Command and Control of Wildland/Urban Interface Fire Operations for the Structural Chief Officer

CCWUIFOSCO-Student Manual

1st Edition, 2nd Printing-May 2002

Homeland Security

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U.S. DEPARTMENT OF HOMELAND SECURITY

PREPAREDNESS DIRECTORATE

UNITED STATES FIRE ADMINISTRATION

NATIONAL FIRE ACADEMY

FOREWORD

The U.S. Fire Administration (USFA), an important component of the Department of Homeland Security (DHS) Preparedness Directorate, serves the leadership of this Nation as the DHS's fire protection and emergency response expert. The USFA is located at the National Emergency Training Center (NETC) in Emmitsburg, Maryland, and includes the National Fire Academy (NFA), National Fire Data Center (NFDC), National Fire Programs (NFP), and the National Preparedness Network (PREPnet). The USFA also provides oversight and management of the Noble Training Center in Anniston, Alabama. The mission of the USFA is to save lives and reduce economic losses due to fire and related emergencies through training, research, data collection and analysis, public education, and coordination with other Federal agencies and fire protection and emergency service personnel.

The USFA's National Fire Academy offers a diverse course delivery system, combining resident courses, off-campus deliveries in cooperation with State training organizations, weekend instruction, and online courses. The USFA maintains a blended learning approach to its course selections and course development. Resident courses are delivered at both the Emmitsburg campus and its Noble facility. Off-campus courses are delivered in cooperation with State and local fire training organizations to ensure this Nation's firefighters are prepared for the hazards they face.

ACKNOWLEDGEMENTS

The preparation of this course was made possible through the assistance, cooperation, and dedication of many people. The National Fire Academy (NFA) wishes to thank all persons and organizations for their roles in the development of this course.

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UNIT 1: INTRODUCTION

INTRODUCTION

The purpose of this course is to provide a basic understanding of the Wildland/Urban Interface (W/UI) environment in which the structural chief officer may be assigned. With the knowledge contained in this course, a structural chief officer will be able to make decisions effectively at a strategic level that will benefit all those involved--firefighters and the public. This class was designed for those individuals who do not deal with the W/UI issues on a regular basis. There are other training opportunities that go into more depth--and we wholly recommend them for those chief officers who will be dealing with these issues on a regular basis.

A wildland fire is definitely different than fires we are used to dealing with. Factors that we use in determining fire behavior in a structure do not transfer easily to the wildland environment. Weather, fuels, and terrain, although important in a structural incident, have entirely different effects when put into a wildfire scenario.

A W/UI fire is a wildland fire that endangers structures, dwellings, and/or infrastructure. As an area is developed, wildland fuel is usually left for various reasons (green space, vacant lots, privacy, etc.) and exposes the development to danger from wildland fires. Some different types of developments are

- isolated areas of wildland within an urban area (example, parks);
- several structures, often on small lots, bordered by wildland fuel on a broad front (example, edges of town); and
- structures scattered over large wildland areas (example, "the cabin in the woods").

Many times the W/UI Incident is complicated by many other factors. In this environment a house is an exposure to a wildland fire. There often are also limited water supplies, limited access for apparatus, and few or no address markings/maps. Additionally, the structure may not meet current building codes and practices. So the cards can be stacked against success from the very first decision to construct structures in an interface situation.

WHAT THIS MEANS TO YOU

It seems that increasing demands for protection of property and the "get away from the city" mentality have combined to provide a problem for America's fire service. Structural chief officers now are expected to respond to W/UI Incidents and protect (save) the property. This creates problems due to the complexity of wildland fire, limited experience, and, of course, limited budgets and resources.

W/UI's often are very fast moving, covering large areas, and containing many unknowns. This will stretch service delivery capability to the breaking point. In order to handle such an incident, the first step is to identify what size incident can be handled by your department without help, how to call help, and how personnel fit into the mix when they arrive. Begin to identify strengths and weaknesses in the various areas such as: personnel training and staffing, apparatus number and type, safety--standard operating guidelines (SOG's), and personal protective equipment (PPE), etc. Many of these items take years to change or improve. Take a proactive stance when dealing with W/UI incidents.

Various agencies have had extensive experience operating within the W/UI. These agencies can provide materials, training, equipment, and advice. It is very important to realize that to become proficient operating in the interface requires much more than will be provided in this course.

NATIONAL WILDFIRE COORDINATING GROUP

W/UI firefighting is a complex and demanding profession that requires significant knowledge in many subject areas obtained through years of experience. For the student who desires to become more proficient and knowledgeable in wildland firefighting, several courses are available from the National Wildfire Coordinating Group (NWCG) and can be obtained through your State or Federal wildland fire agency. A qualified instructor should teach these courses. Contact your local wildland fire agency for assistance.

Some courses available through the NWCG include the following:

- S-130: *Basic Firefighter*.
- S-190: *Introduction to Wildland Fire Behavior*.
- S-215: *Fire Operations in the Wildland Urban Interface*.
- S-290: *Intermediate Fire Behavior*.
- S-230: *Single Resource Boss*.
- S-390: *Fire Behavior Calculations*.
- I-401: *ICS*: *Multi-Agency Coordination*.

What is the National Wildfire Coordinating Group?

The NWCG was formed officially on March 18, 1976, by an interagency Memorandum of Understanding (MOU) between the Secretary of the Interior and the Secretary of Agriculture. The original agreement was modified in June 1994, to include the Federal Emergency Management Agency's (FEMA's) U.S. Fire Administration (USFA) as a member.

The partner agencies all face common problems, including widely disbursed field areas, limited staff, and wildland fire activity levels that vary greatly from year to year. The ability to pool personnel and resources from all agencies during high fire activity is crucial to successful management. An umbrella organization was needed to facilitate the development of common practices, standards, and training to bond the wildland fire community.

The success of the process is demonstrated continually during nationwide response to the heavy fire activity of recent years. It is equally valid for more typical fire years when personnel from adjacent field areas jointly attack local fires with their closest forces. NWCG contributes toward the cost-effective execution of each partner agency's program, to the benefit of the agency mandates and resources, and the taxpayer.

Membership

The NWCG includes representatives of the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (FWS), the Bureau of Indian Affairs (BIA), the National Park Service (NPS), USFA, and two representatives of the National Association of State Foresters.

Technical specialists are drawn from the member agencies, and they focus their collective talents on assigned tasks. Some of the teams are standing groups, while others have a specific charge; they complete their task and are disbanded. Presently there are teams on Incident Operations Standards, Training, Prevention, Education and Communications, Safety and Health, Business Management, Information Resources, and Prescribed Fire Equipment. There are also a Publications Management Unit, and advisory groups that work with Fire Weather, Fire Danger, and the Urban Interface.

The products are approved by a consensus of NWCG members after which agreed-upon polices, standards, and procedures are implemented by each agency through regular channels.

The 70's

- The National Interagency Fire Qualification System and associated suppression training courses were implemented.
- The National Fire Cache System was standardized.
- The step test and/or 1-1/2-mile run was adopted as the standard measure of physical fitness.

The 80's

- The National Interagency Incident Management System (NIIMS) was developed, along with its operational organization, the Incident Command System (ICS).
- Prescribed fire qualifications, monitoring, and smoke management guides were published.
- A new generation of training packages was developed for the ICS.

The 90's

- A performance-based qualification system, the ICS, and suppression fire training and qualification curricula were refined and revised.
- The ICS National Training Curriculum for all-risk users was published.
- Computers were implemented to better link all wildland fire agencies to a common system.
- The use of typical wildland resources was expanded into all-risk applications in support of FEMA.
- Prescribed fire, qualification, and training systems were approved, and courses were developed.

Evolving Programs and Products for the Next Decade

- Increased use of the Internet for information sharing.
- Improved ability of all agencies to use electronic media to share information, skills, and abilities.

For more information, contact the National Wildfire Coordinating Group (http://www.nwcg.gov).

NATIONAL INTERAGENCY FIRE CENTER

An integral component of NWCG is the fire center in Boise, Idaho. This center is the hub of the wildland fire community. All of the NWCG's training materials are managed through this center. They support training, equipment dispersion, dispatching, and many other functions. For the structural departments, National Interagency Fire Center (NIFC) can be a very valuable resource. A portion of their catalog can be found on the NWCG Web site. They have catalogs that deal with both training and publications material and those that deal with equipment. The publications are for sale to anyone; but the equipment has specific requirements regarding their purchase and use. Equipment may be purchased off the General Services Administration Web site as long as certain requirements are met.

NATIONAL FIRE ACADEMY

The National Fire Academy (NFA) is the training delivery arm of the USFA. It is estimated that, since 1975, over 1,400,000 students have received training through a variety of course delivery methods. On the Emmitsburg, Maryland, campus, the NFA conducts specialized training courses and advanced management training programs. On-campus programs target middle- and top-level fire officers, fire service instructors, technical professionals, and representatives from allied professions.

As mentioned above, this course is not designed to make the student an expert in the interface environment. The NFA has developed a set of three courses that will increase the safety and efficiency of structural personnel when dealing with the interface on an occasional basis. The NFA has attempted to bring together various sources of information and make this training on interface operations pertinent to the structural fire company.

NATIONAL FIRE PROTECTION ASSOCIATION

The National Fire Protection Association (NFPA) also has developed some different Standards that could be used in the W/UI situation. Standards topics include equipment, training, certification, and construction, to name a few. In addition, they have developed case studies and recommendations for W/UI incidents.

Your fire department is the final key to the W/UI. How much are you willing to commit to training and equipping your firefighters in light of your particular exposure to the interface situation? How willing are you to answer the increasing requests for assistance outside your jurisdiction? These questions and more will affect how you proceed in the coming years.

Activity 1.1

Introduction of Students

Purpose

To allow you to introduce yourselves.

Directions

Please stand and introduce yourself using the following:

- name;
- rank;
- where you are from; and
- why you are here.

Activity 1.2

Experiences

Purpose

To share experiences in the wildland and W/UI environments and to discuss the expectations that you have for this class.

Directions

1. Working in groups of four, introduce yourselves and take turns sharing any experiences you have had in the wildland or W/UI environments. You should specifically share

   a. Structural qualifications and experience.

   b. Wildland qualifications and experience.

2. On an easel pad, list any problems that group members may have encountered as structural firefighters in a wildland or W/UI situation. If no one in the group has any such experience, list problems that you anticipate may occur.

3. You have 20 minutes to work. At the end of the allotted time, you should be prepared to report to the class.

4. A representative from each group will share the group's problem list.

UNIT 2: INTERFACE INCIDENTS

TERMINAL OBJECTIVE

The students will be able to analyze the differences between structural and wildland/urban incidents.

ENABLING OBJECTIVES

The students will:

1. *Define Wildland/Urban Interface (W/UI) situations.*
2. *Identify challenges in wildland/urban incidents.*
3. *Contrast incident management in a structural Incident Command System (ICS) and W/UI.*
3. *Discuss where "you" fall in this structure.*

CHARACTERISTICS OF WILDLAND/URBAN INTERFACE SITUATIONS

Homes in areas surrounded by vegetation have become very popular, but we must understand that an interface fire need not limit itself to homes alone. While many homes built in areas of dense vegetation serve as examples of a single exposure, we also must include the personal property of residents in the form of motor vehicles (+$20,000), boats (+$2,000), pools (+$5,000) and associated outbuildings as a component of the interface problem. Each of these personal property items has a value, and our citizens include them as part of their real personal wealth. Hence they become part of the interface problem and, as such, part of our total protection responsibilities.

While the potential total dollar losses with these types of fires are important, nothing overshadows the potential for loss of life. W/UI fires move quickly and do so at the whim of nature. The direction of fire travel may change unexpectedly due to wind or topography considerations, which may be apparent or associated with changes in the weather occurring many miles away. Additionally, the populations associated with living in areas exposed to wildland fires frequently are characterized as individualists who may not take warnings to evacuate seriously. Efforts to address life safety issues at the scene of W/UI fires will be resource taxing in that homes may be spread apart or may be clustered with single points of access/egress.

There are other problems associated with interface fires, which multiply the overall potential for loss. These are generally in the form of housing developments. It is easy to see that, when we take the occupants of several homes, several dozen homes, or several hundred homes the problems do not increase on a direct-relationship basis, but multiply rather exponentially. Interface incidents in densely populated areas will offer some of the most difficult challenges that a fire department and, for that matter, a community will ever face. Your response and handling of these types of incidents can define your fire department's perceived competence level for many years into the future.

Sometimes built-up areas in the interface will bring with them light industry and small commercial properties. These two issues must be taken into account in the overall consideration of the problem. Many of these properties will have a higher property value and could result not only in significant loss to area employment, but also a reduction in revenue generation for the support of local government. It needs to be mentioned here that in some areas, such properties that normally would be protected by automatic fire suppression systems will not be in W/UI areas due to the unavailability of municipal water.

"Invisible" properties in the interface areas are what can be referred to as infrastructure properties. While it may not look like much, a simple 2,500-square-foot property in the "middle of nowhere" could be the location of an important microwave transmission tower or other communications facility. Telephone/Electric poles, bridges, roadways, and water treatment facilities are also important considerations.

There are more than a handful of examples where power transmission lines have been interrupted by wildland fires, in turn hampering the ability of the local water generation plant to operate. The resulting reduction in available water supplies for firefighting significantly strained fire suppression efforts. Roadways are another example of infrastructure properties routinely taken for granted. Fires that occurred within the State of Florida in the 1990's cost the State millions of dollars in lost revenue due the closure of interstate highways. It is important that infrastructure concerns be viewed equally within the scope of all property considerations.

While we have examined the potential negative consequences for the community's infrastructure and the personal property and life of our citizens, we also need to include environmental issues among our potential exposures. Fires in W/UI areas by their very nature may occur in areas that are environmentally sensitive. Chief fire officers confronted with fires in such areas need to understand that endangered animal or plant life may be a significant exposure factor. Likewise, elimination of vegetation may cause erosion conditions to worsen in some areas, which will have a resultant negative effect on water quality. Efforts may need to be made to eliminate potential risks to these areas by shifting resources and adjusting action plans. These actions would, of course, never be at the cost of risking human life.

Other areas considered as exposures may be those that are important from a cultural or historical perspective. Areas such as public parks, monuments, and lands of cultural importance to specific groups can translate into significant negative public comment should they fail to be protected appropriately. Like the environment, these exposures can be protected only when action plans for the safety of life have been addressed.

CHALLENGES IN WILDLAND/URBAN INCIDENTS

As we have identified already, many but certainly not all, interface incidents may occur in rural areas. Therefore, inadequate or nonexistent water supply for the purposes of fire suppression can be expected. Where water supplies are present, aggressive fire suppression efforts may deplete

storage supplies rapidly and overrun the capabilities of a municipal water system, should one be available.

In areas not covered with public water supply systems, obtaining water by drafting from static water sources may be the primary source of extinguishing agent. In addition to creeks and streams, pools, cisterns, livestock ponds, and the like may be used to provide this all-important resource. Inasmuch as this may be a significant deviation from normal operations, advance planning may be necessary prior to the response to any W/UI emergency. As we all know, more than one municipality has removed the suction tubes from apparatus because they are not used in their "normal" operations. Such potential shortfalls in ability to use nontraditional available water supplies in mutual-aid districts must be identified and addressed through planning in advance of the emergency.

Resources arriving at the scenes of W/UI Incidents are going to be confronted with several challenges normally not associated with structural fires. Chief among these will be limited access to the properties that resources will be assigned to protect. Not only will many of these buildings be set directly in the fuel load, but residents in a state of confusion or in the process of evacuation will make it difficult for apparatus to get close enough to operate both safely and effectively.

As we discussed earlier in this unit, it will be difficult for the Incident Commander to get an effective handle on the total size and scope of the incident. In addition to dealing with reports from resources that are being affected directly, there will be numerous reports from those that feel they will soon be affected. Likewise, citizens will report the need for assistance based purely upon what they think might occur in the future, as opposed to what is actually transpiring. This conflicting information will stress decisionmaking and directly affect the number of resources required to deal with the incident.

While we touched briefly on evacuation here, we will address the subject more in depth later in the course. This task is going to be difficult to say the least, even under the best conditions. Some members of the public will self-evacuate, and others will wait until the last possible minute. In either case, it will be necessary to deal with the issues that citizens will create once they begin to leave their homes. Clogging the roadways, confusion in locating other family members, attempting to return for precious belongings, and the need for very specific personalized instructions are all issues that will tax local emergency response agencies. All this activity will be complicated further by the fact that smoke conditions and narrow roadways, some underrated for the combined capacity of emergency vehicle and fleeing citizenry vehicles will be encountered.

To this point we have pointed out some of the basic issues in which the interface incident is different from the typical structure fire. To add some more dissimilarities to your list, consider the following:

- When was the last time you had to refuel your apparatus on the way to an incident?
- Are your firefighters prepared to leave on a "run" that lasts more than 12 hours?
- Have you ever had to change a tire to continue in an operation?
- Have you ever had to provide a location for your crew to sleep in the field, or made sure they could all change their clothes?

These issues are typical in a W/UI situation of any duration. They point out the need to be certain that such situations are preplanned, and that those plans are updated routinely. Vendors who have entered into agreements to provide materials need to supply regular updates on their abilities to deliver such services and supplies and provide assurances that they will travel the distances required for delivery. Likewise, members of your department will need to know not only that these items are available, but also know how to order them from the field. In order for these plans to function not only training but careful written documentation that is available in the field will be required.

Due in large part just to the overall size and complexities of the incidents it will be necessary to use all resources, including apparatus and staffing, in far larger quantities than normal structural operations. We all have heard the famous calls from IC's for five strike teams and thought that was a tremendous amount of resources. If we would admit it, some of us even may have thought the IC was playing it safe by overstating his/her needs. But in a W/UI incident, five engines would cover at most, 10 homes. Most any chief officer knows that in any built-up area, 10 homes would be a very small number. Now for the purposes of putting things in perspective, think about a fairly good sized street in your jurisdiction… one or even two strike teams do not go very far do they?

Other issues will be nontraditional for the structural chief officer as well. The need to be sensitive and alert to the emotions of the public will be most important. As we have witnessed time and again, there will be times, however unfortunate, when some civilian properties will be lost directly to the fire, and in some other cases due to your own people determining that existing situations were too dangerous to attempt to save a dwelling. The latter issue will be one that certainly will cause the emotions of the community to boil. Therefore, it is essential that accurate recordkeeping

and display of appropriate respect on the part of all suppression forces is imperative.

Those situations in which our suppression forces are forced to make decisions to sacrifice properties identified as too dangerous to defend will be unique in themselves. In addition to this type of action being contradictory to the public's most direct expectations, it also will go against this grain of all that structural firefighters are taught. While significant efforts industry-wide have been made to weigh safety considerations against potential benefits in structural fire attack, by their very culture, structural firefighters remain very aggressive and even passionate about saving property threatened by fire. When forced to make decisions to give properties up to the fire, our structural firefighters may suffer severe emotional strain. Members of fire suppression crews forced into such situations must be identified and debriefed.

Residents of your community likewise will suffer significant emotional strain when dealing with watching the fire department make decisions to let homes burn. Remember, the reason they called the fire department in the first place was to protect their homes. The anger generated and aimed toward your firefighters coupled with the unusual experience they have just been through makes the debriefing of your firefighters all the more important. Knowing the potential for losing homes in advance should encourage the local fire department to initiate aggressive public education programs in potential W/UI areas **prior** to an incident.

Prior communications with the public at risk will go far in dealing with the pressures that eventually will be brought upon the fire department when residents begin to use the political process to turn emotion into action. The best offense frequently is a good defense and the best actions are preplanned actions. The need to provide explanations as to what happened and how it happened can best be done in advance of the incident. Your local political and civic leaders need to be briefed on just what the potential problems and associated risks are in W/UI areas of your community prior to a W/UI Incident. Any postincident discussion will be viewed as defensive, and all facts presented will certainly be watered down by the emotions present to the point of becoming ineffective. Preplanning both for the emergency and the potential for what would most likely occur in the postemergency period go hand-in-hand.

In discussing this topic we cannot emphasize enough the need of the chief fire officer to plan in advance for W/UI Incidents. There will be many deviations from operations for standard structural fires. Normal aggressive offensive actions will not be the norm for our firefighters. Instead, a defensive posture that provides for broad-based structural protection objectives, while leaving room for escape of fire suppression

forces, will become the mainstay. Such defensive actions will be foreign to our firefighters and paper-based training scenarios may be as close as they ever come to experiencing a W/UI Incident prior to actual operating within one.

We should point out that our firefighters are not alone in their lack of experience. We, as chief fire officers will be thin on experience as well. The entire mindset necessary to address strategic and operational concerns associated with W/UI Incidents will be difficult for the chief officer to establish. As large-scale W/UI Incidents are not frequent, there is not a large experiential base among chief fire officers, structural firefighters, or even well-seasoned wildland firefighters. Therefore, the knowledge and case studies that are available need to be scrutinized closely to take full advantage of those experiences.

STRUCTURAL INCIDENT COMMAND SYSTEM VERSUS WILDLAND/URBAN INTERFACE INCIDENT COMMAND SYSTEM

While structural fires across the United States continue to be reduced in both frequency and severity they are, nevertheless, the bread and butter of most structural fire agencies. Simultaneously, the widespread acceptance and usage of a standard ICS model has further served to reduce the confusion and standardize the management of structural incidents. There will be some surprises, though, when structural firefighters and chief fire officers experience W/UI situations.

It is important for the chief fire officer to bear in mind that the ICS will be more comprehensive than that usually used for routine structural operations. The usual applied model that includes Command, Operations, Staging and perhaps a few divisions will not suffice. Instead those little-used ICS positions that include base, task force, Staging Area, strike teams, Logistics, and a host of the other little-used positions in the structural ICS models, will become major factors in the Command system needed to deal with a W/UI Incident. Even the seldom-used Finance/Administration position not only will be staffed, but actively used as well.

If this is not enough of a deviation from the standard for the chief fire officer, think about the rapidness of the escalation of ICS that is required. Earlier we used the example of five strike teams. Think about that in terms not only of operational direction, but logistical support, communications, and resource tracking. It's easy to see that only a few improved properties need to be threatened to have a huge resultant impact on both resources required and the size of the ICS necessary to manage the incident effectively and safely. The safety of those operating at the scene

of a W/UI Incident and the overall effectiveness of the resources applied will be reflected directly by the chief officer's ability to make proactive decisions regarding the incident as it develops and then supporting those decisions with appropriate ICS.

