Greenthin Escaped Prescribed Fire
Facilitative Learning Analysis

US Forest Service, Pacific Southwest region, Klamath National Forest
Happy Camp/ Oak Knoll Ranger District

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Introduction:

The Klamath National Forest is located in northwestern California. The Forest encompasses 1.6 million acres and has three Ranger Districts, Happy Camp/Oak Knoll, Scott Valley/Salmon River and the Goosenest.

On October 29, 2008, the Happy Camp/Oak Knoll Ranger District ignited the Greenthin prescribed fire. The unit was 24 acres of mostly white fir at 4500 feet elevation on a south aspect with 35% slope. Part of the unit had been thinned under the Greenthin timber sale, a project that was partially completed before the operator defaulted, leaving some units only partially treated. During the night of October 29, the unit experienced heavy winds which caused spotting across the line. Suppression action was taken on the slop-over. Based on the spot weather forecast, other resources at risk and past fire behavior on the district, the burn was declared an escaped fire on October 30, 2008.

Following the escape, the Burn Boss, Burn Boss Trainee, and prescribed fire crew members conducted an After Action Review (AAR). Several participants on the prescribed fire and subsequent escape prepared written statements detailing their recollection of events.

The Review

On November 5, 2008, the Forest Supervisor of the Klamath National Forest requested a review of the Greenthin prescribed fire and escape. A letter of instruction was issued to the review team directing the team to address the requirements of the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide and FSM 5140 for an escaped prescribed fire as well as address five objectives:

1. Determine if the Prescribed Fire Plan was adequate for the project and complied with policy and guidance related to prescribe fire planning and implementation.
2. Determine if the prescription, actions, and procedures set forth in the Prescribed Fire Plan were followed.
3. Describe and document factual information pertaining to the review.
4. Determine if overall policy, guidance, and procedures relating to prescribed fire operations are adequate.
5. Determine the level of awareness and the understanding of the personnel involved, in regard to procedures and guidance.

The Forest Supervisor requested that the review be conducted as a Facilitative Learning Analysis (FLA). The intent of the FLA process is to "improve performance by generating individual, unit and organizational learning". The emphasis of the process is to focus on learning, rather than blaming. The process brings together the personnel involved in the incident to analyze recent performance and to improve future performance.

The FLA was conducted at the Happy Camp District Office. Participants in the prescribed burn and suppression of the escape were facilitated by the review team in an open group discussion that recounted the events of the two day incident. The group was asked to look for "weak signals" in the events leading up to the declaration of the escape. "Weak signals" are

the early warning signs, minor errors, misunderstandings and subtle indications that all might not be going well, even when we assume things are fine. Once these were identified and discussed, the group was asked to suggest possible corrective actions. Together the group evaluated the situations leading up to the escape and developed lessons-learned.

The focus of an FLA is to tell a story by fostering a learning environment for other firefighters, fire managers and land managers both on the unit and across the nation, recognizing similarities that may prevent future escapes without placing blame on any individuals involved. It is hoped that both firefighters and managers will use the "Story of Events," "Discussion Points," and "Lessons Learned" as tools in a learning environment such as pre-burn briefings and prescribed fire burn boss refreshers.

This FLA has been made possible by the cooperation and support of the parties involved and the Klamath National Forest. The FLA team would like to express our deep appreciation to the participants for their willingness and honesty to share their story.

The following document contains a story of the events leading to the incident, the results of the review with the involved personnel and the lessons learned from the review. The objective is to focus on these lessons learned to enhance future management actions.

