Facilitated Learning Analysis

USDA FOREST SERVICE

November 4, 2011

INTRODUCTION

This Facilitated Learning Analysis was conducted under the authority of the Regional Forester, Southern Region and the Director, Aviation and Fire Management, Southern Region. The delegation letter is included in the appendix to this report. The FLA was closely coordinated with the Forest Supervisor, Ouachita National Forest and his staff and affected District Ranger. The FLA Team appreciates the cooperation and hospitality of the leadership and employees of the Ouachita National Forest in supporting this analysis. Click here for a chronological view of the prescribed burn incident.

SUMMARY

On September 11, 2011, the burning crew on a ranger district on the Ouachita National Forest in Arkansas headed to the woods for another routine day of prescribed burning. This was important work: Restoring short-leaf pine is a major goal of the forest and prescribed burning is an important tool in meeting that goal. Though 9/11 was special in the minds of a nation, for those headed to the woods, it was going to be a day just like every other day, or so they thought as they gathered up their gear.

With a district target that typically hits fifteen thousand acres, this was a group of confident burners who knew what they were doing and had years of experience in conducting burns with the kind of weather and fuel conditions that awaited them at the burn site. The day was planned around a 600 acre block; a portion of a 3632 acre project that was originally set up for ignition by helicopter. However, with a summer characterized by unfavorable weather, the possibility of getting a helicopter diminished and the decision was made to break the larger area into blocks that could be hand burned. Another smaller block had already been successfully burned a few days earlier.

At 10:15 in the morning, the Burn Boss conducted a morning briefing with a crew consisting of a Firing Boss, two John Deere 450 dozers, two Kubota utility vehicles and two Type-6 engines plus a five-member firing crew. In total, 11 individuals would participate in the burn, although one (Crew Member #5) was not present at the briefing, but would arrive and be briefed later after checking on a previous burn in same vicinity. A test fire was lit at 10:46 and at 11:01 dispatch was notified that the crew would proceed with the burn. Weather for the day was typical for other burns that had been conducted in the preceding weeks.

SUMMARY (CONT.)

Initial attempts at firing resulted in fire behavior that was at the low end of the prescription, with flame lengths you could hop over of less than a foot and many starts going out before they could carry. Fuel conditions were variable and the burn area included harvested units (with heavier fuels and site preparation objectives), some mature pine stands, and younger pine plantations (with lighter fuels and fuel reduction objectives that included minimizing damage to existing trees). Additionally, there were young pine plantations where the objective was to avoid damaging the new growth. Early on, members of the crew noticed that fire behavior was highly variable from area to area, with more severe behavior in the seed-tree harvest units, which was expected given the heavier fuels and openness of the stand. Not all the stands that had recent harvest activity were correctly depicted on the map that was furnished that morning so the crew was careful to take notice of the different burning conditions as they moved through their assignments.

The burn progressed normally until about 14:00 when members of the crew noticed a change in wind speed coming from the north and a dramatic increase in fire activity with jackpots of fuel showing extreme behavior with torching of individual trees. At this point, a member of the firing crew, Crew Member #1, who was working in a seed-tree harvest unit called to say that he needed help. His radio calls to the Burn Boss became increasingly more urgent. The Burn Boss, the Firing Boss and the crew member closest to him, Crew Member #2, all tried to determine the nature of the situation and offered advice about finding a way out of the burn and reminding him that his fire shelter was an option if he couldn't find an escape route. Finally, the radio was keyed twice with no further communication and the members of the crew who could monitor the radio traffic feared the worst.

The Burn Boss was using his vehicle's horn to indicate the location of the road so the entrapped burner would know which way to go in the thick smoke. The tactic paid off and Crew Member #1 was found a few minutes later safely on the road. However, during the entrapment, he had deployed his shelter, run through an actively burning area to reach the road and sustained first and second degree burns to his hands, face and legs.

