



FACILITATED LEARNING ANALYSIS



PINE GROVE HAND PILES ESCAPED FIRE REVIEW



EXECUTIVE SUMMARY

On April 6, 2018, fire personnel from the Mystic Ranger District of the Black Hills National Forest ignited approximately 125 handpiles in the Pine Grove project area near Rockerville, SD. There was 4-6" of snow on the ground when the piles were ignited, and the forecast called for the snow to remain for at least the next day, and then a chance of snow on the following day, April 8. While snow remained on April 7 as the crew mopped up and cold trailed, it was receding, so further patrol was scheduled for April 8. The patrol crew was just arriving at the station when the fire call went out for the escaped pile burn at 1140. The fire was contained by late afternoon, but approximately 27 acres of grass and old hand piles burned on private land. Because the fire burned onto private land, the Duty Officer declared a wildfire. No injuries occurred.

While the Pine Grove escape itself was relatively benign, a review team was assigned to address the following:

- Maximize the potential to learn from this event and the experiences of those involved.
- Identify any casual factors that may have contributed to the wildfire declaration.
- Identify lessons learned or commonalities from previously completed escaped fire reviews on the Black Hills National Forest not applied which may have contributed to the escape? The three other escapes in the past 10 years that

were reviewed for this Facilitated Learning Analysis (FLA) are Windsong, Picnic, and Zimmer.

SETTING

The Black Hills National Forest is a significant contributor to both the regional timber (volume) and fuels reduction (acre) targets. Mechanical timber harvest is a large component of the Forest's fuel reduction program. The Black Hills is almost entirely a ponderosa pine ecosystem, with about 3900 miles of private land line interior to the proclaimed Forest boundary. Communities such as Hill City, Lead/Deadwood, and Custer are entirely within the proclaimed boundary, and other subdivisions and homes are distributed throughout the Forest. A recent mountain pine beetle outbreak increased the fuel loading. Between January and April, 2018, the Mystic RD burned over 8,000 piles. Landings are being reused for subsequent treatments as rapidly as every 2 to 5 years, necessitating pile burning within that window. The pace of timber harvest and fuels reduction was noted in the three previous escape reviews, and was a common thread among Pine Grove FLA interviewees. Despite that pressure, *all* personnel interviewed said that safety and appropriate fire risk management principles were not being compromised.

The Black Hills used a Forest Wide Prescribed Pile Burning Plan up until approximately 2014, when District specific burn plans were put in place. All of these plans' prescriptions called for snow on the ground prior to ignition, and some had date restrictions. One of the commonalities of the Pine Grove escape with the 3 previous escaped burns was that the snow melted more quickly than expected, and the snow prescription did not hold the fire. In 2017, in response to the fuels attainment and pile burning workload, the Mystic RD asked, "Why not other windows? Better windows. More windows. Not more risk, just other opportunities." In response to this question, the Mystic RD wrote a burn plan that included 'other-than-snow' prescription parameters. While this burn plan allowed for other prescriptions, it is important to note that the Pine Grove hand piles were ignited on April 6 with 4-6" of snow on the ground, and the expectation was that it would stay.

Pine Grove Hand Piles Prescribed Fire Setting

While the Mystic RD plan includes several prescription parameters, the 'snow cover' prescription of "At least 2" of continuous snow cover over the project area that is expected to last a minimum of 48 hrs" was met. In addition, the parameter of "Total moisture accumulation of at least .25" in the past 48 hrs" was also met. More precipitation was forecast for April 8. The outcome of the piles ignited on April 6 achieved the 75% activity fuel reduction objective.

The Pine Grove project area is within the 2002 Battle Creek fire area, and the piles were the submerchantable material that remained after salvage logging operations. Hundreds of acres of hand piles were created adjacent to private land between 2005

and 2009, and most of these remain unburned. Due to the age of the piles, slash to be burned consisted primarily of larger size woody debris with very limited fine debris (needles, etc) resulting in some previous ignition attempts with drip torches as unsuccessful. Gel was used for the April 6 ignition, which proved to be successful. On April 8, numerous piles within the perimeter of the escaped fire did not burn, while some did.

NARRATIVE AND CHRONOLOGY

Pine Grove hand piles were ignited on April 6, 2018. Mop up, cold trailing, and patrol was conducted on April 7. As the patrol crew was assembling on April 8, the fire was reported at 1140.

Weather observations at the Baker Park RAWS showed warmer temperatures and strong winds on the morning of April 8. Average hourly wind speeds between 0600 and 1300 were 10 to 17 mph, with a peak gust of 45 mph recorded between 1000 and 1100. Temperatures were 40 to 49 degrees between 0700 and 1400.

The first responder on scene was the Rockerville VFD, and the Chief served as the IC. Within less than two hours, resources on scene included six engines, one water tender, and one dozer. There are homes in the area. By 1445, the dozer line was nearly complete, and several resources were released by approximately 1600. Patrols monitored the fire for several days, and it was declared controlled on April 16. A total of 62 acres burned, with 27 acres on private land. The fire burned grass and piles on both National Forest System and private lands.

Concerning the declaration of a wildfire, the Mystic Ranger District Duty Officer/Fire Management Officer was on scene before 1215. He sized up the incident, fully understood the Agency Administrator's leader's intent, and had the authority under the District burn plan to declare the escaped pile burn as a wildfire. The District Duty Officer declared the escape a wildfire shortly after 1317 due to the amount of fire on private land. At the time of the declaration, the winds had died down, firefighting resources were making good progress, and the District Duty Officer felt confident that the fire would be contained. The declaration was solely made on the basis of the amount of fire on private land.

