BRUSH 18

FACILITATED LEARNING ANALYSIS

Bridger-Teton National Forest • September 2012

CONTENTS

1. NARRATIVE

On September 8th, 2012 a human-caused fire was ignited about 5 miles south of Jackson, Wyoming. Initial attack resources were dispatched to the fire at around 1500 hours. The fire started on private land, within the jurisdiction of the county and crossed the jurisdictional boundary onto Forest Service managed lands soon after ignition. The fire spread quickly, threatening many structures. The area was in high fire danger as Stage One Fire Restrictions were in effect.

Brush Engine 18, a county municipal engine staffed with three crewmembers, was among the first resources on scene, and immediately began battling the blaze and protecting structures. The crew from Brush 18 used up their tank of water and drove to a fold-a-tank to draft a new load. They had some difficulty getting the pump to draft, but managed to fill their tank and continued on with pump operations. The first area they were in was beginning to look pretty cold, so they moved on to a new subdivision. They continued battling the fire until they drained their second tank of water. At that point the second subdivision was looking pretty good, so they refilled their tank from a water tender and grabbed some dinner. After dinner they were given a new assignment to go scout a two track road and come up with a plan for tomorrow's shift. A new overhead person showed up to the fire and was assigned to take over as Div W on the next shift. Div W contacted Brush 18's Task Force Leader and arranged to take two of her engines (Brush 18 and Engine 441) with him on a scouting mission.

Upon scouting the road, Div W decided, due to diminished fire behavior, that they could make some headway on that section of fire if they engaged the fire immediately instead of waiting until the next shift. The fire in that area was burning in flashy fuels. The climbing relative humidity and temperature drop had an effect on fire behavior, but the wind proved to be the biggest factor in Div W's decision to engage the fire. There was a strong diurnal wind switch just as the sun went down. As the wind started blowing downhill, the fire activity increased as the fire began making a significant downhill run. This run lasted for about 20 minutes, and Div W had his engines hold down at the road as he was unwilling to engage the fire during this run. But after about 20 minutes, the wind just died. And the fire stopped its forward progression. Div W then made the call to engage the fire. At about 2020 hours, Div W instructed Brush 18 to back their truck up a drainage and deploy a hose lay and begin going direct on the fire. The fire was about 300 feet from the road at that point and the engine backed to within 50 feet of the black. There was no active flame in the drainage bottom where they were parked. The edge was still hot however, and there was active flame just uphill from them. At this point the Brush 18 crew was feeling very comfortable with their assignment. They had backed their truck in and were facing their escape route. The fire was fairly calm, and uphill from them. They parked their truck, set the wheel chocks, fired up their pump, and began constructing a hose lay. They established their escape route as being downhill toward Engine 441. By this time it was pretty late in the day, and it was getting fairly dark.

Brush 18 was low on hose because they had left some in each of the other two subdivisions they had worked earlier. So they grabbed what hose they had left on their truck, and took a hose pack from engine 441. As the 1 ½ inch line was laid out, the nozzle person called back

for water. The Engine Operator restarted the pump, but noticed that the pump was not primed. He began to prime the pump, but as he was trying to get the pump primed, it died. The Engine Operator began to trouble shoot the pump, and the other two engine crew members came back to the truck to help out. The Captain yelled for the Operator to check the fuel in the pump. The Operator confirmed that the pump was out of fuel and began filling it with gas. Div W took enough water from Brush 18 to fill a bladder bag and two crewmembers from Engine 441 and began to go direct on the fire while Brush 18 was trouble shooting their pump. Div W instructed Captain 441 to construct a hose lay from his truck to Brush 18 and tie into the existing hose lay while the Brush 18 crew was trouble shooting their pump.

