Rocky Flats Declared Wildfire Review

Chattahoochee-Oconee National Forest, Conasauga Ranger District
Chatsworth, GA

Tuesday, March 21 – Wednesday, March 22, 2023

Table of Contents

I. Executive Summary 3

II. Setting (Environmental, Social, Political) 4
- A. National 4
- B. Regional 4
- C. Forest and District 6
- D. The Sumac RX Project Area 7

***For the Prescribed Fire Plan, Sumac RX Units, see Appendix A**

III. Narrative 8

***For the Technical Planning Analysis for the Rocky Flats RX, see Appendix B**

IV. Lessons Learned 24

V. Recommendations 27

VI. Conclusions 29

VII. Appendices 30
- Appendix A: Prescribed Fire Plan, Sumac RX Units 30
- Appendix B: Planning Analysis for the Rocky Flats RX 39
- Appendix C: Delegation of Authority 43
- Appendix D: What is a Declared Wildfire Review? 44
- Appendix E: Chronology of Events 45
- Appendix F: Review of the Qualifications 46
- Appendix G: Glossary of Terms and List of Abbreviations 47
- Appendix H: Rocky Flats Review Team 50

VIII. End Notes 51

I. Executive Summary

The 2023 Rocky Flats Prescribed Fire on the Conasauga Ranger District of the Chattahoochee-Oconee National Forest was a 73-acre blackline[1] operation planned for Tuesday, March 21, 2023. The primary objective of the burn was to reduce the risk of a spot fire[2] occurring on the larger planned prescribed fire. Numerous spot fires originated during the blackline operation, which grew to 173 acres outside of the burn unit, and by early afternoon required nearly all resources to engage in suppression of the spot fires.

Resources were released for safety reasons and fatigue early the morning of Wednesday, March 22, 2023. The strong winds that had fueled the spot fires in the evening, also brought an early morning downpour of rain that essentially contained the fire. Spot fires only occurred on National Forest System lands. There were no injuries, and no structures or equipment were lost. After considerable deliberation, the Forest Supervisor determined that the prescribed fire needed to be declared[3] a wildfire. Because there were no losses related to the escape, this event presents a favorable opportunity to pause and examine the unintended outcomes with a focus on sharing the learning with other units in the region and across the nation.

The U.S. Department of Agriculture, Forest Service Chief's intent is that every escaped prescribed fire declared a wildfire will be reviewed. To embrace a learning culture, this document uses both a Facilitated Learning Analysis (FLA) and the required "Prescribed Fire-Declared Wildfire Review".[4] The FLA team was staffed with both prescribed fire and FLA subject matter experts who reviewed the planning and execution of the prescribed fire burn plan, the qualifications and experience of those involved, and provided a more complete narrative that reveals why personnel made the decisions they did at the time they made them. In line with a traditional FLA, this document contains a Lessons Learned section with transferrable lessons for firefighters on the ground who might find themselves in similar situations in the future.

To present both the required declared wildfire review documentation and FLA components in a more streamlined manner, parts of the document are highlighted that correspond directly with the following required analysis elements:

1. An analysis of the seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.[5] (see **"Setting"** portion of this document)
2. An analysis of the prescribed fire plan for consistency with agency policy and guidance related to prescribed fire planning and implementation.
   (see **"Narrative"** portion of this document)
3. An analysis of prescribed fire implementation for consistency with the prescription, actions, and procedures in the prescribed fire plan.
   (see **"Conclusions"** portion of this document)
4. The approving agency administrator's qualifications, experience, and involvement.
   (see **"Setting"** portion of this document)
5. The qualifications and experience of key personnel involved.
   (See **"Setting," and Appendix F** of this document)

*A note to the reader: By including the two technical reports (***Prescribed Fire Plan, Sumac RX Units*** and ***Planning Analysis for the Rocky Flats RX****)* as appendices, the reader is provided a more uninterrupted flow of information and an efficient model for future reviews.

*Final edits to this document were made by the Washington Office prior to submission to the Wildland Lessons Learned Center.

II. Setting (Environmental, Social, Political)

National

National prescribed fire goals have increased.
As reflected in the U.S. Department of Agriculture, Forest Service Hazardous Fuels Accomplishments database (see Figure 2 below), the Forest Service annually treats approximately 2.7 million acres of land for both ecosystem restoration and hazardous fuels reduction. Both the Infrastructure Investment and Jobs Act (IIJA)[6] funding and the Forest Service Wildfire Crisis Strategy[7] (10-Year Strategy) are ongoing efforts that aim to increase the treatment goals of the Forest Service and its partners. The 10-Year Strategy calls for treating up to 20 million acres on national forests and grasslands and supporting treatment of up to 30 million acres of other federal, state, Tribal, and private lands.[8]

New prescribed fire program requirements emerge from a national program level review.
In response to the April 6, 2022 Hermits Peak fire, a prescribed fire that was converted to a wildfire, the Chief of the Forest Service initiated a prescribed fire pause.[9] By May 2022, the Chief had convened a large team to conduct a Forest Service-wide "*National Prescribed Fire Program Review*".[10] A 90-day pause was enacted for all prescribed fire activity as the team worked through the assessment process, requiring all prescribed fire programs to undergo a programmatic review before resuming operations. Prescribed fire program staff were required to review existing burn plans to address contingency resource[11] concerns, communication requirements between burn bosses and agency administrators, and requirements regarding declaring a prescribed fire a wildfire.[12] Following the pause, the Southern Region (Region 8) Fire Aviation Management staff began assisting forests with implementing the required updates to their programs.

Regional

The Southern Region leads the nation in prescribed fire.
The Forest Service Region 8 consistently burns more acreage annually than all the other Forest Service regions combined.[13] The fire-adapted ecosystem in the region requires prescribed fire treatments every two to seven years, generally to maintain forest health. In Region 8, fire managers work through a rotation of prescribed fire on multiple projects throughout the year, often requiring additional personnel to implement and assist with the projects across the vast landscape. In support of the IIJA hazardous fuels provisions and the Wildfire Crisis Strategy, all Forest Service Regions are expected to increase their prescribed fire acreage.

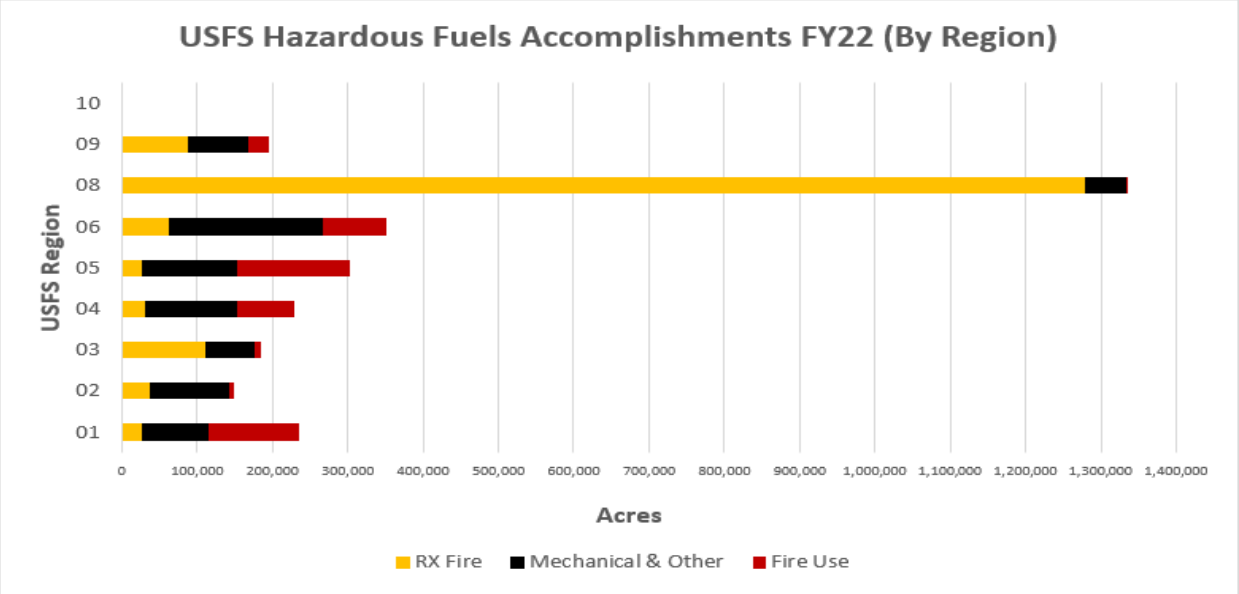


Figure 1 shows the amount of fuels treatment conducted by region, with R8 treating more than all regions combined.

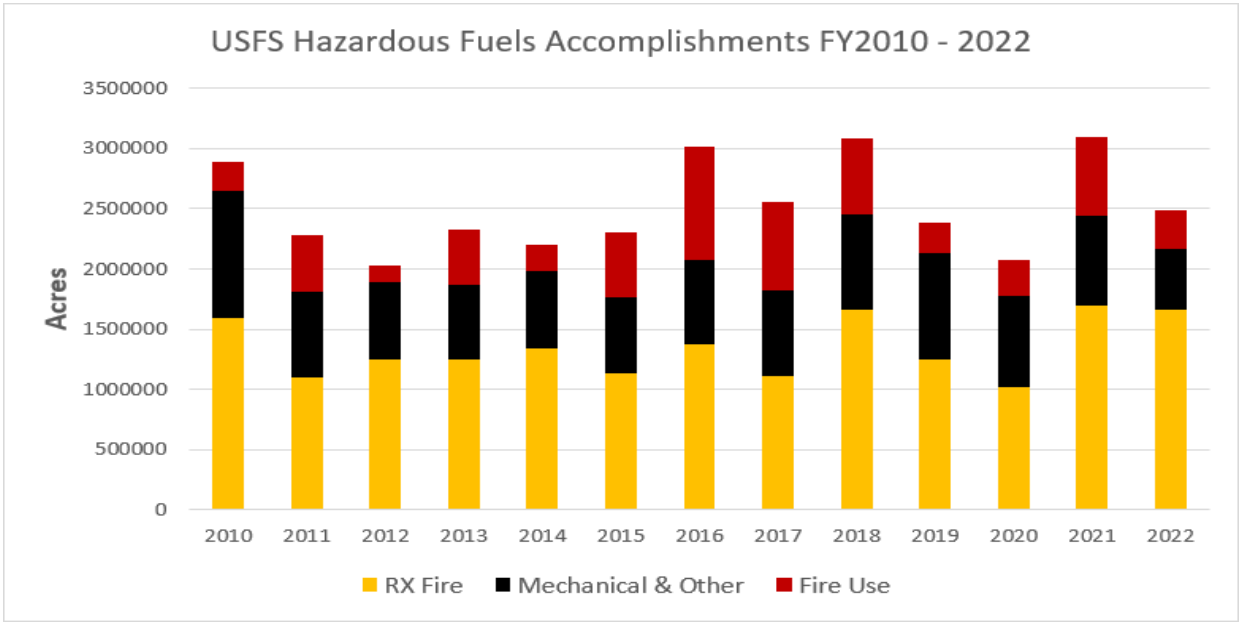


Figure 2 shows the fuels treatments for the past 10 years, for all regions.

In May of 2022, during the prescribed fire pause, Region 8 stood down prescribed fire operations in accordance with the Chief's letter.[14] However, because resources were already in-place for ongoing prescribed fire operations, regional leadership worked with the Chief's office to finish on-going prescribed fire projects. Operations were completed late May 2022 and Region 8 also paused any further prescribed fire projects.

Following the pause, Region 8 Fire Aviation Management staff began assisting forests with implementing the required updates to their programs. Typically, the prescribed fire program in

the South starts around October, but because of the new required updates, Region 8's prescribed fire implementation did not resume in until January 2023.

In late February 2023, a spring wildfire risk assessment of the Southern Appalachians projected "normal to below normal wildland fire risk," primarily due to abnormally wet conditions and an early start of the annual growing season known as "green up". With these conditions, combined with a successful history of prescribed fire implementation in Region 8, a productive spring prescribed fire season was anticipated.

Forest and District

Forest and District Prescribed Fire Goals

The Chattahoochee and Oconee National Forests are in north and central Georgia. The Forests consists of four Ranger Districts: The Conasauga, Blue Ridge, Chattooga River, and Oconee districts, managed by the Supervisor's Office in Gainesville, Georgia. Annually, the forests burn approximately 40,000 acres across all four districts. The Conasauga Ranger District (District) currently has one qualified prescribed fire burn boss (RXB2), and one qualified agency administrator (AA) to manage their 5,500-acre prescribed fire program. Due to the limited permanent fire management personnel, the District relies on outside resources for wildfire response and prescribed fire implementation. The Sumac Prescribed Fire Project is one of the prescribed fire projects on the District and contains both the Rocky Flats Prescribed Fire and the Hickory Ridge Prescribed Fire projects. The project units in the Sumac Prescribed Fire Project are currently burned approximately every 5 years, with prescribed fire reentry on a three-year rotation. As a pro-active fire program, the District successfully coordinates many resources to maintain and treat the National Forest System lands they manage.

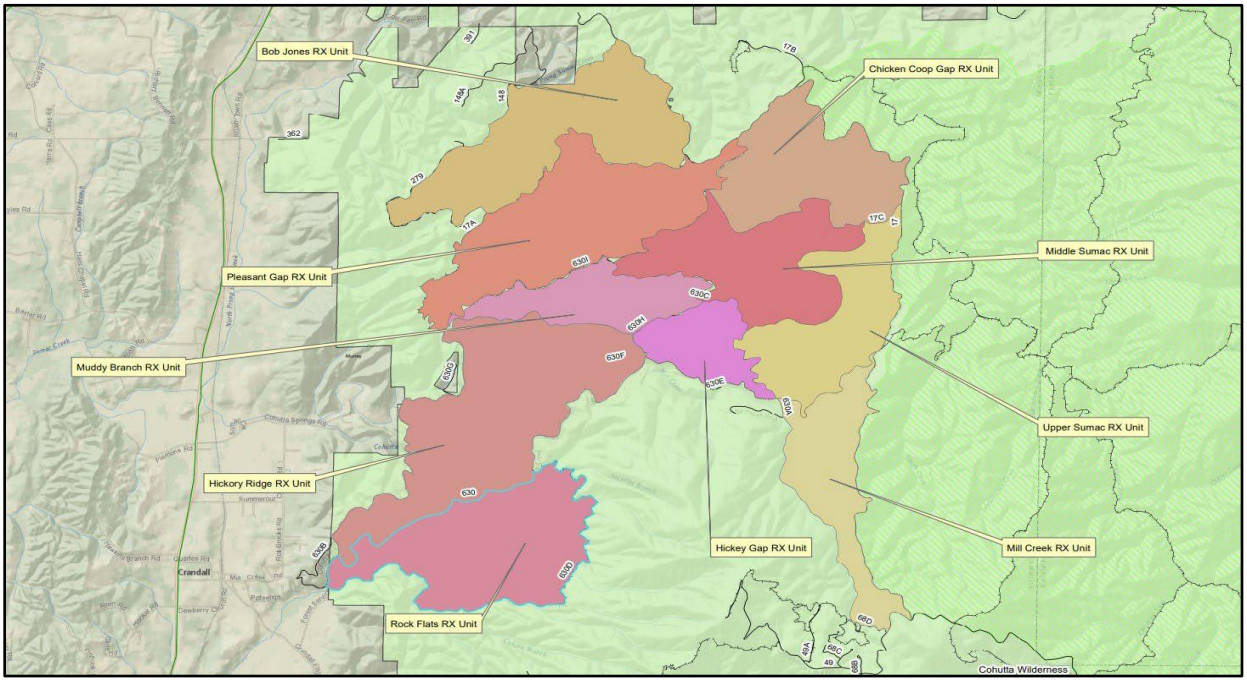


Figure 3 is a vicinity map of all the Sumac RX burn plan compartments. Rocky Flats RX is outlined in blue at the bottom of the image.

The Chief's National Leadership Council visits the Conasauga Ranger District

On March 15, 2023, the Chief's National Leadership Council held a meeting in Atlanta, Georgia. As part of the meeting, they visited the Chattahoochee and Oconee National Forests, specifically the Conasauga Ranger District, to see the prescribed fire and land management projects occurring at a district level. The District welcomes a high number of visitors annually. During the time of the Rocky Flats Prescribed Fire, spring break was occurring and local visitors, as well as 1,200 other visitors, were set to visit the nearby Cohutta Springs Conference Center. During that time, the District was continuing with prescribed fire.

