

Greer WUI Prescribed Fire Lessons Learned Analysis

**Apache-Sitgreaves National Forests
December 7, 2010**



**Springerville Ranger District
Springerville, Arizona**

Table of Contents

EXECUTIVE SUMMARY	3
MAP.....	4
INTRODUCTION.....	5
BACKGROUND AND OBJECTIVES	5
Background.....	5
Prescribed fire objectives.....	5
REVIEW PROCESS.....	6
Requirements	6
Review objectives	6
SYNOPSIS OF EVENTS LEADING UP TO WILDFIRE DECLARATION FOR GREER W.U.I. PRESCRIBED FIRE	7
FINDINGS	11
Prescribed fire plan elements, findings, potential contributions, and consistency with policy.....	11
Qualifications and experience of key personnel involved in the prescribed fire	14
Factors contributing to the escape and the wildfire declaration.....	14
Seasonal severity, weather, and on-site conditions leading up to the wildfire declaration	15
Adequacy of the prescribed fire prescription	16
RECOMMENDATIONS.....	17
LESSONS LEARNED.....	17
COMMENDATIONS	18
REFERENCES.....	20

EXECUTIVE SUMMARY



On Thursday October 28, 2010, the Greer Wildland Urban Interface (WUI) Prescribed Fire was ignited north of Greer and west of Springerville, Arizona. Multiple units (Units 2, 3, and 4) within the Greer WUI burn plan were implemented over the next several weeks.

Prescribed fire activities to treat Unit 4 began on November 2 and ceased the afternoon of November 20 when Greer WUI was declared an escape.

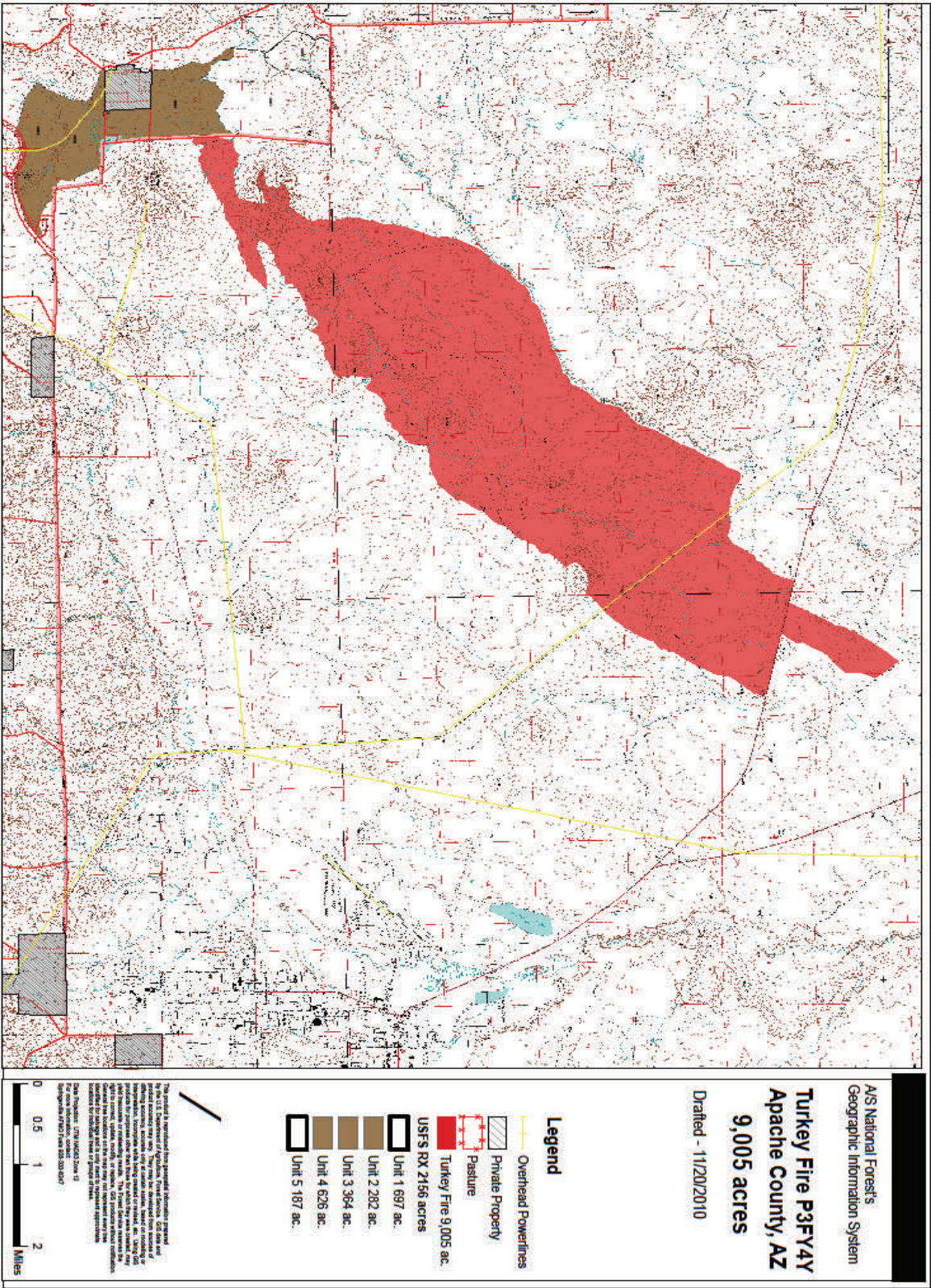
The Forest Supervisor for Apache-Sitgreaves National Forests convened a team to conduct a Lessons Learned Analysis to capture the lessons learned from this event and to address the seven elements identified in the Reviews section of the *Interagency Prescribed Fire Planning and Implementation Procedures Guide (July 2008)*.

