# HOMESTEAD PARK II ESCAPED PRESCRIBED FIRE

# REVIEW

May 12, 2006

## Shoshone National Forest

### Washakie Ranger District

### Lander, Wyoming

Cabin #35, looking south.
*Photo by Clint Dawson, Shoshone NF*

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# EXECUTIVE SUMMARY

On April 10, 2006, a U.S. Forest Service prescribed fire near the town of Lander, Wyoming, escaped, resulting in the loss of four private cabins, a pick-up camper, at least one outbuilding, and miscellaneous other private property. The fire also burned onto federal land that was not to have been treated.

The Homestead Park II Prescribed Fire and the subsequent escaped prescribed fire were immediately adjacent to the Forest boundary and were managed by the Washakie Ranger District of the Shoshone National Forest, in the Rocky Mountain Region of the U.S. Forest Service. Originally the fire was planned to treat up to 153 acres of hazardous fuels on National Forest land; a total of 188 acres burned, including those outside the intended treatment area.

The Deputy Regional Forester of Resources convened a team of six people, including State of Wyoming, Fremont County, and U.S. Forest Service employees, to conduct a review and investigation into the key causal factors for this escaped prescribed fire. The Review Team visited the site, interviewed numerous involved Forest fire and management personnel, met with affected landowners, reviewed photographs of pre- and post-fire conditions, and examined the written record of events and actions leading up to and immediately following the escape.

The Review Team found that the prescribed fire escaped during mop-up operations the day after completion of burning operations. The principal causal factors of the escape stemmed from an underestimation of the complexity of burning so close to private property and structures, and from a mistaken determination by the assigned fire personnel that, upon completion of firing operations, the burned area posed little or no remaining risk to adjacent private land and structures.

High winds did contribute to the spread of the fire outside the intended perimeter. These winds were not addressed in the spot weather forecast obtained for the firing operations but were included in forecasts that became available after all ignition operations were completed.

A Prescribed Fire Burn Plan was prepared but the Burn Plan did not sufficiently address the complexities of the prescribed fire. Two aspects of the Burn Plan were not followed: the positioning of engines near the private structures during ignition phases, and cold-trailing the black line relied on to prevent fire spread onto private land. The failure to position engines and staff close to the structures had no direct effect on the escape of the fire, as the escape did not occur until the following day—when this Burn Plan requirement was no longer in effect. Not cold-trailing the black line quite likely had a direct effect, however, on the escape.

# BACKGROUND

The Washakie Ranger District is one of five Ranger Districts in the Shoshone National Forest east of Lander, Wyoming, in Fremont County, northwestern Wyoming. The Ranger District manages 322,107 acres of the 2,466,097-acre Shoshone NF, which extends from the Montana border to the center of Wyoming.

Prescribed fire has been an important tool in the management of the Forest since the mid-1990s, for maintaining the ecosystem, improving wildlife habitat, grazing livestock, and reducing hazardous fuels. The Washakie RD Homestead Park II Fuels Reduction Project, about 6 miles south-southwest of Lander, Fremont County, Wyoming, was designed to address concerns identified through collaborative efforts between Homestead Park Subdivision property owners and state and federal agencies during the fall of 2002 and summer of 2003.

The prescribed fire was one of several fuels reduction actions included in the overall Homestead Park II Fuels Reduction Project that was approved January 31, 2005. Other actions included commercial timber harvest, precommercial thinning, and other mechanical removal of conifers from aspen stands. The Homestead Park II Project totals 553 acres of mechanical and fire treatments.

The overriding reason for the Homestead Park II Fuels Reduction Project was to respond to the increasing wildfire risk that could threaten life, property, and resource value, and to increase the defensible space near private property and structures. The Decision Memo for the fuels reduction project (January 2005) identifies the risk of wildfire being driven by prevalent winds from National Forest to private land in the area, citing the nearby 2002 Pass Creek Fire—which burned more than 13,000 acres—as an example of the risk posed.

The Decision Memo states, "The primary purpose of the project is to change the vegetative condition class such that wildfire severity is reduce [sic] to a level where suppression activities may be safely and successfully applied." Section 2.01-Project Goal, of the Burn Plan, states, "The primary goal of the Homestead Park Fuels Reduction Project is to create fuel breaks and improve defensible space adjacent to the Homestead Park Subdivision." Specific resource objectives in the Burn Plan include reducing dead fuels; consuming duff; scorching and killing sagebrush; and scorching and killing encroaching limber pine, juniper, and Douglas-fir.

## BASIS FOR THE REVIEW

On Sunday, April 9, 2006, the Shoshone NF ignited one burn unit, totaling 157 acres. By afternoon, the crew began mop-up operations. In the evening, firefighters left the site.

On Monday, April 10, firefighters returned. The crew later declared an escaped prescribed fire. The escaped fire burned 188 acres, of which 123 were on the Shoshone NF, 5 on BLM land, and 60 on private land. Damage included the loss of four summer cabins/homes, a pick-up camper, and various other property.

The Deputy Regional Forester of Resources convened a team to conduct an independent review of the situation, because of the amount of property damage.

## PURPOSE OF THE REVIEW

- Help prevent future escapes.
- Establish accountability.
- Determine if the Prescribed Fire Burn Plan was adequate.
- Determine if the prescription, actions, and procedures set forth in the Prescribed Fire Burn Plan were followed.
- Determine if overall policy, guidance, and procedures relating to prescribed fire operations are adequate.
- Determine the level of awareness and understanding of procedures and guidance of the personnel involved.
- Determine the extent of prescribed fire training and experience of personnel involved.

In accordance with FSM 1416, the team was directed to analyze the following seven elements, to meet the purpose of the review.

1. Causal agents contributing to the wildfire declaration.

2. Seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.

3. The actions taken leading up to the wildfire declaration, for consistency with the Prescribed Fire Burn Plan.

4. The Prescribed Fire Burn Plan, for consistency with policy.

5. The prescribed fire prescription and associated environmental parameters.

6. The approving line officer's qualifications, experience, and involvement.

7. The qualifications and experience of key personnel involved.

## PROCESS

The Review Team spent April 17–21, 2006, on the Shoshone NF, Washakie RD, interviewing key personnel, researching, examining decision-making processes, and reviewing all materials relevant to the Homestead Park II Prescribed Fire.

The team reviewed project files, NEPA documents, relevant policy documents, and personnel fire-qualifications records. In addition, the team interviewed a number of personnel involved with the burning operation.

The review process included review and/or analysis of:

- The NEPA documentation for the project.

- Weather and on-site conditions leading up to the escape.

- Forest policy regarding prescribed fire program elements.

- The qualifications of personnel involved.

- The Prescribed Fire Burn Plan, for consistency with policy.

- The actions leading up to the escaped fire, for consistency with the Prescribed Fire Burn Plan, including causal agents contributing to the escaped fire.

- Suppression actions after the fire escaped.

The team also met with residents of Homestead Park Subdivision, to gain insight into the history and physical setting related to the integrated fuels reduction project and the escaped prescribed fire.

## The Review Team

| | | | |
|---|---|---|---|
| Mark Stiles | Team Leader | Forest Supervisor/ BLM Center Manager | USDA Forest Service and USDI Bureau of Land Management, San Juan Public Lands Center Durango, Colorado |
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# RESULTS OF THE REVIEW

## Introduction

The results of the review include a brief fire narrative or timeline, and the Review Team's findings for each of the seven assigned elements of the review. In preparing this report, the Team attempted to focus on findings that were considered significant contributing factors to the escape of the prescribed fire and the ultimate loss of private property.

In general, the information under each element of the review presented below is organized by leading with a finding and following with supporting discussion and background information. Recommendations have been summarized in a separate section that follows the element-by-element review.

## Fire Narrative

**Friday, March 31, 2006**

- Fuel moisture determined on-site, using electronic fuel moisture probe.

**Tuesday, April 4, 2006**

- Attempt to conduct prescribed burn black-lining.
- Test burn ignited.
- Fire activity too great to proceed with prescribed burn.
- Fire extinguished.

**Saturday, April 8, 2006**

- 2nd attempt to conduct prescribed burn black-lining.
- Test burn ignited.

- Fire activity and results as desired.
- Black-lining continued.


Photo 1: Black-lining along the Forest boundary, Saturday, April 8, 2006.
*Photo by Jay Slagowski, Shoshone NF.*

**Sunday, April 9, 2006**

- Concluded North Boundary black line and began strip burning.
- Continued strip burning of the unit to 1300 hrs.
- Burning operations completed.
- Worked on hotter sections of burn.
- Last resources departed by 2000 hrs.