The Sumac Prescribed Fire Project

For the full Sumac RX Plan including objectives, prescription, and desired outcomes, see Appendix A

The Sumac Prescribed Fire Project includes two burn units; the 1,494-acre Hickory Ridge Unit, and the 1,244-acre Rocky Flats Unit, both of which were impacted by the Rocky Flats escaped prescribed fire. Fuel on the Hickory Ridge Unit includes Yellow Pine and Oak Hickory with dead and down timber. It has active timber and silviculture management projects taking place, and no planned prescribed fire for the 2023 prescribed fire season. As part of the Sumac Prescribed Fire Project, the Hickory Ridge Unit to the north functions as contingency lines for the Rocky Flats Prescribed Fire Project. The last fire that occurred on the Hickory Ridge unit was from a spot fire from the 2016 Rocky Flats Prescribed Fire Project.

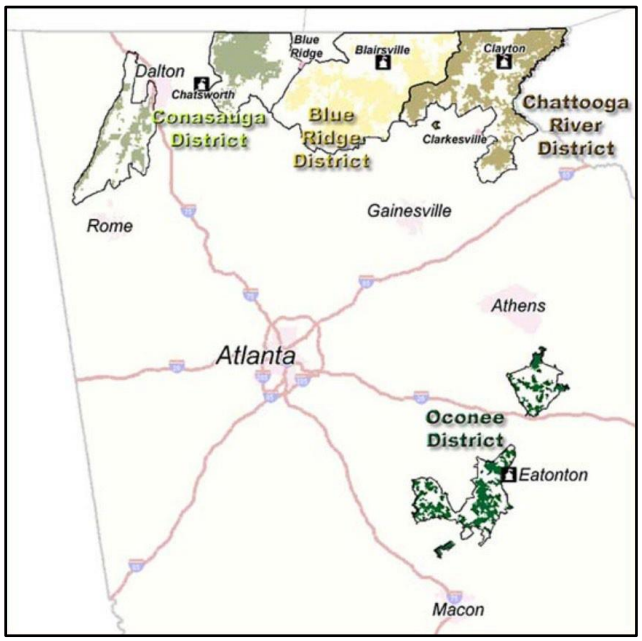


Figure 4 shows the National Forests in Georgia, with the Conasauga Ranger District to the top left.

On the Conasauga Ranger District, the Mill Creek Road is one of the critical holding lines[15] for the Rocky Flats Prescribed Fire Project. During the 2016 Rocky Flats Prescribed Fire Project, fire spotted onto a section of line between Mill Creek and the Mill Creek Road. As a result, in 2018, the RXB2, who was also the District Fire Management Officer, changed the burn plan to include a 73-acre section of line of mixed Oak forest between the Mill Creek Road and Mill Creek to use as a holding line. This meant that he "blacklined" this section of road north of the Rocky Flats Prescribed Fire Project to reduce the risk of a spot fires during the larger prescribed fire. Typically, areas like this next to a large flowing creek with a riparian area and moist 1,000-hour fuels, do not burn well and are easy to hold. Through experience, the District knew that this was not the case on Mill Creek Road and gathered twice the required number of resources for holding[16] and firing

operations to mitigate potential holding issues similar to what occurred with the 2016 prescribed fire.

On the Rocky Flats Prescribed Fire Project, with all the necessary resources needed for the day, the decision was made to initiate and ignite the blackline operation. Although low relative humidity (RH) for the operation was beneficial to burn next to the creek, the spot fires that landed on the Hickory Ridge Unit quickly became established and were difficult to contain due to the steep terrain and accumulated dead and down fuels on the hillside.

III. Narrative

For the full technical analysis of the Rocky Flats RX Plan, see Appendix B

In preparation for the Rocky Flats Prescribed Fire Project, the RXB2 spoke with the Forest Duty Officer (Duty Officer) about the spot weather forecast[17] and variance[18] protocols for the weather window that the District was experiencing. The predicted weather for the Mac White Gap Prescribed Fire Project that was being conducted on March 20, 2023, was very similar to the predicted weather for the Rocky Flats Prescribed Fire Project scheduled for the next day, March 21, 2023.

After speaking with the RXB2, the Duty Officer also went through the variance process with the acting Forest Supervisor who had just started a detail and had never gone through the variance process. The Duty Officer made sure the Forest Supervisor understood how the forecasted weather of low RH would require a regional level variance, and their responsibility to contact the Region with this request. This helped them understand the process more clearly, and how the burn bosses used the predicted weather to determine if the prescribed burn operation would meet the objectives outlined in the prescribed fire burn plan. The Duty Officer knew that multiple districts planned to burn on March 21, 2023, and informed the Forest Supervisor of the need for a regional variance for those additional prescribed fire projects as well. The spot forecast for the Mac White Gap Prescribed Fire Project was accurate, leading the Supervisors Office to expect a similar outcome on March 21, 2023. The general forecast indicated that the weather would be relatively dry for the next two days, with only a 10% chance of wetting rain at 0300, based on the spot weather forecast for March 22, 2023.

Planning the night before the ignition of the Rocky Flats Prescribed Fire Project
The evening of March 20, 2023, the RXB2 began to pull weather and information together for the Rocky Flats Prescribed Fire Project. They spoke with the qualified AA at the Mac White Gap After Action Review (AAR) and discussed the plan for the next day, including the general forecast that called for low RH. They agreed that it was an advantage, as the piece of line they would need to burn was next to the Mill Creek riparian area, and ground fuels would likely not be consumed well if they tried to burn it with higher RH.

The morning of the Rocky Flats Prescribed Fire Project
About 0430 on March 21, 2023, the RXB2 requested a spot forecast from the National Weather Service for the Rocky Flats Prescribed Fire Project. About 0530, the RXB2 also spoke with a National Weather Service forecaster regarding any additional details or updates in the weather, knowing the tactics for the day, such as resource needs, would be based on the information in the spot forecast. It would inform the briefing of those resources and indicate where they would be assigned. The RXB2 knew that having the most accurate weather information early would help with decision making and contacting the resources that may be needed for that day.

A prescribed fire burn boss trainee, RXB2(t), was assigned to the Rocky Flats Prescribed Fire Project and had also been closely monitoring the weather that morning as well. The RXB2(t) arrived at the office around 0700 and tied in with RXB2 to begin the administrative processes required to implement the prescribed burn. The RXB2(t)'s first tasks were to contact contingency resources outlined in the prescribed fire burn plan. This included the Georgia Forestry Commission who they would also obtain a burn permit from through the Murray County Office. The RXB2(t) contacted the Georgia Forestry Commission supervisor and asked if they had any available contingency resources or could assist in locating other contingency resources as the District would not be able to burn that day without them. The Georgia Forestry Commission supervisor responded that they had a D5 dozer and a Type 6 engine available that morning that would be able to respond if needed. They emphasized that although they were available and able to respond in the agreed upon 90-minute time frame (per the "R8 Contingency Resource Response Assessment"), their resources would also be assisting with some small burns taking place nearby.

While the RXB2(t) confirmed the required contingency resources were available, the RXB2 requested another updated spot weather forecast, which predicted 21% RH for the day. The prescribed fire burn plan indicated RH below 30% required a Forest level variance, and RH below 25% required a regional variance. The RXB2 prepared the paperwork for a regional level variance and contacted the Duty Officer to discuss the day's plan, including the mitigations for the low RH, and to ask them to submit the variance to the regional office.

Talking through the variance with the Duty Officer
The RXB2 explained to the Duty Officer that they were going to "blackline" Mill Creek Road for several miles, burning the area in between the road and Mill Creek. Mill Creek is a large, flowing creek that would function well as a holding line. The RXB2 also explained that although the minimum staffing was 17 for the Rocky Flats Prescribed Fire Project, 30 people would be assigned to hold the road and contain any spots that may cross Mill Creek Road. Resources included a RXB2 and RXB2(t); two staffed Type 6 engines; an unstaffed Type 6 engine for water support for the utility task vehicle (UTV); an unmanned aircraft system (UAS) module that could be used for reconnaissance and aerial ignition; three 5-person handcrew squads; one dozer; two prevention patrols; and a firing boss and trainee. They also identified that the Georgia Forestry Commission had one D5 dozer and one Type 6 engine available as contingency resources if needed. The RXB2 reiterated that they would be burning next to Mill Creek and told the Duty Officer that the low RH would help with fire effects and get "solid black"[19] established for the larger Rocky Flats Prescribed Fire Project. The Duty Officer agreed the mitigations were reasonable and told the RXB2 they would contact the regional office to obtain the variance. The

RXB2 then returned to administrative work and prepared to brief resources on the blacklining operation.

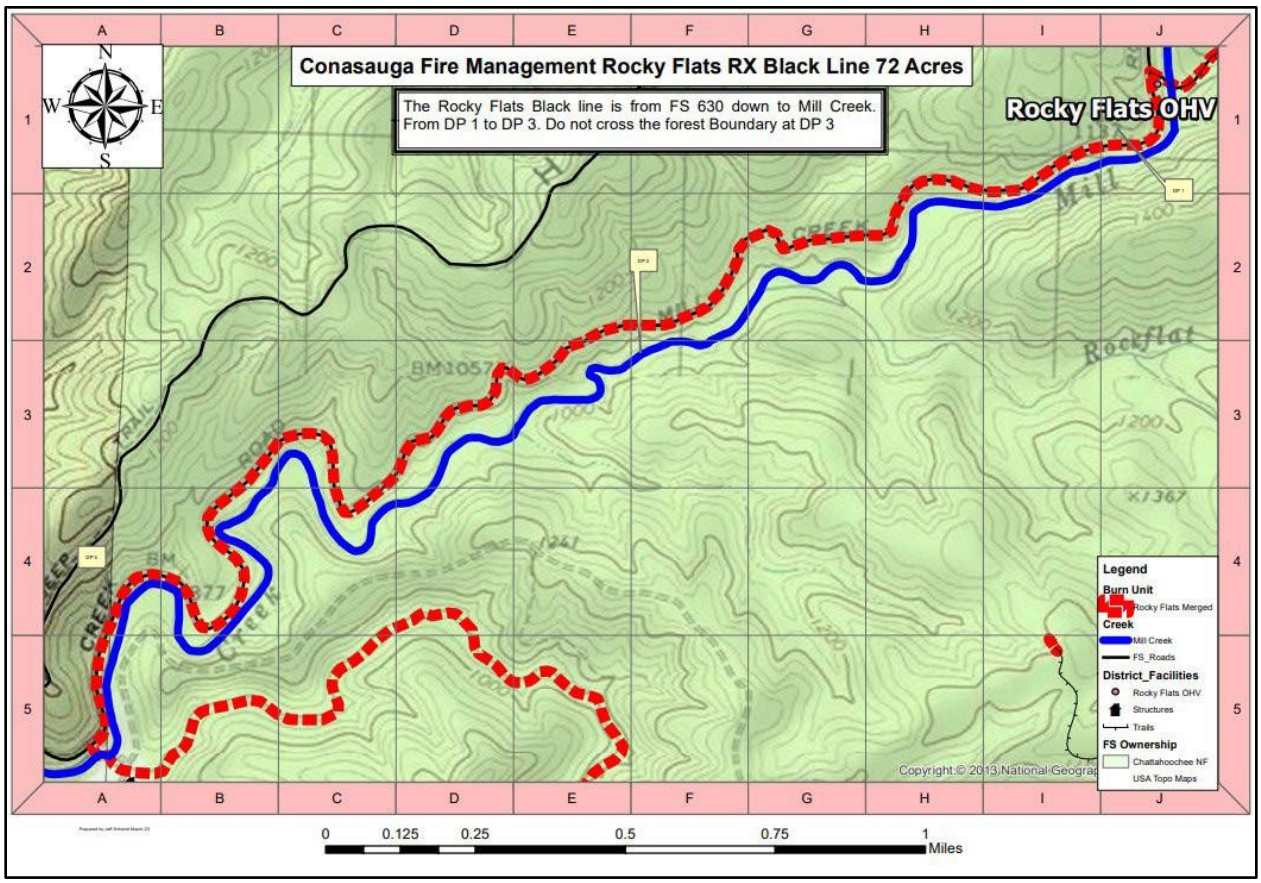


Figure 5 shows the operational map used for the Rocky Flats Blackline RX.

The Duty Officer submitted the variance request, using the R8 Variance Request form, via Teams and called the Regional Fuels Manager to talk through all the variances for the Chattahoochee-Oconee National Forest. The Duty Officer sent the variances, and the Regional Fuels Manager agreed that it was a solid plan, and via a Microsoft Teams chat, gave the Forest the "verbal permission" ~~au~~thorization[20] for a regional variance. The Duty Officer texted the RXB2 stating the *"verbal" had been given, and [they] were clear to burn that day."*

The RXB2 then contacted AA to obtain their burn authorization, the "2A",[21] required for the next 24-hour period. They spoke via Teams video because the AA was on a detail and not physically at the office. When the RXB2 called, the AA was on a call with another RXB2 from a separate district because they were also the designated AA for that prescribed fire project. Around 0830, the AA returned the RXB2's call. They used the 2A to help with the conversation about the weather, resources, and fuels. Due to the 2016 Hickory Ridge Prescribed Fire in that area, the AA realized there was a lot of dead and down fuel from 2016 Hickory Ridge Prescribed Fire on the upslope side. The AA and the RXB2 discussed that crews would have to catch any spot fires quickly, as the steep ground would be difficult and hazardous to work on. They also

discussed potential opportunities for burning on the following day, then they both signed the 2A. The RXB2 then spoke with the acting District Ranger, who was filling in behind the AA. The RXB2 informed the acting District Ranger of the day's operations, explained the plan, and the acting District Ranger agreed it was a logical plan and signed the 2A as the unit Line Officer.

Briefing all resources at the work center parking lot

Resources gathered in the parking lot for an 0900 briefing. Both the RXB2 and RXB2(t) knew not all personnel who were going to be on the burn were at the briefing. However, to get started, they decided that the RXB2(t) would brief the resources there, and individually brief absent resources once they arrived on the project. The RXB2(t) passed around briefing packets and maps, and discussed the briefing checklist, including weather, operations, contingency plans, incident within an incident information, and hazards for the prescribed burn project. Also, the Eagle Cap Wildfire Module (Eagle Cap squad) had just arrived on the district and in addition to their in-briefing, they were provided additional Forest information, repeater information, hospital location, lodging options, etc.

The original plan was to use two firing groups as both firing and holding to "leapfrog"[22] down Mill Creek Road to the west. The local 5-person handcrew (squad), supported by a water capable UTV, would start firing at the test fire location on the far east side of the burn unit. The other 5-person squad, two of whom were qualified firing bosses (FIRB), were supported by Engine 611, staffed by two crew members, and were told to start firing about ½ a mile west of the test fire location. Because the area was "scabby,"[23] these two squads were to stagger their starting locations to make further progress down the road so that they could be prepared for the UAS firing operations.

En-route were the local 5-person Pinhoti handcrew squad and Engine 644 with three crewmembers. Their instructions were that upon arrival, they were to begin firing from the far west end of the prescribed fire and work toward the other two squads on the eastern side. Engines would patrol the road for spots and the dozer would be staged on Hickory Ridge Road to the north of the prescribed fire as a contingency resource and improve the road that would be used as a contingency line. The UAS module would ignite the prescribed fire from the creek towards the road as available, also moving to the west. The RXB2 closed out the briefing by discussing the potential for spot fires, telling everyone that if they a spot fire crossed the Mill Creek Road, it would be difficult to catch due to the steep terrain. The RXB2 explained that they would need to catch the spot fires small, but if they could not, they would hold the line on the Hickory Ridge Road to the north of the planned prescribed fire.

The only resources not at the briefing were the Pinhoti squad, Engine 644, and the assigned FIRB. The RXB2 spoke to each of them that morning and discussed the plan and asked that they check the previous days burn enroute to the Rocky Flats Prescribed Fire project. The FIRB, who had a required meeting with the roads department, would tie in with the RXB2 on scene later that day. By 1030, all resources were enroute to the test fire or checking on the Mac White Gap Prescribed Fire.

