

Wildland Urban Interface

The WUI

A Firefighters Perspective





What is the WUI?

Interface – a condition where structures abut the wildland natural fuels environment.

- There is a clear line of demarcation between the structures and the wildland fuels along roads or back fences.
- Usually identified as housing tracts or developments adjacent to a wildland area
- There is a greater potential for house to house ignition due to close proximity of homes to each other usually small lots and construction type.

What is the WUI?

Intermix – a condition where structures are scattered throughout a wildland area.

- There is no clear line of demarcation; the wildland fuels are continuous outside of and within the developed area.
- Each structure must be assessed independently
- Usually more complex to triage than an interface condition
- Usually more complex to defend than an interface condition
- Usually requires a higher ratio of engines to structures than an interface condition

WUI Hazards

- The safety hazards that exist in a typical protection of structures from wildland fire assignments are significant.
- In addition to applying **THE 10 STANDARD FIREFIGHTING ORDERS** and avoiding **THE 18 WATCH OUT SITUATIONS**, **good judgment and planning** are extremely important because of the presence of homeowners and their families, pets and livestock, traffic, the media, and unknown hazards.

WUI Hazards

- Toxic structure fire smoke
- Driving hazards
 - Heavy smoke & reduced visibility
 - Parked cars on street
 - Septic Systems
 - Evacuees
 - Panicked drivers
 - Pedestrians, Pets, & Livestock
 - Trapped Vehicles on Road Blocking Egress
 - Downed Power Lines
- Taking Shelter in a structure ?
 - Civilian deaths in homes 2012 & 2013
- Hazardous Materials
 - Fuel Storage
 - Propane
 - Gas & Diesel
 - Sheds & Garages
 - Pesticides & Herbicides
 - Compressed Gas Cylinders
 - Flammable liquids
- Media

WUI Watch-Outs

Per Fireline Handbook

- Poor access and narrow one-way roads
- Bridge load limits
- Wooden construction and wood shake roofs
- Power lines, propane tanks, and HazMat threats
- Inadequate water supply
- Natural fuels 30 feet or closer to structures
- Structures in chimneys, box canyons, narrow canyons, or on steep slopes (30% or greater)
- Extreme fire behavior
- Strong winds
- Evacuation of the public (panic)

WUI Fuels

- Structures exposed to wildland fire in the urban interface can and should be considered as another fuel type. Size-up and tactics should be based upon fuels, weather, and topography, just as those criteria would be applied to any wildland fire.
- Ornamental landscape plantings are also fuel and can pose serious threats to structures due to proximity to the structure, i.e. foundation plantings.