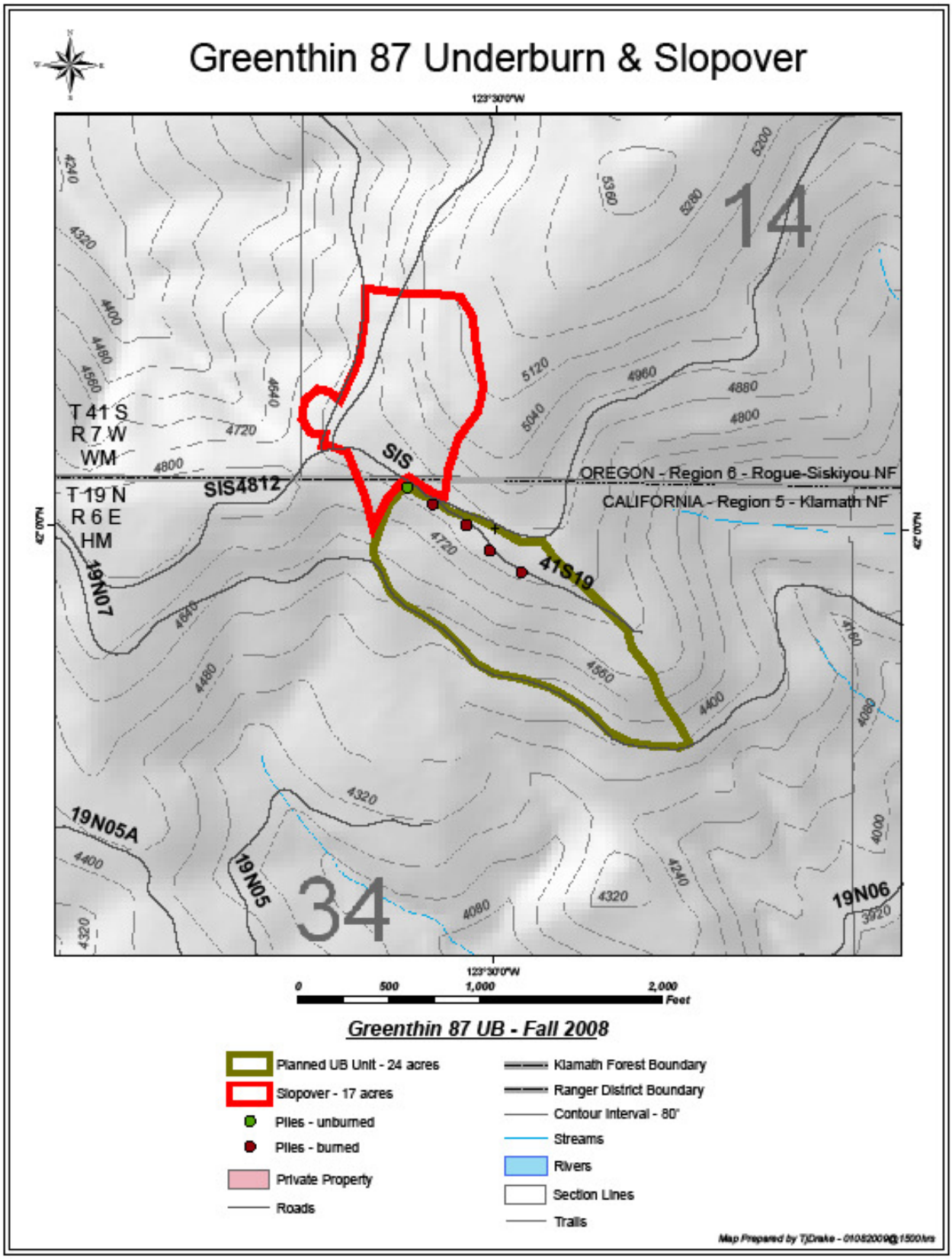
Conditions and Environment:

Objective: The objective of the project was to reduce post activity fuels and reduce potential for future high intensity wildfire by burning the Greenthin unit.

Fuels: The unit is a white fir stand. Part of the unit had been previously thinned and there was a light slash component from past commercial thinning activities. There were five 4 feet by 10 feet piles below the upper road (top boundary of the unit). The unit also has a component of California Hazel and willow. The fuels are best described by fuel model 11. The surrounding stands are mature mixed conifer with closed canopies. There are moderate levels of grasses, mid-story shrubs, and a large component of large down logs.

Fuel conditions were experiencing lower than normal fuel moistures associated with drought conditions. All grasses were cured and live fuel moistures were very dry, estimated at 80-90 percent. The ERC was 66 which was in the 86th percentile.

Location and Topography: The burn unit is located on the northern end of the district with the northern boundary of the unit on the California/Oregon State line which is also the administrative boundary between the Rogue River-Siskiyou and the Klamath National Forests. The unit has moderate slopes (less than 35%) and a SE aspect.


Greenthin 87 Underburn & Slopover
123°30'0"W
14
34
T 41 S
R 7 W
WM
T 19 N
R 6 E
HM
SIS
SIS4812
OREGON - Region 6 - Rogue-Siskiyou NF
CALIFORNIA - Region 5 - Klamath NF
41S19
19N07
19N05A
19N05
19N06
N00°42'
0
500
1,000
2,000
Feet
Greenthin 87 UB - Fall 2008
Planned UB Unit - 24 acres
Slopover - 17 acres
Piles - unburned
Piles - burned
Private Property
Roads
Klamath Forest Boundary
Ranger District Boundary
Contour Interval - 80'
Streams
Rivers
Section Lines
Trails

Burn Plan Prescription:

A. Environmental Prescription:

FUEL MODEL: FBPS FM 11

	HOT	COOL
Relative Humidity	20	50
Wind Speed (Mid-flame)	6	0
Wind Direction	South	North
Temperature (Dry bulb)	75	40
1 hr. fuel moisture	5	13
10 hr. fuel moisture	8	14
100 hr. fuel moisture	5	16

B. Fire Behavior Prescription:

PREDICTED FIRE BEHAVIOR

	HOT	*COOL*
Rate of Spread (ch/h)	*7.8*	*.9*
Flame Length (ft.)	*3.9*	*1.9*
Effective Wind speed (mph)	*6.3*	*1.3*

Redding Interagency Fire Weather Center utilizing nearby RAWS and onsite weather observations.