Photo 2: Forest boundary at the end of ignition on Sunday, April 9, 2006. Cabin #35 is visible on the horizon, right of center.
*Photo by Jay Slagowski, Shoshone NF.*

**Monday, April 10, 2006**

- 0912 hrs. mop-up crew arrives at the project.
- No smoke visible on east project boundary.
- Northwest corner identified as priority.
- Crew noticed winds increasing about 1030 hrs.
- 1045 hrs. Burn Boss contacted crew via radio.
- On-site weather reading taken for spot weather request.
- Eye-level wind speeds recorded at 15–20 mph.
- 1125 hrs. a small group of trees torched and short crown run west of Rock scree near the north edge of project area. The hose lay was charged.
- 1140 hrs. Additional resources ordered.
- 1200 hrs. Two additional engines arrive.
- 1230 hrs. Fire reported beyond northeast project boundary.
- 1245 hrs. Spot fire occurred south of cabin #35 and initiated a rapid run upslope and east of the structure. Shortly after, another upslope fire run brought fire to the west side of cabin #35. This west fire run caused a rapid retreat to a safety zone by personnel who had been wetting down the area.
- 1253 hrs. County fire resources dispatched.
- 1300 to 1315 hrs. Cabin #35 was on fire, fire in tree crowns east of cabin #35.
- 1400 hrs. County fire resources and hand crew arrive on scene.
- 1445 hrs. Unified command formed with USFS and Fremont County Fire, applied full suppression efforts on fire, and structural protection deployed at cabin #10.
- 1600 hrs. Spot fire ½ mile northeast of main fire identified and suppressed.
- 1700 hrs. Fremont County dozer builds fire line on northeast portion of fire.
- 1900 hrs. Winds moderate and relative humidity rises to 51 %.

Photo 3: Burned area; the Forest boundary is along the fence line at the upper left.
*Photo by Clint Dawson, Shoshone NF.*

**Tuesday, April 11, 2006**

- Incident Management Team arrives at incident.
- 1800 hrs. IMT takes over management of the incident.
- Fire at 35% containment.

**Wednesday, April 12, 2006**

- Suppression efforts continued

**Thursday, April 13, 2006**

- Fire 100% contained at end of day.

**Friday, April 14, 2006**

- Mop-up activities continue.

**Saturday, April 15, 2006**

- Delegation of authority returned to the local agency administrators.

# Element #1: Key Causal Factors

In the review of the Homestead Park II Escaped Prescribed Fire, the team found that there was a Burn Plan, it met most policy requirements, and it was followed during implementation, with two significant exceptions. Furthermore, personnel involved in developing the Burn Plan and in implementing the prescribed fire were qualified for their roles, as shown in the Incident Qualification and Certification System. All actions taken were within the scope of their duties.

Upon recognition of the fire's escape, the crews on-site took appropriate suppression actions, while ensuring firefighter safety. Additional resources were called before the fire moved outside the burn unit and again after the fire had escaped. The responsible Agency Administrator evaluated the escaped fire's complexity and ordered an appropriate Incident Management Team shortly after the situation was assessed. The Type 2 Incident Management Team took appropriate actions to contain and control the escaped fire.

The Review Team found that the primary causes of the Homestead Park II Escaped Prescribed Fire can be grouped under two general findings:

- The complexity and risk associated with burning on the Forest boundary immediately adjacent to private property and structures were not fully recognized or understood by the people planning and implementing the prescribed fire, and

- Based on their past experiences with similar fires in similar fuel types in the general area, the personnel implementing the prescribed fire mistakenly thought that the burned area posed little or no remaining risk to adjacent private land and structures, following completion of firing operations.

The following discussion presents the specific, key causal factors that fall under these two general findings.

**Preparations were inadequate for protecting the adjacent private land and structures.**

Resources on the burn on Monday morning, before the significant increase in fire activity occurring about 1100–1130 hours, totaled two engines and five personnel. The engines could not access the cabins along the ridge and were available only to provide water for the hose lay. The hose lay was limited to reaching only the west side of cabin #35, the cabin closest to the Forest

boundary; no water-handling apparatus was available to reach any of the other cabins. A single hose lay—that ultimately was burned through—proved to be inadequate. The intense burning in grass and sagebrush could not be suppressed with hand tools alone. Given the remaining suppression options available, there were insufficient personnel to protect even one of the cabins adequately, and none to patrol for and suppress spot fires.

**There was insufficient attention to keeping current with weather forecast updates.**

A spot weather forecast obtained Sunday morning was relied on for weather throughout Sunday and Monday morning. During this period, that spot weather forecast became invalid. The National Weather Service (NWS) recognized Sunday evening and Monday morning that winds would become much stronger than forecast in the Sunday morning spot forecast. Because the Forest Service personnel did not request a weather-forecast update Sunday evening, they were unaware of the impending change in weather and its implications for this fire. FS personnel did not request a weather update until almost noon on Monday, April 10, 2006, and not until they had actually observed a significant increase in wind speed on-site.

**Staffing for mop-up was not commensurate with the risk and complexity of conducting a prescribed burn next to private land and structures.**

It was well known that high winds are common in the general location of the prescribed fire during the spring. Consequently, even if light winds are forecast in the short term, it would be prudent to complete mop-up as rapidly as possible. This is even more critical when prescribed fires are situated immediately adjacent to private land and significant values at risk.

Personnel assigned to the fire did initiate mop-up immediately following the conclusion of Sunday's ignition operations. Mop-up continued Monday morning, but the heavy fuels along the north ridge of the burn area diverted the attention of the mop-up personnel from the interface of National Forest and private land. Had sufficient resources been planned and made available, mop-up of the ridgeline heavy fuels could have been completed, and adequate patrol for spot fires on the flank next to private land could have been accomplished at the same time. The assigned resources were insufficient to complete mop-up rapidly for even a portion of the heavy fuels along the ridgeline, and there were no backup resources available on-site for cabin protection or spot patrol.

**Reconnaissance of the area immediately downwind, most of which was private land containing structures, was insufficient to ensure that values at risk could be protected adequately.**

Apparently Forest Service personnel were unaware of all of the access routes to all of the structures, nor were they aware of the structural-protection resources that would be adequate for the subdivision. Snow drifts limited, or were thought to have limited, access to the upper homes; alternative measures, i.e., the single hose lay, could not protect any of the cabins that ultimately were lost.

Cabin owner accounts of the road conditions on Sunday, and the experiences of suppression resources on Monday afternoon, suggest that engine access to the cabins next to the prescribed fire boundary may have been possible on Sunday and Monday, the day of the escape. Access to the northeastern corner of the prescribed fire on Sunday and Monday morning may have assisted in more efficient mop-up before the escape, but the density of fuels and restricted space in which to operate engines in this area may have posed significant safety concerns, once the fire spotted outside the prescribed fire perimeter.

**There was an over-reliance on the use of black line and wet line, and no use of hand line and cold-trailing.**

Based on observations made as late as Wednesday, April 12th, the black line had residual heat that the wet line had not extinguished. This residual heat is one of the more likely sources of the spot-fire ignition that led to the burning of the cabins. Cold-trailing the black line might have found the residual heat and prevented secondary ignition. A hand line to mineral soil could have served as a safer location for the hose lay, preventing its loss when fire burned through it.

**Mop-up resources arrived too late in the morning on Monday, April 10, 2006.**

Per dispatch records, the mop-up crew of five arrived at the burn unit at 0912 hours. By the time the mop-up boss had completed reconnaissance of the upper portion of the burn (about 1030 hours), winds had already started to increase. Subsequent evaluation of resource needs and ordering were, therefore, delayed and proved to be too late to ensure that enough resources were present when spot fires occurred. Arrival on-scene at 0912 would not be unusual for the low wind conditions forecasted for Monday in the previous day's spot weather forecast. The absence of updated weather information led to managers' assigning the small crew and 0912 arrival at the prescribed fire site. These factors resulted in the mop-up crew's being "behind the power curve" by the time they started working on Monday morning.

# Element #2: Seasonal Severity, Weather, and On-Site Conditions/Physical Factors Leading Up to the Wildfire Declaration

## Seasonal Severity

**Drought and other seasonal-severity factors were not outside average conditions.**

The Team found that weather conditions pertinent to the escape are those of Monday, April 10th, the day of the escape.

## Weather

**High winds not anticipated by the assigned fire personnel carried the fire outside the prescribed burn perimeter to adjacent private land, while on-scene crews were conducting mop-up.**

On Monday, April 10, winds were estimated to be about 15 mph (eye level) by the mop-up boss at about 0915, when he arrived at the bottom of the burn unit (southeast corner). Winds increased during the next two hours. By 1100 the mop-up boss estimated eye-level winds along the northern perimeter ridge to be 15 to 20 mph, with gusts to 30 mph (recorded by a hand-held anemometer). At about the same time, relative humidity was measured using a sling psychrometer and was found to be 22%. (Subsequent analysis of this reading by the Review Team indicated, however, that dew point was read, rather than relative humidity; the real relative humidity was likely 34 %.)

Winds continued to increase Monday morning and were recorded to be 25–30 mph, with gusts to 40 mph at 1130 along the northern-perimeter ridgeline. At 1140, the winds were measured to be 35–40 mph along the NE perimeter of the burn unit. At noon, the burn boss measured

winds to be 50 mph (by a quick look at a hand-held anemometer; not a two-minute average) near the NE corner of the burn unit.