LEADERS INTENT

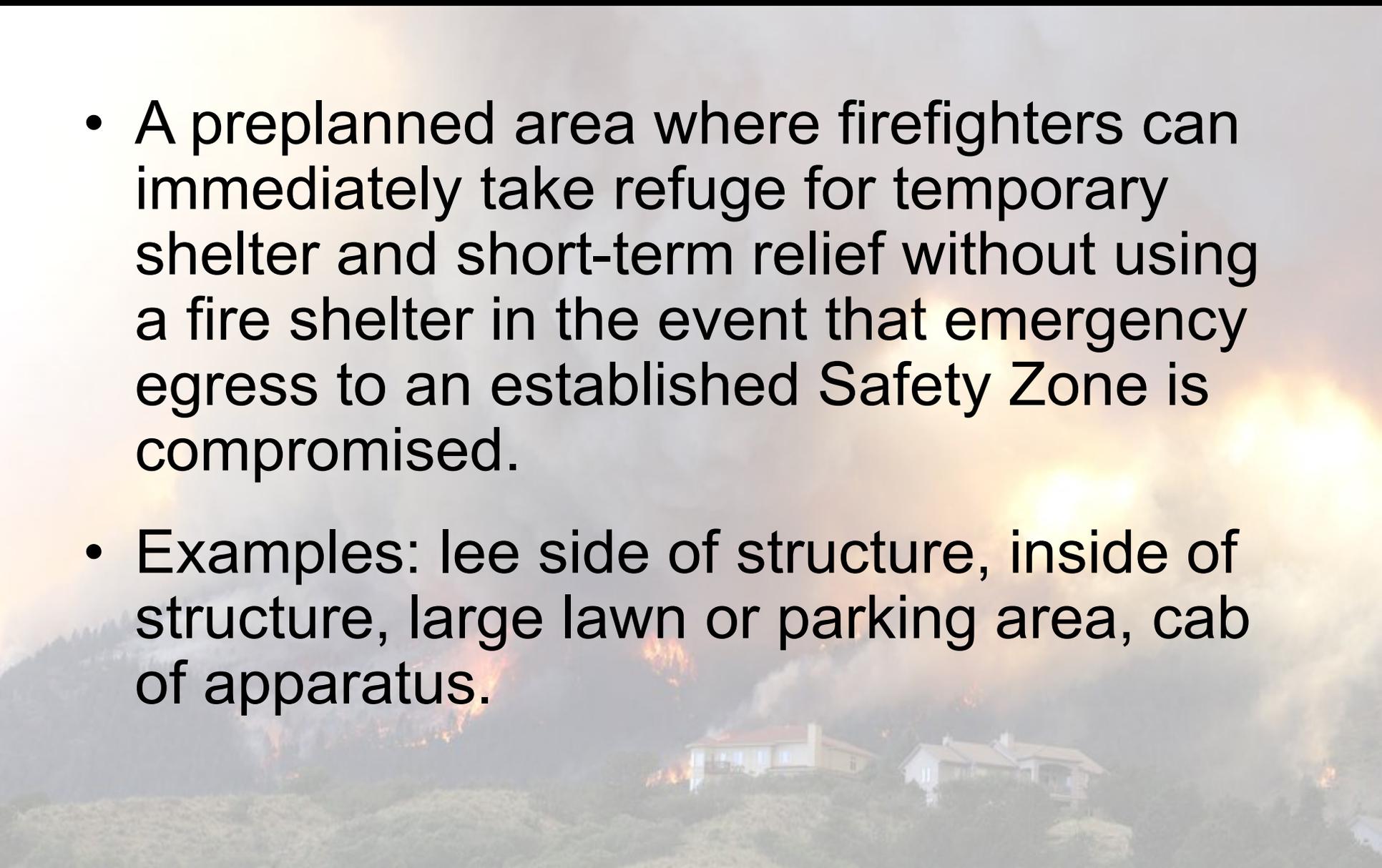
- **The first and foremost intent during structure protection is to keep firefighters and the public safe.**
- **Secondly, once that safety can be ensured, then we can aggressively work towards keeping the wildland fire away from communities and structures.**

LEADERS INTENT

- The development of all strategies and tactics should utilize the risk management process to insure firefighter safety. **Protecting structures from a wildland fire will not be possible in every situation.** Risk to firefighters, fire behavior and availability of resources will dictate the strategies that will be used. Fire Behavior is in command!
- When there is a need to engage in structure protection, firefighters will ensure that they are taking safe, appropriate, and reasonable tactical actions for which they are trained and equipped and are appropriate for the fire behavior.

