

Accident Investigation
Report
Stag Road Fire
Burnover
May 23, 2007

Accident Investigation Team

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Description of Incident: On May 23, 2007 NC Division of Forest Resources (DFR) and VFD personnel initial attacked the Stag Road Fire in Pender County. Estimate of size at initial attack was 5 acres. Initial attack was by two tractor plows plowing the Charlie Division in tandem. Due to heavy pocosin fuels, the lead tractor plow was breaking way for the second tractor plow, which was plowing a fireline. The lead forest fire equipment operator (FFEO) had about 6 months experience operating a tractor plow with the DFR. The second FFEO, who was burned, had just over 18 months experience operating a tractor plow with the DFR. A fully qualified Strike Team Leader-Tractor Plow and crewman were carrying a blackline behind the second tractor plow. At the time of the incident, the tractor plows were 15 – 20 feet off of the fire’s edge, within the indraft. Flame lengths were reported as waist high. Winds were erratic, as the area was feeling the effects of a sea breeze. The tractor plows were well behind the head fire, at the time of the burnover. The fire was flanking to the side, at roughly a ninety degree angle to the prevailing winds. Burning out of the fireline was only needed part of the time as the tractors were able to operate on the edge of the black part of the time. After backing up to clean out a section of the fireline, the second FFEO resumed forward progress, and at the same time, the fire flared up briefly and entered the open tractor cab. The flare up dropped down then increased in intensity and came back into the cab a second time. The intensity of this flare up caused the FFEO to jump off of the tractor



Photo 1: Approximate location of tractor plow when burnover occurred. Looking down the fireline, towards the origin of the fire.

plow on the side opposite the fire. When he jumped off the tractor plow, he left it in gear. The tractor plow continued on for approximately one half mile, before being stopped by a pond pine tree. The FFEO jumped off the tractor plow into the thick pocosin fuels. He

was initially out of contact with the Strike Team leader (STL), until he called the STL by cell phone, to advise him of his situation.

The STL and lead tractor plow FFEO went to the aid of the second FFEO. He was transported by EMS to New Hanover Memorial Hospital, where he was examined for injuries. His only injuries were minor burns to the neck, ear and eyebrow.

Investigation Team Findings: The Investigation Team met with the Forest Fire Equipment Operator (FFEO) who was burned, the lead FFEO and the Strike Team Leader. The site of the burnover was examined to determine what had occurred, based on the burn patterns which were present and what the involved fire fighters said.

The Team feels that the NC DFR Blackline Policy was being adhered to at the time of the burnover. The injured FFEO was utilizing all DFR required Personal Protective Equipment (PPE) at the time of the burnover. DFR Policy for trainee FFEOs was being complied with at the time of the burnover - the Strike Team Leader is state qualified as a Strike Team Leader – Tractor Plow Boss.

The two FFEOs and the Strike Team Leader, when asked about the situation prior to the fire, stated that they felt it was just another day. There had been no discussions or concerns raised about the potential for increased burning intensity or extreme fire behavior due to the drought conditions which were being experienced. They had been stationed at Topsail Tower for standby because of incendiary fires in the area, not because of a heightened fire danger.

It is DFR policy for FFEOs to plow within the indraft of the fire when plowing with the wind, so that the burn out fire being set behind them will not turn into head fire and run them down. However, it is possible to get too close to the fire's edge and not have room to react if something does happen. It is felt that this was the one of the reasons for this burnover occurring. The lead tractor plow was opening a hole in the thick pocosin fuels. Just before the point where the FFEO was burned, the lead FFEO had turned away from the fire, slightly, to avoid a large Pond pine tree and the regeneration around it. The second FFEO was in the area slightly further away from the fire's edge, when he was burned. The second FFEO had not responded to the first flare up which occurred, by stopping or pulling further off the flank due to the increasing intensity.

Based on the burn patterns observed on the ground, it appears that the burn out fire made a short head run which caused the flanking fire to intensify. This intensified fire was fueled by the young Pond pines the tractor plows had turned to avoid and the needle drape that was present from the young Pond pines and the single large Pond pine. This intensified fire occurred just as the second tractor plow was passing. The fire rolled into the open cab of the tractor plow, dropped down and then came back in a second time. The second time this occurred, the FFEO could not bend low enough to get shelter from the flames. He jumped off the tractor plow on the right side, into the green, unburned fuel, to escape the flames, with the tractor plow still in gear and running.