Crews arrive at the test fire location

When crews arrived at the Rocky Flats Prescribed Fire Project, they divided into their firing groups, and moved into position. At 1047, the RXB2(t) contacted dispatch and informed them, *"the test fire is good, and we are proceeding with the burn".* Shortly thereafter ignitions began. As the RXB2(t) began ignition of the test fire, the RXB2 recognized that with the number of resources onsite, they had an opportunity to blackline an additional section of the Rocky Flats Prescribed Fire Project. About 1100, the RXB2 contacted the AA and talked about revising the plan to include the additional acreage. The AA said, *"If you can safely do it, go ahead."* and then emailed the RXB2, RXB2t, Duty Officer, Forest Fire Management Officer, and District Ranger stating, "*In talking with [the RXB2], they have enough resources to conduct additional blackline for the Rocky Flats Rx. I'm good with the plan and attaching the updated map. As the AA authorization was signed this morning, I'll not re-sign but please include this map with the documentation for this burn.*"

As the UAS module was waiting for a firing mission along Mill Creek, the RXB2 requested them to recon and validate the potential additional acres south from the test fire to see if the creek had enough flowing water to function as a holding line. The RXB2 then contacted the Pinhoti squad and Engine 644 and reassigned them to fire and hold this part of the line. They had not arrived from Mac White Gap Prescribed Fire yet, and this change in the plan would not disrupt the ongoing ignitions for the day. Everyone was comfortable with the new plan.

The contingency dozer transport temporarily broke down

The dozer assigned to the Rocky Flats Prescribed Fire project made it to Hickory Ridge Road (aka the 630B road). However, a hose on the transport dislodged and leaked all its coolant, and the transport would need to be refilled immediately. The FIRB had just arrived at the test fire, and the RXB2(t) asked if they would tie in with dozer operator (DZOP) to help fix the transport. Since the other DZOP was not yet operational, and had a vehicle, it made sense for them to go support the transport. The two DZOPs tied in with each other and determined that they would have get more coolant from town. The RXB2(t) felt comfortable sending the DZOP and FIRB on this errand even though they were originally assigned to work with Eagle Cap squad. The RXB2(t) knew the Eagle Cap squad had multiple FIRBs, which would allow them to stay within the overhead[24] requirements within the prescribed fire burn plan while the two were gone.

Beginning to leapfrog in the ignition sequence

The RXB2(t) worked with the local squad to get the initial fire established, then contacted Eagle Cap squad to begin ignitions. At this time, the firing was slow because the 1,000-hour the fuel moisture was high near the creek and not receptive to fire. Additionally, the smaller 1-hour fuels were slow to ignite due to recent rainfall but were mildly consumed. The onsite weather observation, via Kestrel,[25] showed RH at 22% near the road, with light and variable winds. The squads observed that it was *"wet by the creek and dry by the road."* Although, the initial firing was slow, smoke was still impacting the road.

Figure 6 shows the culvert on the left side of the image, with the creek to the left as the holding line.

At 1224, the RXB2(t) contacted dispatch and reported very light fire behavior, but that they were continuing with firing. The local squad began using a Pyro shot hand launcher [26] to fire "ping pong balls"[27] further down toward the creek to allow the fire to increase in intensity coming back up to the road. Because the Pyro shot launcher only fires "ping pong balls" about 50-80 feet away, the local squad also used lit sticks and pinecones as an expedient way of adding fire lower down the slope to increase blackline depth.

Both squads continue lighting off the road

The Eagle Cap squad was seeing similar fire behavior as the local squad. However, because they were working in flatter terrain with lighter fuels, they were seeing a little more fire behavior. They only used a single drip torch to light that strip since it was only 30 yards from the road to the creek. After about an hour and a half of ignition, the local squad reached the area that Eagle Cap squad had burned and decided to take a water break. Around the same time, the Eagle Cap crew boss (CRWB) began to walk east along the line, toward the local squad to check for spot fires and monitor fire behavior.

Figure 7 shows the distance from the road at the bottom of the image to the creek in the middle of the image.

Both squads call in spot fires at about the same time

At 1234, about five minutes later, the Eagle Cap CWRB heard a radio transmission that there were multiple small spot fires near where the Eagle Cap squad had begun their ignitions and where the local squad had taken their water break. The local squad and the UTV were attempting to stop the spot fires. The Eagle Cap CRWB heard their squad's radio transmission that an additional spot fire where they had stopped firing. The CRWB was quickly hiking towards the Eagle Cap squad when Engine 644 drove by on Mill Creek Road, heading towards the test fire.

The local squad with the UTV were able to respond to the initial few spot fires, the largest of which was ~15' x 15'. Also, around this time, another much smaller spot fire, ~5' x 5', was observed just to the east of that initial 15' x 15' spot fire. The UTV operator (UTVOP) and FIRB(t) were able to completely suppress the 5' x 5' spot with the UTV's water. The local squad was engaged with the growing 15' x 15' spot fire when they requested Engine 611. Engine 644 and the Pinhoti squad had just arrived on the burn unit. Engine 644 heard the local squad's request and notified Engine 611 that they would check in with the local squad. Engine 611 and Pinhoti stayed with Eagle Cap squad to support them on the growing spot fire to the west. Both Engine 644 and the local squad began to engage the growing east spot fire by putting in a handline and a hose lay. The Pinhoti squad saw Eagle Cap squad working on the west side of the western spot fire and anchored into the road on the east

side of the spot fire and began digging line. The RXB2, who was near the test fire site with the UAS module, asked them to fly a recon around the spot fires then the RXB2 tied in with the RXB2(t) to discuss the growing spot fires. Due to the steep topography, all three squads were keeping up with the advancing spot fires, but it was matching their pace as they moved up hill. Terrain was very steep, and some resources needed to crawl up the hill to access it. Fuels were thick and they were having to cut a saw line, dig a handline, and use blowers to clear the fuels. At this time the spot fires were very active, and the fire behavior was noted as light to moderate, but the terrain was slowing their progress. The RXB2 and RXB2(t) recognized that the spot fires were growing larger, and RXB2 drove up Hickory Ridge Road to gain situational awareness, while RXB2(t) continued to manage resources from Mill Creek Road.

Figure 8 shows the steep terrain where the local squad began to dig line around the east spot fire.

A FIRB, had since returned from town with coolant for the transport, was working to top it off when the RXB2 arrived and tied in with them. The RXB2 asked them to scout the Hickory Ridge Road to the west, to see if there was a drainage or feature they could use to contain the western spot fire. The RXB2 then hiked down the hill above the eastern spot fire to scout for a viable containment line location. The RXB2 was able to find a ridge line with lighter fuels that the local squad could use to continue constructing fireline. The RXB2 also identified a ridge line that a dozer could navigate, and potentially put a fireline from Hickory Ridge Road to Mill Creek Road.

As the spots continued to grow, the RXB2(t) instructed the local squad and Engine 644 to continue constructing handline up the steep hillside to cut off the spot fire. A firefighter 1 trainee FFT1(t), the squad boss trainee on the local squad, reported to RXB2(t) that their squad was *"working the spot, and that's a tall order, but we will keep working."* The RXB2(t) replied, *"keep working until further direction."* However, the FFT1(t) later recalled, *"I knew immediately that we didn't have the people, but I kept thinking we might get ahead of it."* Since the RXB2 was on the ridge above the FFT1(t), scouting down toward their section of the line, the FFT1(t) asked to tie in with the RXB2 for a face-to-face meeting. As the FFT1(t) walked up to the RXB2, they said, *"hold on, I'd like to tell you what I think the plan should be, and you tell me if it needs to change."* The FFT1(t) then explained where they had hiked up from, and that the ridge had lighter fuels and would be a better handline. The RXB2 agreed with the FFT1(t)'s

assessment and gave them more information on a potential control line location that they had scouted. The RXB2 then continued to hike east scouting for a dozer line, as the FFT1(t) tied back in with their squad to explain the plan.

FIRB plans to build a "T" shaped dozer line down the drainage

The FIRB was scouting from the Hickory Ridge Road, trying to figure out *"which smoke was which,"* because the Broom Sedge and the dead and down were thick on the downhill side of the road, making it hard to determine where the spot fires were. The FIRB had scouted to what they believed was the west spot fire and could see the fire downhill and continuing to move up the drainage. The FIRB identified an area where the dozer could make it part way down the steep drainage, but *"there wasn't a lot of dozer-able land".* The FIRB contacted the RXB2 and suggested that they put in a dozer line above the western spot fire to try and "check the fire" so the squads could tie into it. The FIRB wanted to assist the squads' work in the thick fuels *"even if was just 20 less feet they had to work".* The RXB2 agreed, and the dozer drove down the drainage to put in a "T" feature above the spot for the crews to tie into.

At about 1500, the RXB2 recognized that their dozer was committed to the western spot. The RXB2 and RXB2(t) discussed the need to call the Georgia Fire Commission and request a dozer to put in line where RXB2 had scouted, on the eastern end of the spot fires. As RXB2 contacted the Georgia Fire Commission for an available dozer, the RXB2(t) also contacted the engine boss (ENGB)/District Ranger who was at the District office and requested that they gather any available resources and respond to the Rocky Flats Prescribed Fire Project.

Crews consider local values at risk

As the western spot fire appeared to be the larger of the two spot fires, and with Cohutta Springs Conference Center and a few houses ~1 mile to the north of the drainage the RXB2 and FIRB discussed requesting a helicopter to drop water on the western spot fire to support the resources on the fireline and help hold Hickory Ridge Road. The RXB2(t) contacted dispatch. They then contacted the Duty Officer who then began to make calls to see if there was an available helicopter to assist on the spot fires on the Rocky Flats Prescribed Fire Project.

At about 1600 the Georgia Fire Commission dozer and DZOP arrived to meet with the RXB2. With an additional dozer, the RXB2 informed the DZOP of the adjacent ridge to the eastern spot fire and asked them to construct a control line to burn from when conditions allowed. The UAS module had moved up to Hickory Ridge Road to continue scouting the spot fires with the drone. The squads were reporting that fireline construction was going slow, and the spot fires were continuing to grow.

Figure 9 shows an overview of the spot fires at approximately 1730.

Initially the helicopter (2BH) was working on the Oconee Ranger District was available and could quickly be enroute from Milledgeville, Georgia. It was about a 45-minute flight from where the helicopter was working, and the flight crew told the Duty Officer they would call the RXB2 while enroute. However, smoke from multiple prescribed fires near Oconee District caused low visibility and the helicopter had to cancel and return to base.

The Duty Officer contacted the Blue Ridge Ranger District RXB2(t) to see if they could release the Cherokee National Forest Type 3 helicopter 7TD to assist the Rocky Flats Prescribed Fire Project RXB2 with their spot fires. Helicopter 7TD commonly responds to this area and was already on the Chattahoochee-Oconee National Forest. The Blue Ridge Ranger District RXB2(t) checked on the helicopter 7TD's availability, and although they were on an adjacent district conducting a prescribed fire, they were the next available resource. Helicopter 7TD had just landed to refuel during a Plastic Sphere Dispenser (PSD) operation and told the Duty Officer that they could depart immediately. Helicopter 7TD then loaded two crewmembers and a bucket, and contacted the Rocky Flats Prescribed Fire RXB2 on air to ground and informed them that they were about 30 minutes flight time away with a fuel truck and a support vehicle on the way. The remaining helitack crewmembers stayed with the adjacent prescribed fire as they would need the extra staffing to complete that prescribed fire.

Notifications about the spot fires are made to the Supervisor's Office

About 1500-1700, as the resources on the Rocky Flats Prescribed Fire Project continued working, notifications were being made to the Supervisor's Office. The Duty Officer recalled thinking that the RXB2 could possibly declare the Rocky Flats Prescribed Fire Project a wildfire since the RXB2 had just requested contingency resources not identified on the Incident Action Plan (IAP).[28] The Duty Officer notified the Forest Fire Management Officer that the Rocky Flats Prescribed Fire Project resources were working to contain a ~20-acre spot fire, and then let the Fire Staff Officer know.

The UAS module deconflicts the airspace

Meanwhile, on the western spot fire, the DZOP was able to put in the "T" feature for the squads to tie into. The RXB2 had the DZOP continue to improve the Hickory Ridge Road, in case they needed to fire from the road. Helicopter 7TD was enroute, so at about 1700 the UAS module landed the drone to deconflict the air space. The RXB2 then assigned a FIRB as the ground contact for Helicopter 7TD and told them to work the helicopter on the western spot fire. As Helicopter 7TD arrived over the Rocky Flats Prescribed Fire Project, the helicopter manager

provided the RXB2 with a size up of the spot fires. The western spot fire was about 8-11 acres and progressing north up a drainage, and the eastern spot fire was about 15 acres following a ridge to the northeast. Helicopter 7TD finished the recon flight then proceeded to Cohutta Springs, to the northwest of the Rocky Flats Prescribed Fire Project, to reconfigure for bucket work and started dipping from a nearby lake. The helicopter dropped 28 buckets over the next hour and a half.

The resources on the eastern spot fire continued constructing line on the east side of the spot fire as Helicopter 7TD arrived on scene. A FIRB(t) had flagged a drainage to the west of the western spot fire, that could be used as a holding line if it were improved by the ground resources. As the DZOP continued constructing a dozer line down the ridge to the Mill Creek Road, the Eagle Cap squad on the western spot fire was able to handline into the "T" feature dozer line. Although the Pinhoti squad was continuing to construct hand line and they had not reached the "T" feature. A FIRB had scouted a drainage to the west of western spot fire that they believed would hold if they it was needed. The RXB2(t) had now moved to Hickory Ridge Road and tied in with the RXB2. They had already been discussing an alternate plan of firing from the eastern dozer line, and the western creek if they could not catch the spot fires. As they were discussing a plan, the winds on top of the ridge began to increase. Both RXB2(t) and RXB2 realized that with no line on the west side of the eastern spot fire, and the Pinhoti squad still working to complete their line on the east side of the western spot fire, there was still a large gap in the middle.

Developing a new plan

As the day continued, the RH continued to drop, and winds increased on the ridge line. The FIRB told the RXB2 they could not find a wet drainage to tie in the eastern flank of the western spot fire. Ground resources were tiring from the line construction and the spots continued to grow. The RXB2 talked with the RXB2(t) and developed an alternative plan. They would connect both spots together on Hickory Ridge Road and planned for the UAS crew to fire off the dozer line starting at the northeast corner at Hickory Ridge Road toward Mill Creek Road, containing the east end of the spot fire. The Eagle Cap squad would start firing at the top of a wet drainage and the northwest corner of Hickory Ridge Road, working down the drainage to Mill Creek Road, containing the west end of the spot fire. This drainage had been previously identified by both the FIRB and Eagle Cap squad earlier in the day. From the top northwest corner where the Eagle Cap squad would begin, the Pinhoti squad would fire toward the east. From the top northeast corner where the UAS module would begin, the local squad would fire moving toward the Pinhoti squad. The squads would tie in along Hickory Ridge Road to make a larger 300-acre box.

About 1730, the RXB2 briefed the FIRB who was managing the western spot fire. The FIRB briefed Eagle Cap squad to cut and improve the drainage and prepare to fire from it, and for Pinhoti squad to fire from that drainage east along the Hickory Ridge Road, with support from Engines 611 and 612. Meanwhile, the RXB2 and RXB2(t) had the local squad and Engine 644 disengage from their fire and hike down the hill gathering the hoselay on their way down, and relocate to the top of Hickory Ridge Road, near the new dozer line. The RXB2 and RXB2(t) briefed these resources on the plan to fire from the dozer line, heading west. The FIRB recalled thinking that, *"The plan was to wait it out and do a night burn out."*

The ENGB/District Ranger arrived to staff Engine 612. The engine had been staged at the test fire and was now assigned to the FIRB who used Engines 611 and 612 as holding resources on the west, while Engine 644 was being directed by RXB2 on the dozer line at the top of Hickory Ridge Road. The RXB2(t) was moving between each spot fire along Hickory Ridge Road and continued to monitor the onsite weather, documenting that the RH had dropped to 12% at about this time. The FIRB continued to work with Helicopter 7TD as crews prepared the western line.

The UAS module crewmembers get converted to ground resources

The RXB2 tied in with the UAS module, who was originally going to fly through the evening for night operations, but after considerable coordination at multiple levels, the RXB2 could not secure approval. Because the UAS crew had "stacked fire qualifications," the RXB2 asked them to convert to ground operations and fire off the dozer line that the DZOP was currently constructing. As there were only three people on the UAS module, the RXB2 assigned a district "militia" firefighter to tie in with them to ensure they had enough people to both hold the line and conduct firing operations.