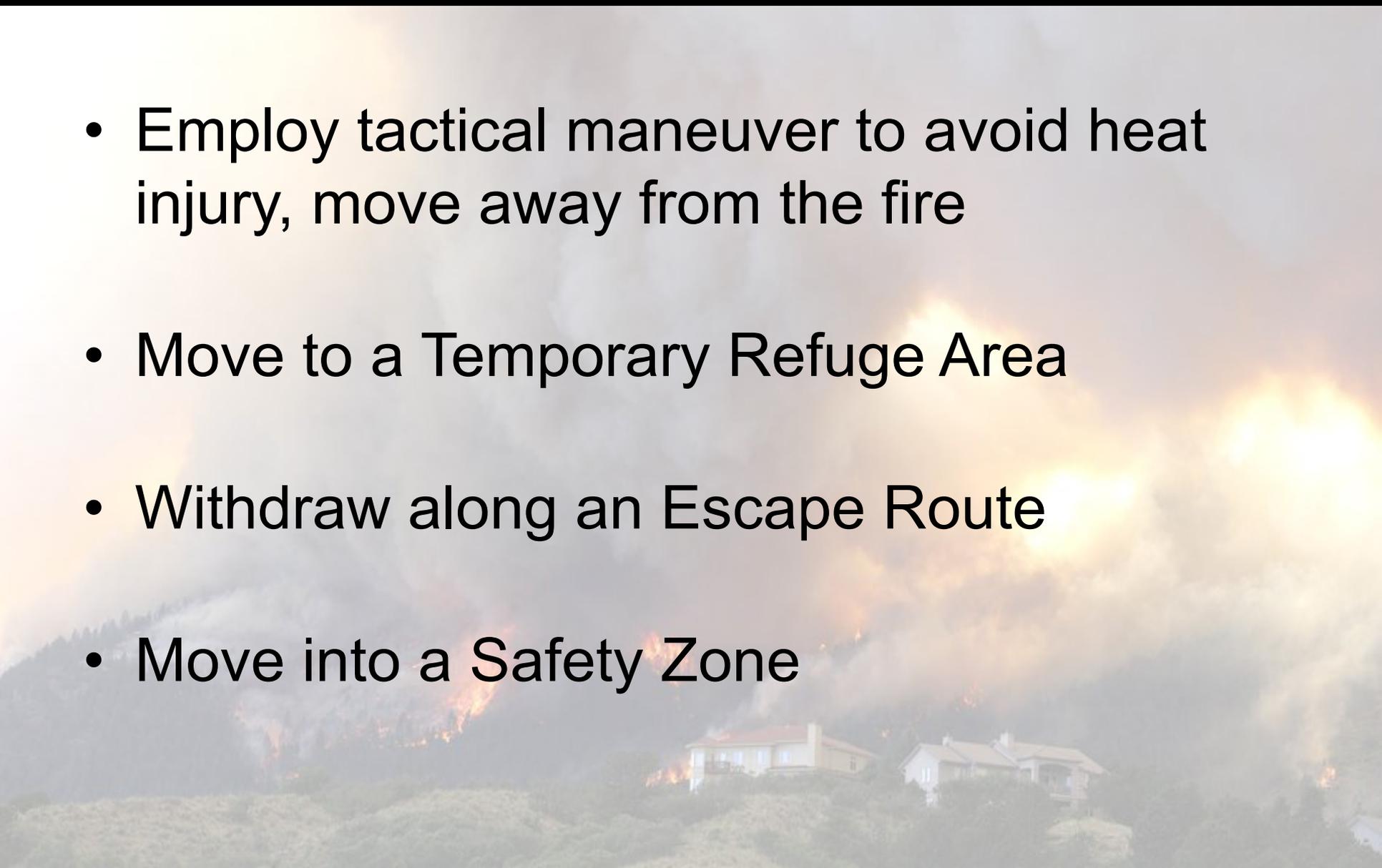
Temporary Refuge Area (TRA)

- A preplanned area where firefighters can immediately take refuge for temporary shelter and short-term relief without using a fire shelter in the event that emergency egress to an established Safety Zone is compromised.
- Examples: lee side of structure, inside of structure, large lawn or parking area, cab of apparatus.



Always have an exit strategy:

- Employ tactical maneuver to avoid heat injury, move away from the fire
- Move to a Temporary Refuge Area
- Withdraw along an Escape Route
- Move into a Safety Zone



How Homes Burn Lessons from Texas 2011





This home on the Willow Creek South Complex was built with fire-resistant materials and surrounded by an area of defensible space — where vegetation and combustible items had been cleared.



Relatively fire-resistant homes can ignite during low-intensity wildfires if a path of combustible material, such as stairs or support beams, leads the fire up to the home.



The porch of this home on the Dyer Mill Fire was ignited by embers that were spread by strong winds. Fortunately, a fire engine was stationed near the home and firefighters were able to extinguish the blaze before it spread to the house.



Combustible decks that aren't treated with fire-resistant paint or chemicals are more likely to catch fire.



Continuous patrol of homes is a key factor in preventing ignitions after the fire front has already passed through. In many instances when homes do ignite, combustible attachments — such as decks and fences — are a contributing factor because they carry flames right up to the structure.

This House Has Bigger Issues



Patio furniture can provide a wildfire enough fuel to ignite a home. Note the green trees on each side of the home did not catch fire, which means they were not contributing factors.



This Bastrop home caught fire after flames crept through surrounding pine needles and bushes until they reached the eaves of the house.