The Team identified one factor contributing to the escape of the prescribed fire—the holding plan. There may not have been full recognition of a low probability event, an escape on the east control line of Unit 4 in light flashy fuels.

Recommendations from the Team include:

- Consider efforts to ensure documentation is thorough and complete before, during, and after prescribed fires (daily burn organization, test fire results, and burn boss daily go/no-go checklist).
- Ensure acting district rangers meet minimum qualifications for signature authority.
- Ensure delegations of authorities are in place.
- Ensure fuels adjacent to the project area are fully considered during burn plan development.

Figure 1. Greer WUI Prescribed Fire's Units 2,3 and 4 and Turkey Wildfire Vicinity Map



INTRODUCTION



Apache-Sitgreaves National Forests include five ranger districts in eastern Arizona's White Mountains. Springerville Ranger District is centrally located on the , situated around the town of Springerville, Arizona.

BACKGROUND and OBJECTIVES

Background

The Greer WUI Prescribed Fire project was developed by personnel on the Springerville Ranger District to reduce hazardous fuels and enhance winter wildlife habitat. The prescribed fire planning area encompasses about 29,500 acres of National Forest System (NFS) lands, including NFS lands adjacent to private property.

The Greer WUI burn plan is designed to accomplish objectives stated in the Apache-Sitgreaves National Forest Plan (August 1987, amended July 2006) and complies with best management practices included in the environmental assessments of the Greer Wildand/Urban Interface Fuel Reduction Project (2004), Ranch Interface Thinning/Slash Treatment and Iris Spring Winter Range Restoration Treatment (2002), and the Hay Timber Sale.

Prescribed Fire Objectives

Below is a summary of the prescribed fire goals and objectives identified in the Greer WUI Prescribed Fire Project:

Goals:

- Reduce the threat of uncharacteristic wildfire by reducing accumulations of hazardous fuels using best management practices.
- Enhance wildlife habitat and browse species.
- Maintain meadows and grassland areas.
- Reintroduce fire into the ecosystem on natural intervals. Move the project area from Condition Class 3 toward Condition Class 1.

Resource objectives:

- Reduce ground fuels and piles.
- Reduce ground fuel loadings and eliminate small tress and seedlings encroaching on grassland areas.
- Maintain ground cover in riparian areas and steeper slopes.

Specific goals and objectives are available in the Greer WUI Prescribed Fire Plan.

REVIEW PROCESS

Requirements

Forest Service Manual 5140.42 (Forest Service, 2008) states that forest supervisors are responsible for “*conducting reviews of all prescribed fires that are converted to wildfire status,*” and for “*reporting the review results to the Regional Forester within 60 days after the prescribed fire was declared a wildfire.*” The goal of this requirement is to guide future program actions by minimizing future resource damage and/or preventing future escape from occurring by gathering knowledge and insight for incorporation into resource management and prescribed fire planning.

Consistent with this requirement, the Apache-Sitgreaves convened a team to conduct a Lessons Learned Analysis of the Greer WUI Prescribed Fire escape, and to address the seven elements in the Declared Wildfire Reviews section in the *Interagency Prescribed Fire Planning and Procedures Guide (July 2008)*. Members of this 3-person team are listed below:

Bea Day	Team Leader	Forest Fire Management Officer Cibola National Forest and Grasslands Albuquerque, NM
Emily Irwin	Team Member	Assistant Director, Fuels and Fire Ecology Southwestern Region Albuquerque, NM
Sharma Hutchinson	Team Member	Information Assistant Gila National Forest Reserve, NM

The Team received an inbriefing and delegation of authority on December 7, 2010. On December 8 –9, 2010, the Team met with key Forest and District personnel and discussed project planning and decision-making processes and reviewed materials relevant to implementation of Greer WUI. The Team accompanied District personnel to the burn site where the escape occurred.

