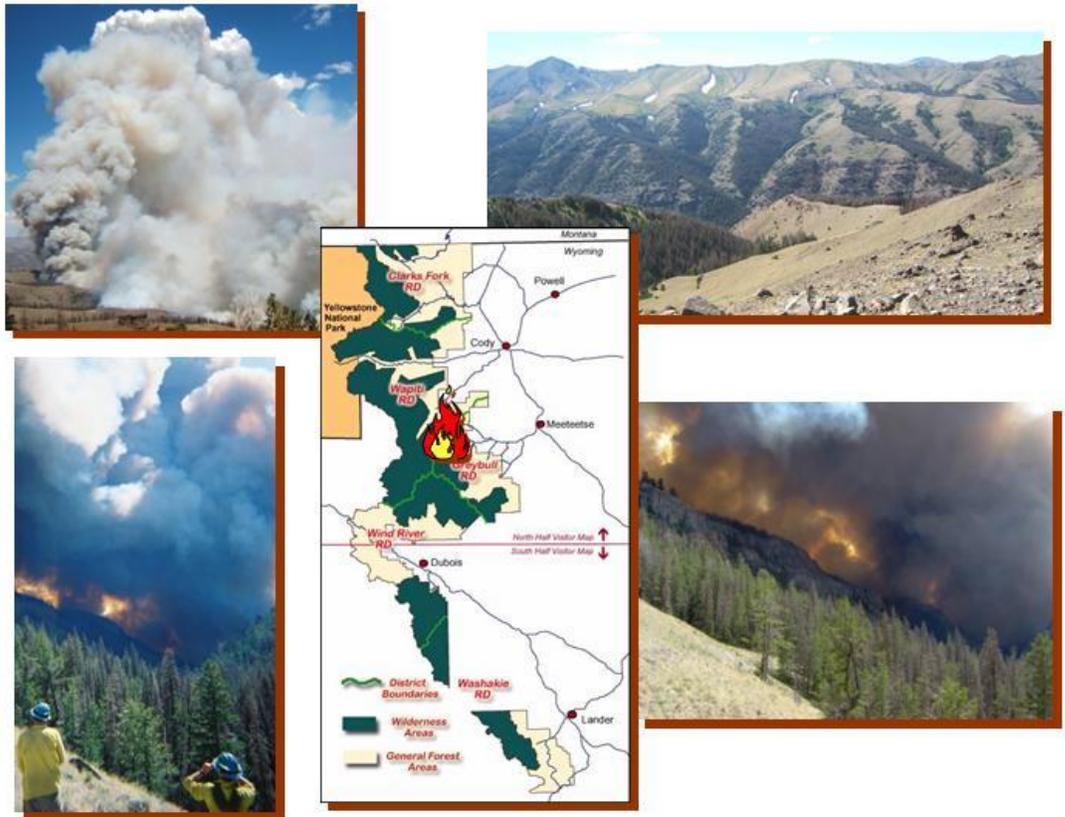




Little Venus Fire Shelter Deployment

July 24, 2006
Shoshone National Forest

Peer Review Report



Rocky Mountain Region
August 24, 2006

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EXECUTIVE SUMMARY

On July 18, 2006, 10 individuals assigned to the Little Venus Fire on the Shoshone NF as part of a fire use module were entrapped by the fire and deployed fire shelters. No significant injuries were sustained, no personnel were hospitalized and all personnel were safely evacuated from the fire. This incident is a significant event but differs from past deployments in that the involved personnel were not actively engaged in the performance of an operational fireline assignment when the deployment occurred. They were enroute to a camp location to de-brief with a crew they were replacing and would not have been given a fireline assignment until the next operational period.

The US Forest Service, Rocky Mountain Regional Office initiated a review of the circumstances surrounding the deployment. A Review Team consisting of Forest Service and Bureau of Land Management personnel was formed and reported to the Shoshone NF Supervisor's Office in Cody, Wyoming, on July 19, 2006. The Review Team utilized a Peer Review process during the Little Venus Fire Shelter Deployment Review, consistent with the 2006 Fire and Aviation Management Briefing Paper. The Peer Review Process in this investigation was designed to yield multiple benefits, including meeting expectations of accident investigations, identifying lessons learned, and contributing to organizational learning in fire management.

The objectives of the Little Venus Fire Shelter Deployment Peer Review were to:

- Through the Peer Review Process, conduct a post-event evaluation, including:
 - an analysis of workforce performance and safety in an unobtrusive and timely manner,
 - a review of the circumstances and decisions that led to the outcome of the Little Venus Fire Shelter Deployment, and
 - a review of the operating principles, leader intent, and situational awareness during the fire.
- Document the Peer Review Process and produce the appropriate reports, including:
 - the 24 and 72 hour briefings of the shelter deployment review status,
 - a final report containing lessons learned and recommendations within three weeks from the Review Team's arrival at the scene.

Formal Accident Investigations look at Human Factors, Equipment Factors, and Environmental Factors, and from these factors draw contributing and causal factors. Similarly, the Peer Review Team looked at these factors and this review focuses and highlights the directly involved participants' feelings about the factors contributing to the entrapment, what the participants learned from the incident, and what the participants believe the greater wildland fire community needs to learn from this incident. With an outsider's view, the Peer Review team then summarized and grouped these perspectives and observations into the three categories.

Interviews with those personnel both directly involved in the shelter deployment and those working on the fire but not involved in the deployment during the Peer Review Process produced much information pertaining to the circumstances that led to the fire shelter deployment. Interview responses from firefighters were grouped into the three broad categories, but were not altered from their original responses.

Within the categories of Human, Equipment, and Environmental Factors, Firefighter Perspectives on Lessons Learned are described in terms of:

- What the firefighters learned for themselves from this incident, and
- What the firefighters said the greater wildland fire community needs to learn from this incident.

Additional information gathered by the Peer Review Team came from interviews with involved participants, from data collected by the Peer Review Team, and from perspectives and analysis by subject matter experts on the Peer Review Team. Peer Review Team Lessons Learned Information is presented in the major categories of Human Factors, Equipment Factors, and Environmental Factors. Within these categories, subcategories of information, as appropriate, are included.

Peer Review Team Lessons Learned are taken from the three categories of Human, Equipment, and Environmental Factors and are summarized as:

- Communication system problems had been identified from the start of the incident. Direct implications of the communications situation include:
 - Poor communication capability led to uncertainty as to whether Unawep had received information in regard to having them and the packer stage downstream from the fire.
 - Poor communication capability led to fire managers being given erroneous information concerning the disposition of Unawep during the fire's major run.
 - Poor communication capability prevented the fire managers from knowing about the shelter deployment until after the firefighters had emerged from their shelters.
 - Poor communication capability caused a high level of confusion after the deployment concerning the disposition of all of the firefighters.
- Full situational awareness was lacking to some degree at all levels of the organization managing the Little Venus Fire.
- Insufficient planning contributed to reduced situational awareness.
- Management organization capability was limited due to collateral assignments and total numbers of overhead personnel.
- Many personnel at all levels of the organization lacked a complete understanding of the various strategies involved in wildland fire management. There were numerous instances where personnel indicated their perceptions that wildland fire use and wildfire suppression were two separate events, even on a single wildland fire such as the Little Venus Fire.
- A perception exists that fire use is a low-cost decision and should be implemented as such. Concerns over cost management may have affected implementation actions.
- Repetitive fire safety training develops an ingrained behavior, which contributed to the positive outcome.

INTRODUCTION

On July 18, 2006, 10 individuals assigned to the Little Venus Fire on the Shoshone NF as part of a fire use module were entrapped by the fire and deployed fire shelters. No significant injuries were sustained and no personnel were hospitalized; all personnel were safely evacuated from the fire. This incident is a significant event but differs from past deployments in that the involved personnel were not actively engaged in the performance of an operational fireline assignment when the deployment occurred. They were enroute to a camp location to de-brief with a crew they were replacing and would not have been given a fireline assignment until the next operational period. This incident qualifies as an entrapment according to FSM 5100, Chapter 5130, section 5130.3, which states,

"...entrapments are situations where personnel are unexpectedly caught in a fire-behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter. These situations may or may not result in injury; and include near misses."