Following an initial assessment of Crew Member #1's injuries, he was transported to an emergency room at the local hospital and then to a regional burn center, where he spent 2 days and one night and was released after treatment for second degree burns on his hands and face.

EVENTS AND OUTCOME

The main focus of this FLA revolves around the fact that Crew Member #1 found himself in a situation where he was entrapped by fire and subsequently deployed his fire shelter. These events commenced at approximately 13:30 when the Burn Boss met with Crew Members#1 & #2 along Forest Road 207. At that time, the discussion was about using a strip-head technique to ignite the fuels in a seed-tree harvest unit near the intersection of Forest Road 207 and the intersection with Forest Road Y08.

Prior to this meeting, the Burn Boss had instructed Crew Members#1 &#2 to use an interior strip-head technique to burn the southern portion of the seed-tree unit. Crew member #2 had radioed back to the Burn Boss that the brush was too thick and that he didn't feel comfortable with the ability to penetrate the thick and tangled fuel. The Burn Boss responded that they could light the perimeter. They did this up to a small drain, a green belt in local terminology, because it was uncut in the harvesting operation.

Events and Outcome (cont.)

Up until then, fire behavior had been low. The crew had been concerned that the low intensity fire was not fully meeting the intent of the site prep burns in the harvest units. At about this time, some crew member were observing an increase in wind speed from the north or northwest and an increase in fire behavior. But this observation was not communicated to all personnel on the burn .

When the Burn Boss met with Crew Members 1 &2 along Road 207, he instructed them to utilize and old logging road and to also traverse the cut unit in a westerly direction along the slope to put fire into the head of the cut unit. Crew members 1 and 2 agreed that Crew Member #1 would walk the old logging road and Crew Member #2 would take the northern route and come out on road PR14. Crew Member#2 did so, laying a line of fire about 200 feet to the north of Crew Member #1's line. Crew Member#2 saw Crew Member #1 at about the location of an old log landing at the end of the road and continued west.

Crew Member #1 continued beyond the old log landing for another few hundred feet and hooked around the end of the small drain, the green belt, turning to the south. His plan was to tie in firing with the fire coming up the hill toward the north and to exit the stand down the green belt to the east. At the head of the drain, Crew Member#1 observed fire in every direction and began to realize that he was entrapped. He called on the radio to the Burn Boss and said that he needed help in getting out. The Burn Boss advised him to head east to Road 207 if he could.

The Burn Boss, who was on the northwest portion of the burn, drove around to Road 207 where he had last talked with Crew Members #1 and #2 and tried to provide guidance to Crew Member#1 by sounding his vehicle's horn. Meanwhile, Crew Member #2 and the UTV #1 were contacting Crew Member #1 by radio and advising him to head north if possible or east to Road 207. UTV #1 told Crew Member#1 to remember his fire shelter and to use it if he needed to.

Crew Member#1 was making his way from an area of very heavy fuel accumulation west of the green belt to the east where he remembered his escape route. At the head of the green belt, it became obvious to Crew Member #1 that he was entrapped and that trees were flaring around him. The heat was growing intense and the smoke was choking and reduced visibility to only the immediate area.

Crew Member# 1 tried to remove his fire shelter from the bag but had trouble finding the flap. He removed his web gear to get the shelter out got the shelter out of the bag but couldn't get it fully deployed with his gloves on. He removed his right glove, tried to shake out the shelter with fire and wind around him. He deployed the shelter on unburned leaf litter and got inside without his web gear, and his right glove. His drip torch was next to him along with his web gear. His hard hat was on in the shelter but fell off when exiting the shelter.

Within less than a minute he noticed that fire was inside the shelter burning the leaf litter that the shelter was deployed on. At this point, the burns to his face likely occurred. He abandoned the shelter. By this time the flaring hardwood crowns had quieted and some of the flaming front had passed. Disoriented from the smoke and confusion of an altered landscape, he heard the vehicle horn being sounded by the Burn Boss and ran south and then east to Road 207. He emerged on Road 207, a distance from the deployment site of about 300 feet, a short distance from where he entered the harvest unit but south of it.