As the Engine Operator from Brush 18 was filling the gas tank using a funnel, the tank filled more quickly than he anticipated and he overfilled the tank, spilling about a cup (8 ounces) of fuel. The Engine was backed up a pretty steep hill so the fuel ran along the bed of the truck and pooled up near the cab. The two engine crew members tried to find something to use to soak up the fuel, but could not find anything. They got the pump started and resumed trying to prime it with water. As the Captain was priming the pump, he saw fire behind the Operator (inside the bed of the truck, toward the cab). He told the Operator about the fire and pushed past him to grab the chainsaw that was next to the flames. He handed the chainsaw to his Engine Crewmember that was still on the ground. The Engine Crewmember took it and noticed that it had “a little bit of fire on it” but thought that if he put it in the black they might be able to salvage it. As he was putting the saw in the black the other two crewmembers were furiously trying to prime the pump so they could put the fire out. They looked for the fire extinguisher that is usually in the back of the truck, but could not locate it.

As the crewmember with the saw set it down in the black, he turned around to find fire on the ground on the east side of the truck. About that time the Engine Captain from 441 called Brush 18 to tell them about the fire next to their engine and to get in the black. This alerted Div W and he came back into view of Brush 18 and began giving instructions to get in the black. The two crewmembers in the back of the truck jumped out and ran to the black. The third crewmember, who had been dealing with the saw, contoured around the ridge on the west side of the truck (the opposite side of the truck from where the fire on the ground was) away from the fire, through the green, and wrapped around the ridge to shield himself from any possible shrapnel in case of an explosion. He heard some shouting coming from the black and wasn’t sure what they were saying or who they were saying it to, but decided to stick with his original plan and use the predetermined escape route, downhill toward Engine 441. Div W radioed to Operations and relayed that there was an engine engulfed in flames on his division, there were no injuries, and everyone was safe and accounted for.

2. CHRONOLOGY OF EVENTS

	Chronology
1500	*Brush 18 dispatched to the fire*
1530~1900	*Brush 18 secured two subdivisions, used two tanks of water and filled gas tank on the pump once*
1900~1930	*Ate dinner*
1930~2030	*Drove to new location, set up hose lay, worked on pump*
2045	*Captain from 441 calls Brush 18 to let them know that there was fire underneath their truck*
~2050	*Ops arrived on scene, took pictures, assessed Brush 18 crewmembers, gave them a ride to ICP, had the medics check them over, and tied them back in with their chief*

3. PHOTOGRAPHS

	**Photo 1** Photo of fire behavior taken from Brush 18 as they arrived on scene.
	**Photo 2** Photo of fire behavior taken as crew is deploying hose