Most, but certainly not all, wildland/urban incidents have occurred in more rural areas of our Nation. Inasmuch as many of our rural areas also are protected by agencies whose primary mission is wildland fire suppression there will associated interaction. These agencies could include among others; the Bureau of Land Management (BLM), U. S. Forest Service (USFS), Bureau of Indian Affairs (BIA), etc. These incidents also have been large scale and, as such, may by shear size straddle more than one community.

These issues bring the application of a Unified Command system to be a necessity. It has long been said that the only thing worse than no plan at an incident is two plans. To avoid such potentials and their associated safety risks, it will be necessary that all jurisdictions present develop and maintain a Unified Command structure. This too, will be a significant deviation from the day-to-day operations normally associated with structural fire suppression. The necessity for all the agencies involved in the incident to know their part of the plan and every other agency involved is important from the perspective of safety and also to maintain organizational accountability.

We mentioned briefly the need for logistics earlier in this unit. Later on we will go into more depth regarding this detail, but it must be restated that incidents of this size and complexity are going to require extensive support for resources. Typically, in structural firefighting we tend to think of the Logistics section as our food and fuel people. By contrast, in W/UI Incidents, in addition to those issues, medical attention for our personnel, housing, facilities, and communications tasks are all critical functions.

It is easy to see that in long-term, highly energized situations like these, effective implementation and completion of these associated support tasks not only become important but also are absolutely critical. Structural firefighters, and for that matter, chief fire officers who are assigned to these "unusual" tasks, may find themselves feeling like fish out of water. In addition to routine training **in all areas** of ICS, the obtaining and distribution of job aids (e.g., Field Operations Guide ICS-420-1) to structural line officers is deemed as important for the successful transition from structural to W/UI firefighting situations.

We touched briefly on the issue of the size of these incidents being routinely large in geographic scale and therefore easily becoming multi-jurisdictional. In most cases, structural chief fire officers will view the

term multijurisdictional as one that involves more than one municipal government having authority. While this assumption is a correct one, in cases of W/UI Incidents, we also need to consider a host of other jurisdictions, including agencies such as State and Federal wildland fire suppression agencies, military agencies, and perhaps even special authorities such as Federal and State environmental agencies. Again, in the cases that the structural firefighter is used to, perhaps only one other agency will be involved in the incident, in W/UI Incidents, numerous agencies may become involved as the incident progresses.

In W/UI Incidents that involve multiple jurisdictions the potential to have leaders from "other" organizations represented in positions of leadership/supervision is not unusual. However, this again would be something that structural firefighters may never have experienced. These situations, if allowed to occur in the field with no advanced awareness training, will result in confusion and corresponding ineffectiveness of operations. Again, advanced training and communication is viewed as essential to avoid this potential pitfall.

Multijurisdictional meetings where wildland/urban incidents and the roles each agency will play are discussed can enhance communication and both identify and resolve issues of conflict prior to an incident occurring. This eliminates surprises in the field that no doubt will have a negative effect on operations and the safety of those operating.

Such advanced meetings also can lead to the identification of resources outside of the emergency services that may be beneficial in such an emergency. Organizations such as religious groups, the American Red Cross, and others may be added to your list of potential resources for use in a wide-scale wildland/urban incident. Such groups may play a significant role not only in immediate assistance with support of our personnel, but also in hosting shelters for displaced persons and operating telephone banks for your personnel.

Again through advanced discussions with other agencies, issues such as the use of specialized teams available through some of the potentially involved agencies may be explored. There are many agencies that maintain Overhead Teams. The purpose of such teams is to supply a highly trained and experienced pool of human resources specifically to manage many of the challenges associated with large-scale incidents.

The availability of such teams can be determined and "plugged in" to plans for such operations. In addition to providing individuals who are highly skilled in the orchestration of such large-scale incidents, it should be kept in mind that the use of such resources would allow local suppression officers to fill field positions. In short, use of Overhead

Teams could make the best use of available human resources overall. While complicated by jurisdictional issues, Overhead Teams may well be an attractive option for communities that could experience not only W/UI situations, but also other similar types of complex emergencies.

THE INCIDENT COMMANDER'S ROLE AT WILDLAND/URBAN INTERFACE INCIDENTS

When confronted with W/UI Incidents, there are essentially three roles that the arriving and succeeding IC's will play.

The first is what is termed initial attack. In this mode the IC is the arriving officer on location and is confronted with the wildland/urban incident with an initial assignment of resources. In this situation the responsibilities of the IC will include addressing the three incident-common priorities of life safety, incident stabilization and property conservation. Through assessment of these priorities, if the IC determines that resources on hand are adequate, he/she manages the situation. If they are not adequate, he/she must apply the available resources to address the most pressing issues and call for additional assistance. Obviously, the need to maintain safe operating conditions for fire suppression and allied emergency members on scene must be at the forefront of all such decisionmaking.

Should the IC determine that the amount of resources on hand is not adequate and that additional resources are required, the incident will move into the second role, known as an extended attack. In situations such as these, while the priorities remain the same, the need for expanded application of ICS and formalized command facilities (Incident Command Post (ICP)) becomes a requirement. In such incidents, the initial IC usually will be relieved by a higher-ranking officer; however, this is not a requirement. The selection of a site and formalization of an ICP is critical in such incidents. The IC at this point is no longer a part of the attack forces. Such incidents most likely will include the use of resources from other communities or State and Federal agencies.

In those incidents where extended attack incidents become protracted or require the use of other agencies, the IC will be required to shift to the third incident role as a member of a Unified Command organization. This form of ICS application generally will be implemented when several jurisdictions or agencies have been called to the scene and close coordination of all is required. It is essential for this type of organization to be implemented when multiple agencies are involved to assure both the safety of all personnel and the development of effective action plans. Each organization's IC will represent his/her department at the ICP. It is

in this type of Command situation that advanced planning and relationship building with other agencies will pay dividends.

By now we hope that we have sensitized the chief fire officer to the fact that W/UI fires are dynamic and challenging incidents. In addition to providing a high degree of hazard to both the lives of our citizens and their properties, such incidents have the potential to damage the infrastructure of our communities and undermine the credibility that the community holds for the fire department.

Wildland/Urban incidents continue to occur today, even though they can be traced all the way back to the very roots of American history. The fact that many citizens have a strong desire to live in areas that are rustic and free of the associated protections afforded by planned development remains in direct contrast to their assumptions that their safety and that of the properties can be guaranteed by municipal fire agencies. All this points to the seriousness with which W/UI Incidents must be prepared for and appropriately responded to when experienced.

Structural incidents and wildland/urban incidents are two distinct types of combat. Failure to realize this at the outset will result in the chief fire officer playing the neverending game of catch up. In as much as these are not incidents to which we respond everyday, a high degree of preparedness planning and awareness training is required to keep these differences at the forefront of our thinking.

Activity 2.1

Identify Wildland/Urban Interface Situations

Purpose

To exercise your ability to recognize the potential for and associated hazards with W/UI Incidents as they exist in your communities.

Directions

1. List three potential sites for W/UI Incidents within your community.

2. Identify three challenges associated with each of the identified sites as presented in the course material.

3. Be prepared to share work with the class.

Activity 2.2

Identify Operational Considerations Involved in a Wildland/Urban Interface Incident

Purpose

To prepare you for a W/UI Incident operation.

Directions

Answer the following questions individually.

1. If you had to respond to an incident that you identified already exists in your community, what are some of the considerations that you would have to take into account?

2. What considerations would you take into account for the initial attack?

3. What considerations would you take into account for the extended attack?

4. You are in charge of multiple units or are sending multiple units to a W/UI Incident. What are your strategic considerations in this situation?

Activity 2.2 (cont'd)

Discuss your answers with your group and complete the following table on one selected incident as a group.

Using one W/UI situation that you identified, complete the following.

Benchmark	Initial Attack	Extended Attack
Response		
Logistics		
ICS		
Civilians		

UNIT 3: FIRE BEHAVIOR

TERMINAL OBJECTIVE

The students will be able to evaluate the impact of fire behavior on the safety of operations at a Wildland/ Urban Interface (W/UI) Incident.

ENABLING OBJECTIVES

The students will:

1. *Identify the factors that affect wildland fire behavior.*
2. *Identify the direct relationship between weather (temperature, humidity, and wind) and fire behavior.*
3. *Identify the relationship between fuel and fire behavior.*
4. *Identify the relationship between topography and fire behavior.*
5. *Identify the indicators of problems of extreme behaviors, spotting, significant runs.*
6. *Identify sources of information on fuel, topography, and weather behavior.*

INTRODUCTION

The key to safety during a Wildland/Urban Interface (W/UI) Incident will be how well you understand the factors that affect wildland fire behavior and what actions you need to take. With knowledge of the factors, you may be able to decide effectively and safely when to stay at a structure, when to leave, and when not even to try.

Three main areas interact to affect the wildland fire--weather, fuel, and topography.

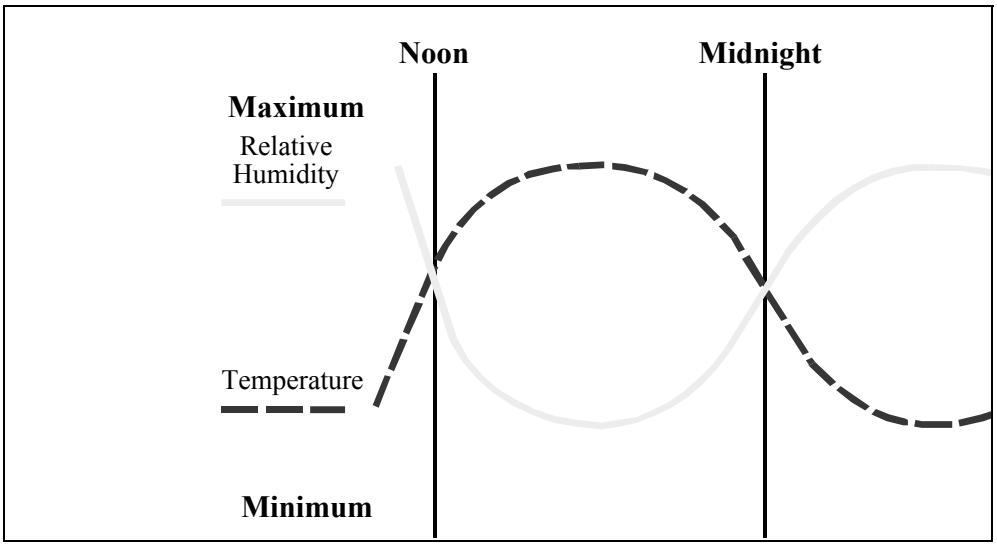
WEATHER

Weather is the most dynamic of the three factors. It varies greatly over time. Weather impacts are both short- and long-term, and both should be considered. Short-term weather includes winds that can push the fire into catastrophic proportions; long-term weather includes drought cycles that may increase your fire danger. High relative humidity can slow or stop a fire easily. Conversely low relative humidity can contribute to extreme fire behavior. Precipitation can put out a fire or can contribute to an unusually high fuel loading. If there is no precipitation, the drought cycle may affect the severity of fire and the availability of fuels to burn. Higher temperatures often correlate with increased fire activity in the wildland environment, while lower temperatures often mean being able to catch up with wildland fires.

Relative Humidity

Relative humidity is the ratio of the amount of moisture in the air to the amount of moisture that the air could hold at the same temperature and pressure if it were saturated, expressed as a percentage.

Dead forest fuels and the air are always exchanging moisture. Low humidity takes moisture from fuels. Fuels, in turn, take moisture from the air when the humidity is high. Light fuels (i.e., grass) gain and lose moisture quickly with changes in relative humidity. Heavy fuels, on the other hand, respond to humidity changes much more slowly.



Temperature/Relative Humidity Chart

FUELS

Wildland fuels can vary greatly with time and distance. Different fuels grow in different areas, altitudes, and aspects. Fuels can change day-to-day or year-to-year in their ability to burn or to reduce fire behavior. Wildland fuels are broken into four groups: grass, brush, timber, and slash. Each group has special characteristics and potential problems.

Grasses burn easily and quickly. The brush groups burn with great intensity and moderate speeds and tend to be more difficult to control. Timber burns intensely but at slower forward speeds; timber fires are difficult to control. Slash models have great intensities, are difficult to control, but do not move very quickly. An over-generalization most definitely, but it gives you an idea of what to expect. Many other factors are pertinent to wildland fire behavior regarding fuels.

- Fuel loading. (How much is there available to burn?)
- Time of year. (Is the fuel dry, alive, dead?)
- What is the arrangement of the fuel? (Is it compact or loose, upright or lying down?)
- What is the closure? (Will the fire spread easily from one tree to another, or are trees spaced so heat transfer isn't a problem?)

TOPOGRAPHY

Topography is the least variable over time, but can change drastically over distance. Steep terrain acts like wind on a fire, controlling the fire's direction of movement and speed. Fires tend to burn very quickly upslope, and back slowly downslope.

Topographical features, such as canyons, actually can intensify the fire and increase the speed at which it moves. Canyons can spell doom for firefighters, and should be avoided. The topography of an area also can affect the local weather. Temperature, moisture, winds, and fuel types are a few of the factors that can be affected by topography.

INDICATORS OF PROBLEMS AND EXTREME FIRE BEHAVIOR

Problem Fire Behavior

Problem fire behavior is fire activity that presents potential hazards to fire line personnel, if the tactics being used for control are not adjusted.

Extreme Fire Behavior

This is the most intense type of fire behavior, and can be described by specific elements that include

- Rapid rate of spread: The rapid advancement of the flame front caused by high wind speeds, fuel type changes, and increase in angle of slope.
- Intense burning.
- Spotting: Sparks or embers from the fire are carried by the wind or the slope and start new fires beyond the zone of direct ignition by the main fire.
- Crowning: Fire advancing from treetop to treetop or shrubs, more or less independent of a surface fire.

The prediction or anticipation (proactive behavior) of fire behavior is always the key to good safety and tactical decisions.

Extreme fire behavior has the greatest potential to put the wildland firefighter in jeopardy; exercise extreme caution to adjust strategies and tactics to the situation.

Indicators

These are clues used to size up the fire environment and to predict or anticipate fire behavior. The following are indicators that fire line personnel must monitor continuously.

Fuel Indicators

- unusually dry fuels;
- large amount of light fuels (shrubs, grass, needles, moss, etc.) that are continuous;
- fuels exposed to direct sunlight;
- fuels dried by prolonged drought;
- ladder fuels that allow a surface fire to move into the crowns of shrubs or trees;
- crown foliage dried by surface fire over a large area; and
- concentration of snags.

Topography Indicators

- Steep slopes allow fire to spread faster upslope and present dangers from rolling debris and embers.

- Chutes, saddles, and box canyons provide conditions for the "chimney effect" to occur.

- Narrow canyons increase the possibility for fire to spread by spotting across drainage.

Weather Indicators

- strong wind;
- sudden changes in direction and/or velocity of wind when weather fronts move through the area;
- high clouds moving fast may indicate unusual surface winds to follow;
- unexpected calm may indicate that winds will shift;
- thunderstorms, above or in close proximity to a fire, usually lead to dangerous downdraft winds;
- unusually high temperatures and low relative humidity;
- dust devils and whirlwinds developing; and
- bent smoke column.

Fire Behavior Indicators

- Keep an eye on the smoke column. This will give you a good idea of the direction of fire spread, location of possible spot fires, and changes in fire intensity.
- Many simultaneous fires starting or smoldering over a large area beginning to pick up in intensity.
- Fire begins to torch small groups of trees or brush.
- Frequent spot fires occurring.
- Firewhirls beginning to develop inside the main fire.
- Crown fires.

SOURCES FOR FIRE BEHAVIOR INFORMATION

Certain specialized information is necessary to make decisions regarding wildland fire behavior. Some sources provide initial information, some extended attack, while others are better for larger, more extended situations. Depending on your needs at the time and your exposure to these incidents you will need to become familiar with the different products available for predicting wildland fire behavior and how to get them.

Information about weather is probably the most important product that firefighters need. Information can be obtained from local TV and radio reports, but these often are not detailed enough to predict the fire or weather's effects on fire adequately. They are obtained easily and provide general weather that may assist in planning your responses on a day-to-day basis. For more indepth information and forecasts, the National Weather Service (NWS) usually can provide you with fire weather forecasts that directly address the effects of weather on wildland fires. You also can request special Spot Forecasts that are fairly accurate (with a little practice and feedback from you). You may be in an extended situation that requires specific weather information, and then you would be better served to order a Fire Meteorologist to your incident. These individuals will come to your area with all the equipment necessary to prepare any weather products that you require for your incident.

Other information you may find helpful either to have on hand or know where to get quickly could include

- Maps:

  - road maps of various areas and mutual-aid areas, and
  - topographic maps that provide you with terrain contours.

- Drought Indices provide you with general weather and fuel conditions, and can be obtained on the Web, from the NWS, and sometimes from your local universities.

- Contact numbers and names from other agencies are helpful, especially agencies that deal with wildland fire on a regular basis. These can be local governments (even a volunteer department an hour away may provide you with valuable information and equipment should it be necessary). State Forestry has much of the information and resources you will need and, of course, the National Wildfire Coordinating Group (NWCG) and all of its products and resources are invaluable.

  Make sure you get this information prior to an incident. Identify and contact them before the emergency to see what they have to offer, and possibly what you can offer them.

Activity 3.1

Variables Affecting Fire Behavior

Purpose

To identify some factors that will affect fire behavior and safety of your personnel, given a topographic map and a picture slide of the fuels.

Directions

1. In your table group, review your scenario, weather, and topographical map.

2. Answer the subsequent list of questions.

3. Be prepared to share your group work with the remainder of the class.

Scenario 1: Northeastern Wyoming

A fire is started next to a highway a few miles north of your town. Review the weather, fuel type, and topography to address the questions in the exercise. This is a rural area and mutual aid is 60 minutes away.

WEATHER

FORECAST FOR GILLETTE, WY
NATIONAL WEATHER SERVICE--RAPID CITY, SD
648 AM MDT THU AUG 1999

HIGH PRESSURE WILL CREATE VARIABLE WINDS

HIGH PRESSURE OVER CENTRAL WYOMING WILL SLIDE SLOWLY EASTWARD TODAY. LIGHT WINDS ARE EXPECTED TO VARY FROM SOUTHWEST TO WEST THIS MORNING…BECOME NORTHWEST BY NOON AND THEN BECOME SOUTHERLY BY EARLY EVENING AS THE AXIS OF HIGH PRESSURE MOVES TO THE EAST.

TODAY

WEATHER…MOSTLY SUNNY
CHANCE OF WETTING RAIN…0
MAX TEMP…84
MIN RH…16
20 FOOT WIND…WIND OF 6 TO 12 MPH WILL VARY FROM SOUTHWEST TO WEST THIS MORNING…BECOME NORTHWEST AT 10 TO 15 MPH AROUND NOON AND THEN BECOME SOUTHERLY AROUND 5 MPH BY EARLY EVENING.
TRANSPORT WIND…NORTHWEST 15 MPH
MIXING HEIGHT…5000 FEET AGL
SMOKE DISPERSAL…FAIR

TONIGHT

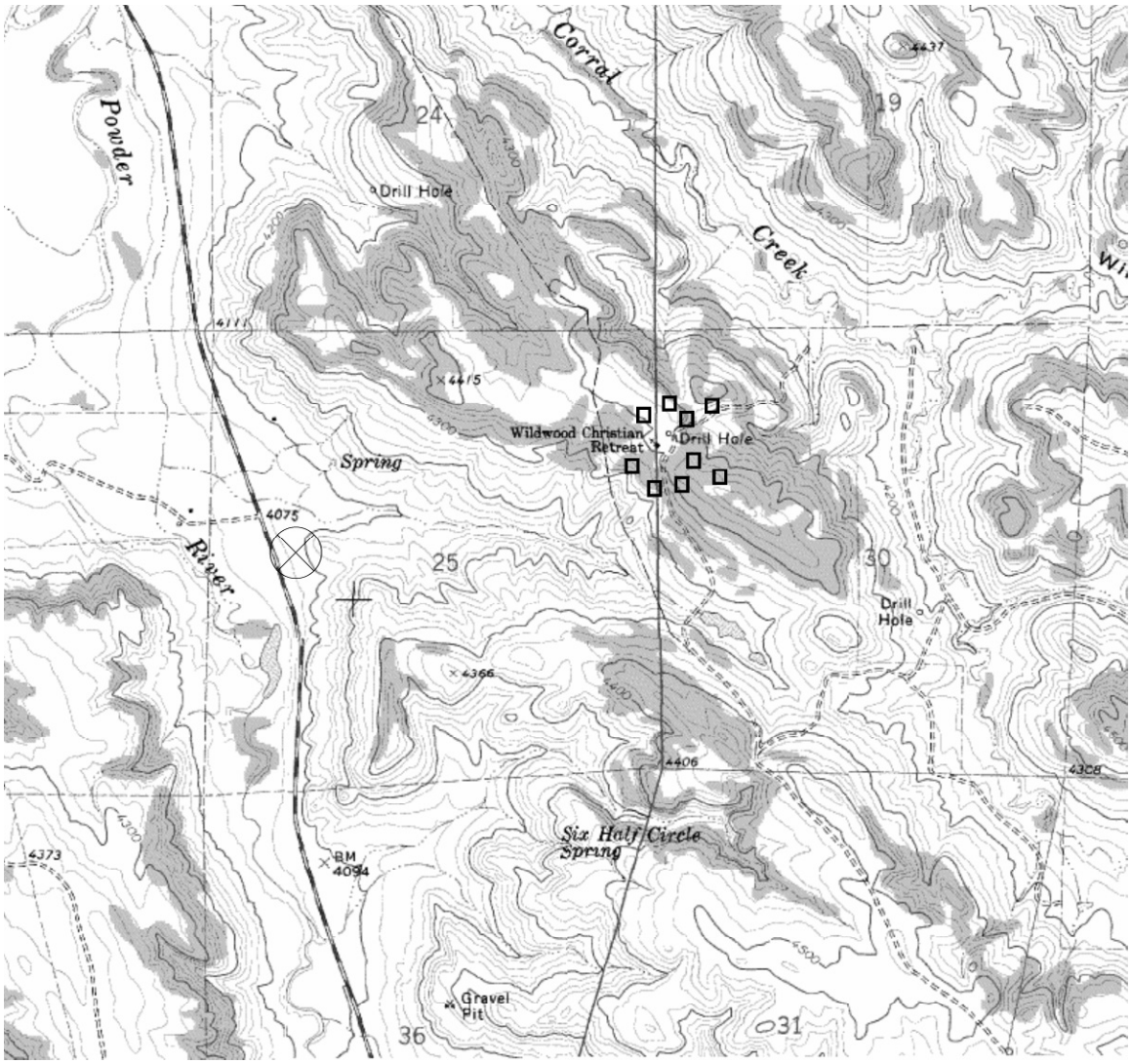
WEATHER…PARTLY CLOUDY
CHANCE OF WETTING RAIN…0
MIN TEMP…63
MAX RH…33
20 FOOT WIND…SOUTHEAST 5 TO 10 MPH
TRANSPORT WIND…SOUTH 15 MPH
MIXING HEIGHT…1000 FEET AGL
SMOKE DISPERSAL…POOR

OUTLOOK

TOMORROW WILL BE THE WARMEST DAY OF THE NEXT FIVE DAYS BEFORE ANOTHER COLD FRONT MOVES IN LATE FRIDAY NIGHT INTO SATURDAY MORNING. THIS FRONT…COMBINED WITH AN UPPER LEVEL DISTURBANCE…WILL BRING A CHANCE OF RAIN TO THE REGION AS WELL AS MUCH COOLER TEMPERATURES.