At around 1800, the Duty Officer called the AA and asked them if they needed to have the conversation about converting the Rocky Flats Prescribed Fire Project to a wildfire. The AA and RXB2 had been communicating throughout the day, and both believed they would be able to manage the spot fires and neither of them had considered converting the prescribed fire to a wildfire. The Duty Officer understood. However, the UAS module had initiated a conversation about nighttime operations and had requested a temporary flight restriction (TFR). The Duty Officer and Forest Fire Management Officer reached out to the Regional Office and were told that they could only implement a TFR during a wildfire, not a prescribed fire. As they were making this request, the UAS module learned that the process for obtaining the TFR would likely take longer to complete than they would be assigned to the fire. Although the UAS module stopped pursuing the TFR, the Regional Office continued to explore the possibility of setting up the TFR, and ultimately determined that it could only be done for a wildfire and could not be done with this type of short notice for a prescribed fire.

Crews begin the "big box" plan

The DZOP finished the eastern dozer line, and "high tracked" back to the top of Hickory Ridge Road. The UAS module established an anchor point on Hickory Ridge Road and the new dozer line and started firing downhill towards Mill Creek Road. The local squad then began to fire from the dozer line moving west across Hickory Ridge Road. About 1830, the winds continued to increase, resulting in spot fires from the firing operation as soon as they began. An additional spot fire was now well-established north of Hickory Ridge Road, so when the DZOP arrived back at the top they began to construct dozer line around it.

Figure 10 depicts a similar image to what RXB2 had sent the DO when texting him updates.

As the UAS module moved below the ridgeline, they had little wind and no issues firing their line.

On the western spot fire, the FIRB waited until the Eagle Cap squad had improved the drainage, and then began firing from the top corner of the drainage. Eagle Cap squad slowly laid fire around the corner from the road into the drainage. Pinhoti squad began to fire the road and immediately began having spot fires. Helicopter 7TD was still flying and began water drops on these new spot fires north of Hickory Ridge Road. The Eagle Cap squad continued to fire south down the drainage, also recalling that once they were in the drainage and below the ridge line, the winds immediately calmed down. The Pinhoti squad and the engines were having multiple spots fires and were concerned that these spot fires would get established north of the road. They aggressively worked with Helicopter 7TD to catch any spot fires they saw. The local squad also had multiple spot fires that led to confusion about where the DZOP and dozer were, and where it was being sent. At one point, the FFT1(t) was told the dozer would be responding to the spot fire they were working. However, because there were multiple spot fires the dozer was actually sent to a nearby spot fire, not the one they were on.

Crews continue working as the helicopter hits "pumpkin time"[29]
Resources on Hickory Ridge Road continued to burn slowly towards each other, catching many spot fires as they tried to fire. The sun was setting, and the helicopter was released for the evening. Around this time, the FIRB recalls, *"I had myself convinced for so long that it was going to get better around dusk, but I was starting to get nervous, and it wasn't letting up."*

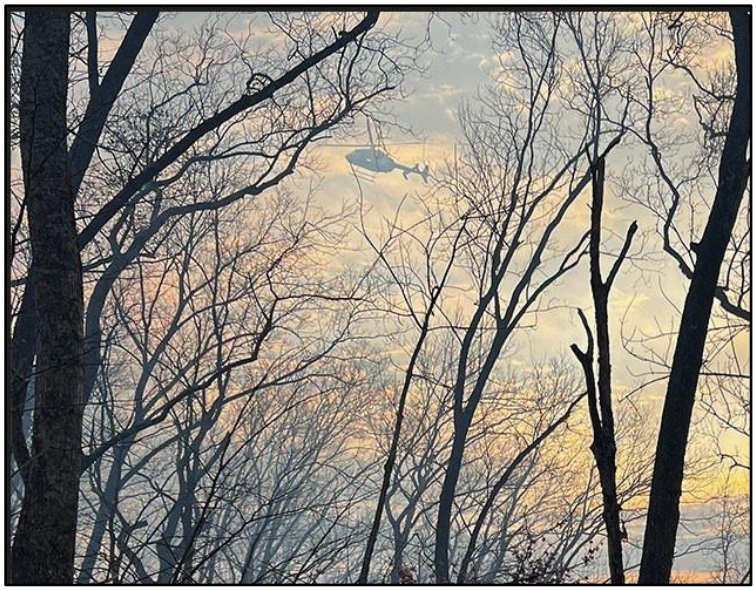


Figure 11 shows helicopter 7TD leaving the Rocky Flats RX at approximately 1915.

The firing operation was difficult and the RXB2 continued to monitor the weather. They knew the winds were a result of a storm cell to the south of the Rocky Flats Prescribed Fire Project. The storm track was moving directly towards them, and the RXB2 believed the rain would reach the area by about 0200 in the morning, however there would be strong winds in front of it.

The Duty Officer continued to text the RXB2 throughout the day and was aware of his plans going into the evening. The RXB2 had sent the Duty Officer a screenshot of the spot fire which showed the spots within the Hickory Ridge Prescribed Fire unit. At 2130, the Duty Officer went home for the evening knowing that the firing operation was likely to create a ~300-acre spot fire.

Operations continue on Hickory Ridge Road

Figure 12 shows ember wash along Hickory Ridge Road as crews were trying to box in the spot fires.

Operations continued to be slow on the Hickory Ridge Road as winds had increased significantly after sunset. Resources waited for the winds to die down enough to fire off the road, and then chased the spot fires as the winds would increase. The FIRB and the DZOP began working on a contingency dozer line north of Hickory Ridge Road. Earlier in the day, the FIRB and Pinhoti CWRB had scouted an old dozer line from the Hickory Ridge compartment boundary that could be improved for an additional line. The CRWB worked with the ENGB/District Ranger and the dozer to punch the line in. The RXB2 did not need the prevention patrols and released them.

Around 2200, crews were experiencing multiple spot fires across Hickory Ridge Road. The RXB2(t) spoke with the DZOP who suggested that an additional dozer and Type 6 engine would help contain the additional spots. The RXB2(t) agreed and the DZOP contacted Georgia Fire Commission supervisor to see if these resources were available. Although Murray County did have one dozer available, the Georgia Fire Commission dispatched a dozer from Catoosa that had multiple dozers available. The Type 6 engine that the Georgia Fire Commission had dispatched from Murray County was available and arrived around 2330. The ENGB tied in with RXB2 and the engine was assigned to the east fire group with Engine 644 to support the local squad with multiple spot fires. The Gordon County dozer arrived at about 2345 and was staged on Mill Creek Road to the west of the prescribed fire.

At midnight, the UAS module had finished their firing operation on the east flank. The RXB2 wanted to use them to scout the fire in the morning so they were released for the night. The RXB2 requested an updated spot forecast from dispatch and texted the AA to inform them on the continuing operations and the increased winds.

The FIRB had the contingency dozer line finished on the west side, north of Hickory Ridge Road, and the two engines were spraying snags while the Pinhoti squad tried to fire the road and continued to move from spot fire to spot fire. With the high winds and multiple spot fires in the green, the FIRB was becoming increasingly concerned about resources working close to snags and radioed the RXB2(t) saying, *"We are getting spots everywhere; what are we doing up here?"* The RXB2(t) said, *"I'm worried because we have structures threatened"* and the FIRB replied, *"I'm worried about getting smushed by one of these snags."*

Firing crews from each side of the spot had not tied in yet, and each time they did put fire on the ground, they started new spots. The local FFT1 squad boss recalled, *"We bumped up the pressure on the hose, but the wind was bending the water, and we couldn't use it to put anything*

out." During the high winds, the ENGB/District Ranger recalls a Pinhoti crew member yelling *"Hey spray that 30-foot snag out!"* As they rushed over to extinguish it, the crew member yelled over the wind *"No, not that one! The other one!"* As the ENGB/District Ranger looked around, he could see that there were several snags on fire around him.

The FIRB contacted RXB2(t) again and expressed his concerns. the resources continued to suppress spot fires for a while longer, until the RXB2 radioed to "*Disengage with the spot fires. Focus on the firing operation*." The FIRB recalls being relieved that they were getting out of the trees, however he knew that meant there would likely be multiple uncontained spot fires as they continued to fire.

Around midnight, the RXB2 spoke with the National Weather Service to get an update on the weather and discuss the current situation with the meteorologist. The meteorologist advised the RXB2 that there were storms moving in from the west, with one small cell approximately 20 miles away over Catoosa County. The storms appeared to contain some moisture and would arrive at the fire area around 0200. Behind that, a larger more solid line of precipitation was currently over Alabama and would arrive over the fire site at around 0300 hrs. The RXB2 knew they would not be able to finish the firing operation before they were rained out. At about 0200, he told all resources to disengage. The FIRB recalls, *"As much as I hated it, I was glad to get off the hill."* Rain was coming in.

All resources released from the fire

The RXB2 and Engine 644 would remain on the spot fire through the night and all other resources were released. They called dispatch to give a resource status update. As crews left, Engine 644 staged on the west end of Hickory Ridge Road, as that was the area closest to values at risk. The RXB2 stayed on the east end of the spot fire, where they could see the entire site, including the eastern dozer line. Firefighters monitored the spot fire throughout the night and no other significant events occurred.

When the ENGB/District Ranger returned to the District Office around 0330, he sent the Forest Supervisor an email saying they had a 300-acre spot, they had received precipitation on the Rocky Flats Prescribed Fire Project, and the RXB2 and an engine were camping on the spot overnight. They also mentioned the values threatened were Cohutta Springs resort and a few

Video 1 Shows a depiction of actions taken on March 21st and 22nd 2023. CTRL CLICK THE IMAGE TO WATCH

houses to the west. The Acting Forest Supervisor woke up to the "pink screen" on their phone as she received the email alert and recalled being immediately concerned by the "values at risk" message and did not fall back to sleep.

Conversations begin at the Supervisors Office

At 0800 on March 22, 2023, when the Fire Staff Officer came into work, the Duty Officer briefed them on Rocky Flats Prescribed Fire Project. As the two talked, they believed that the spot fire may not have been fully contained, even though it had rain on it. Although they recognized that it was not their responsibility to declare the prescribed fire a wildfire, they discussed the possibility because there were still resources assigned to the spot fire. There were other contingency resources not previously identified on the Rocky Flats Prescribed Fire Project burn plan that had already been called to the spot fire as well. The Fire Staff Officer knew that these considerations would likely require the prescribed fire to be converted to a wildfire and began to contact the regional Fire and Aviation staff regarding a declaration. They recalled thinking that this situation was not routine and should qualify for a wildfire declaration given the above-mentioned factors.

Both Fire Staff Officer and Duty Officer talked with the acting Forest Supervisor about the technical requirements of converting a prescribed fire to a wildfire, however they noted there was a lot of discretion around declaring a wildfire. As the Forest Supervisor was an acting, and not a certified AA, to determine if the prescribed fire should be converted to a wildfire, they consulted with fire management staff including, Regional Office Fire Staff; the Fire Staff Officer from the Supervisor's Office; other Forest and Regional leadership including the Deputy Regional Forester; and the AA responsible for the Rocky Flats Prescribed Fire Project. The Acting Forest Supervisor understood the reasoning behind why fire staff believed it should be converted, but since the prescribed fire received rain, and there was no current fire on the ground, the decision was still unclear to them.

Throughout the day the Acting Forest Supervisor worked with the Fire Staff Officer and the Regional Office to gather information to make an informed decision. The Acting Forest Supervisor asked about how other forests in the region had dealt with similar situations, and sought clarification about exactly what was meant by declaring the fire contained in an operational period.[30] She remembered feeling the need to make the decision promptly but did not know if there was a specific time frame in which the decision to declare it a wildfire had to be made. Often, her questions were met with *"that's a bit of a gray area,"* to which she thought *"I don't want a gray area."*

The Augusta Interagency Hotshot Crew (IHC) on the nearby Nantahala District in North Carolina was available so the Regional Duty Officer contacted the Forest Duty Officer and offered to send Augusta IHC to assist with RXB2's operations. Since no prescribed fire was planned on the Cherokee or Chattahoochee-Oconee National Forests that day, the Augusta IHC was available to assist the RXB2 on the Rocky Flats Prescribed Fire Project. The Duty Officer offered the RXB2 the Augusta IHC's help which was accepted.

At 0830, RXB2 got on the Forest Fire Management Officer's Teams call, and briefly described what happened. The Forest Fire Management Officer told RXB2 that there would likely be a

review of the prescribed fire if it was declared a wildfire, but that even if it wasn't declared a wildfire, there still might be some kind of learning review, like a Rapid Lesson Sharing (RLS) or Facilitated Learning Analysis (FLA).

The Augusta IHC arrived at about 1100, and the RXB2 briefed them to ensure they had all the information they needed to for the day. Since it had rained, the RXB2 specifically reminded them about the possibility of slips, trips, and falls during mop-up, and asked them to *"check the lines if you can safely."* The RXB2 stayed on the fire until about 1500 when the RXB2(t) arrived to relieve him. The RXB2 then left the Rocky Flats Prescribed Fire Project and tied in with AA.

Still wrestling with the decision to declare the Wildfire

Throughout the day, the Acting Forest Supervisor worked to get as much information as she could, as she knew the decision to convert the prescribed fire to a wildfire would have implications for the District. The Fire Staff Officer contacted the ENGB/District Ranger and said that the Supervisors Office was considering declaring the prescribed fire a wildfire. The ENGB/District Ranger asked what triggered that decision and was told that they were considering two things: the spot was not contained during a single operational period and the RXB2 requested resources beyond the contingency resources outlined in the prescribed fire burn plan.

Based on the ENGB/District Ranger's experience on the fire and his understanding of the criteria to declare, he did not think that it should be converted, and that the RXB2 should be contacted. The Fire Staff Officer assured ENGB/District Ranger that he wanted to be transparent. Even though the Fire Staff Officer knew that the RXB2 would likely be upset with the decision, he wanted to speak with him personally. The ENGB/District Ranger advised the Fire Staff Officer that he RXB2 was home asleep, and they should let him get his "2:1."[31] The Fire Staff Officer agreed and said that he would wait until the next day to contact him. The Fire Staff Officer then contacted the AA and had the same conversation with him that he did with the ENGB/District Ranger. Through these conversations, the Fire Staff Officer could tell that the ENGB/District Ranger did not fully agree with the decision but realized the complexity around the decision being made by the Supervisors Office.

The following day, Thursday March 23, 2023, the ENGB/District Ranger pointed out that the prescribed fire burn plan stated that a wildfire would be declared when a burn could not be secured by the end of the next burning period.[32] The ENGB/District Ranger also pointed out that the period had not been exceeded, and if wildfire declarations were going to be made based on what resources were called in, it could make people less willing to call for the resources they need when they need them. The Fire Staff Officer and ENGB/District Ranger also discussed the need for a review of the Rocky Flats Prescribed Fire Project and agreed that a review of the incident could help them learn as a Forest and as a District.

Notifying everyone of the declaration and next steps

The ENGB/District Ranger informed the RXB2 that the prescribed fire had been declared a wildfire. The following day, the Fire Staff Officer also called the RXB2 to assure them that no one, including the firefighters, were in any trouble, but that there would be a review to stay in line with the Chief's intent on initiating a review anytime a prescribed fire is declared a Wildfire.

Although the RXB2 and others on the unit did not agree with the need to declare this prescribed fire a wildfire, they were open to learning anything that could help firefighters in the future. They were also glad for the chance to tell the story from their perspectives, and generous with their time through the prescribed fire review and the FLA.

IV. Lessons Learned

A. The process of declaring an escaped prescribed fire a wildfire happens infrequently but can be complicated unless you have prepared for the conversation. Rocky Flats Prescribed Fire Project surfaced the importance of having a robust discussion about a wildfire declaration to share high quality information for decision making and communicate the value of cooperation. The goal of this lesson is to assist people who may be making a wildfire declaration. You, or others around you may be functioning with assumptions about this process (*who should be involved, what should be discussed, how long do you have to make the decision, etc*.). It is wise to have this calibrating conversation ahead of time to improve efficiency and lower risk.