EVENTS AND OUTCOME (CONT.)

While running through the fire, he was without his hard hat and his right glove but was wearing safety glasses that had stayed on throughout the deployment and likely had protected his eyes from damage. At the road, the Burn Boss and others assessed Crew Member#1's injuries and concluded that he had burns to his face, and right hand, knees and back side. He seemed hot and it being a hot day, he was treated for heat stress and to cool any areas of heat on his pants. During the run through the fire, areas on his legs and back side were burned and causing pain.

"I WASN'T THINKING LCES, I WAS THINKING GET THE FUEL OUT THERE AND BURN"

Following first aid treatment and an assessment that the burns to the face and hands were serious, Crew Member #1 was transported to a local hospital by UTV #2 operator at 15:06. He was treated at the emergency room at the local hospital, stabilized and then transported to a burn unit at a hospital in Little Rock, Arkansas. Crew Member #1 was released two days later and was able to participate in this FLA.

At the time of the incident, the other member of the crew were on the west side of the burn dealing with some power poles that needed to be raked to keep them from burning and firing other parts of the burn. As everyone on the burn was on crew-net on their radios, some crew members did not hear the incident-related traffic on the radio and only learned of the incident well after Crew Member# 1 was out of the burn. UTV #2 operator, who had been in contact with Crew Member# 1 and provided the advice to utilize his fire shelter, had made his way to where first aid was being administered. Dozer operator #2 and Crew Member #4 also helped with first aid.

After Crew Member 1 was transported by the person who had been operating the UTV #2, the Burn Boss assembled the crew in the parking area at the junction of CO 207 and County Road 14. A debriefing was held there and everyone told what had happened. Notification was made to the District Ranger, the Fire Staff officer in the Supervisor's Office and through safety channels.

Shortly after this, dispatch notified the Burn Boss that a wildfire had been reported in the district's initial attack area. The decision was made to send everyone but the Burn Boss, Dozer Operator #1 and Crew Members #2 and #3 who remained on the burn with a dozer and an engine. They patrolled until they were confident that the burn was safe and then proceeded to the wildfire.

Dozer Operator #2: "Need to cut back on, minimize interior ignition as that's where there is high risk and we've all gotten into a bad situation at one time or another".

Crew Member #3: "Didn't think twice about LCES because it was a prescribed burn….Was not thinking about LCES because of fire behavior at the time".

The Firing Boss : "Need LCES in place, and we all take that for granted especially in a prescribed fire".

Three firefighters took turns in handling the radio communications with the entrapped firefighter. Thoughtful choices about what information to relay may have meant the difference between life and death. Each radio transmission made use of precious seconds in conveying critical information. Guidance was provided to help the trapped firefighter "think" and overcome panic; reminded him to use his fire shelter; and told him where he was and how to get out by following the sound of the horn. Equally important, was the wisdom of other crew members staying off the airwaves allowing these life-saving communications to occur during a few minute period. This reflected a seasoned and experienced crew.

ROCK CREEK PRESCRIBED BURN CHRONOLOGY - 9/11/2011

Note: Unless otherwise indicated, firing throughout the prescribed burn is conducted with handheld drip torches. Additional equipment includes transport with rollback lowback; two dozers (one 450J Dozer and one 450G Dozer), two Forest Service Type 6 Fire Engines, and two Kubota UTVs. Times were reconstructed and they are often approximate, not exact. Crew member #1 is the individual who deploys their shelter.

1015: Morning briefing for Rock Creek Prescribed burn at the intersection of Road 207 and Road PR14 (parking area).