A complete chronology can be found in Appendix 2, page 13.

LESSONS LEARNED

This review was initiated to maximize the potential to learn from the Pine Grove incident and the experiences of those involved. The following review points are from the Regional Forester's April 19 delegation letter.

Identify any casual factors that may have contributed to the wildfire declaration

The District DO/FMO made the declaration, after consultation with the Forest FMO, because of the amount of private land involved. The District DO/FMO was fully aware of Agency Administrator's leader intent concerning the declaration after considerable discussions and learning from the Zimmer pile burn escape. One of the identified lessons learned from the Zimmer Fire review was for leaders to take the time needed to make the best possible informed decision regarding declaration of a wildfire. For the Pine Grove escape, the District DO/FMO took the time to fully size the incident up and visit with the Forest FMO prior to making the declaration. The Agency Administrator, while not immediately part of the declaration decision, fully concurred with the escape declaration.

The review team found that the Duty Officer made the decision to declare the escape a wildfire based solely on the amount of fire that burned on private land. The Pine Grove declaration was found to be fully compliant with the Mystic District pile burning plan, in that the Duty Officer had the authority to make the declaration and that one of the examples that may warrant a wildfire declaration included burning onto private property. The review team found that neither the declaration itself, nor the declaration process, had any influence on the suppression actions. The review team also could not find agency direction, FS-5140 policy or burn plan constraints that required this escape be declared a wildfire. A more complete discussion of national policy and the District burn plan direction on declaring escaped prescribed fires a wildfire can be found in Appendix 1, pages 11-12.

Are there lessons learned or commonalities from previously completed escaped fire reviews on the Black Hills National Forest not applied which may have contributed to the escape?

Appendix 3, page 15, describes commonalities between the Pine Grove incident and the Windsong, Picnic, and Zimmer escaped pile burns.

- 1. Commonality/Lesson Learned: Two of the previous three escapes plus Pine Grove involved private land. The Black Hills NF has thousands of miles of private landline boundaries, which contain communities, subdivisions, and other values at risk. The risk to private land requires an increased situational awareness for ignition and for post ignition patrol when burning piles near private land. The Forest should continue to learn from past practices that have worked, and lessons learned from the escapes.**

For Pine Grove specifically, the review team found that the ignition decision was sound, and met the prescription in the burn plan. In addition, the review team found

that both direct and planned post-ignition actions taken were reasonable, based on what was known at the time.

The review team inquired into whether or not the April 8 patrol could have occurred earlier. However, our conclusion was that the decision to patrol at about 1200 on April 8 was reasonable based on the conditions observed on April 7.

That said, the fact that the Black Hills has so much fuel to dispose of, and piles to burn, in close proximity to private land, creates an exercise in advanced, informed risk decision making. While the probability and history of escape is low, the consequences are high, in terms of firefighter and public safety, values of property, and public trust. The review team found all Black Hills NF personnel interviewed were well aware of this situation, and were diligent and professional in their actions with respect to getting work done in the face of this risk.

The following are some considerations that are known and being practiced by Black Hills personnel, but that should be re-emphasized. Leadership must balance the cost and the benefit of these practices knowing the total amount of work that must be done against the risk of affecting lands of other ownerships. These should be used as a 'lessons learned' reminder list that leadership and fire personnel could re-emphasize when reviewing project, or daily plans.

- Although the review team found no indications of complacency on the Pine Grove escape, there could be renewed emphasis on not becoming complacent when thousands of piles are ignited each season on the Black Hills NF.
- Extra attention to current and predicted weather. It is well known among Black Hills employees how volatile and fast changing the weather can be.
- Increased, earlier, longer, patrols
- More complete mop-up or holding actions
- Discussions with adjacent landowners – there is no “fire wall” between the forest’s fuels and private lands. This is a monumental task, especially in the case of communities and larger subdivisions. In the case of Pine Grove, pre-ignition discussions with the landowner would not have resulted in different ignition, patrol, or suppression actions, but might have resulted in a different wildfire declaration decision. Many of the landowners will have the same fuel reduction objectives the Forest does, so trying to manage for that synergy would be a benefit to both, although this comes at the cost of increased time spent developing relationships with adjacent landowners.
- Increased emphasis on ‘learning’. Perceptions by people interviewed concerning the Black Hills ‘learning culture’ ranged from “pretty good” to “terrible on lessons learned”.

Ultimately, the lesson learned on this point have to do with reinvigorating the notion of being a learning culture, and making it a systemic part of daily work.

- 2. Commonality: The work load on the Black Hills.** This was a common theme reported in the previous three incident reviews, and what the review team heard in nearly every interview. Each district ignites nearly 10,000 piles per year, which is up to a few hundred thousand piles in this 10 year review period. Landing locations are in some cases reused on a two to five year interval, which creates timing urgency. The percentage of declared escapes is infinitesimally small, but even one near high-value private land carries huge consequences. Some of the other things shared in interviews included:
- a. Not burning is not an option, and carries a completely different set of risks.
 - b. The Forest has, and is continuing, to explore other tools/options for fuel reduction and slash disposal. Some options explored include biomass utilization, other fuel removal options, and more broadcast burning. Currently, the technology and economics have not caught up with the need, nor have markets been developed. Therefore, pile burning remains the primary fuel disposal method.
 - c. Broadcast burning opportunities are limited by current Forest direction that limits mortality allowance in saw timber on suitable lands (5% mortality) and creates implementation risks for prescribed fire practitioners.
- 3. Lesson Learned: The Black Hills' 'snow' pile burn prescription is not foolproof – “Snow is not *the* answer”.**

One of the most obvious commonalities between the four escaped pile burns is that they were ignited with snow cover, weather conditions, and time of year that met the burn plan prescriptions. However, in each instance, within a matter of hours or days, the weather conditions changed, the snow melted, and the prescribed fire escaped.