FUEL--Fuel open ponderosa pine with sagebrush understory

TOPOGRAPHICAL MAP: MOYER SPRINGS; USGS REF. CODE: 44105-D4-TF-024; Centered on WILDWOOD CHRISTIAN RETREAT; LAT: 44° 27' 48.28" N; LONG: 105° 26' 40.24" W.



Fire Location

Scenario 1 Worksheet

1. Identify fuel concerns.

2. Identify weather concerns.

3. Identify topographical concerns.

4. Identify W/UI concerns.

5. Identify potential for extreme fire behavior.

Scenario 2: Florida Scenario

A fire is started by a lightning strike. Review the weather, fuel, and topography to address the questions in the exercise. You are a major metropolitan department.

WEATHER

SOUTH FLORIDA FIRE WEATHER FORECAST
NATIONAL WEATHER SERVICE MIAMI FL
330 PM EDT FRI JAN 12 2001

RED FLAG…FIRE WEATHER WATCH FOR ALL OF SOUTH FLORIDA AND SOUTHEAST COASTAL ZONES FOR SATURDAY AFTERNOON.

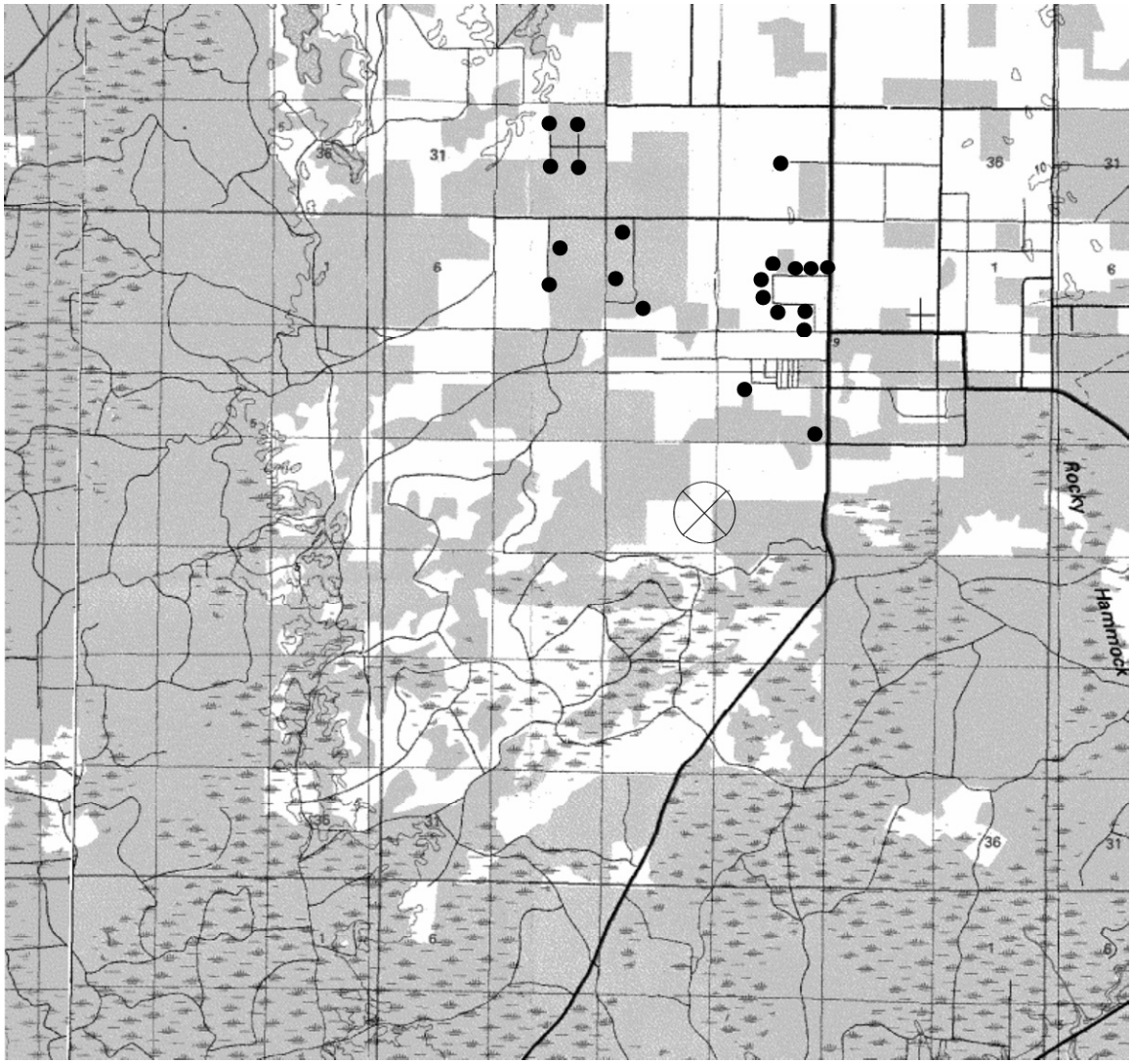
SYNOPSIS…WEAK COLD FRONT FROM OCALA SOUTH TO SARASOTA AND TORUGAS AT 3 PM FRIDAY WILL MOVE THROUGH SOUTH FLORIDA BY MIDNIGHT TONIGHT. THE WIND WILL BECOME SOUTHWEST TONIGHT AND THEN BECOME SOUTH ON SATURDAY. DRIER AIR WILL MOVE INTO SOUTH FLORIDA ON SATURDAY BEHIND THE FRONT.

FLZ068-072-074-131000-
BROWARD METROPOLITAN-MIAMI DADE METROPOLITAN-PALM BEACH
330 PM EDT FRI JAN 12 2001

PARAMETER	TONIGHT	SATURDAY
CLOUD AMOUNT	BCMG CLEAR	CLEAR
CHANCE PRECIP(%)	NONE	NONE
PRECIP TYPE	NONE	NONE
MIN/MAX TEMPS	56/71	56/71
WIND DIRECTION	SOUTHWEST	SOUTH
WIND SPEED MPH	8	14
PRECIP AMOUNT	NONE	NONE
PRECIP BEGINS/ENDS	NONE	NONE
PRECIP DURATION	NONE	NONE
LIGHTNING FREQ	NO TSTMS	NO TSTMS
REL HUMIDITY %	70	40
MIXING HEIGHT	700	3700
CEILING HEIGHT	NO CEILING	NO CEILING
TRANSPORT DIR	SOUTHWEST	SOUTH
TRANSPORT SPEED	8	15
DISPERSION INDEX	5	39

FUEL--Florida Fuel Model

TOPOGRAPHICAL MAP: CHIEFLAND SW; USGS ORDER ID: TFL012; Centered on LAT: 29° 20' 53" N; LONG: 82° 54' 22" W.



Fire Location

Scenario 2 Worksheet

1. Identify fuel concerns.

2. Identify weather concerns.

3. Identify topographical concerns.

4. Identify W/UI concerns.

5. Identify potential for extreme fire behavior.

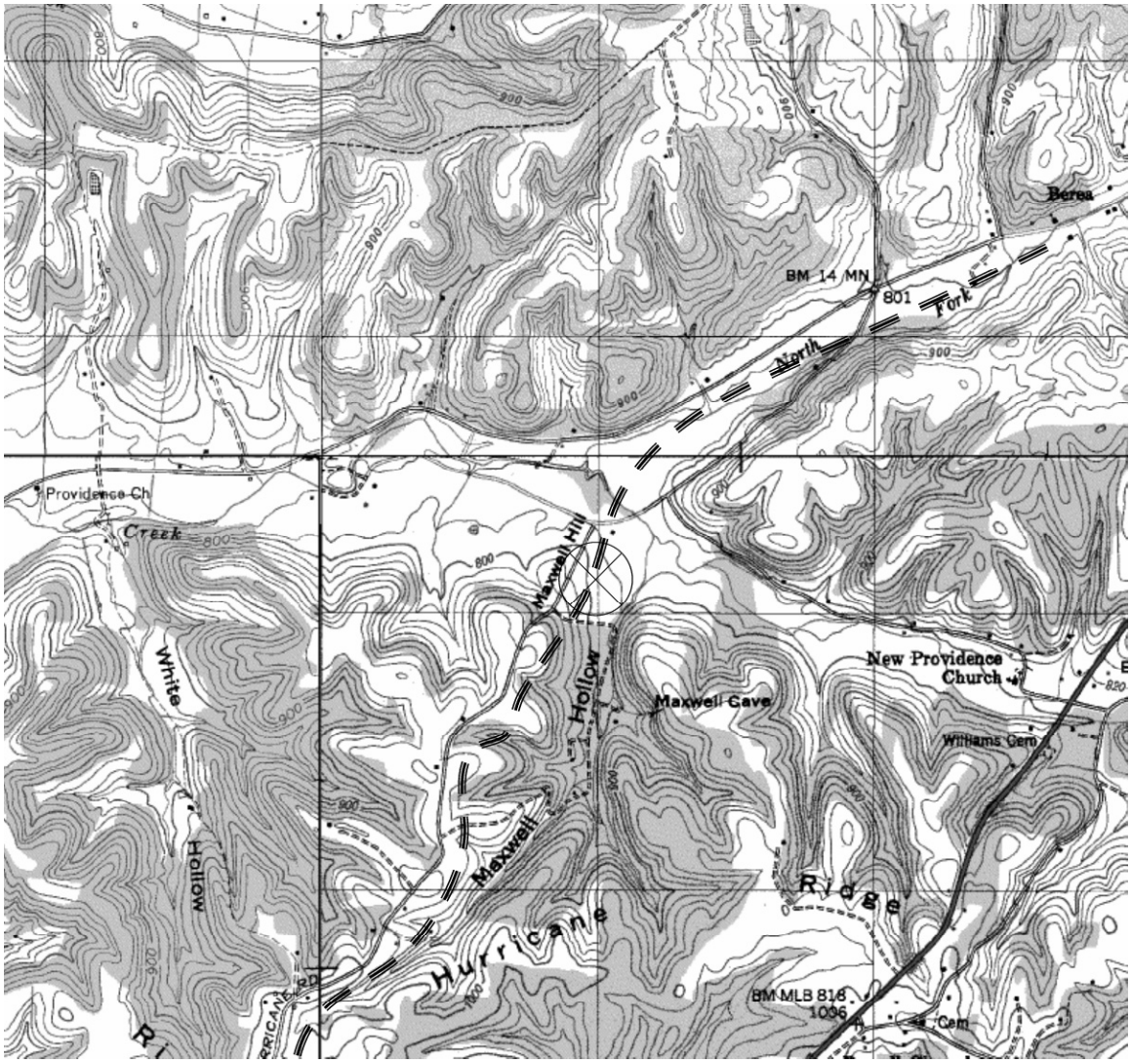
Scenario 3: Tennessee

A fire is started by a downed power line at the Hurricane Road and Maxwell Hollow Road Intersection. Review the weather, fuel, and topography to address the questions in the exercise. This is a rural area and mutual aid is 20 minutes away.

WEATHER	TODAY	TONIGHT	TOMORROW
CLOUDS	MOSTLY SUNNY	CLEAR	CLEAR
TEMPERATURE	81-85	65-69	75-79
HUMIDITY %	36-40	63-67	31-35
AM WIND	SW 5	SW 5	NW 5
PM WIND	W 10	W 5	W 5
PRECIP CHC %	0	0	0
PRECIP DURATION	0	0	0
PRECIP BEGIN			
PRECIP END			
PRECIP AMOUNT	0.00	0.00	0.00
MIXING HGHT (MSL)	5500		4900
TRANSPORT WINDS	SW 15		NW 10
REMARKS			

FUEL--Tennessee Hardwood Fuel Model

TOPOGRAPHICAL MAP: TARPLEY; USGS ORDER ID, Centered on LAT: 35° 14' 39"N; LONG: 86° 58' 45"W.



Fire Location

Scenario 3 Worksheet

1. Identify fuel concerns.

2. Identify weather concerns.

3. Identify topographical concerns.

4. Identify W/UI concerns.

5. Identify potential for extreme fire behavior.

Scenario 4: California

A fire is started by a train near the covered reservoir. Review the weather, fuel, and topography to address the questions in the exercise. This is a rural area and mutual aid is 45 minutes away.

WEATHER

GEOGRAPHICAL AREA COORDINATION CENTER
INTERAGENCY FIRE FORECAST AND WARNING UNIT
RIVERSIDE, CALIFORNIA
FIRE WEATHER FORECAST
1430 pst Friday January 12, 2001

SYNOPTIC DISCUSSION

A weak ridge will bring a little warmer and drier weather this weekend. Another trough will move across the region Monday into Tuesday, but no precipitation is expected with this system. Wednesday through next weekend a strong ridge will form over the State with much warmer, drier weather.

Note: All winds are 20-FOOT WINDS unless specified otherwise.
THUNDERSTORMS imply STRONG, GUSTY and ERRATIC winds.

SOUTHERN MOUNTAINS FROM BIG PINE SOUTH.

TODAY

Sunny. Highs low to mid 80's. Minimum humidity 20-25%. Ridgetop winds north to northeast 5-15 mph. Upslope winds 8-12 mph by mid afternoon.

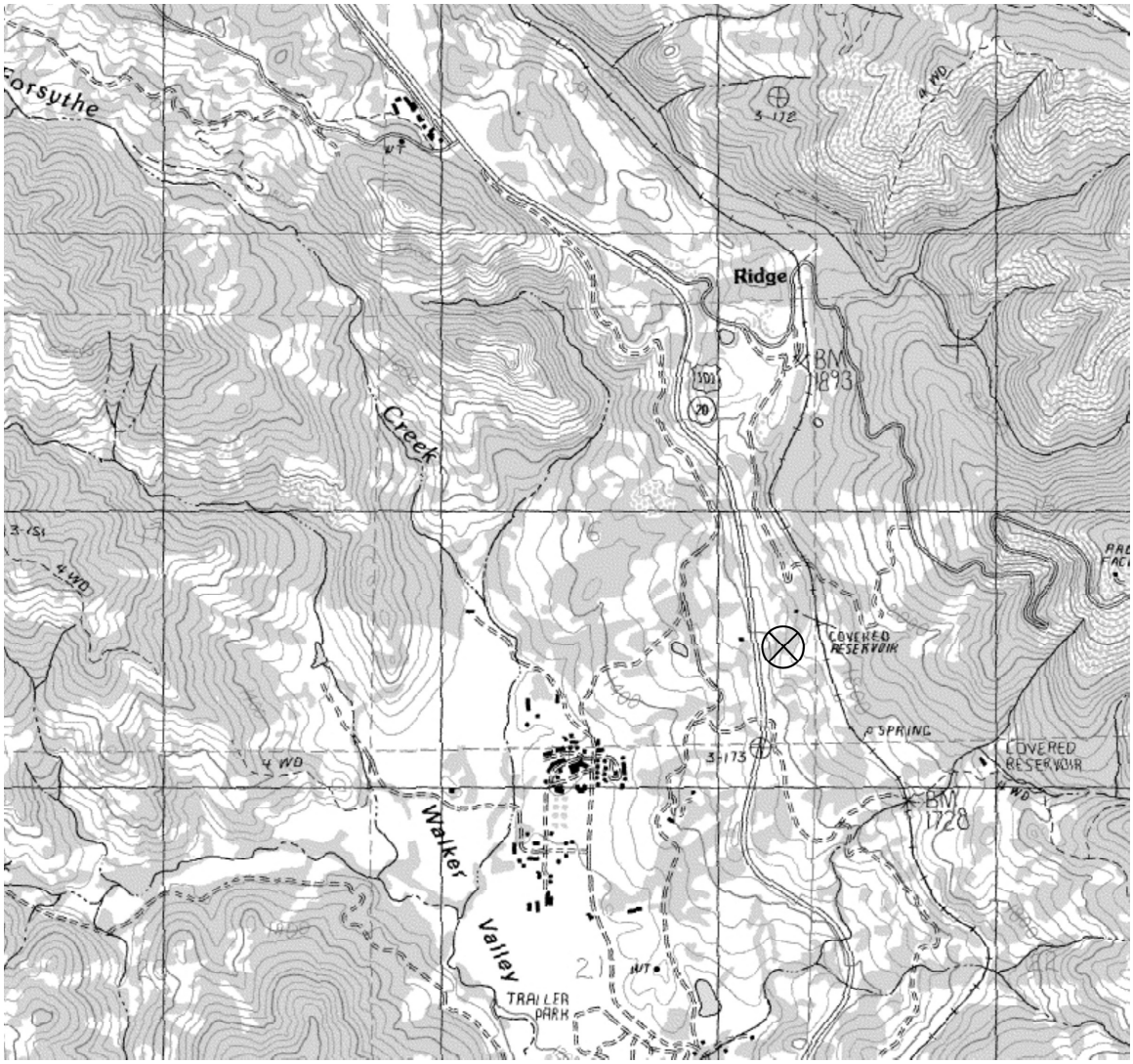
TONIGHT

Partly cloudy. Lows in the mid to upper 60's. Maximum humidity 30-40%. Ridgetop winds north to northeast 5 to 15 mph. Along the slopes, downslope/down canyon 4 to 8 mph.

LAL 1.
WINDS ALOFT FORECAST FOR BISHOP VALID 1600 PST TODAY.
24,000 FEET 330/29 KTS 39,000 FEET 330/67 KTS 53,000 FEET 310/25 KT

FUEL--California Chaparral Fuel Model

TOPOGRAPHICAL MAP: LAUGHLIN RANGE; USGS ORDER ID: ?; Centered on LAT: 39° 19' 26"N; LONG: 123° 17' 56"W.



Fire Location

Scenario 4 Worksheet

1. Identify fuel concerns.

2. Identify weather concerns.

3. Identify topographical concerns.

4. Identify W/UI concerns.

5. Identify potential for extreme fire behavior.

APPENDIX

FIRE WEATHER FORECAST

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ZCZC SDFFWFPAH
FNUS53 KPAH 182011

FIRE WEATHER FORECAST
NATIONAL WEATHER SERVICE PADUCAH KY
300 PM CDT FRI MAY 18 2001

.SYNOPSIS...A COLD FRONT WILL MOVE SOUTH ACROSS MUCH OF THE QUAD
STATE REGION TONIGHT...RESULTING IN A GOOD CHANCE OF SHOWERS AND
THUNDERSTORMS. THE CHANCE OF PRECIPITATION WILL CONTINUE ACROSS
SOUTHWEST INDIANA AND WEST KENTUCKY...EAST OF THE LAKES...SATURDAY
MORNING.  HIGH PRESSURE WILL THEN BUILD INTO THE AREA RESULTING IN
CLEARING SKIES AND DRY WEATHER INTO SUNDAY. ANOTHER WEATHER
DISTURBANCE WILL MOVE ACROSS THE REGION ON MONDAY...WHICH WILL ONCE
AGAIN RESULT IN A CHANCE OF SHOWERS AND THUNDERSTORMS SUNDAY INTO
MONDAY.

