USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

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Fry Prescribed Fire-
Fry Fire Declared Wildfire Review

Superior National Forest, Eastern Region

Tofte Ranger District*

Tofte Ranger District portal sign

Fishfry Lake looking north towards a spot fire

Abstract

On May 15, 2024, the Tofte Ranger District (TOF) in the Superior National Forest (SUF, Forest) implemented the Fry Prescribed Fire (RX) with good fire effects. Shortly after beginning the prescribed firing operations, spot fires were detected outside the unit boundaries. An escaped wildfire was declared, and local resources and air attack responded. Resources reported 100 percent containment by the evening of May 18. Approximately 137 acres outside the RX unit were burned, and about 49 acres within the RX fire unit.

*Established in 1909, the Superior National Forest comprises three million acres of woods and water in the Arrowhead Region of Minnesota between the Canada-United States border and the north shore of Lake Superior. The Superior National Forest's headquarters is in Duluth and the Forest is divided into five ranger districts. The West Zone includes the Laurentian Ranger District, LaCroix Ranger District, and Kawishiwi Ranger District. The East Zone includes the Gunflint Ranger District and the Tofte Ranger District. In this document, the Tofte Ranger District is referred to as the TOF.

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Executive Summary

On May 15, 2024, the Tofte Ranger District (TOF) in the Superior National Forest began a prescribed fire on the planned 64.6-acre Fry Unit near Isabella, MN. The burn plan objectives included reducing hazardous fuels, returning low intensity fire to the landscape, and reducing 1- and 10-hour fuels by 50%. The resource objectives included preparing the site for natural regeneration and increasing the growth of remaining pine.

Following a briefing at the Isabella Work Center, a test fire was initiated at 1050 on the northwest corner of the unit. Conditions were favorable and ignitions began, with one set of hand lighters progressing south from the test fire location along an access road (Group A) and another to the east along the Little Isabella River (Group B). Planned tactics included using an Unmanned Aerial System (UAS) to provide reconnaissance and to drop plastic incendiary devices (dragon eggs), a form of aerial ignition.

Before any aerial ignitions occurred, fire started spotting across the Little Isabella River into untreated fuels at about 1248. Fire was active and started torching very quickly where ladder fuels were present, which allowed the fire to reach crowns of dead balsam fir. The holding boss requested air resources at 1255 and began a backfire between the all-terrain vehicle (ATV) trail and the spot fire. This backfire created an area of burned fuel to slow the fire from progressing north.

Active torching and spotting occurred outside the burn area to the north and then the west. This was somewhat abated by aerial resources, which included an air attack plane and two Fire Bosses aircraft. Due to the spread potential and active fire behavior outside the holding lines, and the use of contingency resources not listed on element 17 of the burn plan, the type 2 burn boss (RXB2) decided to declare the escape a wildfire at 1355. Declaring a wildfire ensured additional resources could be made available if needed. The RXB2 transitioned to incident commander (IC) and transferred control of the remaining prescribed fire to the assigned firing boss (FIRB), a qualified RXB2. Ignitions within the Fry Rx unit were completed at 1904 with both aerial and ground ignitions. Soon after lines were fully established around the fire, light rain began and helped reduce activity. Resources were released for the evening around 2030 with plans to recon with UAS in the morning.

Communication among the Incident Commander, Agency Administrator (AA), Forest Fire Management Officer (FFMO), and Regional Office Fire & Aviation staff was prompt and clear. These two-lines of communication ensured that information related to the incident could be shared quickly with the public. Region 9 (R9) FAM could work to identify other possible nearby resources and perform analysis of possible behavior and spread.

In all, the fire burned 137 acres outside the planned Fry RX unit. No injuries occurred and no structures or equipment were lost. While some smaller-diameter fir and birch had substantial damage, larger pine mortality will likely be within the desired levels identified in the Fry Rx burn plan.

Purpose of the declared wildfire review

According to Forest Service Manual (FSM) 5140, Forest Supervisors are responsible for conducting reviews of any prescribed fire converted to wildfire that does not result in significant damage or cost. The declared wildfire review team consisting of prescribed fire (RX) subject-matter experts (SMEs) convened on June 3, 2024, to review the Fry burn plan document, execution of the burn plan, and qualifications and experience of burn participants. The team conducted interviews with those involved and reviewed supporting documents to develop a narrative that included events and the logic behind actions the participants took before, during, and immediately following the RX burn and subsequent escape. The review team also visited the burn site with TOF personnel to better understand logistics and reasoning behind actions and decisions to help the USDA Forest Service (Forest Service) learn from this incident. This resulting document includes lessons learned and recommendations from which others involved in wildland fire might benefit.

Settings

National

In late 2022, a series of large-scale prescribed fire escapes nationally led to an RX pause, pending the Chief's 90-Day Prescribed Fire Program Review (Chief's Review). Following the Chief's Review and multiple large-fire complexes in several Forest Service regions, United States Secretary of Agriculture Tom Vilsack worked with Forest Service Chief Randy Moore and others to introduce a strategy called "Confronting the Wildfire Crisis: A Strategy for Protecting Communities and Improving Resilience in America's Forests" (Wildfire Crisis Strategy). The strategy has many aims; including the use of prescribed fire to reduce hazardous fuels and risk of wildfire.

Regional

The Eastern Region is one of nine administrative regions within the Forest Service and covers 20 states across the Midwest and Northeast US. This vast landscape includes 15 National Forests and one National Tallgrass Prairie, several major metro areas, and the homelands of 89 federally recognized Tribal Nations. The 12 million acres of National Forest System lands in the Eastern Region are rich in water with over 10,000 lakes, 15,000 miles of streams, and two million acres of wetlands. Generally, National Forest System (NFS) lands in the Eastern Region consist of boreal forests, tall grass prairies, pine barrens, shoreline along three Great Lakes, Appalachian foothills, the White Mountains, and some of the most extensive virgin forests in the eastern US. The Eastern Region supports a comprehensive fire and aviation program in cooperation with national wildland fire agencies and the 20 Eastern Region states. In addition to fire preparedness and emergency response, the program emphasizes the protection of life and property, landscape resiliency, healthy forests, and fire-adapted communities.

Typically, the Eastern Region begins prescribed fire operations in the spring. Project preparation typically begin on Forests as weather conditions allow and holding lines are reinforced as project areas inch closer towards required prescriptions (fuel moisture, weather, etc.) dictated within burn plans. Regionally, a lower-than-average snowfall in 2023-2024 allowed units to begin preparation marginally earlier than usual. By May 15, the Region had burned approximately 97,000 acres across most of the 15 National Forests. Due to the favorable late spring weather, nearly all the Forests were ordering fire resources from other units to help complete many type 2 burns, several type 1 burns, and to assist with any potential wildfire which is common during the prescribed fire season.

Forest

The Superior National Forest (SUF) has a large and diverse fire program. With a variety of fuel types and well-established historical fire patterns, the SUF has proven to be a challenging environment to manage. The SUF lies within a boreal forest system where natural fire occurrence is diverse and common. The Forest also provides for a variety of recreational and management activities which sometimes result in unwanted human-caused fires. Fire management, including prescribed fire, plays a critical role in achieving long-term goals and ecosystem health on the SUF. The SUF burned an average of 2,900 acres annually over the last several years. By the end of May, the Forest had completed 23 burns for 1,288 acres.

Project Area Location and Description

Tofte Ranger District Description

The Tofte Ranger District (TOF) on the SUF is situated between the rocky shores of Lake Superior and the miniature mountains of the Sawtooth Range. The TOF has a total of 740,000 acres and the 2002 Tofte Landscape Project environmental assessment (EA) indicated that the TOF has historically had a lack of fire on the landscape which has impacted vegetation composition. Balsam fir, which is frequently impacted by cyclical spruce budworm attacks, has increased understory fuel loading, leading to an increased risk of extreme fire behavior across the TOF.

Fry Prescribed Fire Project Description

The Fry RX is a planned 64.6-acre unit located in the vicinity of Fishfry Lake near the community of Isabella. The project was analyzed in the TomaInga EA which was approved in 2018 with the unit being harvested in March 2023. The project included both commercial and non-commercial timber harvests. Harvesting reduced stem density by 1/3 and residual balsam fir was cut and crushed inside the harvest area. Along the perimeter, harvesting did not occur, so balsam fir was hand-cut and scattered.

The planned ignition unit was located north of MN Hwy 1 and is bounded on the west by Fish Fry Lake, on the north by the Little Isabella River, and on the east by the Little Isabella

Campground. The unit was harvested in 2023, and the burn unit was extended to the southern bank of the Little Isabella River as an identified holding line (See Appendix B).

The area is surrounded by National Forest System (NFS) lands with private land approximately ½ mile NE of the unit, ½ mile W of the unit, and approximately 1 mile to the SW and NW of the unit. Values at risk include private structures, public highways, public utility lines, Little Isabella Campground, and the Fishfry Lake Unique Biological Area.

Fry Prescribed Fire Objectives and Resource Goals (Burn Plan Element 5)

The Fry RX unit is described in detail within the Fry Burn Plan that lists several project objectives and resource goals.

The prescribed fire objectives were identified as the following:

- Return low intensity fire (1'-8' average flame lengths) on regular intervals (3-5 years) to reduce brush competition.
- Reduce 1- and 10-hour fuels by 50%.

The resource goals in the Fry RX unit were to increase growth and vigor of long-lived conifers with the long-term goal of attaining old, large-diameter red and white pine with a diversity of species.

The resource objectives were identified as the following:

- Prepare the site for natural regeneration and/or planting by reducing the remaining slash by 50%.
- Increase the growth of remaining pine by bringing fire back to the ecosystem on a regular interval to control competition for water and nutrients.
- Reduce hazardous fuels.
- Minimize overstory mortality to < 20%.

The Fry RX unit is also located within a State High Biodiversity Area with Regional Forester Sensitive Species plants located to the west of the unit.

(For a complete vegetation description see Analysis #1: Fuels)

Prescribed Fire Prescription (Burn Plan Element 7)

When under burning pine stands after understory fuels reduction (UFR) activities have occurred, lower intensity fire is desired. Head fire flame lengths averaging 1-8 feet and backing flame lengths averaging 1-6 feet in surface fuels are needed to meet objectives and limit mortality. The Fry RX unit contains scattered areas where fuel bed heights vary due to the amount of balsam fir that was treated. The Fry RX burn plan stated it was acceptable to exceed 6-foot flame lengths in the scattered areas where higher fuel beds exist.

To achieve the desired prescribed fire effects, the TOF used information from numerous East Zone projects that have successfully taken place under similar parameters. It has been documented that burning post-UFR activity fuels when the Initial Spread Index (ISI) value is

greater than 10 may increase overstory pine mortality. At high-end parameters, head fire flame lengths exceed desired intensity, but fire modeling and empirical evidence show backing and flanking fire can be used under such parameters to achieve desired fire behavior and stay within the defined mortality limits listed in the burn plan.

The **Initial Spread Index (ISI)** which combines Fine Fuel Moisture Content (FFMC) and windspeed to estimate fire spread potential. ISI adjusts based on the time of day and the wind speed.

Predicted Weather and Variances

The spot weather forecast obtained from the Duluth National Weather Service (NWS) office for May 15 indicated that all weather parameters were within prescription for the Fry RX. Winds were predicted from the SE at 6-9mph with the discussion mentioning Southeast wind gusts ranging from 12-15mph (see attached spot weather forecast and completed prescription table in Appendix A). Great Lakes Fire and Fuels (GLFF) data available for the day showed that the Canadian Forest Fire Danger Rating System (CFFDRS) Fire Weather Index System parameters were within the prescription for this plan.

Prescribed Fire Outcomes

The review team SMEs' on-site observations revealed that the prescribed fire within the unit met the planned objectives. Timber and fire staff from the TOF perceived that fire effects within the Fry RX unit met the desired objectives. Mortality could not be immediately established, as post-fire mortality may take one to two years to be observed. District personnel plan to conduct post-treatment monitoring.

Fry Prescribed fire outcomes taken on June 8

Wildfire Declaration

The Fry Wildfire Declaration was made quickly after conversations regarding fire behavior and the need for additional resources. The Acting Forest Supervisor, FFMO, and RXB2; as well as Region 9 Fire and Aviation Management staff discussed those concerns, and the wildfire declaration was made quickly. It was determined that the opportunity for a declared wildfire review would allow the Agency Administrators, the Forest, and the Region to share some of the lessons that firefighters and Forest staff learned during this event. While other learning tools may have been available, one of the motivating factors was that a declared review would provide an outside team to the Forest that could help tell the story and better improve prescribed fire operations on the District, the Forest, and the Region.

The Narrative

Background

Spruce Budworm

The spruce budworm, a native insect that feeds on spruce and balsam fir needles, fluctuates in 30-40-year cycles. The majority of the current outbreak of spruce budworm is in Lake, Cook, and northern St. Louis counties with the last significant outbreak occurring in the 1980s. In 2023, the outbreak impacted just under 665,000 acres across these three counties, which is the highest amount since 1961. Outbreaks eventually lead to widespread mortality of balsam fir and white spruce. With the increased spread of spruce budworm, wildfire risk is increasing across northeastern Minnesota, but efforts are ongoing to monitor, manage, and mitigate the impact of spruce budworm.

Seasonal Prescribed Fire Planning

Prescribed fire planning began in 2023 and was completed in February 2024. Timber sale and mechanical fuels treatments were implemented concurrent with plan development. The District considered the fuel types within the Fry RX unit, adjacent fuel types, and modeled potential fire behavior. This modeling established the appropriate weather parameters to conduct the prescribed fire. Fire management had conversations regarding firing and holding tactics, as well as planning for contingency resources in case the holding plans were unsuccessful. The plan was developed and signed by a RXB2, reviewed by a RXB2, and approved by an AA.

Fry Unit post-harvest before RX.

The project had been planned several years ago and spruce budworm had been recognized as an issue during development of the EA, both inside and outside of the planned RX unit. The basal area was very high on the site and the stand had a good overstory of red and white pine and was a natural regeneration site. A stewardship contract was used to implement timber harvest (thinning) to reduce stand densities to 80 sq/ft basal area and improve growing conditions for desired red and white pine. Post harvest, mechanical and hand treatment of non-merchantable trees was conducted to reduce ladder fuels and limit height of ground fuels to below 3 feet in preparation for prescribed fire treatment.

Events Preceding the Week of the Fry Fire

Two separate Interagency Hotshot Crews (IHC) established a p-line on the south bank of the Little Isabella River in the spring of 2023 to provide access across the north end of the project.

The original specification for the p-line was two feet wide from the Little Isabella Campground west to Drop Point 1 (DP1) (see Appendix B). In the spring of 2024, the p-line was improved to approximately 10' wide by cutting and piling all standing fuel along the "p-line" accumulating additional fuel on both sides of the line.

By late May of 2024, the East Zone staff of the SUF had successfully implemented eight prescribed fires utilizing an abundance of off-forest resources. Crews that were brought in helped prepare planned burn areas and were prepared to implement prescribed fire in areas where the prescription was favorable. The SUF was strategically taking advantage of the additional crews and favorable weather across the zone. This maneuvering indicated that resources may be on a different district in a different area from day to day, reducing the ability for off-forest resources to fully scout out planned project areas.