REDDING INTERAGENCY FIRE WEATHER CENTER
0820 PDT Wednesday Oct. 29, 2008
Spot Forecast for the Green Thin Burn – Klamath NF, Happy Camp RD

T39N R11W Sec 4-6 Elev. 4335-4681 ft S Aspect 24 ac timber/slash Drainage: Indian Creek

Based on weather from Slater Butte RAWS and the following onsite observations taken 10/28 at 4950 ft on a South aspect under clear skies:

Time	Temp	RH	Wind
1230	61	44%	0-1 mph, no direction given
1330	63	38%	0-1 mph
1430	63	38%	0-1 mph

*** **Note**: Forecast winds are for eye level as requested. ***

Discussion: Large changes in the weather pattern are coming over the next few days as a high pressure ridge that has been over the region is replaced by a rather continuous series of cool, wet weather systems. Snow levels will likely drop to the project site elevation by the end of the weekend, and some accumulation is quite possible. Starting later today winds will be on the increase and it will become quite windy. Haines index of 4 today, then 2-3 Thursday through the weekend.

Today: Variable high cloudiness with otherwise sunny conditions. Max temp 67-72, minimum RH 21-25%. Winds S to SSW 2-6 mph with afternoon gusts to around 15 mph. Ridgetop winds becoming southerly 5-15 mph with afternoon gusts to around 22 mph. Afternoon mixing height 2500 ft AGL, transport wind south 10 mph.

Tonight: Increasing high cloudiness. Min temp 48-53, maximum RH 50-60% although recovery this evening will likely continue to be at a rather slow rate. Wind SE to S 3-7 mph with gusts to 15 mph. Ridge wind SE to S 8-18 mph with gusts to around 30 mph. Overnight mixing height less than 500 ft AGL, transport wind SE 8 mph.

Thursday: Becoming cloudy. Light showers developing in the afternoon. Chance of wetting rain (0.10 inch) about 20% during the afternoon, but increasing to 100% overnight. Much cooler and more humid with a max temp near 55 and min RH above 35%. RH is likely to increase in the afternoon after an early afternoon minimum. Wind SE to S 4-10 mph with afternoon gusts to around 18 mph. Ridgetop winds SE to S increasing to 10-20 mph with gusts to around 35 mph.

Outlook Friday through Sunday: Cool and wet with precipitation. Rain on Friday and Saturday, then rain or snow or a mix of that Sunday. Max temps 30s and 40s. Min RH over 60%. Winds S to SW 5-15 mph with gusts to around 25 mph at times. Ridgetop winds S to SW 10-25 mph and gusting to around 45 mph at times.

Forecaster: B. Belongie

Oct. 29 Measured on-site weather

1100-Temp 55°, RH 52%, wind NE 1-4 mph, fine dead fuel moisture 11
1200-Temp 59°, RH 42%, wind NE 1-3 mph, fine dead fuel moisture 10
1220-Temp 62°, RH 41%, wind SE 4-7 mph, fine dead fuel moisture 10
1300-Temp 63°, RH 42%, wind SE 4-8 mph, fine dead fuel moisture 11
1330-Temp 64°, RH 31%, wind NNE 5 mph, fine dead fuel moisture 9

Weather Day After Ignition Commenced: The following is the spot weather forecast by the Redding Interagency Fire Weather Center for the day following ignition.

REDDING INTERAGENCY FIRE WEATHER CENTER
0845 PDT Thursday Oct. 30, 2008
Spot Forecast for the Green Thin Burn – Klamath NF, Happy Camp RD

T19N R11E Sec 34 Elev. 4335-4681 ft S Aspect 24 ac timber/slash Drainage: Indian Creek

Based on weather from Slater Butte RAWS and the following onsite observations taken 10/29 under clear skies:

Time	Temp	RH	Wind
1200	59	42%	E 1-3 mph
1220	62	41%	SE 4-7 mph
1300	63	42%	SE 4-8 mph
1330	64	31%	NNE 5 G 10 mph

*** **Note**: Forecast winds are for **20-ft level**, per your request, unless noted otherwise. ***

Discussion: Last night and this morning are the final transition out of the recent dry weather pattern under strong high pressure, into a much wetter pattern dominated by a West coast low pressure trough. Gradient winds will be picking up from the SE and south today, and remain SE to SW for several days. Look for an increasing chance of at least light rain or showers this afternoon, then periods of rain for several days, which could become briefly heavy at times. Snow levels are expected to stay above 5500' through Saturday night, but could drop to around 4500' at some point Sunday.

Today: Becoming cloudier with time this morning, and the chance of light rain or showers increases to 50-60% (but CWR just 15%) by day's end. Haines Index 3 then 2 later. Max temps cooler in the mid 50s, with minimum RH 32-39% this morning then getting higher in afternoon. Wind becoming SE to SSW, and increasing to 8-16 gusts 22-29 mph by early afternoon. Mixing heights rising to just 450-700' AGL, with transport and ridge level winds becoming SE to South 15-20 mph.