Lesson Learned Analysis Objectives

The objectives of the Lessons Learned Analysis were developed from: guidance in the Forest Supervisor’s Delegation of Authority to the Team Leader, FSM 5100, Chapter 5140 (Forest Service 2008), the Lessons Learned Template, and the *Interagency Prescribed Fire Planning and Implementation Procedures Guide (July 2008)*.

These objectives were to:

- Use mindful processes and protocols to identify and document factors (environmental, human, administrative, etc.) that contributed directly or indirectly to the escape and the lessons learned.
- Promote a respectful learning culture. Create an environment and opportunity for learning that will benefit all prescribed fire practitioners and line officers by facilitating a pro-active forum for positive discussion and documentation.
- Provide written report for posting on the Lessons Learned Center website in a timely manner. The written document should capture the lessons learned and address the seven elements identified in the *Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide*.

SYNOPSIS OF EVENTS LEADING UP TO THE WILDFIRE DECLARATION FOR THE GREER W.U.I. PRESCRIBED FIRE

The Greer WUI project was planned and implemented in several phases that included a mechanical component and prescribed fire application. Over the course of several years, portions of the unit were thinned and piled. Adjacent to the private land, thinning and chipping occurred. The chipping operation resulted in a residual fuelbed of chips 3”-6” deep. Once mechanical treatments were completed, the follow-up prescribed fire application was planned and implemented.

The Greer WUI prescribed fire units north of State Hwy 260 are divided into five units. (*Refer to the map on Page 8.*) The original plan was to treat the north units first and work south toward Highway 260. Resource concerns altered this plan and Unit 3 was identified to treat first. Implementation of Unit 3 successfully occurred between October 28-31, 2010. During this timeframe, a strong wind event surfaced in the project vicinity (35 m.p.h. SW winds), which was described as “nerve wracking.” The Burn Boss felt the organization was spread a little thin. However, no significant control issues occurred during this timeframe.

The next targeted unit for treatment was Unit 2. On November 1, 2010, north winds were predicted, which would potentially result in smoke impacts along Highway 260. Therefore, the decision was made to move to Unit 4. On November 2 and 3, 2010, ignitions occurred south and east of the private land in this unit.

PROJECT MAP

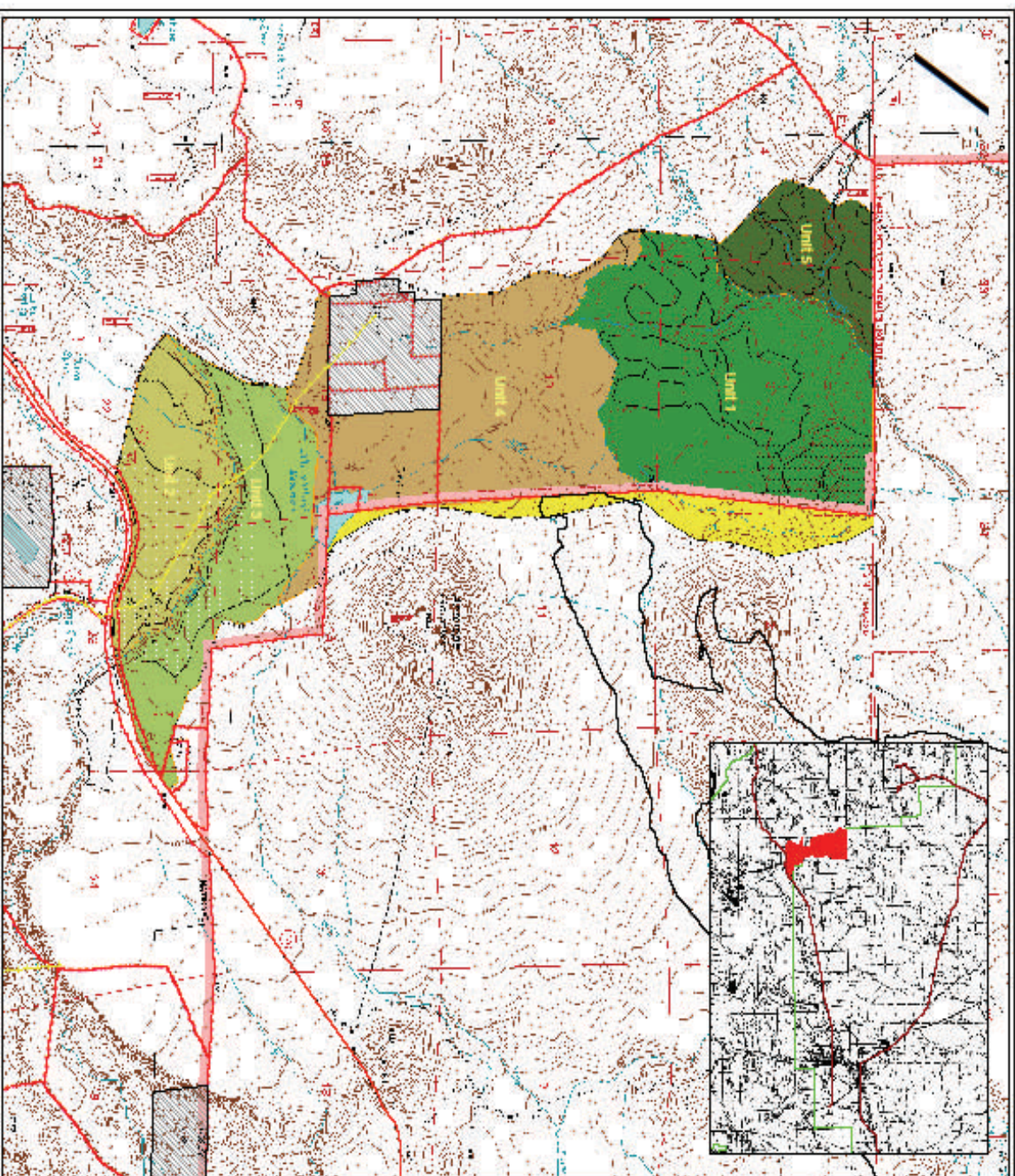
A/B National Forests
Geographic Information System