The East Zone also had planned two type 1 prescribed fires, the Sunfish and Kawishiwi Lake prescribed fires. The SUF had brought in additional overhead to implement these type 1 prescribed fires, including a qualified RXB1 and two AAs (RXA1) which were later assigned to the Fry RX. Although a helitorch was ordered for these type 1 RXs, the weather did not align with the helicopter's availability. It was released before it was used, and the type 1 burns were postponed. However, a Wildfire Use Module (WUM) was assigned as an Unmanned Aircraft System (UAS) module for the spring, and they were working on the East Zone to scout and assist on RXs where needed for aerial firing.

Coordinating the Plan

The evening of May 14, Paul, the RXB2, Zane, the RXB2 trainee, and Sam, the RXA1 (as the Agency Administrator) conducted the Agency Administrator Ignition Authorization (Element 2A). The overhead believed that they had enough information available to have the conversation at the time and wanted to reduce conversations in the morning to save time. While Sam was on a resource order from outside R9, both Paul and Zane were very familiar with the project, the local factors, and the resources that would be available the following day.

"...the Agency Administrator discuss the key items listed in the Agency Administrator Ignition Authorization with the FMO or Burn Boss (or both), and that these discussions and any additional instructions are documented." -PMS 484

Zane led the 2A conversation with the acting DR, as well as with Sam and Paul, which included a discussion on contingency resource concerns, holding concerns, political concerns, as well as what the criteria may be for declaring a wildfire. Using the Fry RX burn plan (elements 15,16,17, and 18) they determined that if fire were to cross the Little Isabella River to the north, they would likely have to declare a wildfire. Primarily this was in case they required additional aviation resources. With a solid understanding of the operational concerns, Paul, Sam, and the Acting District Ranger signed the 2A with an authorization to burn the Fry RX unit on May 15, 2024.

Operations and Wildfire Response

Early Morning

On the morning of May 15, Paul and Zane began to complete the necessary "day of" tasks such as obtaining a Spot Weather Forecast, determining ignition patterns, and firing or holding assignments, as well as assigning incoming resources. One key conversation that morning was to clarify where firing would take place on the north line. Conversation between Paul and Zane confirmed that the intent of the project was to burn the interior compartment, as well as the short distance from the creek to the "p-line" so that fire would make it all the way to the river and meet the identified plan objectives.

Pre-Burn Activities

Resources assigned to the prescribed fire assembled at the Isabella Work Center for a morning briefing at 0900. The briefing included a discussion of values at risk, fuel types, current and forecasted weather, predicted fire behavior, holding concerns regarding fuels on the northern perimeter, firing tactics, and firefighter safety. All weather parameters were within prescription based on the spot weather forecast. The unit had received significant rain four days prior, and most weather and fuel condition metrics were at the low end of the prescribed values. Paul assigned resources, which included people, water pumps, engines, a dozer, and a UAS to specific duties associated with firing, holding, or contingency operations. The predicted weather included a high of 59°F, relative humidity (RH) of 29%, and winds out of the SE at 6-9 miles per hour (mph). The Haines Index (HI), which estimates large plume-dominated fire growth, was predicted to be low to moderate. Although the lower RH and winds were discussed during the briefing, they were not specifically identified as a primary concern.

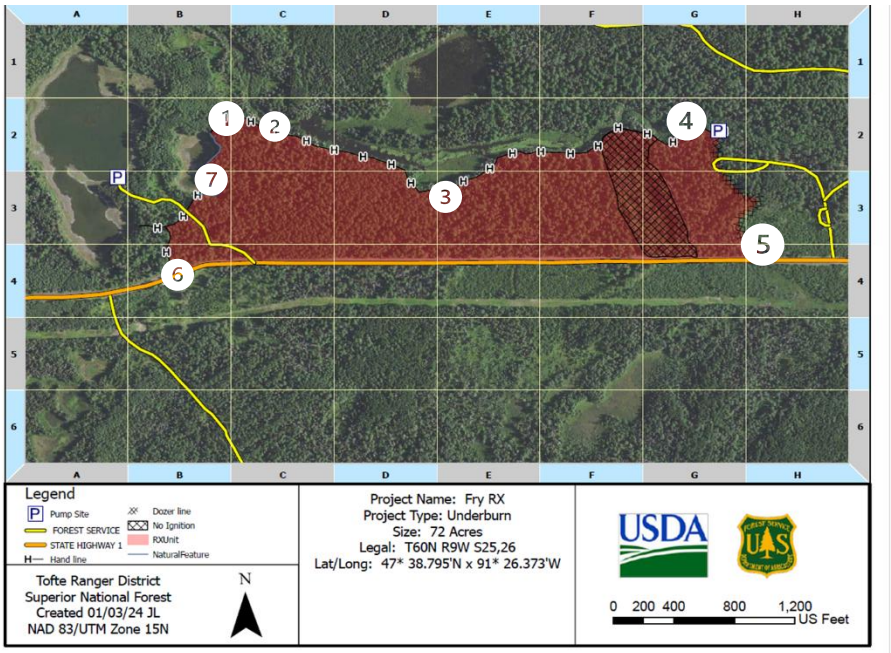
Test Fire

Crews began to move to their assigned areas for holding, firing, and contingency assignments and waited for the test fire to begin. The test fire was started near DP1 at the NW corner of the Fry RX Unit by the FIRB and the RXB2(t). Initial fire behavior was favorable for the planned objectives with 1-3' flame lengths and up to 6' in jackpots of heavy fuel. Fire was backing through the vegetation and consuming UFR fuels. The firing crews then lit a second area to additionally determine how the varying fuels would burn throughout the day. Favorable fire behavior and effects were observed in both areas. Zane reported a successful test fire to Sam, as well as confirming with dispatch at 1120 that they would proceed with ignitions. Zane then notified all personnel on the RX that they were proceeding with the burn.

Test firing near DP1.

Firing Activities

The initial plan for firing and holding was to divide into two groups, both working for the FIRB (Andy) and FIRB trainee (t) (Porter). One group (Group A) would work from DP1 south toward DP7, with 4 lighters and 4 holders. The second group (Group B) with 2 lighters and 4 holders would work their way east from DP1 to DP 4, skipping the exclusion area for a "mosaic pattern" in the eastern half of the burn area and using the Little Isabella River as a holding line. Jennifer, a qualified TFLD, was the holding boss and would remain near DP1 to direct the holding resources assigned to each group as needed.



Group A moved south and began ignitions towards DP7 with the FIRB and FIRB(t) and Zane. With the winds out of the southeast, resources were concerned that the west line was the pressure line and wanted to slowly move through the area. As they were working to the south, the Mark III pump setup near DP 2 had stalled requiring the firing group to hold up where they were until the pump issues were resolved.

Group B began firing shortly after Group A began. A FFT1 and FFT2 from the off-forest UAS module were assigned to Group B as the two lighters. They understood their assignment, but the FFT1 later recalled that he would have preferred to have an FIRB or a local resource with him as he was not sure what the fire effects would look like in this fuel type. However, they continued to light both sides of the "p-line" as they worked east, following their direction and instructions from the FIRB. Initially they strip-fired a section of line but changed firing techniques and started to use "dashes" due to observed fire behavior being higher than desired. A short time later they transitioned to a dot firing technique to reduce fire activity and allow the fire to burn to the river.

After Group B had lit for several minutes, the four holders assigned to Group B passed by the lighters. With the fire progressing down to the river, there was nowhere for them to see spot

fires across the river through the smoke and fire. Instead, they bumped forward, ahead of the two lighters, to observe any spots to the north from ahead of the ignitions.

Spot Fire Reports

As Group B fired between DP2 and DP3, Paul the RXB2 and Steve, a firefighter qualified as an RXB1, met the lighters on the line. The four holders were slightly to the east of them, when one of the crew members saw some paper birch bark loft across the river where fuels are predominately comprised of a dense stand of dead/dying fir (50% snags). While Paul was observing the fire behavior in the unit, Steve was looking across the river and saw smoke. Several other people saw the spot fire at the same time, and it immediately began to grow. At this point Jennifer, the holding boss, began directing resources staged on FR177A towards the growing spot fire. Jennifer began making her way towards FR177A from DP1.

Fire behavior during RX, image taken from the exclusion area near DP4.

While staged at the Knotted Pine at the intersection of Hwy 1 and Mitawan Lake Road, the E611 engine captain could see a smoke column that "got their attention." The chase vehicle group for E611 accessed the FR177A area and hiked in to check the spot fire and see if they could catch it. They quickly realized it was not possible. At the same time, Jennifer continued deploying her contingency resources on the north side to engage the spot fires. Resources recalled that the spots "grew to 5 acres quickly" and they observed "100 ft flame lengths with crowning." E611 tied in with the chase vehicle group on FR177A and began to assess their holding options. It was thought if the fire was not caught at the FR177A road, the fire had the potential to grow to 5,000 acres. Shortly after, E671 arrived on FR177A and tied in with the E611 crew.

The west side firing group (Group A) had made it to the access road on the west line when they heard the reports of spot fires to the north of the river. Over the radio, the spots were reported at 2-5 acres, and one of the crew members recalls saying "We are not going to catch it." They ceased firing on the west side as they waited for a better size up regarding the growing spot fires. The four lighters and four holders assembled on the west line near the access road and waited for more information.

Contingency Actions Taken

As the UAS module heard about the spot fire, they contacted Paul (RXB2) to determine if he wanted them to launch the drone and begin scouting the spots. Paul agreed, and the drone quickly flew to the spot. As the UAS began scouting, they determined that the initial spot fire was approximately 20 acres and growing with very active fire behavior. As the UAS continued

to recon the area, they discovered a second spot fire north of the river near DP1. As these spots grew, the UAS continued to scout for additional spotting.

As Jennifer arrived on FR177A, she had the crew members from E611 return to the road. She realized that the spot fires were growing rapidly and immediately determined that aircraft were going to be needed to support any contingency operations. She later recalled "there was no time to sit there and ponder about it. It was time to go." As she was requesting aircraft, she tied in with E611 and E671 directly north of the spot fires. Being familiar with FR177A, she decided that they would fire off that road north of the spot fires working their way west.

As the UAS continued to scout the growing spots, they were also monitoring both the tactical and air frequencies, knowing that air attack would be arriving soon. They were able to fly for approximately 20 minutes over the spot fires when they made communication with air attack and returned the drone to the campground and deconflicted the air space for additional aircraft.

As air attack arrived, they confirmed the UAS had landed and scouted the fires as well. They could see that the fires had grown to over 20 acres with additional spots, and that resources were beginning to fire FR177A. A fireboss (air tanker) was enroute to the fire, and air attack coordinated a plan to slow the largest spot fire moving north to give the firefighters on FR177A time to establish a backfire and stop progress to the north from a spot fire that had jumped north of FR177A. Jennifer had the fireboss work this critical spot and support the dozer as they kept the fire from growing and running north. The aircraft was on station for one fuel cycle and dropped two loads. A second fireboss arrived on scene and dropped two loads on the north end of the spot fire, south of FR177A, and then returned to base as well. Air attack stayed on scene for approximately another hour monitoring the escape, and then returned to station.

RXB2 converts Incident from RX to WF

Paul called the Acting Forest Supervisor, David, and provided notification that spot fires were outside the unit and contingency resources were engaged. David then called Sam, the onsite AA, and Nate, the Forest FMO, to talk about the growing spots and the threat to values at risk. As they gathered more information, David and Nate both reached out to the regional office, anticipating that the spot fires were going to grow rapidly and that several resources may be needed. Fire and aviation staff within the regional office immediately began modeling potential fire spread and determined what additional resources might be available within the region in preparation.

As Paul observed the extreme fire behavior outside the planned holding line, he decided that the RX should be converted to a WF. He believed the existing contingency resources were not going to be adequate to catch the spot fires. By declaring a wildfire, additional resources such as aircraft, dozers, and more crews would be available sooner. Paul discussed the escape with Sam and the RX was formally declared a WF at 1359.

As the RX burn and associated spots were now declared a WF, Paul converted to the Fry IC and discussed transferring RXB2 responsibility and operations of the RX with Andy and Zane. Paul knew that the area was going to have to be fired out for containment, and he decided to

transition the RXB2 role to Andy, who was also a qualified RXB2. Paul discussed his holding concerns with the Fry WF and wanted Andy and Zane to monitor the RX fire and wait until resources were available to fill in the planned ignition area. Andy monitored the RX from around the north and west holding lines and waited to re-engage.

Paul then called David (Acting Forest Supervisor) and informed him that they had declared the WF and that he had transitioned to the IC. Paul then contacted Nate (FFMO) and provided a short size-up and informed him of what his current concerns were with homes to the west of the fire and potential for the fire to jump Mitawan Lake Road. They determined additional resources were needed, and Nate began to work with adjacent districts and units to see what resources would be available for the Fry WF.

As Nate continued to make contact with local FMOs and duty officers, he also coordinated a Teams call with key personnel. He reached out to the RO FAM staff and worked with Sam to communicate what was happening and what was needed. This call took less than 15 minutes, but by coordinating early, Nate was able to obtain required suppression resources and reassign them as needed. Additionally, Nate worked with the Forest DO to divide the Forest into zones for coverage. The Forest Duty Officer (DO) took the west zone as there were ongoing RX operations, and Nate took the east zone to coordinate resources for the Fry Fire.

The FFMO set up a Teams call with all the key players early in the decision process, including the AA in the field. This rapid and inclusive communication helped all players understand immediately what was happening and what was planned.

Spot Fires South of Little Isabella River

As Paul transitioned with Andy, IHC1 began going direct on spot fires south of the river. Wayne, (IHC1 Superintendent (SUP)), attempted to use his handheld to contact Jennifer on FR177A but could not reach her. He could hear they were firing on FR177A, so he went to Mitawan Lake Road to scout possible control lines. He also had the contingency squad head towards the Mitawan Lake Road and Highway 1 junction. As Wayne arrived near the junction at Knotted Pine, he exclaimed “holy shit there are structures” because he was unaware of any at-risk structures west of the Fry RX/WF. Wayne was able to contact Jennifer on the TAC channel and they discussed that the holding group on the north was going to burn off of the FR177A to the west and out along the Arrowhead ATV Trail to the bridge. She also wanted to bring fire from Hwy 1 north to the ATV bridge and” build the box”. Wayne realized that his resources would be inside the box and so he planned to gather the crew, anticipating

Dozer line on FR177A at the corner that spotted over.

that they would become suppression resources as the spot fires grew. Wayne and Jennifer discussed the IHC1 crew firing north along the utility line right-of-way and catching the ATV trail to black line the west end of the fire. She agreed, and Wayne lined out a squad to begin firing from the utility road and Hwy 1 north to meet resources heading south.

As Wayne tied in with the crewmembers near the Knotted Pine, an additional spot fire was reported south of the Little Isabella River, west of the planned RX unit, and was growing. Wayne had the IHC1 crewmembers that were still on the west line start working the spots south of the Little Isabella River. As IHC1 was the main resource south of the river, Paul (IC) contacted Wayne (SUP) and assigned him as Division Bravo, dividing the fire into A and B divisions using the river as the division break. As Wayne assumed DIV B, he worked with his crews on the spot fires, the firing operation, and requested additional resources. Paul similarly assigned Jennifer to be Division Alpha as he established the staging area at Knotted Pine.