A thorough examination of the burn before the location of the burnover, at the location of the burnover and further down the fireline showed that the intensity of the burning was greatest where the burnover occurred. This appeared to be a result of a combination of factors: the burnout fire made a brief run as head fire, there was a greater fuel loading due to the presence of one large and numerous small Pond pines, and the two FFEOs had

turned out slightly to dodge the Pond pines and avoid the possibility of getting stuck which gave the fire room to make its brief head run.



Photo 2: Green fuel on off side of fireline, near where the FFEO jumped from the tractor plow.



Photo 3: Area inside fireline, adjacent to burnover location. Note difference in intensity of burn , between foreground and background.

Review of Standard Fire Orders and 18 Situations That Shout Watch Out: All NC DFR personnel are expected to comply with the Standard Fire Orders and conduct fireline operations in a way that mitigates the risks identified in the 18 Situations That Shout Watch Out. This review indicated that this was not done on this fire and probably contributed to the accident.

Fire Orders:

1. Keep informed on fire weather conditions and forecasts. Personnel had not discussed the day's morning weather forecast, or heard the 1400 Fire Danger Readings when they were broadcast by the Whiteville District Ops Officer. All personnel involved stated that they felt it was just another routine day.
2. Know what your fire is doing at all times. This was generally complied with.
3. Base all actions on current and expected behavior of the fire. Actions were based on the current behavior of the fire. No thought was apparently given to what the fire behavior could become, given the drought conditions that existed at the time.
4. Identify escape routes and safety zones, and make them known. This was complied with. The Strike Team Leader and crewman were carrying a blackline, burning out the unburned fuel between the fire and the fireline, so that there was an escape route/safety zone present as the fireline construction progressed.
5. Post lookouts when there is possible danger. The Whiteville patrol/scout plane was requested and was over the fire when the burnover occurred. The Initial Attack Incident Commander recognized the need for a lookout/scout and requested the plane along with other initial attack forces.
6. Be alert. Keep calm. Think clearly. Act Decisively. This was not met. When the fire flared up the second time and came into the cab of the tractor, the FFEO apparently panicked. Instead of staying on the tractor plow and turning right, away from the fire, or simply stopping, he jumped off of the tractor plow, while it was still in motion, and went into the green brush. He was extremely lucky that he cleared the tracks and was not run over as the tractor plow continued its forward progress.
7. Maintain prompt communications with your forces, your supervisor and adjoining forces. This was met, until the FFEO jumped from the tractor plow. The Strike Team Leader and 2 FFEOs were in communication by radio. After the FFEO jumped into the green brush, he was not in communication with the STL or other FFEO until he called the STL by cell phone.
8. Give clear instructions and insure they are understood. The Strike Team Leader briefed the initial FFEO on scene, then the second FFEO when he caught up with the first FFEO.
9. Maintain control of your forces at all times. This was generally met.
10. Fight fire aggressively, having provided for safety first. This was not met. FFEOs were too close to the fire, to have reaction time when the fire flared up. Strike Team Leader should be very alert to distance from fire of trainee FFEOs to be sure that they remain within the in-draft, but with room to react if something unexpected occurs, such as a flare up.

Watch Out Situations

1. Fire not scouted and sized up. Fire was sized up by the Initial Attack IC. He made a request for significant resources, recognizing the fire's potential. One of the

resources requested was a scout plane, which was overhead when the incident occurred.

2. In country not seen in daylight. This was not applicable.
3. Safety zones and escape routes not identified. Escape route/safety zone was known. It was the blackline that was being carried by the Strike Team Leader and crewman. Despite being known, it was not used by the FFEO when he decided to jump off of the tractor plow.
4. Unfamiliar with weather and local factors influencing fire behavior. Despite being in their normal work area, both FFEOs were not aware of the potential for extreme fire behavior that the fuels presented. The long term drying of the fuels had made them much more volatile than is normal for late May in Southeastern North Carolina.
5. Uninformed on strategy, tactics and hazards. No one had briefed the trainee FFEOs on the potential volatility of the fuels. The FFEOs treated the fire as just another fire.
6. Instructions and assignments not clear. Instructions and assignment were given and understood.
7. No communication link with crew members/supervisor. The Strike Team Leader and FFEOs had communication by radio, until the FFEO jumped off of the tractor plow.
8. Constructing fireline without safe anchor point. Fireline was safely anchored at the origin.
9. Building fireline with fire below. This was not applicable.
10. Attempting frontal assault on fire. This was not applicable.
11. Unburned fire between you and the fire. Neither FFEO nor the Strike Team Leader recognized the hazard posed by the fuel remaining after the head fire had passed. The fire was a flanking fire until it made its brief, intense run towards the fireline.
12. Cannot see the main fire, not in contact with anyone who can. Plane 2 was overhead and was watching the main fire, which had already passed the area where burnover occurred. FFEOs had radio communication with the pilot.
13. On a hillside where rolling material can ignite a fire below. This was not applicable.
14. Weather is getting hotter and drier. This was not applicable.
15. Wind increases or changes direction. There were no indications of a wind shift, from the examination of the burn patterns at the burnover site. All of the pine needles were fixed in the direction the main fire had run.
16. Getting frequent spot fires across line. This was not applicable.
17. Terrain and fuels make escape to safety zones difficult. Fuels were thick and terrain was wet natured, which made walking difficult. However, by carrying a blackline behind the tractor-plows, the escape route was always in immediate proximity to the FFEOs. However, when the FFEO jumped off of the tractor plow, he went into the green and away from the plowed/black line that was his escape route.
18. Taking a nap near the fireline. This was not applicable.