1045:Burn Boss takes the weather and conducts test fire at the intersection of County Road 207 and Forest Road Y08

1100-1210:Burn Boss notifies dispatch that they are proceeding with the prescribed burn and provides the following directions to the crew:

- Crew Member #1 and #2 instructed to start firing from intersection of the Y08 road from 207 heading west with drip torch.
- Firing Boss and UTV #1 follow behind Crew Members #1 & 2 touching up areas that burnt out.
- Fire Engine patrols the Y08 road
- Dozer #1 staged at intersection of Y08 and 207 roads
- Burn Boss and Fire Crew Member #3 fire the tree plantation near the end of the Y08 road

1210-1330:Burn Boss moves in circular pattern around the perimeter of the project area to check on efforts and provide direction to crew members.

- Instructs Crew Member #3 to finish firing the tree plantation at the end of Y08road, moving eastward as they fire from the road.
- Burn Boss proceeds east down Y08 to tie in with Crew Member #1 and #2 at the seed tree stand and discuss firing techniques. Crew Member #1 lights the edge of the pine plantation/seed tree stand and Crew Member #2 fired an old road going through the interior of the stand.
- Burn Boss observes fire activity in the seed tree stand was sustained 1 foot flame length, with increased fire activity of 4-6 foot flame lengths limited to the jackpots of fuel. Instruct Firing Boss and UTV#1 to light another interior seed tree stand past the end of Y08 road.
- Burn Boss and Fire Crew Member #3 proceed to the end of Road Y08 and stage there until the Firing Boss and UTV#1 return to the fireline. Burn Boss instructs the Firing Boss to utilize Crew Member #3 and UTV#1 to fire the remainder of the line to PR119.

1330 to 1420:Burn Boss instructs Crew Member #1 and #2 to use the striphead firing technique to light the seed tree stand along the 207 road, just north of the Y08 and 207 intersection. Crew Member #1 discussed with the Burn Boss that he would be more comfortable lighting off the 207 road due to the dense vines and brush and Burn Boss concurs. Crew Members #1 & #2 then proceed to light off the 207 road.

- Crew Member #5 arrives at the burn and is assigned to patrol the Y08 road and relight the flat on the south end that did not burn earlier in the day.
- Coming from checking on another nearby burn conducted on 9/8/11, UTV #2 and Dozer #2 arrive back at the Rock Creek Prescribed Burn, meeting the Burn Boss at the intersection of Y08 and 207. UTV #2 and Dozer #2 and Fire Engine are instructed to head to the northeast section of the burn and light the seed tree on the north side of County Road 14.
- Dozer #2 takes the Kubota and heads north on Road 207, stops and briefly talks with Crew Members #1 and #2. Continues to the Northwest portion of the burn where he meets up with Dozer #1 and Fire Engine and they proceed to light the east side of the NW portion. UTV #2 lets the east side back off some before continuing to light the north line.

ROCK CREEK PRESCRIBED BURN CHRONOLOGY - 9/11/2011

1420: Burn Boss ties in with the Firing Boss on road PR119 where the dozer line takes off. While updating each other on the progress, radio comments are heard about how well the seed tree stand was burning north of road PR14. Fire intensity is picking up at this time on the NW side of the burn but not yet observed in other parts of the project area.

Firing Boss is instructed to complete firing of PR119 until it intersects with PR14. Burn Boss observes fire at this location at no higher than 1 foot flame lengths, as he proceeds up Road PR119 to PR14 intersection he observes flame lengths of 10 feet. Firefighters working the NW corner notice that wind is picking up out of the North and fire activity has visibly increased.

Sometime around this time, the LEO who is in the general vicinity starts to head their direction as she sees a tall column of smoke and radios her observation.

1430-1445: Burn Boss arrives at intersection of PR119 and PR14 to check on Dozer #2 and UTV #2.