Tonight: Cloudy with periods of rain or showers… CWR increasing to 70%. Haines 2. Min temps lower 40s, with maximum RH 88-100%. Wind SE to SSW 7-12 gusts 19-25 mph. Mixing height below 250'AGL after dark, with transport winds SE to SSW 12-17 mph and ridge level winds 18-24 mph, with higher gusts.

Friday: Periods of rain or showers, with a slight chance of isolated thunderstorms in the afternoon. CWR 70% or higher. Max temps upper 40s, with minimum RH 60%-plus. Wind varying SSE to SW mostly 7-15 mph, with gusts 20-26 mph.

Outlook Saturday through Monday: Cloudy much of the time, with rain or showers each day, probably heaviest on Saturday. Also a slight chance of isolated thunderstorms on the weekend days. Max temps lowering by Sunday to upper 30s, with minimum RH above 65% Saturday and above 55% the other 2 days. Winds SSE to WSW mainly 8-17 G 23-30 mph Saturday and 6-13 G 20-25 mph Sunday and Monday. Ridgetop winds at least 12-19 mph each day, with higher gusts

Forecaster: Snook

Oct. 30 Measured on-site weather

1000- Temp 58°, RH 41%, wind SE 0-5 mph
1100- Temp 57°, RH rh 49%, wind SE 0-2 mph
1200- Temp 47°, RH 57%, wind E 0-3 mph
1300- Temp 55°, RH 62%, wind 0 mph
1400- Temp 60°, RH 61%, wind 0 mph
1500- Temp 58°, RH 50%, wind 0 mph
1600- Temp 55°, RH 57%, wind 0 mph

Resources Used:

RXB2, RXB2(t), FIRB(t), Holding Specialist, 2 type 3 engines, 1 water tender, 2 ten person crews, miscellaneous district employees used as lighters and holders.

Story of Events:

October 29, 2008

0800-1000: Resources arrived at their duty stations. The burn plan and spot weather forecast were reviewed. A short briefing was conducted, then all resources left for the burn unit. There was some confusion about how to get to the unit and location of water sources. Some resources indicated there was not enough information on how to get to the unit and that initial coordination and planning was lacking. All units arrive at scene.

1015: All resources are on site. A briefing was conducted with all resources, then break out briefings were conducted for the lighting and holding resources.

1100-1130: The test fire was started and completed without incident.

1135: Ignition of the unit was started.

1205: They picked up multiple spot fires across the road and stopped ignition.

1345: Spots were secured, and the team decided to continue firing.

1400-1700: Firing continues on the top, east and west side of the unit. Fire on the west side of the unit was rolling out and flanking to the east. Several piles left from previous logging operations are complicating holding. Holding personnel are assigned to treat log piles on the west side by lining and foaming the piles to exclude them from the unit. By about 1500, two piles below the skid road are burning. A third pretreated slash pile on the west side near top of line ignites. Engine 27 is repositioned in anticipation of new spots. By 1600 the fire was at the skid road and the decision was made to fire across the skid road.

1700-1800: Spot fires detected above the road, ignition was stopped. Decision was made to put in a hose lay on the west line. Once the hose lay was in place, ignition was resumed. The direction was to blacken the west line (active lighting) and let the fire back down the hill. Crews brought fire down the east side flank to the bottom of the unit. Crews continue to grid above the road, looking for spots. By 1800, fire on east and west flanks is brought down to the bottom road, with fire in the middle of the unit continuing to back down the hill.

1800-2400: Resources are released. A 10 person crew volunteers to spend the night on the unit to reduce travel time to and from the unit. The crew rests and monitors the fire about every 1 ½ hours.

Oct. 30, 2008

0230: A 1-3 acre spot fire is detected by the crew on scene. Suppression actions are started and additional resources ordered. Winds are blowing hard and fire is moving along the slope.

0800: The District Ranger and suppression resources arrive on scene. Fire outside the planned unit is estimated at about 15 acres. Winds continue from SE and push fire to NW with continued spotting. A cabin 1.5 to 2 miles ahead of the fire is a concern and the fire is burning onto the Rogue River-Siskiyou NF across the state border into Oregon.

0900-1000: The District Ranger, burn leadership, District staff and SO staff discuss current and expected weather, values at risk and current fire behavior.

1030: The Greenthin prescribed fire is declared a wildfire

1800: The wildfire is contained at about 22 acres.

Situation, Weak Signals, and Lessons Learned

This is a description of situations that occurred before, during and after the escape of the Greenthin burn and the declaration of the escape as a wildfire. The events described here were discussed by the group participating in the FLA and are supported by logs kept by the Burn Boss and Burn Boss Trainee as well as by statements from other personnel that were involved with the burn and suppression of the escape. The group identified "weak signals," the early warning signs, minor errors, misunderstandings and subtle indications that all might not be going well, even when it is assumed that things are fine. Weak Signals are clearly highlighted in this report to illustrate how these often subtle indicators of operational stress may point to (or contribute to) more significant potential for failure.

