

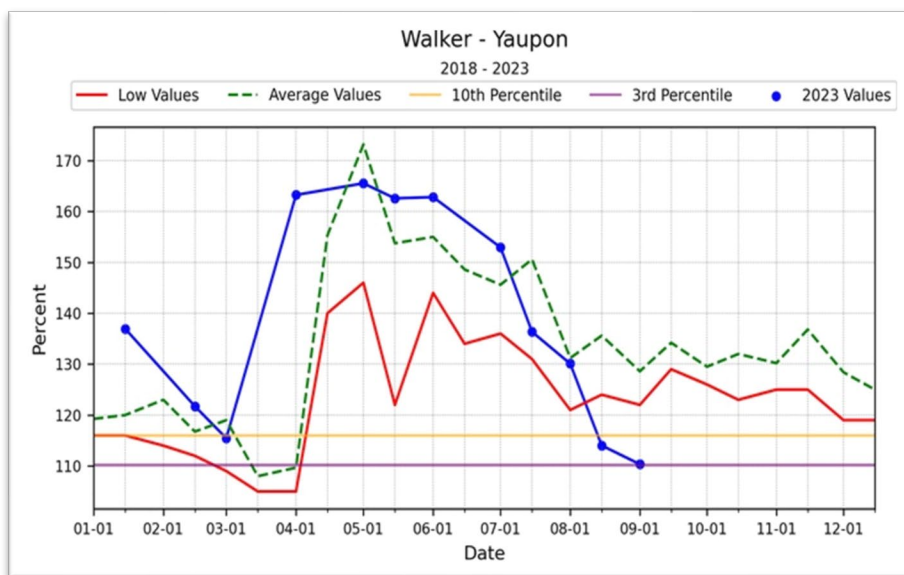
Summary

On August 2, 2023, the San Jacinto County Sheriff’s Office requested assistance from the Texas A&M Forest Service (TAMFS) on a grass fire at FM 946 South and Harrell Road. TAMFS resources arrived on scene and engaged the fire utilizing tractor plows, engines, and aviation resources from multiple agencies. When two additional tractor plow units arrived from a nearby TAMFS office, the fire had spotted across Harrell Road at the heel of the fire, and they were tasked with containing that spot. While engaging the roughly 15-acre spot fire, one of those tractor plow crews stopped to swap operators in order to mitigate heat and fatigue for one of the swampers. During that swap, fire activity drastically increased and rapidly approached the crew, causing two swampers to escape down their line, both of whom received burns in the process.

Conditions

A strong and dominant upper-level ridge of high pressure set up over Texas by the middle of June, persisting through July and early August. This upper-air feature resulted in flash drought conditions, defined by the rapid intensification of drought caused by well below normal rainfall and abnormally high temperatures for most of Texas. The U.S Drought Monitor showed a rapid development of drought conditions with the Western Pineywoods going from no drought in mid-June 2023 to widespread moderate to severe drought by August 1st. Daily maximum temperatures at the nearby Coldsprings RAWs were above 100 degrees between July 10th and August 1st. Energy Release Component (ERC) fuel model G values increased rapidly in the Western Pineywoods, with ERC values above the 90th percentile by August 1st, which is an indicator that surface fuel was critically dry

and that potential fire intensities would be higher. Rapidly decreasing foliar moisture content in high-risk yaupon fuels is another indicator of flash drought. On June 1st, yaupon live fuel moisture at the nearby Walker County live fuel sampling site was observed at 163%. With the onset of the flash drought, that value declined to 130% by August 1st. The combination of both critically dry surface fuel and rapidly decreasing foliar moisture content in yaupon understory could produce a fire with high resistance to control.



Yaupon Live Fuel Moisture Values in Walker County

Initial attack fire activity in June was near 50% of normal for Southeast Texas with Texas A&M Forest Service responding to 9 wildfires. In July, as critically dry surface fuels began to emerge and expand across Southeast Texas, initial attack activity picked up significantly to 66 fires for 1,412 acres. Fires began to exhibit resistance to control including group torching, crown fire, and spotting. Larger diameter and ground fuels were holding heat for several days to weeks after a fire was contained.

On the day of this incident, a nearby RAWS was reading an air temperature of 105°F, relative humidity of 28%, and winds out of the Southwest at 4.6 mph, gusts to 17 mph.

Narrative

When TAMFS resources were requested to assist local fire departments on the Snow Hill Fire in San Jacinto County on August 2, they arrived to find approximately 10 acres burning with moderate to high fire behavior in a thinned loblolly pine plantation with the potential for rapid growth and threats to homes. Given the time of day (approximately 13:30), conditions, and potential of the fire, more resources were ordered, including additional dozer and tractor plow units, engines, and aviation resources. There was already an ambulance on scene that came with one of the local fire departments, but an Emergency Medical Task Force (EMTF) that was staged in Jasper, approximately 90 miles away, was also requested due to the potential for heat related injuries for responders. Some of the additional resources ordered included two tractor plow units from the nearby TAMFS office in Huntsville. Tractor Plow 1 was staffed with an Initial Attack Tractor Plow Operator (TPIA) and a Firefighter Type 2 (FFT2) as a swamper. Tractor Plow 2 was staffed with Noah, a qualified TPIA, Jack, also a TPIA and Heavy Equipment Boss (HEQB), and Dylan, a FFT2.