The review team was told that the Black Hills weather is known for its volatility, and personnel are well aware of this condition. Temperatures and winds can increase, and relative humidities can drop very rapidly. During the time of year the Black Hills has typically been implementing the 'snow' pile burn prescription, one and ten hour fuels are dead and/or dry rapidly. The review team was told piles are typically ignited between October and March/April, although the dates are not strictly determinative – the 'season' parameter is based upon the location on the forest. The 'northern' season can be later, while the 'southern' and 'east of Highway 385' season has traditionally ended earlier.

- 4. Recognition of Lessons Learned on the Black Hills: Based on the previous items, the 2017 Mystic Ranger District's pile burn plan utilizes risk informed decision making that address the work load and conditions encountered on the Black Hills.**

The review team found that the 2017 Mystic District Pile Burn Plan addresses the work load with sound science and risk management decision principles. The broader prescription windows available allow for increased work accomplishment, but with the requirement of increased communications between all levels of the

District organization. The burn plan provides processes for those communications. The District is aware that as they implement the new prescriptions, it will be important to monitor and potentially refine the prescriptions and implementation guidance as practical lessons are learned.

It is important to reiterate that the new, alternative, Mystic RD burn plan prescriptions were not implicated in the Pine Grove escape. The 4-6" of snow on ground at time of ignition and the 1-2 day forecast would have met previous burn plan prescriptions.

COMMENDATIONS

1. The amount of work getting done on the Mystic RD, and the entire Black Hills National Forest, is significant. It is clearly a forest-wide, team effort. Many people spoke of pressure due to the workload, but not one person said that pressure supersedes safety/risk considerations.
2. Mystic RD is using lessons learned and adapting to the large workload. Two examples of this are the Brush Disposal (BD) funded pile burning crew used for the first time in 2018, and the new Mystic District Pile Burning Prescribed Fire Plan, which identifies and manages for better and more prescription windows. Forest leadership deserves commendation for providing the District the space for this learning and adaptation.
3. "Never been involved with an Agency Administrator that is more involved." Leadership on the Mystic District, especially in fire, is thinking outside the box, evolving and adapting. This could very well be true for the Forest as a whole, but the FLA team did not engage at that level.

SUMMARY

The Black Hills National Forest has a large and complex fuels workload. The Forest is among the National Forest System's leaders in terms of total timber output. Additional fuel loading has occurred from a mountain pine beetle outbreak in the fire-based Ponderosa pine ecosystem. The large number of high-value private land inholdings create a complicated and high risk environment. Forest personnel work extremely hard and diligently at managing the fuel load while minimizing risk to the Forest's neighbors. During the course of burning hundreds of thousands of machine and hand built slash piles, four declared escapes have occurred over the past ten years. This review found that the Forest, and Mystic RD in particular as the subject of the review, continues to explore new methods of slash disposal. Concerning pile burning in particular, the Mystic RD has implemented a new pile burn plan that attempts to achieve the work load with additional burn prescription parameters, as opposed to the more historical prescription of burning during certain seasons with snow on the ground and favorable weather forecasts.

The risk to private land requires an increased situational awareness for ignition and for post ignition patrol when burning piles near private land. The Forest should continue to learn from past practices that have worked, and lessons learned from the escapes. With the goal of reducing the number of escapes, improvements could be made in:

- Re-emphasizing the learning culture on the Forest, particularly in sharing lessons learned on the situation surrounding escaped pile burns. This includes the application of risk management principles to balance the need to burn the piles against the increased cost of the extra time and effort of increased post-ignition patrols.
- Continuing to utilize new methods and processes in accomplishing priority fuel reduction work.

Review Team Members:

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APPENDIX 1: Five elements of an escaped prescribed fire review specified in the Interagency Prescribed Fire Planning and Implementation Guide, NWCG publication PMS 484

1. An analysis of the seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.

Ignitions on the Pine Grove RX burn began on April 6th, 2018 at approximately 1030 with approximately 5" of snow on the ground. Ignitions lasted for approximately 2 hours, and were completed at approximately 1230. Maximum temperatures were in the upper teens to low 20's during implementation with overnight lows dropping to 7 degrees at 2300. During ignition, winds were generally easterly with a maximum average wind speed of 6 MPH with gusts around 12 MPH. Winds switched to a west/southwesterly direction and were relatively calm through the nighttime hours (see Table 1). April 7th weather had maximum temperatures in the mid to upper 30's and low 30's through the overnight hours with wind gusts reaching 13 MPH at 2200 out of the Southeast. On April 8th (the day the fire was converted from an RX burn to a wildfire), by 0500 the temperature had reached 37 degrees with an average wind speed from the Northwest at 8 MPH gusting to 30 MPH. The wind increased to average wind speeds of 15 MPH, with gusts to 45 MPH, out of the northwest by 1100. Winds decreased in the early afternoon, and by 1800, average winds were 3 MPH and gusting to 8 MPH out of the northeast (see Table 2).

