- Describe the 18 Watch Out Situations and provide examples of their application.
- Identify the common denominators of fire behavior on tragedy fires.

S-130 Unit 5: Risk Management 15

- Review unit objectives.

Slide 16

Objectives

Students will be able to:

- Define Lookouts, Communication, Escape Routes, and Safety Zones (LCES) and describe factors that influence escape time and safety zone size.
- Describe how LCES is related to the 10 Standard Firefighting Orders and 18 Watch Out Situations.
- Identify elements of risk management in the Point Fire case study.

S-130 Unit 5: Risk Management 16

- Review unit objectives.