Embers from a nearby fire gained access to this home's interior, igniting it and causing significant damage.



Note the unburned vegetation surrounding the home, which indicates ground fire intensity was low and points to ember intrusion as a probable factor in ignition.



Open or unscreened foundation vents provided embers access to a vulnerable pier and beam foundation.



Combustible soffits can melt or ignite, giving embers access to an attic. Once inside, the embers can go undetected until it is too late to save the home.



The concrete driveway and gravel walkway created a critical space that firefighters needed to defend this home in the path of the Pinnacle Fire in Austin.



The noncombustible stone retaining wall along the back of this home helped stop the spread of the Pinnacle Fire. Conversely, retaining walls constructed out of combustible materials such as railroad ties can ignite easily and burn intensely for long durations.



Wildfire traveled unimpeded through the landscape of this home, igniting shrubbery in front of a window. Fortunately, the homeowners used fire-resistant, double-paned windows. Although the first pane was compromised, the inner pane withstood fracture, helping the home survive.



Not so lucky



The tiered landscape, elevated retaining wall, irrigated lawn, flagstone fire break and non-combustible wrought-iron fence likely provided additional protection to this home.

Jack Cohen – Your Home Can Survive

Structure Triage

Your Safety & Effectiveness

Depends On

Tough Choices & Your Good Decisions

Merriam-Webster:

Triage: The sorting of and allocation of treatment to patients and especially battle and disaster victims according to a system of priorities designed to maximize the number of survivors.

STRUCTURE TRIAGE CATEGORIES

1. **Not-Threatened:** Safety Zone and TRA are present and construction features or defensible space make it unlikely that the structure will ignite during initial fire front contact.
2. **Threatened Defensible:** Safety Zone and TRA are present and construction features, lack of defensible space, or other challenges requires firefighters to implement structure protection tactics during fire front contact.
3. **Threatened Non-Defensible:** Either there is no Safety Zone or TRA present and/or the structure has challenges that do not allow firefighters to safely commit to stay and protect the structure during fire front contact.

STRUCTURE TRIAGE CONSIDERATIONS

- Forecasted fire behavior and intensity - the greater the intensity, the greater the defensible space required. Fire Behavior is in command!
- Is there adequate space to park your apparatus safely based upon forecasted fire behavior?
- Safety Zones should be identified and designated based upon forecasted fire behavior.
- Temporary Refuge Areas (TRA) should be preplanned and identified in the event that emergency egress to an established Safety Zone is compromised.

STRUCTURE TRIAGE CONSIDERATIONS

Evaluate the location of the structure and the surrounding area with the forecasted fire behavior in mind. Fire Behavior is in command.

- Should I even be in the neighborhood?
- Are wind and slope in alignment with topography leading to the structure?
- Where is the location of the structure on the slope; canyon bottom, mid-slope, or ridge top.
- Is the structure in or near a chute, chimney, saddle, or other topographic hazard?
- Time of day, slope aspect – Why does this matter?

STRUCTURE TRIAGE CONSIDERATIONS

- Evaluate the location of the neighborhood/structure and the surrounding area with the forecasted fire behavior in mind.
- Should I even be in the neighborhood?
- Type, condition, density, and continuity of fuels.
- Is the structure in or near a chute, chimney, saddle, or other topographic hazard?

STRUCTURE TRIAGE CONSIDERATIONS

- Do you have adequate lookout and communication capability?
- Evaluate the proximity of the fuels and forecasted flame lengths in relation to the structure; is there defensible space? Fire Behavior is in command!
 - What is the position of the structure on the slope relative to fire spread,
 - Avoid narrow canyon bottoms, mid-slopes with fire below, or narrow ridges near chimneys and saddles.

STRUCTURE TRIAGE CONSIDERATIONS

- Are there narrow roads, unknown bridge limits, and septic tank hazards?
- Are there ornamental plants and combustible debris next to the structure?
- Does the structure have open vents, eaves, decks, and other ember traps?
- Are there power lines adjacent to the structure?

STRUCTURE TRIAGE CONSIDERATIONS

- Is there an adequate limited water supply to support the necessary flow rates and gpm output?
- **Did the property owners remain onsite?**
- Does the structure have a flammable roof and/or siding (wood roof and siding and/or vinyl siding, along with inadequate defensible space, may make structure impossible to protect)?
- Is there adequate time and available resources to protect the structure (if you do not have time to position resources or there are a lack of resources, then it may be impractical to protect the structure)

Let's Play Can You Save It?