Situation 1: Distracting Events

District resources were dispatched to three other incidents during the day of the burn. These occupied the Duty Officer and some of the resources at the burn. (Car accident with helicopter medivac, smoke check, and structure fire that pulled an engine off the burn).
The assigned Holding Boss was involved in one of the morning dispatches and a substitute Holding Boss was assigned until the Holding Boss returned. The Duty Officer spent some time on the burn as a Firing Boss (FIRB) without assigning another Duty Officer to cover other activities on the District.

According to the burn plan a FIRB was required, however a Trainee FIRB was assigned and it was not clear who was to be the trainer. An initial FIRB was assigned and when responsibilities changed the transition was not clearly communicated.

Weak Signals

- Distracting events (dispatches to other incidents) may have reduced focus on the task at hand.
- Breaks in continuity of leadership may have caused confusion in the implementation of the plan and operations.
- Unclear assignments were not rectified. A Trainee was expected to act in a key role without appropriate supervision. Within one afternoon assignment, the Trainee FIRB had three different trainers without clearly communicated transitions.

Lessons Learned

- When a trainee is assigned, commit to having a qualified trainer on site and avoid changes, if possible. If changes in the trainer must occur during an assignment, be sure to clearly communicate the change to the trainee and other resources affected

by the change.

- Resources need to have a single assignment, either committed to the burn or committed to district initial attack.

- Recognize that distracting events can reduce focus on task at hand. Arrange for other resources to handle initial attack, and commit key resources for a burn to that project only without collateral duties.

Situation 2: High Staffing Levels Led to False Sense of Security

About 40 people were on site at the time of the ignition, well above the lighting and holding needs identified in the burn plan.

Weak Signals

- High staffing, well above levels specified in the burn plan, may have lead to a false sense of security despite high winds and frequent spotting. The burn plan only required a 5 person engine crew to meet the holding plan which was inadequate for the actual and predicted fire behavior. Without the extra resources, the decision to continue burning when spotting occurred may have been different.

- Some people in the fire organization seem to be making their own decisions when it comes to participating in the prescribed fire program. There is a lack of a spirit of cooperation or team environment.

Lessons Learned

- Be clear on who is committed to the prescribed fire and who is not.

- Base actions on the resources that are committed to the burn, not the extra resources that show up, particularly when those resources are not actually committed to the project and may leave with short notice.

- Resources stated in the burn plan for holding were inadequate for the actual and predicted fire behavior.

Situation 3: Crew Chatter

Before the burn and during the afternoon, crews were chattering about tree top winds, concerns with mid-slope holding, receptive fuel bed ("the fuels crunched when walked upon"), an engine crew noted "We are going to suck smoke." The Burn Boss Trainee stated at the review that he should have looked at the 20 ft winds. The Burn Boss indicated the NW corner was getting surface winds but the rest of the unit looked okay.

Weak Signals

- Prior to the burn and throughout the afternoon, crews were talking about the winds, risk of spotting, the smoke they were going to "suck" and even the "Swiss Cheese model" of events leading to problems. Crew chatter indicated that many people on the burn were uncomfortable with the weather, fuel conditions, organizational confusion and the potential that conditions may be lining up for a difficult operation.
- Crew supervisors may not have been forwarding concerns to appropriate leadership on the burn.
- Leadership on the burn may not have been listening.

Lessons Learned

- Pay attention to observations made by the crews, as well as weather, fuels and other factors affecting the burn.
- Crew supervisors need to forward concerns to the Burn Boss and/or Burn Boss Trainee.
- Fire people are trained to speak up (lead up) about things they observe, and the same rules apply for a prescribed fire.
- Overhead needs to listen to the crew chatter and consider their observations when making decisions.

Situation 4: Night Staffing

The original plan for the night was to not staff the burn. Due to travel times from the duty station to the burn, a 10-person crew "volunteered" to stay on site overnight and "monitor" the burn. Assignment instructions for the night were not clear. The crew module remaining on site indicated they needed 8 hrs of rest to be available for potential ready reserve assignment. Patrolling was not clearly defined and or assigned. The crew had no full-time patrol that night and looked at the fire about every 1.5 hours from their sleeping area. Once the escape was detected at 0230, the crew took suppression action, requested additional resources and was the sole resource on the incident until reinforcements started to arrive around 0800.

Weak Signals

- The Burn Boss Trainee stated that his experience had been that they did not staff night shifts on prescribed fires and the plan for this burn was to send all resources home for the night after the top and flanks of the burn were blackened.
- Keeping the 10 person crew on the burn was, essentially, an after thought and night shift patrol assignments were unclear.
- Rather than actively patrolling, the crew moved away from the project area and bedded down. The crew had no full time patrol that night and looked at the fire about every 1.5 hours from the sleeping area. It appeared that if the crew had not volunteered to stay on site, to eliminate the drive to Happy Camp and back again in the morning, there would have been no one on the unit that night and the spot fire would have burned unchecked from 02:30 until crews arrived in the morning.

Lessons Learned

- The burn was still in the holding phase, not the patrol phase. The burn was still active with fire backing down the hill to the bottom control line and control lines were not fully secured. Staffing for the burn should have been based on the holding plan rather than the post ignition staffing guide.