Suppression Operations

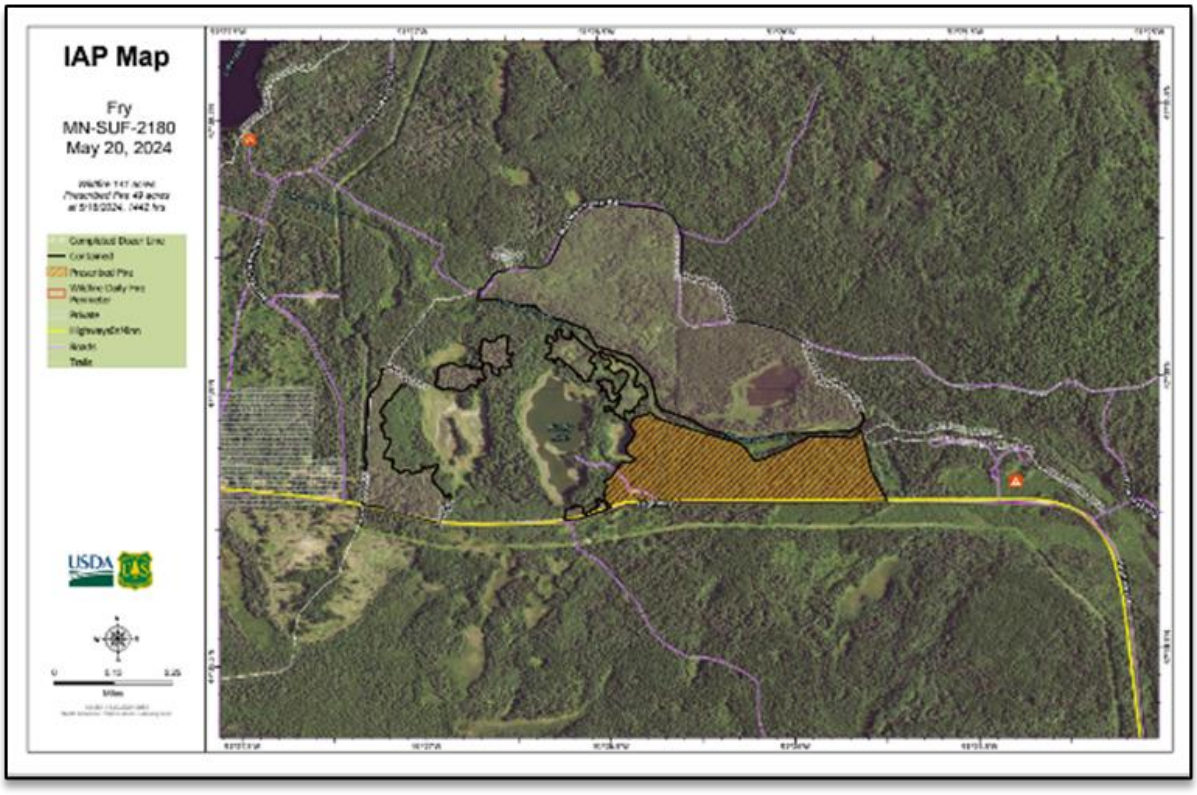
As the dozer and heavy equipment boss arrived at the staging area, they were quickly assigned to secure the utility line road and put in a buffer line for IHC1 to light from. Once the dozer line was established, the crew put in an anchor point at the corner of Hwy 1 and the utility road and burned to both the north and to the east to establish an anchor point on the corner. The dozer put in a line off Hwy 1 near Fishfry Lake to contain the corner. The crew continued to slowly burn out this corner for the next few hours.

DIV A continued to burn west from FR177A. As they began working the west end of the FR177A, they had an additional spot fire. With the two engines on scene, they were able to quickly contain it. However, the dozer was requested to line the spot and continue to move along FR177A pushing out the road. DIV A continued to burn out the road moving west. The dozer then lined the spot that was worked by crews north of FR177A. DIV A then had the dozer put in a line on the east end of FR177A, heading south to line up with planned ignitions on the RX so they could finish the box.

As both Divisions continued to work on firing operations, the UAS module sent two additional people on a UTV to assist on FR177A, leaving both pilots to staff the UAS platform. Air attack stayed on scene for approximately another hour and then transitioned with the UAS for aerial support. The UAS had two requests for missions, the first being a recon of the spot fires and the second was to continue firing operations on the planned RX units. Both divisions were making good progress on their lines, so the priority was to assist with the RX first, and then work on the recon as needed. The UAS fired the RX unit for about 30 minutes, dropping less than 100 aerial spheres and then landed to reconfigure for the recon of the WF.

Around 1530, IHC2 arrived at the staging area and was assigned to Division Bravo. They were asked to first burn out a small section on Hwy 1 to contain the RX area east of Fishfry Lake. They were also asked to put a handline in between Fishfry Lake and the unnamed pond to the west, to keep the spot fires north of Fishfry Lake, as there was large timber and sensitive plants in the area to the south. A type 4 engine, E442, arrived from the Slim Lake RX unit and was

assigned to DIV B as holding resources for IHC1's firing operation. E442 stayed with IHC1, as E612 continued to hold Hwy 1 for IHC2 and then waited for further firing operations on the RX.



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Continued Operations

Division A continued to progress west on FR177A with their firing operations. The ATV trail wrapped towards the bridge crossing the Little Isabella River at the DIV A/B break. Division B continued to fire up the ATV trail to tie into the river. As they came off the utility line, fire behavior was diminishing so they slowly burned north. The IHC1 squad was still working direct handline on a few spot fires south of the river, while IHC2 worked on a second contingency. They then tied in with crew members from IHC1 to go direct where necessary. Engines arrived to help hold and the operational tempo "mellowed out" as resources arrived.

The UAS finished firing on the RX unit and configured for recon for the entire fire. The UAS mapped the WF, and were then requested for an aerial firing mission on Div B. The request was to fire south of the spot fires to IHC2's contingency line and build some more blackline. As the

UAS began to fly the mission, IHC2 called back on TAC "you're firing across our holding feature." The UAS returned to the campground and requested that someone tie in with them to confirm the operation before they continued. The IHC2 sent a crew member to the campground with the UAS as a liaison for further operations. The UAS module and the IHC2 crew member quickly realized the advantage of having a ground resource with the UAS to confirm operations and reinitiated firing operations. They supported DIV B, and a short time later were requested to finish minimal acreage of the RX with aerial firing as night fell.

End of Shift

The two UAS module members returned to the campground from FR177A and were asked to complete an IR recon of the perimeter. The UAS module leader had the two crewmembers, UAS position trainees (UASP(t)), configure for the flight and complete the mapping. The IR recon showed that the indirect lines were holding and the direct lines around the interior spot fires had slowed the spread. At 2018 Paul called the fire contained as the natural features and holding lines had contained the spots, and rain began to fall. Paul had the Divisions start to assemble their resources s and began to release resources as they finished their assignments. By 2200 all resources had been released from the Fry WF/RX.

Continued Fry Fire Operations

On May 16, crews and engines were assigned to the Fry Wildfire to monitor control lines and mop-up on the day after the fire. The rain from the night of the fire had put out most of the fire so crews worked hot spots near the line, checked the spot fires on FR177A, and patrolled the direct lines on the spot fires. Crews reported no holding concerns, and no additional line construction or firing were needed.

For the next two days, resources were assigned to check the fire and ensure that the control lines and areas of concern were fully controlled. On May 18, the Fry Fire was called "controlled" and the local unit began the necessary fire effects monitoring. At 1300 on June 5, the fire was declared "out" by the Incident Commander.

Lessons Learned

The following lessons were shared by participants and observed by the review team. The combination of burn plan analysis, RX implementation, and wildfire actions helped shape the lessons so that other fire managers and practitioners may learn from this event.

1. **When planning prescribed fire in sensitive areas, such as political, biological, etc., Agency Administrators may need to develop a collaborative team approach to working through all the burn plan elements to successfully implement a prescribed fire.** Using a collaborative team approach to identify values at risk, resource objectives, barriers to success, and other considerations may improve the chance to adhere to policy and to identify tactical considerations during the implementation phase.

    a. **Using NEPA as an integrated resource consideration may ensure that program areas such as timber, botany, and fire work together to ensure that planned projects have considered the outcomes during prescribed fire.** The Tofte Ranger District completed the NEPA process using the TomaInga EA in 2018 with an IDT approach that identified the concerns within the planned unit.

    b. **Units may need to consider the same cohesive integrated approach when completing the complexity analysis for prescribed fire planning**. A key aspect of developing a complexity analysis is identifying the values at risk within and adjacent to planned project areas. By integrating all necessary program areas (fire, biology, timber, etc.) in the complexity analysis conversation, burn plan preparers will better ensure that all values at risk are properly identified and rated at the appropriate level. The ratings for the Fry RX were rated at "moderate" during pre-planning and did not accurately reflect the ratings that SMEs identified during the burn plan analysis.

    c. **Burn plans may need to be developed using a similarly collaborative team process using qualified burn bosses to develop and review burn plans.** Having multiple burn bosses work together as a team on these plans may ensure that technical elements are fully explained and developed consistent with policy and with the intended outcomes in mind. Consider PMS 484 *"Prescribed fire plan development and complexity analysis are team, not individual events."*

        I- When developing a collaborative team to create burn plans, an out of area resource may help identify elements that are "normal" locally but may not make sense to resources from out of the area, *such as* the use of the Canadian Forest Fire Danger Rating System (CFFDRS) on the SUF burn plans.

II- Burn plan collaborative teams may also be useful when considering quality assurance of existing burn plans. The SUF has many written and developed plans that may need to be reviewed by an IDT for this purpose.

d. When planning holding and contingency strategies and tactics, scenario planning as a team may help identify tactical gaps in what are the management action points, locations, resource staging, and access issues. Similarly, the use of an IDT for plan development, giving specific attention to "what ifs" will help realize critical holding concerns and develop workable contingency plans prior to implementation and avoid complacency from high success rates.

I- "We struggle with contingency" was a direct quote from a SUF burn boss in an interview. Consider scenario planning or sand table exercises in pre-season fire refreshers to include prescribed burning, not just wildfire suppression. Encourage all resources to find and identify gaps in holding and contingency planning.

II- Clearly identify values at risk beyond the project boundary and develop holding and contingency tactics and necessary resources, along with the management action points needed to protect those values at risk. Ensure these identified risks and associated contingency tactics are included in pre-burn conversations and morning briefings, particularly when off-forest resources are engaged.

2. Regardless of the complexity or the size of the burn, prescribed fire planners and Agency Administrators should consider developing briefing elements at the lowest level possible so that all resources understand the plan and the objectives during briefing. While the local resources on the Fry RX understood the plan and the values at risk, out of area resources were not clear on objectives and values at risk.

a. Key personnel that are identified in the plan should be identified earlier during the planning and implementation process, and if using out of area resources they should have time to scout the project area to understand their assignment.

I- Key personnel roles that may need to be considered early are the IC and the RXB2 if a RX is converted to WF. Operational considerations should determine how these roles are assigned and communicated, however having the conversation early will reduce confusion during a declaration.

b. Element 9, and Appendix I, in the Fry Burn plan had notifications to be made on the day of the RX. However, having a "notified by" section included could reduce confusion during a declaration. Providing the notification page to the DO could help ensure timely contacts are made during a declaration.

3. **When there are multiple operational components, such as holding, firing, contingency, or aviation, consider developing geographical "groups" for operational assignments such as those used during wildland fire operations.** On the Fry RX, holding and firing were considered individually for all operations on the unit, and when the RX was converted to a WF, they assigned divisions to control the resources and operations with more overhead and operational control.

   a. By developing operational groups during planning, it may allow further breakouts during briefing with groups to ask more questions. Off unit resources on the Fry RX felt that the briefing was clear, however there were so many people at the overall briefing that participants were not able to ask detailed questions regarding their assignments at the briefing.

   b. When developing contingency resource assignments, leadership may consider having a contingency group leader that is not geographically assigned to manage the additional resources. While contingency resources were assigned to the Fry RX, they were operationally controlled by the holding boss who was quickly responsible for Division Alpha, leaving some resources unassigned during operations.

   c. When using aerial ignitions such as UAS on WF or RX operations, consider having a "group supervisor" assigned that is familiar with the planned operations. The UAS module had a clear understanding of the planned operations during the RX, however as the tempo picked up with the WF, they were initially confused by some aerial firing requests. Once a "liaison" from the IHC2 tied in with them, they understood what the mission objectives were and had better communication with ground resources. When developing operational maps, having a larger briefing map, as well as operational maps broken out in geographical groups would allow assigned resources to better understand their assignments and the values at risk in those areas. Similar to WF operational maps, having more details helps clarify the responsibility of resources in those areas. Additionally, operational maps should include management action points and/or contingency lines identified in the burn plan.

4. **When reviewing burn plans for adherence to the post-burn pause policy changes, consider leader's intent to *"improve quality control."*** While the Fry RX burn plan and its implementation had been updated post-burn pause, several issues of policy adherence were

noted and there was lack of clarity for incoming resources. By reviewing the Quality Assurance Checklist burn plan preparers or reviewers will have a clearer understanding of the intent of the Chief's Review.

a. **Burn plan signatures by the plan developer, the technical reviewer, and the Zone FMO ideally should be three separate people to ensure that a span of individuals agree to the plan implementation.** The technical reviewer and the Zone FMO signatures were the same individual for the Fry RX. Additionally, the RXB2 was the Zone FMO, leading to one individual carrying a lot of responsibility on burn plan development and implementation.

b. **Fire leadership may need to ensure that the Duty Officer, key personnel, and the RXB2 are having conversation regarding coverage assignments when the potential for wildfire exists with prescribed fire;** The Duty Officer on May 15 was the Zone AFMO, however the Zone FMO signed the 2A the previous evening and was subsequently the RXB2 the following day. By bringing in the DO assigned the day of RX, responsibility may be shared regarding resource assignments.

c. **The Agency Administrator should provide a time, as well as a date for implementation on the 2A and this should only be done once predicted conditions (weather, smoke, resources) are known, to document the conversation.** There is no policy requiring that signatures be completed the day of, however conditions on the Fry RX were not fully known until the morning of the burn.

d. **When developing burn plans, the elements should reflect what tactics and assignments should ideally look like at the time of implementation.** While the operations on the Fry RX and Fry WF were sound, the burn plan did not indicate that these were the actions that were going to be taken.

    I- When developing the plan, consider outside resources unfamiliar with the area, and how to word the burn plan so that they understand what needs to happen to successfully implement the plan.

    II- By ensuring the plan is detailed enough during development, incoming resources may review it ahead of time to understand the project before having to scout the area, reducing valuable time needed on the ground.

e. **Funding for resources such as aircraft have changed during the post burn pause, and units should continue to work with the Washington or Regional Office on determining how to fund aircraft for RX contingency resources.** In the fuel types

such as those on the SUF, aircraft may be needed. Identifying the funding and a method to "reserve" these types of resources could help develop a more secure holding and contingency plan. Although the local Unit was aware of the funding process, there was little certainty that they would be able to retain the aircraft if there were additional Forest priorities.

5. **The SUF should continue to develop their NFDRS adjective ratings to allow identification of wildfire danger for counties and adjoining counties to further adhere to the 2016 Prescribed Fire Burn Act.** While parts of the SUF have included the rating in the burn plans, it is not consistent across the SUF, and the Fry RX Burn Plan did not have it included. Although the adjective ratings were not a contributing factor, the inconsistency was noticed by the review team.