Representative fuels near the incident site

Tractor Plow 1 and 2 arrived on scene around 16:00 and received a briefing from the Incident Commander Type 4 (ICT4) and ICT4 trainee. They were tasked with working the right flank of the fire on the northern end of Harrell Road working west. Both tractor plow units parked near the intersection of FM 946 and Harrell Road (reference map on Page 7), at which time they discovered that the fire had spotted across to the east side of Harrell Road. Jack, with Tractor Plow 2, suggested to the IC that the two tractor plow units address the spot fire. The IC agreed, and their assignment was adjusted accordingly. Tractor Plow 1 tracked north along Harrell Road and began direct attack tactics when they reached the southern edge of the spot fire. Tractor Plow 2 was going to fall in behind Tractor Plow 1 to widen and improve their line as they worked around the spot fire, but when Tractor Plow 1's progress was halted due to a deep creek, the plan was for Tractor Plow 2 to continue down Harrell Road and begin putting in direct line from the north, working toward Tractor Plow 1.



Tractor Plow 2 working Snow Hill Fire
(fire activity shown in photo not representative of
what was observed at the time of the incident)

At this time, Noah was operating the tractor plow with Dylan as the swamper. Jack was scouting down Harrell Road to ensure there were no additional spot fires, and he tied in with Tractor Plow 2 shortly after. Due to the dexterity needed to manipulate the controls of the tractor plow, Noah was not wearing gloves. Likewise, Dylan was actively using Field Maps on his phone in order to map the progress of line production, so he was not wearing gloves either. Neither Noah nor Dylan were wearing a shirt underneath their Nomex shirt. The fire activity they were experiencing at this time was low with 2-3' flame lengths and a slow rate of spread. They were constructing plow line as direct as possible but having to pick routes around trees in some areas. These pockets of unburned fuel were not burned out at the time because Jack hadn't reached their location yet, and Dylan did not have enough experience to handle the burnout operation safely. After about an hour from the time they unloaded, Jack was feeling the effects of the heat. To prevent becoming overheated, he proposed to Noah that they swap so that Jack could operate the tractor plow and cool down in the air conditioning in the cab. That plan was agreed upon, so they halted line production. Noah exited the tractor plow, and he started donning his line pack while Jack started removing his. Where they stopped, there was approximately 30-40 feet of unburned fuel between their plowed line and the fire edge.

With the slow, backing fire, it was assumed by the crew that they would have plenty of time to swap operators and reengage before the fire reached their location. However, an unexpected wind shift combined with a pocket of susceptible mid-story vegetation caused the fire behavior and intensity to rapidly and drastically increase. As the growing fire quickly moved toward the crew, they were forced to make hasty decisions in order to find safety.

“We were looking at the fire behavior we had instead of what we could have had.” – Jack

Jack, still wearing his line pack, hurriedly entered the dozer, closed the door, and quickly decided his best option was to grab a load of dirt with the blade and push through the flame front. As he moved forward, he felt the heat from the fire, but he and the dozer remained unharmed while he made it into the black. Meanwhile, Noah and Dylan were on foot and faced with two possible escape options. They could either escape into the green, or they could run back down their plow line to the black. Given the uncertainty of running into unburned fuel, they quickly chose to run down the plow line. By this time, the fire had moved to the plow line and had spotted across it, so there was fire on both sides. On the west side of the line, flame lengths were approximately 10-15 feet, and they were 3-4 feet on the east side where it had spotted across. Noah was in the lead, running as fast as he could, with Dylan right behind him. They ran approximately 20-30 yards down the line to an area where the fire was low so they could step into the black.

While Noah and Dylan ran down the plow line, Jack radioed to the Task Force Leader (TFLD) on scene that was coordinating aviation resources and requested that a Type 1 helicopter that was working the main body of the fire come cool down the flare-up. The helicopter made a water drop shortly after, followed by two drops from scoopers that were also working the main body of the fire. This cooled down the fire activity, and Jack was able to contain the area that had spotted over their plow line.

Noah and Dylan stayed in the black for about 10 minutes to regroup and make sure everything was cooled down. Once the adrenaline subsided, Dylan was having some difficulty keying up his radio to talk and realized it was due to his hands being burned. He also noticed that his side was hurting. After he, Noah, and Jack gathered up and discussed this, they decided that Dylan needed to be checked out by the ambulance that was on site. A nearby fire department engine gave Dylan a ride down Harrell Road to the ambulance, which was staged near where they had parked their transport. Upon assessing Dylan's burns, the paramedics advised that he go to the hospital for treatment. Dylan agreed, so he was transported via ambulance to Huntsville Memorial Hospital, which was about 30 minutes away. Two agency administrators met Dylan at the hospital and stayed with him while he got treatment and until he was discharged about 3 hours later.