Table 1. April 6th Baker Park RAWS weather Summary

<div> <div>Prev Day</div> <div>Station Summary</div> <div>Next Day</div> </div>											
Baker Park South Dakota											
Daily Summary for											
April 6, 2018											
Hour of Day	Total Solar Rad.	Ave. Wind	Wind Dir.	Max. Wind	Air Temperature Mean	Fuel Temperature Mean	Fuel Moisture Mean	Relative Humidity Mean	Dew Point	Wet Bulb	Total Precip.
Ending at L.S.T.	° ly.	mph	Deg	mph	Deg. F.	Deg. F.	Percent	Percent	Deg. F.		inches
1 am	0.0	6.0	344	10.0	18.0	18.0	26.3	80	14	18	0.00
2 am	0.0	5.0	334	13.0	17.0	17.0	25.8	82	13	16	0.00
3 am	0.0	6.0	359	12.0	17.0	16.0	25.2	81	13	16	0.00
4 am	0.0	4.0	25	11.0	14.0	14.0	24.7	86	11	13	0.00
5 am	0.0	5.0	24	10.0	12.0	12.0	24.9	85	9	11	0.00
6 am	0.0	4.0	11	10.0	10.0	10.0	25.1	83	6	9	0.00
7 am	0.4	3.0	15	7.0	10.0	10.0	24.7	82	6	9	0.00
8 am	1.9	3.0	31	8.0	10.0	12.0	23.6	80	6	9	0.00
9 am	4.2	3.0	26	6.0	14.0	21.0	23.0	75	8	12	0.00
10 am	9.5	4.0	54	9.0	18.0	31.0	20.5	66	10	16	0.00
11 am	13.0	5.0	85	10.0	18.0	35.0	17.6	66	10	16	0.02
12 pm	18.6	5.0	85	12.0	19.0	41.0	15.8	65	10	16	0.05
1 pm	20.6	6.0	86	12.0	18.0	36.0	13.1	66	10	16	0.07
2 pm	21.7	5.0	72	11.0	20.0	39.0	12.9	63	11	17	0.07
3 pm	19.7	6.0	73	11.0	19.0	34.0	13.3	65	10	16	0.04
4 pm	17.1	4.0	67	10.0	18.0	28.0	12.5	65	9	15	0.01
5 pm	9.7	6.0	82	10.0	14.0	18.0	12.4	71	7	12	0.00
6 pm	4.4	4.0	109	9.0	13.0	15.0	12.9	77	8	12	0.00
7 pm	0.8	2.0	141	5.0	11.0	12.0	13.8	81	7	10	0.00
8 pm	0.0	2.0	137	5.0	9.0	7.0	14.5	83	5	8	0.00
9 pm	0.0	3.0	157	4.0	8.0	5.0	16.1	85	5	7	0.00
10 pm	0.0	1.0	298	4.0	7.0	5.0	16.6	83	3	6	0.00
11 pm	0.0	4.0	291	7.0	7.0	7.0	17.7	82	3	6	0.00
12 am	0.0	4.0	280	8.0	10.0	9.0	18.9	79	5	9	0.00