Greer/Iris

Prescribed Burn

Springerville Ranger District
Apache County, AZ
T 8N R 27E Sec 10

Drafted - 07/17/2009



Legend

- | | Positive | Survey polygon | Private Property | Pasture | Ten 2008 | Ten 2003 | USFS POX 2155 acres | Unit 1 6907 ac. | Unit 2 282 ac. | Unit 3 364 ac. | Unit 4 620 ac. | Unit 5 167 ac. | AZ State POX 154 acres |
|--|----------|----------------|------------------|---------|----------|----------|---------------------|-----------------|----------------|----------------|----------------|----------------|------------------------|
| | | | | | | | | | | | | | |

SYNOPSIS OF EVENTS LEADING UP TO THE WILDFIRE DECLARATION FOR THE GREER W.U.I. PRESCRIBED FIRE

On November 4, 2010, blackline operations were completed on the east side of Unit 4 along the fence line. An agreement with Arizona State Forestry Division was in place that allowed the District to use the 2-track dirt road outside the planned unit as their primary control line. The decision was made not to use this road for several reasons, including that the wooden stays in the fence line needed to be protected, the 2-track road needed improvement, and a stand of timber was adjacent to the road. The 1-day blackline operation (3'-6' blackline in cured grass) was completed without incident.



Fence line on east side of Unit 4 - Unit Boundary

On November 8, 2010, Unit 2 was successfully completed.

On November 9, 2010, the prescribed fire area received a couple inches of snow. Future prescribed operations were questionable.

On November 15, 2010, blackline operations were completed on the northwest corner of Unit 4, along a ditch that was used as a control feature between Units 1 and 4. The blackline operation continued to the drainage (running north and south) and ceased. The burn organization expressed potential holding concerns along this boundary due to activity fuels not treated in Unit 1.

On November 17, 2010, blackline operations continued east of the drainage towards the fence line on the east side of the unit. The fire progressed south in the interior of the unit, and the decision was made to continue ignitions along the east and south sides of the Unit, north of the private property. On November 18, 2010, the far west portion of the Unit was completed without incident. Between the drainage to the road, ignitions on Unit 4 were completed.

SYNOPSIS OF EVENTS LEADING UP TO THE WILDFIRE DECLARATION FOR THE GREER W.U.I. PRESCRIBED FIRE



On November 19, 2010, patrol and mop up occurred on Units 2, 3, and 4. Prior to the end of the operational period, the Burn Boss and Burn Boss Trainee discussed staffing for Saturday, November 20. The decision was to have one Type 6 engine with two personnel on scene prior to the burn period. This decision was based on two factors: probability of ignition for the next burn period and observed residual smoke. At the time this decision was made, smoke was visible adjacent to private property and the north side of the Unit adjacent to the ditch. No residual smoke was observed on the east perimeter of Unit 4. Mop-up and patrol priorities were established and communicated. The priorities were to mop up and patrol adjacent to the private property and the north boundary of Unit 4 along the ditch.