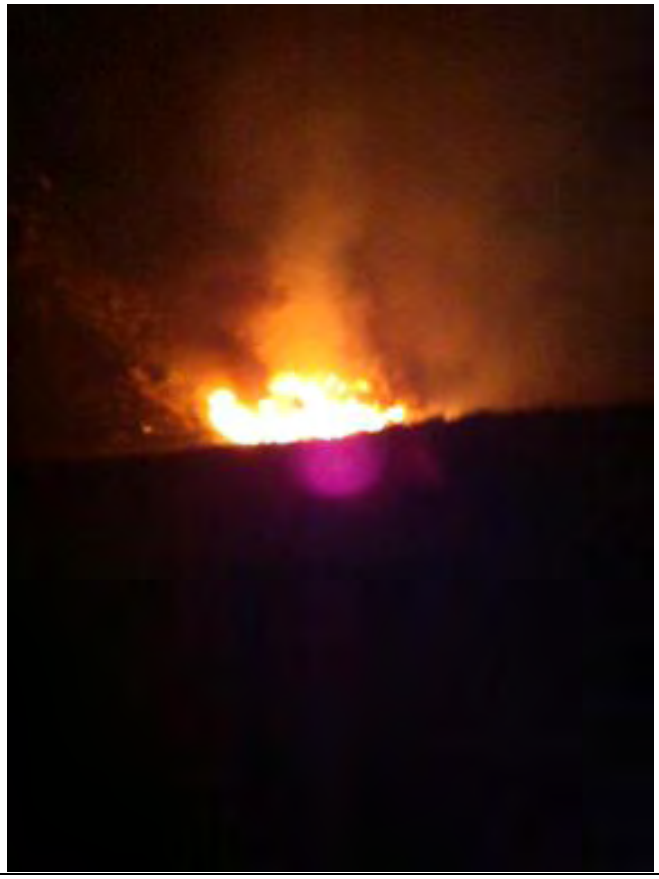
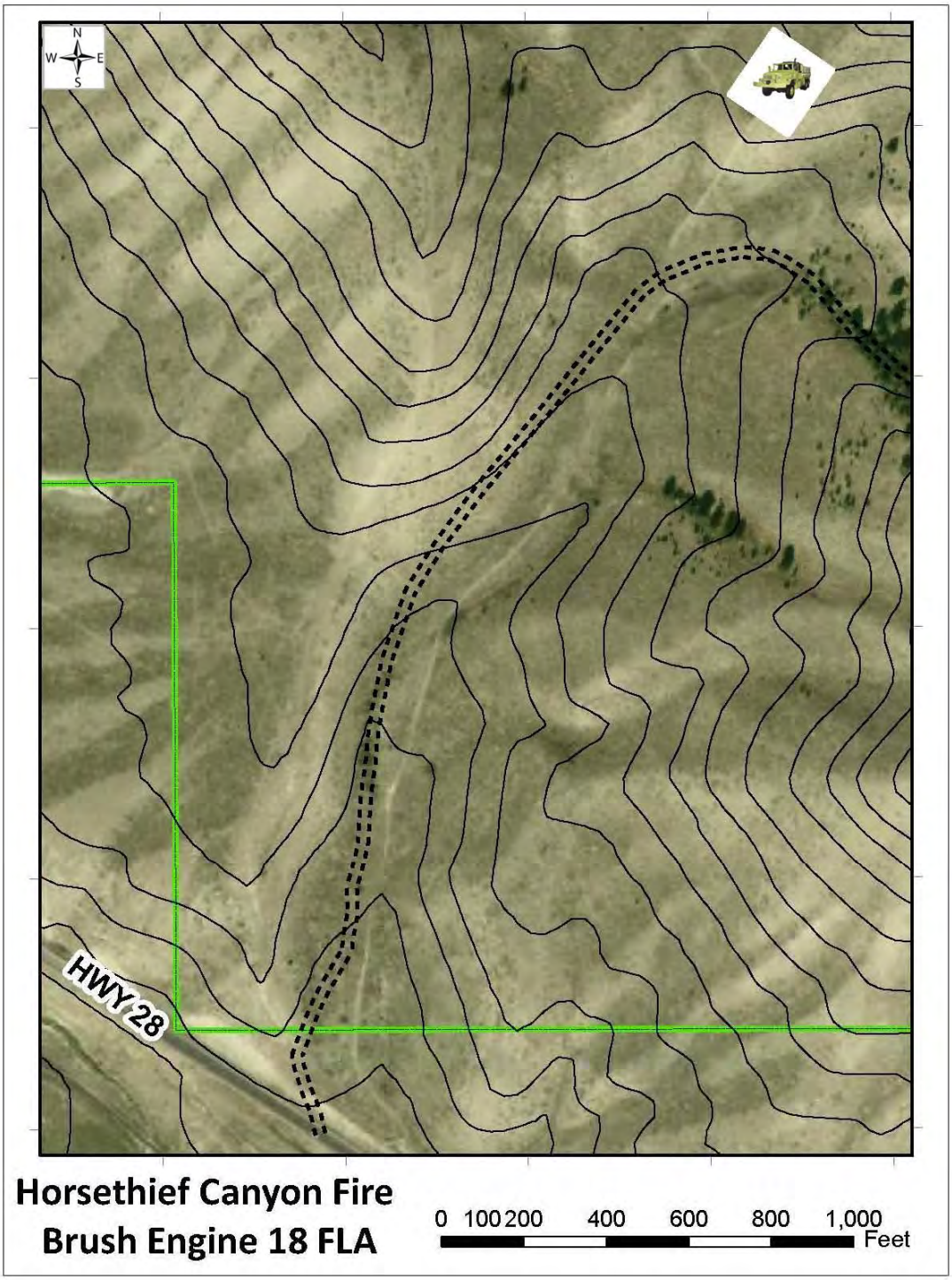
	**Photo 3** Photo of fire behavior taken four to five minutes after Brush 18 caught on fire
	**Photo 4** Photo showing that the main fire never touched Brush18. It was ignited by a spot fire.