ILZ075-076-080>082-084>086-088>090-092>094-KYZ001>005-MOZ074>076-
085>087-098-100-106>112-114-191330-
ALEXANDER-BALLARD-BOLLINGER-BUTLER-CAPE GIRARDEAU-CARLISLE-CARTER-
FRANKLIN-FULTON-HAMILTON-HICKMAN-JACKSON-JEFFERSON-JOHNSON-MADISON-
MASSAC-MCCRACKEN-MISSISSIPPI-NEW MADRID-OREGON-PERRY-POPE-PULASKI-
RIPLEY-SALINE-SCOTT-SHANNON-ST. FRANCOIS-STE. GENEVIEVE-STODDARD-
UNION -WAYNE-WILLIAMSON-

.TONIGHT...
 SKY/WEATHER...OCCASIONAL SHOWERS AND THUNDERSTORMS.
 TEMPERATURE...60 TO 65
 RH.............88 TO 98 PERCENT
 20 FT WIND....SOUTHWEST 5 TO 10 MPH
 WIND SHIFT....NORTH AROUND MIDNIGHT

 CHC OF PCPN...100 PERCENT
 TYPE..........SHOWERS/THUNDERSTORMS
 DURATION......3 TO 4 HOURS
 AMOUNTS.......0.50 TO 1.00 INCHES...WITH ISOLATED 1.5 INCH AMOUNTS

.SATURDAY...
 SKY/WEATHER...MORNING CLOUDS...THEN MOSTLY SUNNY
 TEMPERATURE...77 TO 82
 RH.............50 TO 60 PERCENT
 20 FT WIND....NORTH 5 TO 10 MPH
 WIND SHIFT....NONE

 CHC OF PCPN...10 PERCENT
 TYPE..........SHOWERS
 DURATION......NONE
 AMOUNTS.......NONE

 1700 FT MIXING TEMP.....73 DEGREES
 MIXING HEIGHT...........3300 FT AGL
 TRANSPORT WIND..........NORTH 4 M/S
 STABILITY RATING........SLIGHTLY UNSTABLE

.EXTENDED FORECAST...
.SUNDAY...INCREASING CLOUDS. A CHANCE OF SHOWERS AND THUNDERSTORMS.
LOW IN THE UPPER 50S. HIGHS 80 TO 85.
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.MONDAY...MOSTLY CLOUDY WITH A CHANCE OF SHOWERS AND THUNDERSTORMS.
LOW 60 TO 65. HIGH AROUND 80.
.TUESDAY THROUGH THURSDAY...PARTLY CLOUDY. LOWS IN THE 40S. HIGHS
IN THE 60S.

$$

ILZ077-078-083-087-091-INZ081-082-085>088-KYZ006>022-191330-
CALDWELL-CALLOWAY-CHRISTIAN-CRITTENDEN-DAVIESS-EDWARDS-GALLATIN-
GIBSON-GRAVES-HARDIN-HENDERSON-HOPKINS-LIVINGSTON-LYON-MARSHALL-
MCLEAN-MUHLENBERG-PIKE-POSEY-SPENCER-TODD-TRIGG-UNION-VANDERBURGH-
WABASH-WARRICK-WEBSTER-WHITE-

.TONIGHT...
 SKY/WEATHER...OCCASIONAL SHOWERS AND THUNDERSTORMS.
 TEMPERATURE...63 TO 68
 RH.............85 TO 95 PERCENT
 20 FT WIND....SOUTHWEST 5 TO 10 MPH
 WIND SHIFT....NORTH LATE

 CHC OF PCPN...100 PERCENT
 TYPE..........SHOWERS/THUNDERSTORMS
 DURATION......3 TO 4 HOURS
 AMOUNTS.......0.50 TO 1.00 INCHES...WITH ISOLATED 1.25 INCH AMOUNTS

.SATURDAY...
 SKY/WEATHER...A 30 PERCENT CHANCE OF MORNING SHOWERS...THEN
               DECREASING CLOUDS.
 TEMPERATURE...75 TO 80
 RH.............50 TO 60 PERCENT
 20 FT WIND....NORTH 5 TO 10 MPH
 WIND SHIFT....NONE

 CHC OF PCPN...30 PERCENT
 TYPE..........SHOWERS
 DURATION......ONE HOUR OR LESS
 AMOUNTS.......UP TO 0.05 INCHES

 1700 FT MIXING TEMP.....73 DEGREES
 MIXING HEIGHT...........3300 FT AGL
 TRANSPORT WIND..........NORTH 4 M/S
 STABILITY RATING........SLIGHTLY UNSTABLE

.EXTENDED FORECAST...
.SUNDAY...INCREASING CLOUDS. A CHANCE OF SHOWERS AND THUNDERSTORMS
LATE. LOW IN THE UPPER 50S. HIGHS 80 TO 85.
.MONDAY...MOSTLY CLOUDY WITH A CHANCE OF SHOWERS AND THUNDERSTORMS.
LOW 60 TO 65. HIGH AROUND 80.
.TUESDAY THROUGH THURSDAY...PARTLY CLOUDY. LOWS IN THE 40S. HIGHS
IN THE 60S.

$$

JSH
NNNN
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Station	GOES ID	Elev	Lat	Long
KY KYLBL	326F645C	649	36:46:35	088:03:47

	Day/Time	Tmp	Dew Pt	Wind	Pcpn	Rh	Fuel Temp	Peak Wind	Bat Volt	Fuel Moist	
KY KYLBL	15/0114Z	81/	74/	1403/	6.27	RH 82	FT 32/	16G08	13.5	FM	MM
KY KYLBL	15/0014Z	85/	76/	1505/	6.27	RH 75	FT 32/	11G11	13.6	FM	MM
KY KYLBL	14/2314Z	86/	77/	1406/	6.27	RH 77	FT 32/	12G12	14.3	FM	MM
KY KYLBL	14/2214Z	86/	77/	1505/	6.27	RH 77	FT 32/	15G12	14.7	FM	MM
KY KYLBL	14/2114Z	87/	76/	1308/	6.27	RH 70	FT 32/	13G16	13.9	FM	MM
KY KYLBL	14/2014Z	88/	73/	1308/	6.27	RH 62	FT 32/	14G18	14.0	FM	MM
KY KYLBL	14/1914Z	89/	73/	1507/	6.27	RH 60	FT 32/	12G13	13.9	FM	MM
KY KYLBL	14/1814Z	88/	74/	1806/	6.27	RH 65	FT 32/	16G12	14.5	FM	MM
KY KYLBL	14/1714Z	87/	74/	1407/	6.27	RH 67	FT 32/	13G13	14.0	FM	MM
KY KYLBL	14/1614Z	83/	75/	2504/	6.27	RH 78	FT 32/	15G09	14.7	FM	MM
KY KYLBL	14/1214Z	76/	72/	2303/	6.27	RH 89	FT 32/	16G11	13.3	FM	MM
KY KYLBL	14/1114Z	73/	71/	1902/	6.27	RH 96	FT 32/	15G06	13.2	FM	MM
KY KYLBL	14/1014Z	73/	71/	1803/	6.27	RH 94	FT 32/	16G07	13.2	FM	MM
KY KYLBL	14/0914Z	74/	71/	1604/	6.27	RH 91	FT 32/	15G06	13.2	FM	MM
KY KYLBL	14/0814Z	72/	69/	1502/	6.27	RH 91	FT 32/	18G05	13.3	FM	MM
KY KYLBL	14/0714Z	73/	68/	1403/	6.27	RH 87	FT 32/	11G05	13.3	FM	MM
KY KYLBL	14/0614Z	72/	68/	1203/	6.27	RH 89	FT 32/	12G04	13.3	FM	MM
KY KYLBL	14/0514Z	74/	68/	1103/	6.27	RH 82	FT 32/	12G06	13.3	FM	MM
KY KYLBL	14/0414Z	78/	69/	1304/	6.27	RH 75	FT 32/	17G06	13.3	FM	MM
KY KYLBL	14/0314Z	76/	70/	1102/	6.27	RH 83	FT 32/	12G05	13.3	FM	MM
KY KYLBL	14/0214Z	75/	70/	1103/	6.27	RH 85	FT 32/	14G05	13.4	FM	MM
KY KYLBL	14/0114Z	78/	70/	1102/	6.27	RH 79	FT 32/	16G05	13.5	FM	MM
KY KYLBL	14/0014Z	85/	69/	1403/	6.27	RH 60	FT 32/	13G09	13.6	FM	MM
KY KYLBL	13/2314Z	87/	66/	1405/	6.27	RH 51	FT 32/	13G10	14.2	FM	MM
KY KYLBL	13/2214Z	89/	68/	1404/	6.27	RH 51	FT 32/	12G11	13.9	FM	MM
KY KYLBL	13/2114Z	88/	67/	1506/	6.27	RH 51	FT 32/	12G12	14.3	FM	MM
KY KYLBL	13/2014Z	89/	67/	1606/	6.27	RH 49	FT 32/	15G12	13.9	FM	MM
KY KYLBL	13/1914Z	89/	67/	1806/	6.27	RH 50	FT 32/	17G11	14.5	FM	MM
KY KYLBL	13/1814Z	87/	68/	1307/	6.27	RH 54	FT 32/	13G13	14.3	FM	MM
KY KYLBL	13/1714Z	86/	69/	1604/	6.27	RH 58	FT 32/	14G10	14.1	FM	MM

KY KYLBL 13/1614Z 86/ 71/1404/ 6.27 RH 63 FT 32/ 17G10 14.8 FM MM
KY KYLBL 13/1514Z 84/ 71/1703/ 6.27 RH 67 FT 32/ 16G08 14.4 FM MM
KY KYLBL 13/1414Z 81/ 74/2004/ 6.27 RH 80 FT 32/ 20G08 13.9 FM MM
KY KYLBL 13/1314Z 78/ 72/2003/ 6.27 RH 84 FT 32/ 16G05 13.4 FM MM

UNIT 4: OPERATIONAL CONSIDERATIONS

TERMINAL OBJECTIVE

The students will be able to identify the needs and requirements for strategies that are applicable in Wildland/Urban Interface (W/UI) Incidents.

ENABLING OBJECTIVES

The students will:

1. Identify operational considerations.

2. Explain benchmarks of the incident progression.

3. Identify where to find specialized resources.

THE ORGANIZATION

The organization of a Wildland/Urban Interface (W/UI) Incident becomes very important in achieving a positive outcome. Because these fires become so large and move so quickly, it is important to get, and stay, ahead of the ball. You must quickly identify the positions that will need to be filled within your Incident Command System (ICS) and continue to evaluate your system from the top, down to ensure span-of-control, etc. Positions like Logistics, Planning, and Finance are not usually filled by separate individuals while on scene at a structure fire; in the W/UI there are just too many things going on for those positions to be filled by the same person. Make sure you have individuals you can call on to fill those positions when necessary. Spend some time and money to prepare those individuals for their expected position.

Strategic complexity of the incident is yet another consideration when staffing your ICS. Strategic operations can vary greatly on a WUI. One area may be fighting fire, another may be mopping up (overhaul), another may be on structure protection, and another setting backfires. All these different strategies together are just too much to control without the proper structure.

The Planning Section typically is involved in incident information and strategic information gathering. Things like weather forecasts, fire behavior predictions, number of resources onscene, etc., are all areas that the planning section should be responsible for. A good tool to use is the ICS Form 201. It is a basic tactical sheet that can assist you in preparing Incident Action Plans (IAP's).

The Logistics Section orders resources for the operation, takes care of personal needs (food, water, medical needs, etc.), can line up transportation for resources, etc. An ineffective Logistical operation can spell doom for your plans. Make sure these people are well prepared to assume the responsibilities of this section. Set them up to succeed by doing your homework and compiling resource lists and solving funding issues prior to the incident.

When we think of Finance/Administration we usually relate it to pre- or postincident activities. During a W/UI it is possible to expend tremendous amounts of money in a very short time protecting structures. Aircraft that drop retardant on houses can run upwards of $10,000 per drop; helicopters are $500 to $12,000 per **hour**; adjoining resources may need reimbursement; equipment may be damaged or ruined. It is important to have systems in place to expend the funds necessary to accomplish your goals. The Finance Section can keep track of equipment and personnel times and costs, oversee the agreements between private and public

agencies, and track losses. The Finance/Administration Chief can help keep things in perspective when you start trying to decide what resources to order. A major concern should be whether the things that are at risk are commensurate with the costs of the incident. A $10,000 retardant drop many not be wise when the only values at risk are vacant lots.

Every extended attack operation should have an IAP. This should be written. Understanding that facilities may not be available to make copies for all firefighters on scene, those in Command and Control positions should have access to the written plan to transcribe the information affecting their area. IAP's should identify the Command structure, objectives, assignments, weather forecast, fire behavior prediction, and maps, etc., that are necessary for operational success.

Some positions with the ICS that are not usually used need to be explained. These areas are very helpful in ensuring adequate supervision and to accomplish the objectives of the incident.

Division Supervisors

- Controls up to five Strike Team or Task Force Leaders (or any combination).

- They make adjustments and assignments based on the strategy of the operation.

Divisions are established in geographic areas. Example: From Highway 102 to County Road 14 is Division A.

Group Supervisors

Group Supervisors are exactly like Division Supervisors and operate at the same strategic levels with one exception. They usually are established and oriented for tasks.

Group H is responsible for structure protection. This Group could be within Division A, but is at the same ICS level.

Strike Team Leaders are in charge of single, like resources. The number of resources assigned depends on the type.

- Two dozers are a Dozer Strike Team.

- Two hand crews are a Crew Strike Team.

- Five engines are an Engine Strike Team.

- They make decisions and implement the tactical operations from the strategic instructions from Division/Group.

Task Force Leaders are in charge of single, dissimilar resources. They operate at the same level, or often above the level, of Strike Team Leaders, but make decisions on the same basis of implementing a tactical objective. An example of what they may be in charge of:

- one dozer, one hand crew, two engines; or
- three brush units, one Class A engine, two tenders.

Multijurisdictional Response

You are probably aware of the challenges involved in calling in resources from out of your area, or responding to other areas. Some additional issues come to light during a W/UI Incident. As we mentioned above, operational periods, length of assignments, special resource requirements, and other things affect your relationships and legal agreements. Be proactive and evaluate your agreements regarding these types of incidents. Other mutual-aid issues include cost-share agreements. If the incident crosses political boundaries, you need to know how the costs, etc., are going to be split up.

SPECIALIZED RESOURCES

Various factors will limit your effectiveness on a W/UI using conventional equipment and tactics. Therefore, you must be aware of various specialized resources that you can call upon, or that you will be exposed to, during these types of incidents. There will be special support and Command and Control issues when these types of resources are onscene.

Aircraft are probably the most common specialized resources that you will be around during a W/UI. Two major types of aircraft are fixed wing and rotary wing, and each one has special safety and operational issues. Fixed wing aircraft are used in various roles on the W/UI. Aircraft are invaluable for their ability to provide an aerial view of the incident. You can gather intelligence regarding the fire behavior, potential for fire growth, resources at risk, and safety issues for your firefighters. These aircraft usually have someone in the passenger seat who is familiar with the area and has the authority of Command and Control (for example, chief officers).

Another use for aircraft is arresting the spread of the fire. This is accomplished through the use of aerial product delivery. Most common is the use of retardant, but water or water/foam mixes also are available. A common misconception is that retardant, which is a bright red color, is used to put out the fire. Retardant is actually a mixture of many different chemicals that decreases fire behavior. It is usually applied to unburned fuel in front of the fire. It can be used as a fireline by itself, in support of fireline that has been constructed, or to reinforce natural barriers. When fire burns up to a retardant line expect the fire behavior to be a fraction of what it was.

When fixed-wing aircraft are onscene you will need to ensure that a few logistical and operational issues are provided for:

- You will need a communication link between the aircraft and someone in control on the ground. There are standard air-to-ground frequencies published by the National Wildfire Coordinating Group (NWCG) every year.

- You will need to be familiar with the availability and location of fuel and landing facilities.

- You may need to place special restrictions on the airspace above the fire.

Another resource you should become familiar with are rotary wing aircraft--helicopters. These are a valuable tool during a W/UI. Their maneuverability and availability for different missions make them almost indispensable on a dynamic incident. But, like other resources, you need to know what is required of you when a helicopter is operating onscene.

Some of the missions that these "ships" can perform

- Surveillance. The ability to land onscene and pick up individuals for reconnaissance contributes to a better strategic plan that seems to be implemented more quickly than when you must gain your intelligence from others, or in a less timely manner.

- Water drops, either through buckets that hang below the ship on a cable, or through attached tanks.

- Sling loads. Helicopters can pick up hundreds of pounds of equipment and drop them into areas--even if they can't land there. This is helpful when supplying firefighting resources quickly or when roads, etc., become impassable either due to the fire or the evacuation process, or other reasons.

- The resource includes a helicopter, all the support personnel and supplies, and initial attack crew members. This resource can perform recon, locate new starts or priority areas, drop the firefighters into the area, and then support them with water drops. This is a very useful tool in remote areas or, as stated before, when roads are impassable but resources are still at risk.

As with fixed-wing aircraft, helicopters require some type of coordination from the incident. This is accomplished, usually, through the use of an air-to-ground radio frequency. Other options are to provide an aerial observer who would serve as a kind of "air traffic controller" for the incident.

When helicopters are supporting the fixed-wing operation, you may need to provide some, all, or none of the following. If in doubt, contact the pilot and request direction.

- You may need to provide a fueling point.

- You may need to provide fire protection at a helibase.

- You may need to provide dust abatement at a helibase.

When dealing with a large fire and where firefighting aircraft will be operating, it is always a good idea to issue what the Federal Aviation Administration (FAA) calls a NOTAM--Notice to Airmen. Call the FAA Office or Control Tower in your area and discuss your exact needs with the representative. You can provide information to other aircraft through this system, or you may completely close the airspace above and around your incident to increase safety.

Although you are familiar with National Fire Protection Association (NFPA) engine types and their uses and limitations, in a W/UI you probably will be exposed to other types of engines and different classifications. A complete listing of all six types is available from the NWCG. Probably the most common types of engines you will encounter on a W/UI are

- Type 1 engines are basically Class A engines.

- Type 3 engines are very valuable in W/UI Incidents. They are pump and roll, have enough tank water to make a difference, and they usually are set up for both structural and wildland operations.

- Type 4 engines are pump and roll and have large tank capacities. The military 6x6's usually fall into this category.

- Type 5 engines are very similar to Type 6 except they have a larger tank capacity.

- Type 6 engines are basically 1-tons with pump and roll capability; they are maneuverable and can be very useful in W/UI incidents.

NFPA engines have limited uses during a W/UI. Although they have large pumps, they generally don't have large water tanks and cannot pump and roll. Take these limitations into account when deploying resources and what assignments they are given.

Heavy equipment is useful in a W/UI incident. Bulldozers, road graders, log skidders, etc., can decrease fuel or build fireline quickly. Another use is to improve roads to allow apparatus to gain access; yet another possible use is to construct safety zones for personnel who cannot escape the fire to other safety areas easily.

The challenge on any nonstandard incident is being able to call upon the necessary resources quickly. Developing a list of where to find resources, and working out some issues in advance (such as costs, staffing, supervision, etc.) can be a big help in the heat of the battle. Agencies that may be able to assist you with nonstandard resources are mutual-aid agencies, State agencies, Federal agencies, and private companies.

PLANNING TO PROTECT STRUCTURES DURING WILDLAND/URBAN INTERFACE INCIDENTS

Two strategies you need to be familiar with to accomplish a positive outcome during a W/UI are structural triage and structural protection. Using these two strategies correctly will enable you to save the most structures and avoid putting your firefighters in danger.

Structural triage is exactly what you are probably thinking. Like the triage that is performed on medical incidents every day, firefighters need to be able to recognize when a structure can be saved or when it would take too much work to save it and, therefore, risk losing more structures that could have been saved. Triage categories are

- Needing little or no attention now--These structures require little or no work to be saved--sort of like the walking wounded.

- Needing protection, but savable--These structures can be saved but require some preparation work and suppression forces onscene when the fire goes through--yellows and reds.

- Hopeless--Black tagged. These structures cannot be saved either because of the structure and its surroundings, or because of resources available, or a combination. Lots of things go into the decision to walk away from someone's home. It is not an easy thing to do for task-oriented firefighters. The main reason to walk away from a structure is safety concerns for the firefighters.

Some specific triage factors to look at:

- Roadways: Apparatus must be able to get in and out of an area quickly during a W/UI. Roads to residences that are too narrow, are not rated for your apparatus weight (or are 4-wheel-drive-only accessible), have no turnarounds, traverse heavy fuels--especially midslope--and other access issues are a primary reason to "write-off" a structure as not savable. Firefighter safety is the number one issue when dealing with any W/UI, especially when confronted with access problems.

- Fuel proximity: The type, amount, and proximity of fuel to the structure are the next triage point. If the fuels are too heavy or too close, there is probably a good chance that the structure will not be saved.

- Property maintenance: The amount of debris and flammables around the structure also play a major part in whether a structure can be saved. If too much "junk" hinders suppression operations, it may not be worth the effort. Simple items, such as where the wood for the fireplace is stacked, clean gutters, and whether the grass is mowed and green can make a big difference, especially on initial attack.

- Construction materials and techniques: This is the last major factor you look at in a quick assessment of a structure. Buildings that have lots of unprotected wood are a big danger. Wood shingles, either on the roof or as siding, decks, large soffit overhangs, vents, large windows, etc., make protecting a structure very difficult.

Structural Protection

When the decision actually is made to go ahead and protect a structure there are many things you can, and should, do to make it easier to defend. As we said before, many of the tactics depend on how much time you have and how many resources you have available.

Many tactical items are not really covered in this course. Those tactical items are included either in the National Fire Academy's (NFA's) company officer course on W/UI, or in the S-215 from NWCG. Briefly, we'll explain some nuts-and-bolts of protecting a structure, so you can become aware of what is happening when a resource is assigned to a W/UI.

- Always make sure that your apparatus is pointed out. This reduces the amount of time necessary if a quick evacuation is called for.

- Fuel and debris need to be cleared in order to make it easier to work around the structure, and to reduce the amount of fire and the intensity of the fire that the structure is exposed to.

- Inside the structure you can close heavy curtains to provide a radiant heat barrier and remove combustibles from around the windows to prevent them from igniting.

- Although it sounds like a helpful solution, prewetting a structure and the fuels around it has limited success. Wildland fires burn with such intensity and duration that they can dry up quickly any water you have put down. If prewetting is a tactic you'd like to use, you need to look into specialized equipment such as compressed air foam systems (CAFS). Especially if you are on a limited water supply, you won't be able to prewet, but even on municipal systems try to look at the big picture to see what effect your water usage will have on the rest of the incident.

After the structure is prepared, or when the fire is getting close, you need to decide whether to stay or to leave. Depending on how big your safety zone is and how intense the fire is, you may be able to stay. You can attempt to stay outside and put the fire out as it hits the protected area around the structure, you can go behind the structure and use it to shield the majority of the heat until the main fire front has passed, you can sometimes go inside a structure (even if it does ignite, you will have plenty of time to evacuate if you keep your heads up), or you can leave the structure and return when the fire has passed. Whatever you decide, safety is your first concern.

If you do decide to stay and fight, some general rules apply. It is usually best not to lay more than one or two lines off your truck and then they should only be 150 to 200 feet (This is called the 200-Foot Rule). If you are protecting multiple structures, the amount of hose you have becomes an issue. If you lay out 200 feet of hose on three structures, and then you have to leave it and get out for safety reasons, you might well be out of hose when it comes time to go to the next one.

Once the fire passes you need to look at the structure very critically. Generally, if more than 25 percent of the roof is burning (the 25-Percent Rule) it will take too much time and personnel to extinguish it, and you might be able to save others in the area. This, of course, depends on the number of resources you have available and how many structures you are protecting. This is a very difficult rule for firefighters to live by. In a normal situation 25 percent involvement really is not much, and is extinguished easily. But in a W/UI Incident, many other factors come into play to decrease the amount of fire you can be expected to extinguish.

If the structure appears to have survived the initial fire front, be very careful that hidden embers do not ignite it after you're gone. Perform a very thorough investigation to discover any smoldering embers on the roof, in the gutters, in the debris next to the structure, and elsewhere. You may need to mopup some smoldering fires around the structure or within 10 to 20 feet before you leave.

A general rule of thumb for determining the number of engines you will need to protect structures is

- For separated structures mostly surrounded by wildland fuels: one engine per structure.
- For continuous structures, less than 50 feet apart: one engine per two structures.
- Provide an additional engine to float for every five engines assigned to structures.
- For clusters of 20 or more homes less than 50 feet apart, count the number of home on the perimeter, divide by four and that equals the number of single engines needed, plus one additional engine strike team. Add another strike team if the roofs are combustible.