1. Who needs to be involved when declaring a wildfire? *PMS 484, Element 18: Wildfire Declaration*, pg. 27, reads, *"The Prescribed Fire Plan will specify who has the authority to declare a prescribed fire a wildfire. A prescribed fire, or a portion, or segment of a prescribed fire, must be declared a wildfire by those identified in the plan with the authority to do so . . ."* This official language focuses on authority, but to make the best decision, include personnel who have the most knowledge and expertise in their areas. To avoid miscommunication because of message atrophy (or the "telephone game") the best option is to have one conversation with everyone, if possible.

a. You should include personnel who have the most knowledge about:

- **i.** The fire itself (ex. RXB2).
- **ii.** The coordination of simultaneous prescribed fires on a Forest and coordination with the Regional Office (ex. Forest Duty Officers).
- **iii.** The administrative complexities facing a Forest (ex. Agency Administrators).
- **iv.** The reporting process to the Regional Forester and Chief of the Forest Service, (ex. Forest Supervisor and fire support staff) as well as programmatic relationships (ex. relationship between fire and timber).

b. Learning from the Rocky Flats Prescribed Fire Project

- **i. The Sumac Prescribed Fire Burn Plan that includes the Rocky Flats Prescribed Fire Project identified the RXB2 and the AA on the 2A as the personnel who had the authority to declare the prescribed fire a wildfire. However, the ultimate decision was made by the Forest Supervisor in consultation with the AA.** A pre-season discussion should include setting expectations about who has authority delegated by the Regional Forester as an AA, and who has the authority to declare the prescribed fire a wildfire as described in FSM 5140 and in the written prescribed fire burn plan. The discussion should also include the scope of line officer authority, which intersects with the AA scope of authority.
- **ii. The Rocky Flats Prescribed Fire Project also revealed that the authority to declare a prescribed fire a wildfire was not clear throughout the process.** Forest Service Manual (FSM) 5140 explains that the AA has the authority to make management decisions concerning prescribed fire, including declarations to wildfire. The list of qualified and approved AAs is reviewed and updated annually by the Regional Forester. However, not being a qualified AA or on the approved list

does not remove responsibilities from the Forest Supervisor in land management decisions. This requires that AAs and Forest Supervisors have quality conversations about making the decision to convert a prescribed burn to a wildfire.

2. <u>What</u> should be discussed and calibrated during declaration conversations? ***<u>P</u>MS 484*** also includes the following two bullet points and concluding sentence to set parameters for declaring a prescribed fire a wildfire when either or both of the following criteria are met:

- *Prescription parameters are exceeded and holding, and contingency actions cannot secure the fire by the end of the next burning period, or*
- *The fire has spread outside the project area or is likely to do so, and the associated contingency actions have failed or are likely to fail and the fire cannot be contained by the end of the next burning period.*

"A prescribed fire can be declared a wildfire for reasons <u>other than those identified above</u> if events cannot be mitigated as determined by the Prescribed Fire Burn Boss and Agency Administrator."

a. How will you ensure that a common understanding has been reached regarding these parameters? The concluding sentence of the PMS 484 (about additional reasons) may seem like the subjective part, but the first two bulleted parameters (about contingency actions and burning periods), which appear to be objective can be interpreted differently. Pre-season discussions should occur and can reduce confusion during a wildfire declaration.

b. Learning from the Rocky Flats Prescribed Fire Project. Language choices may seem clear in the abstract, but when you begin to discuss concrete definitions, you will start to see different understandings emerge.

i. **What do we mean by "next burning period?** The terms "operational period," "burn period," "the next burning period," and "beyond the next burning period" were all being used to discuss how long resources have to "catch" a prescribed fire before it needs to be declared a wildfire. One question that was raised early in the process was "*Was the fire contained during the first operational period?"* However, "containment during the first operational period" isn't the metric; it is actually the "end of the next burn period," but that still may need clarification.

ii. **What does it mean to say a "contingency action has failed?"** If a prescribed fire burn boss is offered additional resources and accepts the offer (as was the case with Augusta IHC temporarily assigned to the Forest), is that the same as "requesting" additional contingency resources not listed on the burn plan? Or, if a forest resource that would normally be available is requested to "assist" and is replaced by an off-forest resource (such as Helicopter 2BH being unable to respond and helicopter 7TD responding instead), does this mean the contingency action has failed? Be aware of how making a request or accepting offered resources could be interpreted differently, and the implications for a wildfire declaration. It is important to know that it is not necessarily the number of resources requested that would trigger a wildfire declaration. However, if your current actions are not working and additional resources are needed, that had not been considered in your contingency plan, then it might be necessary to convert

the prescribed fire to a wildfire.

iii. **What might be considered "other reasons not identified" to declare a wildfire?** Other than declaration requirements around contingency actions and burn periods, additional decision criteria may prove valuable. The implementation guide gives you the outermost, allowable sideboards. But what else can your unit pre-identify to help determine if the prescribed fire needs to be converted to a wildfire? For example, basing the decision on risk (when it becomes necessary to pull resources off the line) and not the time frame (next burning period) may be a clearer standard for declaring a wildfire.

v. **If a contingency resource is unable to respond in the allotted time, is this a failed action?** On the Rocky Flats Prescribed Fire Project, all contingency resources that were listed were able to respond within the allotted time. However, the discussions around the declaration revealed that different perceptions exist around these allotted times. If a prescribed fire burn plan indicates that contingency resources need to respond within 30 minutes, does that mean they mobilize in 30 minutes, arrive at the burn unit within 30 minutes, or arrive on the Forest within 30 minutes?

vi. **How long do you have to declare a prescribed fire a wildfire?** During the Rocky Flats Prescribed Fire Project declaration discussion, there was a perception that the declaration needed to be made fairly quickly. However, the declaration of a wildfire can technically be made any time before a prescribed fire is declared "out." If the actual fire is not forcing an immediate decision (ex. because rain has controlled the fire), there is time to consult with additional resources to gain a complete picture and reach a mutual decision.

B. Determining fire behavior from current forecast models is already difficult and the rapidly changing fire environment means that fire practitioners need to adapt just as rapidly.

1. Be prepared to use the standard tools, but seek to validate information using additional tools, and keep good on-site weather and fire behavior records for planning future prescribed fire.

a. If you have a known problem with your Remote Automated Weather Stations (RAWS) (such as broken sensors or poor location) refer to the installation guidelines at https://raws.nifc.gov/standards-guidelines. Without having a fully functional RAWS for weather information, you will not be able to validate it against other tools.

b. When it comes to weather and fuels information consult the official site Weather Information Management System (WIMS) and official forecasts by the National Weather Service. However, realize there are supplemental tools that may serve you well in the field, such as The Fire Weather Intelligence Portal or applications on smart phones such as Storm Radar or Windy.

c. Even though there is requirement to record weather every two hours, the documentation is not standardized. Keeping a thorough record, including how general forecasts compared to spot forecasts as well as observed weather on any given prescribed fire will provide a detailed history of the weather on the unit that will enable better planning and implementation.

d. As well as having accurate weather records, documenting accurate fire behavior is also essential for successful future prescribed fire. Noting when fire behavior changes in relationship to weather changes on a particular unit helps with more precise planning. Additionally, understanding the fire behavior on a particular unit can help you plan how to respond to slop overs or spots on adjacent units.

e. Using standard fuel models in BehavePlus runs for your prescribed fire unit may not represent the fuels in an adjacent unit. Fuels in the adjacent unit should be included in CONTAIN runs to determine the number of resources required to catch spots. However, multiple behave runs may be needed to determine your minimum staffing or a different run may be needed for contingency resource needs. Furthermore, estimating fire behavior with BehavePlus requires "calibration" - A continual cycle of confirming predicted fire behavior through observation on the burn. Adjustments to the inputs and/ or fuel model are made as necessary until outputs match observed fire behavior.

2. By becoming more familiar with weather forecasting and the people supplying those forecasts, you'll be able to make more efficient decisions.

a. Get to know the weather forecasters and consider having annual meetings with them. Consider scheduling a weekly Forest level conference call with the National Weather Service, Fire Management Officers, Assistant Fire Management Officers, Duty Officers, and Zone Fire Management Officers, and include them in other creative ways, such as inviting them to visit a RAWS station, going out to a burn unit, or inviting them to a prescribed fire to experience the spot forecast they generated. Alternatively, seek out opportunities to engage with *their* operations for a richer understanding of their work.

b. Learn to ask the right questions. Getting a weather forecast is one thing, but knowing how confident the forecaster is in the forecast provides better insight. Ask this question of your forecaster, ***"****What is your confidence level in this?".* Additionally, ordering an Incident Meteorologist (IMET) may be the best way to learn how to ask the right questions and engage in understanding fire weather forecasts. Without receiving feedback from onsite observations, meteorologists may be unaware of inaccuracies in their spot weather forecasts. Using the online form and talking with them will lead you to ask the right questions.

c. Local weather phenomenon may be difficult to predict, such as the "mountain wave"[33] seen over the Rocky Flats Prescribed Fire Project during the burn period. These high winds are associated with strong southeast wind flows that cross over perpendicular to the southwest to northeast running Appalachian Mountain Range, resulting in highly localized strong wind gusts on the lee side of the mountain range.

RXB2s can provide local knowledge to meteorologists that may more accurately predict these type of wind events.

d. Encourage all FFT2s to open their Fire Effects Monitor (FEMO)/Field Observer (FOBS) taskbook[34] to better understand fire behavior and fuels conditions. On the Rocky Flats Prescribed Fire Project, the RXB2 and RXB2(t) were continuously taking weather. Had a FEMO been assigned to the prescribed fire, the RXB2 and RXB2(t) could have relied on the FEMO's observations of the weather and fire behavior for both documentation and a historical record for informing future prescribed fire.

V. Recommendations

A. A Prescribed Fire-Declared Wildfire Review includes optional 'recommendations,' that were suggested by the participants during the overall review process. These are their recommendations:

1. Brief all resources that a variance is being used. While using a regional- or forest-level variance on a prescribed fire, fire managers need to ensure that everyone on the prescribed fire knows about the variance. Although there was clear weather and fuels information provided during the briefing, some resources reported not being aware that a variance was authorized. Knowledge of the variance may influence an individual's assessment of risk, and their decision to take or not take an assignment.

Telling resources about a variance can both heighten their awareness of the weather and fuel conditions and educate them about the advantages of burning in those conditions.

2. Fully integrate the USDA Forest Service "Prescribed Fire-Declared Wildfire Review Process" and other learning processes into the existing Facilitated Learning Analysis (FLA) process to help achieve a more just culture. The USDA Forest Service Prescribed Fire Declared Wildfire Review process focuses on whether the actions taken were within policy and procedure, per PMS 484. However, the FLA seeks to give voice to participants who experienced an unintended outcome, by capturing their story, and transferring lessons from their experiences to others in similar situations.

a. Develop a standard delegation of authority template in the Wildfire Review that includes protection of participants from punitive administrative action and provides for confidentiality throughout the process (as long as there is no willful disregard for safety or criminal intent found) just as we do with other unintended outcome FLAs. The perceptions of socio-political, administrative, and potentially legal unintended outcomes of declaring a prescribed fire a wildfire is a concern that cannot be dismissed. This perception, if unaddressed by leadership, not only discourages a safety reporting culture but also discourages burn bosses from ordering the resources they need to safely suppress an escaped prescribed fire.

b. If both processes are requested, continue to refine the best way to present this information to increase the likelihood of a wider readership, starting with the layout of this document. Use the information from the Review as supporting information in appendices for the FLA document.

VI. Conclusions

The Rocky Flats Prescribed Fire Project's blackline prescribed fire operations were implemented to reduce the risk of spotting during the larger Rocky Flats Prescribed Fire Project planned for the near future. The wet spring, recent rain, and proximity to a riparian area led the RXB2 to burn at a lower RHs to get the desired effects of solid black needed for containment lines for aerial ignitions. Spotting occurred on the prescribed fire due to lower than predicted RH and receptive fuels on steep slopes above the planned burn. More than adequate resources were assigned to the burn based on the burn plan, and contingency resources were identified and available based on predicted weather and predicted fire behavior. However, due to actual weather and resultant fire behavior, multiple spots became established at roughly the same time in steep rough terrain, with thick receptive fuels making containment efforts difficult and allowing the spots to outpace resources. Additional resources were requested to assist in containment efforts but, due to higher than anticipated winds, their efforts were unsuccessful. The fire was ultimately brought under control by rain early the next morning. The prescribed fire was declared a wildfire in the afternoon of the following day by the Acting Forest Supervisor. Part of the rationale for the wildfire conversion decision on the Rocky Flats Prescribed Fire Project was to ensure that a transparent and thorough review of this unintended outcome occurred for the long-term organizational benefit of the agency's prescribed fire program.

Having provided a thorough understanding of the events on March 21 and 22, 2023, it is prudent to revisit the required questions from PMS-484. The Regional Office and Washington Office Fire and Aviation Management asked the FLA team to answer these questions in accordance with PMS-484: *Did they have a plan? Was it a good plan? And did they follow the plan?* In summary, the Conasauga fire management staff had a thorough prescribed fire burn plan which included the Rocky Flats Unit. It was clear that the plan was in place the day of the prescribed fire and in line with the overall Sumac RX Plan, as well as Forest goals and objectives. Furthermore, it was a flexible plan that allowed the Rocky Flats Unit to be broken into smaller units to reduce the risk of an escape. Finally, the RXB2 did follow the plan. The actions taken on the March 21 and 22, 2023 were within policy and executed in accordance with the Sumac Fire Units Prescribed Fire Plan. The declaration of the wildfire followed plan with the addition that Forest Leadership wanted to learn from the event to better prepare the Chattahoochee-Oconee National Forest in the future.

VII. Appendices (A-H)

Appendix A: Prescribed Fire Plan, Sumac RX Units

1. Objectives

2. Prescription

3. Seasonal Severity

4. Analysis of Information Related to Fuel Conditions, Weather, and Other Key Factors)

1. Objectives (Element 5)

The Sumac Fire Units Prescribed Fire Plan is a Programmatic Moderate Plan (also known as a Multiple Unit Plan) used for prescribed fire projects with multiple ignition units that can be ignited separately or concurrently. The Rocky Flats Black Line Ignition Unit is a portion of an ignition unit within the Sumac Plan. The Sumac burn plan specifies that - *these units may be burned individually, subdivided into smaller sections, or combined with each other to meet the intent and prescription of this plan.*

The Sumac Fire Units Prescribed Fire Plan is maintained in a project folder with ignition unit maps, complexity analysis, and job hazard analysis (JHA). The Conasauga Ranger District uses an IAP burn day documentation. The IAP includes information copied from the prescribed fire burn plan to make a daily briefing packet.

The packet for the Rocky Flats Black Line Ignition Unit contains the burn day organization assignment list, personal contact information, burn objectives, specific safety concerns, radio channel list, contingency plans, emergency medical procedures, Element 2B (Prescribed fire Go/No-Go checklist), Element 2A (Agency Administrator Ignition Authorization), Prescription, day of burn notifications (cooperators, nearby land owners, etc.), Behave Plus fire behavior modeling, spot weather forecast, and onsite weather observations. An ignition unit map was distributed to burn personnel that identified the number of acres being burned, designated drop points, and a physical description of the unit.

A. Resource Objectives:

1. Maintain existing Oak and Oak-Pine forests by reducing stem density (FLRMP Objective 3.7, Page 2-6)
2. Expand the role of fire to recover and sustain short interval fire-adapted ecosystem through the use of both prescribed and managed ignition fires. (FLRMP Goal 61, Page 2-53)
3. Enhance, restore, manage and create habitats as required for wildlife and plant communities, including disturbance-dependent forest types. (FLRMP Goal 3, Page 2-6)
4. Contribute to the Conservation of State-Identified locally rare species. (FLRMP GOAL, 19 Page 2-13)

B. Prescribed Fire Objectives:

1. Reduce 10-hour fuel loading between 30% and 70%
2. Reduce the stem density of the Brushy understory by 20%-70%
3. Reduce the threat of an unwanted wildland fire in the Wildland Urban Interface
4. Break up the continuity of fuel bed to reduce the severity of a wildland fire
5. Keep RX fire related mortality in the over-story Canopy to less than 20% of the total burn unit acres
6. Release Long Leaf Pine Plantations by reducing competition of surrounding plants

2. Prescription (Element 7)

The table below illustrates the burn plan prescription, inputs, and source used for implementation of the burn. Forecasted values indicate that parameters were met except for rate of spread. The prescription has a range of 8-25 chains per hour upslope and the modeling outputs were 3.2 to 3.8 ch/hr. All other parameters were well within prescription parameters. The RH was forecast to be 21% which is 4 points below the Southern Area regional parameter of 25% and 9 points below the prescription parameter of 30%. A regional variance for low RH was requested and granted. Prescribed fire implementation in this area is routinely conducted under very dry conditions for adequate consumption of fuels in the relatively sheltered sites. For example, the 2016 ignition of the burn unit had an RH minimum of 25%.