1

Triage This Home



2

Triage This Home

©IRES



3a Triage This Home

© IRES



3b

Triage This Home



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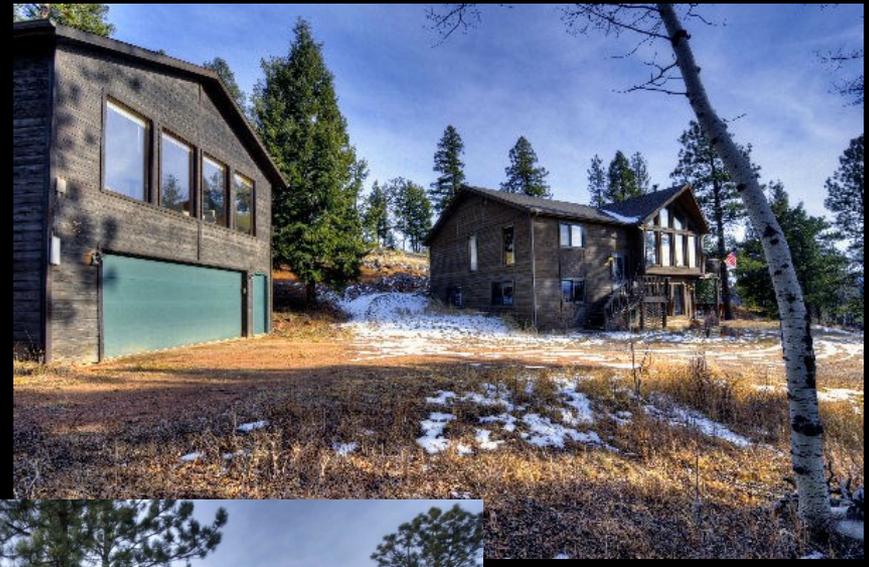
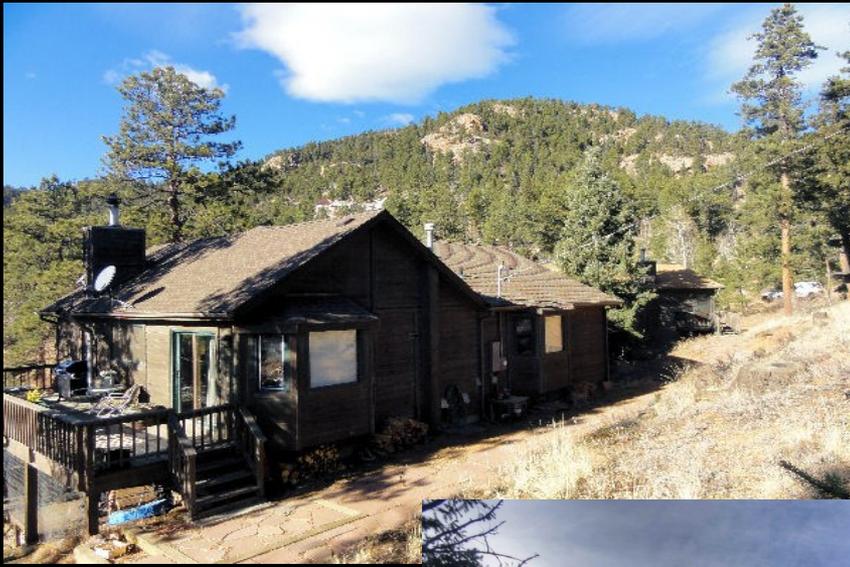
Triage This Home



11 Triage This Home



12 Triage This Home



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Triage This Home



14

Triage This Home

Structure Preparation





Equipment Placement

- Identify escape routes and Safety Zones and TRA's and make them known to all personnel
- STAY MOBILE and wear all of your PPE
- Back equipment in for a quick escape
- Park in a cleared area (watch for overhead hazards)
- Protect your equipment (park behind the structure, placing the structure between equipment and fire front; be aware of spot fires occurring behind you)