Recommendations

The following recommendations were developed by the Fry Fire Review Team in concert with Appendix A of this review and conversations with SUF fire management, Agency Administrators, and SMEs.

1. **The SUF needs to develop an internal process to ensure plan consistency and quality control using an IDT approach that distributes risk and responsibility amongst subject matter experts and utilizes off-unit resources.**

    a. **SUF Fire Management should begin audits on 10% of the existing burn plans on all Ranger Districts, using an IDT approach.** Using the PMS 484, FSM 5140, and the Prescribed Fire Quality Assurance Checklist, the group should go through a technical audit on these plans, in a similar fashion as the review requirements during a declared wildfire review.

    b. **The SUF had successfully met the National reengagement requirements for prescribed fire through their bi-annual burn boss refresher, unit engagements, and RT-130s. The SUF should consider an additional RT-300 conversation that is dedicated to discussing the specific SUF requirements that need to be implemented as part of the ongoing reengagement conversations concerning the Chief's intent for prescribed fire.** This may help ensure that everyone has the same intent and understanding of policy requirements, prescribed fire re-engagement intentions, and plan consistency for planned projects. Currently the understanding of the Chief's intent and post-pause changes was not fully disseminated across the forest and may need to be clarified.

Conclusion

On May 28, 2024, the Acting Forest Supervisor for the Superior National Forest signed a Delegation of Authority to initiate a formal Declared Wildfire Review (FSM 5140 Declared Wildfire Review) for the Fry RX implemented on May 15, 2024, resulting in the Fry WF. According to the procedures found in the National Wildfire Coordinating Group's (NWCG) Standards for Prescribed Fire Planning and Implementation (PMS 484), the review team was delegated to conduct a thorough analysis of the SUF's efforts to meet the five required review elements listed below, which are addressed in detail within Appendix A of this report.

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.

Between the dates of May 28 and June 7, the review team conducted a thorough review of all relevant project files associated with the TomaInga EA, the Fry RX Burn Plan, IAPs, and the Superior National Forest Land & Resource Management Plan (LRMP). The team further conducted 18 interviews with staff from the SUF and off-Forest resources who were engaged in the planning and implementation of the Fry Rx, and/or suppression efforts on the Fry WF. Finally, the Review Team participated in a site visit to the Fry RX/Fry WF, where the RXB2/IC and holding boss on the Fry RX/WF provided a thorough summary of actions taken on the day of the RX/WF.

The Review Team developed a comprehensive understanding of the actions taken by the Tofte Ranger District to conduct necessary planning and preparation for the Fry RX in accordance with Forest Service and NWCG policy, as well as the Quality Assurance Checklist; what factors may have been contributing factors for the fire to escape outside established holding lines; and how contingency resources were utilized to contain the Fry WF prior to significant impacts occurring on NFS and private lands.

Below is a synopsis of the team findings regarding PMS 484 requirements:

1. Seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration were determined be within established thresholds. Due to precipitation over the prior two months, the area was no longer within drought conditions and additional precipitation events were predicted in the day(s) following May 15, leading to few seasonal severity concerns. The Fry RX Burn Plan had appropriately identified critical weather and fuel parameters and established threshold ranges that reflected desired fire behavior to meet restoration and fuel reduction objectives. The Fry RX

Burn Plan assessed fuel conditions within the unit and determined they were significantly different than fuel conditions found in adjacent forest stands as the Fry RX unit had been mechanically treated. Fuels located north of the Fry RX unit had not been mechanically treated and included areas that had been impacted by the ongoing spruce budworm outbreak. Ultimately, fire management staff recognized that adjacent fuels would be more receptive and harder to contain than fuels inside the planned project area due to fuel loading and hard to access areas.

2. The analysis of the Fry RX Burn Plan found that many elements of the burn plan were well developed, but other critical elements were general in nature and in some instances were not consistent with Forest Service policy and guidance. Specifically, the Complexity Analysis (Element 3) the ignition plan (Element 15), holding plan (Element 16), contingency plan (Element 17), and Fire Behavior Modeling (Appendix E) lack site specific information to provide high quality conversations between fire personnel and Agency Administrators. For a more detailed discussion on all Burn Plan Elements, (see Table 1. Fry Prescribed Fire Plan Analysis in Appendix A).

3. Overall, implementation of the Fry RX Project was consistent with the prescriptions, actions, and procedures outlined within the Fry RX Burn Plan. However, several discrepancies and inconsistencies exist between implementation of this RX project and what was written in the burn plan. Although a more detailed summary of the review teams findings is found below, the team identified a few elements that contributed to the need to declare a wildfire. These include several categories:

- **a.** An opportunity to ensure all resources received appropriate levels of communication and direction on the planned tactics and roles,
- **b.** Access to detailed project maps that include all ingress/egress routes and potential contingency action points/lines, and location of adjacent private lands and infrastructure located within maximum spotting range,
- **c.** Element 16 of the Burn Plan states that “Holding lines are in place and adjacent heavy and ladder fuels removed...” Accumulated fuel from the p-line on the south side of the Little Isabella River, and similarly, heavy and ladder fuels were prevalent on the north side of the river,
- **d.** The holding plan was developed as it were a contingency plan, and the contingency plan was immediately transitioned into a suppression plan or initial attack. (See Appendix A #3 for detailed findings).

4. The approving Agency Administrator had qualifications and experience that exceeded the minimum requirements to implement the Fry RX unit. Although the approving Agency Administrator was on assignment from outside R9, he participated and was engaged in the Agency Administrator Ignition Authorization (2A) that occurred on May 14, and was on-site of the prescribed burn on May 15. He maintained good communication with the RXB2/RXB2(t), FFMO, and Acting Forest Supervisor

throughout the incident, and was engaged in the decision-making process to Declare a Wildfire.

5. Our review of the Fry RX IAP and associated IQCS qualifications determined that all personnel assigned to the Fry RX were qualified for their respective assigned positions on May 15.

Appendices

Appendix A: Analyses and Assessments

#1: Analysis of seasonal severity, weather events, and on-site conditions

The TOF experienced a drier than average winter with below normal snowfall which created moderate drought conditions as of early April. Snow and rain increased during the month of April and May with the burn area receiving 125 to 150 percent of the normal precipitation for the month of April and early May. This ended drought conditions for the TOF by mid-May as indicated in the May 14 U.S. Drought Monitor.

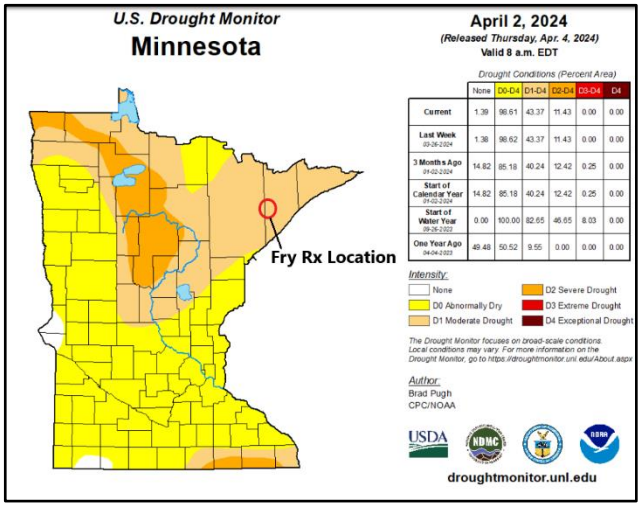


Figure 1 Minnesota drought monitor with Fry RX location.

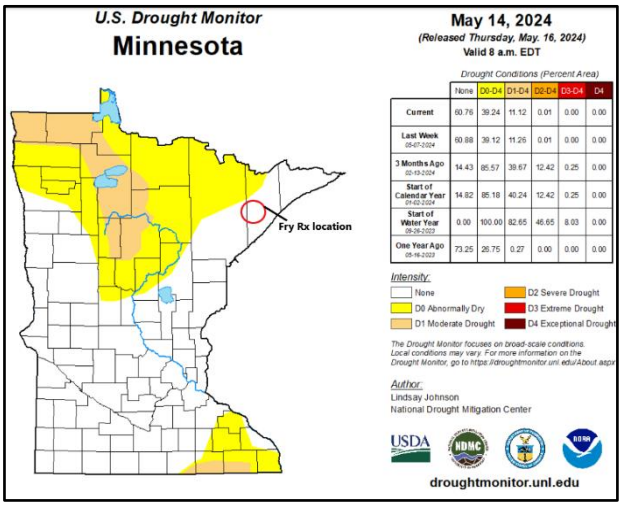


Figure 2 Minnesota drought monitor with Fry RX location.

Fire Weather Index (FWI) System

The state of Minnesota and the Superior National Forest use the FWI system to determine fire danger. Similar in concept to the National Fire Danger Rating System (NFDRS), the FWI system relies only on weather readings to determine the three fuel moisture codes.

- The **Fine Fuel Moisture Code (FFMC)** is a numeric rating of fuel moisture content in litter fuels under a shaded forest canopy. The FFMC is an indicator of the relative ease of ignition and flammability of fine fuels. It is unitless and ranges from 0-101 and the time lag is 2/3 day.
- The **Duff Moisture Code (DMC)** represents loosely compacted, decomposing organic matter underneath litter. It is unitless and open ended with a time lag of 15 days.

- The **Drought Code (DC)** represents fuels that are deep into the soil which determines the resistance to extinguishment. It is unitless with a maximum value of 1000 and the time lag is 53 days.

There are also three fire behavior indices that represent fire spread, fuel consumption, and fire intensity within the FWI system.

- The **Initial Spread Index (ISI)** which combines FFMC and windspeed to estimate fire spread potential. ISI adjusts based on the time of day and the wind speed.
- The **Buildup Index (BUI)** represents the total amount of fuel available for combustion. It is a combination of DC and DMC and fluctuates little throughout the day in the absence of rainfall.
- The **Fire Weather Index (FWI)** combines ISI and BUI and represents the intensity of a spreading fire. It is unitless and open ended.

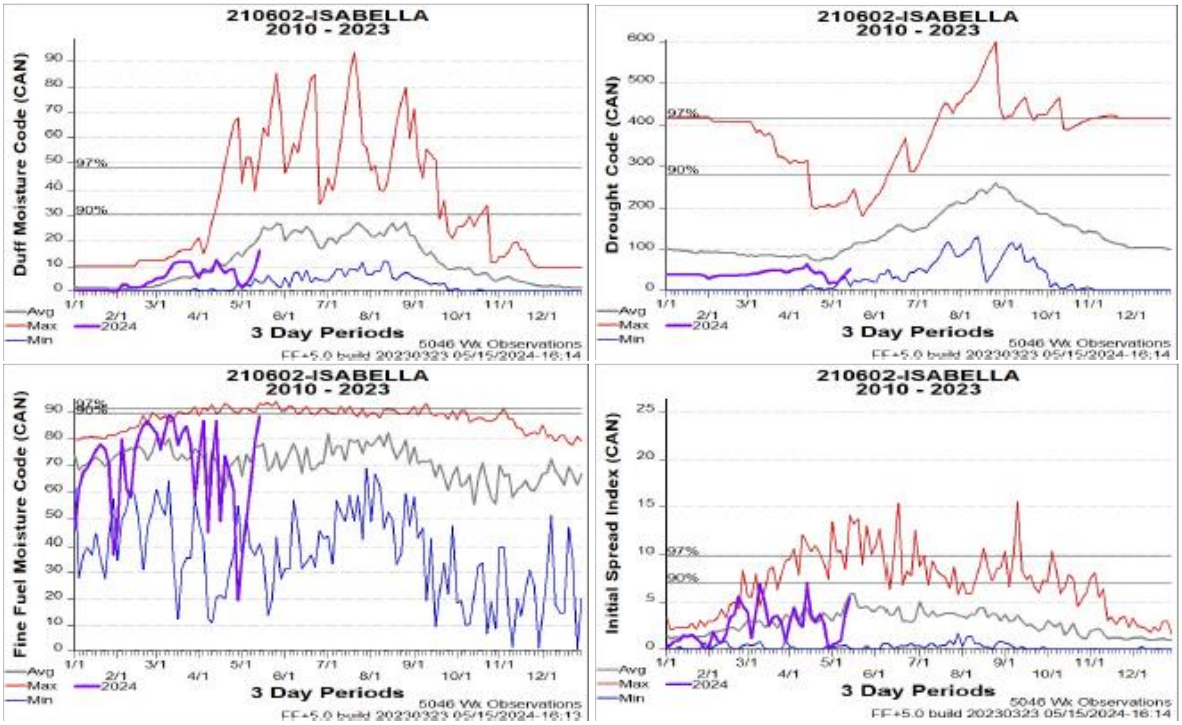


Figure 3 Graphs show CFFDRS Indices from the Isabella RAWS with values recorded on 5/15/24.

MesoWest
Great Lakes Fire & Fuels

ISAM5 ISABELLA

Change Stn | MODE | CFFDRS | NFDRS | MESOWEST | NO-PRECIP | GRAPH

Date	ATF	RHP	WSM	GUST	VPD	GSI	PREC 24h	FFMC	DMC	DC	ISI	BUI	FWI
2024-05-22 hrly	50	83	11	25	2	0.8	1.78	22.6	2.7	9.5	0	3.2	0
2024-05-21 hrly	51	100	10	16	0	0.7	0.15	19	6.1	85.1	0	10.3	0
2024-05-20 hrly	56	87	3	8	2	0.7	0.22	41.5	9.7	85.4	0.1	15.1	0.1
[illegible] hrly	66	22	11	22	17	0.7	0.00	87.2	15.7	88.8	7	21.8	11.1
[illegible] hrly	72	61	9	17	10	0.7	0.08	64	11.6	83	1	17.2	0.8
2024-05-17 hrly	54	96	3	11	1	0.6	0.12	30.9	11	76.6	0	16.2	0
2024-05-16 hrly	41	98	5	12	0	0.6	0.11	49.6	14.9	75	0.2	19.9	0.2
2024-05-15 hrly	59	28	5	16	12	0.6	0.00	90	19.2	71.7	6.4	23	10.6
2024-05-14 hrly	56	40	3	15	9	0.5	0.00	87.9	16.1	66.6	4	20.1	6.5
2024-05-13 hrly	55	44	6	15	8	0.6	0.00	87.4	13.8	61.8	4.8	17.7	7.1
2024-05-12 hrly	67	25	11	24	17	0.5	0.01	87.4	11.8	57.1	7.2	15.6	9.5
2024-05-11 hrly	61	37	4	12	12	0.5	0.18	66.5	7.7	51.2	0.8	11.2	0.5
2024-05-10 hrly	50	67	4	9	4	0.5	0.01	81.5	8.5	51.5	1.9	12	1.9
2024-05-09 hrly	55	40	5	13	9	0.5	0.00	80	7.5	47.3	1.7	10.7	1.3
2024-05-08 hrly	60	48	7	14	9	0.4	0.06	65.6	5.3	42.6	1	8.1	0.5
2024-05-07 hrly	48	96	6	18	0	0.4	0.14	40.8	3.4	37.4	0.1	5.5	0

Fry Rx

Figure 4 Show the indices calculated by MesoWest for the Fry RX on May 5, 2024.