Table 2. April 8th Baker Park RAWS weather Summary



Station Summary



Baker Park South Dakota

Daily Summary for

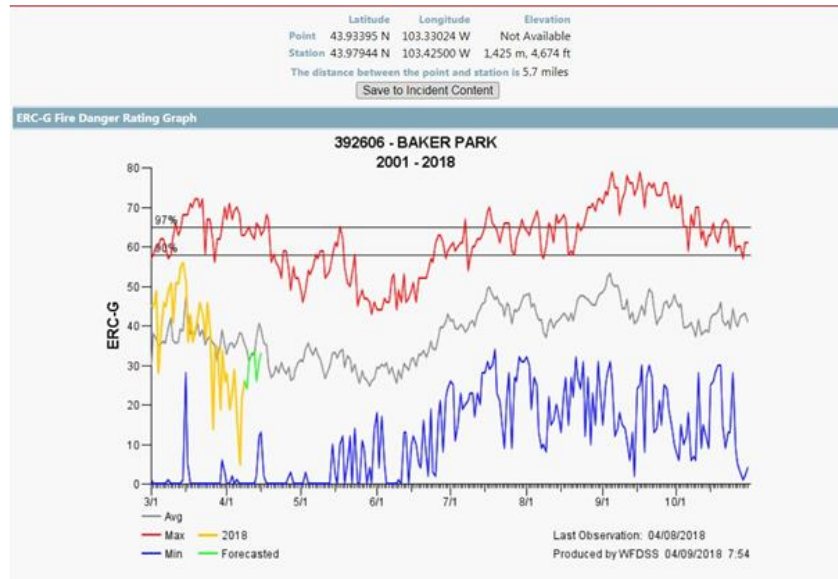
April 8, 2018

Hour of Day	Total Solar	Wind			Air Temperature	Fuel Temperature	Fuel Moisture	Relative Humidity	Dew Point	Wet Bulb	Total Precip.
Ending at L.S.T.	Rad. ° ly.	Ave. mph	V. Dir. Deg	Max. mph	Mean Deg. F.	Mean Deg. F.	Mean Percent	Mean Percent	Mean Deg. F.	Mean Deg. F.	Mean inches
1 am	0.0	4.0	187	12.0	32.0	31.0	21.5	89	29	31	0.00
2 am	0.0	2.0	18	10.0	31.0	30.0	22.3	92	29	30	0.00
3 am	0.0	2.0	188	6.0	31.0	31.0	22.6	92	29	30	0.00
4 am	0.0	2.0	353	7.0	30.0	29.0	23.3	94	29	29	0.00
5 am	0.0	8.0	338	30.0	37.0	34.0	22.2	72	29	33	0.00
6 am	0.1	10.0	340	32.0	38.0	35.0	19.7	64	27	33	0.00
7 am	8.3	13.0	332	34.0	40.0	38.0	17.5	56	26	34	0.00
8 am	21.1	17.0	327	34.0	41.0	41.0	15.2	51	24	34	0.00
9 am	45.5	13.0	330	38.0	43.0	45.0	14.3	48	25	35	0.00
10 am	52.4	14.0	331	33.0	43.0	47.0	12.1	48	25	35	0.00
11 am	69.8	15.0	333	45.0	45.0	52.0	11.9	45	25	36	0.00
12 pm	79.0	11.0	337	29.0	48.0	58.0	10.8	43	27	38	0.00
1 pm	56.5	10.0	349	29.0	47.0	54.0	10.4	43	26	37	0.00
2 pm	61.0	9.0	342	28.0	49.0	60.0	11.1	39	25	38	0.00
3 pm	53.8	7.0	88	21.0	41.0	54.0	10.9	67	31	36	0.00
4 pm	20.7	4.0	86	12.0	36.0	41.0	10.5	78	30	33	0.00
5 pm	16.8	4.0	128	11.0	36.0	41.0	12.0	81	31	34	0.00
6 pm	6.5	3.0	72	8.0	31.0	33.0	12.6	88	28	30	0.00
7 pm	1.5	2.0	203	6.0	29.0	28.0	13.5	92	27	28	0.00
8 pm	0.0	3.0	50	8.0	28.0	27.0	15.6	94	27	27	0.00
9 pm	0.0	1.0	312	5.0	28.0	27.0	17.3	97	27	28	0.00
10 pm	0.0	4.0	36	18.0	28.0	29.0	19.7	97	27	28	0.00
11 pm	0.0	2.0	322	5.0	29.0	27.0	21.8	98	29	29	0.00
12 am	0.0	7.0	353	19.0	35.0	33.0	23.2	74	28	32	0.00

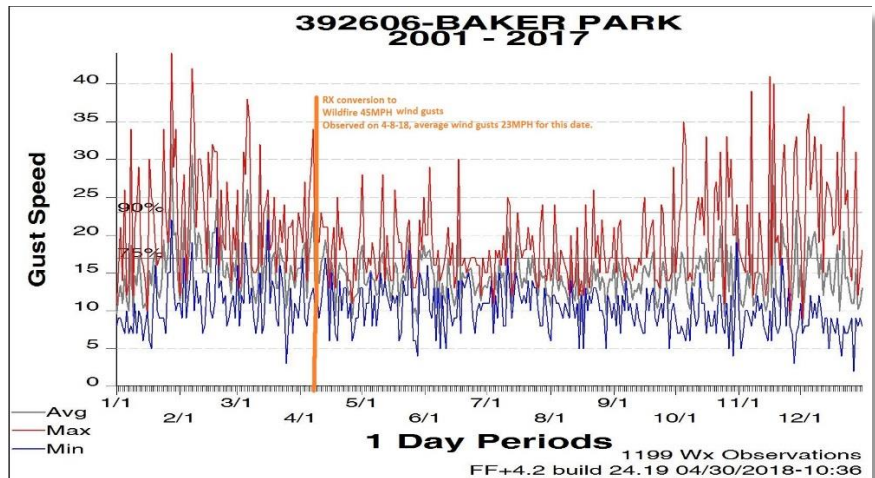
Wildfire
Conversion

Based on the Wildfire Decision Support System (WFDSS - See Graph 1) weather information from the Baker Park Remote Automated Weather Station (RAWS) which is approximately 6 miles South East from the Pine Grove escape, seasonal severity would best be described as below average and trending to average (see Graph 1). ERC's from the WIMS site were a maximum of 28 on April 8th which is consistent with the forecasted WFDSS database. The weather events that played the largest roll in the escape was wind speed (see Fire Family Plus Graph 2) which were well over the average wind gusts of 17-23 MPH on the morning of the 8th (see Graph 2).

Graph 1. WFDSS Baker Park observed and forecasted ERC chart



Graph 2. Baker Park Historical wind gusts speed from Fire Family Plus



2. An analysis of the prescribed fire plan for consistency with agency policy and guidance related to prescribed fire planning and implementation.

and

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

The Pine Grove RX was implemented using the Mystic District Pile Burning Prescribed Fire Plan (signed May 12, 2017). The plan was consistent with the November 2013 Interagency Prescribed Fire Planning and Implementation Procedures Guide PMS 484 and associated template. The 2017 Mystic District Pile

Burning Prescribed Fire Plan varied from other pile burn plans on the Black Hills National Forest in it gave more flexibility to burn under different environmental conditions.

The Pine Grove prescribed fire was declared a wildfire since it had burned on private lands. There seemed to be, and still is, confusion concerning if a prescribed burn moving to adjacent private lands necessitates a wildfire declaration. FSM 5142.3 references NWCG, PMS 484 which says:

“A prescribed fire, or a portion or segment of a prescribed fire, must be declared a wildfire by those identified in the plan with the authority to do so, when either or both of the following criteria are met:

- Prescription parameters are exceeded and holding and contingency actions cannot secure the fire by the end of the next burning period, or,
- The fire has spread outside the project area or is likely to do so, and the associated contingency actions have failed or are likely to fail and the fire cannot be contained by the end of the next burning period.” (PMS 484, page 33)

There is no mention of fire spread onto adjacent private lands. While the Mystic Duty Officer was not required per the criteria in PMS 484 to declare a wildfire, he chose to because of the size of the fire on private land.