Equipment Placement

- Watch for hazards (drop-offs, pot holes, above-ground fuel storage, chemicals, and septic tanks)
- Keep egress routes clear
- Have an engine/personnel protection line charged and readily available
- Avoid long hose lays
- Try to keep sight contact with all personnel

Preparing the Structure

- Determine if residents are home. If so, advise them to leave.
- For roof access, place the owner's ladder at a corner of the structure on the side with the least fire threat and away from the power drop.
- Clear the area around above-ground fuel tanks, shutting off tanks
- Place combustible outside furniture inside the structure
- Close windows and doors, including garage, leaving unlocked

Preparing the Structure

- Remove combustibles immediately next to the structure and scatter firewood
- Construct a fire line around out-buildings, power poles and fuel tanks
- Remove vegetation from the immediate area of the structure
- Have garden hose(s) charged and placed around structure for immediate use. Need to verify if power & well pump are on & reliable.
- MAY USE THE STRUCTURE AS A TEMPORARY REFUGE AREA (TRA) - ???

Structure Protection



STRUCTURE PROTECTION TACTICAL ACTIONS

- After making a fire behavior forecast and triaging the assigned structures, responders must now implement the necessary tactics to defend the structure from the advancing fire front. Fire Behavior is in command!
- Supervisors must keep in close communication with those they supervise and adjoining forces in the area. The following are the seven tactical actions available to structure protection resources:

STRUCTURE PROTECTION TACTICAL ACTIONS

- **CHECK AND GO**
- **PREP AND GO**
- **PREP AND DEFEND**
- **FIRE FRONT FOLLOWING**
- **BUMP AND RUN**
- **ANCHOR AND HOLD**
- **TACTICAL PATROL**

CHECK AND GO

- “Check and Go” is a rapid evaluation to check for occupants requiring removal or rescue.
- **Structure Triage Category: Threatened Non-Defensible**
- This tactic is most appropriate when there is no Safety Zone or TRA present and the forecasted fire spread, intensity, and the projected impact time of the fire front prohibit resources from taking preparation action to protect the structure.
- Evaluate the structure for follow up action when additional resources become available, the fire front passes or fire behavior intensity is reduced

PREP AND GO

- “Prep and Go” implies that some preparation of the structure may be safely completed prior to resources leaving the area.
- **Structure Triage Category – Threatened Non-Defensible**
- A tactic used when a Safety Zone and TRA are not present and/or when fire spread and intensity are too dangerous to stay in the area when the fire front arrives, but there is adequate time to prepare a structure for defense ahead of the fire front.
- Utilized for structures where potential fire intensity makes it too dangerous for fire resources to stay when the fire front arrives

PREP AND GO

- There is some time to prepare a structure ahead of the fire; resources should engage in rapid, prioritized fire protection preparations and possibly foam the structure prior to leaving
- Resources should leave with adequate time to avoid the loss of Escape Routes
- Advise residents to leave and notify supervisors of any residents who choose to stay so that you can follow-up on their welfare after the fire front passes
- As with Check and Go, Prep and Go is well suited for engine strike teams and task forces

PREP AND DEFEND

- “Prep and Defend” is a tactic used when a Safety Zone and TRA are present and adequate time exists to safely prepare a structure for defense prior to the arrival of the fire front.
- **Structure Triage Category – Threatened Defensible**
- An ideal multiple resource tactic especially in common neighborhoods where efforts may be coordinated over a wide area. A tactic used when it possible for fire resources to stay when the fire front arrives. Fire behavior **MUST** be such that it is safe for firefighters to remain and engage the fire
- Adequate escape routes to a safety zone must be identified. A safety zone or **TRA** must exist on site
- Firefighters must be vigilant to sudden changes in fire intensity and be prepared to move to the TRA or withdraw along the escape route to the safety zone
- Adequate time must exist to safely prepare the structure for defense prior to the arrival of the fire front

FIRE FRONT FOLLOWING

- “Fire Front Following” is a follow up tactic employed when Check and Go, Prep and Go, or Bump and Run tactics are initially used.
- A tactic used to come in behind the fire front.
- This action is taken when there is insufficient time to safely set up ahead of the fire or the intensity of the fire would likely cause injury to personnel located in front of the fire
- The goal of “Fire Front Following” is to search for victims, effect perimeter control, extinguish spot fires around structures, control hot spots and reduce ember production.