1445-1500: Crew Member #1 radios to the Burn Boss: "[Name of Burn Boss], I need help getting out of here." Radio transmission is described by all hearing it as calmly relayed:

> Burn Boss: "O.K, Where are you at?" At this time, the Burn Boss leaves the intersection and heads back to the 207 road where he had last seen Crew Member #1. While in route he advises Crew Member #1 to use the old road he had gone down to get back to road 207.
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> Crew Member #1 radios again with more urgency stating that "I've got fire all around me, you've got to come get me!". At this time, the other crew members who could hear radio transmissions have stopped work, listening intently to radio transmissions.
>
> Burn Boss radios Crew Member #2 (closest firefighter) and asks him if he can calm Crew Member #1 down and go try to find him.
>
> UTV #2 radios and tells Crew Member #1 "Don't forget about your shelter".
>
> The Burn Boss has now arrived at the logging road that Crew Member #1 had walked in on. Crew Member # 2 advises the Burn Boss to honk his horn to give him a direction to head to.
>
> The Burn Boss can hear Crew Member #1 talking at this time. He starts yelling to see if Crew Member #1 could hear him and there was no response. He goes back to the truck and honks his horn and continues yelling.
>
> Crew Member #1 again states with utmost urgency "Fire all around [me], help, help me, help get me out!!".
>
> UTV #2 stated firmly "Get your fire shelter out" (Crew Member #1 did not respond or acknowledge UTV #2 though later after the incident, he indicated he had heard all of these radio transmissions except possibly while he was getting in his fire shelter). UTV #2 yelled to get the Dozer Operator #2 (who was in the engine) down here and he jumped in and said get to Crew Member #1 "ASAP" with the idea that the engine might be able to assist the trapped firefighter.
>
> Crew Member #2 tells Crew Member #1 to calm down, and says to" listen to [name of UTV #2] about using your fire shelter". He also tells him "if you can't come back to the west to get out of the fire then try to go east and also listen for [name of burn boss] blowing his truck horn". Further, Crew Member #2 tells him that he was close to the road.

ROCK CREEK PRESCRIBED BURN CHRONOLOGY - 9/11/2011(CONT.)

1445-1500: (Cont.)

Crew Member #1 yells "Come and get me, I need help!!"

The Burn Boss could tell that Crew Member #1 was yelling, but became unresponsive to the calls. All that could be heard were 2 clicks of the radio.

During this time, Crew Member # 1 deployed his shelter and stays in the shelter for approximately 20 seconds or less.

The Burn Boss continued to yell at Crew Member #1 and honk his horn and told Crew Member #1 to follow the sound of the horn. The Burn Boss hears Crew Member #1 yelling and moving around. He could hear his yells getting closer to the truck until he finally appeared in the stand, making his way to the truck. As he got to the road, Crew Member #1 was very shaken. It was obvious he had burns and needed immediate medical attention.

When the Engine got to the road, Crew Member #1 was standing on the road. First aid was administered and crew members were assigned to get him to the hospital.

1500: UTV#2 radios Crew Member #4, under direction of Firing Boss, to stand by on the road and stop firing and lets him know Crew Member 1 is out on the road "really shaken, but OK".

1506: Crew Member #1 (after providing his consent) is transported to the nearest hospital escorted by UTV#2 Crew Member 5 (also the District Safety Officer) and UTV #1travel later in another vehicle. After examination at the hospital, he is transported to the nearest burn center at another hospital where he is treated over the next 2 days for 2nd degree burns.

DON'T ASSUME THAT YOU WILL GO HOME AT THE END OF THE DAY"

1510: Burn Boss pulled the crew together and explained the situation. The Forest FMO and District Ranger were notified. The LEO arrives and instructs on what needs to be done to preserve the scene of the accident including fire shelter and boot tracks. Crews work to complete prescribed burn.

1659: Crews were dispatched to first new wildfire on the District.

1830: Crews dispatched to second wildfire on the District.