Situation 5: Prep of the Unit and Piles

There were five piles located below the road that was used as the top boundary of the unit. The presence of these piles required the holding crew to construct fireline and foam the piles on the north west corner of the unit, in an attempt to prevent holding problems. Fire lines also needed some prep on the west side of the unit.

Weak Signals

- The unit was not fully scouted or prepped prior to ignition, leading to containment problems.
- Piles from previous logging were a surprise to the holding crews on the burn and had to be dealt with during the holding operations. The burn plan mentioned the piles although did not mention what they were going to do with them.
- Information about the piles was not conveyed to personnel on site.

Lessons Learned

- Review the burn plan prior to ignition. The burn plan indicated there were piles in the unit.

- Remove or pre-treat piles that are near control lines before underburning.

- During the planning and preparation phases, suppression resources need to be engaged in layout and prep of units, since they often have a better understanding of holding challenges.

Situation 6: Burning Against Multiple Administrative Boundaries.

The Greenthin is on the border of the Klamath and the Rogue River - Siskiyou National Forest. This is also the California-Oregon State line. The Greenthin unit was originally planned to go to the ridge (in Oregon). Rather than working with the adjacent forest to make a logical burn unit boundary, the burn unit boundary was adjusted to a midslope road to avoid crossing the California-Oregon State line. The escape burned into and beyond the area that was originally planned to be burned before the adjustment occurred.

The Happy Camp District communicated with the Rogue River-Siskiyou National Forest prior to the burn, but apparently did not fully consider contingencies should the burn escape the planned control lines. The Rogue River - Siskiyou National Forest was not informed the day of the ignition. When the burn spotted outside control lines and burned into Oregon and onto the adjacent forest, the boundary crossing ended up being a concern that was considered when the escape was declared a wildfire.

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Weak Signals

- Contingency planning with the adjoining unit was lacking.
- Neighboring jurisdictions were not notified the day of ignition.

Lessons Learned

- In the planning phase, communicate with adjacent land owners to see if a joint project would be possible.

- Before conducting a prescribed fire against administrative boundaries, communicate with adjacent administrative units to discuss: “Can we burn on your side? What will happen in the event of an escape? Can we burn to a better holding location (i.e. the ridge) instead of using a mid-slope road?” Establish, in advance, whether an escape across administrative boundaries is a significant concern.

- Conducting suppression actions outside the unit and across administrative (unit, State line, National Forest, Regional, or any other) boundaries does not mean a prescribed fire needs to be or should be declared a wildfire.

Situation 7- Lack of Significant, Recent Experience with Understory Burning

The District has not had a significant understory burning program for several years and therefore was lacking in experience and practice. There have been recent changes in personnel on the district with several people, key to the prescribed fire program, being relatively inexperienced. The District did call in outside resources to supplement local skill sets and all positions were filled with qualified personnel, with the one exception of the Firing Boss.

Lessons Learned

- Before a unit initiates a new or renewed program of work that has long been idle, find ways to increase local skill sets by taking similar assignments on other units.
- Look for other ways to practice planning and operations, such as drawing upon outside resources to serve as mentors and to fill key positions. Be a little more conservative, at first, until the individual skills and organizational abilities are sharpened into a high performing organization.

Situation 8: Situational Awareness

Ultimately many factors indicated the best decision may have been to terminate the prescribed fire early, after the test burn and the multiple spots received after the first pass by the lighters. Tree top winds, organizational confusion, multiple spots, fire behavior and low fuel moisture of dead and down fuels were all signals that the situation had a high risk of an undesired outcome. In a prepared statement, an igniter indicated that firing had gone ½ way across the top of the unit from the west side. The Burn Boss and Burn Boss trainee were not aware that the west flank had started ignition.

Weak Signals

- Situational awareness was lacking. Constrained situational awareness has potential to cause leadership on the burn to make decisions that could place crews in a high risk situation. It would impede their ability to make fully informed decisions and would have limited options they may have believed were still available to them.
- Being uninformed about what parts of the unit are on fire is a watch-out situation.

Lessons Learned

- Maintain a high level of situational awareness and monitor a multitude of factors, not just relying on the prescriptive information to determine if the burn should continue.
- It takes a strong leadership presence to shut down a burn that is already underway.

Commendations

After 126 days of wildfire this year, as soon as conditions were right for RX fire, the District moved forward with the prescribed burning program.

Despite not having a significant prescribed understory burn program recently, the District is working on developing a program and increase capacity on the unit to do complex burn projects.

The district did a good job of dealing with the escaped burn. They realized they had a problem, ordered the appropriate resources and fought fire with an excellent safety record.

We commend the participants in the review for being very candid, open and willing to learn from their shared experiences.

We would like to commend the Forest for using the FLA (Facilitative Learning Analysis) model for this review, so the participants and other individuals can learn from this event.