SYNOPSIS OF EVENTS LEADING UP TO THE WILDFIRE DECLARATION FOR THE GREER W.U.I. PRESCRIBED FIRE

On November 20, 2010, at approximately 1130 hours, the patrol engine arrived on the burn. At about 1230 hours, personnel were on the east side of Unit 4 checking the fence line to ensure the boundary was secure. On site personnel noted it was windy and estimated winds to be steady out of the southwest at about 20 m.p.h. As the patrol moved north along the fence line, they observed heat (a single wispy smoke) underneath a single ponderosa pine tree, about a half-chain in from the fence line in the black. The decision was made to not mop up this heat



source. This decision was based on experience and perceived lack of threat across the unit boundary. The patrol unit continued around to the north boundary, patrolled along the ditch, and ended up at the private property.

Within the hour, the patrol unit began receiving text messages and voicemails inquiring about a large volume of smoke visible from Springerville east of the burn unit. Discussion ensued between the Duty Officer and the patrol unit on the location, wondering if the smoke was a result of a new start or someone else's burn. The patrol unit responded to the east side of Unit 4 and discovered that prescribed fire was established outside Unit 4. On scene personnel protected the origin of the escape and ordered resources.

Greer WUI Prescribed Fire was declared escaped at approximately 1330 hours on November 20, 2010, and renamed Turkey Wildfire.

Law enforcement investigation concluded the escape originated from a heat source underneath a single pine tree (*pictured above*).

FINDINGS

Prescribed fire plan elements, findings, potential contributions, and consistency with policy.

PREScribed FIRE PLAN ELEMENTS:	COMMENTS/FINDINGS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
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Signature page

The District Ranger approved the Greer WUI Prescribed Fire Burn Plan in July 2008. A letter from the Washington Office (*File Code 5150-2; Subject: The Prescribed Fire Planning and Implementation Procedures Guide: Updated and Signed*) was issued on October 27, 2008. The letter states under Line Officer approval/re-certification: *"All burn plans must be reviewed and updated if necessary to comply with new policy or procedures, and re-authorized if more than one year has elapsed since initial approval."* Re-authorization of the Greer WUI Prescribed Fire Burn Plan is not documented on the signature page. * Need W.O. clarification whether the letter is still current.

NO

In FSM 5140.42, forest supervisors are responsible for approving or rejecting prescribed fire burn plans and delegating this authority to district rangers on the basis of qualifications, experience, and demonstrated ability. A generic delegation letter from the Forest Supervisor was signed in 2008; however, the letter did not specify a name to whom it was addressed. During implementation of the Greer WUI Prescribed Burn, an acting district ranger signed the Agency Administrator Pre-Ignition Go/No-Go Approval Checklist. This authority was never formally delegated in writing.

PRESCRIBED FIRE PLAN ELEMENTS:	COMMENTS/FINDINGS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
Agency Administrator Pre-Ignition Go/ No-Go Approval Checklist	The Agency Administrator Go/No-Go Pre-Ignition Approval Checklist was completed daily. However, documentation of the Go/No-Go approval was completed on an obsolete form.	NO
Prescribed Fire GO/NO GO Checklist	The Prescribed Fire Go/No-Go Checklist must be completed for each day of active ignition on a prescribed fire. The only documented Go/No-Go checklist available in the project record was dated October 28, 2010.	NO
Complexity Analysis Summary	The Prescribed Fire Complexity Rating System Guide (2004) was completed for the Greer WUI Burn Plan. The Complexity Analysis Summary was approved and appears to be adequate for the project.	NO
Description of Prescribed Fire Area	Good description but the burn plan did not address in sufficient depth the different fuel types outside the burn area. On-site leadership understood the challenges of containing a slop-over or spot fire if it became established east of the unit, in continuous cured grass. On November 4, 2010, a 3'-6' blackline was burned along the east boundary to reduce this risk and protect the fence line (wood stays).	NO
Objectives	Good objectives in well-stated measurable terms, which tied back to best management practices identified in the environmental analysis.	NO
Funding	Partnership funding was used for this project. Funding was adequate.	NO
Prescription	Associated fire behavior outside of the burn unit (rate of spread) in cured grass was not fully considered.	NO
Scheduling	Detailed information provided regarding scheduling of burn windows to address resource concerns. The plan allowed for maximum flexibility relative to seasonality if test fire results suggested burn objectives would be achieved.	NO
Pre-Burn Considerations	The burn boss and burn organization had adequate time to scout the units and mitigate concerns associated with values at risk inside the units. Spot weather forecasts were submitted and the burn organization was aware of a strong system approaching the project vicinity over the next 72 hours.	NO