Environmental Parameters of Prescription	**Regional Standard**	**RX Prescription**	**Forecast**	**Source**
Date/Time			3/21/23	
Fuel Models (FBPS)		9/10	9/10	Burn Plan
*1 HR Fuels %		≥7%	8	Estimate based on RAWS
*10 HR Fuels %	≥7% open Site >9% closed Site	Same as Regional Standard	10	Estimate based on RAWS
Live Fuel Moisture (Herb) %		N/A	70	Estimate based on RAWS
Live Fuel Moisture (Woody) %		N/A	100	Estimate based on RAWS
Temperature (F)		75º F Dormant	62	Spot WX FX
RH %	≥25%	≥30%	21	Spot WX FX
20 Ft Wind (mph)	<20 MPH	<20MPH	7-12 G17	Spot WX FX
20 Ft Wind Direction	All Units	S-NW 180º-330º		
	Mill Creek	Any Direction 0º-360º	SE/ SSE	Spot WX FX
Midflame Wind Speed (Mph)		2-12 MPH	2.0	Behave
Midflame Wind Speed Direction		Upslope	SE/SSE	Spot WX FX
Transport Wind Speed (M/S)		Use sliding AGL scale	17	Spot WX FX
Transport W/S Direction		Same as 20' winds	S/ SE	Spot WX FX
AGL Mixing Height (Min)	2700 @ 7 MPH 2300 @ 8 MPH 2000 @ 9 MPH	Same as Regional Standard Speeds are minimums	4100 @ 17	Spot WX FX
Smoke Dispersion		>21**	73	Spot WX FX
NFDRS Parameter (ERC)		0-38 (Middle P-level4)	ERC Y 21.3	Cohutta RAWS
Probability of Ignition (%)		<60%	39	Behave

KBDI		<350 Dormant	4	Cohutta RAWS
Firing Technique		Head, Backing, Flanking		
Ignition Method		Ground/ Aerial		
Slope (Average) %		5%-40%	30	Behave
Effective Windspeed (Mph)		2-10 mph	2.8	Behave
Flame Length (Ft)		2-10’	1.8 – 3.4	Behave
Rate Of Spread (Chs/Hr)		8-25 upslope	3.2 – 3.8	Behave
Fireline Intensity (Btu/Ft/Sec)		164+ Btu/ft/sec.	20 - 83	Behave
*Fuel moistures may be determined utilizing Cohutta Raws Station 090402, GFC Mixing Height is 1650 AGL with a transport Wind Speed of 9 MPH. ** Dispersion >21 recommended but not required. Issuance of a burn permit from the state demonstrates compliance with State Smoke Management Regulations.				

3. Seasonal Severity, Weather, and On-site Conditions

A. Seasonal severity

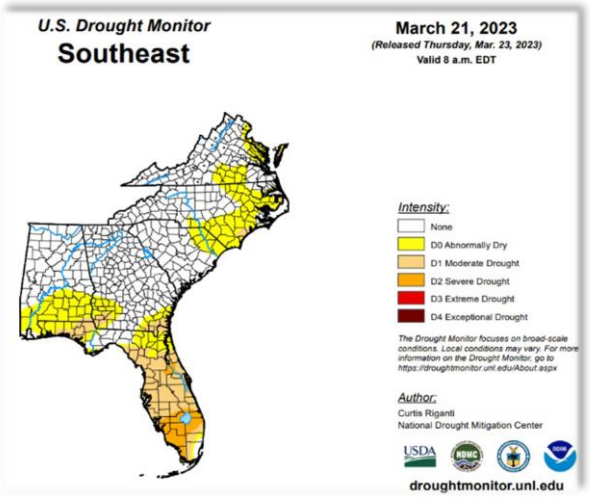


Figure 14 Shows the seasonal droubt across the east part of Region 8, with GA at about average.

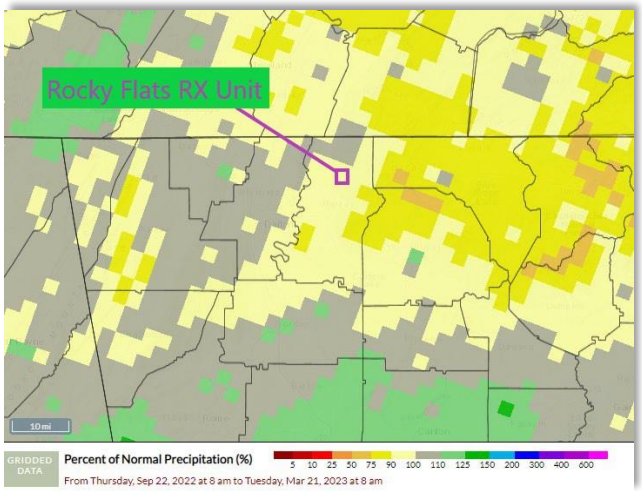


Figure 13 shows the percent of precipitation from Sept. 2022 to March 2023 on the Conasauga Ranger District.

A spring wildfire risk assessment was published for the SA in late February, this assessment projected normal to below normal wildland fire risk across the southern Appalachians, primarily due to abnormally wet conditions and early green up. The US Drought Monitor released on 3/21/23 indicated no drought conditions in north Georgia at the time of ignition on the Rocky Flats RX burn.

Percent of normal precipitation over the previous 6 months shows rainfall totals were between 90- and 100% of normal at the burn site.

The Energy Release Component (ERC) is a calculated output of the National Fire Danger Rating System (NFDRS). The ERC is a number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. The ERC is considered a composite fuel moisture index as it reflects the contribution of fuels to potential fire intensity. The ERC has memory. Each daily calculation considers the past 7 days in calculating the new number. Daily variations of the ERC are relatively small as wind is not part of the calculation.

100-Hour Fuel Moisture (100-hr FM) represents the modeled moisture content in dead fuels in the 1-to-3-inch diameter class.

The Keetch-Byram drought index (KBDI) is a continuous reference scale for estimating the dryness of the soil and duff layers. The index increases for each day without rain (the amount of increase depends on the daily high temperature) and decreases when it rains. The scale ranges from 0 (no moisture deficit) to 800. The range of the index is determined by assuming that there is 8 inches of moisture in a saturated soil that is readily available to the vegetation.

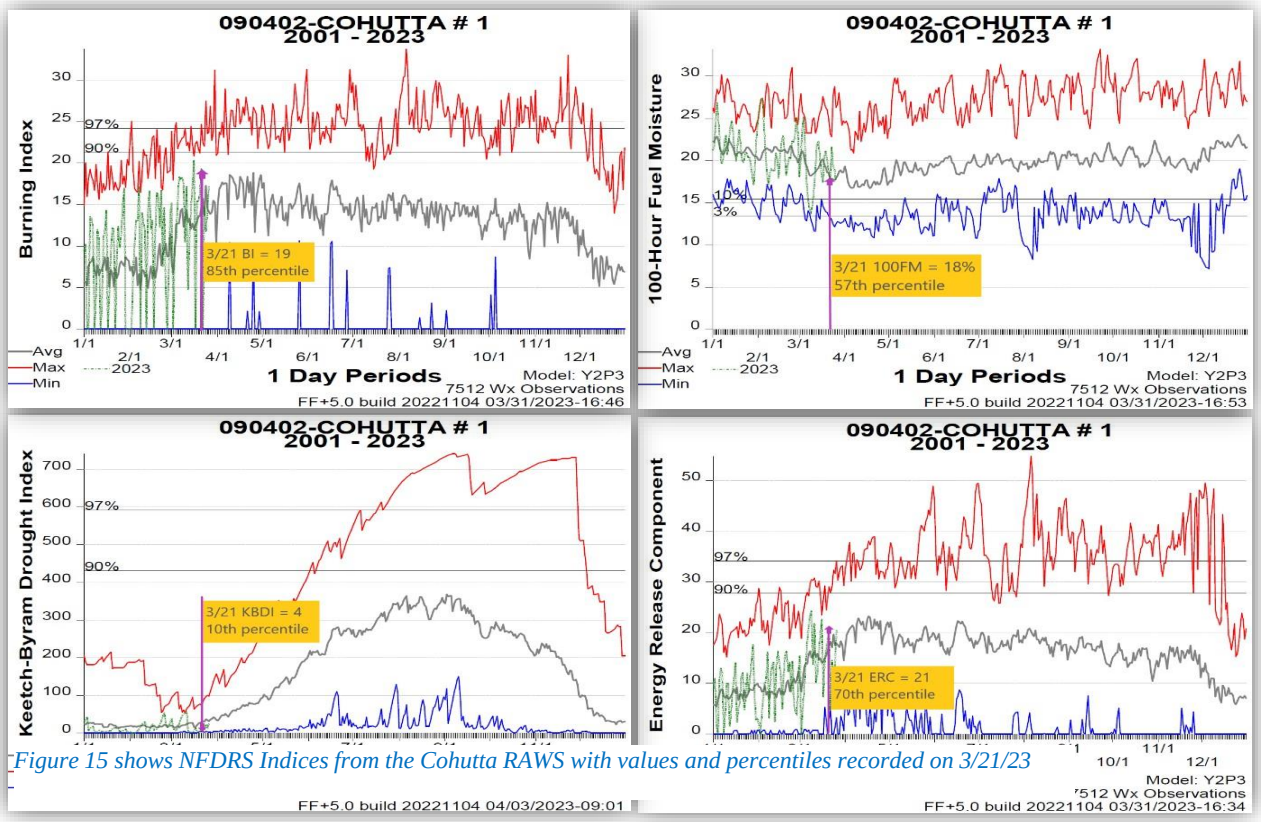


Figure 15 shows NFDRS Indices from the Cohutta RAWS with values and percentiles recorded on 3/21/23

Burning Index (BI) - A measure of fire intensity. BI combines the Spread Component and Energy Release Component to relate to the contribution of fire behavior to the effort of containing a fire.

B. Weather

The spot weather forecast for March 21, 2023, indicated typical conditions for prescribed burning on the Conasauga Ranger District. Several other prescribed burns were being implemented in the area including on the adjacent ranger district. In fact, the last time this unit was burned on April 10, 2018, the weather forecast was similar. However, on that day RH values bottomed out at 25% for a short period before recovering. On this blacklining ignitions, RH values were predicted to be lower at 21% and required a regional variance for implementation. This factor was thought to be offset by recent rainfall that amounted to nearly 2 inches in the last 10 days and higher fuel moistures. The NWS also issued a fire danger statement due to low RH and cautioned that RH values could be lower if dry air aloft mixes down. And that downslope winds could cause relative humidities lower than forecast. This caution proved accurate as RH values dropped earlier than forecast and remained low late into the night. Wind speeds were forecast at 10 mph sustained with gusts up to 17 mph and expected to decrease overnight.

```
. DISCUSSION...

A Fire Danger Statement has been issued for all of north and
central Georgia for this afternoon due to expected low minimum.
relative humidity values.

Winds should from remain from the SE/SSE through the rest of the
day, with surface and 20ft winds between 7-12mph, with gusts up to
17mph possible this afternoon. Transport winds and ventilation
rates increase after 11am, with optimal dispersal conditions.
expected by 2pm through 5pm EDT. Given expected increase in cloud.
cover through the afternoon, max mixing heights should be limited.
to around 4000-4500ft by 2pm.

Minimum relative humidity values are expected in the low 20s to
upper teens across the burn area. However, with very dry air aloft
and mixing heights ~4000ft, will be borderline conditions on if.
drier air mixes down, lowering dewpoints/relative humidities than
forecast. In addition, with burn site located on the northerly
side of Hickory Ridge and winds from the S/SSE expected, could see.
locally lowered dewpoints/relative humidities due to downslope
winds.

As for fog development on Wednesday morning, low confidence
forecast as it will be determined by how quick the low level.
moisture returns into north Georgia. Given burn site located near
Mill Creek can't rule out some locally elevated.
dewpoints/relative humidities as winds decrease overnight into
Wednesday morning, leading to a potential brief window of
scattered fog development in valleys between 7am-10am EDT.

. REST OF TODAY...

Sky/weather.........Mostly sunny (40-50 percent).
CWR.................0 percent.
Max temperature.....Around 62.
Min humidity........21 percent.
Wind (20 ft)........South winds 6 to 10 mph.
Mixing height.......4100 ft AGL.
Transport winds.....South 13 to 17 mph.
LVORI...............2.
ADI.................23 early in the morning increasing to 73 in the
                    afternoon.
Pcpn amount.........0.00 inches.
CEILING (KFT).......20.

TIME (EDT)      10A 11A 12P 1PM 2PM 3PM 4PM 5PM
Sky (%).........23  35  55  40  38  49  57  62
Weather cov.....
Weather type....
Tstm cov........
CWR.............0   0   0   0   0   0   0   0
Temp............44  50  53  57  59  61  62  61
RH..............41  35  31  27  25  23  21  22
20 FT wind dir..S   S   S   S   S   S   S   S
20 FT wind spd..6   7   8   9   10  9   10  9
20 FT wind gust.10  13  14  15  17  17  17  16
Mix hgt (kft)...1.4 2.6 3.0 3.7 4.1 4.0 4.0 4.0
Transp wind dir.S   S   S   S   S   S   S   S
Transp wind spd.13  15  16  16  16  17  17  16
LVORI...........2   1   1   1   1   1   1   1
ADI.............23  49  56  71  69  73  69  66
Ceiling (kft)...20  20  20  20  20  20  20  20
```

```
.TONIGHT...

Sky/weather.........Mostly cloudy (65-75 percent)
CWR.................10 percent.
Min temperature.....Around 44.
Max humidity........77 percent.
Wind (20 ft)........Southeast winds 7 to 13 mph.
Mixing height.......300 ft AGL.
Transport winds.....Southeast 8 to 14 mph.
LVORI...............2.
ADI.................6 to 37.
Pcpn amount.........0.00 inches.
CEILING (KFT).......20 decreasing to 12 late in the evening
                    decreasing to 9.0 early in the morning.

TIME (EDT)      6PM 7PM 8PM 9PM 10P 11P MID 1AM 2AM 3AM 4AM 5AM
Sky (%).........73  67  46  48  52  59  56  71  79  83  71  91
Weather cov.....
Weather type....
Tstm cov........
CWR.............0   0   0   0   0   0   0   0   0   10  10  10
Temp............59  56  51  49  47  46  47  47  48  48  47  46
RH..............22  26  32  38  43  44  45  45  45  47  49  53
20 FT wind dir..S   S   SE  SE  SE  S   SE  SE  SE  SE  SE  S
20 FT wind spd..9   8   7   8   8   13  13  13  13  13  12  12
20 FT wind gust.16  15  13  13  14  22  21  22  22  22  21  21
Mix hgt (kft)...2.2 0.4 0.3 0.3 0.4 0.9 0.8 0.9 0.9 0.9 0.8 0.8
Transp wind dir.S   SE  SE  SE  S   S   S   SE  SE  S   S   S
Transp wind spd.14  10  8   9   10  13  13  13  12  12  12  12
LVORI...........1   2   2   2   2   2   2   2   2   2   2   2
ADI.............37  9   6   6   8   10  10  10  10  10  10  9
Ceiling (kft)...20  20  15  12  12  12  12  15  12  12  12  9.0
```

Figure 16 shows the spot weather forecast for the Rocky Flats RX on March 21st, 2023.