Accordingly, the Rocky Mountain Regional Office initiated a review of the circumstances surrounding the deployment. A Review Team consisting of Forest Service and Bureau of Land Management personnel was formed and reported to the Shoshone NF Supervisor's Office in Cody, Wyoming, on July 19, 2006. The Review Team utilized a Peer Review process to assess the Little Venus Fire Shelter Deployment Review, consistent with the 2006 Fire and Aviation Management Briefing Paper (Appendix A). While Peer Reviews have been used prior to this incident, no specific application guidelines, suitability criteria, or sample formats exist. The Peer Review Process in this investigation was designed to yield multiple benefits, including meeting expectations of accident investigations, identifying lessons learned, and contributing to organizational learning in fire management.

This report presents the results of the Little Venus Fire Shelter Deployment Peer Review and documents the event and associated circumstances, and provides a discussion of the fire, chronology of events, lessons learned, recommendations, and commendations.

REVIEW OBJECTIVES

Objectives of the Little Venus Fire Shelter Deployment Peer Review were to:

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 - an analysis of workforce performance and safety in an unobtrusive and timely manner,
 - a review of the circumstances and decisions that led to the outcome of the Little Venus Fire Shelter Deployment, and
 - a review of the operating principles, leader intent, and situational awareness during the fire.
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DESCRIPTION OF THE LITTLE VENUS WILDLAND FIRE

The Little Venus Fire was located in the Washakie Wilderness, an area authorized for wildland fire use (WFU) in the Forest Plan. As a naturally ignited wildland fire in an area approved for WFU, the fire became a candidate. Forest staff initiated the Wildland Fire Implementation Plan (WFIP) (on file at Shoshone NF Forest Supervisor's Office) Stage I on June 23. The fire met criteria for management as a

WFU and the decision was made to implement it as such by the Forest Supervisor. This instance marks the first wildland fire use event of this complexity on the Shoshone NF.

Wildland fire use involves responses to naturally ignited wildland fires that permit accomplishment of beneficial effects such as removal of dead and down fuels and removal of some younger trees which could serve to reduce the overall fire danger and promote a more healthy forest. Healthier forest and grassland conditions also have improved habitat for wildlife, increased grass and herbaceous plant growth, and a larger variety of plant species. Planning and implementation procedures for wildland fire use events are described in the *"Wildland Fire Use: Implementation Procedures Reference Guide"* (BLM/BIA/FWS/NPS/USFS 2005) which states:

"Wildland fire use, based on the Federal Fire Policy direction, is a direct component of wildland fire management. It is a management action equal to wildfire suppression and thus, constitutes an emergency action. It receives consideration, management attention, and management policies equal to wildfire suppression, except for specific differences related to ignition source and management action success..."

The Little Venus Fire was situated in the Washakie Wilderness on the east side of the Shoshone NF. It was located southwest of Cody, WY, and west-southwest of Meeteetse, WY (figure 1).

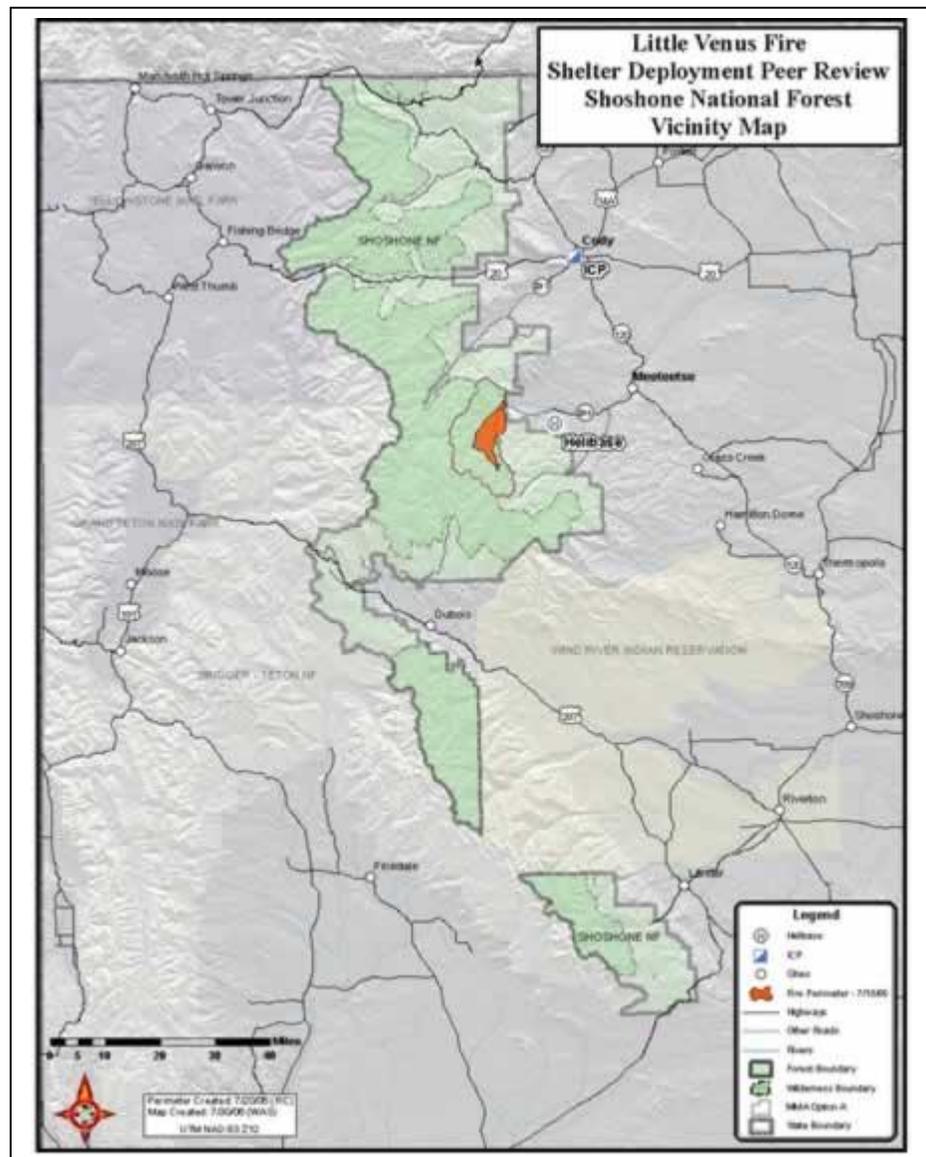
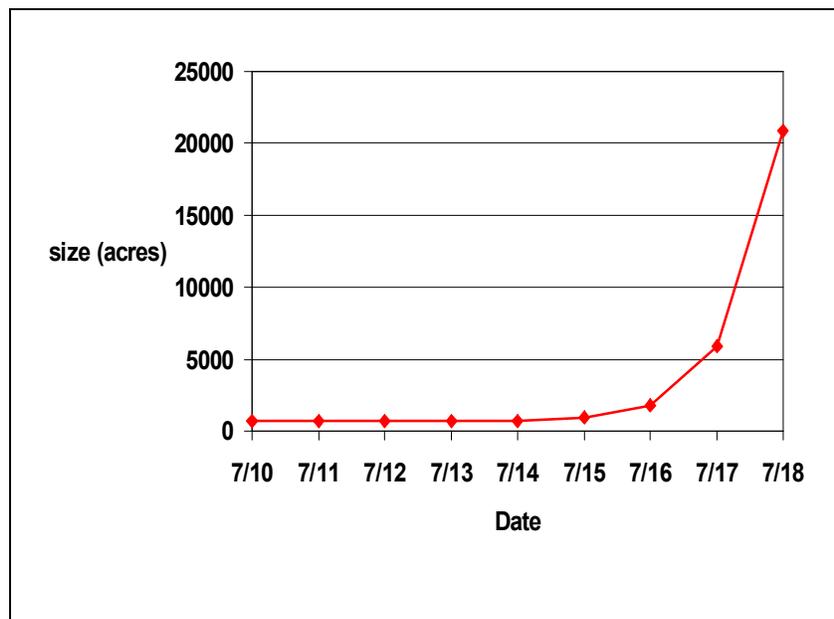


Figure 1. Little Venus Fire – general vicinity map.

Because the fire had actively grown in size on June 23, and the WFIP Planning Needs Assessment indicated the need to complete a Stage III, a Fire Use Management Team (FUMT) was ordered. The team arrived, had command of the fire transferred to them, and prepared the WFIP Stage III (on file at Shoshone NF Forest Supervisor's Office). Specific objectives for managing the fire are described in the WFIP Stage III (on file, Shoshone NF Supervisor's Office).

Moderating weather caused a lessening of fire behavior and activity and the team was released on July 2, 2006. Command of the fire transferred back to the forest, although an Operations Section Chief from the team remained behind until July 5 to assist with the fire until arrival of a Type 2 Fire Use Manager (FUM2). The fire was managed by a FUM2 from July 5 until July 15. Increasing complexity led the forest to assign a FUM1 with the FUM2 becoming the Operations Section Chief.