APPENDIX

INCIDENT ACTION PLAN

INCIDENT OBJECTIVES	1. INCIDENT NAME CALABASAS	2. DATE PREPARED 10/22/96	3. TIME PREPARED 0100

4. OPERATIONAL PERIOD (DATE/TIME) 10/22/96 0600 hrs. to 1800 hrs.

5. GENERAL CONTROL OBJECTIVES FOR THE INCIDENT (INCLUDE ALTERNATIVES)

A. Hold fire within established fire lines: South of Hwy 101, East of Kanan, West of Mulholland/Stunt/Piuma, North of PCH.

B. Life safety is everyone's responsibility. Provide for firefighter and public safety at all times.

C. Keep property losses to a minimum by aggressively protecting all structures and improvements in the path of the fire. Maintain presence after fire front passes.

6. WEATHER FORECAST FOR OPERATIONAL PERIOD

See attached Fire Weather and Fire Behavior forecasts.

7. GENERAL/SAFETY MESSAGE

A. Full safety equipment is required at all times.

B. Follow standard safety orders at all times.

C. Respond immediately to the orders of the safety officer.

8. ATTACHMENTS (X IF ATTACHED)

[X] ORGANIZATION LIST (ICS 203)	[X] MEDICAL PLAN (ICS 206)	[ ] _____
[X] DIVISION ASSIGNMENT LISTS (ICS 204)	[X] INCIDENT MAP	[ ] _____
[X] COMMUNICATIONS PLAN (ICS 205)	[X] TRAFFIC PLAN	[ ] _____

ICS 202 11/94	9. PREPARED BY (PLANNING SECTION CHIEF)	10. APPROVED BY (INCIDENT COMMANDER)

ORGANIZATION ASSIGNMENT LIST ICS-203

1. INCIDENT NAME	2. DATE	3. TIME
CALABASAS INCIDENT	OCT 21, 96	2400 hrs

POSITION	NAME
5. INCIDENT COMMANDER STAFF	
INCIDENT COMMANDER	Ryland / Corbett
DEPUTY	
SAFETY OFFICER	LaFever
INFORMATION OFFICER	
LIAISON OFFICER	Gaither

6. AGENCY REPRESENTATIVES

AGENCY	NAME
	See Attachment for Additional Reps

7. PLANNING SECTION	
CHIEF	Perez
DEPUTY	
RESOURCES UNIT	Lee
SITUATION	Nieto
DOCUMENTATION UNIT	Cocker
DEMOBILIZATION UNIT	
REHAB LEADER	
TRAINING SPECIALIST	
FBA	Smith
FBA	Green

8. LOGISTICS SECTION	
CHIEF	Leininger
DEPUTY	Baker
a. SUPPORT BRANCH	
SECURITY MANAGER	
SUPPLY UNIT	Chalton / Johnson, R
FACILITIES UNIT	Vidalis / Romo
GROUND SUPPORT UNIT	Smith / Johnson, K
b. SERVICE BRANCH	
DIRECTOR	
CAMP MANAGER	Veverka
COMMUNICATIONS UNIT	McCarthey
MEDICAL UNIT	Jones
FOOD UNIT	Washington

4. OPERATIONAL PERIOD (DATE, TIME)		
OCT 22, 96	DAY SHIFT	0600-1800 HRS

9. OPERATIONS SECTION		
CHIEF		Alexander
DEPUTY		
a. BRANCH I - DIVISION/GROUPS		
BRANCH DIRECTOR		Branch 1 - 5 Assignments
DEPUTY		See Attached
GROUP		
GROUP		
GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
b. BRANCH II-DIVISION		
BRANCH DIRECTOR		
DEPUTY		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
STAGING		
STAGING MANAGER		Enriquez
DEPUTY		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		
DIVISION/GROUP		

d. AIR OPERATIONS BRANCH	
AIR OPERATIONS BR. DIR.	Cosey
AIR ATTACK SUPERVISOR	AA 01
AIR SUPPORT SUPERVISOR	
HELICOPTER COORDINATOR	Copter 10
AIR TANKER COORDINATOR	Lead 5-7

10. FINANCE SECTION	
CHIEF	Cline / Broussard
DEPUTY	
TIME UNIT	Lim
PROCUREMENT	Abarca
COMPENSATION/CLAIMS UNIT	
COST UNIT	

ICS 203 (4/93)

PREPARED BY (RESOURCES UNIT)

OCTOBER 22, 1996 0600 1800 HRS

a. BRANCH I - DIVISION/GROUPS		
BRANCH DIRECTOR		Harris
DEPUTY		
DIVISION	A	Anderson
DIVISION	C	Pisano
DIVISION	D	Brooks
GROUP	Monte Nido	Marshall
GROUP	Piuma	

b. BRANCH II - DIVISION/GROUPS		
BRANCH DIRECTOR		Land
DEPUTY		
DIVISION	S	Langhorne
DIVISION	T	Kemp
DIVISION	V	Summers
DIVISION	X	Deneen
DIVISION	Z	Mastain
DIVISION	R	Clark

c. BRANCH III - DIVISION/GROUPS		
BRANCH DIRECTOR		Chapman
DEPUTY		
DIVISION	M	Howard
DIVISION	N	Lecou
DIVISION	O	McCleod
DIVISION	P	Parker
DIVISION		

d. BRANCH IV - DIVISION/GROUPS		
BRANCH DIRECTOR		Lockhart
DEPUTY		
DIVISION	G	Johnson, M
DIVISION	H	Vaughn
DIVISION	I	Hone
DIVISION	J	
DIVISION	K	

e. BRANCH V - DIVISION/GROUPS		
BRANCH DIRECTOR		Pierpont
DEPUTY		
DIVISION		
DIVISION		
DIVISION		
DIVISION		
DIVISION		

1. BRANCH	2. DIVISION/GROUP	DIVISION ASSIGNMENT LIST	ICS 204 (4-93)
I	C		

3. INCIDENT NAME	4. OPERATIONAL PERIOD
CALABASAS INCIDENT	DATE: *Oct 22, 96* TIME: *0600 - 1800 HRS*

5. OPERATIONS PERSONNEL

OPERATIONS CHIEF(S):	PROBEYE OPERATOR(S):
DIVISION/GROUP SUPERVISOR: PISANO, G	FIELD OBSERVER(S):
SAFETY OFFICER(S):	WATER HANDLING SPECIALIST(S):

6. RESOURCES ASSIGNED THIS PERIOD

STRIKE TEAM/TASK FORCE/ RESOURCE DESIGNATOR	LEADER	NUMBER PERSONS	TRANS. NEEDED	DROP OFF PT./TIME	PICK UP PT./TIME
LAC w/T 125					

7. CONTROL OPERATIONS

STRUCTURE PROTECTION AND MOP-UP FROM MULHOLLAND & COLD CREEK TO MULHOLLAND & LAS VIRGENES.

8. SPECIAL INSTRUCTIONS

SEE SAFETY MESSAGE

SEE COMMUNICATIONS PLAN FOR RADIO CHANNEL UTILIZATION

PREPARED BY (RESOURCE UNIT LEADER)	APPROVED BY (PLANNING SECTION CHIEF)	DATE	TIME
M. Lee		10-22-96	0500

1. BRANCH	2. DIVISION/GROUP	DIVISION ASSIGNMENT LIST	ICS 204 (4-93)
II	Z		

3. INCIDENT NAME	4. OPERATIONAL PERIOD
CALABASAS INCIDENT	DATE: *Oct 22, 96* TIME: *0600 - 1800 HRS*

5. OPERATIONS PERSONNEL

OPERATIONS CHIEF(S):	PROBEYE OPERATOR(S):
DIVISION/GROUP SUPERVISOR: MASTAIN	FIELD OBSERVER(S):
SAFETY OFFICER(S):	WATER HANDLING SPECIALIST(S):

6. RESOURCES ASSIGNED THIS PERIOD

STRIKE TEAM/TASK FORCE/ RESOURCE DESIGNATOR	LEADER	NUMBER PERSONS	TRANS. NEEDED	DROP OFF PT./TIME	PICK UP PT./TIME
LFD ENG 1001 LFD ENG 1002 LFD ENG 1003 XLA ENG 1075 LAC ENG 1103					

7. CONTROL OPERATIONS STRUCTURE PROTECTION AND MOP UP

8. SPECIAL INSTRUCTIONS SEE SAFETY MESSAGE

SEE COMMUNICATIONS PLAN FOR RADIO CHANNEL UTILIZATION

PREPARED BY (RESOURCE UNIT LEADER)	APPROVED BY (PLANNING SECTION CHIEF)	DATE	TIME
M. Lee		10-22-96	0500

INCIDENT RADIO COMMUNICATIONS PLAN	1. INCIDENT NAME CALABASAS FIRE	2. DATE/TIME PREPARED 10-22-96 0200 HRS	3. OPERATIONAL PERIOD DATE/TIME 10-22-96 0600-1800 PAGE 1

4. BASIC RADIO CHANNEL UTILIZATION

SYSTEM/CACHE	CHANNE	FUNCTION	FREQUENCY	ASSIGNMENT	REMARKS
NIFC	MOT45 BK 1	COMMAND	168.100	OPS,BRANCH I, DIV B,C, AND MONTENITO/ PIUMA	
NIFC	MOT47 BK 2	COMMAND	168.075	OPS, BRANCH I, DIV A & D	
LAC BLUE	UHF CH. 3	COMMAND	470.6125	OPS, BRANCH II,III, IV, AND V	
NIFC	MOT39 BK 3	TACTICAL	168.050	DIV. B, C, V, X, Z,T, AND MONT/PIUMA STRUC.GROUPS	
NIFC	MOT40 BK 4	TACTICAL	168.200	DIV. J, K, L, AND I	
NIFC	MOT41 BK 5	TACTICAL	168.600	DIV. F, H, P, G	

INCIDENT RADIO COMMUNICATIONS PLAN	1. INCIDENT NAME CALABASAS FIRE	2. DATE/TIME PREPARED 10-22-96 0200	3. OPERATIONAL PERIOD DATE/TIME 10-22-96 0600-1800 PAGE 2

4. BASIC RADIO CHANNEL UTILIZATION

SYSTEM/CACHE	CHANNE	FUNCTION	FREQUENCY	ASSIGNMENT	REMARKS
LAC	MOT1 BK 6	TACTICAL	154.430	DIV. A, AND D	
LAC	MOT4 BK 7	TACTICAL	153.830	DIV. M, N, O, AND R	
NIFC/USFS	MOT30 BK 8	AIR TO GROUND	170.000	AIR OPERATIONS	
FAA		AIR TO AIR	123.975	AIR OPS, AIRCRAFT ONLY	
FAA		AIR TO AIR	169.200	AIR TANKER COORDINATOR	
NIFC	CH 6	LOGISTICS	415.500	CP, BASE, LOGISTICS	

ICS 205 11/94

8. PREPARED BY: (Communications Unit Leader) F.MCCARTHY

MEDICAL PLAN	1. INCIDENT NAME: CALABASES	2. DATE PREPARED: 8-21-96	3. TIME PREPARED: 1530	4. OPERATIONAL PERIOD: 0600-1800

5. INCIDENT MEDICAL AID STATIONS

MEDICAL AID STATIONS	LOCATION	PARAMEDICS YES	PARAMEDICS NO
SQ 88	STAGING AREA	X	
MOBIC AID (~~2~~)	STAGING AREA	X	

6. TRANSPORTATION

A. AMBULANCE SERVICES

NAME	ADDRESS	PHONE	PARAMEDICS YES	PARAMEDICS NO
MED TRANS - UNIT 408	Phone - # 800 821-5141	821 5141		X
UNIT 422				
UNIT 419				
L.A COUNTY AIR SQ"	LACC.		X	
CAMP 8 DAY/NIGHT				
~~Basal~~ ~~Hilton~~.				

B. INCIDENT AMBULANCES

NAME	LOCATION	PARAMEDICS YES	PARAMEDICS NO
MED TRANS - #406	STAGING NEXT TO COMM. UNIT.		X
LACo F.D SQ 88	STAGING NEXT TO COMM UNIT	X	
LACo F.D MOBILAID 2 - [redacted]	STAGING NEXT TO COMM UNIT	X	

7. HOSPITALS

NAME	ADDRESS	TRAVEL TIME AIR	TRAVEL TIME GRND	PHONE	HELIPAD YES	HELIPAD NO	BURN CENTER YES	BURN CENTER NO
UCLA	1001 Brain Blvd	30	30		X			
Sherman Oaks	4929 Van Nuys Blvd., Van Nuys	10	40		X		X	
Lcs Santa Monica	1250 16th St. Santa Monica	Ø	18			X		
Saint Johns	Santa Monica.	Ø	20					
Los Robles	Thousand Oaks	15	30		X			X

8. MEDICAL EMERGENCY PROCEDURES

IN EVENT OF MEDICAL EMER, NOTIFY BEACH DIRECTOR, BEACH DIRECTOR TO NOTIFY Communications who will NOTIFY MEDICAL UNIT LDR & SAFETY OFFICER. During Daylight hours LACoFD Air SQ will be designated. As EMS Air EVAC. Please advise Communications of exact Problem & if PTS is Ambulatory MEDICAL UNIT IS LOCATED IN THE STAGING AREA Helipad Located Behind MALIBU CITY HALL For Medical TRASPORT. H-52

H-52 ICS 8/78	9. PREPARED BY (MEDICAL UNIT LEADER) CAPT. BEECHES	10. REVIEWED BY (SAFETY OFFICER) Capt Brian Hughes

FORECAST FOR THE CALABASAS WILDFIRE
OPERATIONS AND COORDINATION CENTER WEATHER UNIT
1900 PDT MONDAY OCTOBER 21, 1996

RED FLAG WARNING FOR TONIGHT AND TUESDAY FOR GUSTY SANTA ANA WINDS

SYNOPSIS…
STRONG HIGH PRESSURE AT THE SURFACE OVER THE GREAT BASIN, COUPLED WITH NORTHEAST WINDS ALOFT TO 10,000 FEET AND HIGHER, ARE PRODUCING LOCALLY STRONG SANTA ANA WINDS OVER THE FIRE. THE SURFACE HIGH IS SHIFTING SLOWLY EASTWARD, WITH SOME REDUCTION IN WINDS EXPECTED, BUT STILL REMAINING QUITE STRONG THROUGH TUESDAY MORNING. WINDS THIS AFTERNOON WERE GENERALLY FROM THE NORTHEAST, BUT SHOULD SHOW SOME TENDENCY TOWARD MORE OF AN EASTERLY DIRECTION THIS EVENING AND TONIGHT. WINDS WILL DECREASE MORE TUESDAY AFTERNOON, AND BECOME MORE NORTHWESTERLY, WITH SOME ONSHORE BREEZES NEAR THE COASTLINE TUESDAY AFTERNOON.

THE FORECAST FOR TONIGHT…
WEATHER…CLEAR EXCEPT FOR SMOKE FROM THE FIRE.
LOW TEMPS…IN THE UPPER 50S TO LOW 60S.
MAXIMUM HUMIDITY…25-40%
EYE LEVEL WINDS…NORTHEAST TO EAST 12 TO 25 MPH, WITH GUSTS TO 35 MPH.

THE FORECAST FOR TUESDAY…
WEATHER…SUNNY.
HIGH TEMPS…LOW TO MID 70S.
MINIMUM HUMIDITY…10-20%
EYE LEVEL WINDS…NORTHEAST TO EAST 12 TO 25 MPH, WITH GUSTS TO 35 MPH IN THE MORNING, BECOMING NORTHWEST 8 TO 16 MPH LATE MORNING, WITH LOCAL GUSTS TO 25 MPH. LATE AFTERNOON WINDS WEST TO NORTHWEST 8 TO 15 MPH, WITH GUSTS TO 20 MPH.
****
THE FORECAST FOR WEDNESDAY…
WEATHER…SUNNY.
HIGH TEMPS…NEAR 77.
MINIMUM HUMIDITY…15 TO 25%
EYE LEVEL WINDS…WEST TO NORTHWEST 8 TO 12 MPH WITH GUSTS TO 20 MPH.

****
THE FORECAST FOR THURSDAY THROUGH SATURDAY…

THURSDAY…
CONTINUED SUNNY DURING THE DAY WITH COASTAL FOG DEVELOPING AND MOVING INLAND LATE NIGHT. A LITTLE COOLER AND MORE HUMID. LIGHTER WINDS FROM THE SOUTHWEST IN THE AFTERNOON, 5 TO 15 MPH…

FRIDAY…
COASTAL FOG AND LOW CLOUDS INLAND TO NEAR AND POSSIBLY OVER THE FIRE SITE IN THE MORNING. COOLER, WITH MUCH HIGHER HUMIDITY. INCREASING WEST TO NORTHWEST WINDS 15 TO 25 MPH DURING THE AFTERNOON.

SATURDAY…
CLEAR. A LITTLE WARMER AND DRIER. STRONG NORTHWEST WIND 15 TO 30 MPH.

END/COFFER
NNNN

SAFETY MESSAGE
"CALABASAS FIRE"

- Remember LCES

LOOKOUTS

COMMUNICATIONS

ESCAPE ROUTES

SAFETY ZONES

- SAFETY IS EVERYONE'S FIRST PRIORITY!

- Be aware of high winds, steep terrain, erratic fire behavior

- Power lines down in places, other poles have been burned, so be careful when parking near power lines.

- Be alert of falling rocks. Heavy boulders and rock slides have crushed people and vehicles in this area before. Malibu Canyon Rd. and similar roads are well known for this.

- Park vehicles wisely--back in, ensure adequate clearance around vehicles.

- Be cautious and be alert when on mid-slope roads, near saddles, narrow canyons, chutes, chimneys, etc.

- Homes in the area are on Propane--LPG. If on structure protection, locate LPG tank and be aware of this hazard.

- Some hydrants in the area (Topanga, Monte Nido, other areas) are high pressure (as much as 300 PSI). Be careful when opening hydrants and be alert for this. Some may have painted red tops--that indicates greater than 100 PSI.

- Use extra caution when working on or near roadways in heavy smoke--private cars, police units, media, etc. may not see you and may be speeding.

- Remain hydrated and eat when you can.

- FIGHT FIRE AGGRESSIVELY, BUT PROVIDE FOR SAFETY FIRST!!!

Brian Hughes

Capt. Brian Hughes
LACoFD Safety Officer

Monday, 10/21/96 19:00
#02

UNIT 5: SAFETY

TERMINAL OBJECTIVE

The students will be able to evaluate the safety and effectiveness of operations in a Wildland/Urban Interface (W/UI) Incident.

ENABLING OBJECTIVES

The students will:

1. *Identify specialized personal protective equipment (PPE) available.*

2. *Identify decisionmaking templates for safe fireground operations (LCES, nine urban situations).*

PERSONAL PROTECTIVE EQUIPMENT

Structural firefighting turnout gear has taken on many changes over the last four decades. In the early years structural firefighters wore rubber hip boots and rubber coats, helmets made of plastic, and self-contained breathing apparatus (SCBA) were not widely endorsed. Firefighter safety started to become an issue in the late 70's. Firefighters started wearing bunker gear, a simple design of a fire-resistant pair of pants with suspenders and a coat of the same material. Boots no longer had to be hip length, just calf length. Helmets were being made of composite materials and gloves became better fitting. SCBA was hardly used due to its weight and confining face-piece, so it started getting lighter and more widely used.

By the mid-90's, National Fire Protection Association (NFPA) standards such as NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, and NFPA 1971, *Standard on Protective Ensemble for Structural Fire Fighting*, made firefighters' bunker gear safer and lighter. Helmets are stronger and lighter; gloves, Nomex hoods, lightweight, better-fitting leather bunker boots, and SCBA that weigh less than 5 pounds are all part of the structural firefighters' safety gear.

Likewise, the wildland firefighter 40 years ago wore blue jeans and long-sleeved cotton shirts with a construction hard hat. NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*, was used to create safer turnout gear for the wildland firefighter. With the advent of fire-resistive materials such as lightweight Nomex, the wildland firefighter now has his/her own turnout gear, boots, helmets, respiratory protection, and fire shelter.

PROS AND CONS OF STRUCTURAL GEAR VERSUS WILDLAND GEAR

Structural gear was designed for a specific job--to enter a confined, burning structure with a temperature reaching between 1,000 to 1,300ºF (538 to 704ºC). The entire ensemble of bunker gear, boots, gloves, hood, helmet, SCBA was made to offer limited thermal protection so that firefighters could enter a burning structure to locate victims and extinguish the fire at its seat.

The problem that now arises is the fact that more and more structural firefighters are fighting W/UI fires in structural gear which is causing heat-related injuries. Firefighters now are dealing with the heat of the fire, heat of the ambient temperature, and a different workload at a much faster pace.

Wildland turnout gear was designed to be lightweight but afford the user limited thermal protection. It was not made to enter into a confined structure fire. The reason for the lightweight gear was to give the wildland firefighter better mobility and freedom of movement. Wildland firefighters will deal with more uneven terrain, slopes, and poor footing. To combat the lightweight gear, the wildland firefighter carries a fire shelter. The fire shelter is made of an aluminized material over fiberglass that, when deployed, a wildland firefighter can survive direct flame contact. However, deploying a shelter is a last effort for safety that we will discuss later in this unit.

Summary

In most cases the structural firefighter can use his/her existing structural gear to fight the W/UI fire for short durations. The use of structural turnout gear over long periods can be detrimental to the user's health and safety because the gear was never designed for wildland firefighting.

Structural fire departments that typically fight structure fires, but are faced with an increasing number of W/UI fires, may wish to consider equipping their firefighters with wildland gear. This gear should include pants, jacket, helmet with Nomex liner, gloves, boots, and a fire shelter.

With any PPE, proper training of its use is critical to peak performance. Fire shelters must be trained on proper use each year to maintain efficiency.

STRUCTURAL APPARATUS VERSUS WILDLAND APPARATUS

Most modern-day structural fire departments have a fleet of trucks of various manufactures and designs. Some municipal departments may have as many as 1,000 pieces of apparatus, compared to the volunteer department that may have 5 or 6 pieces of apparatus.

It does not matter whether it is a municipal or volunteer department; they purchased the apparatus to fit the individual needs of their community. Some city departments may have 500-gallon water tanks and 1,750 gpm pumps because their response zone has hydrants on every corner. However, a more rural department might elect to have a 1,000-gallon water tank and a 1,250 gpm pump because they have a limited water supply.

One common factor for the departments is the fact that these structural firefighting engines were not made to go off the hard road. Whether it is a paved road, a gravel road, or even a dirt road, these trucks need a solid surface under them to function.