	**Photo 5** Photo taken by Operations, showing the ambiguity surrounding the origin of the fire.
	**Photo 5** Second photo taken by Operations when he arrived on scene.

	**Photo 7** Photo of fire behavior rapidly burning uphill toward the main fire.
	**Photo 8** Photo showing distance to and condition of ingress/egress route.

	**Photo 9** Photo showing how the Engine was oriented in relation to the topography.
	**Photo 10** Photo showing what's left of the chainsaw that the crewmembers were trying to save.

4. MAPS

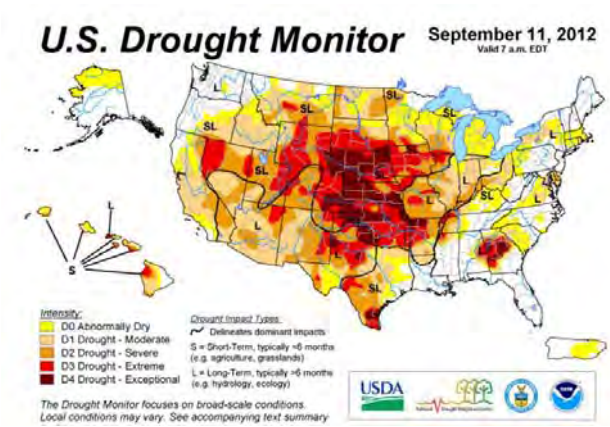

N
W
E
S
HWY 28
Horsethief Canyon Fire
Brush Engine 18 FLA
0 100 200 400 600 800 1,000
Feet

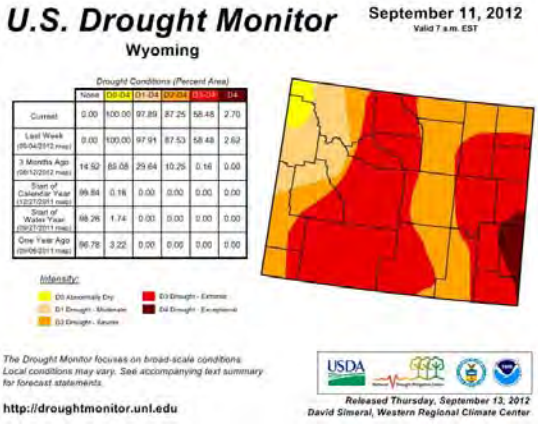
The image above is a Google Earth depiction of the heel of the fire. It is oriented so that the top of the page points north. The blue line is the fire perimeter. The image labeled as Brush 18 shows the location of the incident. Brush 18 initially started working near the structures northwest of the incident site. As the day went on, Brush 18 moved along the perimeter to the southeast. Their last assignment took them well away from the houses, and farther into the wildland.

Vicinity Map showing the location of Jackson, Wyoming

5. ENVIRONMENTAL CONDITIONS

SEASONAL SEVERITY AND DROUGHT





The U.S. Drought monitor showed that the Jackson, Wyoming area was in a moderate drought. As noted earlier, this area was under Stage One Fire Restrictions due to high fire danger.