Moderate fire behavior and growth continued until July 18 when the fire significantly expanded from 5917 acres to 20,618 acres in size (total fire size from July 10 – July 18 is shown in figure 2).



Because of the on-the-ground activities, increased fire activity, and the fire shelter deployment, the management strategy of the fire was shifted from wildland fire use to wildfire suppression and a T2 Incident Management Team (IMT) was ordered on July 18, 2006. Management responsibility for the fire was transferred to the IMT on July 20. This team was charged with providing for firefighter and public safety, implementing the appropriate management response to protect structures near the fire area, and limit additional spread outside the Washakie Wilderness.

Figure 2. Little Venus Fire total fire size from July 10 – July 18, 2006.

THE STORY OF THE LITTLE VENUS FIRE SHELTER DEPLOYMENT

The Unawep Fire Use Module (FUM) is normally a 7 person crew, managed by the Bureau of Land Management (BLM) in Grand Junction, Colorado. One of the purposes of Fire Use Modules is to support wildland fire use implementation for federal wildland fire management agencies. On wildland fire use assignments, module members carry out on-the-ground activities that range from monitoring fire behavior and weather to limited firefighting to check a fire's intensity or spread in certain areas. Modules frequently serve as field observers supplying maps and fire intelligence to fire behavior and resource unit personnel. On suppression incidents, modules may serve as fire crews building line and conducting complex burnout operations. Nationwide, fire use modules are valued for their high level of fire behavior monitoring expertise, and known for their ability to safely operate with little logistical support in very remote wilderness areas.

Unawep has an excellent reputation for safety and professionalism. Partly because of this reputation, they rotate trainees into the module throughout the season. Approximately one week before the Little Venus fire, two fire use trainees from the Payette National Forest were added to the module. Unawep also had a BLM trainee, a jumper from the Boise Smoke Jumper base who had been working with the module temporarily to gain experience in fire use. In total there were 8 firefighters; two were Forest Service trainees from the Payette National Forest, one Forest Service individual from the White River National Forest, one BLM trainee from the Boise smoke jumper base, and the rest were BLM employees stationed in Grand Junction. **Take note:** The morning of July 18th prior to Unawep Module hiking into the Little Venus Fire, the module will be joined by two additional Forest Service firefighters from the Shoshone National Forest to gain experience as Fire Effects Monitors. All module members were well qualified, physically fit, and experienced firefighters. The module leader was aware of the importance of crew cohesion and had devoted special time to ensure that visiting trainees knew the rest of the module members and that there was a foundation of respect among all module members.

The Little Venus Fire had been ignited by lightning on June 19, 2006. The fire was not discovered until June 23. Initially, the fire was situated on a ridge north of Venus Creek. This area was dominated by grass, sagebrush and heavy dead and down woody forest fuels. In this area, there is a large amount of trees dead or dying from past insect and disease. An estimated 50% or more of the Engelmann spruce, lodge pole pine, and whitebark pine trees were dead throughout the area (figure 3).



Figure 3. Fuels in the Greybull River drainage.

A national Fire Use Management Team (FUMT) was assigned to the fire in late June and prepared a long-term strategic implementation plan. Periodic rain showers and light winds kept fire growth moderate over the next several weeks. The FUMT returned management responsibility for the incident to the

Forest and departed on July 5. A Type 2 Fire Use Manager (FUM2) took over managing the event on July 5 and was replaced on July 17 by a Type 1 Fire Use Manager (FUM1). The general fire area is shown in figure 4.

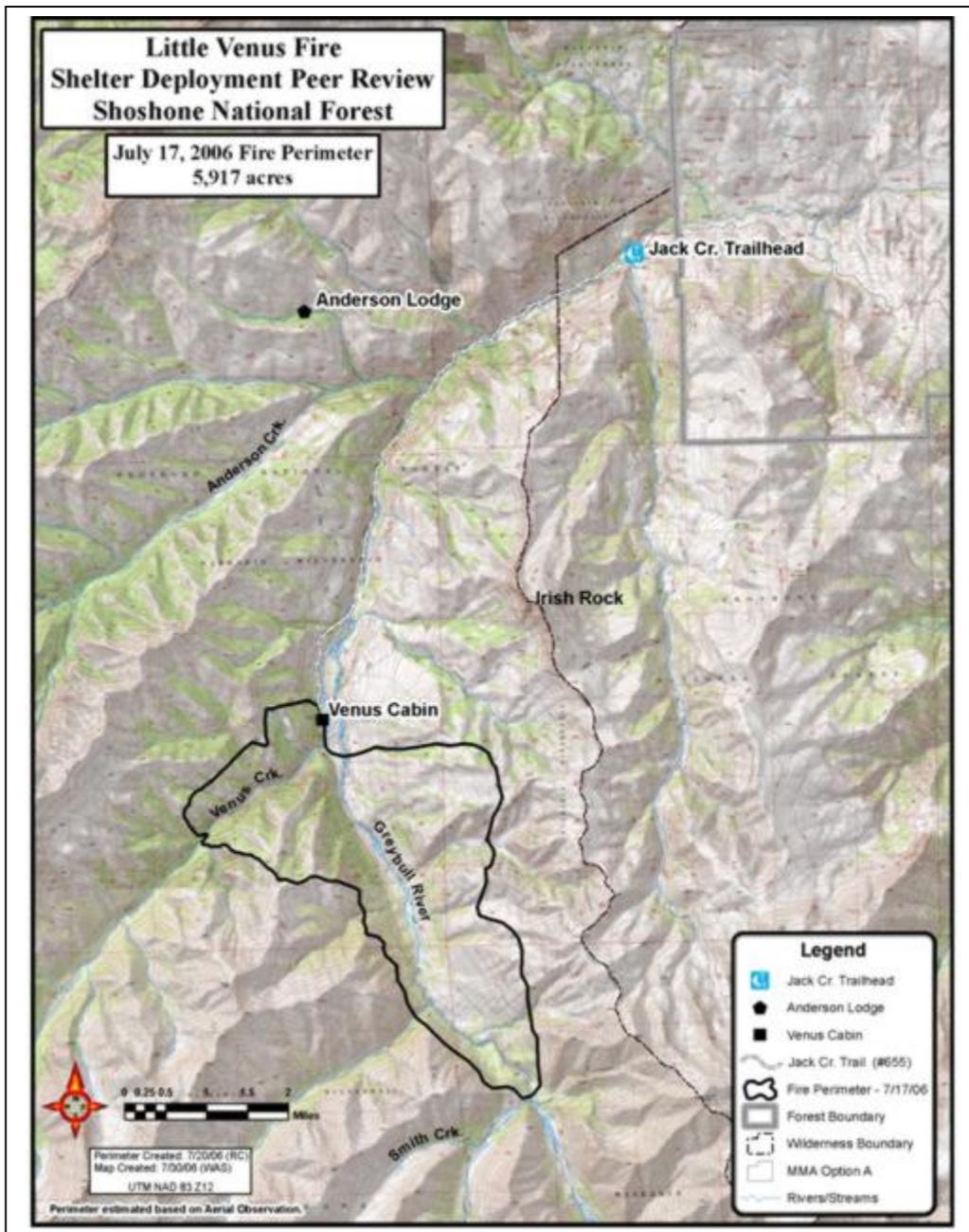
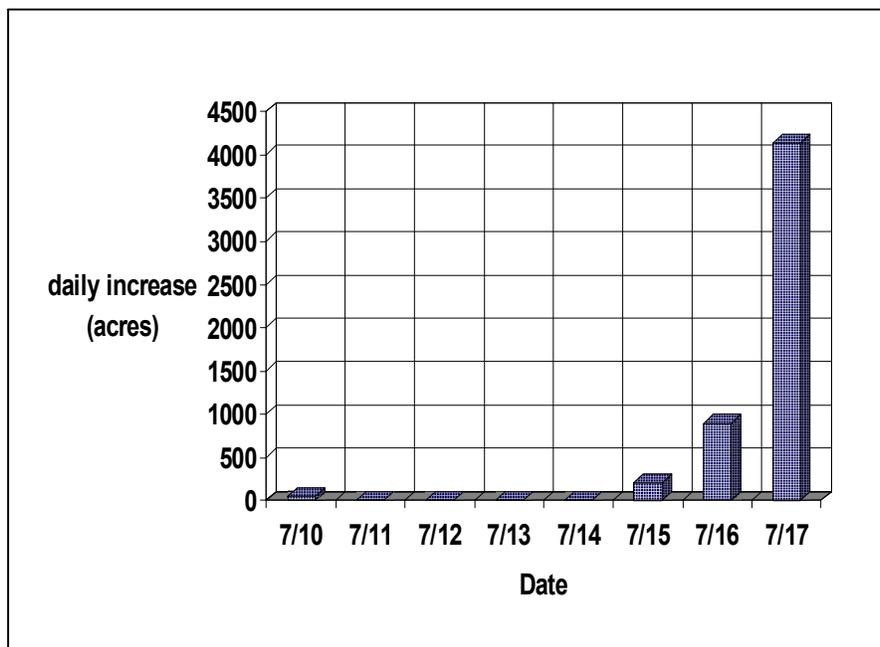


Figure 4. Little Venus Fire location and specific area with fire perimeter for July 17, 2006.