The Four Major Common Denominators of Fire Behavior on Tragedy Fires

1. Most incidents happen on *small* fires or on *isolated sections* of large fires. This burnover occurred on a division where the head fire had already passed. The only fire present was flanking and backing towards the fireline.
2. *Flare-ups* generally occur in deceptively *light fuels*, such as grass and light brush. This flare-up occurred in heavy pocosin type fuels, not light fuels.

3. Most fires are innocent in appearance before unexpected *shifts in wind direction and/or speed* result in flare-ups. Sometimes, tragedies occur in the mop-up stage. It appears that no wind shift occurred, based on examination of the burn patterns. The flare-up appears to have been a result of the merging of the burn out fire and the flanking fire, and the opportunity to make a short head run, due to the turn away from the fire, to avoid the group of pond pines.
4. Fires respond to large- and small-scale *topographic conditions*, running uphill surprisingly fast in chimneys, gullies and on steep slopes. This was not applicable.

Factors Contributing to the Burnover

1. Inexperience of the two FFEOs on the division. Both FFEOs had been with the DFR less than 24 months. Division policy was complied with, in that a qualified Strike Team Leader was with them in the woods. However, both FFEOs were too close to the fire for the fuel conditions. FFEOs need to stay within the indraft to prevent the burn out fire from turning into head fire and burning over them, but they also need to stay far enough away from the fire, to give themselves time to react appropriately in case something such as this type flare up occurs.
2. The FFEO did not turn out or stop and see what the fire was going to do after the first flare-up. If he had stopped and waited just a minute or so, to see what the fire was going to do, the burnover would have likely been prevented. Likewise, if he had turned right, away from the fire, when the first flare-up occurred, he would likely have been far enough away from the fire that the burnover would not have occurred.
3. Drought conditions had the fuels more volatile than is normal for late May in southeastern North Carolina. Normally, there would have been enough rain to harden off the pocosin fuels and reduce their volatility. The rains had not occurred at the time of this fire, and the fuels responded accordingly.
4. Extreme fuel conditions and the erratic winds brought on by the sea breeze and the tractors pulling away from fire edge allowed the short head run to develop along the flank. The flare-up was intensified by the heavy brush fuel load.
5. The fire curtains were not dropped when the first flare-up occurred. FFEOs are taught to use the curtains only as a last resort, not for routine plowing. The intensity of the flare-up was certainly such, that the use of the fire curtains would have been justified.

Recommendations to Prevent Recurrence

1. Improve training for FFEOs, so that they understand staying in the indraft does not mean they have to stay on the fire's edge. FFEOs should understand that they always should remain within the indraft when plowing with the wind, but the distance they stay off of the flank is dependant on factors including fire intensity, spotting distance, flare-ups occurring and the ability of the crewman to endure heat on the fireline. The FFEO needs to have enough space/time to react if something unexpected does occur.
2. Improve fuels training for all DFR personnel so that there is better understanding of what to expect when in drought conditions. This would include a better understanding of daily NFDRS reading.
3. Remind FFEOs, during training, that it is safer to stay with a tractor-plow and turn away from a fire, rather than to jump from a moving tractor-plow and risk being run

over by the still moving tractor-plow, when flames come into the cab with the FFEO. If the tractor plow must be abandoned, then it should be stopped prior to leaving it.

4. When tractor-plows are plowing in tandem, the lead FFEO should be tractor-plow boss qualified, if possible.