Photo 4: A Douglas-fir that reportedly fell during Monday's wind event, a short distance from the fire.
*Photo by Clint Dawson, Shoshone NF.*

## On-Site Conditions/Physical Factors

**Fuel conditions were not found to be a significant contributing factor.**

Fuels inside the burn unit were dominated by a mixed mosaic of sagebrush and perennial-grass. The area immediately east of the burn unit (private land) was also sagebrush and grass, but much more dominated by sagebrush. The heavier brush component created higher fire intensities on the private land than on the Forest Service burn unit. The north perimeter of the unit and the immediately adjacent area (to the east on private land) was a short-needle mature forest of lodgepole and limber pine, with pockets of heavy dead and down snags. Young-tree encroachment was scattered throughout the sagebrush-grass in the unit interior but was thickest just below the north-perimeter ridgeline.

Fuel moisture was measured with a fuel moisture probe on March 31, 2006 at the top, middle, and bottom of the burn unit. Live-fuel moisture was determined to be about thirty percent. The dead-fuel moisture of 100- and 10-hr. time lag fuels was recorded as follows:

| Size Class | Fuel Moisture Range |
|---|---|
| 10 hr. | 8–9% |
| 100 hr. | 13–20% |

**The slope, aspect, and other physical features were not found to be significant contributing factors.**

The burn unit was on a south-facing aspect. The top of the unit (north perimeter) was along a ridgeline that flattened out for 50–100 feet, and then sloped to the north. Patches of snow were present during the burn on the ridge top and the north-facing aspect.

A road system accessed the cabins in the subdivision east of the burn unit. The roads were narrow, surfaced with gravel, dirt, and native rock. The road accessing the northeast corner of the burn unit (and cabin #35) was snow covered in an area east of the cabin. During a reconnaissance of the road on April 4th the burn boss determined that the snow cover prevented access by the engines to the northeast corner of the burn unit and the cabins along the Government Line Road (the east-west road along the BLM boundary with private land that was used to access the cabins which ultimately burned). Cabin #35 was reached by a Fremont County six-wheel-drive fire engine during late afternoon on Monday. A dozer later cleared out the snow for other vehicles.

## Element #3: The Actions Taken Leading Up to the Wildfire Declaration, to Determine Consistency with the Prescribed Fire Burn Plan

**Implementation of the burn was consistent with the written plan, except in two instances. Cold trailing was not done on the eastern boundary as indicated in the Burn Plan. The fire spotted across this same eastern boundary. Also, the plan for situating two engines with staff near the private structures during ignition operations was not followed.**

The Homestead Park II burn was implemented on Saturday, April 8 and Sunday, April 9, 2006. A test burn was conducted on the 4th, but conditions were not within prescription parameters, so the test burn was ended. All conditions were in prescription on Saturday and Sunday, and ignition was completed around 1330 on Sunday. Mop-up of the unit continued through the remainder of the shift, ending around 2000 hours. Everything went well and according to plan during ignition operations. Spot weather forecasts were requested and received on both days. All resources, including ignition, holding, and contingency forces identified in the Burn Plan, were in place, except for its requirement to place two engines with staff near the private structures. This deviation from the plan had no effect on the subsequent escape. Mop-up was started according to the mop-up standards in the plan, but by all accounts cold trailing did not occur as outlined in the plan. This deviation may have contributed to the spot fire occurrence that led to the escape.

The Burn Plan states (5.13-Holding Procedures), "Two Type 6 engines, as defined in 7.0-Contingency Plan, will be staged near the residences to the east of the unit boundary." Later in the same section the plan states, "A minimum of two firefighters will be assigned to each of the engines on the burn, including the two engines assigned to the homes that are listed in section 7.0 as on-site contingency resources." Section 7.0-Contingency Plan states: “As a contingency, two Type 6 engines separate from and in addition to the two holding engines will be assigned to patrol the area and be on scene as contingency resources."

Nowhere does the Burn Plan state that engines will be assigned to any specific structure, but it does state that they would be "staged near the residences,” implying that they would be close enough to assist in protection of the cabins. Although this portion of the Burn Plan was not followed, it had no direct effect on the fire’s escape. No spots occurred during the ignition phase on Saturday and Sunday, the time in which this plan requirement applied. There was no such Burn Plan requirement during mop-up and patrol stages of the prescribed fire.

Photo 5 :Hot spot remaining along the fire line two days after the escape. Fire moved across this area and burned through the hose lay (near middle of picture) sometime Monday.
*Photo by Clint Dawson, Shoshone NF.*

**Updating on the weather, including submitting data for a spot forecast, did not occur on Sunday night.**

Resources left the unit by 2000 and the unit was quiet, except for a hot spot in the upper NW corner. The burn boss indicated that he had left instructions to other fire personnel to submit weather data that evening for a spot forecast for the following day, but that did not happen. National Weather Service information was available Sunday evening that the weather forecast for the next day would contain somewhat higher winds than had been predicted previously, but that information was unknown to the assigned fire personnel.

**Forces were unaware of and unprepared for the change in wind forecast for Monday. High winds caused the fire to spread across the eastern line. Resources on-site during mop-up were inadequate to protect residences immediately adjacent to the burn unit.**

On Monday, April 10, the holding boss from the previous day returned with resources to the burn around 0912. Wind speeds were higher than he expected. He reconnoitered the unit, and resources were deployed to the hot spot on the NW corner. All smokes were inside the unit at that time. There were no smokes on the east line. By 1100 the winds were reported at 15 to 20 mph, sustained, at the top of the unit. A spot forecast was requested. Fire behavior was increasing along the top of the unit in the heavier fuel.

The fire made a small run and slopped over to the back side of the slope west of the rock-scree area. Around 1135 the fire near the northeast corner increased in intensity, and the priority shifted to the NE corner and the east boundary. The hose lay up the east side was charged. From 1140 to 1200 structure-protection actions were begun. Reinforcements were requested at 1140. The fire was still on National Forest land.

Around 1200 the burn boss arrived on-scene and took charge. About 1230 a spot was noticed near the east line around the bench area, roughly 1/3 down the slope, in the sagebrush and grass on private property. The spot started a run up the hill toward the westernmost residence, cabin #35. The holding forces retreated to their safety zone in the black around 1245. Fremont

County resources were requested, an incident management team was ordered, and a Wildland Fire Situation Analysis (WFSA) was started through communications with the South Zone FMO at the U.S. Forest Service Lander office. No air tankers were available.

The spot fire made a run to the east of the residence and then another one on its west side. At about 1300 to 1315 a group of trees torched next to the residence, caught the porch on fire, and spread fire to the rest of the structure. Between 1320 and 1330, the hose lay was burned and pressure was lost. By 1345 the holding forces moved to their vehicles at the bottom. The burn boss met with the Fremont County Sheriff at the portable water tank, who then started an evacuation. Although reinforcements were not requested in time to save the upper residences, Fremont County resources were able to respond in time to save the two residences above Lander Mountain Road east of the burn unit.

## Element #4: The Prescribed Fire Burn Plan and Consistency with Policy

**The Prescribed Fire Burn Plan was consistent with policy, except that (1) a decision documented at the end of the NEPA process that "…hand lines will be constructed along the Forest/Residence boundary and where needed on the burn boundary" was not carried forward in the Burn Plan, and (2) the conditions under which the prescribed fire could be left unattended were not specified.**

The team thoroughly reviewed the Prescribed Fire Burn Plan, which met policy, except as noted above. National Environmental Policy Act documentation completed in January 2005 specified that hand line would be constructed along the east perimeter of the burn (along the USFS boundary fence with private land). In the peer review, the Forest FMO agreed that "wet line in combination with the black line meets this and is a better option." He further advised that this change be documented and explained in the Burn Plan. There was no amendment to the Decision Memo of January 31, 2005, nor any documentation that this was discussed with the agency administrator.

The lack of a hand line on the east perimeter may have contributed to the escape, in two ways:

- Residual heat along the black line could have crossed more easily without a hand line that had been cut to mineral soil. Although the burn boss insisted that the black line was cold, several witnesses stated that smokes were found near the edge of the black line as late as two days after the escape.

- Regardless of the source of the ember that ignited the spot fire, it burned upslope and back to the fence line where the hose lay was situated. A portion of the hose burned through, and water was no longer available for attacking the spot fire or wetting down cabin #35.

On March 24, 2006, Forest Service Manual (FSM) Chapter 5140 – Fire Use, was amended. The effective date of the new Manual chapter was four days before the technical review of the Burn Plan was completed and 11 days before the Burn Plan was approved. It was clear from interviews of the Burn Plan preparer and others involved in the review of the Burn Plan that they were not yet aware of the new FSM Chapter 5140.

The amended FSM Chapter 5140, section 5142.6, requires that burn plans specify the conditions under which prescribed fires may be left unattended before being declared out. These conditions apply to burns that are left without firefighting resources at night, as well as those left unattended for multiple days before being declared out. The Burn Plan for the Homestead Park II Prescribed Fire did not specify the conditions under which the fire could be left unattended per the new FSM. The prescribed fire did not escape during the period it was not staffed,

however, but instead escaped while crews were actively conducting mop-up operations the following day. Failure to comply fully with this very recent FSM amendment, therefore, was not a key causal factor.