Once Dylan was under the care of the paramedics, Noah expressed that he felt fine and was ready to get back to work, so he and Jack decided to reengage the fire. At that time, the spot fire on the east side of Harrell Road had been contained, so Noah and Jack began improving line on the right flank of the main fire. They worked for 2 hours with Noah operating and Jack as the swamper. Once they tied into a clearcut area, they met the TFLD and Safety Officer that were patrolling that side of the fire. They both looked at Noah's hands and encouraged him to get checked out by the medical staff on scene. Noah insisted he felt fine, but he agreed to get checked out. Jack and Noah made their way back to the staging area, and Noah got examined by the paramedics that were there with a local fire department as well as the EMTF paramedics that had recently arrived. Noah was advised to go to the hospital for treatment. At this time, Jack was feeling some back pain, which was related to a pre-existing condition that was likely aggravated by quickly entering the tractor plow during the flare-up. Since Jack didn't feel fit to continue working on the fire, he volunteered to take Noah to the hospital, so they took Jack's agency pickup to Huntsville Memorial Hospital.

When Jack and Noah arrived at the hospital, they saw Dylan as he was leaving. Jack stayed with Noah at the hospital while he was evaluated and treated. He was released about 4 hours after arriving and was advised by the hospital physician to setup an appointment with the wound care center located at Memorial Hermann Hospital in Houston for further evaluation and treatment for the burns on his left hand and elbow.

Post-Incident/Injury Treatment

Dylan received first-degree burns to the backs of his hands and left side. After treatment at the hospital, he did not require any additional care. He saw his primary care physician 8 days after the incident and was cleared for full duty.

Noah received second-degree burns on the back of his left hand and left elbow and first-degree burns on his left ear, left side of his face, and nose. He visited Memorial Hermann Hospital in Houston the day after the incident to get a second opinion on treatment options. The physician he saw there gave the same recommendation to setup an appointment with their wound care center there at Memorial Hermann. The soonest the wound care center had an appointment was 6 days from the day the incident occurred. During that appointment, they treated his burns and debrided the burns on his left hand. Noah was cleared for full duty 15 days after the incident.

Noah's Hand Injury



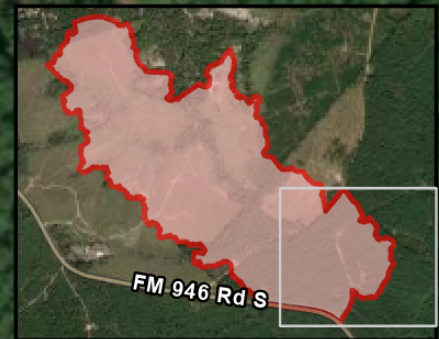
Lessons Learned

1. When operating tractor plow units, the decision to use the blade vs. plow is often based on fire behavior, suppression efficacy, and minimizing environmental impact.
 - Do we factor in the safety of ground personnel (swampers) into this assessment? From this perspective, what are some of the benefits and disadvantages to each method of line construction?
2. Standard Firefighting Order #3 states that we should always base our actions on current and expected fire behavior. This ensures we are considering the potential of the fire when formulating our plan of attack.
 - Do you maintain enough situational awareness of current fuel and weather conditions in your area?
 - Are you using that awareness to adjust your suppression tactics based not only on the fire behavior you're seeing but what you could be seeing?

3. On the fireline, we have access to mapping programs, weather apps, and electronic documents on our phones, all of which are intended to increase our situational awareness. Our reliance on these tools, and the expectation to use them is increasing every year.
 - Has this expectation impacted how and when we wear our PPE on the fireline?

4. In order to mitigate risk of heat-related injury, some firefighters opt not to wear anything under their Nomex shirt. While this does provide better cooling and ventilation for the firefighter, it reduces the amount of insulation/protection between a firefighter's skin and potentially high radiant or direct flame heat.
 - Our FLA team reached out to the National Technology and Development Program in Missoula, MT for input on the protection provided by undergarments worn under Nomex shirts. They provided us with a document that discusses a study where different undergarment fabrics were tested against both direct flame and radiant heat. This document can be found here: [Tests of Undergarments Exposed to Fire](#)
 - It was also pointed out that Chapter 7 of the Interagency Standards for Fire and Fire Aviation Operations (Redbook) recommends that firefighters wear undergarments made of natural fibers and not synthetic. However, it does not specifically require or recommend undergarments are worn vs not worn.
 - Does your agency have a defined standard for PPE and what is worn underneath?

Snow Hill Fire Burn Injury FLA



- Staging Area
- Tractor Plow 1 Encountered Deep Creek
- Incident Location
- Tractor Plow Path 1
- Tractor Plow Path 2
- Creek Crossing
- Wildfire Daily Fire Perimeter

SNOW HILL RD

Tractor
Plow Path 2

HARRELL RD

Tractor
Plow Path 1

FM 946

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