WEATHER

PREDICTED WEATHER

Predicted Weather	Day	Night
Sky Weather	Mostly Sunny	Clear
Max/Min Temp	65-75°	37-43°
24 Hour Trend	Up 6°	Up 3°
Max/Min RH	17-23%	56-62%
24 Hour Trend	Down 4%	Down 11%
20 Foot Wind	Up Slope Up Valley 5-9 mph	Down Slope Down Valley 4-7 mph
Ridge Top Wind	South 5 to 10 until 1500 then SW around 15 mph	West 5 to 10 mph
LAL	1	1
Haines Index	4	4

OBSERVED WEATHER*

Time (MDT)	Temp.	Dew Point	Humidity	Wind Dir	Wind Speed	Gust Speed	Conditions
2:51 PM	**75.2** °F	**26.6** °F	17%	SSW	**6.9** mph	**16.1** mph	Clear
3:51 PM	**77.0** °F	**23.0** °F	13%	South	**10.4** mph	-	Clear
4:56 PM	**77.0** °F	**23.0** °F	13%	SSE	**8.1** mph	-	Clear
5:52 PM	**77.0** °F	**23.0** °F	13%	SSW	**6.9** mph	-	Clear
7:51 PM	**66.2** °F	**30.2** °F	26%	NNW	**8.1** mph	-	Clear
8:51 PM	**57.2** °F	**28.4** °F	33%	ENE	**6.9** mph	-	Clear
8:55 PM	**57.2** °F	**28.4** °F	33%	ENE	**6.9** mph	-	Clear
9:15 PM	**55.4** °F	**28.4** °F	36%	NNE	**4.6** mph	-	Clear
9:35 PM	**53.6** °F	**30.2** °F	41%	Calm	Calm	-	Clear
10:15 PM	**51.8** °F	**32.0** °F	47%	NNE	**4.6** mph	-	Clear
10:35 PM	**55.4** °F	**30.2** °F	38%	North	**9.2** mph	-	Clear

The highlighted section of the chart above shows a wind switch near the time of the incident.

***Weather provided by Weather Underground for Jackson Wyoming at www.wunderground.com**

6. CONCLUSION

The crewmembers from Brush 18 came to the tentative consensus that an ember landed in the back of the truck, and then spread to the ground. ("I am 90 percent sure that the fire started in the back of the truck, it is hard to know for sure, but the first fire I saw came from the back of the truck.") The chainsaw was on fire before it came out of the truck. When the engine crew member on the ground took the saw from the Engine Captain, the only fire he saw at that point was in the bed of the truck. He did not notice that there was fire on the ground underneath the truck until after he had walked up to the black, set the saw down and turned around to head back to the truck. All three remembered seeing fire in the back of the truck first, that is why they were working so frantically to prime the pump. They were trying to contain the fire within the truck before it spread.

It is unclear whether the fire that burned Brush 18 started in the back of the truck and then went to the ground, or whether it started on the ground first and then traveled to the truck. Post incident review of the site made it clear that the fire that consumed Brush 18 was not part of the main fire (see Photo 4). "It must have started from an ember."

The distinction between the two possible origins of the fire is immaterial to this FLA. Facilitated Learning Analyses are not aimed at finding "cause". In other words, if the fire started in the bed of the truck then it is possible that the spilled fuel caused the fire. That is to say that had the fuel not been there, the ember that started the fire may have just landed in the bed of the truck and fizzled out. It is also possible that the ember landed in the grass beside the truck, in which case the spilled fuel would not have been significant as a contributor to the incident. In either case, it is a good idea to have a HAZMAT pad in the back of the truck and easily accessible to enable the engine crew to clean up any spills that may occur, and thereby mitigate the risk of the fuel catching fire.

This example captures the essence of what FLAs are about. They are not about finding cause, rather they are about figuring out better ways to do business in the future. With that in mind, there are several lessons to be learned from this incident. Implementation of these lessons may or may not have changed the outcome in this particular situation, but, either way, they highlight better ways to do business in the future.