C. Onsite conditions

Fuel moisture modeling. Fuel moisture used for fire behavior modeling were estimated based on the WIMS output which is produced using the Nelson dead fuel moisture model. On 3/21/23 the Cohutta RAWS forecasted dead fuel moisture values were 1 hour – 10.25, 10 hour – 10.14, 100 hour – 17.06, 1000 hour – 20.12. From these numbers the burn boss estimated the 1 hour at 8, 10 hour at 10, and the 100 hour at 16 based on the FDFM tool, local topographical influences, and previous experience estimating fire behavior in this area. The FDFM tool in Behave would have produced an estimate of 8% 1-hour fuel moisture for shaded conditions on a north slope and 5% for unshaded conditions on a south slope. Using a 1-hour fuel moisture value of 5% for estimating fire behavior in the contingency area on the south facing unshaded slope containing a heavy dead and dead component (FM 11) would produce rates of spread of 4 to 4.5 Ch./hr. and flame lengths of 2 to 4'.

Contain modeling for line production rates. According to the NWCG line production rates guidance, the line production rate in fuel model 10 or 11 is 1.0 chains per hour per crew member for hand crews and 3 chains per hour per crewmember for engine crews. Each of the two spots onto the north side of Mill creek road was discovered when very small. On the western spot, an engine with 2 fire fighters and two hand crews of 5 people each engaged almost immediately. Line production capability for these combined resources in FM 11 light slash is 16 Ch./hr. A contain module run indicates that a line production rate of 16 would contain the spot in 42 minutes at a total size of 0.5 acres with 8.9 chains of perimeter installed. For the eastern spot an engine with 3 firefighters and a hand crew of 5 engaged immediately. These resources have a combined line production rate of 14 Ch/hr. A Contain Module run indicated that the resources would be able to contain the eastern spot at 0.6 acres and install 10.1 chains of line in 48 minutes.

Determining the correct fuel model. The line production guide has the same rate for fuel models 10, 11, and 12. Perhaps the fuels on the slope that day would be more accurately represented by fuel model 13 (heavy logging slash) which has a line production rate of .4 Ch./hr./person for hand crews and 2 Ch./hr./person. For example, fuel model 13 in the same scenario would require 21 chains per hour of capability for each established spot and the combined capability of the crews on Mill Creek Road at the time of the spot overs would be 16 chains per hour. The same crews working in fuel models 10, 11, or 12 have 30 chains per hour of line building capacity.

Identifying staffing needs. The staffing on the burn far exceeded the minimum organization required for the ignition. Contingency resources located on Hickory Ridge included a type 3 dozer. The firing and holding resources assigned to Mill Creek Road during the ignition were sufficient to contain multiple spots based on the forecast and contain modeling analysis. See Below.

Position Needed	Black Line Ops Required		On site 3/21/23	
	Number	Crew	Number	Crew
RX Burn Boss Type 2	1		1 qualified 1 trainee	
Firing Boss			1 qualified 1 trainee	Qualified arrived at 1230
Holding Specialist (Min SRB)				
Type 6 Engine	1	2 personnel ea.	2	E611 at 1030 E644 at 1230
Type 3 Dozer	1	1 personnel	1	1 pers. arrived at 1230
UTV	1	2 personnel	1	Attached to Squad 1
Dispatcher/ radio operator	1			
Fire Effects/WX Monitor				
Ignition crew/ Holding crew	1 squad (3 Person's)	1 FFT1 required per squad	3 squads	Pinhoti (5 pers) arrived at 1230. Eagle Cap (5 pers) Squad 1 (5 pers)
Information Officer/ Smoke Chaser				
Type 3 Helicopter				
Helicopter Manager				
Aerial Ignition Operator (PLDO)				
Total Minimum Personnel				20 personnel at 1030 30 pers total at 1230
Recommended Personnel				

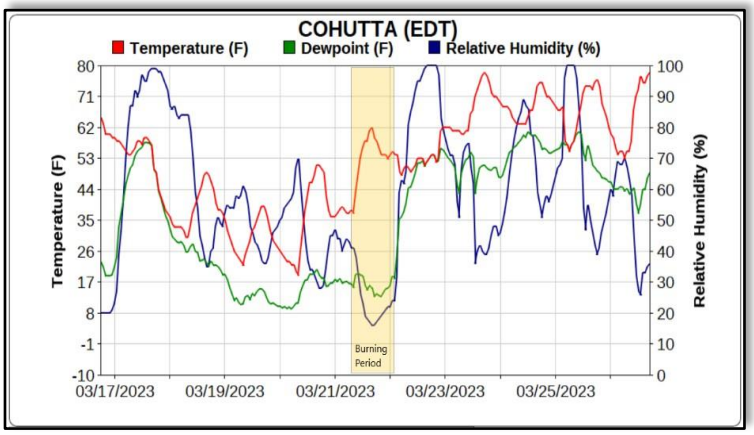
4. Analysis of Information Related to Fuel Conditions, Weather, and Other Key Factors

A. Onsite Fuel and Weather Conditions

The Cohutta RAWS is located 4 miles to the northeast and at a similar elevation to the Rocky Flats Ignition. On the day of the burn the RAWS recorded RH reached 23% at 1200 though the spot weather forecast indicated the low would not be achieved until 1600. RH continued to drop before bottoming our 1700 at 16%. RH values did not climb above 25% until 0300 the next day. The wind direction sensor on the Cohutta RAWS was inoperable and stuck at north for the duration of the burn. The wind speed sensor was operational and showed winds ranging from 3 to 8 mph during the burning period.

Weather collected onsite using a kestrel starting at 1000 till 1800 indicate that the RH reached 12% at 1600 and that wind speeds were light and variable throughout the ignition period. As resources attempted to contain the spots in the afternoon, upslope winds began to limit their ability for direct attack. Later in the night resources reported sustained wind speeds at 15 – 20 mph and gusts at 30 to 40 mph. During attempts to extinguish burning snags along the 630B road, nozzle streams were reported to be bent by the force of the wind. What likely transpired is known as a "mountain wave" which is a localized event associated with strong wind gusts on the lee side of mountain ranges where general winds are perpendicular to ridges. Grassy mountain and associated ridges at 3,694 feet is perpendicular and less than 3 miles southeast of Hickory Ridge which is 1,400 feet.

Fuel moisture estimates or sampling was not recorded during the ignition. An analysis of onsite weather observations suggests that the 1-hour fuel moisture at 12% RH was 6% shaded and 3% unshaded. This would indicate a probability of ignition from embers at 54% and 82% respectively. It's possible that onsite fuel moistures had been dried further during the previous three days due to poor overnight humidity recovery. During the 24 hours prior to ignition the maximum RH value on the Cohutta RAWS was 47%.



Time	Temp	Rh	Wind
1000 (Test Fire)	47	44%	L/V
1130	49	34%	L/V
1200	60	22%	L/V
1400	63	14%	L/V
1500	74	14%	L/V
1600	65	12%	L/V
1700	66	16%	L/V
1800	66	28%	L/V
Taken with Kestrel			
Site Taken adjacent to Mill Creek Road (FS630)			

Figure 17 shows the Cohutta RAWS graphical data from the 17th to the 23rd of March. Fig18 Shows the onsite weather observations taken on March 21st, 2023 for the Rocky Flats RX

B. Fire behavior (Element 4 and 7)

Fire Behavior Fuel Model Assignment and Percent Cover in Rocky Flats RX

Element 4 in the burn plan for the Sumac RX Units identified fuel model 9 as representative of all vegetation types in the Rocky Flats ignition unit. The vegetation types listed are 59% Yellow Pine (680 acres), 39% Mixed Oak (457 acres), 3% Cove hardwoods, White Pine (35 acres). No specific information was included to describe the vegetation in the 72-acre Rocky Flats Black Line ignition.

Contingency areas located in the Hickory Ridge ignition unit, which is adjacent and north of the Rocky Flats Black Line ignition unit is described as 53% Yellow Pine (821 acres) fuel models 9/10, 33% Oak Hickory (493 acres) fuel model 9, and 12% Dead and Down (180 acres) fuel model 11.

The Element 7 sheet used in the burn day IAP assigned fuel models 9 and 10 as representative of

fire behavior.

Fire Behavior Modeling

BehavePlus 6.0.0 was utilized to estimate fire behavior on the day of the burn. Inputs used for fuel models 9 and 10 were:

1H fuel moisture – 8, 10H fuel moisture – 10, 100H fuel moisture – 16, live herbaceous fuel moisture – 70, live woody fuel moisture – 100, 20-ft wind speed – 10, wind adjustment factor - .2, air temperature – 62, fuel shading from the sun – 30, slope steepness – 30.

Outputs were:

Fuel model	Rate of Spread Ch./hr.	Heat per unit area BTU/ft2	Fireline intensity BTU/ft/s	Flame length ft.	Reaction Intensity BTU/ft2/ min	Midflame wind speed mph	Effective wind speed mph	Fire brand ignition
9	3.2	343	20	1.8’	2220	2.0	2.8	39%
10	3.8	1199	83	3.4’	5510	2.0	2.8	39%

Appendix B: Planning Analysis

The following documents were used to review the prescribed fire plan and IAP for consistency with policy:

- NWCG Standards for Prescribed Fire Planning and Implementation_ PMS 484 *May 2022*
- US Forest Service Prescribed Fire Plan Template _ Meets or Exceeds NWCG PMS 484-1 *August 2022*
- NWCG Summary and Final Complexity Worksheet, PMS 424-1 *March 2022*
- Appendix B Post Pause Forest Service Prescribed Fire Plan Quality Assurance Checklist – Not utilized because the plan had been revised and included all National Review Burn plan template changes.
- wo_5140_Amend-2020-1

Prescribed Fire Plan Elements	Policy Consistency	Comments	Contributing Factor?
Element 1: Signature Page	Yes	Technical Reviewer signature is not in ink or electronic certificate. AA qualification not listed by AA name (*USFS Burn Pause template)* Sumac Fire Units RX Plan Technical Review was completed 10/26/22.	No
Element 2a: Agency Administrator Ignition Authorization	Yes	Element 2a – Agency Administrator Ignition Authorization- satisfactory No burn boss signature on the 2a (BB signature on the 2b)	No
Element 2b: Prescribed Fire Go/ No Go Checklist	Yes	Signatures for Forest Duty Officer and Agency Administer are signature font not in ink or electronic certificates	No
Element 3: Complexity Analysis Summary and Final Complexity	Yes	Criteria met as per PMS-484	No
Element 4: Description of the Prescribed Fire Area	Yes	Criteria met as per PMS-484	No
Element 5: Objectives	Yes	Criteria met as per PMS-484	No

Element 6: Funding	Yes	Criteria met as per PMS-484	No
Element 7: Prescription	Yes	Criteria met as per PMS-484	No
Element 8: Scheduling	Yes	Criteria met as per PMS-484	No
Element 9: Pre-burn Considerations and Weather	Yes	Criteria met as per PMS-484	No
Element 10: Briefing	Yes	Criteria met as per PMS-484	No
Element 11: Organization and Equipment	Yes	Criteria met as per PMS-484	No
Element 12: Communications	Yes	Criteria met as per PMS-484	No
Element 13: Public and Personnel Safety, Medical	Yes	Criteria met as per PMS-484	No
Element 14: Test Fire	Yes	Criteria met as per PMS-484	No
Element 15: Ignition Plan	Yes	Criteria met as per PMS-484	No
Element 16: Holding Plan	Yes	Criteria met as per PMS-484	No
Element 17: Contingency Plan	Yes	Criteria met as per PMS-484	No
Element 18: Wildfire Declaration	Yes	Criteria met as per PMS-484	No
Element 19: Smoke Management and Air Quality	Yes	Criteria met as per PMS-484	No
Element 20: Monitoring	Yes	Criteria met as per PMS-484	No
Element 21: Post- burn Activities	Yes	Criteria met as per PMS-484	No
Prescribed Fire Plan Appendices:	Yes	Criteria met as per PMS-484	No

Appendix A: Maps: Vicinity, Project, Ignition Units			
Appendix B: Technical Review Checklist	Yes	Criteria met as per PMS-484	No
Appendix C: Complexity Analysis	Yes	Criteria met as per PMS-484	No
Appendix D: JHA/Risk Assessment	Yes	Criteria met as per PMS-484	No
Appendix E: Fire Behavior Modeling Documentation	Yes	Criteria met as per PMS-484	No
Appendix F: Smoke Management Plan and Smoke Modeling Documentation	Yes	Criteria met as per PMS-484	No
Appendix G: Burn Day Briefing	Yes	Criteria met as per PMS-484	No

**Although there were technicalities with the type of signatures provided in Elements 1 and 2, those technicalities had no impact on the outcome of this prescribed fire declared wildfire. Multiple parts of the burn plan require signatures (i.e., signature page, 2A, go/no-go checklist, variance), from multiple people (AA, Burn Boss, etc.), and there are multiple ways to provide signatures (pen and paper, electronic, digital, email as signature, etc.). Future guidance around these signatures needs to remain flexible enough to accommodate field going personnel who may not be at their computers when providing signatures.*

Appendix C: Delegation of Authority

Forest Service **Southern Region** **1720 Peachtree Road, NW**
Atlanta, GA 30309
FAX: 404-347-4448

File Code: 5100/5190 **Date:** March 24, 2023
Route To:

Subject: Delegation of Authority – Rocky Flats Rx Burn Wildfire Declaration Review

To: Robert Sitzlar and Heath Bell – Review Team Co-Leaders

I have chosen to utilize the Facilitate Learning Analysis Process in conjunction with the enclosed *What is a Declared Wildfire Review* (WO guidance revised March of 2023) to fulfill my responsibility to review the Rocky Flats Escaped Prescribed Burn/Wildfire Declaration.

This delegation formalizes your appointment as Co-Team Leaders for the Wildfire Declaration Review Team. As Team Leaders, you have the full authority of my office to execute and complete the review. You are scheduled to in-brief with my staff and me at 0900 on Saturday March 25 at the Conasauga Ranger District, 3941 Highway 76, Chatsworth, GA 30705.

Region 8 FAM Assistant Director Andy Baker (andrew.baker@usda.gov) will be my liaison to you. Please coordinate with him regarding your technical and/or logistical needs. Acting Forest Supervisor Judy Toppins and Fire Staff Officer Mike Brod will serve as your local Forest contacts. I expect you to work in partnership with the Forest to ensure a smooth and efficient review that maximizes organizational learning.

You are expected to produce and return the final draft report to me within 30 calendar days. You will also afford the Forest the opportunity to review the final draft before completion. I also agree that **no punitive actions will be taken by the Forest Service against any employee as a result of information provided to any member of your team.**

Your authority includes, but is not limited to:

- Controlling, organizing, managing, and directing the analysis/review.
- Authorizing additional technical specialists and releasing them upon completion of duties.
- Authorizing and coordinating the expenditure of funds.

All travel, equipment, and salary costs related to this Declared Wildfire Review should be charged to the Rocky Flats Wildfire (GA-CHF-2023-230061) financial code P8P53H23 with an override code of 0803.

/s/

Regional Forester

cc: Judy Toppins, Mike Brod, Ed Hunter, Shardul Raval, Andy Baker

Appendix D: What is a Declared Prescribed Fire Review?

USDA

United States Department of Agriculture

hat is a Declared Wildfire Review?

- FSM 5142.3 requires we review all prescribed fires that result in the declaration of a wildfire and directs us to Interagency Prescribed Fire Planning and Implementation Procedures Guide (NWCG, PMS 484) for further direction.
- According to the NWCG Prescribed Fire Planning and Implementation Guide PMS-484 pages 38 & 39, such reviews are known as a ***Declared Wildfire Review***
- Per PMS 484, at a minimum, a Declared Wildfire Review will contain the following information:
  - Executive Summary
  - Setting-environmental, social and political
    1. Prescribed fire objectives
    2. Prescribed fire prescription
    3. Prescribed fire outcomes
  - Narrative and chronology
  - Lessons Learned identified by the participants
  - Lessons Learned identified by the team (Optional-Complex)
  - Summary
  - Maps and photos
  - Recommendations (optional)
  - Additional **Required** Analyses (may be documented in the report body, in the appendices, or as a separate document):
    1. An analysis of the seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.
    2. An analysis of the prescribed fire plan for consistency with agency policy and guidance related to prescribed fire planning and implementation.
    3. An analysis of prescribed fire implementation for consistency with the prescription, actions, and procedures in the prescribed fire plan.
    4. The approving agency administrator's qualifications, experience, and involvement.
    5. The qualifications and experience of key personnel involved.
- The Facilitated Learning Analysis is the preferred methodology for conducting a Declared Wildfire Review but isn't required; alternative methodologies such as Root Cause Analysis, Serious Accident Investigation, etc., may be used depending on the preferences and objectives set forth by the Delegating Official.
- The focus of the FLA process is on increasing safety and reliability by maximizing information sharing to promote individual and organizational learning and better understand what conditions lead to unwanted outcomes so these can be avoided in the future.
  - There are 2 flavors of FLA, Basic, and Complex - Basic focuses on lessons learned by the individuals involved; Complex ventures beyond that to better understand what conditions led the individuals involved to act in the manner that they did -why did it make sense to them?
  - Declared Wildfire Reviews may elect to use either the Basic or Complex FLA depending on the complexity and richness of the event; the AA delegating to the review team will specify if they want a Basic or Complex FLA process to be used.
    1. Basic FLA is well suited for relatively benign events where the Delegating Officials focal point is on the individual learning from those directly involved.