Greenthin Escaped Prescribed Fire Review Objectives

The Forest Supervisor directed the review team to explore the following questions:

1. Was the prescribed fire plan adequate for the project? Did it comply with the policy and guidance related to prescribe fire planning and implementation?

The plan was originally written on the R-5 format and then moved to the new national format. There are several issues with the plan:

- The unit was a white fir unit. The burn plan talks about Douglas-fir.
- There was confusion in the burn plan about fuel models. Under fuel models, the plan says it is a fuel model 10, the prescription is written for a fuel model 11.
- Prescription for wind direction was south on the hot end and north on the cold end. There was no range specified which unduly limits options and put the prescribed fire out of prescription for any other wind direction but north or south..
- There is limiting statement in the burn plan stating “The burn plan will not be implemented should any adverse weather events be predicted that would exceed

prescription parameters or threaten burn plan objectives." Winds exceeding the high end parameters in the burn plan were predicted in front of the oncoming storm arriving the day after ignition commenced.

- The burn plan required notification of Region 6, Rogue River-Siskiyou NF which was done several days prior to ignition. Notification also needs to occur on the day of the burn.
- The contingency modeling for the hot end of the prescription was not representative of the hot end of the prescription. In the Burn Plan, the hot end of the prescription called for a mid-flame wind speed of 6 mph and the contingency modeling was only for 5 mph. The same thing was done on the cool end of the prescription using 5 mph mid-flame wind speed for contingency modeling instead of 6 mph wind speed.
- The complexity analysis was incomplete. There was not an initial rating as required, only a final.
- Under the Agency Administrator pre-ignition approval, the question of "Are there any other extenuating circumstances that would preclude the successful implementation of the plan" was checked "yes" without explanation.
- There was also no mitigation for the piles near the unit boundaries. They were mentioned but it did not say what they were going to do with them. The section of the burn plan under "unique features" of the burn plan would be a good place for discussion of what to do with the piles.

2. Were the prescription, actions and procedures set forth in the Prescribed Fire Plan followed? If not, provide specific examples:

- No. The burn plan calls for a qualified ignition specialist (firing boss). They had a trainee, but not a qualified firing boss. It was not clear who was assigned to train the trainee FIRB.
- The complexity analysis discusses the Single Resource Boss for the holding action. Due to the number of people and resources on the burn, an individual qualified as a Strike Team / Task Force Leader should have been assigned as Holding Boss.
- The burn plan was written for a north or south wind direction. On the day of the burn, the wind was south east, putting them out of prescription.
- When they left the burn at 2130 and left a 10 person crew on the unit, the burn was still active. The burn was staffed based on the post ignition multiple day staffing requirements. With the burn still actively backing down the hill, and open fireline, the burn should have still been staffed for the holding phase of the prescribed fire plan.

3. What facts were pertinent to this incident?

- There were piles in this unit that where not burned nor moved before the prescribed fire was ignited. Due to the prolonged drought the heavy fuels burned readily (snags, stumps, and logs) and were receptive to embers.
- The predicted winds associated with the incoming cold front contributed to the rapid spread of the escape.

- Leadership intent was to leave the fire unstaffed, however, a 10 person crew volunteered to spend the night to save travel time. (The 10 person crew was on ready reserve and was there to rest, rather than patrol.) Holding forces should have been committed to the burn with clear direction to patrol through the night.
- The district had recently experienced the run of the Panther fire in early October. The Panther fire made a major run under a wind event, running almost 12 miles in 6 hours, burning over 13,000 acres. This was in the back of their minds when declaring the escape on this prescribed burn.

4. Were overall policy, guidance, and procedures relating to prescribed fire operations adequate?

- The policy, guidance and procedures relating to prescribed fire operations were marginally adequate. In the discussion with people involved on the project, some points were made about things that could be improved on. These include:
    - Implementers need to be involved in project design and layout.
    - The NEPA documentation was old and may have set some resource objectives that were not achievable (e.g. maintaining 90% of the overstory trees).
    - The piles were a surprise to some who were involved with the burn and likely contributed to the spotting problems.

5. What was the level of awareness and the understanding of the personnel involved, in regard to procedures and guidance.

- The conditions at the site were relatively mild, 35% slope, the windspeed was within parameters however, the wind direction did not meet the overly restrictive requirement in the burn plan. Only one week before lighting Greenthin, the District shut down a Rx burn because it would not meet objectives due to being too cool. This may have led to a complacent attitude among some of the personnel since conditions had been so mild that they were not anticipating a significant potential for an escape.
- There were several split missions that may have caused some distractions.
    1. District resources were dispatched to three other incidents during the day of the burn. These occupied the Duty Officer and some of the resources at the burn. (Car accident with helicopter medivac, smoke check, and structure fire that pulled an engine off the burn).
    2. The assigned Holding Boss was involved in one of the morning dispatches and a substitute Holding Boss was assigned until the Holding Boss returned.
    3. The person who had retained Duty Officer responsibilities for the day also got involved in the burn as the FIRB for a period of time without relinquishing the Duty Officer responsibilities.
- The focus of some resources assigned to the burn was distracted by other IA assignments.