The Mystic District Pile Burning Prescribed Fire Plan includes the following:

Element 18: Wildfire Declaration

Wildfire Declared By: Burn Boss, Duty Officer, FFT1/ICT5 assigned to patrol, or District Ranger. Using the following notifications procedures:

1. Burn Boss will notify:
 - District FMO or acting Duty Officer.
 - Great Plains Dispatch
2. District FMO or Acting Duty Officer will notify:
 - District Ranger
 - Forest Duty Officer

This direction was followed the day of the Pine Grove declaration. In addition, the Mystic District pile burn plan includes “some examples that may warrant a wildfire declaration are:”

- Spot fire/fires exceeds suppression capabilities of on-site and contingency resources.
- Fire behavior exceeds prescription and threatens to leave control lines.
- Fire burns onto private property.

The decision to declare the Pine Grove escape a wildfire is fully compliant with the District burn plan direction.

BHNF staff was diligent about the timeliness of reporting the escape and the wildfire declaration to the Regional Office. FSM 5142.45 requires that Forest Supervisor must “Ensure accurate and timely reporting of all Forest or Grassland prescribed fire activity and report all wildfires resulting from prescribed fire actions to the Regional Forester within 12 hours of the wildfire declaration. Report any exceedance of the National Ambient Air Quality Standards (NAAQS) to the Regional Forester as soon as practicable.” Furthermore, FSM 5142.6 states District Rangers “Ensure adequate oversight and status reporting of all prescribed fires at the district level; reporting all wildfires resulting from prescribed fire

actions to the Forest Supervisor within 4 hours.” The review team found that BHNF staff made the required notifications well within the FSM timeframes.

4. The approving agency administrator’s qualifications, experience, and involvement.

and

5. The qualifications and experience of key personnel involved.

The review team found that these two criteria were fully met for the Pine Grove prescribed pile burn actions.

The Agency Administrator is certified at the Advanced level for wildfires and is qualified to approve type II and type III burn plans. The RXB3 and the RXB3 (T) were qualified for the positions they held, per the pile burn plan Element 11: Organization and Equipment; during mop-up and patrol an ICT5 or FFT1 can take the place of the RXB3. During this phase of the prescribed burn the individuals where qualified for the positions they had held.

APPENDIX 2: Chronology

Date	Time	Activities on Pine Grove RX pile burn and suppression
4/5/18		FMO and fuels crew discussed burning Pine Grove piles on 4/6.
4/5/18		FMO discussed plan for ignition, holding, and weather with agency administrator. AA gave ignition authorization.
4/6/18	1019	Test Fire began on Pine Grove hand piles under snow prescription parameters, 4-5 inches of snow on site
	1220	Ignition completed. About 125 hand piles ignited.
	1437	Mystic squad 1 departs burn site. Plan was to patrol 4/7, and decided on Sunday patrol at that time.
4/7/18	1200	3 firefighters patrol Pine Grove Rx. Mop up, cold trail, walk thru.
4/7/18	1400	Depart burn site. RX patrol IC and FMO discuss status of piles, determine to patrol again on 4/8. Patrol crew to meet at Station at ~1130, 4/8 to go to Pine Grove site.
4/8/18	1120	Page for possible slash pile wildfire.
	1122	District D.O./FMO in contact w/IC and GPC
	1215	District D.O. called Forest D. O. – gathering intel
	1245	District D.O. to GPC – Do not declare wildfire at this time, want to size up and talk to AA.
	1309	IC size up. About 6 engines, 1 water tender, 1 dozer on scene. Homes in area, but not threatened at this time.
	1317	District D.O. to GPC – declare wildfire because enough is on private land.
	1445	Dozer line around most
	1516	78 acres. 30% contained.
	1536	Release VFDs at about 1600, some resources to stay all night
	1550	Dozer released.
4/9 to 4/12		Resources mopped up and checked fire.
4/16	1525	Pine Grove Controlled. Final size: 62 acres, 27 on private.

APPENDIX 3: Lessons learned from three other pile burn escapes on the Black Hills NF in the past 10 years