BUMP AND RUN

- “Bump and Run” is a tactic where resources typically move ahead of the fire front in the spotting zone to extinguish spot fires and hot spots, and to defend as many structures as possible.
- Bump and Run may be effective in the early stages of an incident when the resource commitment is light and structure protection is the priority.
- Bump and Run may also be used on fast moving incidents when there are adequate resources available, but where an effort must be made to control or steer the head and shoulders of the fire to a desired end point.
- Perimeter control and structure protection preparation are secondary considerations with the Bump and Run tactic.

BUMP AND RUN

- Resources must remain mobile during Bump and Run and must constantly identify escape routes to Safety Zones and Temporary Refuge Areas as they move with the fire front.
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BUMP AND RUN

- Perimeter control and structure protection preparation are secondary considerations with the Bump and Run tactic.
- Resources must remain mobile during Bump and Run and must constantly identify escape routes to Safety Zones and Temporary Refuge Areas as they move with the fire front.
- Bump and Run is a defensive tactic when fire front impact in the WUI is imminent and there are not enough resources to effectively take perimeter control action. It is an offensive tactic when resources are steering the head of the fire to a desirable end point.
- The tactic is useful when terrain and fuels are suitable for mobile attack.

BUMP AND RUN

- Fire line supervisors and strike team/task force leaders must realize that Bump and Run places resources in front of the advancing fire front and that extreme caution should be exercised.
- Control lines in front of the fire should be identified and prepared with dozers and fire crews enabling the bump and run resources to direct the fire to logical end point. This is a frontal attack strategy and a watch out situation. Control lines in front of the main fire must be reinforced with retardant drops, coordinated firing operations and engine support.

ANCHOR AND HOLD

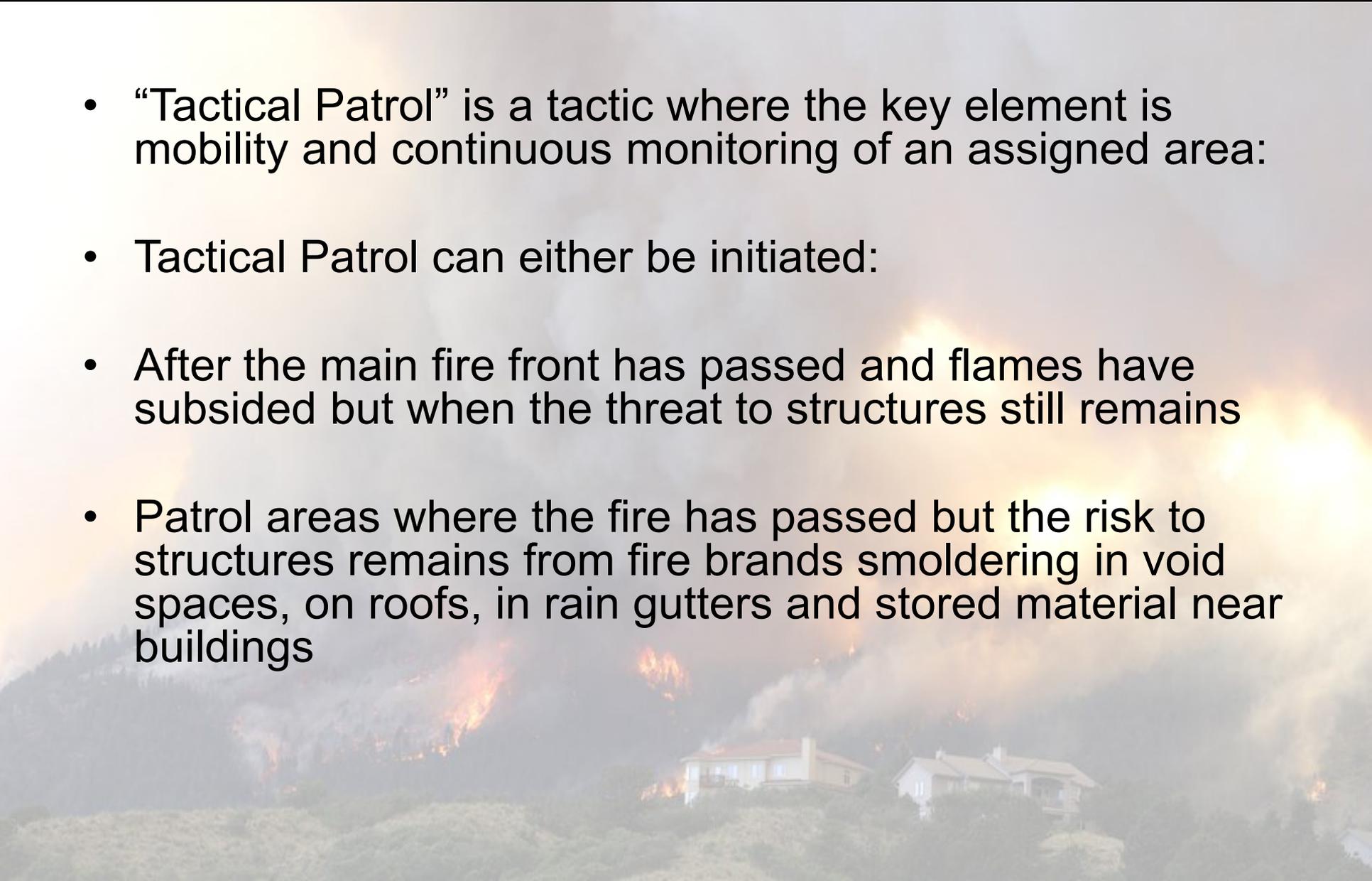
- “Anchor and Hold” is a tactic utilizing control lines and large water streams from fixed water supplies in an attempt to stop fire spread. The goal is to extinguish structure fires, protect exposures, and reduce ember production.
- Anchor and hold can be referred to as taking a stand to stop the progression of the fire.
- Anchor and hold tactics are more effective in urban neighborhoods where the fire is spreading from house to house.
- Establishing an anchor and hold line requires considerable planning and effort and utilizes both fixed and mobile resources