## Element #5: Prescribed Fire Prescription and Consistency with On-Site Measured Prescription Parameters

Through review of project documentation and interviews with burn personnel, it appears that the Prescribed Fire Burn Plan prescription was followed during the ignition of the Homestead Park II Burn. Prescribed weather, fuel-moisture conditions, and fire-characteristics parameters were identified in the Burn Plan. Both acceptable and optimum ranges were developed for weather and fuel parameters. An acceptable range for fire characteristics (flame lengths) was listed.

All identified prescribed weather parameters were measured and found to be within acceptable ranges during all ignition phases, both black lining and general unit stripping, on April 8th and 9th. Those parameters included temperature, relative humidity, eye-level wind speed and direction, and transport wind. Probability of ignition (PIG) was required to be below 60% before and during ignition phases. PIG readings were 40% or 50% during lighting operations.

A record of observed prescription fire characteristics was not found in the documentation package. Typically, speed of ignition is adjusted by the ignition specialist to meet desired flame lengths. Discussion of events with burn personnel (both on- and off-Forest resources) indicates that normal ignition patterns and procedures were being followed.

Fuel-moisture readings were taken for 10-hr., 100-hr., and live herbaceous fuels on March 31, 2006. Samples were taken by probing with a moisture meter. Readings were not taken again before burn implementation, but actual burning conditions indicate fuel moisture was within acceptable ranges. Readings on March 31st were within the acceptable range for those samples taken. A test fire was ignited on April 4; however, wind speeds and resultant fire behavior exceeded prescription parameters about an hour into the test, and the ignition ceased. The test fire was mopped up. Rain and snow were received on the unit on April 6th and 7th, but the actual precipitation amounts are unknown.

## Element #6: Approving Line Officer's Qualifications, Experience, and Involvement

**The responsible line officer was qualified and had considerable experience in prescribed fire and fire suppression. The Shoshone National Forest took obvious steps to ensure that a fully qualified line officer was involved, rather than assigning line-manager responsibilities for the prescribed fire and escaped prescribed fire to the recently appointed Washakie District Ranger before completion of necessary training.**

The line officer responsible for the management of the National Forest land involved in the Homestead Park II prescribed fire—the Washakie District Ranger—did not serve as the approving line officer or as the Agency Administrator. At present, the Washakie DR has not been delegated authority to sign prescribed fire burn plans and, before April 14, 2006, had not been delegated authority to serve as the responsible Agency Administrator for fire suppression. At the time of the test burn and prescribed fire, the Washakie DR was attending the requisite training, "Local Fire Management Leadership," in Albuquerque, NM, and then took several days of planned annual leave.

The Shoshone National Forest acted responsibly in requiring the completion of required training before authorizing the Washakie District Ranger to serve in the line-officer role for fire suppression and before delegating authority to sign prescribed burn plans. This choice was made even though the Washakie DR has 12 years of experience working in the wildland fire arena, primarily with "overhead" teams. In lieu of the Washakie DR, the DR of the adjacent Wind River Ranger District served as the line officer for the review and approval of the Homestead Park II Burn Plan, and for the approval to commence burning operations. Following the escape of the prescribed fire, the Wind River DR also served as the Agency Administrator for suppression actions.

The Incident Qualification and Certification System shows that the Wind River District Ranger last completed the requisite "Local Fire Management for Agency Administrators" April 19, 2004. The Wind River DR has been involved in fire suppression and prescribed fire for about 25 years, and has been involved in prescribed fire and fire suppression in an Agency Administrator role for about the last 8 years. Included in the DR's experience is the review, approval, and implementation of prescribed fire burn plans. The Wind River DR was delegated authority to sign burn plans by the Shoshone Forest Supervisor via letter dated June 9, 2005. The record and information obtained during the Review Team's interviews show that the Wind River DR did possess the qualifications and experience necessary for reviewing and approving the Prescribed Fire Burn Plan and for serving as the Agency Administrator for the suppression of the escaped prescribed fire.

**The responsible line officer was engaged in the review, approval, and implementation of the Prescribed Fire Burn Plan and subsequent fire suppression. The line officer did not review the original Decision Memo for the Homestead Park II Fuels Reduction Project, however, and, as a result, was not prepared to ensure that the decision stating that "…hand lines will be constructed along the Forest/Residence boundary and where needed on the burn boundary" was carried forward in the Prescribed Fire Burn Plan. [See the discussion of Prescribed Fire Burn Plan consistency with policy, above.]**

The responsible line officer's involvement in the planning and approval of the Homestead Park II Prescribed Fire was determined through personal interviews and a review of pertinent documents. This review found that the current Wind River District Ranger was not involved in the early planning for the Homestead Park II project, some of which reportedly began in 1999, nor was he a signatory to the Decision Memo for the project. The Decision memo was signed by the previous Washakie DR on 31 January 2005. The responsible line officer stated that he did not personally review the Decision Memo for the Homestead Park II Prescribed Fire but had been somewhat aware of the project for several years.

The Prescribed Fire Burn Plan was approved by the Wind River District Ranger on April 4, 2006. This approval came after the plan was signed by the preparers and reviewers, including a review by the Washakie DR. The Homestead Park II Prescribed Fire file includes documentation of a verbal approval of the "Go/No Go" checklist by the responsible line officer to the Burn Boss on April 3, 2005. The date of this documented verbal approval would have been one day before the signature of the Burn Plan, but the Wind River District Ranger recalls giving his verbal approval the morning of April 4, 2005, the day of the test burn.

Interviews and at least one firefighter log indicate that the responsible line officer communicated with key fire personnel about the Homestead Park II Prescribed Fire several times during the period of April 4, 2006 through the morning of April 10. The Wind River District Ranger stated that he gave his verbal approval of the Go/No Go checklist on April 4th to the Homestead Park II Burn Boss and was advised of snow drifts blocking access to the area near the northeastern portion of the burn unit; spoke with the Burn Boss on April 5th and learned that the test burn was too hot and that there were concerns with the height of the sagebrush along the area to be black-lined; spoke with the Zone FMO on Saturday night and heard that the black lining went well and that the area would be ignited on Sunday, April 9th; and spoke with the South

Zone FMO and the Burn Boss on Monday, April 10th, sometime before 0800, and was told that both were happy with the results of the previous day.

When the District Ranger stated that he had heard on the morning TV news that the Casper forecast was for high winds, he was told by either the South Zone FMO or the Burn Boss that the spot forecast was for light winds in the morning, increasing in the afternoon. The DR was made aware of increased fire activity and the intent to call for County support about 1145. Shortly afterwards, the Wind River DR drove to Lander, arriving in the Washakie Ranger District Office about 1330 hours.

The Wildland Fire Situation Analysis (WFSA) was signed by the Shoshone Forest Supervisor at 1740 on April 10th. The Wind River District Ranger was subsequently identified as Agency Administrator in the Delegation of Authority to the incoming IMT 2 Incident Commander, signed by the Forest Supervisor on April 11, 2006. The fire documentation prepared by the IMT shows evidence of the responsible line officer's involvement throughout the suppression period. The Wind River District Ranger accepted the return of authority for the incident on April 15, 2006.

## Element #7: Qualifications and Experience of Other Key Personnel

**All personnel assigned to the fire at the time of the escape, and personnel in responsible management positions for the Homestead Park II Prescribed Fire, were qualified and possessed sufficient experience in prescribed fire and other fire management activities.**

The Review Team examined Incident Qualification and Certification System (IQCS) records for all personnel assigned to the fire at the time of the escape, as well as the IQCS and local-unit documentation of the qualifications and delegations of authority for key management personnel. Assigned personnel all possessed the necessary experience, training, and certified qualifications to participate in their assigned roles. The Burn Boss had over 15 years of experience and has successfully led multiple prescribed fires of similar complexity. All five personnel on scene Monday at the time of the escape had wildland fire experience. Four of the five firefighters completed their initial training four years or more ago, and they have continued to advance in their qualifications each year.

Several personnel are awaiting return of medical-fitness reports conducted per Federal Interagency Wildland Firefighter Medical Qualification Standards. The Shoshone National Forest documented extensions of Incident Qualifications pending receipt of necessary information in a letter dated March 20, 2006. The following table presents the names, role in the Homestead Park II Fire, and additional relevant fire qualifications.