Windsong - March 2010 Hell Canyon RD	Picnic – January 2012 Northern Hills RD	Zimmer – February 2016 Mystic RD	Pine Grove - April 2018 Mystic RD
POL piles – adjacent to private	Hand piles – adjacent to private	Machine piles – adjacent to private	Hand piles – adjacent to private
No post ignition patrol prior to escape. Plan was to have dozer spread piles the day of the escape, but that did not happen – one spot says dozer operator not available, chronology says determined not needed.	Post ignition patrol – not applicable. Escape essentially when lighting ceased.	Patrolled and checked every day after ignition, including dozer work.	Piles checked day after ignition, and planned for day of escape.
Escape – 2 days after ignition	Escape - Very soon after ignition	Escape – ~8 days after ignition	Escape – 2 days after ignition
3” fresh Snow, more next 2 days	2-4” snow	6” snow	4-6” snow
Forest wide burn plan – Snow on ground	Forest wide burn plan - 2”, last for 48 hrs	District burn plan – 2”, last for 48 hrs	2017 District Burn Plan – Multiple parameters, although snow was used for this ignition, similar to other burn plans.
Snow loss, low RH (10%), planned dozer spread did not happen. One hour fuels dried out, snow cover deteriorated rapidly.	Wind, drop in RH, melting snow	Snow on site thru about day 6. High winds, melting snow	High winds, warmer temperatures, melting snow
Not declared wildfire – small amount on private, little to no ‘damage’.	Declared wildfire	Declared wildfire – beyond resources available, ordered what was needed.	Declared wildfire – Impacts to private
Burned onto private	Burned onto private	No private involved.	Burned onto private
The Forest has an extensive history of vegetation management and these prescribed fires were implemented to reduce a backlog of piles created as part of their	Human Factors Having a backlog of 30,000+ piles is a burden that members of the Northern Hills District Fire and Fuels program are eager to be free of. The	“Potential Lesson Learned” The Black Hills has a very active timber program that produces numerous machine and hand piles every year. This has created a	The Black Hills continues to be a significant contributor to the regional Timber and Fuels targets. Project generated, and natural fuels, are largely mechanically treated, although

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<p>accelerated hazardous fuels reduction program.</p> <p>District personnel successfully completed in excess of 10,000 piles during the winter months of FY 2010.</p> <p>In 2010, 30,000 piles had been ignited by that date.</p>	<p>desire to ‘keep up’ with an accelerated timber program contributes additional stress.</p> <p>The forest is still engaged in an accelerated timber harvest program in response to the ongoing mountain pine beetle epidemic. Machine pile creation is outpacing the number of piles that are being burned each year on the Northern Hills Ranger District. At the time of the Picnic Fire, Northern Hills District fire crew members had burned approximately 350 machine piles and approximately 5,000 hand piles since November 1, 2011.</p>	<p>backlog of piles to be burned. During one of the AAR’s it was discussed that there are pressures, perceived or real, to get these piles burned. However, the fire and fuels personnel felt that there is no pressure to burn when the conditions are not right. The team feels a duty to complete this work, but they feel there is full support from the District and SO management to make good decisions on when to do it.</p>	<p>Forest has explored other options. This leads to a large number of piles that need to be treated. Pile locations are being reused for subsequent treatments within 5 years, in some cases as soon as every 1-2 years. District burned about 8400 piles since start of season. Despite that, no one visited with felt the need to ‘cut corners’ regarding safety or pile burning management.</p>
			<p>The Forest faces the complexity of intense public scrutiny, and a huge amount of Wildland Urban Interface. Currently, despite the ecological need to use fire in Ponderosa Pine ecosystem, Forest direction sets the prescribed fire mortality limits of 5% in 7”+ timber in the suited base.</p>
	<p>Project Design:</p> <p>Though consistent with forest plan guidance (Guideline 4110), hand piling a narrow strip of slash (as a fuel break) along the middle of a slope makes little ‘tactical’ sense. Fuel breaks should offer some sort of (fire suppression) tactical advantage. Additionally, the proximity of the piles to property</p>		<p>Not applicable to Pine Grove</p>

Windsong - March 2010 Hell Canyon RD	Picnic – January 2012 Northern Hills RD	Zimmer – February 2016 Mystic RD	Pine Grove - April 2018 Mystic RD
	boundaries (<5 feet) contributed to the complexity of holding operations. Project design in this case exposed the burn team to an elevated risk of the fire burning onto private property.		
	Mission Planning The RXB3 chose to implement a project that had not been identified as a district priority and had not been under consideration for that day. Many were unaware of his chosen location, including the ZFMO. Had the RBX3's intention been more widely known, situational awareness regarding winter weather patterns and pile burning risk in that portion of the district might have been raised.		Not applicable to Pine Grove
	Mission Planning A wind event lasting through the afternoon and evening occurred shortly after the crew completed ignition. The weather forecast issued for the Lead/Deadwood area (22 miles northwest) misled the RXB3.		Wind and warmer temperatures beginning at about 0600 on April 8 was a factor to melt snow on Pine Grove. Winds gusted to 45 mph, were steadily between an hourly average of 10 to 17 mph between about 0600 and 1300, and temperatures were in the 40's.
		Potential Lesson Learned Another area to look for possible lessons learned was in the area of predicted weather or prescription limitation that may have been missed in consideration and discussion on whether to burn that day. Although the gusty winds melted the snow sooner than was	Not considered to be a factor for Pine Grove. All people interviewed, and FLT team felt ignition decision on 4/6 was appropriate.

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		expected, there was still snow on the ground for 5-6 days. Respecting hind sight bias, there was nothing that the team felt they missed that would have resulted in a “no go” decision.	
	Situational Awareness Given the history of pile burning escapes on the Black Hills, there appears to be an underestimation of the associated risks/ consequences (and given pile backlogs--perhaps an over-reliance on pile burning as a means of fuels reduction). Winter weather in the Black Hills is difficult to predict (especially winds) and changes rapidly.		FLA team did not find this to be applicable to Pine Grove. District was aware of history of weather changes, and planned patrols.
	Situational Awareness Despite the fact that the current U.S. Drought Monitor is showing near normal conditions for the Black Hills, above normal ERC's and fire behavior observed on the Picnic Fire (spotting from log-to-log) provide contrary evidence.		Based on the Wildfire Decision Support System (WFDSS) weather information from the Baker Park Remote Automated Weather Station (RAWS) which is approximately 6 miles South East from the Pine Grove escape, seasonal severity would best be described as below average and trending to average (see Graph 1). ERC's from the WIMS site were a maximum of 28 on April 8th which is consistent with the forecasted WFDSS database.
	Situational Awareness The burn team was in a 'pile burning mode' and not in a fire suppression mode. The crew initially lacked hand tools to deal with the spot fires. One		Not applicable to Pine Grove.