On July 13 the general weather pattern changed to hotter and drier but a return to cooler and moist conditions was mentioned in the 3-5 day forecast. By July 15 a high pressure over the fire area brought high temperatures and single digit relative humidity. The growth of the fire increased markedly on July 15, 16, and 17 (figure 5).



On July 16, Unawep was ordered for the Little Venus WFU. This assignment had all the ingredients of most Fire Use Modules' favorite type of assignment: The firefighters would be in timber country, in a wilderness area, in a cooler high elevation climate and the fire's location was fairly remote. They looked forward to a two week assignment in the rugged Washakie Wilderness area.

Figure 5. Daily increase in fire growth from July 10 – 17, 2006.

Due to the growth of the fire, management on the Little Venus was becoming more complex. By July 17, resources assigned to this fire included one type 1 and one type 2 helicopters (both helicopters were restricted use ships, meaning they are not certified or equipped to transport firefighters), an interagency hotshot crew, a type two hand crew, a FUM1, an Operations Section Chief, a trainee Division Supervisor and a few miscellaneous overhead. Also, another fire use module, the Black Hills FUM, had been assigned to Little Venus for the past two weeks. Black Hills was briefed that they would transition and be replaced by Unawep on July 18. On July 17, the complexity of Little Venus was well within the capabilities of a FUM1 and comparable to a moderately complex Type 3 suppression incident.

Unawep arrived in Cody the afternoon of July 17. After a brief visit with a few members of the fire use team, Unawep was advised their gear would be packed into Little Venus Cabin by a contracted packer. They needed to have their gear loaded onto a waiting truck so that it could be hauled out to the packer that evening. Unawep purchased additional supplies and food and then at about 2000, loaded most of their gear onto a truck that was then taken to the packer.

At 0730 on the morning of July 18, Unawep arrived at the Shoshone National Forest Supervisor's Office where the Incident Command Post (ICP) was located. This was about an hour and 15 minute drive to the nearest resources on the Little Venus Fire.

The Unawep leader and assistant received briefings first from the FUM1 and then from the Operations Section Chief. The leader received a three day Incident Action Plan (IAP), the current morning's spot weather and fire behavior forecasts. The module leader reported being comfortable at that time with the quality of the briefing on all issues including safety. The leader was advised that radio communications, were not good. In fact, communications had been a persistent problem on this incident. The portable repeater dedicated to the incident broke down for various reasons almost daily. Operations believed they would have two portable repeaters fully functional on the incident by July 19. July 19 would be Unawep's first day with an actual operational assignment on Little Venus. Unawep had a satellite phone with them to further mitigate communication concerns.

The weather forecast for July 18 stated:

"RED FLAG WARNING IN EFFECT FOR THE FIRE AREA FROM NOON TODAY UNTIL 8 PM MDT THIS EVENING. A COLD FRONT WILL MOVE INTO NORTHERN WYOMING THIS MORNING...PRODUCING A SHARP WIND SHIFT TO THE NORTHWEST TO NORTH OVER THE FIRE AREA BY 2 PM MDT THIS AFTERNOON. SOUTHWEST WINDS WILL INCREASE OVER THE FIRE THIS MORNING. ISOLATED DRY THUNDERSTORMS ARE POSSIBLE ACROSS THE AREA THIS AFTERNOON AND EVENING. DRY LIGHTNING AND STRONG GUSTY WINDS WILL BE THE THREAT. RELATIVE HUMIDITY VALUES WILL BE IN THE 7 TO 15 PERCENT RANGE."

The fire behavior forecast in the IAP under-predicted a significant increase in fire behavior.

With two additional firefighters from the Shoshone National Forest attached to Unawep, the module size totals ten, five Bureau of Land Management employees and five Forest Service employees. The two Shoshone N.F. employees briefly meet the Unawep module members that morning and they leave the office to ensure the packer's operation was working smoothly.

One of the Shoshone NF firefighters knew the fire area very well and had hiked or ridden a horse on all the trails in the area. Having a local resource who knew the country was a comfort to most members of Unawep. The crew's sole mission for July 18 was to drive out to the Jack Creek trailhead, meet up with the two Shoshone NF employees, hike a gentle and well established 8-mile trail up the Greybull River to Venus Cabin, and meet with the Black Hills module. It seemed entirely reasonable that a more complete briefing on work assignments, specifics on fuel conditions, fire behavior and logistic details would take place with Black Hills during the transition.

After the initial briefing with the FUM1 and later with the Operations Section Chief, Unawep took bear safety training and then had to run additional errands to prepare for their assignment. Most module members reported feeling some frustration with the length of time it was taking to get going on their assignment. Initially they had thought they would be joining Black Hills by 1200 or so; but at 1115 they were just leaving the Cody city limits.

At approximately 1245, Unawep arrived at Jack Creek Trailhead near the confluence of Jack Creek and the Greybull River just outside the wilderness area. This would be their starting point for the eight mile hike up the Greybull River to Venus Cabin. Unawep firefighters were dismayed to see the packer's mules still at the trailhead and their gear not yet loaded on the mules. It was also disturbing to many members of the module that one of the packers was a 14 year old boy and neither packer had a fire shelter, hard hat or nomex. At this time one of the local firefighters with Unawep overheard a conversation between ICP and the Division Supervisor about getting the packer a radio. The firefighter replied that they would loan the packer a radio.

With Unawep's help, it still took an additional one and a half hours to complete the loading of the mules. Before they left, one of firefighters gave the lead packer his radio. When the packer turned on the radio to test it, the radio worked but they noticed the "LOW-BATT" warning showed on the display. The firefighter asked the packer to wait a moment while they got him fresh batteries. The packer replied he'd just turn the radio off and call them if he needed them. At approximately 1400 the packers started up the trail. The packers were ahead of the module, having no personal protective equipment with either of the two individuals, no firefighter escorts, no other individuals ahead of them to evaluate the situation in the canyon, and a radio that would be turned off and unable to receive incoming communications. As the pack string moved away from the module, they became separated so much that they were out of sight. The only way that Unawep could communicate with them was to overtake them on the trail.

At this time it was hot, dry and breezy at the trailhead. Unaweep could see smoke from Little Venus rising over Irish Ridge; however, from this vantage point the smoke gave no indication of significant fire behavior. Some members of Unaweep were concerned with starting their hike so late in the day. The alternative wasn't good. Stopping now meant breaking down the packs and either camping out at the trailhead or returning to town in hope of finding hotel rooms. This would not only extend the packer's work by another day but it would also mean Unaweep wouldn't have a full day to transition with Black Hills.

The Unaweep leader decided to continue as planned and hopefully meet up with Black Hills by 1600 or so. They all knew they would be approaching the fire about the time of peak burning conditions. The Unaweep leader gave the module a briefing and read them the fire behavior forecast. Based on their years of experience, their training, the appearance of the smoke and the fire behavior forecast, all felt reasonably comfortable as they began their hike.

When the dust of the pack train settled, Unaweep began their hike at about 1405. As they left the trailhead, their view of the skyline and their view of the Little Venus smoke column was largely blocked by the canyon walls to their left. About 20 minutes into their hike, the trail led them into timber; their view of the sky was now further blocked by trees. Fire activity began to pick up significantly about this time. The ridge tops were experiencing strong winds but the Greybull River canyon was still sheltered. A Division Supervisor trainee assigned to the ridge just south of Irish Rock reported that, at the ridge line, he could hit the only working repeater but the winds were so strong on the ridgeline his radio communications couldn't be understood. When he went down off the ridgeline, sheltered from the wind, his radio couldn't hit the repeater.