Some departments may, in fact, incorporate some 4x4 technology into their structural apparatus due to terrain and road conditions.

Brush apparatus like structural apparatus were designed with a specific mission in mind. Some may carry as little as 50 gallons of water to as much as 1,000 gallons of water. These apparatus were designed to go off road over rough terrain, through mud, soft sand, and many other hazards that would stop structural apparatus. Brush apparatus may be a small 3/4-ton pickup truck, a 2-1/2-ton 4x4 or even a 5-ton 6x6. Each department decides what it needs, based on the topography of their area.

One major factor between structural and wildland apparatus is the pumping capability of each. If you want a large volume of water in one place the structural engine will deliver, but the wildland apparatus usually has a pump and roll capability. This was designed into the apparatus so they can fight a fast-moving fire.

Crew compartment size on structural engines could transport anywhere from 4 to 12 firefighters. On the other hand, the brush apparatus may hold as few as two firefighters, or in some cases, as many as four firefighters. There are even some older model fire apparatus equipped with open cabs. For a structure fire this would not create a problem; however, in the W/UI this could become a safety issue for those riding there.

Structural fire apparatus will in most cases carry four different size hoses of varying lengths. They may have 3/4-inch or 1-inch booster line, 1-1/2- or 1-3/4-inch attack lines, 2-1/2-inch or 3-inch supply/attack lines to 4- or 5-inch-diameter supply lines. These hose lays were designed to combat a variety of different fire situations.

The wildland fire apparatus were designed to be mobile and agile to move through the wildland environment. A limited amount of hose is placed on these apparatus. A 3/4-inch to 1-inch attack line to a 1-1/2-inch attack line with limited amounts, usually 150 feet. Some of the pumps may have extra outlets for garden hose or forestry hose to be used also.

Most of the structural fire service today has gone to diesel engines for the apparatus. There were many reasons for this transition;, however, there are still many gasoline-engine apparatus. The main difference as it applies to a wildland fire is the amount of smoke that may be encountered. The gasoline apparatus are air breathers and diesel apparatus are not. Some burnovers involving firefighters and their trucks were due to the trucks overheating, or the apparatus simply stalled out due to the lack of oxygen for the engine.

That is why the maintenance of their apparatus and the condition are critical to firefighter safety. Poorly maintained apparatus that are subject to breakdown can contribute to firefighters not being able to egress out of a bad situation. The same maintenance program that is used on structural apparatus must be maintained on wildland apparatus.

Summary

In summary, the type and design of apparatus used depends on the mission of the department. There are many different configurations, but the common denominator is that they should provide for firefighter safety and extinguish fires.

RISK ANALYSIS TEMPLATES TO BE USED

In the world of firefighting many acronyms are used to describe every facet of firefighting. The glossary will be full of them. A term structural fire officers will remember is REVUS, or a hazardous materials term GEDAPER.

Almost all structural fire officers can name many more. These acronyms were designed to help structural officers remember a key point so that as they are doing the strategy of an incident they will recall these items from their long-term memory.

In wildland firefighting two major acronyms are used: FIRE ORDERS and LCES, both of which are used by wildland fire officers to remember certain key points that they must use on the fire line. In this course we are going to concentrate on LCES, which applies not only to the wildland fire officer, but equally to the structural fire officer.

LCES

Lookouts

Lookouts are an important part of any fireground operation. On structural firegrounds you as a Command Officer have lookouts. We just don't call them lookouts; in the structural role they might be called division leaders. Their purpose is to be in a geographical area and observe what is going on and report to Command what they see, or observe changes in the fire's behavior. In a W/UI Incident, lookouts play a vital role in the safety of firefighters. When the fire cannot be observed directly, or the fire is some

distance away, then lookouts must be posted to keep Command abreast of what the fire is doing.

Communications

Communications is the most frequently identified factor in any postincident analysis. Communications need to be established with all members of the firefighting team and from the Company Officer to Command. At a structural fire working within the confines of a building the distances are not critical. In fact, most fires are fought within sight of the Command Post. In a W/UI Incident firefighting crews could be spread out over miles of terrain. In some States it may be flatland, in others there may be hills, mountains, valleys, and any number of obstacles separating the Command Officer from the firefighters.

Escape Routes

As in structural firefighting, we teach our firefighters to be aware of their surroundings at all times. Firefighters are trained to know where the windows and doors are, and do only one type of search so as not to get lost. The same principal applies in the W/UI. Firefighters may be in unfamiliar terrain and may not be used to fighting a wildland-type fire. If the fire approaches them from a different direction, they must have a pre-established escape route so that they do not turn and retreat directly into the path of the fire or fall into a ditch or ravine.

Safety Zones

Safety zones are areas that are big enough in size and devoid of vegetation, so that if a fire were to overrun the firefighters they could use their pre-planned escape routes to the safety zone. In the W/UI, position the structural apparatus so that it will be in a safety zone.

LCES Summary

Lookouts, **C**ommunications, **E**scape routes, and **S**afety zones are an integral part of the safety of firefighters in the W/UI. As structural chief fire officers, it is up to you to ensure that your personnel learn this acronym and use it during an interface incident.

Nine Wildland/Urban Interface "Watch Out" Situations

Toxic Fumes or Hazardous Materials

During a W/UI Incident, firefighters think that, because it is wildland vegetation burning, they do not have to worry about the smoke; a bandanna will do. However, many people use the wildland environment as a personal landfill. No one knows for sure how much is out there or where people have dumped it. Respiratory protection is a major safety concern.

Wear All Personal Protective Gear

This goes back to structural turnout gear versus wildland gear. If structural firefighters are in their structural gear and not entering a confined structure fire they may relax their awareness of safety and not wear their gear, or remove the vapor barrier. They may go as far as to just fight the fire in a tee shirt. All PPE must be worn on the fire line at all times. If firefighters must wear structural gear, get extra resources so that they can be rotated more frequently to avoid heat problems.

Always Back the Engine into Position

The obvious reason for this is so your apparatus is not trying to back out of a one-way street or driveway. The apparatus can pull forward to make an exit rather than moving the truck for a three- or four-point turn. The area that you back in to also is important. Make sure you do not park under trees or brush. Also, try not to park under or near power lines, and look for septic systems.

Keep a 100-Gallon Water Supply in Your Tank

When working in the W/UI environment your apparatus is parked within a safety zone. If your firefighters escape to the safety zone they will need water to protect themselves and their apparatus should the fire overrun their position. Also the apparatus operator should have a booster (1-inch) or a 1-1/2-inch hand line pulled for the protection of themselves and the apparatus.

Use 1-1/2-inch Lines Whenever Possible

The larger diameter hose will give more protection then the 3/4-inch or 1-inch forestry hose when protecting a structure. With the many varied types of nozzles that are out in the market today, it would be hard to say they should flow 30 gpm. However the nozzles you use should be set at the lowest setting to help conserve water.

Remember that you are protecting a structure, not fighting a fire. Use your water judiciously.

Use Backup Line Whenever Possible

We are all aware that, on every fire, something will break or will malfunction. If at all possible extend two 1-1/2-inch lines around the structure. We do this for two reasons: first, it gives enhanced protection for the structure and the crew; second, you can cover more area with the two lines. Also, if one of the lines fails you will have a backup that can be used to save the structure and provide continuous protection for your personnel.

Use Foam or Other Gels to Coat Structure--Time Permitting

Structural firefighters must become familiar with the many advances in technology that have been made in the last decade, and with different types of foams and firefighting gels for wildland firefighting. Most structural firefighters are familiar with a Class B foam for fighting petroleum-based fires. Recently, a Class A foam was introduced and it works very effectively on wood and other ordinary combustibles. During a W/UI fire an accepted method of structural protection is to pretreat the structure with a foam or gel. With the compressed-air foam (CAF) systems firefighters can put a blanket of Class A foam on a structure that will stick to it and protect it from an oncoming fire. Likewise with the gels they can pretreat a structure and leave. The advantage of this is that, if there are limited resources, structures can be pretreated then left. This allows firefighters to be available for other structural assignments.

However, a drawback to this procedure is time. If the fire is fast moving there may not be enough time to pretreat prior to the head fire arriving. The second disadvantage is that the foam will break down due to wind and ambient temperature, so if the structure was pretreated too soon the coating will disappear. Some of the gels have a longer staying power than foams. Take some time to do adequate research on which will best suit your department.

Do Not Park Under Power Lines

As we stated before when we talked about positioning apparatus, you do not want to park under power lines. With the amount of smoke that is in the air, containing carbon particles that are good conductors of electricity, a high-voltage line could spike and go to ground. If your apparatus happens to be in that area and there is moisture in the air from firefighting, personnel could be electrocuted. The wooden power poles could burn through and topple, dropping live wires across your personnel or apparatus.

Do Not Enter Burning Structures Unless You Have Training and Proper Equipment

This may seem odd to a structural firefighter, but if you do not have the proper equipment such as a SCBA, you should not enter the structure. If the structural firefighter has wildland gear on, he/she should not enter the structure.

Summary

The common thread that runs through a structure fire and a W/UI Incident is the constant need for safety. There should be a Safety Officer assigned; however, all members of the firefighting force must be Safety Officers. The acronym LCES can be used on any fireground whether it is a structural fire or a wildland fire. All firefighters must be lookouts for safety, communicate what they see, know where their escape routes are and how to get to them, and know the safety zones.

EFFECTS OF EVACUEES ON FIREFIGHTER SAFETY

During a W/UI fire there are many dynamics taking place. Homeowners are not sure whether to evacuate or to stay, and may try to protect their home. Others want to come and look at the fire. Then there is the news media, which will be out in force to cover the big story.

What do all of these have to do with firefighter safety? As firefighters we must protect lives, then property. Homeowners want to stay and protect their home, but they do not have the proper gear and run the risk of being burned. Therefore, trying to get the homeowners to leave and not fighting the fire hamper the task of firefighters fighting fire.

Who Will Do the Evacuation?

Evacuations are difficult under the best circumstances. The first priority is a preplan of how the evacuation will be done. It is important to work with your local law enforcement organization prior to an emergency. As the Incident Commander (IC) you may be faced with making the decision to commit forces to evacuation or to the fight fire. It is a very difficult decision.

Is There a Planned Place for Them to Go, and How to Keep Them From Returning?

Emergency management officials will be an invaluable resource during this operation. They already have a plan in place and know whom to call to open shelters. Again preplanning for this event and working with the emergency management officer will help. Once people have been directed out of the area and sent to shelters, they need to stay there. Law enforcement will be needed to establish a perimeter in order to keep the residents from re-entering the area.

How Do You Deal With Citizens Who Will Not Go?

This is an age-old problem within the emergency services. A person's home is his/her kingdom. It will be up to the local authority having jurisdiction (AHJ) to make a decision on what they should do. You can advise people to leave, you can even make it mandatory for them to leave, but outside of physically removing them, you cannot make them leave. However, once they do leave, you can keep them from returning.

Danger Posed to Firefighter Means of Access to the Fire

As firefighters are entering an area to fight fire in a rural area some of the problems faced are narrow roads, limited access in and out, or only one way in and out. These factors compounded with residents evacuating or people moving in to get a good look will cause traffic problems within the fire area. Firefighters will get bogged down in traffic and will not be able to get to the fire.

As the fire situation changes, there will be times that a retreat of forces may be called for to reassemble and put together new strategies. The problem lies in civilians leaving their homes, or onlookers causing traffic tie-ups. These citizens are not accustomed to emergencies, so they have a tendency to panic. When that happens, firefighter safety could become

compromised by traffic accidents with civilian vehicles, or just be stopped with no place to go. Fire apparatus has been burned over in situations like this.

Summary

Have a plan for evacuations. Work with your law enforcement agency to put together a plan to cover who, what, when, and where. Work with your emergency management officials on shelters and food for evacuees. Last but not least, have a plan developed with your firefighters prior to a W/UI, let them know what is expected of them and what there roles and responsibilities are.

WILDLAND/URBAN INTERFACE OPERATIONS IN HEAVY SMOKE CONDITIONS OR NIGHT TIME/SMOKE OPERATIONS

W/UI Incidents present us with the unique problem of driving in smoke conditions. Driving in these conditions is similar to driving in heavy fog conditions. The major difference is that in a fog you are just trying to get somewhere safe; in smoke conditions you are trying to get somewhere quickly to fight a fire.

As IC's on W/UI fires, safety of firefighters, forestry, law enforcement, and civilians will be of the highest priority. As we discussed earlier, lookouts are a vital part of the incident. Not only will the Company Officer post lookouts to observe fire behavior, but lookouts can be posted for smoke and nighttime operations. Ensure that there are Safety Officers moving about the incident; they will be your lookouts.

Here are some good safety procedures to consider while working in smoke conditions or night/smoke conditions on a W/UI fire.

- Make sure that all emergency vehicles operate with all of their visual warning devices, including headlights on low beams.
- Post law enforcement at intersections to keep unnecessary traffic from entering the scene.
- Post spotters at blind intersections or where you have vehicles staging for manpower, water, rehab. This will keep someone from being run over.
- Keep all personnel onscene updated on changing conditions.

Working in these conditions can be difficult at best; make sure you slow down, and use commonsense driving techniques. Post spotters at blind intersections, and use your Safety Officers as lookouts to keep the IC informed not only of the fire, but the conditions in which you are working.

Activity 5.1

Apparatus and Equipment

Purpose

To make an inventory list of apparatus and equipment your department carries to combat W/UI Incidents.

Directions

1. Answer the survey questions as they apply to your own department.

2. Instructors will call on you individually to supply answers, and facilitate class discussion.

	YES	NO
Bunker gear		
Wildland gear		
Wildland firefighting hand tools		
Class "A" foam		
Firefighting gels		

How many structural apparatus do you have? How much foam do they carry?

How many wildland firefighting vehicles do you have and what type (4x4 or c.a.f)?

With the above information, if a W/UI fire were to occur in your community do you have the equipment to handle it?

Activity 5.2

Calabasas, California, October 22, 1996

Purpose

To evaluate the safety and effectiveness of operations in a W/UI Incident.

Directions

1. Read the case history individually.

2. Complete the activity worksheets as a group.

CALABASAS INCIDENT
ENTRAPMENT ANALYSIS

SUMMARY

Location: Malibu, California
Los Angeles County
Date: October22, 1996

INCIDENT OVERVIEW

At 1035 hours on Monday, October 21, 1996, the County of Los Angeles Fire Department dispatched an augmented brush assignment to a reported brush fire at the Ventura Freeway, east of Las Virgenes Road. The first arriving engine reported 1/4 to 1/2 acre of medium brush burning uphill pushed by strong winds. The fire was caused by arcing power lines and grew quickly in size and intensity. The fire escaped beyond initial attack. At approximately 1800 hours on October 21, 1996, the fire burned to Pacific Coast Highway at the bottom of Corral Canyon. Later in the evening the winds diminished, but continued to blow through the night, and the fire's advance also diminished.

On the morning of October 22, 1996, the Calabasas Incident had been expanded into an organization of 5 Branches and 21 Divisions. Division Z Included Corral Canyon Road from the Pacific Ocean to Mesa Peak Motorway and had a total of six engine strike teams assigned to it: Los Angeles City (LFD) 1001A, LFD 1002A, LFD 1003A, LFD 1075A, Los Angeles County (LAC) 1103A, and Area "C"/Glendale (GLN) 1202A. Within Division Z, a housing tract known as the Malibu Bowl was protected by Strike Teams LAC 1103A and GLN 1202A (see Diagram A). By the late morning, fire had gradually increased in the bottom of Corral Canyon just east and below the Malibu Bowl housing tract. Air resources were used all morning in an attempt to control the fire spread.

A total of 13,010 acres were burned during the Calabasas Incident, six structures were lost, and the fire was declared under control at 1800 hours on Sunday, October 27, 1996. More than 4,400 fire fighters plus support personnel worked on the Calabasas Incident.

Corral Canyon Road runs north from Pacific Coast Highway. It is a two-lane road with many turns, which generally follows a ridgeline on the west side of Corral Canyon itself. It has three groups of structures: several clustered along the coast, a tract of approximately thirty homes 1-1/2 miles up canyon called the Malibu Hills housing tract, and a tract of approximately forty homes three miles up the canyon called the Malibu Bowl housing tract (see Diagram A). A Wildland Pre-attack Plan had been prepared for this area which called for 20 engine companies each to protect the Malibu Hills tract and the Malibu Bowl tract.

The terrain around the Malibu Bowl tract consisted of steep slopes (80%) in the bowl area where the entrapments occurred. Corral Canyon Road and Newell Road traversed

the bowl area midslope approximately 600 feet above the bottom of the bowl. The bowl in this area faced south to southwest and had three major "chimneys" in it. The bowl area consists of medium to heavy brush with brush clearance that varied from good to poor. The roads in the Malibu Bowl tract were narrow, with a considerable number of civilian autos routinely parked on them.

Shortly after noon on October 22, 1996, the winds decreased and gradually switched from down canyon (offshore) to up canyon (onshore) at 3 to 5 miles an hour. The fire increased in intensity at the bottom of Corral Canyon, just east of and below the Malibu Bowl housing tract. The fire was now threatening the homes in the Malibu Bowl tract. Additional resources were requested for the Malibu Bowl tract and some engine companies already committed to the tract were repositioned.

The fire approached the Malibu Bowl from first the east and then the south. As the fire approached from the east, Burbank (BUR) 16 and Pasadena (PAS) 31 personnel narrowly missed entrapment as they operated hand lines on the slope east of 2004 and 2008 Newell Road. At approximately 1243 hours a very rapid rate of fire spread occurred in the bowl area east and south of the intersection of Corral Canyon Road and Newell Road. This sudden rapid rate of fire spread entrapped the three members of GLN 24 protecting 2050 Newell Road as they attempted to run the approximately 170 feet to a safety zone. The three Glendale Fire Fighters suffered burns and/or smoke inhalation. One was burned critically.

Simultaneously, while moving into position for structure protection, LFD Strike Team 1001A was overtaken by the same rapid rate of fire spread in the bowl area. LFD 10 and 17 were entrapped on Newell Road and LFD 4 was entrapped on Corral Canyon Road north of Newhall Road (both of which were mid slope roads above the bowl area). LFD 10 and 17 were blocked by civilian autos exiting the Malibu Bowl tract as the fire approached. Three members of LFD 10 attempted to deploy their fire shelters, only one succeeded. All four members of LFD 10 took cover under the single fire shelter which was partially deployed by one of the fire fighters on LFD 10. LFD 4 and 17 members did not have to deploy their fire shelters. LAC 25 (from Strike Team 1103A) was just in front of LFD 17 and narrowly avoided entrapment on Newell Road.

Rescue and evacuation operations were initiated immediately after the entrapments occurred. Personnel from several Strike Teams in the area assisted. A total of six personnel were transported by vehicle to a temporary helispot near the Malibu Hills housing tract and then air lifted by two helicopters to UCLA Medical Center. The last of the victims arrived at UCLA Medical Center approximately 50 minutes after they were injured. Four were subsequently transferred to Grossman Burn Center for more advanced treatment for their burn Injuries.

Personal protective equipment functioned within designed limits. The concept of "layering," as it related to personal protective equipment was again validated at this Incident.

CONDITIONS IMMEDIATELY BEFORE THE ENTRAPMENTS

Just prior to the **entrapments** of GLN 24, LFD 17, LFD 10, and LFD 4 and the **near misses** of BUR 16, PAS 31, and LAC 25, the following conditions were evident and observed by overhead personnel:

1. The mild offshore winds ceased at approximately 1100 hours. A typical or normal still period followed for a brief time. This was then followed sometime between 1200 and 1225 hours, by mild onshore winds of 3 to 5 miles per hour.

2. The bowl area consisted of a southwest aspect below GLN 24, and a southeast aspect below the LFD Engines, with 75-80% slopes. This particular bowl has south, east, west and north aspects.

3. The bowl contained three major drainages commonly referred to as chimneys.

4. The fire crossed the bottom of the drainage and spotted near the saddle on the south end of the bowl. Shortly thereafter, fire extended from the bottom of the bowl, up each exterior ridge that formed the bowl, in a large "V" pattern. The rate of fire spread was increasing and would significantly increase within seconds.

ANALYSIS AND CONCLUSION OF ENTRAPMENTS

The following conclusions pertain to the entrapments of GLN Engine 24 and LFD Engines 10, 17, and 4:

- The fuel in the bottom of the bowl had a very high dead to live ratio. The fuel moistures were at a 1 5-year low. Both of these factors made the bowl area ripe for ignition when the fire began to generate spot fires and hot gases.

- The wind shifted as predicted in the IAP for October 22, 1996. This shift was from an offshore to an onshore wind of approximately 3 to 5 miles an hour. This initially caused fire behavior to subside. At this time of day, solar radiation on the south slope raised the temperature of the brush to its maximum. The onshore breeze then swept the fire up the steep slopes.

- The fire made a run of 600 feet in approximately 30 seconds. This rapid rate of spread was accentuated by the nature of the bowl, which captured the hot gases generated by the fire, and the brush that was at its maximum heating from the sun.

- Lookout(s), Communication(s), Escape Routes to Safety Zone(s) (LCES) Is the absolute minimum to be used to ensure the safety of a single or multiple unit configuration. In wildland firefighting, this concept is to utilize the lookout(s) with communication(s), escape routes to safety zone(s) as an integrated system to guarantee fire fighters safety.

- Ordering and assigning Chief Officers for overhead positions, without knowledge or verification of their experience or training impacted firefighting strategy and tactics in the division within which the entrapments occurred.

- Experience in overhead positions such as **division**, structure protection **group**, **branch**, **operations** is a significant deterrent to entrapments on wildland interface fires.

- Ordering Strike Team LFD 1001A units to travel along Newell Road did not allow sufficient time to move and deploy in a safe area before being entrapped.

- Division Z's assignment for October 22, 1996, as stated in the Incident Action Plan, ICS 204, Item 7, Control Operations was: 'STRUCTURE PROTECTION AND MOP UP.' Structure protection was the number one priority in Division Z. The reference to "Mop Up' was inappropriate as there was very little, if any, mop up to accomplish. The fireline was primarily across the canyon and not readily accessible to safely contain or mop up.

- The IAP Safety Message for the operational period made some very appropriate comments. Nearly two-thirds of the Safety Message pertained to the **primary** and **secondary** causes relating to Strike Team LFD 1001A's and GLN 1202A's entrapments.