Spring Dip and Live Foliar Moisture Content (LFMC)

The Spring Dip is a seasonal reduction of foliage moisture in pine trees across the Great Lakes region. The spring dip occurs between April and July depending on the location and corresponds with an increase in the likelihood of crown fire, increase in lateral spread, and rapid rates of spread. Before the spring dip LFMC can range in pine species between 110% -125%. During the spring dip LFMC will drop to 80%-90% with values below 100% as a threshold of increasing fire behavior.

ISABELLA					
Date	BF	RP	JP	WP	BB
5/6/2024	79%	99%	90%	110%	
5/12/2024	75%	98%	93%	100%	

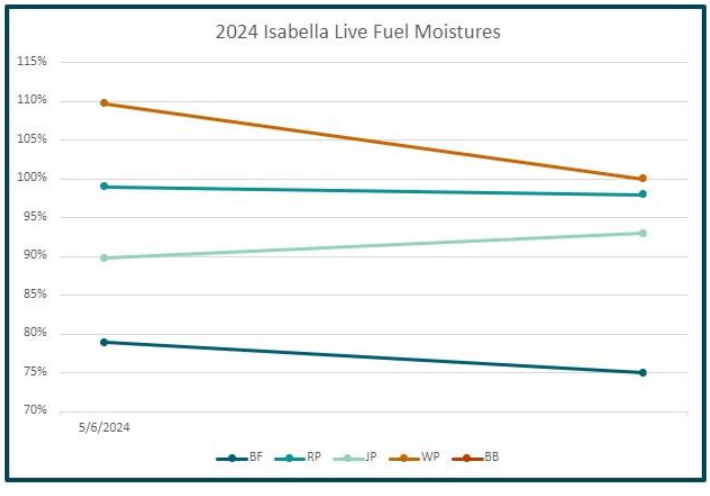


Figure 6 shows the calculated LFMC for May 6 and 12.

Figure 5 shows the spring dip as recorded at Isabella RAWS.

Fuels

Photo shows fuels condition pre-burn, mechanical treatment of understory balsam fir.

Boreal forests of spruce, fir, jack pine, red pine, white pine, and pockets of northern hardwoods encompass the Superior National Forest and the Fry RX area. Fire, wind, and insects play an important disturbance role in maintaining these forests. In particular, the eastern spruce budworm, a native insect that is responsible for defoliating and/or killing large acreages of balsam fir and spruce annually. Balsam fir is the most susceptible to the budworm and large-scale outbreaks occur in the same areas every 25 to 40 years. The Superior National Forest is currently being affected by a large outbreak of budworm and this has caused large scale mortality of balsam fir and some spruce. The mortality has caused a large increase in both standing and dead spruce/fir and significantly increased hazardous fuels throughout the area. Many of the stands that surround the Fry RX are categorized as M-3/M-4 within the Canadian Forest Fire Behavior Prediction System (CFFBPS) with upwards of 70% dead balsam fir. These fuel types are defined as dead fir-mixed hardwood leafless (M-3) and green (M-4) that are moderately well stocked mixed stands of spruce, pine, and birch with dead balsam fir that is often in the understory. Fuel type S-2 represents stands that have had mechanical fuel treatments and was the primary fuel type within the Fry RX boundary. S-2 fuel type is described as slash from logging of mature or overmature white spruce or balsam fir.

Weather Events

The spot weather forecast for May 15 indicated favorable conditions for prescribed burning on the Fry RX.

Precipitation had occurred within the last 4 days at the Isabella RAWS with 10 days since the last 0.25” of precipitation. The night prior to the burn the Isabella RAWS recorded poor overnight relative humidity (RH) recovery. Between the evening of May 14 to the morning of May 15 RH values only recovered to 45% at 2200 and then fell as low as 18% by 0200 slowly increasing after that time.

Spot Forecast for Fry Rx...USFS
National Weather Service Duluth MN
533 AM CDT Wed May 15 2024

Forecast is based on ignition time of 0700 CDT on May 15.
If there are questions or concerns with this forecast, or if
conditions become unrepresentative, contact the National
Weather Service in Duluth at 218-729-0653.

.DISCUSSION...

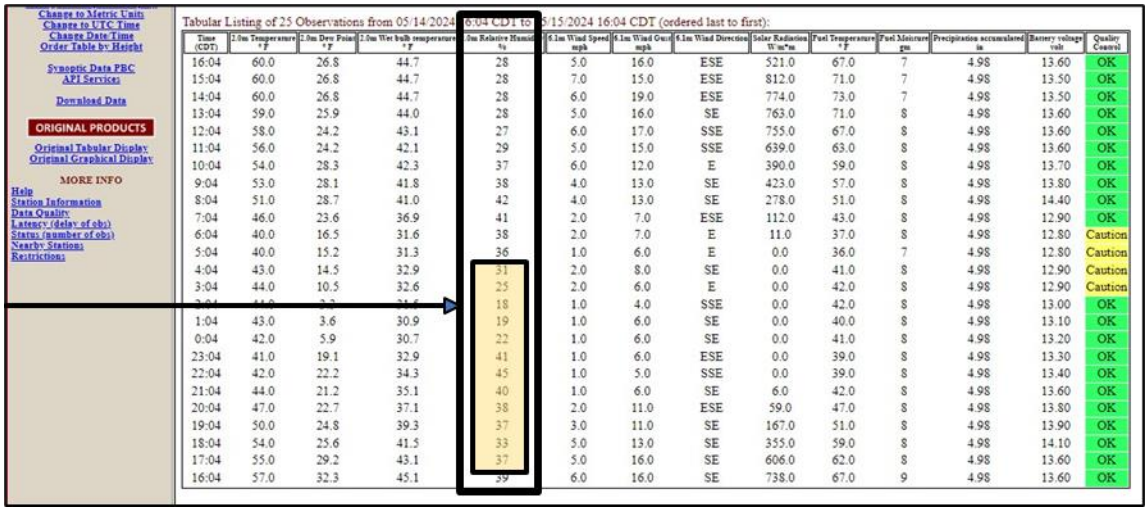
Mostly sunny skies early this morning give way to mostly cloudy skies
by mid-afternoon. Outside of scattered sprinkles early to mid-afternoon
today the best chance of rain arrives after 1700 LT. With rain not
arriving until later in the day, relative humidity will still be able
to drop out to around 30% and have good mixing. Expect fair to good
smoke dispersal in the late morning and afternoon. Southeast wind gusts
range from 12-15 mph today, but otherwise sustained winds from 7-9 mph
are expected. Light rain tonight lasts into Thursday when a quarter
inch of precipitation is forecast by tomorrow afternoon.

The minimum relative humidity only drops to 65-70% Thursday behind a cold
front, leading to a low mixing height aiding in only poor to fair smoke
dispersal all of tomorrow.

.REST OF TODAY...

Sky/weather.....Mostly sunny (40-50 percent) then becoming
mostly cloudy (75-85 percent). Slight chance of
rain showers late in the afternoon.
Chance of pcpn.....20 percent.
LAL.....1.
Max temperature.....Around 59.
Min humidity.....29 percent.
Wind (20 ft).....Southeast winds 6 to 9 mph.
Mixing height.....2100 ft AGL increasing to 3400 ft AGL late in
the morning.
Transport winds.....Southeast 12 to 15 mph.
Smoke dispersal.....Poor to fair (5300-24600 knot-ft) increasing to
fair to good (25700-39200 knot-ft) late in the
morning.
Haines Index.....4 to 5 or low to moderate potential for large
plume dominated fire growth.
Pcpn amount.....0.00 inches.

Figure 7 is the Spot Weather Forecast for the Fry RX.



Change to Metric Units
Change to UTC Time
Change Date/Time
Order Table by: Height

Synoptic Data PBC
API Services

Download Data

ORIGINAL PRODUCTS

Original Tabular Display
Original Graphical Display

MORE INFO

Help
Station Information
Data Quality
Latency (delay of obs)
Status (number of obs)
Nearby Stations
Restrictions

Tabular Listing of 25 Observations from 05/14/2024 16:04 CDT to 05/15/2024 16:04 CDT (ordered last to first):

Time (CDT)	2.0m Temperature °F	2.0m Dew Point °F	2.0m Wet bulb temperature °F	2.0m Relative Humidity %	6.1m Wind Speed mph	6.1m Wind Gust mph	6.1m Wind Direction	Solar Radiation W/m²m	Fuel Temperature °F	Fuel Moisture gm	Precipitation accumulated in	Battery voltage volt	Quality Control
16:04	60.0	26.8	44.7	28	5.0	16.0	ESE	521.0	67.0	7	4.98	13.60	OK
15:04	60.0	26.8	44.7	28	7.0	15.0	ESE	812.0	71.0	7	4.98	13.50	OK
14:04	60.0	26.8	44.7	28	6.0	19.0	ESE	774.0	73.0	7	4.98	13.50	OK
13:04	59.0	25.9	44.0	28	5.0	16.0	SE	763.0	71.0	8	4.98	13.60	OK
12:04	58.0	24.2	43.1	27	6.0	17.0	SSE	755.0	67.0	8	4.98	13.60	OK
11:04	56.0	24.2	42.1	29	5.0	15.0	SSE	639.0	63.0	8	4.98	13.60	OK
10:04	54.0	28.3	42.3	37	6.0	12.0	E	390.0	59.0	8	4.98	13.70	OK
9:04	53.0	28.1	41.8	38	4.0	13.0	SE	423.0	57.0	8	4.98	13.80	OK
8:04	51.0	28.7	41.0	42	4.0	13.0	SE	278.0	51.0	8	4.98	14.40	OK
7:04	46.0	23.6	36.9	41	2.0	7.0	ESE	112.0	43.0	8	4.98	12.90	OK
6:04	40.0	16.5	31.6	38	2.0	7.0	E	11.0	37.0	8	4.98	12.80	Caution
5:04	40.0	15.2	31.3	36	1.0	6.0	E	0.0	36.0	7	4.98	12.80	Caution
4:04	43.0	14.5	32.9	31	2.0	8.0	SE	0.0	41.0	8	4.98	12.90	Caution
3:04	44.0	10.5	32.6	25	2.0	6.0	E	0.0	42.0	8	4.98	12.90	Caution
2:04	44.0	3.3	31.6	18	1.0	4.0	SSE	0.0	42.0	8	4.98	13.00	OK
1:04	43.0	3.6	30.9	19	1.0	6.0	SE	0.0	40.0	8	4.98	13.10	OK
0:04	42.0	5.9	30.7	22	1.0	6.0	SE	0.0	41.0	8	4.98	13.20	OK
23:04	41.0	19.1	32.9	41	1.0	6.0	ESE	0.0	39.0	8	4.98	13.30	OK
22:04	42.0	22.2	34.3	45	1.0	5.0	SSE	0.0	39.0	8	4.98	13.40	OK
21:04	44.0	21.2	35.1	40	1.0	6.0	SE	6.0	42.0	8	4.98	13.60	OK
20:04	47.0	22.7	37.1	38	2.0	11.0	ESE	59.0	47.0	8	4.98	13.80	OK
19:04	50.0	24.8	39.3	37	3.0	11.0	SE	167.0	51.0	8	4.98	13.90	OK
18:04	54.0	25.6	41.5	33	5.0	13.0	SE	355.0	59.0	8	4.98	14.10	OK
17:04	55.0	29.2	43.1	37	5.0	16.0	SE	606.0	62.0	8	4.98	13.60	OK
16:04	57.0	32.3	45.1	39	6.0	16.0	SE	738.0	67.0	9	4.98	13.60	OK

Figure 8 shows data from the Isabella RAWS on May 15th.

On-site Conditions

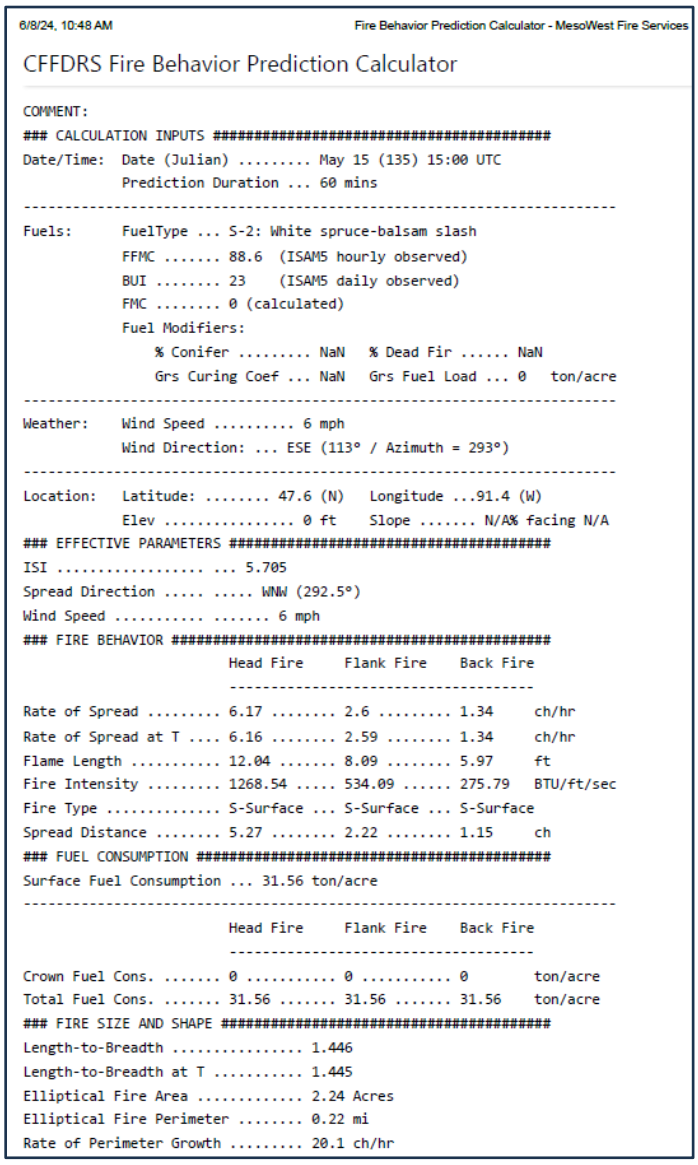
The weather during the fire matched the forecast well as documented by the weather taken on site as well as from the Isabella RAWS which is located about 3 miles SE of the Fry RX. The maximum temperature was 60 degrees with the lowest RH value recorded during the burn of 27% and ESE winds 4-7mph with gusts up to 19mph.