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	of the crewmembers made a special trip to a nearby work center to gather tools.		
	Situational Awareness The Northern Hills District (with the exception of the southeastern corner of the district where the Picnic Fire occurred) receives more snow than any other portion of the forest. Often times, there is too much snow to burn piles.		Not applicable to Pine Grove.
	Human Factors The <i>RXBP</i> allows for a considerable amount of flexibility in implementation. Burn Bosses need to ensure that they are familiar with the plan. They must also understand the responsibility (and liability) they assume when implementing the plan.		Mystic RD had active communications between AA/DR, FMO, fuels crew supervisors, and fuels crew. These communications happened at beginning of pile burning season, and immediately preceding Pine Grove ignition. Burn plan says: Notifications for Declared Wildfire: 1. Burn Boss will notify: a. District RMO or Acting Duty Officer b. Great Plains Dispatch 2. a. District Ranger b. Forest Duty Officer
		Lessons Learned: Agency Administrators Ignition Authorization This was completed in November between the District Ranger, DFMO, and Fuels DAFMO. The lesson learned through discussion was that	The review team found that the lines of communication between the District Ranger/Agency Administrator to the FMO/Duty Officer through to the prescribed pile burn and suppression implementation were thorough and complete.

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		some of the information from that “Agency Administrators Ignition Authorization” meeting may not get to the RXB3 in charge of burning those piles. It was felt that having a meeting with all of the fire/fuels personnel and the District Ranger in the fall to share “leader’s intent” of the authorization to ensure everyone had necessary information and intent would be valuable.	
	Human Factors As the fire spotted onto private property, the RXB3 (fear of humiliation) delayed notifying the ZFMO of the situation for several hours. Had the notification been more immediate, additional resources would have been ordered sooner, easing the landowner’s concerns and (very possibly) affecting the fire’s final acreage burned.		Not applicable to Pine Grove.
		Lessons Learned: The process of wildfire declaration. The burn plan states that the RXB3, Agency Administrator (AA), District FMO or AFMO, district duty officer, or ICT5, during patrol status, may declare a wildfire. On the Zimmer Ridge fire, the District FMO made the declaration based upon separate conversations with the Forest FMO/Deputy Forest Supervisor and the District Ranger. The ability of	The District DO/FMO made the declaration, after consultation with the Forest FMO, because of the amount of private land involved. The District Ranger/AA’s leader was known throughout the District organization with respect to Pine Grove. One of the lessons learned after Zimmer was to not rush to declaration. For the Pine Grove escape, the District DO/FMO took the time to fully size the incident up and visit with the Forest FMO prior

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		<p>the district FMO on scene to accommodate a joint call was difficult. In this instance, the declaration was not time sensitive and the group recognized that there was time for more communication between the AA, district fire personnel, and SO personnel. Although the burn plan does not require this communication to happen, we agreed that it is essential to have collective group discussion to assure the most informed decision is being made. There is no proposed change in policy, it is merely highlighting the critical nature to make sure of the communication/discussion (no slow to go fast). The group agreed that in some instances the declaration may be time sensitive, therefore there needs to be flexibility to declare wildfire promptly.</p>	<p>to making the declaration. The AA fully concurred with the escape declaration.</p>
	<p>A few other observations in appendix:</p> <ul style="list-style-type: none"> • WX change. Extra attention, planning, and monitoring needs to take place Feb-Apr. • Crew unaware of proximity of private boundary • GPC dispatch had service outage – missed notifications. • In setting: AFMO on leave day of burn; ZFMO/DO scheduled to 		

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	<p>leave work at 1200, but cell phone coverage.</p> <ul style="list-style-type: none"> No briefing, trigger points passed did not notify ZFMO. 		
<p>Recommendation:</p> <p>The Black Hills National Forest (BKF) Programmatic Pile Prescribed Fire Plan is scheduled for review in FY 2010. BKF needs to consider standards and/or guidelines that could increase, or at least raise, awareness for planners and implementers during late winter and early spring operations. Examples could include ensuring the Go/No Go checklist is signed for each project rather than for an entire season or month. In addition, the long term forecast should be documented and discussed.</p> <p>Ensure all district personal involved with pile implementation review the Burn Plan annually and document in a tailgate safety session in the fall before pile burning begins.</p>	<ul style="list-style-type: none"> The 2010 version of the <i>RXBP</i> needs a technical review. The cover page is missing the signature block for 'Technical Reviewer.' The Agency Administrator Go/No-Go Pre-ignition Approval Checklist was not completed for the 2010 version of the <i>RXBP</i>. The Forest has been operating under the Checklist for the 2008 plan, signed 5/12/08 (with an expiration date of 5/9/14). The <i>RXBP</i> was not reviewed in 2011. 	<p>"... district wide level III complexity burn plan. This plan was written in October 2015, having a technical review and silviculturist review completed in November of 2015. The plan was also approved and signed by the District Ranger in November of 2015. On November 30, 2015 the District Ranger, District FMO, and District Fuels AFMO met together and completed the Agency Administrator Ignition Authorization with an expiration date of February 29, 2016."</p>	

APPENDIX 4: Map of Pine Grove incident