2. Complex FLA is better suited to more consequential events where in addition to the lessons learned by the participants themselves, the Delegating Official wants to have the third-party review team **SME's** evaluate the event and provide their opinions and/or recommendations for making improvements.

- There are 2 main differences between a typical FLA done for accidents and a Declared Wildfire Review
  1. The Additional Required Analyses (sometimes called the 5 Questions) that must be addressed described in the NWCG PMS-484.
     - The 5 Questions can usually be addressed through the review of existing documentation such as the burn plan, weather forecasts, and training records and should not require the review team to ask direct questions of the individuals involved, thus preserving the integrity of the facilitated learning conversation with the participants.
  2. The AA may request the review team to make recommendations; for some NWCG agencies this is a requirement, for FS this is optional;
     - NWCG PMS-484 does provide latitude for the AA to request the team make recommendations to improve processes or systems, typically as part of a Complex FLA; this is somewhat unique to prescribed fire as most FLA's prefer not to make recommendations other than those made by the individuals involved.

- A complete Declared Wildfire Review package consists of all the elements of a typical FLA as well as the analysis addressing the 5 Questions.
  - Policy allows us to address the FLA and the 5 Questions together in one document (preferred) or in two separate documents, but to ensure consistency across reports, USFS will include the analysis of the 5 questions in the appendix of the report while the FLA will typically be the basis for the body of the report; the FLA and the analysis of the 5 Questions need to be submitted together to be considered a complete Declared Wildfire Review.
- The FLA-LR Guide states that if the AA for an incident under review wants recommendations, then the Learning Review process is typically invoked either up front before the FLA gets started or at the conclusion of the Complex FLA;
  - The Learning Review is lengthy and uses focus groups to contemplate larger questions like whether our policies are still applicable given changes in environmental conditions or other larger organizational scale questions.
  - Declared Wildfire Reviews do not require a Learning Review process to seek out recommendations. The Declared Wildfire Review instearl celies ao a review team of SME's to provide recommendations as an added part of the Complex FLA
  - The Learning Review option remains available and could be considered as a follow-up to the Declared Wildfire Review if deeper learning and understanding that leads to systemic or organizational change is being pursued
- The Rapid Lessons Sharing (RLS) format has been used by some forests to report on prescribed fires that resulted in wildfires. While the RLS can be an effective communication tool especially if there is a critical piece of information that needs to be sent out quickly to raise awareness of a key issue, is does not meet the requirements for a complete Declared Wildfire Review as stated in NWCG PMS 484.

Appendix E: Chronology of Events

March 19th UAS scouting operational areas

March 20th

Mac Gap RX

Pre-planning based on weather

1700 Spot weather forecast request

March 21st

0530 Spot weather request
0830 Signed 2A
0900 Rx Briefing
1047 Test Fire
1100 Additional Acreage
1110 Firing Operation
1224 First update to dispatch
1236 Spot Fire
1245 Pinhoti and 644 arrived
1315 Scouting holding lines
1445 Dozer line "T" feature
1500 Request GFC dozer
1523 Acting Forest Supervisor
1503 Request for additional militia
1505 Request Helicopter
1600 GFC Dozer arrives
1615 Militia resources arrive
1715 Helicopter 7TD arrives
1800 Winds increase as crews work on the ridge
1920 Helicopter 7TD released
2015 Firing operations on Hickory Ridge Road, and east west flanks begin
2130 Patrol's released from RX
2300 Significant wind increase with approaching storm
2330 Firing completed on flanks, continuing to fire and hold Hickory Ridge Road
2400 UAS Module Released

March 22nd

0100 Weather on Hickory Ridge Road measured at RH 19%, winds 30-40 mph from the south, expected thunderstorm at 0400.
0140 Decision to stop chasing spot fire and focus on firing
0200 Resources advised to dis-engage from the fire
0215 Most resources released from the RX
0245 Philip and engine 644 remain on scene at the west end of the spot
0300 Walker sends Forest Supervisor an email update
0325 Light precipitation on the RX
0715 Augusta IHC reassigned to RX
0800 Forest Supervisor briefed on actions on the RX from the night operations
1100 Augusta IHC arrives on scene and relieves 644 and Philip
1118 644 back in quarters

1430 RXB2(t) arrives on RX to relieve RXB2
1500 RXB2 back in quarters
1630 Augusta disengaging from RX
1700 RX declared as WF by the Forest Supervisor

Appendix F: Review of the Qualifications

All personnel participating in the Rocky Flats prescribed fire planning and implementation were current and qualified for their assigned positions. Review team members were also qualified to conduct their respective reviews.

According to IQCS records, the qualifications and experience of key personnel at time of ignition were as follows:

- Agency Administrator (RXA2) - Fully Qualified
- Burn Boss (RXB2) - Fully Qualified
- Burn Boss (RXB2(t)) - Fully Qualified Trainee
- Firing Boss (FIRB) - Fully Qualified
- Firing Boss Trainee (FIRB(t)) - Fully Qualified Trainee
- Holding Boss (FIRB, ENGB) - Fully Qualified

Appendix G: Glossary of Terms and List of Abbreviations

"2:1" For every 2 hours of work or travel, provide 1 hour of sleep and/or rest.

"2A" Agency administrator's burn authorization within a burn plan.

Blackline Preburning of fuels adjacent to a control line before igniting a prescribed burn. Blacklining is usually done in heavy fuels adjacent to a control line during periods of low fire danger to reduce heat on holding crews and lessen chances for spotting across control line. In fire suppression, a blackline denotes a condition where there is no unburned material between the fireline and the fire edge.

Burning Period That part of each 24-hour period when fires spread most rapidly; typically from 10:00 AM to sundown.

Contingency Resource Planned and identified fire suppression personnel and equipment that mitigate possible but unlikely events that exceed or are expected to exceed holding resource capabilities.

"Hand Jam" (Pryoshot) Single-shot incendiary plastic sphere dispenser that is hand-held and spring-loaded.

Holding Any actions taken to stop a prescribed fire or wildfire.

Holding Line	Primary or contingency firelines used to stop the forward spread of a prescribed fire or wildfire.
Incident Action Plan	Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map. Formerly called shift plan.
Kestrel	Handheld meteorological instrument used to gauge weather observations; to include wind speed, RH, Dewpoint, Temperature, and other measurements
Leapfrog	Term used to describe crews work to a determine location, then move past the alternate crew(s) to engage further down the line.
Mountain Wave	When the wind speed is above about 25 knots and flowing perpendicular to the ridge lines, the air flow can form waves, much like water flowing over rocks in a stream bed. The waves form downwind from the ridgeline and will be composed of very strong updrafts and downdrafts, with the probability of dangerous rotor action under the crests of the waves. If enough moisture is present, standing lenticular clouds can form to give a visual indication of the wave action. These clouds are also an indication of moderate to severe turbulence.
Operational Period	The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational Periods can be of various lengths, although usually not over 24 hours.
Overhead	Personnel assigned to supervisory positions, including incident commander, command staff, general staff, branch directors, supervisors, unit leaders, managers and staff.
“Ping-Pong Balls”	Plastic spheres (similar to ping-pong balls) charged with potassium permanganate activated by ethylene glycol.
“Pumpkin Time”	The time a helicopter must stop operations, typically 30 minutes before official sunset, or 30 minutes after sunrise.
Scabby Fuels	Fuels that lack continuity or density to carry fire beyond the immediate vegetation.
Solid Black	Area of fuels and vegetation that has recently been burned with no available fuels to reburn.
Spot Fire	Fire ignited outside the perimeter of the main fire by a firebrand.

Spot Weather Forecast	A special forecast issued to fit the time, topography, and weather of a specific incident. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts. Usually, on-site weather observations or a close, representative observation is required for a forecast to be issued.
Variance	Written documentation allowing a burn plan to be to be implemented during conditions that need approval at either the Forest or Regional level.
"Verbal Permission" Authorization	Authorization given once a variance has been approved, awaiting the signature from either the forest or the region.
Wildfire Declaration	"When prescription parameters are exceeded and holding, and contingency actions cannot secure the fire by the end of the next burning period, or, the fire has spread outside the project area or is likely to do so, and the associated contingency actions have failed or are likely to fail and the fire cannot be contained by the end of the next burning period. A prescribed fire can be declared a wildfire for reasons other than those identified above if events cannot be mitigated as determined by the Burn Boss and Agency Administrator. "

List of Abbreviations

Agency Administrator (AA)
District Fire Management Officer (DFMO)
District Ranger (DR)
Duty Officer (DO)
Fire Aviation Management (FAM)
Facilitated Learning Analysis (FLA)
Firing Boss (FIRB)
Forest Supervisor (FS)
Georgia Forestry Commission (GFC)
Interagency Hotshot Crew (IHC)
Line Officer (LO)
Prescribed Fire (RX
Prescribed Fire Burn Boss-Type 2 (RXB2)
Prescribed Fire Review (PFR)
Regional Office (RO)
Trainee (t) or [t]
Unmanned Aircraft System (UAS)
Utility Terrain Vehicle (UTV)
Wildfire (WF)

Appendix H: Rocky Flats RX Declared WF Review and FLA Team

This four-person learning team interviewed 23 participants, conducted a site visit with 12 of the participants, and reviewed numerous documents (including the burn plan and all required review information, AAR documents, NEPA documents, interviewees' notes, maps, weather documents, photos, video, and audio-recordings from dispatch). We want to thank all of the participants for being generous with their time and for sharing what they learned through this process. We also want to thank Teressa Brown, the Forest union representative, for being available throughout the entire process.

Co-Team Lead – Heath Bell
Regional Risk Management Officer
Forest Service
Southern Region Fire and Aviation Management

Co-Team Lead – Robert L. Sitzlar
District Ranger
Forest Service
Francis Marion and Sumter National Forests
Andrew Pickens Ranger District

Subject Matter Expert – David Quisenberry
Fire Planner/Analyst
Forest Service
Southern Region Fire and Aviation Management

Writer/Editor – Dr. Rebekah Fox
Professor of Communication Studies
Texas State University
National Forests and Grasslands in Texas

VIII. End Notes

[1] Blacklining is the process of preburning of fuels adjacent to a control line before igniting a prescribed burn. Blacklining is usually done in heavy fuels adjacent to a control line during periods of low fire danger to reduce heat on holding crews and lessen chances for spotting across control line. In fire suppression, a blackline denotes a condition where there is no unburned material between the fireline and the fire edge.
[2] Fire ignited outside the perimeter of the main fire by a firebrand.
[3] "When prescription parameters are exceeded and holding, and contingency actions cannot secure the fire by the end of the next burning period, or, the fire has spread outside the project area or is likely to do so, and the associated contingency actions have failed or are likely to fail and the fire cannot be contained by the end of the next burning period. A prescribed fire can be declared a wildfire for reasons other than those identified above if events cannot be mitigated as determined by the Burn Boss and Agency Administrator. "
[4] The FLA process is grounded in social science research and is designed to promote learning across an organization and be a catalyst for creating safer working environments. FLA principles are grown from scholarly study of human factors, error, and communication. The FLA process re-frames the way we think about accidents. It is a safety investigative process that chooses to promote a culture of learning in the face of an accident rather than a culture of blame. FLA has been supported by the U.S. Forest Service Chief as an organizational learning tool since 2014. It evolved separately from the USFS Safety Engagement and Safety Journey efforts but now complements these and other initiatives to enhance employee safety. Many other federal, state, and local organizations also use the FLA process to guide Lessons Learned Reviews.
[5] "When prescription parameters are exceeded and holding, and contingency actions cannot secure the fire by the end of the next burning period, or, the fire has spread outside the project area or is likely to do so, and the associated contingency actions have failed or are likely to fail and the fire cannot be contained by the end of the next burning period. A prescribed fire can be declared a wildfire for reasons other than those identified above if events cannot be mitigated as determined by the Burn Boss and Agency Administrator. "
[6] H.R.3684 - 117th Congress (2021-2022): Infrastructure Investment and Jobs Act | Congress.gov | Library of Congress
[7] Confronting the Wildfire Crisis (usda.gov)
[8] These annual goals will help achieve the longer-range goal of treating 50 million acres over the next ten years. Prescribed fire has, and will continue to play a large role in achieving these goals. Over the last 10 years, prescribed fire has accounted for 51% of hazardous fuel's reduction overall, or an average of 1.4 million acres annually. The expectation to increase fuel treatments using prescribed fire means that the USFS will need to burn between 2.5 and 4 million acres annually. This will be a significant increase in the amount of work required by the USFS.
[9] https://www.fs.usda.gov/news/releases/statement-forest-service-chief-randy-moore-announcing-pause-prescribed-fire
[10] https://www.frames.gov/documents/usfs/USFS_20220908_National-Prescribed-Fire-Program-Review.pdf
[11] Planned and identified fire suppression personnel and equipment that mitigate possible but unlikely events that exceed or are expected to exceed holding resource capabilities.
[12] Ex. An Oregon burn boss was arrested following a prescribed fire in October 2022.
[13] This accomplishment is spread across 13 states ranging from the mountains to coastal plains, as well as grasslands and the southern rough. Each ecosystem has specific challenges that require experience and competence by prescribed fire burn bosses. Due to the long duration of the prescribed fire season in the Southern Region (approximately October to May), R8 depends on out-of-geographical area resources from other regions to meet their goals annually.
[14] https://www.fs.usda.gov/news/releases/statement-forest-service-chief-randy-moore-announcing-pause-prescribed-fire
[15] Primary or contingency firelines used to stop the forward spread of a RX or WF
[16] Any actions taken to stop a RX or WF
[17] A special forecast issued to fit the time, topography, and weather of a specific incident. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts. Usually, on-site weather observations or a close, representative observation is required for a forecast to be issued.
[18] Written documentation allowing a burn plan to be to be implemented during conditions that need approval at either the Forest or Regional level
[19] Area of fuels and vegetation that has recently been burned with no available fuels to reburn

[20] Authorization given once a variance has been approved, awaiting the signature from either the forest or the region
[21] Agency administrator's burn authorization within a burn plan
[22] Term used to describe crews work to a determine location, then move past the alternate crew(s) to engage further down the line.
[23] Fuels that lack continuity or density to carry fire beyond the immediate vegetation
[24] Personnel assigned to supervisory positions, including incident commander, command staff, general staff, branch directors, supervisors, unit leaders, managers and staff.
[25] Hand held meteorological instrument used to gauge weather observations; to include wind speed, RH, Dewpoint, Temperature, and other measurements
[26] Single-shot incendiary plastic sphere dispenser that is hand-held and spring-powered
[27] Plastic spheres charged with potassium permanganate activated by ethylene glycol
[28] An IAP contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map. Formerly called shift plan.
[29] The time a helicopter must stop operations, typically 30 minutes before official sunset, or 30 minutes after sunrise
[30] The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational Periods can be of various lengths, although usually not over 24 hours.
[31] For every 2 hours of work or travel, provide 1 hour of sleep and/or rest
[32] That part of each 24-hour period when fires spread most rapidly; typically from 10:00 AM to sundown
[33] When the wind speed is above about 25 knots and flowing perpendicular to the ridge lines, the air flow can form waves, much like water flowing over rocks in a stream bed. The waves form downwind from the ridgeline and will be composed of very strong updrafts and downdrafts, with the probability of dangerous rotor action under the crests of the waves. If enough moisture is present, standing lenticular clouds can form to give a visual indication of the wave action. These clouds are also an indication of moderate to severe turbulence.
[34] https://www.nwcg.gov/sites/default/files/products/training-products/pms-311-30.pdf