Date/Time	Temp. (°F)	Dew Point (°F)	Relative Humidity (%)	Wind Chill (°F)	Wind Direction	Wind Speed (mph)	Fuel Temp. (°F)	Fuel Moisture (%)	Solar Radiation (W/m²)	Percent Possible (%)	Accumulat Precip (in)	1 Hour Precip (in)
May 16, 2:04 am	47	18	32		E	5G12	46	8	0	--	4.98	0
May 16, 1:04 am	48	19	31		E	4G10	47	8	0	--	4.98	0
May 16, 12:04 am	48	20	33		E	5G12	47	8	0	--	4.98	0
May 15, 11:04 pm	48	22	36		E	4G12	47	8	0	--	4.98	0
May 15, 10:04 pm	47	29	50		ESE	3G13	47	8	0	--	4.98	0
May 15, 9:04 pm	48	32	54		ESE	4G12	47	7	3	14%	4.98	0.98
May 15, 8:04 pm						0					4	0
May 15, 7:04 pm	52	32	46		ESE	4G12	53	7	83	18%	4.98	0
May 15, 6:04 pm	54	29	38		ESE	2G14	55	7	136	19%	4.98	0
May 15, 5:04 pm	58	24	27		SE	4G16	62	7	456	51%	4.98	0
May 15, 4:04 pm	60	27	28		ESE	5G16	67	7	521	50%	4.98	0
May 15, 3:04 pm	60	27	28		ESE	7G15	71	7	812	71%	4.98	0
May 15, 2:04 pm	60	27	28		ESE	6G19	73	7	774	65%	4.98	0
May 15, 1:04 pm	59	26	28		SE	5G16	71	8	763	64%	4.98	0
May 15, 12:04 pm	58	24	27		SSE	6G17	67	8	755	67%	4.98	0
May 15, 11:04 am	56	24	29		SSE	5G15	63	8	639	63%	4.98	0
May 15, 10:04 am	54	28	37		E	6G12	59	8	390	46%	4.98	0
May 15, 9:04 am	53	28	38		SE	4G13	57	9	423	64%	4.98	0
May 15, 8:04 am	51	29	42		SE	4G13	51	8	278	63%	4.98	0
May 15, 7:04 am	46	23	41		ESE	2G7	43	8	112	50%	4.98	0
May 15, 6:04 am	40	16	38		E	2G7	37	8	11	100%	4.98	0
May 15, 5:04 am	40	15	36		E	1G6	36	7	0	--	4.98	0
May 15, 4:04 am	43	14	31		SE	2G8	41	8	0	--	4.98	0
May 15, 3:04 am	44	10	25		E	2G6	42	8	0	--	4.98	0
May 15, 2:04 am	44	3	18		SSE	1G4	42	8	0	--	4.98	0
May 15, 1:04 am	43	3	19		SE	1G6	40	8	0	--	4.98	0
May 15, 12:04 am	42	6	22		SE	1G6	41	8	0		4.98	0

Figure 7 Isabella RAWS observations during the Fry RX and following Fry WF.

Fuel Moisture Codes and Fire Behavior Modeling

Using CFFDRS, the hourly FFMC was 88 with an ISI of 6 and a BUI of 23 at the time of ignition which are in the middle of the prescription. FFMC reached a maximum of 90.4 and an ISI of 7 for the remainder of the burn period, both of which are within prescription parameters. These on-site readings are also verified with the Isabella RAWS using Great Lakes Fire and Fuels (GLFF). Fire modeling was completed and show that modeled head fire flame lengths are above the prescription narrative to accomplish the unit objectives. Prescription narrative limits head fire in S-2 fuel model to 1'-8' with a backing fire flame lengths of 1'-6'. GLFF model predicts head fire flame lengths up to 12' and backing fire flame lengths up to 6'.



6/8/24, 10:48 AM Fire Behavior Prediction Calculator - MesoWest Fire Services

CFFDRS Fire Behavior Prediction Calculator

```
COMMENT:
### CALCULATION INPUTS ########################################
Date/Time:  Date (Julian) ......... May 15 (135) 15:00 UTC
            Prediction Duration ... 60 mins
-------------------------------------------------------------------------
Fuels:      FuelType ... S-2: White spruce-balsam slash
            FFMC ....... 88.6  (ISAM5 hourly observed)
            BUI ........ 23    (ISAM5 daily observed)
            FMC ........ 0 (calculated)
            Fuel Modifiers:
                % Conifer ......... NaN   % Dead Fir ...... NaN
                Grs Curing Coef ... NaN   Grs Fuel Load ... 0   ton/acre
-------------------------------------------------------------------------
Weather:    Wind Speed .......... 6 mph
            Wind Direction: ... ESE (113° / Azimuth = 293°)
-------------------------------------------------------------------------
Location:   Latitude: ........ 47.6 (N)   Longitude ...91.4 (W)
            Elev ................ 0 ft    Slope ....... N/A% facing N/A
### EFFECTIVE PARAMETERS ######################################
ISI .................. ... 5.705
Spread Direction ..... ..... WNW (292.5°)
Wind Speed ........... ....... 6 mph
### FIRE BEHAVIOR #############################################
                      Head Fire     Flank Fire    Back Fire
                      ------------------------------------
Rate of Spread ......... 6.17 ........ 2.6 ......... 1.34     ch/hr
Rate of Spread at T .... 6.16 ........ 2.59 ........ 1.34     ch/hr
Flame Length ........... 12.04 ....... 8.09 ........ 5.97     ft
Fire Intensity ......... 1268.54 ..... 534.09 ...... 275.79   BTU/ft/sec
Fire Type .............. S-Surface ... S-Surface ... S-Surface
Spread Distance ........ 5.27 ........ 2.22 ........ 1.15     ch
### FUEL CONSUMPTION ##########################################
Surface Fuel Consumption ... 31.56 ton/acre
-------------------------------------------------------------------------
                      Head Fire     Flank Fire    Back Fire
                      ------------------------------------
Crown Fuel Cons. ....... 0 ........... 0 ........... 0        ton/acre
Total Fuel Cons. ....... 31.56 ....... 31.56 ....... 31.56    ton/acre
### FIRE SIZE AND SHAPE #######################################
Length-to-Breadth ................ 1.446
Length-to-Breadth at T ........... 1.445
Elliptical Fire Area ............. 2.24 Acres
Elliptical Fire Perimeter ........ 0.22 mi
Rate of Perimeter Growth ......... 20.1 ch/hr
```

Figure 80 Fire Behavior outputs calculated for the time of ignition on the Fry RX, calculated using GLFF.

Photo shows fuels along north line post burn, near potential spot fire origin location.

#2: Analysis of the prescribed fire plan for consistency with agency policy

The Fry Prescribed Fire Plan is an individual-unit burn plan. The Plan is maintained in a project folder with ignition unit maps, complexity analysis, and a job hazard analysis (JHA). The TOF uses an IAP for burn day documentation. The IAP includes information copied from the RX burn plan to build a daily briefing packet.

The Pinyon digital burn plan folder for the Fry RX project contains the following:

- Cover sheets with basic required information, such as location (latitude/longitude and section, township, and range), size in acres, aspect, elevation, allowable wind directions, unique features, contact information.
- Element 1: Signature Page with signatures/dates
- Element 2A: Agency Administrator Ignition Authorization with signatures/dates
- Element 2B: Prescribed Fire Go/No Go Checklist
- Element 7: Prescription Parameters
- Organization Chart
- Briefing Checklist
- Medical Plan (ICS 206)
- Unit Operational Map

IAP elements were found in digital format, and some were scanned hard copy documents from the burn boss trainee and FEMOs, including the following:

- Spot Weather Forecast
- Element 2B: Prescribed Fire Go/No Go Checklist
- Test Fire/Post-Burn Report
- Organization Chart
- Briefing Checklist
- Medical Plan (ICS 206)
- Operations Map
- Prescribed Burn “Called Out” Declaration Page

An ignition unit map was distributed to RX personnel that identified the number of acres being burned, control lines, designated DPs, and unique features such as pine plantations and wildlife openings. Table 1 below contains the Fry Fire Prescribed Fire Plan Analysis reviewed by the DWFR Team.

Table 1. Fry Prescribed Fire Plan Analysis

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Element 1: Signature Page	Yes	Yes	It is encouraged by PMS 484 that separate individuals approve and conduct the technical review of the plan.	No
Element 2A: AA Ignition Authorization	Yes	No	Date of AA ignition authorization approval is documented but time of the approval was not. Time of approval may be needed because the approval expires after 24 hours. The ignition authorization was signed the day prior to the burn. This is within policy, but a discussion between the burn boss and AA on the morning of the burn prior to completing the authorization allows consideration of the most current site-specific information. The Duty Office could have been a better choice to sign the authorization since the FMO was also the burn boss. This would allow for greater input from different perspectives.	No
Element 2B: Go/No Go Checklist	No	No	The go/no go checklist is signed and filled out partially by the RXB2(t) in the burn organizer but dated 3 days after the burn day. The RXB2 stated in conversation that a separate go/no go checklist was signed by them on the day of the burn, but the team has been unable to locate it in the provided burn day documentation. Although only the RXB2 signature is required, it would be preferable for the RXB2 and trainee to complete and sign one go/no go checklist to demonstrate the decision to implement was agreed upon.	No

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Element 3: Complexity Analysis Summary and Final Complexity	No	No	Preliminary complexity analysis determinations were not reviewed with the AA. The fact that all the categories were rated moderate through all phases of analysis suggests the preparer/AA did not follow the process as it is described in PMS-424. The narrative for the management organization notes that most, or all local resources would be used for implementation. In this instance burn overhead was local but multiple off-forest resources were used.	No
Element 4: Description of Prescribed Fire Area	Yes	Yes	The burn unit boundary was moved from the harvest unit line to lowlands or water features where applicable to reduce holding concerns. An access line was cut, creating downed fuels on both sides of the access line.	No
Element 5: Objectives	Yes	Yes	Objectives are consistent with the silviculturist's prescription.	No
Element 6: Funding	Yes	Yes	No findings.	No
Element 7: Prescription Parameters	Yes	Yes	A narrative description of the use of the Canadian Models System for parameters would be helpful for resources unfamiliar with the system.	No
Element 8: Scheduling	Yes	Yes	No findings.	No
Element 9: Pre-burn Considerations and Weather	Yes	Yes	Pre-burn considerations are satisfactory, but a checklist identifying specific tasks and who is responsible for completing them would be best practice.	No
Element 9 B: Method and Frequency of Weather and Smoke Management	Yes	Yes	On-site weather and Canadian Model indicators were taken, and a spot weather forecast was requested and referenced. Smoke modeling is optional and was not completed but given the proximity to the highway and campground it may have been appropriate in this instance.	No

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Element 10: Briefing Checklist	Yes	Yes	Satisfactory checklist is in the plan.	No
Element 11: Organization and Equipment	Yes	No	Line production calculations in Appendix E are mislabeled for the Bandit Rx, not the Fry RX. The burn plan organization chart lists "firing crew" and "holding crew" but does not specify number/qualifications of individuals needed. The QA checklist requires the verification of minimum number and type of resources required to maintain control of the fire at each phase or stage is based on calculations made using the best available tools, and any additions or modifications made based on knowledge and experience from previous projects that augment those calculated minimums are also described. Watercraft/canoe is listed in the equipment section of the burn plan, but it is not noted in day-of materials. Canoe was on site but was not deployed and no resources assigned to it.	No
Element 12: Communications	Yes	Yes	The plan for declaring an escaped wildfire is well developed in the plan. Phone numbers are included in Appendix H, but pertinent numbers are not listed in the plan or IAP. Recommend listing pertinent numbers in IAP and/or plan and developing a notification sheet to distribute to dispatch and the DO.	No

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Element 13: Public and Personnel Safety, Medical	No	No	PMS 484 suggests adding a PPE statement. A similar statement is included in plan, but PPE requirements are only included in the Risk Assessment in Appendix D. PMS 484 states that a JHA or RA is required for each prescribed fire and must include safety hazards (including smoke exposure). Safety hazards and mitigations are identified in the plan but are inconsistent with the RA documents included in Appendix D. Medical plan documentation is well developed, and a detailed medical plan is included in Appendix J (Plan does reference Appendix H for medical plan). The medical plan is also included in the IAP. Unit-specific directions to and from the nearest medical facilities are included in the medical plan and IAP.	No
Element 14: Test Fire	Yes	No	The USFS RX Fire Template requires test fire documentation, including conditions on-site and test fire results. Consider using the prescription table to document test fire observations. The burn plan requires documentation of weather conditions and test fire results (flame length, ROS, smoke dispersion, etc.). Weather conditions are noted in day of burn organizer but results beyond "Test Fire Successful or Favorable" are not recorded.	No
Element 15: Ignition Plan	Yes	Yes	The ignition plan is very generic. Stronger site-specific narrative relating ignition considerations relative to fuels in and adjacent to the unit and unit objectives would strengthen the plan.	No

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Element 16: Holding Plan	No	No	Pumps/hose/accessories are listed in the supplies section, but water use is not listed in the holding plan. The critical holding points and mitigation actions section speaks to response to multiple or hard to control spot fires but does not identify critical holding points or considerations about why they might be resistant to control. The mop up section header calls for general procedures and observable standards to be achieved. The plan states that standards will be established by the burn boss based on several criteria. This may not meet the intent of the section. Recommend including narrative regarding how mop-up will be done and what conditions need to be achieved. The patrol/out section has specific criteria. Critical holding points and actions in the critical weather step-up plan describe actions to take if fire crosses control lines but does not clearly define those critical holding points or suggest actions to prevent spread outside the burn area. The supply list includes pumps, hose, etc. but their use is not described in the holding or contingency plans. Pumps/hose were utilized on west and east flanks of burn unit but not described in plan.	Yes

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Element 17: Contingency Plan	Yes	Yes	Identifying a Contingency Group Leader to manage contingency resources may have lessened the burden on the Holding Boss in this instance. Consider shifting some of the strategies identified in the holding plan to the contingency plan. Consider adding additional maps scaled beyond the spotting distance to account for fire growth/spread and possible contingency lines.	Yes
Element 18: Wildfire Declaration	Yes	Yes	Plan elements regarding the process and notification are in place.	No
Element 19: Smoke Management/Air Quality	Yes	Yes	Plan elements are in place. No smoke sensitive areas/receptors are identified, but a MAP with smoke impacts to residences is included in the contingency plan. The mitigations section mentions avoiding sensitive receptors, but none are identified for this unit. This appears to be a generic statement. Consider making smoke mitigations unit specific.	No
Element 20: Monitoring	Yes	Yes	The plan states that fuels, weather, fire behavior, plan objectives, and smoke will be monitored. Fuels and weather monitoring is recorded, but others are absent in the day of burn notes. FEMO personnel and others documented fire behavior via video, but this was not included in initial day of burn materials.	No
Element 21: Post-burn Activities	Yes	Yes	Line rehab or other on-site activities are not addressed.	No
Appendix A: Vicinity, Project (Ignition Units)	Yes	Yes	Acre discrepancy between the map (72 acres) and the burn plan (64.6 acres). A contingency plan map with pre-identified potential control lines should be developed that considers maximum spotting distance calculations.	No

Prescribed Fire Plan Elements	Policy Consistent (NWCG)	Policy Consistent (USFS)	Comments	Contributing Factor?
Appendix B: Technical Review Checklist	Yes	Yes	The proper form was used, and it was completed. It is recommended that the zone consider having technical reviews completed by other zones or forests as encouraged by PMS 484.	No
Appendix C: Complexity Analysis	No	No	See Element 3 comments.	No
Appendix D: JHA Risk Assessment	Yes	Yes	A boat or canoe is listed as equipment needed. A JHA or RA for boating should be included. Additionally, the listed risks or hazards should have a corresponding JHA or RA when applicable.	No
Appendix E: Fire Behavior Modeling Documentation	Yes	Yes	The production rate spreadsheet is labeled for a different burn. The modeling run predicts a ¾ mile spotting distance. Recommend greater consideration of this relative to adjacent fuels, firing patterns, holding resources, and contingency resources.	Yes
Appendix F: Smoke Management Plan and Smoke Modeling Documentation (optional)	Yes	Yes	The smoke model is optional, and the unit is small but with a state highway on the south flank and a campground on the east side a smoke model would be appropriate.	No
Appendix H: Post-Burn Evaluation	N/A	N/A	N/A	N/A

Overall Comments:
Some elements of the burn plan are well developed, but other critical elements are general in nature. Specifically, the firing plan, holding plan, and contingency plan lack site specific information. More thorough information in these elements would clarify intent for how the unit should be lit to safely achieve unit objectives, what holding strategies should be employed and where they should be deployed, and how contingency resources should be staged.