- The creation of structure protection GROUPS in housing tracts or where there were numerous properties to protect would have assisted in control of the division where the entrapments occurred. In this particular situation, utilizing structure protection groups would have alleviated the division supervisor's direct responsibility to supervise five miles of open line that included two housing tracts, and required 40 engines for structure protection.

- Division Z was a very complex Interface that required significant attention, experience and skill. The Division supervisor was required to organize, supervise and request additional resources and overhead to complete his assignment In a safe manner, i.e., pre-deploy a total of 20 engines in the Malibu Bowl tract prior to their immediate need.

- Intelligence reports must be submitted by command position personnel to the Planning Section in a timely manner to allow time to properly verify overhead qualifications, identify critical areas, and assign overhead to match available resources with appropriate needs.

- The actions of command personnel in the Division Z area were due primarily to a lack of experience in wildland fire behavior.

- "Currently there is no training to teach fire fighters when you're in over your head. Usually, by the time it sinks in, your safety has been compromised. The tendency is to hang on too long because it is admitting defeat if you do not. There needs to be more agency direction here, to take pressure off the individual. Fire fighters need training to recognize clues and early warnings to pull out or to ask for more resources before the situation becomes desperate.

- The potential of the fire situation in the Malibu Bowl area was not fully recognized nor communicated to all members in the area. It is important that the existence of a hazard be recognized and communicated to all members of the affected area.

- Before making the transition from a non-emergency to emergency status, all members on a strike team or other increment shall have their personal protection equipment on, and in place.

- If a fire fighter is inexperienced in wildland fire behavior, the Fire Order, "Initiate all action based on current and expected fire behavior," becomes rather ambiguous. This reinforces the urgency to assign experienced wildland fire fighters to overhead positions.

RECOMMENDATIONS

The recommendations listed below are based on information that became apparent during the analysis process. Some of these recommendations may not apply to each agency, as some are already in practice.

Command

1. Command Officers, Division/Group Supervisors, and Strike Team Leaders should insure a systematic review of the Incident Action Plan. Critical safety issues should be discussed with all supervisors and their subordinates assigned to the fire. Discussions and briefing will ensure an alert fire force and minimum complacency.

2. Incident Commanders and Operations Chiefs should strongly consider structure protection groups on urban wildland incidents. Structure protection groups can focus on protecting housing tracts thereby enabling the Division Supervisors to concentrate on fire containment and control.

3. Fire agencies should consider establishing and using the position Operations/Plans Chief. This position would identify critical hazardous areas by using intelligence reports from the field. Feedback to plans must be prompt and accurate.

4. Train and utilize Field Observers to provide prompt, accurate feedback to the Operations/Plans Chief.

5. Develop an organization system within the Region to explore the feasibility of a standard process and format for all officers and overhead to submit a résumé fact sheet upon check in. A résumé should be completed by all Officers arriving at an incident in order that the Plans Section may have information to put officers in the roles to which their experience and training would qualify them. This would allow fire fighters or overhead to perform in a training position or to fill positions they are qualified to fill.

6. When appropriate, specific safety issues that apply to individual division/group should be extracted from the IAP Safety Message. This Information should be stated on the form ICS 204 for each division/group, under Item #8, "Special Instructions." Appropriate division/group specific safety items could include: fuels, local weather, extreme hazard areas, evacuation areas, vulnerable areas, road conditions, or other known division/group specific hazards.

EQUIPMENT AND PROTECTIVE CLOTHING ITEMS

1. Expedite replacement of existing fire shelters with new shelters (double pull rings). Ensure all shelter pouches are retrofitted and have webbing (lift) strap. Fire shelter shelf life should be evaluated. Review and upgrade shelters as technology and materials become available.

2. Enforce the requirements of members to be attired in proper protective clothing prior to entering an operational area. When a strike team leaves staging or base, to return to a division, all members shall be attired in required personal protective clothing.

3. Re-enforce that all fire fighters have on their person a fire shelter when in an operational area. When driving, fire shelters shall be immediately available in the cab of the engine and/or in sedans.

4. Utilize fully enclosed apparatus on strike teams whenever possible. Study the feasibility of retrofitting open cab jumpseats with fire curtains. Study the feasibility of developing a fire resistive cab.

5. Issue long sleeve T-shirts. Require mandatory use of long sleeve T-shirts on wildland fires. Minimum standard of 100 percent cotton. Conduct a review of the specifications for undergarments and accessories.

6. Provide protective shrouds for all members (neck and ear protection) and require its proper use.

7. Request existing research information from CDF and USFS regarding respiratory protective devices for wildland firefighting. Evaluate respiratory research and determine product suitability for firefighting purposes.

8. Encourage use of structure protective clothing when fire conditions are severe, for example, potential for entrapment, roadways blocked. Structure protection PPE shall be worn when assigned to structure protection duties at wildland interface fires.

9. During an incident, emergency repair of vehicles can be accomplished by contacting ground support unit through the communications unit.

10. Advise fire fighters of the danger involved wearing light weight cotton bandannas as respiratory protection.

TRAINING ITEMS

Region I Director should consider forwarding a letter to the appropriate agency which addresses and recommends a unified approach to:

- Development of qualifications and experience requirements for personnel assigned to wildland/urban interface incidents, commensurate with their assignment.

- Develop minimum training requirements for all fire fighters responding to mutual aid wildland /urban interface incidents.

- Development of a videotape training program addressing fire behavior issues, such as the Campbell Prediction System to be used for annual training programs.

- Distribution and use of the "Wildland Fire Journal - The Harris Memoirs" for annual training sessions.

- Provide mandatory training for all fire fighters in Fire Shelter Deployment following the NWCG Document "Your Fire Shelter, Beyond the Basics" 1996 Edition - PMS 409-1. Provide realistic fire shelter deployment training to include wind, heat, smoke and noise. Training must be repetitive, consistent, and documented. Emphasize "when to stop and deploy."

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2. Recommend that all fire fighters, particularly Strike Team Leaders and Division/Group Supervisors, receive Instruction in S-205 Fire Operations in the Urban Interface.

3. Consider providing training and annual review on Basic Fire Behavior (S-190), Campbell Prediction System, compass reading and topography maps for all fire fighters.

4. Recommend the development and delivery of minimum training requirements for all fire fighters responding to OES Mutual Aid incidents.

5. LCES should be considered as a minimum safety briefing given or received by leaders/supervisors of all organizational units including single increments, units, Branches, Divisions, Groups or Sections.

6. Provide a Campbell Prediction System decal for each apparatus to be mounted in a conspicuous location.

7. Provide all fire fighters with personal copy of Fireline Safety Reference, NFES 2243 Booklet. This booklet may be ordered from National Interagency Fire Center Supply, 3905 Vista Avenue, Boise, Idaho 83705.

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1. Identify radios with markings for Command and Tactical to match descriptions in the communications plan. Provide instruction card with each radio issued.

2. Encourage agencies to conduct multi-agency drills utilizing realistic scenarios. Utilize overhead personnel, agency specific radios, and mutual aid radios.

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1. Encourage universal application of the vehicle roof top (serial) unit identification.

2. Encourage agencies to maintain helispot identification and marking systems so that all assisting agencies can recognize approved helispots. In addition, these helispots should be identified on the IAP maps.

3. Encourage agencies to dispatch Safety Officer(s) to mutli-alarm wildland fires and attempt to provide Safety Officers for each critical division/group.

INCIDENT ITEMS

1. Strike Team Leaders should utilize members on strike teams with wildland experience to assist Strike Team Leaders with reconnaissance of an area prior to placement or movement of Strike Teams. At the formation of the Strike Team, Identify members with wildland experience and place their apparatus in front of other apparatus with less experience. Use experienced members as Assistant Strike Team Leaders.

2. Issue pre-attack plans to all Strike Team Leaders as available. County of Los Angeles Fire Department pre-attack plans are operational and distributed within the County of Los Angeles Fire Department.

3. To improve the value of the pre-attack plans to mutual aid resources, consider the provision of area maps to Strike Team Engines, which depict topography, fire hydrants, water sources, and helispots.

4. Evaluate the number of apparatus required for a Division/Group. Predict where the fire will do the most damage, and deploy an adequate number of resources in strategic positions prior to the arrival of the fire.

5. Assign qualified personnel as designated LOOKOUT(S) on all Incidents, and ensure the lookout has communications with the appropriate personnel.

6. Utilize fire fighters (of all ranks) with knowledge of the district to assist "Bird Dog" out of area Strike Team Leaders and Division/Group Supervisors.

7. Command Officers, Division/Group Supervisors and Branch Directors must identify dangerous fire areas and not allow media, civilian, police or fire department personnel to park vehicles there.

8. Request jurisdictional law enforcement agency for road closures early in the incident, to prevent vehicles not involved in fire protection, from blocking the road access.

OUTSIDE AGENCY--ORGANIZATION ITEMS

1. Establish a training program for the media, consisting of the use of protective clothing, Identification of potential dangerous fire areas, and vehicle operation and placement in the fire area.

2. Restrict media access to hazardous areas where it may compromise fire department operations and the safety of fire fighters and media personnel. Use media pool resources to assure freedom of the press is maintained. Assign a Public Information Officer to the media pool resources.

3. Develop information programs for the public. Address hazard reduction around structures, actions to take prior to and during a wildland fire, evacuation plans, etc. Deliver the programs by press releases, television media and delivery by the jurisdictional fire station.

4. Develop joint training exercises with the jurisdictional law enforcement agency regarding required road closure and civilian evacuation plan.

5. Fire agencies which have wildland interface areas should conduct a study of their current brush clearance program to ensure that proper brush clearance around structures is obtained in a timely manner.

6. Fire agencies which have wildland interface areas should review policies which require brush clearance from the responsible parties for private and public access roadways.

7. Fire agencies which have wildland interface areas should study the feasibility of installing "No Parking - Fire Lane" signs on existing non-conforming public and private access roadways.

8. Review wildland pre-attack plans for all areas. Provide for public safe refuge areas on plans similar to the Malibu Bowl area, where evacuation or escape by civilians, is questionable. Identify indefensible areas on each map.

9. All areas within Region 1 should be encouraged to develop a standard pre-attack plan for the wildland interface areas. This allows operations to place resources quickly, and provides a reference for Incident Command which is developed in times of calm to be used in times of emergency.

10. Recommend that symbols on the pre-attack plans be universally recognizable and understood by all fire fighters.

11. Consider a survey of all departments that sent resources to the Calabasas Fire. This survey should be filled out by all appropriate officers, company officers, strike team leaders, and crew supervision overhead personnel. Analyze the survey results to help determine if training issues raised by the Calabasas Fire are being answered. The purpose of this survey Includes Items such as briefings attended, incident action plan discussions, safety issues, and LCES review.

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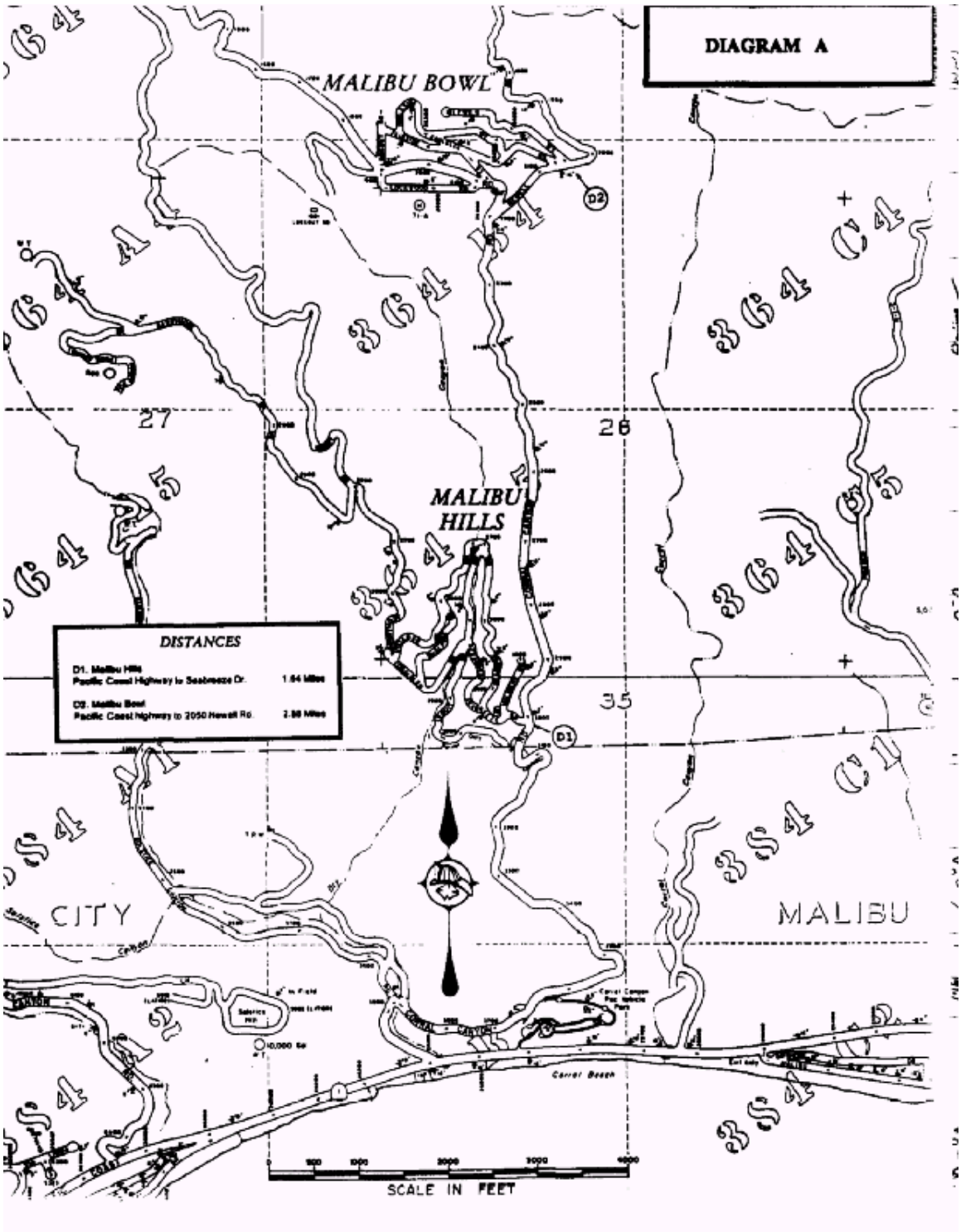
DIAGRAM A
MALIBU BOWL
MALIBU HILLS
DISTANCES
D1. Malibu Hills
Pacific Coast Highway to Seabreeze Dr. 1.64 Miles
D2. Malibu Bowl
Pacific Coast Highway to 2050 Hewett Rd. 2.88 Miles
CITY
MALIBU
SCALE IN FEET

Activity 5.2 (cont'd)

Worksheet 1

After reading the report, list all of the factors that led up to the entrapments.

Activity 5.2 (cont'd)

Worksheet 2

What safety problems did you discover?

Activity 5.3

Safety Case Studies

Purpose

To evaluate the safety and effectiveness of operations in a W/UI Incident.

Directions

1. Read both of the case studies.

2. In your small group, discuss the safety issues involved in the two cases.

3. Complete the items on the worksheet.

4. Be prepared to discuss the answers to the questions with the remainder of the class.

Activity 5.3 (cont'd)

Read the following case histories then answer the questions given:

Case History Number One

In a W/UI fire in a rural area in Florida, a large 300-acre fire was burning in heavy fuel. Several structures were in immediate danger, and 45 more also would be in danger if the fire couldn't be stopped. On scene were two Florida Division of Forestry tractor plow units operating in a direct attack mode in front of the fire. The fire was large enough that the fire department where the fire started asked for mutual aid. There were four 6x6 (type IV) brush units onscene. The closest water source to the incident was down a 2-1/2-mile dirt two trail. This trail had some blind corners and was only wide enough for one vehicle at a time. One of the departments onscene had an extended bumper on the truck where a firefighter with a 1-1/2-inch hose would fight fire.

During the fire there was a wind switch and the heavy smoke of the fire laid down the dirt two trail. As one truck was coming from the fire for water the other truck was returning and they met head on at one of the curves. The firefighter on the front bumper was thrown onto the other truck and hit his head on the windshield. Neither driver was injured. The firefighter who was thrown suffered a dislocated shoulder and some minor neck pain. The firefighter was wearing his approved helmet. The investigation afterwards revealed that the truck coming from the fire was traveling at 45 miles per hour on a narrow winding road, heavy smoke conditions with poor visibility. The other vehicle going to the fire was traveling at 25 miles per hour. That gave an impact speed of 70 miles per hour. In this case only minor injuries were received. This could have been worse.

Case History Number Two

On September 15, 1999, a 31-year-old female volunteer firefighter (the victim) died after being struck by an engine at the scene of a wildland/field fire. The victim was part of an initial-attack firefighting crew which had been dispatched to a 430-acre wildland/field fire. The victim and the chief from the fire department responded in an emergency command car. A firefighter/driver of Engine 8911 responded to the scene after hearing the call for additional manpower on his radio. He approached the fire scene and positioned the engine on the southwestern side of a barn near the fire scene. He parked the engine and began pulling 200 feet of 1-1/2-inch hose lays with the assistance of a civilian who was at the scene already. He and the civilian began wetting down the barn and fighting the fire in the field and spot fires as they occurred. When the chief and victim arrived they began pulling and positioning additional hoses. As the driver, chief, civilian, and victim were wetting down the barn and fighting the fire in the field, the fire began to increase in size causing visibility to decrease and making it hard to breathe. The fire started progressing towards the engine and the driver decided to move the engine. Prior to moving the engine, the driver positioned himself on the tailboard of the engine

and began to yell "**area clear**" warnings. The driver remembered seeing the Chief, civilian, and victim all leaving the fire scene on foot moving in a westward direction. As the smoke intensified, the driver got in the engine, rapidly backed it in a westward direction and, once he cleared the barn, parked the engine (*see Figure*). The driver asked the chief if everyone was accounted for and the chief responded that the victim was missing. The driver decided to walk around the barn to search for the victim, but halfway around, the barn became unable to see or breathe due to the intense smoke. Making his way back to the engine, the driver put on a self-contained breathing apparatus (SCBA) and continued his search for the victim. A few minutes later the driver located the victim lying motionless on the ground near the barn where the engine had been parked previously (*see Figure*). After informing the chief, a radio request was made for medical assistance, and a firefighter/Emergency Medical Technician (EMT) from the fire scene across the highway responded. The EMT announced that the victim was dead from obvious traumatic injuries to her head and face.

NIOSH investigators concluded that, to minimize similar occurrences, fire departments engaged in wildland firefighting should

- implement an ICS with written SOP's for all firefighters and ensure they are trained on the system;
- use National Weather Service (NWS) Fire Weather (WX) forecasts for all fire weather predictions and immediately share will all personnel all information about significant fire behavior events (e.g., long-range spotting, torching, spotting, and fire whirls); and
- learn, communicate, and follow the 10 Standard Fire Orders as developed by the NWCG.

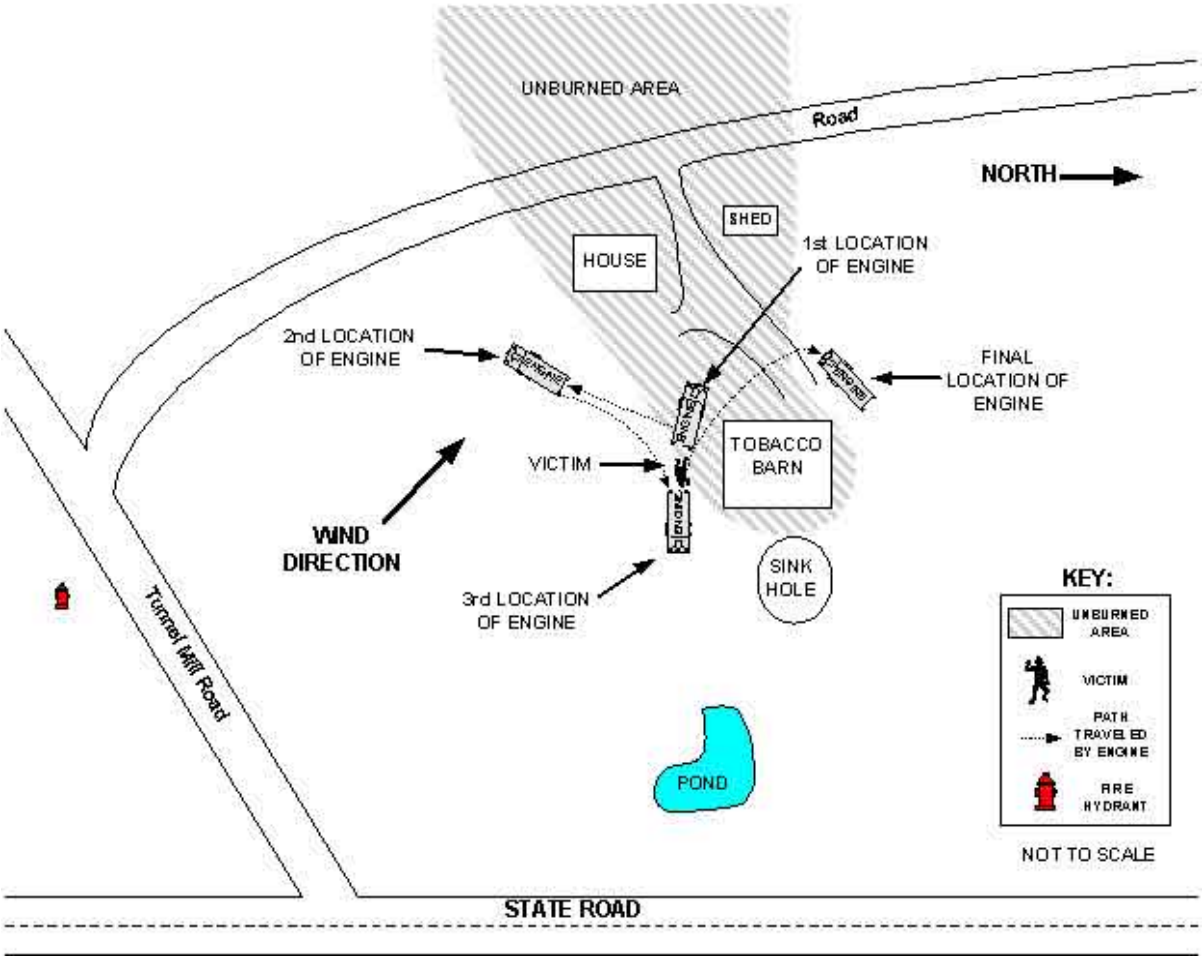

Figure
Overview of Incident Scene

Activity 5.3 (cont'd)

1. What were the common safety problems you noted in each case history?

2. In Case Number One, how could this accident have been avoided?

3. In Case Number Two, how could this accident have been avoided?

4. What lessons learned can you apply to your own department?

5. Write a brief safety message for working in smoke/night conditions.

APPENDIX

CALABASAS, CALIFORNIA, CASE STUDY RECOMMENDATIONS

RECOMMENDATIONS

The recommendations listed below are based on information that became apparent during the analysis process. Some of these recommendations may not apply to each agency, as some are already in practice.