**Validation of Personnel Qualifications**

| Name | Role | Pertinent Fire Qualifications |
|---|---|---|
| Rick Metzger | Agency Administrator | |
| Sean Johnson | Ignition Specialist | RX Fire Burn Boss 2; Ignition Specialist Type 2 |
| Jay Slagowski | Burn Boss | RX Fire Burn Boss 2; Ignition Specialist Type 2 |
| Todd Beasley | Holding Boss | Crew Boss; Engine Boss; RX Fire Burn Boss 3; RX Fire Crew Member; Ignition Specialist Type 2 |
| Mark Giacoletto | Technical Reviewer | RX Fire Planner |
| Adam Cook | Ignition Specialist | RX Fire Burn Boss 3; RX Fire Crew Member |
| Victoria Kohn | Firefighter Type 2 | Firefighter Type 2 |

# RECOMMENDATIONS

Additional care (beyond current policy requirements) must be taken when conducting prescribed fire operations in the wildland urban interface (WUI). The following recommendations should reduce the risk of prescribed burns in the WUI escaping and causing damage to private property.

- Keep updated on weather through spot weather forecasts, general weather forecasts, and/or personal communication with NWS forecasters throughout ignition, mop-up, and patrol phases.

- Develop additional standards for Fire Weather Operating Plans that require full explanation of the planned prescribed fire program for the Operating Plan area. Explanation will identify WUI burns, expected duration of the burn and subsequent mop-up, and expected continued NWS attention to the burn until declared out.

- Contingency plans should be developed for the mop-up and patrol phases of prescribed fire plans conducted in the WUI.

- Region 2 should reassess all pending WUI prescribed fire plans to ensure adequate protection of adjacent private property and to make certain that holding, patrol, and mop-up resources are commensurate with the values at risk.

- Develop national guidance for WUI contingency plans that address resource sufficiency for protection of structures, should a prescribed fire escape.

- Make use of readily available infrared or other heat-sensing equipment for identification of hot spots, especially in the WUI.

- Discuss lessons learned from the Homestead Park II Escaped Prescribed Fire at post-season (fall 2006) and preseason (spring 2007) Fire Management Officer meetings throughout the Rocky Mountain Region, and during future "Local Fire Management for Agency Administrators" training. Fire managers should be reminded of the pitfalls of relying on wet line and black line in the absence of fire line cleared to mineral soil.

# COMMENDATIONS AND ACKNOWLEDGEMENTS

The Review Team makes the following commendations and acknowledgements:

Firefighters on-scene Monday, April 10th, took appropriate and responsible actions to ensure their safety. They fought the escaped fire aggressively but maintained the awareness necessary to move to safety when conditions would have otherwise put them at significant risk.

The Shoshone National Forest maintains very good records of fire qualifications and delegations of authority, and takes responsible steps to ensure that people in fire management and suppression roles are fully qualified.

Clint Dawson of the Shoshone National Forest provided excellent photo documentation and logistical support to the Review Team.

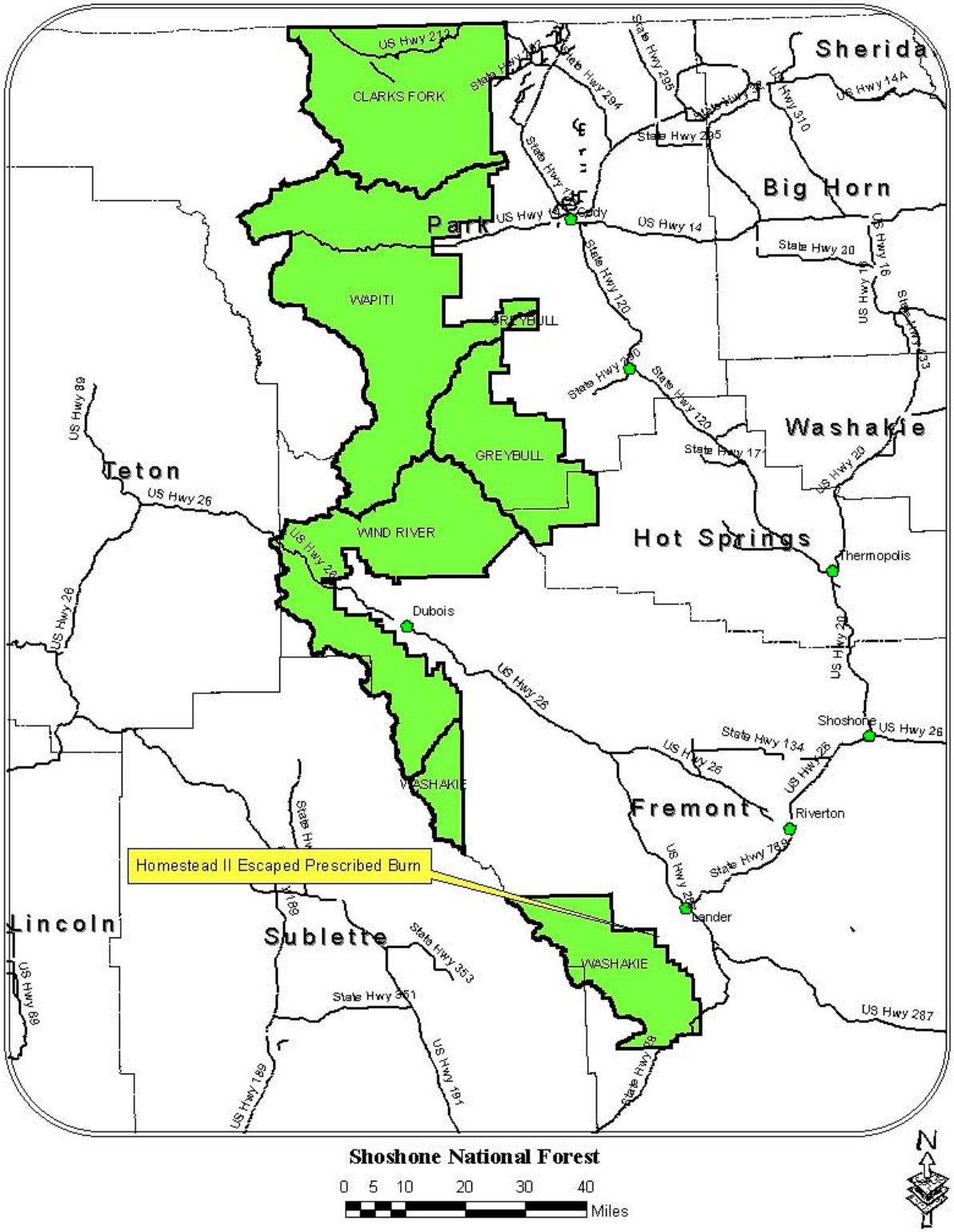
Dan Perko, Deputy State Forester in the Wyoming Division of Forestry, and Pat Hickerson, Fremont County Commissioner, participated actively as Review Team members throughout the

process, including nearly all interviews, document review, and drafting of this report. They provided valuable local insight and intergovernmental viewpoints. Involvement of nonfederal employees in a review of this type has not been a standard practice, but it proved to be of great benefit to this review.

Fremont County Fire and the Fremont County Sheriff's Office responded promptly and effectively to the escaped fire. Based on statements made by nearby landowners, the Fremont County Sheriff's Office gave almost immediate notification and evacuation assistance to persons potentially at risk.

Landowners who lost their cabins and other property due to the escaped fire spent hours talking to Review Team members to explain their concerns and questions, and provided valuable photographic documentation used in preparing this report.