Earlier in the day, two Black Hills module members had hiked up to a lookout point to serve both as lookouts and human repeaters. From this location, about two miles south of Venus Cabin, they believed they could hear most of the radio traffic broadcast through the repeater. By about the time Unaweep left the trailhead, the lookouts could see black smoke rising from an intense fire on both sides of Greybull River. They relayed to the Black Hills leader that they had not heard from Unaweep. In fact no one on Black Hills or anyone else on the incident knew whether Unaweep had entered the Greybull River canyon, was at the trailhead, or had returned to town. All that Black Hills knew for sure was that Unaweep wasn't at the Venus Cabin; they should have arrived at the Venus Cabin by this time; and now Unaweep's route to the cabin was a very dangerous place. There was anxiety with many members of Black Hills for the safety of Unaweep. The Black Hills lookouts were also frustrated because it seemed to them virtually all radio traffic was focused on what seemed to be "suppression" activities associated with the Division Supervisor trainee and his operations near the ridgeline between Greybull River and Smith Creek.

By 1429, the Black Hills module leader was concerned that it seemed no one in operations was directing Unaweep to stay out of the Greybull River canyon. He attempted to contact ICP directly but ICP was unable to understand his radio transmissions. He then asked his lookouts to ask the ICP to contact Unaweep and turn them around. The lookouts successfully made contact with ICP and relayed, "we are suggesting that Unaweep and the pack train turn around, they are not going to be able to get through the north end of fire." The radio operator at ICP asked, "Would it be advisable to turn them around but maybe stage them down the trail and see if they could get in later this afternoon?" Black Hills replied, "Affirmative. I will try to contact them directly." Then the Black Hills lookouts contacted Unaweep. Because of poor radio communications the Black Hills lookout stated very calmly, clearly and slowly, "we're suggesting that you guys find a place to stage north of the fire in a safe area because you will not get through, we do not believe you will get through (pause) the Greybull" and "try to find a place downriver from the fire on the north end, and try to stop the packer as well." Unaweep received this message but was unable to hit the repeater to acknowledge it.

The Unaweep leader and the experienced local Shoshone employee briefly discussed this message and evaluated their situation. From their limited view of the smoke, it appeared that the fire was moving

more easterly than in their direction and they believed they were still three, maybe four, miles from the fire. The local employee knew that up Anderson Creek (about a mile up the river from their location) there were good safety zones in which to stage. He also advised that he knew of an alternate route to Little Venus by going up Anderson Creek. If the Greybull River route was unsafe they could take this alternate route. Unawep firefighters also knew the two packers were probably about a mile ahead of them. Their concern for the packers' safety weighed heavily into their assessment. All these factors, combined with the lack of urgency in the tone of the lookout's voice, reaffirmed in their minds that they had plenty of time to proceed up the Greybull River and locate the packers. Unawep replied to the lookout that they would find the packers and then find a place to stage up Anderson Creek. All Black Hills could hear is static. "The Black Hills lookout reported to ICP *"I am not sure unless you heard, it sounded like Unawep did copy that message, but they were pretty broken for me."*

At about 1530 the helicopters assigned to Little Venus were grounded due to high winds. The fire was now racing up to the eastern ridge line south of Irish Rock. Soon thereafter the hand crews in that area were forced to abandon containment efforts and retreat east to their vehicles near Smith Creek.

Experienced firefighters instinctively make mental notes of potential safety zones and emergency deployment areas whenever they are approaching a fire. As the module passed Anderson Creek, many of them noted a wide spot in the river and adjacent rock faces. In the worst case scenario, they thought, this area could offer them, probably, a survivable area.

The module continued past Anderson Creek thinking they would probably return to this location and then turn up Anderson taking the alternate route to the cabin. But first they needed to find the packers and they also needed to get a better view of the fire.

Just south of Anderson Creek about 400 yards, the trail rises about a hundred feet in elevation as it turns to the left. From this point, on any other day, a person could see two straight miles up the Greybull from river to ridgelines. As the module reaches this point they can see only $\frac{3}{4}$ mile up the canyon. Beyond that is a massive black plume arising from a full crown fire burning from river to ridgelines (figure 6).



Figure 6. View of Little Venus Fire from Greybull River drainage on July 18, 2006, approximately 1550 hours.

Everyone in the module knows they will have to leave and leave very soon. As long as the column is rising straight up, they can out pace the fire with a margin of safety. They are also all aware that, between them and the crown fire, is the packer and his 14 year old assistant. It is now approximately 1600.

The two Payette employees had been at the end of the line. They pair up and discuss their situation. One of them is becoming visibly nervous and tells the firefighters around her that they need to leave immediately. She asked her fellow Payette employee if he thinks it would be a good idea to look for a deployment site. She announced to her fellow Payette employee and to those around her that she felt they should all leave and leave now! The Unaweep leader and most of the rest of the module recall the firefighter being nervous but did not hear her announcements.

As the module lines up for retreat, the leaders and most of the crew are very concerned about the welfare of the packers and are agonizing for ideas for anything they could possibly do to help them. They know the packers could not have retreated to the trailhead without the module seeing them. They know the packers would have turned around as soon as they saw the fire. They had been following the packers' tracks. They didn't see any evidence the pack string had backtracked and then tried to escape up Anderson Creek but maybe they missed something. They tried calling the packer on every frequency. The module leader directed his assistant to lead the crew out. The leader and two others remained at this point to wait, briefly, for the packers.

Within moments, two things happened almost simultaneously. First, the winds shifted from westerly to south, straight down the canyon. Second, the plume that was previously rising straight up began to barrel down towards them. The 14 year old packer then seemed to appear out of nowhere on the trail between Unaweep and the crown fire, riding fast with two of his original five mules behind him. As he neared the crew, he cursed at them to clear the trail. The module scattered off the steep side slope into the timber. A Shoshone employee yells at the boy to "keep going and don't stop till you reach Jack Creek Trailhead!" The boy rode through the module and apparently did not stop until he reached the Jack Creek trailhead.

Between 1605 and 1610, after the boy packer ran through the crew, the two Payette employees gather together back on the trail. They separated slightly from the rest of the crew and are ahead of the crew down the trail. They discuss with each other what they should do. As the rest of the module get back up to the trail, the plume began filling the canyon with smoke. The firefighters could feel the heat within the plume, and burning chunks of bark, twigs and pieces of pine cones were falling all around them. The three Unaweep members remaining at the viewpoint looked back towards the fire with one last hope of seeing the older packer. Initially, they saw a large spot fire developing between them and the main fire. Then, the older packer with eight tethered mules was seen riding through the spot fire. His five mules, plus three from the first packer, are panicked as the packer reaches the firefighters; some of the mules try to bolt through the timber for the river. Some lead lines are broken and others become tangled in the timber and brush. One mule makes it to the river and has no intention of going any further. The packer yells for the firefighters to help him cut the lead lines and round up the mules.

The survivors of the Little Venus entrapment refer to this event as "the rodeo." Most of the firefighters know instinctively what they need to do and others follow the shouting orders of the packer. Using pocket knives the firefighters cut the lead ropes from the panicked mules. One firefighter jumps into the river and chases the mule back out to the bank. Another mule is frozen in fear close to the bank. The packer yells, "hit him with your Pulaski!" A firefighter hits the mule and the mule then bolts back up the steep bank to the trail. Spot fires emerge down canyon from the firefighters, between them and their only escape route.

During the rodeo the Payette firefighters become separated from each other. The Payette firefighter that had been more assertive about leaving earlier makes it back up to the trail and briefly runs behind the mules. She then cuts off the trail towards the river, pulls her fire shelter out of her pack and drops her pack. She caught a glimpse of her fellow Payette employee also dropping his pack. She scans across the river and sees a wide gravel bar and a rock embankment. She runs across the river thinking she'd deploy against the embankment. She gets to the embankment with her shelter. This site didn't feel right to her. She knows she has only minutes to decide exactly where to deploy, she uses those minutes and runs up

the gravel bar and sees a small gravel island in the Greybull River. She decides that's a better place and deploys on the island. This location is hereinafter referred to as the Greybull River Deployment Site (figure 7).