Review Questions (from FSM 5140)

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

Seasonal Severity: The Palmer drought index shows the area in a moderate to severe drought. During the time of ignition people made the comments that the unit was "crunchy" and the punky logs extremely receptive to embers.

The first question on the Go/No Go Checklist is "Has the burn unit experienced unusual drought conditions or does it contain above normal fuel loadings which were not considered in the prescription development?" This item was checked yes. The prescription development did not include consideration for drought, particularly in the number of resources designated for holding.

Weather events: There was a change in weather from high pressure to be replaced by cool, wet weather systems. This change in weather conditions lead to an increase in winds for Thursday, Thursday night and Friday.

On site conditions were within prescription parameters with the exception of wind direction as discussed above.

2. An analysis of the actions taken leading up to the wildfire declaration to determine consistency with the prescribed fire burn plan.

The District Ranger was on scene of the burn and slop-over. The Ranger, in consultation with available fire staff. declared the burn an escaped wildfire based on perceived values at risk, the crossing of the Oregon State line by the fire, review of the spot weather forecast and their experience with the unprecedented run made by the Panther Fire on four weeks prior.

3. An analysis of the prescribed fire burn plan for consistency with policy.

The burn plan was mostly consistent with policy, and there are some areas that could be improved upon to assist their decision making and broaden the prescribed fire window such as:

- Wind direction should be a range, not just north or south.
- Limit the use of restrictive phrases, such as ""The burn plan will not be implemented should any adverse weather events be predicted that would exceed prescription parameters or threaten burn plan objectives." Given our ability to

predict weather several days in advance, this statement could restrict ever burning before a predicted storm with storm winds in excess of the prescription.

- Use the correct cover page, have signatures be from people currently on the unit, show signature date and add extra lines if necessary to accommodate more reviewers.
- Sign and date burn plan with current signatures.
- Contingency modeling should reflect hot end.
- Fuels conditions write up should reflect the actual condition on the ground: correct fuel model, tree species.
- Objectives need to be realistic.

4. An analysis of the prescribed fire prescription and consistency with on-site measured prescription parameters.

They were in prescription with the burn plan except for wind direction. The burn plan states the wind direction is from the south on the hot end and the north on the cool end. The wind direction when they were burning was from the NE to SE. The spot was calling for S to SSW wind direction.

5. A review of the approving line officer's qualifications, experience and involvement.

The line officer (Deputy District Ranger) that signed the agency administrator "go/ no go" was qualified to sign. However, he was on annual leave the day of the burn and the day of the escape. The District Ranger was present on the day of the burn for 1-2 hours and was on scene when the escape was declared. The District Ranger is working to obtain qualifications to sign burn plans.

6. A review of the qualifications and experience of key personnel involved. (Added by Team: How well did they work together?)

The key personnel on the burn were qualified for their positions. After reviewing their IQCS profiles, they are consistent with policy.

During the review of the prescribed burn and escape there were comments made about the various conversations that took place among the crews. Comments were made about "sucking smoke", "Swiss-cheese model", lack of knowledge of water sources, high winds at the tree top level, and confusion on the location of the burn. There were issues discussed and brought up at the crew level, but never made it to the overhead. Overall the group worked well together. They dealt with several waves of spots and other staffing issues that caused the group to rethink the plan.

7. A summary of casual agents contributing to the wildfire declaration.

Causal agents for the Greenthin wildfire can be attributed to several factors. The winds on the prescribed fire were high enough to result in spotting into a receptive fuel bed during ignition. Winds for the evening were predicted to increase and there was no plan in place to staff the burn that evening. Ignition of the unit had not been completed and staffing for the evening did not comply with the holding plan. The post ignition staffing guide was used and was insufficient for expected fire behavior.

The mental slides were "We always go home at night after a prescribed fire." Conditions that night warranted a holding crew. The fact there were any resources there was due to a crew wanting to stay overnight to avoid travel times to and from the unit.

Another contributing factor was the piles in the unit. Although the burn plan mentioned the piles, there was no plan to deal with them prior to ignition. Heavy concentrations of fuel close to the line can contribute to spotting, particularly in high winds with a receptive fuel bed across the line.

8. An evaluation of the appropriateness of declaring the Greenthin underburn a wildfire.

Based on the knowledge they had and being on scene, declaring the Greenthin underburn a wildfire was appropriate in the minds of the Ranger and burn staff. There may have been an opportunity to wait awhile (several hours) before declaring the escape in order to validate the weather in the spot forecast, the size of the slop-over and the expected fire behavior. FSM 5140 purposely allows discretion in declaring a prescribed burn a wildfire. "A prescribed fire must be declared a wildfire when the fire has spread outside the project boundary, or is likely to do so, and cannot be contained by the end of the next burning period." A decision not to declare Greenthin a wildfire would have also been appropriate. Some forest personnel believed jurisdictional boundaries were important in making the decision, however, that is irrelevant in making a wildfire determination.