Map 1: Vicinity of Homestead II Escaped Prescribed Burn



Map 2: Homestead II Escaped Prescribed Burn

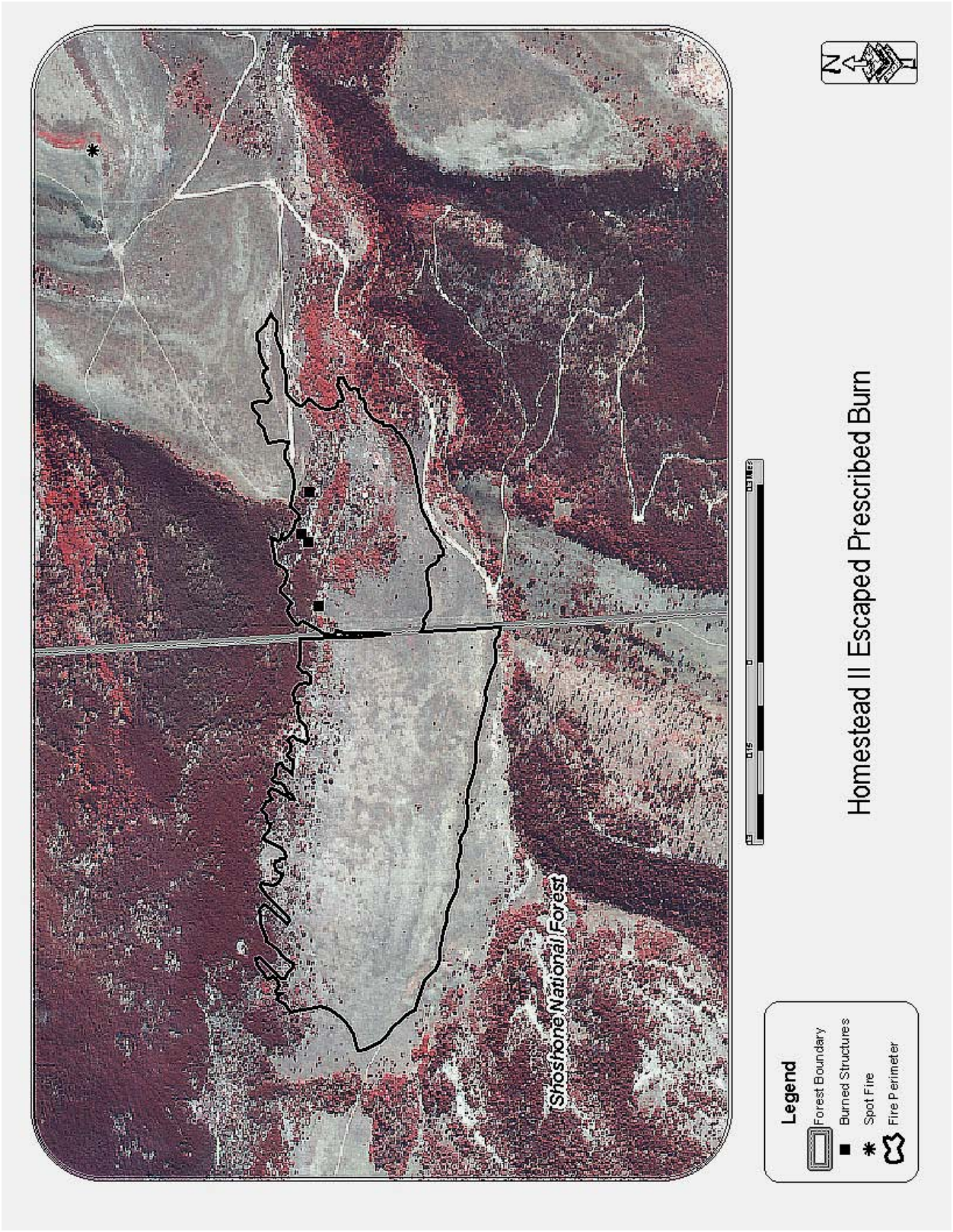


Photo 6: Cabin #35.
*Photo by Shelli Johnson.*

Photo 7: Cabin #35 after the prescribed burn escaped.
*Photo by Clint Dawson, Shoshone NF.*

Photo 8: Cabin #30.
*Photo courtesy of the Hessling family.*

# QUESTIONS FROM THE PUBLIC

The following questions were asked of the review team as it met with the public during the review process.

**Did our cabins ever have a chance with this prescribed fire? Did the Forest Service take adequate measures to protect our property?**

On the ignition days, Saturday and Sunday, there were adequate resources in place for the weather conditions and fire behavior that occurred. Holding forces patrolled the private land for spot fires both days. No spot fires developed on private land either Saturday or Sunday.

If conditions had stayed as forecast on Sunday morning, the fire resources in place would have been adequate to provide protection. Strong winds late Monday morning, however, led to a level of fire activity and spotting that the on-scene mop-up resources were not able to handle. Given what the responsible fire managers knew at the time, the planned staffing should have been sufficient; however, with rapidly increasing winds and fire activity on Monday morning, that soon proved not to be the case. Had fire managers been aware of the impending change in weather conditions, they likely would have been able to deploy more resources for patrol, mop-up, and eventually suppression actions. Current USFS policy does not require a contingency plan for mop-up. Had a robust contingency plan been included, additional personnel and equipment, such as hose, fittings, and holding tanks of water near the structures, would have been in place.

When fire personnel recognized the significant increase in fire activity late on Monday morning, additional resources were requested. Two additional engines arrived on-scene about noon, one-half hour before the fire had moved outside the prescribed fire's perimeter at about 12:30 P.M.; shortly thereafter, spot fires advanced on the structures.

**Once the fire escaped, what was done to guard our homes from the fire?**

Fire resources conducting mop-up within the area of the prescribed burn redirected their priority to structure protection as winds and fire activity increased Monday morning. Firefighters used the hose lay put in place on Saturday to wet brush below cabin #35. They also started moving wood away from cabin #35, until fire spotted across the prescribed burn perimeter below them and they could no longer work there safely.

When crews could no longer work safely on protecting cabin #35, they retreated into the area burned the previous day. Fremont County resources were requested, and responded with 19 pieces of equipment. The County resources were dispatched at 12:53 P.M. and arrived on-scene about 2:00 P.M. Although fire behavior was such that these additional resources could not immediately access the cabins on the ridge, they built line above the lower road to secure cabin # 10. After the fire front passed the cabins, Fremont County engines were able to reach the upper cabin area on Government Line Road.

**How can the Forest Service leave hot spots unattended in the Forest?**

At the time that fire crews left the fire Sunday evening, there were remaining hotspots within the perimeter of the area burned during the prescribed fire. Mop-up of the hot spots considered to pose the greatest risk to fire spread had taken place from 1:30 P.M. through about 8:00 P.M. Sunday, and was planned to continue the following morning.

Leaving hot spots within a suitably sized blackened area is typically an accepted and efficient practice for both prescribed burning and fire suppression. Lower temperature, higher relative humidity, and, frequently, lighter wind all contribute to greatly reduced burning conditions after nightfall.

In the case of the Homestead Park II Escaped Prescribed Fire, this approach proved acceptable, given that the fire remained within the burned area and was not very active when crews arrived on-scene to continue mop-up on Monday morning. The fire escaped about 12:30 P.M. Monday while crews were on-scene and actively trying to suppress hot spots.

**Hot spots were witnessed by at least one area landowner late Sunday afternoon, at approximately 4:30 P.M. Did the Forest Service do anything with these hotspots along the ridge?**

Crews conducted mop-up Sunday night until about 8:00 P.M. and returned to that area the next day to continue mop-up. Crews worked in the areas thought to contain higher-priority hot spots. These included hot spots along the ridge in the northern portion of the burned area, but it cannot be determined if crews worked on all of the particular hot spots viewed by area landowners on Sunday afternoon.

**Knowing the likelihood of high winds, and the effect of high winds, why did the Forest Service leave the fire unattended?**

During Sunday evening, relative humidity increased and air temperatures dropped enough to diminish fire activity. Crews remained on the site until then. At the time crews left the fire Sunday evening, winds were quite calm and fire personnel were not aware of a revised forecast for increasing winds Monday morning. The last spot weather forecast (a forecast done specifically for the burn site) received earlier in the day predicted winds increasing moderately after 6:00 P.M. Monday. The last weather observation recorded by fire personnel on Sunday occurred at 3:00 P.M. Wind speeds were recorded of 3 to 5 miles per hour, with gusts up to 10 miles per hour. Crews left the burned area about five hours later, on Sunday the 9th. Weather records from the nearest weather station (Lander) indicate that area winds were light, with a steady wind of 3 miles per hour and no gusts recorded at 7:50 P.M.

At the end of Sunday's work on the fire, crews were not aware of imminent high winds. Crews returned Monday morning and were conducting mop-up operations when winds increased and a fire spotted outside the burn boundary.

**How do you know the fire escaped mid-day Monday rather than Sunday or overnight?**

Crews were on-scene beginning 9:12 A.M. Monday and were actively engaged in mop-up when fire activity within the perimeter of the prescribed fire noticeably increased. At that time, mop-up crews shifted their attention from hot spots along the northern border of the burn to the northeast corner, near the cabins. No fire was observed outside the burn perimeter at this time. Witness accounts, dispatch records, and other evidence all help to frame the time and location of the fire's escape at about 12:30 P.M. Monday, with the first of the spot fires that burned cabin #35 advancing about 12:45 P.M.

Furthermore, the light grass and sage fuels immediately east of the intended burn area would have ignited fairly quickly when exposed to warming temperatures, drying winds, and an ignition source. It is extremely unlikely that an ignition source could have remained in this light fuel overnight without some noticeable burning and smoke the following morning.

**Were those involved getting regular weather forecasts?**

Spot forecasts were obtained every day that ignition occurred on the burn, April 4th, 8th, and 9th. In addition to spot weather forecasts that were made available and obtained electronically, fire personnel made telephone contact with the National Weather Service forecasting office early on Sunday morning, before igniting the main portion of the burn. On Sunday, there were no additional spot forecasts requested after completion of the burning operation. A spot forecast was requested late Monday morning, as winds began to exceed those anticipated in the previous day's forecast. This spot weather forecast was received at 12:15 P.M., shortly before the fire moved outside the prescribed fire's perimeter.

**The Burn Plan called for two engines to protect the cabins. We didn't see these engines on Saturday or Sunday. Were they actually there?**

The Burn Plan states, under 5.13, Holding Procedures: "Two Type 6 engines, as defined in 7.0 Contingency Plan, will be staged near the residences to the east of the unit boundary." Later in the same section: "A minimum of two firefighters will be assigned to each of the engines on the burn, including the two engines assigned to the homes that are listed in section 7.0 as on-site contingency resources." Section 7.0, Contingency Plan, states: "As a contingency, two Type 6 engines separate from and in addition to the two holding engines will be assigned to patrol the area and be on scene as contingency resources."