#3: An analysis of prescribed fire implementation for consistency with the prescription, actions, and procedures in the prescribed fire plan

Table 2 below illustrates the burn plan prescription, inputs, and source used for implementation of the Fry RX. Forecasted values were all within prescription values.

Table 2. Burn plan prescription, inputs, and source used for the Fry RX implementation.

Environmental Parameters of Prescription	RX Prescription	Forecast	Source
Date/Time		05/15/24 0700	
Wind Direction	Any direction	SE	Spot WX FX
Wind Speed (MPH) Sheltered (Eye level)	1-8	1.8-2.7 G 4.2	Spot WX FX*
Fine Fuel Moisture Code	78-92	90	FWIS
Buildup Index (BUI)	20-50	23	FWIS
Initial Spread Index (ISI)	**1-11**	**6.4**	FWIS
* Sheltered wind speed calculated as 0.3 X 20 ft windspeed from the Spot WX FX			

Overall, implementation of the Fry RX Project was largely consistent with the prescriptions, actions, and procedures outlined throughout the 21 elements and appendices within the Fry Prescribed Fire Plan. However, a few discrepancies and inconsistencies exist between implementation of this RX project and what was stated in the burn plan, such as the following:

- Element 8. Because the Superior National Forest uses the Canadian FFIS rather than the Fire Danger Rating System, no documentation of the National Fire Danger Rating System for the county or a contiguous county is available per the Prescribed Burn Approval Act of 2016. Although not required for the day of this RX, it would have been required if there were "extreme" ratings in the county or surrounding counties.
- Element 9. Pre-burn considerations are described well in the plan, but accountability and documentation are not clear. Notifications and consultations were not conducted, and more thorough documentation is needed. Weather observations were documented well.
- Element 10. Interviews indicated that the briefing checklist was used properly. However, the burn maps and vicinity maps used in the briefing were not available to all resources. Important features such as drop points, pump locations, and values at risk in contingency areas were not available.
- Element 11. All resources identified in the organization were present. Some critical personnel, such as the FIRBs, was not determined until the morning of the RX. When resources unfamiliar with the fuels and vicinity are assigned, earlier notification is

advised. A canoe was onsite but was not staged in a way it could be used by holding or contingency resources in a timely manner.

- Element 11. This element states “Before implementation of the prescribed fire, documentation of the organization will be completed.” Three separate IAPs were provided, none of which had the correct name of the qualified FIRB.
- Element 12. It appears that all required communications occurred. However, many communications were not received well on the tactical channels.
- Element 14. The burn plan requires the following results of the test fire to be documented: Flame length, Rate of spread, Smoke dispersion, Torching (if any), and Spotting (if any). The Burn Organizer only notes the test fire was “Favorable.”
- Element 16A. The plan states “Holding lines are in place and adjacent heavy and ladder fuels removed. Snags near the line will be removed if safety or ability to hold line could be compromised. Holding boss will check lines prior to ignition to ensure they are cleared.” The primary holding line on this day was the Little Isabella River. The cut-line used to access this line had substantial heavy and ladder fuels remaining. Similarly, heavy and ladder fuels were prevalent on the green side of the holding line. The plan did not clearly identify how to access spots across the river. Additionally, strategies for engaging contingency resources north of the Little Isabella River was not discussed during the morning briefing.
- Element 16C 2. The plan lists the Little Isabella River as a critical holding point. The management action only recommends “Determine if fire can be directly suppressed or indirect tactics are needed. Call for additional resources. Use FS Road 177A to contain”. FS177A was used accordingly but was not known to many resources prior to the burn and was not available on the burn maps. Additional detail on how resources could access the area between the river and FS177A is needed, such as canoe access or staging holding resources across the river, or another cut-line to facilitate access. Given the critical nature of this holding line, details of how to hold this section are lacking.
- Element 17. Contingency actions are listed for a Management Action Point for spotting outside the “treatment area boundary out to the maximum spotting distance” yet only noted one engine and one squad (5 FFT2s) as needed resources. No discussion of how these resources would be able to access the spots within the spotting range was provided. It is unclear if the required contingency resources were considered with respect to the fuel types and predicted fire behavior in the contingency area. An additional level of leadership should be discussed.
- Element 18. Declaration and notifications were conducted very well. While not all personnel were immediately notified due to radio communications issues, this was addressed very well and ensured resources from across the GACC were available.
- Element 21. Post-burn documentation was incomplete and documented in three separate documents. One document should have all information and be complete.

#4: The approving agency administrator's qualifications, experience, and involvement

Erin, the TOF District Ranger, signed the burn plan, but was not present for implementation. Erin has been qualified as RXA1 for a year and a half but has been qualified as AADM since 2018.

Sam was the AA of record for the Fry prescribed fire. He is qualified as a RXA1 and WFA1. Sam has been a Forest Supervisor in R5 for many years and was previously qualified as an AADM since 2010. He responded to a nationwide request for qualified RXA1 administrators in case one or both of two Type 1 burns could be conducted on the SUF. Prior to the Fry RX, he served as RXA2 for the Bobcat RX on the Gun Flint District.

Sam was briefed on the Fry RX, and signed the 2A ignition authorization, but did not enter a time because of common practices on his home unit. He was present on the unit during the Fry RX implementation and was included in all discussions of the wildfire declaration. Sam was not given a delegation of authority from the SNF.

#5: The qualifications and experience of key personnel involved

The RXB2 has been qualified for nine years and is local to the TOF. He regularly conducts RXB1-3 on the unit. The RXB2(t) is a qualified RXB3 and has been working toward his RXB2 for almost a year. He is also local to the TOF. The FIRB was from within region but not the SNF. He has been qualified as a FIRB for 14 years and as a RXB2 for ten years. He normally serves as the UAS FIRB. The FIRB(t) has been working on his taskbook for almost a year and is local to the unit. The holding boss was listed in the plan as a TFLD, which they have been qualified at for a little over two years. In addition, they are qualified as a RXB2, and is local to the unit.

Appendix B: Fry Prescribed Fire and Wildfire Unit Map

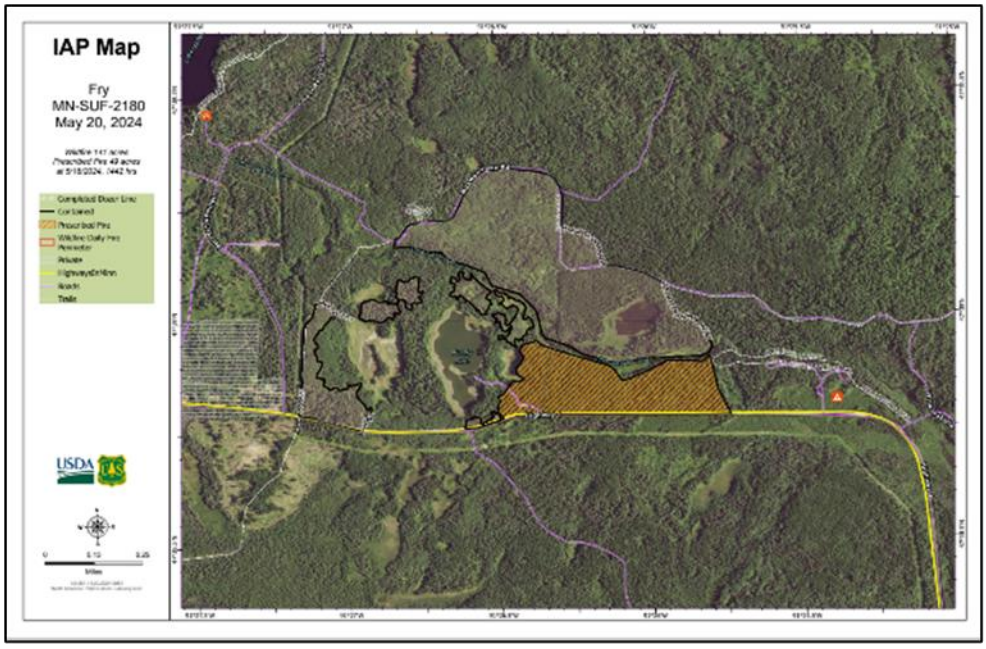


Image of the Fry RX and Fry WF.

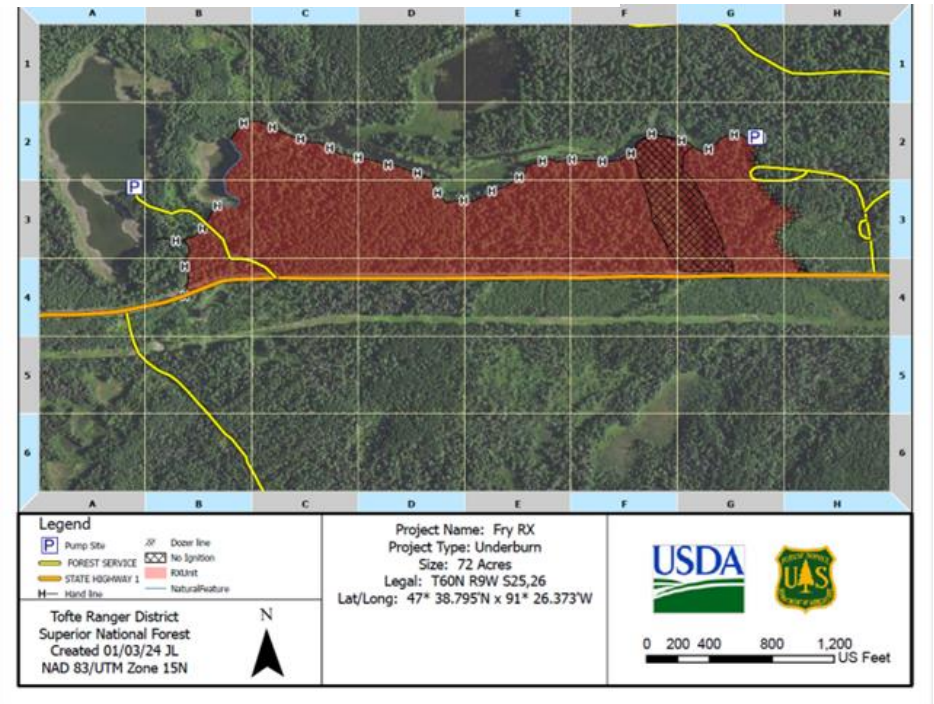


Image from the Fry RX IAP for May 15.

Appendix C: Contributing Factors or Conditions

	Contributing Factor or Condition	Mark "X" If observed
Planning	Burn area boundaries not aligned with favorable locations for fire containment.	X
	Interdisciplinary team coordination lacking during design and planning of the treatment.	X
	Lack of proficiency using fire behavior and related modeling tools.	
	Insufficient holding plan.	X
	Insufficient ignition plan.	X
	Insufficient mop-up and patrol plan.	
	Insufficient contingency plan.	X
	Insufficient technical review.	
	Complexity rating did not adequately reflect the conditions actually experienced.	X
Operations	Burn could not be completed and secured before forecasted worsening weather arrived.	
	Test fire did not provide accurate representation of fire potential.	
	Actions taken inconsistent with those described in the burn plan.	X
	Insufficient patrol after burn boss transfers control to local unit.	
Communications	Unit boundaries or special features not communicated or identified accurately.	
	Instructions not given or well understood.	X
Equipment	Malfunction or breakdown.	X
	Equipment not set-up and tested prior to need.	
Fire Environment	Extended fire persistence – 2 weeks or more in patrol status.	
	Actual weather experienced was outside what was forecast.	
	Severe drought conditions contributing to unusually dry fuels.	
Fuels	Higher than typical fuel quantity/loadings.	X
	Large machine piles.	
	Hand piles.	
Human Factors	External influences or distractions.	
	Internal stress or fatigue.	

If applicable, list contributing factors or conditions identified by this review not already found in the table above to consider for long-term tracking:

Contributing factors or conditions listed above are further described below.

- Planning – The river was not a favorable location for control line placement on burn day due to several factors. Holding plan does not describe hose lay design or layout and is vague regarding tactics and strategies for holding. The ignition plan is not site-specific and is not detailed enough to support the prescribed fire objectives. Contingency plan did

not identify a leader for the contingency group and tends to include holding plan elements that do not fit the intent of the contingency group's mission. The complexity analysis lacks detail, does not acknowledge that the AA conversation took place, and lists all categories as moderate across the matrix suggesting that the analysis was not properly prepared.

- Operations – Due to the lack of site-specific detail in the burn plan some actions taken were out of sequence or inconsistent with burn plan direction.
- Communications – Due partly to the lack of structure in the burn organization, resources we interviewed cited incomplete information or misunderstood instructions from burn leadership.
- Equipment – A pump malfunction had to be remedied during burn operations and contributed partly to efficiency and effectiveness.
- Fuels – Fuel loads from activity fuels and control line prep contributed to fire line intensity and added to holding issues when combined with dead standing balsam and receptive paper birch bark lofting embers.

Appendix D: Delegation of Authority

Forest Service

Superior National Forest
Supervisor's Office

8901 Grand Avenue Place
Duluth, MN 55808,
218-626-4300

File Code: 5140 **Date:** May 28, 2024

Route To: Drew Stroberg, Deputy Forest Supervisor, Nick Petrack, Forest Fire Management Officer

Subject: Delegation of Authority – Declared Wildfire Review for Fry Prescribed Fire

To: Heath Bell, R8 Regional Risk Management Officer

This letter formalizes your appointment as Review Team Leader to complete a Declared Wildfire Review for the Fry Prescribed Fire (RX) initiated on May 15th, 2024, resulting in the Fry Wildfire (WF) on the Superior National Forest, Tofte Ranger District, in Minnesota. A Facilitated Learning Analysis (FLA), including the five elements required per policy for escaped prescribed burns, will be conducted to ensure the learning value of the review includes perspectives of the employees involved and uninvolved subject matter experts assigned to the review team. To ensure an objective and insightful review, I have approved your review team roster, which includes subject matter experts from various US Forest Service offices.

Per Forest Service Manual (FSM) 5140, all prescribed fires that result in a wildfire declaration must be reviewed according to the procedures found in the National Wildfire Coordinating Group's NWCG Standards for Prescribed Fire Planning and Implementation, PMS 484.

As Team Leader, I am delegating to you the expectation and authority to execute and complete a thorough review that will include:

- An analysis of the seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.
- An analysis of the Prescribed Fire Plan for consistency with agency policy and guidance related to prescribed fire planning and implementation.
- An analysis of prescribed fire implementation for consistency with the prescription, actions, and procedures in the Prescribed Fire Plan.
- The approving Agency Administrator's qualifications, experience, and involvement.
- The qualifications and experience of key personnel involved.

It is my expectation that that your team be alert to any findings of conditions that may have contributed to the eventual outcome along with any recommendations your team might offer to mitigate and reduce the risk of experiencing those same conditions in the future.