PRESCRIBED FIRE PLAN ELEMENTS:		COMMENTS/FINDINGS	DID THIS PLAY A ROLE IN ESCAPED FIRE?
Briefing	Adequate		NO
Organization and equipment	The burn organization was based on probability of ignition and wind speeds. There was no discussion of minimum burn organization based on expected fire behavior and production rates of resources. Before implementation (all phases) of the prescribed fire, documentation in the form of an organization chart must be completed. The organization was not documented daily.		NO
Communication	Adequate for the project		NO
Public, personal safety, and medical procedures	Firefighter and public safety adequately covered.		NO
Test fire	Test fire was conducted on November 18 and documented in the unit log. However, the results of the test fire were not documented.		NO
Ignition plan	Adequate		NO
Holding plan	Minimum organization was not identified in the burn plan based on expected fire behavior and production rates. The escape occurred on the east side of Unit 4 under the influence of strong winds. Mop up and patrol priorities were west and north sides of the unit. The east side was unstaffed.		YES
Contingency Plan	Minimum contingency organization was identified based on probability of ignition and wind, but did not address needed production rates based on expected fire behavior. Burn boss had flexibility to step down contingency.		NO
Wildfire Conversion	This element was clear and followed as described in the Burn Plan.		NO
Smoke Management and Air Quality	This section addressed compliance needs with Arizona Department of Environmental Quality, smoke-sensitive areas, and mitigation strategies to reduce smoke impacts.		NO
Monitoring	Adequate		NO
Post-Burn Activities	Adequate		NO

Qualifications and Experience of Key Personnel Involved in the Prescribed Fire

Below are key fireline leadership personnel involved in the Greer WUI Prescribed Fire project. All fireline personnel were qualified to serve in the positions identified below.

Position	Qualification Date	Meets Requirements	Other Qualifications
Burn Boss Type 2	RXB2 - September 2002	Yes	RXB1, ICT3, FIRB, FALC, FELB, RXM2, SOPL, STCR, STEN
Burn Boss Type 2	RXB2 - December 2004	Yes	DOZB, ENGB, FALB, FEMO, FIRB, ICT4, TFLD
Burn Boss Type 2 Trainee	RXB2(t) - Task Book Activated August 2010	Yes	ENGB, FALB, FEMO, FIRB, ICT4, RXB3,
Holding Specialist Single Resource	TFLD - June 2008	Yes	DOZB, ENGB, FALC, FIRB, ICT4, RXB2
Holding Specialist Single Resource	ENGB - June 2003	Yes	DOZB, FALC, FIRB, ICT4, RXB2
Holding Specialist Single Resource	ENGB - June 2008	Yes	DOZB, FALC, ICT5,
Firing Boss Trainee	FIRB - Task Book Activated May 2010	Yes	ENGB, FALC, ICT5, RXCM,
Firing Boss Trainee	FIRB - Task Book Activated May 2009	Yes	DOZB, ENGB, FALC, ICT5

The district ranger who approved the Greer WUI Prescribed Fire Burn Plan was qualified and is actively engaged in the District's fire management program. The ranger met the intent of FSM 5140 relative to experience, skills, and knowledge. The ranger completed the Fire Management Leadership for Local Agency Administrators course in 2007. The acting district ranger who signed some of the daily Agency Administrator Go/No-Go approvals was not qualified. The acting ranger does not have record of completing a Fire Management Leadership course.

Factors Contributing to the Escape and the Wildfire Declaration:

Based on discussions and reviewing the Burn Plan, the Team found one contributing factor that resulted in the escape, the holding plan.

Holding Plan: Based on experience, observed smoke, and forecasted weather, the appropriate level of staffing was determined on Friday for Saturday's operations. This discussion met the intent of the burn plan. Patrol priorities were established adjacent to the private property and the north control line in Unit 4.

When implementing prescribed fire across multiple units or in a large burn block with a strong weather system forecasted, consider additional personnel on the downwind side for patrol and mop up.

Seasonal Severity, Weather, and On-Site Conditions Leading Up to the Wildfire

Seasonal Severity—The 2010 summer monsoon season was robust and produced an abundant crop of fine fuels. October saw an average high temperature of 1-4 degrees below average for the northwest third to half of Arizona. The latest Climate Prediction Center climate outlook for November indicated a high likelihood for above normal temperatures areawide.

The Greer WUI Prescribed Fire is located within Fire Weather Forecast Zone 114, which is forecasted from the Flagstaff, Arizona, office of the National Weather Service. For the Greer WUI Prescribed Fire, one remote automated weather station (RAWS) was monitored to track fire danger and potential fire severity, Greer 020404.