The remaining nine firefighters were gathering back together as the packer literally herded the mules down the trail. The packer, remarkably, was able to herd all the animals all the way out to Jack Creek Trailhead, but of course this fact was unknown to the firefighters. The fire was spreading by *leapfrog spotting* faster than the main crown fire spread. The firefighters ran down the trail a short way, a few beginning to pull out their fire shelters from their packs as they ran. The firefighters then crossed the Greybull River near its confluence with Anderson Creek. This location is the site previously referred to in this narrative as a "worst case, but probably survivable" area. They were only about 120 yards away from the firefighter that had already deployed but in the heavy smoke none of them saw her shelter. The firefighters began to deploy their fire shelters. Some firefighters remember trees being blown over by the force of the fire wind; others saw tops of trees snapped off and blown back into the direction of the main fire. There was a brief and limited conversation over their chances of out flanking the fire by running up Anderson Creek. The local Shoshone employee knew they would have to go through some heavy timber along Anderson Creek before they could reach safe areas. Some firefighters were already getting into their shelters. Not knowing for sure how far they would have to run up Anderson and feeling fairly sure they could survive where they were, the Module Leader decided they would stay where they were and ride out the firestorm. This location is hereinafter referred to as the Anderson Creek Deployment Site (figure 7).

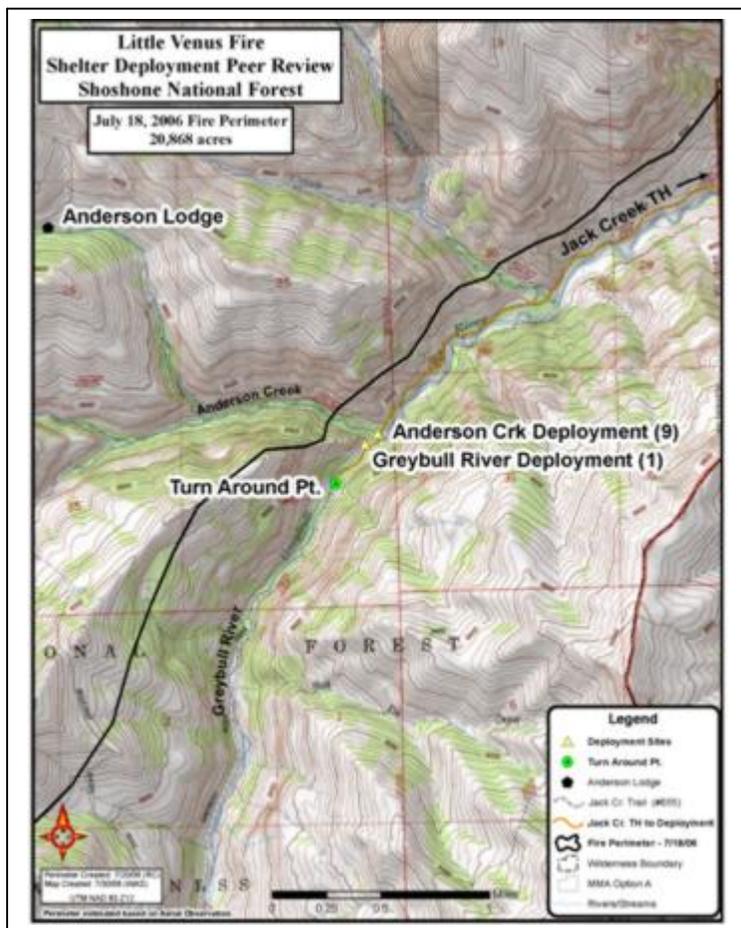


Figure 7. Greybull river canyon showing turnaround point and the Greybull River and Anderson Creek deployment sites.

The firefighter at the Greybull River Deployment site remembers thinking the rest of her crew must be trying to outrun fire. She heard the rodeo. She questioned herself, should I maybe get out and look for a better deployment site? She felt it was too late to change her mind and stayed in her shelter.

At the Anderson Creek Deployment site the module leaders did a head count, and then multiple re-counts, one firefighter was missing. Extreme anxiety over the missing firefighter overshadowed concerns for their own safety. In the confusion of the rodeo, no one at the Anderson Creek Deployment Site had noticed a firefighter had left the rest of the module. The natural assumption was that the missing firefighter must have continued down the Greybull River. Those that could think about it, knew that, if she had chosen this route, the chances of her outrunning the fire was probably nil. The only hope was that their missing crew member had somehow found another safe

deployment site. No one could remember seeing another safe deployment site for quite a distance back down the river. Some speculated, that maybe she jumped on a mule and rode out during the rodeo.

All but one of the firefighters entered their shelters. One crouched with his shelter over him. The hail of embers became very intense. Firefighters reported feeling a relatively short heat pulse, after it ended, several firefighters emerged from their shelters and took a few minutes to move burning packs and prepare a better deployment site by digging out or burning out grass around their shelters and rearranging how they were situated in relation to one another. One of the firefighters had a 43 inch tear in the center seam of his shelter. He was placed between other members' shelters for additional protection. The module leader and one other firefighter lit fusees and burned out the fuels just west of their location along Anderson Creek, then threw fusees over Anderson Creek to ignite the fuels to the north. All the while, the other firefighters were yelling for, and by radio calling for, the missing firefighter. Four firefighters at this location had new generation fire shelters and the remaining five had old generation shelters

They remained inside the shelters for the passage of two; some say four, additional "heat pulses". In total, they were in their shelters for nearly an hour. Several firefighters reported being preoccupied with thoughts of their missing crew member. All calls for the missing firefighter had remained unanswered. Most firefighters reported talking with each other while in their shelters and this provided some with a level of comfort during the ordeal.

Because the Anderson Creek Deployment Site was adjacent to a large rock face, these firefighters were somewhat protected from the strong winds that were channeling down the canyon. The shelters worked to keep the firefighters alive but many reported that the smoke inside the shelters was intense. Tears and rips in some shelters let burning embers inside. In one case, a firefighter reported that the frequency display panel on his radio was burned through by an ember while it was inside his shelter.

The firefighter at the Greybull River Deployment Site remained inside her fire shelter for probably just over an hour. She recalled five distinct fire fronts passing over her. At first she thought she had left her radio outside with her pack but later in the ordeal she remembered she had her radio. She tried to reach her fellow Payette employee and the rest of the crew several times but was sure they had all died. Through the early phases of the deployment, this firefighter was exposed to very high winds and reported that it was very difficult to hold down the shelter in the high winds.

At 1618 ICP asked Black Hills if they had communications with Unawep. Black Hills lookouts responded that they had communications earlier with Unawep and that Unawep was headed back down the river. Black Hills relayed that they didn't have current communications with Unawep.

At about 1700, most of the heat and noise had diminished. The firefighters at the Anderson Creek Deployment Site slowly emerged from their shelters and reported snags falling "everywhere," along with rocks tumbling down off the cliff ledge above them. The module leaders did a quick welfare check and then directed all the firefighters to line up with backs against the rock wall as shelter from the falling rocks and snags. The shelters, the training on the use of the shelters and the training on selecting a deployment site all worked.

The firefighter at the Greybull River Deployment site reported she stayed in her shelter until she noticed it was getting light outside and could hear the river again. She got out briefly, looked around, and then went back in to her shelter. As with the Anderson Creek Deployment Site, the fire shelter and her training, worked.

After countless attempts to contact ICP, the missing firefighter and Black Hills, one of the firefighters at the Anderson Creek Deployment Site was able to make contact with ICP at 1708. Because of

scratchiness and fade-outs it took eight minutes to confirm the message that there had been a deployment and there was one Unaweep missing. The firefighter was able to transmit a request for a helicopter to search for the missing member and also requested that a life flight helicopter come to Jack Creek Trailhead.

At about this time, the fire was clearly visible as it approached the Jack Creek Trailhead (figure 8).



Figure 8. Little Venus Fire in Greybull River drainage as it approached the Jack Creek Trailhead on July 18 around 1713 hours.

The firefighter at the Greybull River Deployment site overheard part of the radio traffic. She believed she heard, "nine Unaweeps at the Jack Creek Trailhead". While she hoped for the best she knew this was impossible. She again tried to make contact with her crew but got no reply. She was unable to make sense of the communication and she remained convinced she alone had survived the ordeal.

Radio communications from ICP and the helibase were not working at this time. A firefighter overhearing and helping to relay the previous conversation was about a 10 minute drive away from the helibase. He drove to the helibase and briefed the helibase manager on what he had heard. After a quick evaluation of the safety of flying in 30 to 50 knot winds, the pilot of the Type 2 helicopter and the helibase/helicopter manager loaded a 20-person first aid kit onto the ship. The pilot and manager lifted off from the helibase at 1723. The type-1 helicopter also lifted off and took on a full load of water in case it was needed.