Weather Measurements Taken at Rock Creek Prescribed Burn 9/11/11

10:45 Temp 82 F RH 55 Wind West 1mph

12:00 Temp 85 RH 53 Wind Light and Variable

12:55 Temp 87 F RH 48 Wind N 0-2 mph

13:40 Temp 88 F RH 42 Wind N 0-2 mph

14:40 Temp 89 F RH 39 Wind N 0-2 mph

CONDITIONS:TOPOGRAPHY

The shelter deployment occurred on a ranger district on the Ouachita National Forest in West Central Arkansas on September 11, 2011. The terrain in this part of Arkansas is characterized by ridges that run east and west and broad valleys. The area being prescribed burned at the time of the deployment has private land immediately to the north, but is surrounded by National Forest Land on the other three sides. The land to the immediate north is farmland, part of a broad valley that is cultivated for various row crops.

The burn area has an average slope of 20 percent with elevations running between 500 feet above sea level at the southern margin of the burn to a little less than 400 feet above sea level at the northern edge. The deployment site was at the head of a dry stream channel that drained the burn area running to the east, with a slight uphill slope to a rocky outcrop just to the north.

County Road PR14 is the northern boundary of the burn area, Forest Road Y08 is the southern boundary and Forest Road 207 is the eastern boundary. The western boundary is County Road PR 119 and a dozer line. The burn area for the day is approximately 600 acres in size and was part of a larger 3700 acre area that was included in one burn plan, originally prepared for helicopter ignition, with several completed burns lying to the east.

CONDITIONS:WEATHER

A seasonal drought had precluded burning for most of the summer leading up to September. Rain during late August and early September had ended the dry spell and allowed prescribed burning activities to resume. Immediately preceding the burn, weather was characterized by mostly sunny days with temperatures in the high 80's and northwest winds at 2 to 4 miles per hour. On the day of the burn, the forecast was for mostly clear skies , dry and warm conditions with temperatures in the mid to high 80's and relative humidity at 37 percent and light and variable winds from the northwest. On-site observations at the start of the burn show RH at 55 percent but falling as the day progresses to a low RH of 36 percent at 4 PM. Winds remained light from the North or northwest.

CONDITIONS:FUEL

The burn area is a complex mosaic of three main types of fuel: young short-leaf pine plantations, logging slash remaining after a seed tree harvest and natural fuels in mixed short-leaf pine stands with understories of mixed hardwoods. In the pine plantations, mostly grasses and other emergent vegetation carried the fire. In the harvest units, some of which had been further used as firewood gathering areas, hardwood tops and jackpots of heavy fuels were interspersed with bare ground and light ground cover. Natural stands had hardwood and pine litter as the main fuel source.

The shelter deployment occurred at the top of a dry drain, referred to as a "green belt" locally since it was not harvested during the logging operation. Just a few feet to the west of the deployment site, the fuels were typical of the harvest unit with hardwood tops, logging slash and occasional hardwood saplings constituting the fuel. At the deployment site, the hardwoods were thicker, there was more leaf litter on the ground but there was no logging slash.

LESSONS LEARNED AND RECOMMENDATIONS FROM THE PARTICIPANTS

- **"There is not a wildfire and a prescribed fire: fire is fire."** (Burn Boss of Rock Creek Prescribed Fire). Because prescribed burning was a common work activity, all crew members said they had become complacent. One crew member described their thinking before the incident: "We weren't on a fire, we were burning". With hindsight, the fire boss shares a lesson learned that "On a wildfire you show up respecting it. On a prescribed fire, something's going to happen before you respect it" and that mindset has to change.
- **Crew members did an outstanding job of using radio communications potentially providing life-saving guidance to their entrapped crewmember.** At the same time, other crew members knew to stay off the radio and keep the airwaves available for critical communications that could mean the difference between life and death.
- **Don't make "risky" assumptions in a high risk environment.** Never assume leader's intent is understood until it is acknowledged and ensure you have a firm understanding of your crew's capability and comfort zone.
- **The Firing Boss needs to closely monitor their geographic span of control as it relates to communications with their crew, especially those farther from their safety zone.**
- **Ensure basic proper gear and functioning equipment are provided, otherwise mitigate the need.**
- In this incident, functioning spare radio batteries were in chronic short supply. "I thought a lot about the [dead] clamshell. If that would have been me, I wouldn't have had the radio communication."