Spot Weather Forecasts— The Flagstaff National Weather Service Office issued Wednesday November 17, 2010.

Discussion: Expect near to above normal daytime temperatures, mostly clear skies, and generally light winds through Thursday. Winds will increase Friday and especially Saturday in advance of a strong trough with cooler temperatures, and changes for precipitation join the gusty winds later this weekend and early next week.

National Weather Service Forecasts (Spot Weather Forecasts):

- **Issued 1151AM MST 11/17/10 (FWF)** -The FWF for Wednesday , November 17, was for minimum RH values between 18% to 30% and for light variable upslope winds around 3 to 7 m.p.h. Light winds were forecasted for Wednesday night.
- **Issued 940 AM MST 11/18/10 (FWF)** -The FWF for Thursday, November 18, was for minimum RH values between 15% and 18% and for a north wind 1 –2 m.p.h. with gusts to 5 m.p.h. Increasing southwesterly winds and upper-level cloud cover will develop Friday as a Pacific storm system approaches. The storm will bring strong and gusty southwesterly winds along with much cooler temperatures and chances for showers beginning late Saturday and continuing into early next week.

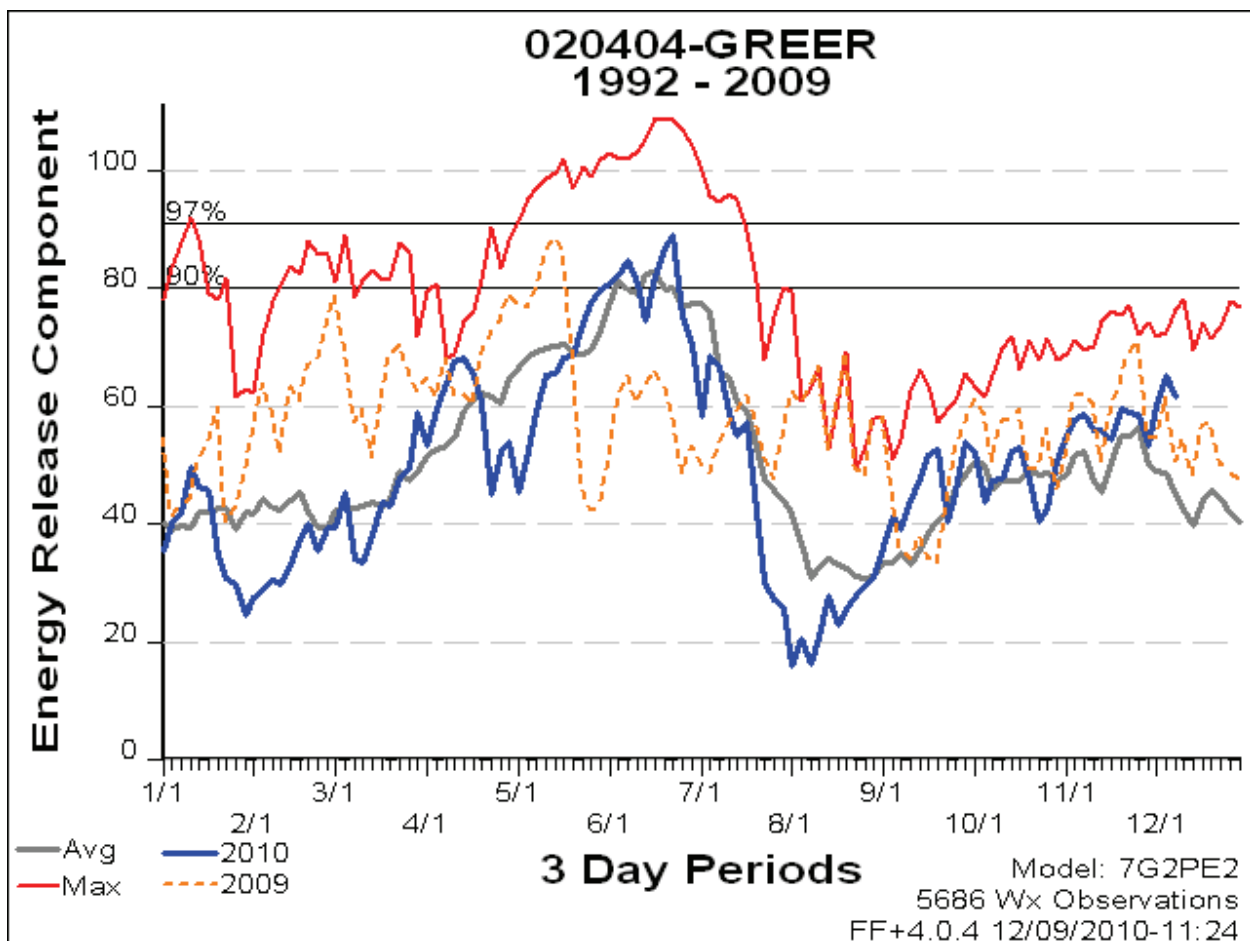
Environmental parameters identified in the spot weather forecast were within the prescription developed in the Greer WUI Prescribed Fire Burn Plan.