The Burn Plan does not state that engines were to have been assigned to any specific structure, but it does state that they would be "…staged near the residences." Although dispatch and other records show that there were four engines on-scene during burning operations, the Burn Plan's call to stage engines near the residences was not followed. Not following this portion of the Burn Plan, which applied during the ignition phases of the prescribed fire, had no effect, however, on the escape; the escape occurred the day after all ignition and prescribed burning were completed. No spot fires occurred during the ignition phase, when the holding procedures and location requirement were in effect. There was no Burn Plan requirement for engines to be located in any specific area during the mop-up and patrol stages of the burn, which began at the end of firing, about 1:30 P.M. Sunday.

**We heard the Burn Plan called for two engines on Monday, but nearby landowners saw only the one at the south end of the fence line, along with a flatbed trailer. Were there two engines on the fire Monday morning?**

Dispatch records and the logs and testimony of fire personnel show that all of the engines called for in the Prescribed Fire Burn Plan were in place beginning Saturday and through Monday's fire escape. In addition to the engine seen Sunday evening and Monday morning at the south end of the fence line near the portable tank used to charge the hose lay, another engine was situated on the westernmost portion of the burn area, having followed the primitive road along the creek. Also near the portable tank was a trailer that was used to transport ATVs. Two additional engines responded to a request made Monday morning and arrived at the fire about noon, shortly before spot fires advanced toward cabin #35 and crews were forced to disengage.

**Why didn't the involved personnel drive an engine all the way into the subdivision?**

Our review shows that attempts were made to access the northeast corner of the prescribed fire by road on April 4th, the date of the initial test burn, but the burn boss did not believe an engine could make it through the snow bank in the road. Once the fire became very active on Monday, there were also safety concerns about driving engines and perhaps getting them stuck in the heavy fuels downwind of the extreme fire behavior going on at the top of the ridge.

**Did the Forest Service check for all alternative routes?**

Alternative routes were not fully checked immediately before black lining and ignition of the unit. The Review Team understands that this may have been because access through private land had not been secured by agreement, and because snow was known to have impeded access a few days earlier.

**Did the Forest Service have enough people staffed for the job on Monday, April 10th, 2006?**

Had the weather remained the same as forecast the previous day, staffing would have been sufficient to continue mop-up as planned. With the significant increase in winds on Monday, additional staffing, equipment, and water would certainly have proved useful.

**At a public meeting sometime after the fire escaped, we were told the responsible fire personnel "were just kids." Were the firefighters on-scene qualified to do this job?**

The Review Team examined documentation of fire training and qualifications for all persons involved, as well as the process the Shoshone National Forest has used for certifying fire qualifications. All personnel assigned to the Homestead Park II Prescribed Fire, including those present at the time it escaped, were found to be qualified for the positions in which they served.

Training records show that five personnel on-scene Monday morning and through the suppression effort that began Monday afternoon had from two to seven years of experience in wildland firefighting, and that four of the five firefighters completed their initial training and have continuously advanced in their qualifications, for four years or more. The burn boss had 15 years' experience as a firefighter and had successfully completed six burns of like complexity before the Homestead Prescribed Fire.

**Did the Forest Service rush to complete the burn before the snow melted?**

No. The weather and fuel parameters specified in the Burn Plan were the determining factors of whether to burn. Those conditions existed when the burn was lit. "Go/No Go" checklists completed by the burn boss and by the responsible line officer confirm that weather and fuel parameters were found to be within the prescription. Snow in the lodgepole pine forest to the north was desirable, in terms of providing additional assurance that the fire would not spread through the timber to the north, but does not appear to have been an overriding factor in selecting the burn window.

**Where were the bosses—those people who could make decisions? We heard the person making the decisions was in Albuquerque.**

The burn boss was at the burn on Saturday and Sunday. He was in contact with the mop-up crew by radio on Monday morning and was on-site by noon that day. He was fully empowered to make all decisions associated with the prescribed burn and ordering additional resources.

The Washakie District Ranger was, in fact, attending required fire training in Albuquerque and then took planned leave later in the week of April 2nd. The District Ranger did not serve as the responsible line officer for the approval of the Burn Plan, however, nor was she the Agency Administrator for the escaped fire. The Shoshone National Forest instead assigned the neighboring Wind River District Ranger to take the line officer role in reviewing and approving the Burn Plan, making the "Go/No Go" decision required before any ignitions, and serving as the Agency Administrator following the fire's escape. This delegation of authority ensured that a fully quali-

fied and experienced line officer was involved in the decision making. The Wind River District Ranger made all the necessary decisions delegated to him regarding this prescribed fire.

**Even the highway sign for South Pass was lit Monday morning, to prohibit trailer traffic due to high winds; why didn't you know there would be high winds?**

Following this question, the Review Team contacted the Wyoming Department of Transportation to verify when the sign was indeed lit. Per WYDOT records, the sign was not lit until 2:38 P.M. on the 10th and was turned off at 9:17 P.M. According to WYDOT records, the high-winds warning was not posted the morning of the fire's escape.

**Was the gate being locked following fire operations? Things appear to be missing from our burned structures.**

The Review Team understands that, except for the time when numerous resources were arriving for suppression efforts, the gate was locked by fire personnel. This information was provided by fire personnel, as well as at least one resident of the Homestead Park area. The gate was secured with a separate U.S. Forest Service lock at the time the Review Team visited the burned area.

# APPENDIX 1: GLOSSARY

**Black lining**: Burning of fuels next to a control line before igniting a prescribed burn. Black lining is usually done during periods of low fire danger, to reduce heat on holding crews and lessen chances for spotting across the control line. Black lining may be conducted without a control line, by immediately extinguishing the outer edge of the black-lining fire.

**Cold trailing**: A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

**Defensible space:** An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

**Fire line**: A linear fire barrier that is scraped or dug to mineral soil.

**Fuel moisture (fuel-moisture content)**: The quantity of moisture in fuel, expressed as a percentage of the weight when thoroughly dried.

**Hand line**: A fire line built with hand tools.

**Heavy fuels**: Fuels of large diameter, such as snags, logs, and large-limb wood, that ignite and are consumed more slowly than flash fuels.

**Live fuels**: Living plants, like trees, grasses, and shrubs, in which the seasonal-moisture-content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

**Mop-up**: To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

**Overhead**: People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

**Prescribed fire**: Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, before ignition.

**Prescribed fire plan (burn plan)**: This document gives the prescribed fire burn boss information needed to implement an individual prescribed fire project.

**Safety zone**: An area cleared of flammable materials, used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of a blowup in the vicinity.

**Spot weather forecast**: A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

**Test fire**: A small fire ignited within the planned burn unit to determine the characteristics of the prescribed fire, such as fire behavior, detection performance, and control measures.

**Time lag**: Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four time lag periods.

**Wet line**: A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

**Wildland urban interface**: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

# APPENDIX 2: REFERENCES

Forest Service Manual Chapter 1410 - Management Reviews. Section 1416 was superseded in March 2006 by Forest Service Handbook 1409.18, section 12.

Forest Service Manual Chapter 5140 – Fire Use. March 24, 2006.

# APPENDIX 3: EXHIBITS

List of Homestead II Prescribed Burn Personnel; undated; unsigned.

Map of Land Ownership; undated; source: Fremont County, via Craig Haslam.

Letter to Bryan Armel, Burns Davison, Mark Giacoletto, Rick Metzger, and Dave Myers: "Prescribed Fire Plan Approval Authority"; File Code 5140; June 9, 2005; signed by Becky Aus, Forest Supervisor.

Letter to Shoshone NF Fire Management Officers: "Incident Qualifications Card Extension"; File Code 5130; March 20, 2006; signed by Karin Lancaster for Becky Aus, Forest Supervisor.

Letter to Burns Davison, Mark Giacoletto, Rick Metzger, Dave Myers, and Ruth Esperance: "WFSA Approval Authority"; File Code 5130; April 11, 2006; signed by Becky Aus, Forest Supervisor.

Letter to Ruth Esperance: "WFSA Approval Authority"; File Code 5130; April 14, 2006; signed by Becky Aus, Forest Supervisor.

Memo to Homestead Park Fire Investigation Team c/o Dan Perko: "Actions taken during the fire"; April 20, 2006, signed by Paul Morency, Wyoming State Forestry Division District Forester.

Wildland Fire Situation Analysis #1, "Home Stead Park II"; April 10, 2006, 1740; prepared by Clint Dawson, NZ FMO.

Letter to Incident Commander: "Delegation of Authority"; delegating "…the authority and responsibility for the management of the Homestead II to Incident Commander Mark Mullenix"; April 11, 2006, signed by Rebecca Aus, USFS Agency Administrator.

Letter to Incident Commander: "Delegation of Authority"; delegating "…the authority and responsibility for the management of the Homestead Park #2 Fire to Incident Commander Chris Thomas"; April 15, 2006, signed by Ruth M. Esperance, USFS Agency Administrator.