ANCHOR AND HOLD

- Fixed engines should be spotted in safe areas where they can safely withstand any fire situation.
- Mobile engines or task forces can engage in individual structure defense actions or perimeter control and re-supply from fixed water source.
- Mobile engines should be prepared to re-deploy to other areas should the fire escape the Anchor and Hold line.
- Ground resources, such as engine crews and fire crews should staff hose lines and be prepared to extinguish hot spots, fire perimeter, and structures.
- Hand crew strike teams should be deployed to construct fire control lines wherever needed and conduct firing operations.

TACTICAL PATROL

- “Tactical Patrol” is a tactic where the key element is mobility and continuous monitoring of an assigned area:
- Tactical Patrol can either be initiated:
- After the main fire front has passed and flames have subsided but when the threat to structures still remains
- Patrol areas where the fire has passed but the risk to structures remains from fire brands smoldering in void spaces, on roofs, in rain gutters and stored material near buildings



TACTICAL PATROL

- In neighborhoods away from the interface where there is predicted to be significant ember wash and accumulated ornamental vegetation.
- The goal is to patrol areas downwind of potential ember showers
- This tactic should be used to extinguish hot spots or secondary structure ignitions, and address safety issues such as power lines, weakened trees, and other hazards.
- Vigilance, situational awareness and active suppression actions are a must

Post Fire Analysis Waldo Canyon 2012





What Happened Here?



Wood shake roofs took out the entire block.
Heavy fire department protection saved 4.



What Do You Think?



Very Random



Great D-Space



Did “Big Fire” Hit This Neighborhood?

Mt. Shadows 2013- Before



Mirror Lake Court / Majestic Drive

The Denver Post

Mt. Shadows 2013- After



Mirror Lake Court / Majestic Drive

The Denver Post



Over 100 homes lost in structure to structure conflagration.







Just a few feet can make a difference.



Opinions?



**Were Some of These
Homes Protected?**



Ponderosa Stringer Carried Fire



Embers or Direct Impingement?



Why didn't these homes burn?



#WALDOCANYONFIRE

WALDO CANYON FIRE MIRACLES

Why junipers are bad things. Ignited by embers. This was extinguished before the fire breached the door. No Miracle - Good save!



**Not the time
to start Mitigating!**

Stay Safe!



Missiles

Duck & Cover