Energy Release Component

The National Fire Danger Rating System (NFDRS) index used to track the combined effects of fuel dryness on fire potential is called the Energy Release Component (ERC). The following table displays current ERCs and compares them to historic readings.

The 2010 ERC table from the Greer Weather Station (represented by the blue line) indicates that conditions in mid-November were between average and maximum ranges for this time period.

In summary, for the days leading up to the escape, the spot weather forecasts and environmental conditions were within the parameters identified in the Greer WUI Prescribed Fire burn prescription. Because the escape did not occur during ignitions, further analysis of the fire behavior outputs were not fully analyzed.



Adequacy of the Prescribed Fire Prescription

The escape occurred during the patrol and mop-up phase of the prescribed burn. Weather and environmental conditions were within the prescribed fire prescription in the burn plan. Further analysis of the burn prescription elements was not done because they did not directly contribute to the escape.

RECOMMENDATIONS

- **Burn Plan development -**
 - For Agency Administrator GO/NO-GO documentation use the checklist in the Interagency Prescribed Fire Planning and Procedures Guide (July 2008).
 - Discuss spread potential for fuels outside of the planned unit.
 - Identify minimum burn organization in the burn plan for all phases of implementation.
 - Use production rates to determine resources needed for all phases of implementation and contingency planning.
 - Consider efforts to ensure documentation is thorough and complete pre, during, and post prescribed fires (daily burn organization, test fire results, and Burn Boss daily Go/NO-GO Checklist). Such documentation facilitates process improvements in a prescribed fire program.
 - Current line officer signature to re-authorize and validate the burn plan is current.
- **Position Qualifications -**
 - Ensure Acting District Rangers meet minimum qualifications for signatory authority.
- **Delegations of Authority -**
 - FSM 5140 requires the Forest Supervisor to delegate approval authority to district rangers. It was unclear if the delegations are current because they were not addressed to an individual.
 - Forest Supervisor should specifically delegate authority to rangers and key acting's for signature on levels of complexity (Type 1 or Type 2).

LESSONS LEARNED

Participants in the Lessons Learned Analysis identified the following lessons:

- Participants did not believe grass would hold heat (approximately 2 days).
- Consider wind direction in developing patrol priorities.
- Fuels east of Unit 4 and within the burn unit adjacent to the fence line were grass. The grass fuel model may have deceived the burn organization into believing the prescribed fire could not escape. Identify *“where you don’t think it will happen,”* because that is where it will.
- Participants caution that what we believe *“can’t happen”* or *“won’t happen”* can and will happen.

COMMENDATIONS

General - The Team could not have completed the assigned task without significant support from Apache-Sitgreaves NFs and Springerville RD personnel. The Team thanks all individuals who openly and honestly discussed what they learned and the rationale behind their decision-making on the Greer WUI Prescribed Fire.

Pre-burn Preparations— Key resource staff including the District Ranger made multiple site visits to the burn unit to better understand the challenges and benefits associated with implementing this project. Burn personnel acknowledged they were fully supported to take the time needed to ensure they knew the burn units, implement mitigation measures prior to ignition, and understood the intent of the burn plan.

District Leadership — The burn organization recognizes the Ranger’s support of the District’s prescribed fire program. The Ranger “*does not apologize for smoke and explains the prescribed fire program*” to ensure the public is properly informed on prescribed fire. The Ranger believes the project is not complete “*until the broadcast burning is done.*” The burn organization’s anxiety was lessened when the District Ranger clearly articulated it was his responsibility to address the political climate.

Burn Boss (T) - The Burn Boss Trainee was recognized by peers for “*being patient when needed,*” “*being flexible,*” and making good decisions anticipating the future and assessing current information. An example cited was discussion to burn an additional unit on Friday, November 19. The Burn Boss Trainee listened to the burn organization’s input, then chose not to enter a new unit based on forecasted weather, the upcoming weekend, and the upcoming holiday. This decision was respected.

High Reliability Organization Principles — The District fire management program recognized the need to be resilient. They approached the Lessons Learned Analysis as a means to improve their program locally and share the lessons learned with the wildland fire community. District personnel routinely challenge “group think,” and have fostered an environment to openly contribute thoughts and ideas.