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6. Utilize fire fighters (of all ranks) with knowledge of the district to assist "Bird Dog" out of area Strike Team Leaders and Division/Group Supervisors.

7. Command Officers, Division/Group Supervisors and Branch Directors must identify dangerous fire areas and not allow media, civilian, police or fire department personnel to park vehicles there.

8. Request jurisdictional law enforcement agency for road closures early in the incident, to prevent vehicles not involved in fire protection, from blocking the road access.

OUTSIDE AGENCY--ORGANIZATION ITEMS

1. Establish a training program for the media, consisting of the use of protective clothing, Identification of potential dangerous fire areas, and vehicle operation and placement in the fire area.

2. Restrict media access to hazardous areas where it may compromise fire department operations and the safety of fire fighters and media personnel. Use media pool resources to assure freedom of the press is maintained. Assign a Public Information Officer to the media pool resources.

3. Develop information programs for the public. Address hazard reduction around structures, actions to take prior to and during a wildland fire, evacuation plans, etc. Deliver the programs by press releases, television media and delivery by the jurisdictional fire station.

4. Develop joint training exercises with the jurisdictional law enforcement agency regarding required road closure and civilian evacuation plan.

5. Fire agencies which have wildland interface areas should conduct a study of their current brush clearance program to ensure that proper brush clearance around structures is obtained in a timely manner.

6. Fire agencies which have wildland interface areas should review policies which require brush clearance from the responsible parties for private and public access roadways.

7. Fire agencies which have wildland interface areas should study the feasibility of installing "No Parking - Fire Lane" signs on existing non-conforming public and private access roadways.

8. Review wildland pre-attack plans for all areas. Provide for public safe refuge areas on plans similar to the Malibu Bowl area, where evacuation or escape by civilians, is questionable. Identify indefensible areas on each map.

9. All areas within Region 1 should be encouraged to develop a standard pre-attack plan for the wildland interface areas. This allows operations to place resources quickly, and provides a reference for Incident Command which is developed in times of calm to be used in times of emergency.

10. Recommend that symbols on the pre-attack plans be universally recognizable and understood by all fire fighters.

11. Consider a survey of all departments that sent resources to the Calabasas Fire. This survey should be filled out by all appropriate officers, company officers, strike team leaders, and crew supervision overhead personnel. Analyze the survey results to help determine if training issues raised by the Calabasas Fire are being answered. The purpose of this survey Includes Items such as briefings attended, incident action plan discussions, safety issues, and LCES review.

GLOSSARY

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Aerial Fuels — All live and dead vegetation located in the forest canopy or above the surface fuels, including tree branches and crowns, snags, moss, and high brush.

Anchor Point — An advantageous location or point, usually a barrier to fire spread, from which to start constructing a fire line. It is used to minimize the chance of being flanked by the fire while the line is being constructed.

Area Ignition — Igniting, throughout an area to be burned, several individual fires either simultaneously or in rapid succession and spaced so that they soon influence and support each other to produce a hot, fast-spreading fire throughout the area. Also called simultaneous ignition.

Aspect — The direction a slope is facing, i.e., its exposure in relation to the sun.

Available Fuels — Those fuels that will burn during a passage of a flaming front under specific burning and fuel conditions.

Backfiring — When attack is indirect, intentionally setting fire to fuels inside the control line to contain a fire. Backfiring is a tactic that makes possible a strategy of locating control lines at places advantageous to the firefighter.

Barrier — Any obstruction to the spread of fire; typically an area or strip devoid of flammable fuel.

Blackline Concept — Fuels that remain between the main fire and a fire line are burned out to ensure safety of control forces and security of control lines.

Brush Fire — A fire burning in vegetation that is predominately shrubs, brush, and scrub growth.

Burning Out — Conducted when attack is direct or parallel, and the control line touches points of the fire. Burning out is intentionally setting fire to fuels inside the control line to strengthen the line. Burning out almost always is done by the crew boss as a part of line construction. The control line is considered incomplete unless there is no fuel between the fire and the control line.

Burning Period — That part of each 24-hour period when fires will spread most rapidly. Typically, this is from about midmorning to about sundown, or late afternoon.

Canopy — The stratum containing the crowns of the tallest vegetation present (living or dead), usually above 20 feet.

Celsius — (Centigrade) A temperature scale with 0°C as the melting point of ice and 100°C as the boiling point of water.

Chain — A measuring instrument consisting of 100 wire links, each 7.92 inches long, or 792 inches, or 66 feet.

Chinook, or Chinook Wind — A foehn wind blowing down the eastern slopes of the Cascades, Rocky Mountains, and over the adjacent plains in the United States and Canada. In winter, this warm, dry wind causes snow to disappear with remarkable rapidity; hence, it has been nicknamed the "snoweater." In hot, dry weather, Chinook winds can extend fire weather conditions quickly to the "extreme."

Cirrus — A form of high cloud composed of ice crystals, which often does not obscure the sun.

Climate — The prevalent or characteristic meteorological conditions of any place or region, and their extremes.

Cloud — A visible cluster of minute water and/or ice particles in the atmosphere above the earth's surface.

Cold Front — The leading edge of a relatively cold air mass that displaces warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, cloudiness, precipitation, and even thunderstorms may result. In case both air masses are dry, and there may be no cloud formation. Following a cold front passage (in the Northern Hemisphere), often westerly or northwesterly winds of 10 to 20 mph or more continue for 12 to 24 hours.

Combustion — The rapid oxidation of combustible materials that produces heat energy.

Combustion Period — Total time required for a specified fuel component to be burned completely.

Compactness	The spacing between fuel particles. This can be especially important in the surface layer of fuels, where the amount of air circulation affects rate of drying, rate of combustion, etc.
Condensation	The process by which a vapor becomes a liquid.
Conduction	The transfer of heat between molecules in contact with one another.
Conflagration	A raging, destructive fire. Often used to denote such a fire with a moving front as distinguished from a fire storm.
Continuity of Fuels	The proximity of fuels to each other that governs the fire's capability to sustain itself. This applies to aerial fuels as well as surface fuels.
Contour Map	A map having lines of equal elevation that represent the land surface.
Control Line	An inclusive term for all constructed or natural fire barriers and treated fire edges used to control a fire.
Control Line Standards	The depth and width to which fuels must be treated or removed to control any portion of a wildfire perimeter.
Convection	Vertical air movements resulting in the transport of atmospheric properties. In meteorology, atmospheric motions that are predominantly vertical, i.e., usually upward.
Convection Column	The thermally produced ascending column of gases, smoke, and debris produced by a fire.
Convective Winds	All winds, up, down, or horizontal, that have their principal origins in local temperature differences.
Creeping	Fire burning with a low flame and spreading slowly.
Crown Closure	The spacing between tree crowns; usually expressed as the percent of area covered by tree crowns in the forest canopy region as viewed from above.
Crown Fire	A fire that advances from top to top of trees or shrubs. Crown fires are classed as passive, active, or dependent, to distinguish the degree of dependence on the surface fire.

Cumulonimbus	The ultimate growth of a cumulus cloud into an anvil shape, with considerable vertical growth, usually fibrous ice crystal tops, and probably accompanied by lightning, thunder, hail, and strong winds.
Cumulus	A principal, low cloud type in the form of individual cauliflower-like cells of sharp nonfiberous outline and less vertical development than cumulonimbus.
Defensible Space	A fuel break adjacent to improvements in which you can defend improvements safely.
Dew Point	The temperature to which air must be cooled, at constant pressure and moisture content, in order for saturation to occur.
Direct Attack	A method of suppression that treats the fire, or all its burning edge, as a whole, by wetting, cooling, smothering, or by chemically quenching it or mechanically separating it from unburned fuel.
Diurnal	Daily, especially pertaining to cyclic actions which are completed within 24 hours, and which recur every 24 hours.
Dry Bulb	A name given to an ordinary thermometer used to determine the temperature of the air (to distinguish it from the wet bulb).
Dry Lightning Storm	A lightning storm with negligible precipitation reaching the ground.
Duff	A mat of partially decomposed organic matter immediately above the mineral soil, consisting primarily of fallen foliage, herbaceous vegetation, and decaying wood (twigs and small limbs).
Eddy	A whirl or circling current of air or water, different and differentiated from the general flow.
Elevation	The height of the terrain above mean sea level, usually expressed in feet.
Equilibrium Moisture Content (EMC)	The level at which dead fuels neither gain nor lose moisture with time, under specific constant temperature and humidity. The water vapor pressure in the air is equal to the vapor pressure in the fuel. A fuel particle, at EMC, will have no net exchange of moisture with its environment.

Equilibrium Vapor Pressure	Occurs when there is no net gain or loss of water molecules between the air and a solid or liquid.
Evaporation	The transformation of a liquid to the gaseous state. Heat is lost by the liquid during this process.
Extreme Fire Behavior	Implies a level of wildfire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rates of spread, prolific crowning and/or spotting, presence of firewhirls, and/or a strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment, behaving erratically and sometimes dangerously.
Fahrenheit	A temperature scale on which 32°F denotes the temperature of melting ice, and 212°F the temperature of boiling water, both under standard atmospheric pressure.
Fine Fuels	Fuels that are less than 1/4-inch in diameter such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash which, when dry, ignite readily and are consumed rapidly. (Also called flash fuels.)
Fire Perimeter	The entire outer edge or boundary of a fire.
Fire Storm	Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts near and beyond the perimeter, and sometimes by tornado-like whirls.
Firebrand	Any source of heat, natural or manmade, capable of igniting wildland fuels. Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or by gravity into unburned fuels.
Firebreak	A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.
Firing Out	Also called firing. The act of setting fire to fuels between the control line and the main fire in either a backfiring or burning-out operation.
Fire Line	The part of a control line that is scraped or dug to mineral soil. Sometimes called fire trail.

Firewhirl A spinning, moving column of ascending air which carries aloft smoke, debris, and flames. These range in size and intensity from a foot or two in diameter to small tornadoes.

Flanking Attacking a fire by working along the flanks, either simultaneously or successively, from a less active or anchor point and endeavoring to connect the two lines at the head.

Flanks of a Fire The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

Flareup Any sudden acceleration of fire spread or intensification of the fire. Unlike blowup, a flareup is of relatively short duration and does not radically change existing control plans.

Flash Fuels Fuels such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash that ignite readily and are consumed rapidly when dry. Also called fine fuels.

Flashover Rapid combustion and/or explosion of unburned gases trapped at some distance from the main fire front. Usually occurs only in poorly ventilated topography. More commonly associated with structural fire behavior.

Foehn (Pronounced "fern.") A type of general wind that occurs when stable, high pressure air is forced across and then down the lee slopes of a mountain range. The descending air is warmed and dried due to adiabatic compression. Locally called by various names such as Santa Ana, Mono, Chinook, etc.

Fog A cloud at or near the earth's surface. Fog consists of numerous droplets of water which individually are so small that they cannot be distinguished readily by the naked eye.

Front The transition zone between two different air masses.

Frost Crystals of ice formed and deposited like dew, but at a temperature below freezing.

Fuel Break A wide strip or block of land on which the native or preexisting vegetation has been modified permanently so that fires burning into it can be extinguished more readily. It may or may not have fire lines constructed in it prior to fire occurrence.

Fuel Moisture Content	The amount of water in a fuel, expressed as a percentage of the "oven-dry" weight of that fuel.
General Winds	Large-scale winds caused by high- and low-pressure systems, but generally influenced and modified in the lower atmosphere by terrain.
Gradient Wind	A wind that flows parallel to the isobars or contours and has a velocity such that the pressure gradient, Coriolis, and centrifugal forces acting in the area are in balance. It does not occur at the earth's surface due to fractional influence, but occurs at a height of roughly 1,500 feet above mean terrain height. Nearly synonymous with "free air" winds.
Ground Fire	All combustible materials lying beneath the ground surface, including deep duff, roots, rotten buried logs, peat, and other woody fuels.
Gust	A sudden, brief increase in the speed of the wind.
Head of a Fire	The most rapidly spreading portion of a fire's perimeter, usually to the leeward or upslope.
Heavy Fuels	Fuels of large diameter such as snags, logs, and large limb wood that ignite and are consumed much more slowly than flash fuels. (Also called coarse fuels.)
High	An area of relatively high atmospheric pressure that has a more or less closed circulation; an anticyclone. Winds around a high move clockwise in the Northern Hemisphere, while spiraling out from the high toward lower pressure.
Horizontal Continuity	The horizontal distribution of fuels at various levels or planes.
Hotspotting	Checking the spread of fire at points of more rapid spread, or special threat. It is usually the initial step in prompt control with emphasis on first priorities.
Humidity	The measure of water vapor content in the air.
Ignition	The initiation of combustion.

Indirect Attack — A method of suppression in which the control line is mostly located along natural firebreaks, favorable breaks in topography, or at considerable distance from the fire, and all intervening fuel is backfired or burned out. The strip to be backfired is wider than in the parallel method and usually allows a choice of the time when burnout or backfiring will be done.

Insolation — Solar radiation received at the earth's surface.

Instability — A state of the atmosphere in which the vertical distribution of temperature is such that an air particle, if given either an upward or downward impulse, will tend to move vertically away with increasing speed from its original level (unstable air).

Interface — That line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Inversion — A layer in the atmosphere where the temperature increases with altitude.

I-Zone — See Interface.

Ladder Fuels — Fuels that provide vertical continuity between strata. Fire is able to carry from surface fuels by convection into the crowns with relative ease.

Land Breeze — A light nighttime breeze that originates over the relatively cool land surface and flows out over the warmer coastal waters.

Lightning — A sudden visible flash of energy and light caused by electrical discharges from thunderstorms.

Litter — The uppermost layer of loose debris composed of freshly fallen or slightly decomposed organic materials such as dead sticks, branches, twigs, and leaves or needles.

Local Winds — Small-scale convective winds of local origin caused by temperature differences.

Long-Range Spotting — Large glowing firebrands are carried high into the convection column and then fall out downwind beyond the main fire, starting new fires. Such spotting can easily occur 1/4 mile or more from the firebrands' source.

Low	An area of relatively low atmospheric pressure in which winds tend to move in a counterclockwise direction, spiraling in toward the low's center.
Precipitation	The collective name for moisture in either liquid or solid form large enough to fall from the atmosphere and reach the earth's surface.
Pressure Gradient	The change in atmospheric pressure per unit of horizontal distance.
Psychrometer	An instrument for measuring atmospheric temperature and humidity, consisting of a dry-bulb thermometer and a wet-bulb thermometer (bulb covered with a muslin wick); used in the calculation of dew point and relative humidity.
Rainfall	A term sometimes synonymous with rain, but most frequently used in reference to amounts of precipitation (including snow, hail, etc.).
Rain Gauge	An instrument for measuring precipitation.
Rate of Spread	The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire; or as rate of forward spread of the fire front; or as rate of increase in area, depending on the intended use of the information. Usually its (forward) rate of spread is expressed in chains or acres per hour.
Reburn	1. Subsequent burning of an area in which fire has previously burned, but has left flammable fuel that ignites when burning conditions are more favorable. 2. An area that has reburned.
Red Flag Warning	An ongoing or imminent critical fire weather pattern or condition. The "warning" is provided by the National Weather Service to weather forecast users to alert wildland fire services of conditions conducive to extreme fire behavior.
Relative Humidity	The ratio of the amount of moisture in the air to the amount which the air could hold at the same temperature and pressure if it were saturated; usually expressed in percent.
Resistance to Control	The relative difficulty of constructing and holding a control line as affected by resistance to line construction and fire behavior. Also called difficulty of control.

Ridge	An elongated area of relatively high pressure extending from the center of a high-pressure region.
Roll Cloud	A turbulent altocumulus-type cloud formation found in the lee of some large mountain barriers. The air in the cloud rotates around an axis parallel to the range. Also sometimes refers to part of the cloud base along the leading edge of a cumulonimbus cloud; it is formed by rolling action in the wind shear region between cool downdrafts within the cloud and warm updrafts outside the cloud. Sometimes called rotor cloud.
Running	Behavior of a fire that is spreading rapidly, usually with a well-defined head.
Safety Island	An area for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety island close at hand, allowing the fuels inside the control line to be consumed before going ahead.
Saturated Air	Air that contains the maximum amount of water vapor it can hold at a given pressure and temperature (relative humidity of 100 percent).
Scratch Line	An unfinished preliminary control line hastily established or constructed as an emergency measure to check or slow the spread of a fire.
Sea Breeze	A daytime breeze in which cooler, higher pressure air from over coastal waters moves on shore to replace heated air rising off the warmer land mass.
Short-Range Spotting	Firebrands, flaming sparks, or embers are carried by surface winds, starting new fires beyond the zone of direct ignition by the main fire. The range of such spotting is usually less than 1/4 mile.
Size and Shape	Fuel characteristics affecting the fuel moisture time lag, the amount of heat required for ignition and to sustain combustion, and the burnout time of fuels. The surface-area-to-volume ratio is a representation of size and shape.
Slash	Debris left after logging, pruning, thinning, or brush cutting; also debris resulting from thinning, wind, or fire. It may include logs, chunks, bark, branches, stumps, and broken understory trees or brush.

Slope Winds	Small-scale convective winds that occur due to local heating and cooling of a natural incline of the ground.
Slope Percent	The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent. One hundred feet of rise to 100 feet of horizontal distance equals 100 percent.
Smoldering	Behavior of a fire burning without flame and barely spreading.
Snag	A standing dead tree or part of a dead tree from which at least the leaves and smaller branches have fallen. (Often called stub, if less than about 20 feet tall.)
Spot Fire	Fire set outside the perimeter of the main fire by flying (or rolling) sparks or embers.
Spotting	Behavior of a fire producing sparks or embers that are carried by convection columns and/or the wind and which start new fires beyond the zone of direct ignition by the main fire.
Stability	A state of the atmosphere in which the vertical distribution of temperature is such that an air particle will resist vertical displacement from its level (stable air).
State of Weather	A brief description of current weather that expresses the amount of cloud cover, kind of precipitation, and/or restrictions to visibility being observed at a weather observation site.
Subsidence	An extensive sinking motion of air in the atmosphere, most frequently occurring in polar highs. The subsiding air is warmed by compression and becomes more stable. Of particular importance due to the heating and drying of the air, it is often the cause of very rapid drying of fuels in the smaller size classes.
Suppress a Fire	To extinguish a fire or confine the area it burns within fixed boundaries.
Surface-Area-to-Volume Ratio	The ratio of the surface area of a fuel to its volume, using the same linear unit for measuring volume; the higher the ratio, the finer the particle.
Surface Fire	A fire that burns surface litter, debris, and small vegetation.

Surface Fuels	All materials lying on, or immediately above, the ground, including needles or leaves, duff, grass, small dead wood, downed logs, stumps, large limbs, low brush, and reproduction.
Surface Wind	The wind measured 20 feet above the average top of the vegetation. It is often a combination of local and general winds.
Temperature	A measure of the degree of hotness or coldness of a substance.
Temperature Lapse Rate	The amount of temperature change with altitude change, expressed as degrees Fahrenheit per 1,000 feet of rise or fall.
Thermal Belt	An area of a mountainous slope that typically experiences the least variation in diurnal temperatures, has the highest average temperatures, and thus, the lowest average relative humidity.
Thermometer	An instrument for measuring temperature; in meteorology, generally the temperature of the air.
Thunder	The sound emitted by rapidly expanding gases along the channel of a lightning discharge.
Thunderstorm	A storm invariably produced only by a cumulonimbus cloud, and always accompanied by lightning and thunder; usually attended by strong wind gusts, heavy rain, and sometimes hail. It is usually of short duration, seldom over 2 to 3 hours for any one storm.
Topography	The configuration of the earth's surface, including its relief and the position of its natural and manmade features.
Torching	Fire burning principally as a surface fire that intermittently ignites the crowns of trees or shrubs as it advances.
Vertical Arrangement	The relative heights of fuels above the ground and their vertical continuity, which influences fire reaching various levels or strata. (Surface fuels versus aerial fuels, and their relationships to one another.)

Vertical Development of Column	Depending on fire intensity and atmospheric conditions, the smoke or convection column might rise a hundred feet or many thousands of feet. A low-intensity fire with a low smoke column might be termed "two-dimensional," whereas a high-intensity fire with a well-developed convection column rising thousands of feet into the atmosphere can be termed a "three-dimensional" fire. (See Convection Column.)
Virga	Wisps or streaks of water or ice particles falling out of a cloud but evaporating before reaching the earth's surface.
Visibility	The greatest distance that prominent objects can be seen and identified by unaided, normal eyes. (Usually expressed in miles, or fractions of a mile.)
Warm Front	The discontinuity at the forward edge of an advancing current (or mass) of relatively warm air which is displacing a retreating colder air mass.
Weather	The short-term variations of the atmosphere in terms of temperature, pressure, wind, moisture, cloudiness, precipitation, and visibility.
Wet-Bulb Temperature	The lowest temperature to which air can be cooled by evaporating water into it at a constant pressure when the heat required for evaporation is supplied by the cooling of the air. It is measured by the wet-bulb thermometer, which usually employs a wetted wicking on the bulb as a cooling (through evaporation) device.
Wet Line	A fire control line, usually temporary, prepared by treating the fuels with water and/or chemicals which will halt the spread of the fire.
Wildfire	An unplanned wildland fire requiring suppression action, or other action according to agency policy, as contrasted with a prescribed fire burning within prepared lines enclosing a designated area, under prescribed conditions. A free-burning wildfire unaffected by fire suppression measures.
Wildland Fuels	Any organic material, living or dead, in the ground, on the ground, or in the air, that will ignite and burn.
Wildland/Urban Interface	See Interface.

Wind	The horizontal movement of air relative to the surface of the earth.
Wind-Driven Wildfire	A wildland fire that is controlled by a strong consistent wind.
Windspeed Meter	A handheld device that indicates wind speed, usually in miles per hour.

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