Since no one knew the location of Unaweep and since there was a request for life flight to come to the Jack Creek Trailhead, the radio transmissions were interpreted to mean that there was a deployment at the Jack Creek Trailhead. A three person Youth Conservation Corps (YCC) crew was scheduled to be at the trailhead that afternoon. The fear that YCC were involved in a burn over added a great deal of chaos to the radio traffic and to the overall situation. Three ambulances in addition to a life flight helicopter were ordered to Jack Creek Trailhead.

Flying into the edge of the fire plume, the type-2 helicopter pilot and manager realized their efforts were useless. They could not see anything through the smoke. By radio, the pilot tried to convey this information to the firefighters below. A firefighter at the Anderson Creek Deployment site relates to the helicopter crew that "two" are unaccounted for. One of these "two" was the missing firefighter at the Greybull River Deployment Site, and the other actually referred to the pair of packers, but communications were too poor for the helicopter to understand where the crew was located or who exactly was missing. The single firefighter at the Greybull River Deployment Site heard the helicopter on the air-to-ground frequency and then successfully called the helicopter on her radio.

The firefighters at the Anderson Creek Deployment Site heard her call the helicopter. A wave of relief swept over the crew. They soon established direct radio contact with this firefighter on air-to-ground. The message was conveyed to the helicopter (who then relayed to ICP) that all members of Unawweep were accounted for and there were no serious injuries.

There was still confusion over the second missing person and whether this was one or two packers so the type-2 helicopter landed at the Jack Creek Trailhead whereupon the helibase manager made face to face contact with the older packer and figured out that the second "missing person" was, indeed, the pair of packers. The helicopter then conveyed to ICP that all persons involved were accounted for and that there were no serious injuries.

At 1755, the Little Venus Fire was declared "a wildfire" and the overhead organization and position titles were adjusted. Fifteen minutes later a firefighter at the Anderson Creek Deployment Site was able to reach the Operation Section Chief and advise him of their location "at the mouth of Anderson Creek".

With heavy smoke and abundant snags, it was still too unsafe for the Anderson Creek firefighters to try to exit, or to even try to physically locate the separated firefighter. The firefighters waited almost an hour for the rate of snag-fall to subside. They then began the search for the separated firefighter and eventually saw her while they were crossing the Greybull River. At 1911, Unawweep contacted Operations and reported that "all of Unawweep is safe and together at Anderson Creek."

About an hour later, Unawweep leaders reason it was safe enough to attempt to hike out. That message was conveyed to Operations. The crew devised a scheme of staging two "snag lookouts" ahead of the module, and then bumping them up as the crew progressed, to ensure someone was always looking up as the module was walking out.

At 2105 the module reached the Jack Creek Trailhead. They were met by the Forest Supervisor at the trailhead and given first aid and oxygen at the ambulances. Most of the firefighters reported intense headaches and general respiratory irritation, and one firefighter suffered a small "silver dollar sized" burn on her knee. After evaluation and treatment, the firefighters drove back to a motel in Cody.

The following day, July 19, all module members received Critical Incident Stress Diffusion in Cody. After interviews on July 20 and 21 with the Peer Review Team and Missoula Technology and Development Center Equipment Specialists, the module members were released to return to their home units.

Fire spread and area increase on July 18 had been the greatest since the fire had started. The progression of the Little Venus Fire through July 18 is shown in Figure 9.

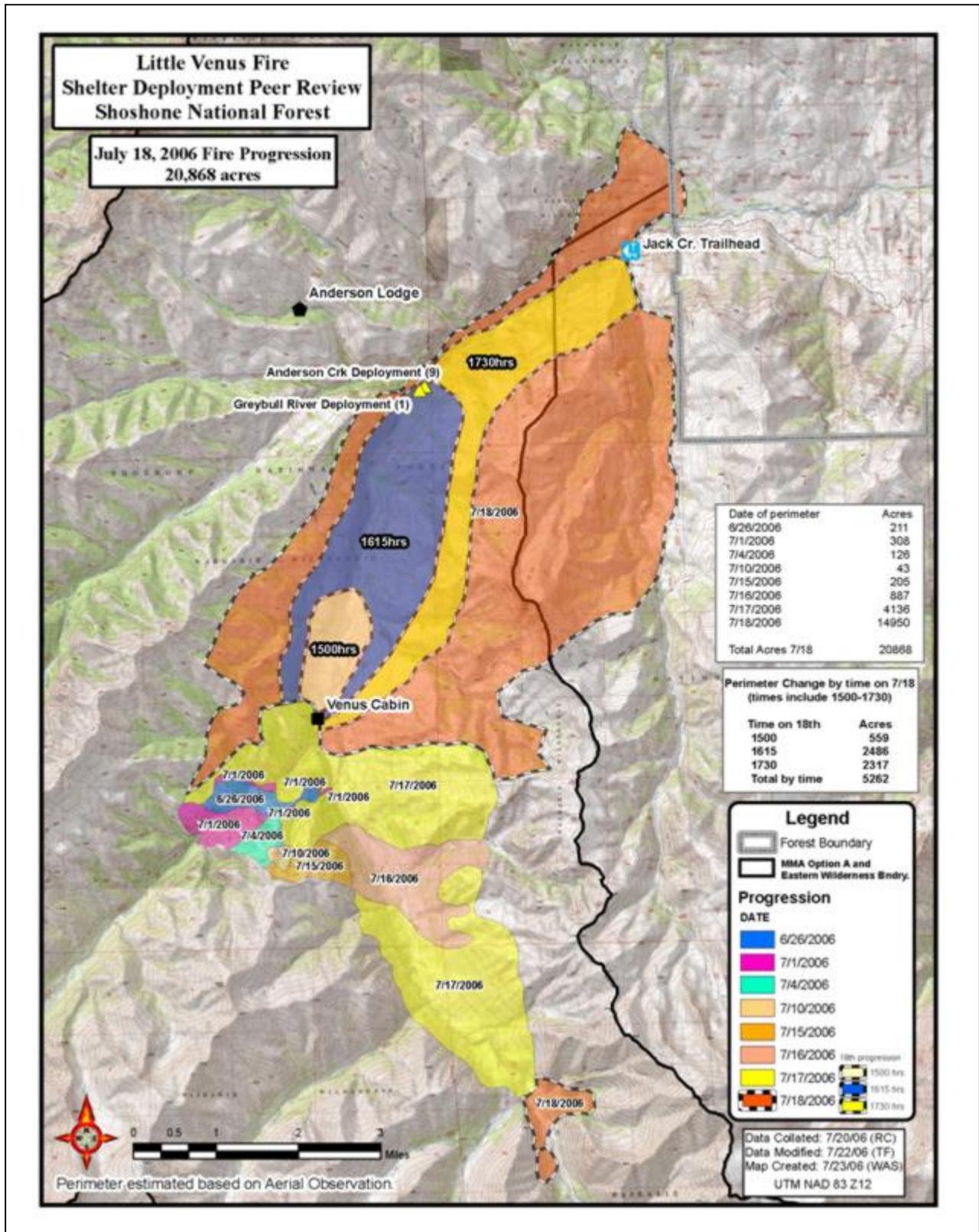


Figure 9. Little Venus Fire progression through July 18, 2006.

EPILOGUE

Twenty-seven year old Monica Lee Zajanc started her career in the fire organization in 1999 on the Boise National Forest in Garden Valley, Idaho on an engine crew. She moved to Lowman, Idaho in 2001 to work on a seven-person engine module. In 2003, Monica worked for the Cascade Ranger District on a six-person hand crew and then moved to the Payette National Forest in 2004 as a helicopter crewmember on the Krassel Helitack operation. In June 2006 Monica accepted a temporary trainee assignment on the Unawweep Fire Use Module. She was one of the ten firefighters that survived the entrapment on the Little Venus fire on July 18th.

In the days following the entrapment Monica was interviewed by members of the review team and fire shelter technical experts from Missoula Technology and Development Center. As with all members of the Unawweep Module, Monica expressed strong compassion for her fellow employees and was pleased to see the review of Little Venus was focused on learning from Unawweep's experience.

When the first draft of *The Story of the Little Venus Fire Shelter Deployment* was completed, the Peer Review team called several members of the Unawweep Module to read them the story; giving them an opportunity to correct, change or add important details. Monica was the last to be contacted. On August 4th she listened to the story and made a few minor changes. At the conclusion of the reading, Monica said the story was powerful and thanked the team for the opportunity to hear it and make some changes. She said she wanted to help with getting the story out to other firefighters. She asked if there was anything she could do to help. Our reply to her was - yes, we would use her to help get the lessons of Little Venus out. Her final words to the team were that she was excited to be a part of a life-saving lesson to firefighters.