"Letter of Incident Acceptance" to Agency Administrator(s); on Rocky Mountain Incident Mgt Team letterhead; April 11, 2006, signed by [illegible] for Marc R. Mullenix, Incident Commander.

"Return of Delegation of Authority" to Agency Administrators; on Rocky Mountain Incident Mgt Team letterhead; April 15, 2006, signed by Rick Metzger, USFS Agency Administrator.

"Homestead Park II Public Comment Analysis"; tabular format, October 20, 2004, with attached letter to Stakeholder; "Revised Proposal – Homestead Park Fuel Reduction Project"; File Code 1950; March 16, 2004; signed by Burns L. Davison, District Ranger, Washakie RD.

"Decision Memo, Homestead Park II Fuels Reduction Project"; January 31, 2005; signed by Burns Davison, District Ranger, Washakie RD.

"Prescribed Fire Plan Technical Review"; Project Name: Homestead Park II; March 28, 2006; signed by Mark Giacoletto, RXM1.

"Prescribed Fire Burn Plan"; Project Name: Homestead Park II; April 4, 2006; prepared by Jay Slagowski, RXB2, approved by Rick Metzger, District Ranger, Wind River RD.

Fuel-sample measurements from three locations in burn unit; March 31, 2006; signed by Jay Slagowski.

E-mail from Mark Arn, State of Wyoming DEQ, Air Quality Division, to Richard Connell, Assistant Fire Management Officer, Shoshone NF, assigning Burn ID#293 and approving waiver request; April 3, 2006.

Cody Interagency Dispatch Center Resource Orders for Homestead Park #2
- Equipment, April 3, 2006.
- Overhead, April 6, 2006.
- Initial Attack, April 10–11, 2006.

Documents from Homestead Park II Unit 6 Burn Plan, "Prescribed Fire Daily Report"

- "Appendix H –Prescribed Fire Organization Chart"
  - April 4, 2006.
  - April 8, 2006.

- "Daily Log"
  - April 4, 2006; signed by Jay Slagowski, Burn Boss.
  - April 8, 2006, signed by Jay Slagowski.
  - April 9, 2006, signed by Jay Slagowski.

- "Test Fire Record, Prescribed Fire Results, Daily Accomplishment Report"; April 4, 2006; unsigned.

- "Prescribed Fire Preburn/Burn Day Weather Observations" and attached, handwritten weather-observation notes; April 8, 2006; unsigned.

- Section 6.0, "Cooperation" (affected parties contact record); unsigned.
  - April 4, 2006.
  - April 10, 2006.

- "Prescribed Fire Daily Monitoring Data"
  - April 8, 2006, signed by Bobby Sutton, Monitor.
  - April 9, 2006, signed by Molly [illegible], Monitor.

- "Final Checklist"; April 9, 2006; unsigned.

Cody Interagency Dispatch Center Log; April 6–10, 2006.

"ICS Unit Logs" (Form 214) prepared by Victoria Kohn
- April 4–6, 2006.
- April 8–9, 2006.
- April 10, 2006.

"ICS Unit Logs" (Form 214); April 4–11, 2006; apparently prepared by Reid Marquart (per Mark Stiles).

Unidentified crew notes; April 8, 2006.

"ICS Unit Log" (Form 214); April 8–9, 2006; prepared by Todd Beasley.

"Activity Logs"; prepared and signed by Adam Cook
- April 9, 2006.
- April 10, 2006.

Incident timeline for Todd Beasley and crew; April 10, 2006; unsigned.

"ICS Unit Log" (Form 214); April 10, 2006, 0700–2300 hrs; signed by Bill Mayer.

"Incident Organizer"; Shoshone NF, Fire Management, Version 2004
- April 9, 2006, prepared by Sean Johnson.
- April 8, 2006, prepared by Sean Johnson.
- April 10, 2006; prepared by Victoria Kohn.
- April 10, 2006, prepared by Jay Slagowski (with additional, handwritten notes attached0.
- April 10, 2006; prepared by Todd Beasley.

Shoshone NF Forest Qualifications Review Committee meeting notes, March 1, 2006.

Washakie Ranger District employees "Incident Qualification and Certification System Master Record"; April 14, 2006.

Wind River Ranger District employees "Incident Qualification and Certification System Master Record"; April 14, 2006.

Incident Qualification Cards ("Red Cards") of the following employees
- Beasley, Todd (March 24, 2006)
- Cook, Adam (June 22, 2005)
- Kohn, Victoria (March 29, 2006)
- Marquart, Reid (May 26, 2005)
- Mayer, William (June 10, 2005)

"Incident Qualification and Certification System Master Record" for two employees; April 15, 2006
- Giacoletto, Mark
- Vanderhoeven, Jon

Tape-recorded Fremont County Sheriffs Office Dispatch Center; April 10, 2006, 1230–1500 hrs., intermittent.

Pre-burn and active-fire photographs (digital) provided by Jay Slagowski.

Fire photographs (digital) provided by
- Craig Haslam
- Dave Geibel

Post-fire photographs provided by
- Cabin owner Robert Lowe (prints)
- Clint Dawson (digital)
- Fremont County Sheriffs Office (digital)

## Weather-Related Documents

Staff directory, NOAA's National Weather Service Weather Forecast Office, Riverton, WY; from NOAA Web site (http://www.crh.noaa.gov/riw/staff/); accessed May 1, 2006.

Seven-Day Forecasts, Lander, WY, National Weather Service
- March 30, 2006.
- April 3, 2006.
- April 6, 2006.

Zone Forecasts, Riverton, WY, National Weather Service
- April 4, 2006.
- April 5, 2006.
- April 12, 2006.

Map showing locations of Wind River and Anderson Ridge Remote Automated Weather Stations (RAWS), © Garmin Corporation 1995-2002, undated.

RAWS data, NOAA
- Lander station, April 7–14, 2006.
- Wind River station, April 12–14, 2006.
- Anderson Ridge station, April 7–14, 2006.

Spot Weather Forecasts, National Weather Service
- Homestead Park, April 3, 2006, 1649 hrs.
- Homestead Park, April 7, 2006, 1501 hrs.
- Homestead Park, April 8, 2006, 1103 hrs.
- Homestead Park, April 9, 2006, 0738 hrs.
- Homestead Park, April 10, 2006, 1214 hrs.
- Homestead Park, April 10, 2006, 1947 hrs.
- Homestead Park, April 11, 2006, 0917 hrs.

Weather observations on ridge top, Homestead Park; April 10, 2006; unsigned.

# APPENDIX 4: PERSONS CONTACTED

The review team met with numerous individuals and discussed information relevant to the planning, implementation, and communication of the prescribed fire. Landowners from the Homestead Park Subdivision also met with the review team. The following individuals participated in discussions with the review team.

| | | |
|---|---|---|
| Ruth Esperance | District Ranger | USDA Forest Service, Shoshone NF<br>Washakie Ranger District |
| Rick Metzger | Agency Administrator | USDA Forest Service, Shoshone NF<br>Washakie Ranger District |
| Sean Johnson | South Zone FMO | USDA Forest Service, Shoshone NF<br>Washakie Ranger District |
| Jay Slagowski | South Zone AFMO | USDA Forest Service, Shoshone NF<br>Washakie Ranger District |
| Reid Marquart | South Zone Firefighter | USDA Forest Service, Shoshone NF<br>Washakie Ranger District |
| Dave Bell | Firefighter | Bureau of Indian Affairs<br>Wind River Agency |
| Travis Bratton | Northern Zone Firefighter | USDA Forest Service, Shoshone NF |
| Cory Bowser | Northern Zone Firefighter | USDA Forest Service, Shoshone NF |
| Tavis Sorenson | Northern Zone Firefighter | USDA Forest Service, Shoshone NF |
| Erik Ostresh | Northern Zone Firefighter | USDA Forest Service, Shoshone NF |
| Todd F. Beasley | Engine Foreman | USDA Forest Service, Shoshone NF<br>Washakie Ranger District |
| Craig Haslam | County Fire Warden/<br>Rural Fire Protection Chief | Fremont County, Wyoming |
| Warren Ulmer | Resident | Homestead Park Subdivision |
| Karl Brauneis | Retired Forest Service Employee | Lander, Wyoming |
| Jerry & Shelli Johnson | Cabin Owner | Homestead Park Subdivision |
| Adele & Vic Hessling | Cabin Owner | Homestead Park Subdivision |
| Patti & Del Hessling | Cabin Owner | Homestead Park Subdivision |
| Sheryl Lehman | Cabin Owner | Homestead Park Subdivision |
| Julie Hrast | Cabin Owner | Homestead Park Subdivision |
| Robert Lowe | Landowner | Homestead Park Subdivision |
| Jack Nicholas | Landowner | Homestead Park Subdivision |
| Hart Jacobson | Homeowner Assoc. Pres. | Homestead Park Subdivision |
| Kenny and Tyson Rhoads | Landowners | Sinks Canyon Area |
| Joe Sullivan | Meteorologist | National Weather Service<br>Riverton, Wyoming |