Given the sensitive nature of these reports, Team Leaders, Agency Administrators, Directors, and Staffs are expected to maintain close control over all drafts, final reports, and related materials. Use care and discretion when sharing these reports adhering closely to the processes described below.

It is my intention that no punitive actions, such as removal or termination from their position, will be taken by the Forest Service against any employee as a result of information provided to any member of your team. Since this wildfire did not affect other jurisdictions or private land, there are no known civil or criminal proceedings that could affect employees involved. Information provided to your team may be used by individual supervisors at their discretion to inform discussions with employees pertaining to their individual performance. If you discover information that would warrant a different type of review or investigation, please contact immediately to discuss further.

You are scheduled to in-brief with my staff and I on June 3rd, 2024 at the Superior National Forest, Supervisors Office. Your Point of Contact for assistance and coordination with the Superior National Forest is District Ranger Sunny Lucas, 612-468-4434 sunny.l.lucas@usda.gov. If you have process questions or simply seeking advice or coaching related to the conduct of the Declared Wildfire Review, please contact Brian Schaffler, Regional Fuels Program Manager, at 517-285-9258 brian.schaffler@usda.gov or Ilene Wadkins, Regional Risk Management Officer at 971-409-1281 ilene.wadkins@usda.gov.

For necessary travel and salary costs related to this review, use the WFSE or NFSE charge code for all Forest Service employees. For all equipment and other related costs, use NFHF0124 with override 0901.

Your authority includes, but is not limited to:

- Controlling, organizing, managing, and directing the review
- Maintaining the confidentiality of the process
- Protecting and managing the integrity of documents, media, or other artifacts collected.
- Authorizing requests for additional personnel, including technical specialists, to support the Team and release them upon completion of assigned duties.
- Authorizing and coordinating the expenditure of funds.
- Work with Joy Vandrie, Public Affairs Staff Officer, 231-878-0998 joy.vandrie@usda.gov, to develop any media releases about the review.

I request that your team conduct an out-brief with myself and identified staff when your team is ready to leave the local unit. Please provide me and my staff updates on your progress and any needs. The Team's final report is to be submitted to me by no later than June 28th, and upon my approval will be submitted to the Regional Forester's Office by no later than July 15th. If there are any edits, questions, or comments during the drafting process, the Team Lead will coordinate with all parties to ensure that any changes are representative on a final Master Copy.

I want to thank you for your willingness to lead this important review. Please contact Anthony Parker, Executive Assistant-Superior National Forest, at 715-685-4594 or anthony.parker@usda.gov if you need to discuss the details of this assignment or to schedule key team meetings or status reports.

Approved By: SUNNY LUCAS Digitally signed by SUNNY LUCAS Date: 2024.05.28 11:22:32 -05'00'

Sunny Lucas, District Ranger/Forest Point of Contact

Accepted By: HEATH BELL Digitally signed by HEATH BELL Date: 2024.05.28 12:41:45 -04'00'

Heath Bell, Team Lead

Digitally signed by DREW STROBERG Date: 2024.05.28 12:30:07 -05'00'

DREW STROBERG
Acting Forest Supervisor

Enclosure

cc:
Steve Miller
Brian Schaffler
Daniel Anerino
Ilene Wadkins
Nicholas Petrack
Sunny Lucas
Joy VanDrie

USDA

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Printed on Recycled Paper

Appendix E: Chronology of Events

Fry Prescribed Fire Declared Wildfire
Saturday, May 15, 2024
Superior National Forest
Tofte Ranger District
Isabella, MN

May 14

1600 - Agency Administrator Ignition Authorization Briefing (Element 2A)

May 15

0900 - Fry Rx Morning Briefing completed at Isabella Work Station

0930 - Rx personnel arrive at Fry Rx unit

1040 - UAS completes pre-burn recon flight of Fry Rx unit

1049 - Initiate test fire at DP-1 located in NW corner of Fry Rx unit

1120 - RXB2(t) determines test fire was successful, and makes decision to proceed with Rx operations

1248 - Report of spot across Isabella River north of Fry Rx. Request for aviation resources made through dispatch.

1252 - RXB2 activates contingency resources. Holding boss, IPNF IHC squad, and Flathead Engine moved from north control line to FSR #177A to engage in contingency actions on north side of Isabella River.

1255 - RXB2 calls FFMO to inform that the fire had jumped the river and was active on the north side of the river with group torching and spotting

1256 - RXB2 calls Zone Aviation Officer (ZAO) to let him know I would be ordering aerial resources

1259 - RXB2 calls Agency Administrator (AA) to let to let them know that contingency resources had been activated and air resources had been ordered.

1300 - Dozer was moved from Isabella Work Station to FSR #177A to unload and engage in contingency line construction

1300 - Request made to dispatch to order Fire Boss and Air Attack

1318 - Report of spots across west line (south of Isabela River)

1320 - UAS initiates recon flight of spots located north of Isabela River. Spot fire estimated at 20-30 acres.

1321 - Burn out operations initiated off FSR #177A by contingency resources

1330 - Fire Boss and Air Attack arrive to incident

1335 - Additional Fire Boss ordered through dispatch

1350 - Second Fire Boss arrives to incident

1359 - Fry Rx declared a wildfire (Fry Fire).

- RxB2 assumes Incident Command of Fry Fire.
- Firing Boss takes over RXB2 duties on the Fry Rx.

1715 - UAS initiates lighting within Fry Rx, west of exclusion area

1810 - Ignitions along HWY 1complete

1904 - Fry Rx ignitions complete

2030 - UAS fills in unburned gaps within the Fry Rx north of HWY 1.

2200 - Fry Fire/Fry Rx resources released

May 17

0800 - Resources depart Isabella Workstation to check lines and complete mop-up on Fry Fire/Fry Rx.

0834 - UAS completes recon of Fry Rx/Fry Fire

May 19

1200 - Fry Fire containment increased to 100%

June 5

1300 - Fry Fire called out.

Appendix F: Glossary of Key Terms

The main reference glossary for this guide is the National Wildfire Coordinating Group (NWCG) Glossary, which is updated periodically: http://www.nwcg.gov/.

AA – Agency Administrator.

AAR – After-Action Review.

AFMO – District Fuels Assistant Fire Management Officer.

BehavePlus – The BehavePlus fire modeling system is a Windows®-based computer program that can be used for any fire management application that needs to calculate fire behavior. It uses specified fuel and moisture conditions to simulate surface and crown fire rate of fire spread and intensity, probability of ignition, fire size, spotting distance, and tree mortality.

BI – Burning Index.

Blackline/Blacklining – Preburning of fuels adjacent to and within a control line before igniting a prescribed burn. Blacklining is done prior to main ignitions to reduce heat on holding crews and lessen chances for spotting across control line.

Burn Boss (RXB2) – Person responsible for supervising a prescribed fire from ignition through mop-up. The Burn Boss is responsible for writing prescribed fire plans, determining when the prescribed fire is in prescription, obtaining smoke clearance and weather forecasts, notifying officials of the upcoming fire, and obtaining all qualified personnel and equipment needed to conduct and patrol the area. The Burn Boss must also ensure all operations are conducted in a safe manner and considers personnel and public safety during and after the prescribed fire.

Burning Season (In-Season Burning) – The number of days available each year for prescribed fire implementation is constrained by weather variables such as temperature, wind speed and relative humidity. In many areas, the season for prescribed fire implementation is late winter to early spring. Often, a narrow window of weather parameters is required due to safety issues, policy, and regulation, which will reduce the number of available days.

Chain – Unit of measure equaling 66 feet.

Chains Per Hour – The rate of fire spread is measured in “chains per hour.” A chain is 66 feet.

Chief’s Review – Chief’s 90-Day Prescribed Fire Program Review.

Cross Boundary Cooperation – Voluntary behavior in which adjacent or nearby landowners use shared cooperative or stewardship agreements to improve forest health and resiliency across management jurisdictions.

Crown Fire – A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as “running” or “dependent” to distinguish the degree of independence from the surface fire.

CRWB (Crew Boss) – A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

Declared Wildfire Review – Per Forest Service Manual (FSM) 5140, all prescribed fires that result in a wildfire declaration must be reviewed according to the procedures found in the NWCG Standards for Prescribed Fire Planning and Implementation, PMS 484.

DFMO – District Fire Management Officer.

Dozer – DZIA, DZ1, or DZ2.

DR – District Ranger, specifically the TOF District Ranger.

Drop Point – A previously agreed upon rendezvous or supply location noted on situational maps.

Dry Bulb Temperature – The ambient air temperature that is measured by a thermometer.

Duty Officer (DO) – Individual working for a jurisdiction or agency responsible for coordinating that agency (Wildland Fire Response) on a given day.

EA (Environmental Assessment) – A requirement of National Environmental Policy Act (NEPA), an EA evaluates the potential impacts of proposed actions, such as a prescribed fire, on the environment and suggests alternatives or mitigations to reduce or eliminate these impacts.

EC – Engine Captain.

EIS – Environmental Impact Statement.

ENGB (Engine Boss) – The Engine Boss (ENGB) leads a single fire Engine and attached personnel and is responsible for the crew’s safety on wildland and prescribed fire incidents.

ERC (Energy Release Component) – Index of the National Fire Danger Rating System (NFDRS) relating to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It is a cumulative or “build-up” type of index and is an indicator of potential fire intensity.

Escaped Prescribed Fire – A prescribed fire that has exceeded or is expected to exceed prescription parameters or otherwise meets the criteria for conversion to wildfire. Criteria are specified in “Interagency Prescribed Fire – Planning and Implementation Procedures Reference Guide.”

FDFM (Fine Dead Fuel Moisture) – The moisture content of dead organic fuels, expressed as a percentage of the oven dry weight of the sample, which is controlled entirely by exposure to environmental conditions.

FDRA – Central Fire Danger Rating Area.

FEMO (Fire Effects Monitor) – The Fire Effects Monitor is responsible for collecting the on-site weather, fire behavior, and fire effects information needed to assess whether the fire is achieving established resource management objectives.

FFMO – Forest Fire Management Officer.

FFT1 (Firefighter) – A working leader of a small group (usually not more than seven members), who is responsible for their performance, safety, and welfare.

FFT2 (Firefighter) – Firefighter Type 2.

Fine Fuels – Fast-drying dead or live fuels, generally characterized by a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a time lag of one hour or less. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

FIRB (Firing Boss) – The Firing Boss reports to the Prescribed Fire Burn Boss and is responsible for supervising and directing ground and/or aerial ignition operations according to established standards in the Prescribed Fire Plan.

Fireline – The part of a containment or control line that is scraped or dug to mineral soil.

FLA (Facilitated Learning Analysis) – A non-punitive accident review process that seeks to understand the events of an accident through the process of "sensemaking." The FLA process seeks to understand "how" it made sense to those involved, rather than "how" it makes sense in hindsight.

FM – Fuel Moisture.

FM9 – Fuel Model 9, as described in LANDFIRE.

FOBS (Field Observer)—this position is responsible for collecting and reporting situation information for an incident.

Foliar Moisture – The moisture content of the conifer needles in tree crowns. It is used along with surface fire intensity and crown base height as input to the crown fire initiation model.

FS – Forest Supervisor.

FSR – Forest System Road.

Fuel Loading – The amount of flammable material that surrounds a fire. Fuel load is measured by the amount of available fuel per unit area, usually tons per acre. A small fuel load will cause a fire to burn and spread slowly, with a low intensity.

GACC – National Geographic Area Coordination Center

Haines Index – Is an index developed by meteorologist Donald Haines in 1988 that measures the potential for large fire growth (Plume-Driven). The index is derived from the stability (temperature difference between different levels of the atmosphere) and moisture content

(dew point depression) of the lower atmosphere. The data may be acquired from radiosonde information. The index is calculated over three ranges: low elevation (950---850mb), mid elevation (850---700mb), and high elevation (700---500mb). A Haines Index of 6 means a high potential for large fire growth. 5 means medium potential, 4 low potential, and anything less than 4 (2 and 3) means very low potential.

HYSPLIT Model – A HYSPLIT (Hybrid Single Particle Lagrangian Integrated. #' Trajectory) Model simulates the dispersion and trajectory of substances transported and dispersed through our atmosphere, over local to global scales.

IAP – Incident Action Plan.

IC – Incident Commander.

ICS – Incident Command System.

IDT – Interdisciplinary Team.

IHC – Interagency Hotshot Crew.

Incident – An occurrence either human-caused or natural phenomenon, which requires action or support by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources.

JHA – Job Hazard Analysis.

LEI – Law Enforcement and Investigations.

LRMP – Land and Resource Management Plan.

Mechanical Treatment – Mechanical fuel treatments involve the use of hand tools, such as chainsaws and rakes or large machines like bulldozers and woodchippers, to reduce the amount of vegetation or fuel that has built up to dangerous levels.

MNICS – Minnesota Interagency Coordination Center.

National Wildfire Coordinating Group (NWCG) – An operational group designed to coordinate programs of the participating wildfire management agencies.

NFDRS – National Fire Danger Rating System.

NFS – National Forest System.

NWS – National Weather Service.

PMS – Publications Management System.

POI – Probability of Ignition.

Prescribed Fire Burn Boss – Type 2 (RXB2) – Person responsible for supervising a prescribed fire from ignition through mop-up. See definition for “Type” below.

Prescribed Fire Plan – A plan required for each fire application ignited by management. It must be prepared by qualified personnel and approved by the appropriate Agency Administrator prior to implementation. Each plan will follow specific direction and must include critical elements and how to mitigate each element.

RAWS (Remote Automatic Weather Station) – A weather station that transmits weather observations via GOES satellite to the Wildland Fire Management Information system.

RD – Ranger District.

RH – Relative Humidity.

RO – Regional Office (specifically Region 9).

ROS – Rate of Spread.

RX – Prescribed Fire.

RXA1 – Agency Administrator.

RXB2 – Burn Boss.

SME – Subject-Matter Expert.

SO – Forest Supervisors Office.

SOP – Standard Operating Procedure.

Spot Fire – Fire ignited outside the perimeter of the main fire by a firebrand.

Spot Weather Forecast (NWS) – A site-specific forecast issued by the National Weather Service (NWS) 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. On-site weather observations or a close, representative observation is required for a forecast to be issued.

Spotting – Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

UAS – Unmanned Aircraft System.

USDA Forest Service – United States Department of Agriculture Forest Service.

USFS – Forest Service.

UTV – Utility Task Vehicle.

Wet Bulb Temperature – Dry bulb and wet bulb are used to calculate relative humidity. Wet bulb temperature is measured by sling psychrometers within a belt weather kit using thermometers that are wrapped in wetted wicks. The higher the difference between the dry bulb and wet bulb temperatures (called the depression), the greater the felt effect is on the discharge air temperature.

WF – Wildfire.

WFA2 – Wildfire Agency Administrator Type 2

WFDSS (Wildland Fire Decision Support System) – Map-based application that displays information to agency administrators, line officers, fire managers, and analysts as they move through the risk-informed decision process for wildland fire. Combines desktop applications for fire modeling into a web-based system.

Wildfire Crisis Strategy – "Confronting the Wildfire Crisis: A Strategy for Protecting Communities and Improving Resilience in America's Forests."

Wildland Fire – Any nonstructural fire, other than prescribed fire, which occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

Wildland Urban Interface (WUI) – The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels.

Appendix G: Fry Declared Wildfire Review Team

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Risk Management Officer
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Atlanta, GA

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