7. LESSONS LEARNED BY PARTICIPANTS

When you fill you Engine up with water, it is a good idea to top off the pump fuel as well. You have some down time while the engine fills, so you might as well take advantage of it.

When you fill your Engine off of a water tender or fire hydrant, it is a good idea to prime the pump while you are filling your engine. You want to drive away from the fill station completely ready to go fight fire. You shouldn't put yourself in a situation where you are trying to prime the pump while you are trying to fight fire if you can avoid it.

Put a HAZMAT pad in the back of the engine near the pump fuel tank, that way if you have a fuel spill you have a way to easily clean it up.

Make sure you have everything that should be on the truck before you leave the station. The fire extinguisher that was supposed to be in the bed of the truck could have proved very useful in this situation. "The NWCG standards state that a fire extinguisher is a required item on a wildland engine. We do a good job of making sure we are up to standards when we go on an out-of-area assignment, we need to make sure we are up to standards when we go out on a local wildland initial attack. We need to make sure the truck doesn't go out the door unless it has all of the necessary gear, and that includes a fire extinguisher."

If you find yourself in a situation where you have a fuel spill in the back of your engine and no way of cleaning it up, it may be a good idea to dilute the spill with foam (e.g. the Phos-Chek or Silv-Ex) as it has a lower flash point than gasoline. However, keep in mind that using foam on a metal surface may cause a slipping hazard. One reviewer of this FLA report commented that dirt may be a good alternative to foam. The dirt could soak up the spilled fuel without causing a slipping hazard.

Some consideration should be given to developing a fueling system with a sight glass or some other way to visually see how full your fuel tank is. That would help with troubleshooting pump problems in high stress situations as well as help prevent over-filling the fuel tank.

Engine 18 was parked on a steep hill in pretty heavy grass and sagebrush. Each of the crewmembers stated that in the future they will take greater care when deciding where to place the engine when engaging in direct attack and deploying a hose lay.

Earlier in the day this engine crew was involved in many high stress situations, fighting fire in people's back yards and frantically trying to protect structures. The last assignment of the day

was in a much more remote area with fewer values at risk. But the crew recognized (after the fact) that the change in scene did not have an effect on their attitudes. They were still acting as though they were fighting fire in a subdivision. There was some expression of trying to recognize those changes in the future, and making a conscious effort to calm down and slow down, to be more deliberate in their actions.

The crew from Brush 18 had experienced some problems getting the pump to draft a load of water earlier in the day. They finished that assignment, and then accepted another one. One crewmember commented that if he had it to do over again, he would have taken the time to make sure his equipment was working properly before he accepted the other assignment. They also had deployed a lot of hose throughout the day and were short on hose when they accepted their last assignment for the day. A crewmember commented that if it is possible, it is a good idea to take an inventory of what is left on the truck between assignments and restock as needed.

Although Engine 18 was parked downhill of the fire, and it seemed as though this was a textbook example of how to fight fire, a careful look at the fire behavior prior to when it moderated reveals that the head of the fire was actually moving downhill. Because of this, Brush 18 was technically engaging in a frontal assault. A lesson learned from the Division Supervisor's standpoint was that, if he had it to do over again, he would have asked the engine to leave the area until they got their pump running, rather than allowing them to trouble shoot the pump in the midst of (technically speaking) a frontal assault.

When Operations drove up on scene, the truck was engulfed in flames. He noticed that there were trucks directly downhill of the burning engine and was worried about the flaming truck rolling down the hill and impacting the vehicles below. Take care to minimize the risk to surrounding equipment during incidents such as these.

8. COMMENDATIONS

This situation could have very easily resulted in an injury. Because incident personnel were watching out for each other, communicating well, and prioritizing well, injuries to firefighters were avoided.

It is obvious that there is a very strong interagency relationship of trust and respect between the County and the Forest Service. This relationship benefits all involved, and makes each party in the relationship stronger and more effective.

9. FACILITATED LEARNING ANALYSIS TEAM MEMBERS

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