"UNLUCKY THAT I WAS IN THAT SPOT AT THAT TIME"

LESSONS LEARNED AND RECOMMENDATIONS FROM THE PARTICIPANTS (CONT.)

"WE ARE GONNA GO BURN TODAY, JUST ANOTHER DAY"

- Bring a tool with you even if you are carrying a drip torch so you can scrape an area to deploy a shelter.
- Worn, dirty or disrepair nomex clothing should not be worn on a fire. Remove these items from fire service.
- Consider rigging noisy Kaboda UTV with device that would allow radio to be heard while the engine is running.
- **Establish LCES and consider it a moving target on a prescribed burn.**
- **Maintain supervisory communications with employees at all times and if you can't it's time for a change in plan.** Plan your operation on the assumption that there might be no radio communication.
- **Simulate realistic conditions as much as possible during fire shelter deployment training.** The crew recommends shelter deployment training that requires wearing gloves, hard hats, actual shelters, fans to simulate wind while conducting training outdoors. Also, teach the importance of knowing which side of the pouch your shelter is going to come out.
- **It's critical to seek immediate and proper medical attention given the serious nature of burns injuries and tendency for visible or invisible damage to occur days later.**
- **As appropriate, minimize interior ignition through use of aerial devices.**
- **Though not needed during this incident, the crew recommended identifying a helispot in future Prescribed Burn Plans.**

Lessons Learned and recommendations from FLA Facilitators

Don't wait, as too many have, to deploy. Many firefighters who have deployed shelters, including this incident, have indicated they waited too long to deploy, resulting in more serious outcomes. In general the agency must de-stigmatize the use of shelters as a "not good" or a "weakness".

The words, inflection and tone need to convey and communicate accurately the seriousness of the situation. There appears to be a cultural expectation for all radio transmissions to be "calm" despite the fact that it might mislead understanding of the urgency of the situation. In this instance, the urgency of the transmission prompted potentially life-saving actions.

Recommend that those working out of sight on a prescribed fire be within a few seconds of a safety zone or if working the interior or away from safety zones, are within line of sight of another crew member. Employees using drip torches should be well trained on their use and capability in creating the black safety zone as they move with great attention to flame length and potential fire behavior. Recall that it is generally not possible to build direct fireline with flame lengths over 3 feet. Likewise, it would be difficult to cross a 3 foot flaming front to get to the black.

DON'T ASSUME THAT EVERYONE UNDERSTANDS LEADER'S INTENT"

Quality of the safety briefing and establishing leader's intent is key to setting the tone for the entire operation. On any project, it's important that escape routes are identified and communicated to all involved. Extra care should be provided in briefing personnel arriving later in the day who were not at the initial briefing.

Burn Plans need to be followed: They function as an agreement where authority and liability are shared from the Burn Boss all the way to the Forest Service Chief. The burn plan is used to determine the complexity of the burn and therefore, experience level of those assigned to implement it. The burn plan serves as an "agreement" between line officers and the burn boss as to the conditions that the burn may proceed, thus sharing the responsibility as well as liability. The burn plan is intended to serve as a checklist to ensure that all requirements have been satisfied as the burn proceeds and that the burn boss is responsible in relaying key information in the burn plan to implementers. Recommend periodic review and discuss the medical plan given the turnover in personnel.

Ensure working maps showing sufficient detail regarding variation in terrain and detail of past treatments (such as seed tree v. plantation). Maps and other geographic products such as photos and internet downloads are critical tools to help field personnel visualize the elements and challenges of the burn plan. Maps need to show important geographic information to help provide an "overview" perspective of the project.