On Sunday August 13th Monica Zajanc, Michael Lewis, Lillian Patten and Quin Stone were killed when their helicopter crashed on the Krassel Ranger District. This report is dedicated in the spirit of Monica's wish that firefighters learn the lessons offered by the Little Venus Fire and apply those lessons in future operations.



LESSONS LEARNED

FIREFIGHTER PERSPECTIVES ON LESSONS LEARNED:

Interviews with involved personnel during the Peer Review Process produced much information pertaining to the circumstances leading to the fire shelter deployment. Interview responses are provided in the following section and have been grouped into broad categories, but have not been altered from the original responses.

Formal Accident Investigations look at Human Factors, Equipment Factors, and Environmental Factors, and from these factors draw contributing and causal factors. Similarly, the Peer Review Team looked at these factors and this review focuses and highlights the directly involved participants' feelings about the factors contributing to the entrapment, what the participants learned from the incident, and what the participants believe the greater wildland fire community needs to learn from this incident. With an outsider's view, the Peer Review team then summarized and grouped these perspectives and observations into the three categories.

Human Factors

What the firefighters learned for themselves from this incident:

- Will pay more attention to Red Flag warnings.
- Will be more cautious hiking into a fire late in the day.
- Will not assume communications are adequate.
- Will establish communications with aircraft so they can also serve as our look outs and give us a heads up on developing fire activity.
- Will be more mindful of conditions; maintain situational awareness and attention to planning potential safety zones. Will more thoroughly analyze fuels and topography, escape routes, and the overall general situation. Will pay more attention to assessing safety zones, lookouts, and preplanning when walking into a fire. Will be especially mindful of potential safety zones in thick timber conditions.
- Will be more mindful and not become totally distracted by external events such as the rodeo and packer demands. Will not totally lose situational awareness during chaotic events and will keep focused on safety of crew. Will put human safety over the safety of stock animals.
- Will be more cautious and less likely to underestimate the fire potential. Never underestimate Mother Nature.
- Will be less trusting of persons not known to the crew.
- Will be more assertive and speak up to express thoughts and concerns. Will not defer to others just because they have more experience.
- Will request thorough briefings before accepting an assignments including knowing fire danger conditions are covered and potential for extreme fire behavior is discussed.
- Will call ICP periodically for information updates.
- Will resolve confusing issues over chain of command and reporting protocol.
- Will evaluate the impacts of delays to safety and mission accomplishments.
- Will treat WFU more like a suppression fire and assure complete adherence to LCES. Will treat WFU no different than suppression including ensuring I know who the IC is.
- Will be more aggressive in asking and knowing what adjacent crews are doing and where.
- Will better integrate the suppression operations with monitoring operations.
- Will stand up and not allow a young boy to enter the fire area.
- Will better explain what fire use is to local permittees and recreationist to ensure they understand and respect the hazards of wildland fire.
- Natural barriers such as rock embankments provide good shelter.

- Repetition and practice of shelter deployment saved lives. Ingrained training came out and saved lives.
- Training as a team was valuable, and will keep it up
- Will be more mindful of potential deployment sites and safety zones.

What the firefighters said the greater wildland fire community needs to learn from this incident.

- Be more flexible with plans so that they can adapt to adjust to changing conditions (ex: exercise the option of holding the BH module for several more days and transition with Unawep later when fire activity has subsided.)
- If there is a possibility of extreme fire behavior it must be briefed and mentioned in IAP.
- Defer low priority missions (like hiking in crews) when the incident hazards are high.
- Agencies need to teach operational overhead and suppression crews the mission and role of FUMs. Agencies need to teach operational and suppression crews how FUMs need to be supported especially under extreme conditions.
- Flying crews in can be much safer than hiking them into the fire. Evaluate and assess the risks of hiking crews into a fire especially an active or potentially active fire.
- Hiking crews in to a fire should be considered an operational assignment. That means it is planned and implemented accordingly including map, routes, drop off times pick up times, oversight and monitoring by operations, etc.
- Fire use is more dangerous than firefighting, and needs to be treated accordingly. Agencies need to train FUMs and WFU Teams to ensure that all incidents have clear objectives, full and complete overhead, full briefings, complete information sharing and full implementation of LCES. Agencies must also require all the same rules of engagement be enforced on fire use as they are on suppression, this includes requiring contractors be escorted, trained and equipped in the use of PPE.
- Fire use needs same attention as suppression and must not allow cost containment objectives to take priority over firefighter safety. The focus on keeping costs low interfered with mitigating key safety concerns and this is unacceptable. Agencies must STOP fostering a culture of doing more with less.
- The linkage and transition between fire use and suppression organizations is not smooth. Suppression and fire use are seen as two separate organizations with separate missions. Agencies need to clarify the difference in the missions and the organizations and clarify how we transition back and forth between suppression and use.
- Fire Use Modules need to have the same care and oversight as do suppression crews especially when the incident is transitioning to suppression. Fire use organizations need to establish a clear chain of command just like in suppression.
- Fire Use organizations need to fill the FBAN and SOFR positions when the fire is as complex as a type-3 incident.
- Fire Use organizations should require that the operations section chief be on the fire line.
- Fire Use organizations needs to be less reactive and more proactive in planning strategies and tactics.
- Fire Use organizations need to better articulate contingency plans at various Action Points and ensure the crews understand these plans. Fire Use organizations need to develop contingency plans for all operations including contingencies for a safety during a blowup.
- Management needs to be firm with permittees, outfitters and recreationists to keep them from interfering with WFU operations and for their own personal safety.
- Agencies need to keep reinforcing the value of fire shelters and emphasize training in shelter deployment.
- Agencies need to emphasize training as a team.
- Agencies need to teach firefighters to be mindful of potential deployment sites and safety zones.

Equipment Factors:

What the firefighters learned for themselves from this incident:

- Will not rely on satellite phones to mitigate poor communications. They are inconsistent and should not be relied on to mitigate radio deficiencies.
- Will not delay deployment or worry about cost of shelters.
- Will conduct extra practice with new generation shelters.
- Will inspect fire shelters regularly.
- Will test communications and verify they are satisfactory. If they are not satisfactory, will refuse or disengage from the assignment. Will be more forceful, in demanding satisfactory communications.
- Will establish communications with all other crews on the fire. If communications aren't working or fail during the incident will establish mitigations to communicate with ICP and adjoining crews and aircraft as the priority.
- Will establish radio contact with helicopters flying over and use them to get more information on the fire.
- Fire shelters work.

What the firefighters said the greater wildland fire community needs to learn from this incident

- Agencies should consider giving incoming crews opportunities to fly fire. Flying the fire can mean a big difference in firefighter situational awareness.
- Agencies should not let cost management concerns limit overhead positions.
- Fire Use organizations need to ensure communications are good between ICP, helibase, and adjoining resources, evaluate holes in the communications where you are placing crews. And don't put crews into areas where there are no communications.
- Fire Shelters Work and that message needs to be reinforced to the greater firefighter community.
- Place extra emphasis on fire shelter inspections and training on new shelters.

Environmental Factors

What the firefighters learned for themselves from this incident:

- Will be especially cautious when hiking up a canyon trail. Safety zones in the canyon need to be thought out in advance.
- Will step back and look at how the fuel conditions are changing area wide and evaluate how other fire use incidents are going. Will become more cautious when other fire use incidents are converted to wildfires.
- Will not rely on fire behavior prediction models to predict spread in beetle killed areas. The models were not accurate.

What the firefighters said the greater wildland fire community needs to learn from this incident.

- Fire Use Managers need to be trained to step back and look at how the fuel conditions are changing area wide and evaluate how other fire use incidents are going and factor these conditions into decision making.
- Fire Use organizations need to be trained to be extra cautious when managing a fire at the edge of acceptability.
- Fire Use organizations need to respect that fire behavior models under represent behavior in standing dead timber.

PEER REVIEW TEAM ANALYSIS:

Information gathering during the Peer Review Process resulted in much information surrounding the circumstances that led to the fire shelter deployment. Information was gathered from interviews with involved participants, from data collected by the Peer Review Team, and from perspectives and analysis by subject matter experts on the Peer Review Team.

Information is presented in the major categories of Human Factors, Equipment Factors, and Environmental Factors. Within these categories, subcategories of information, as appropriate, are included. The report includes a description of lessons learned and recommendations associated with those circumstances that led to the fire shelter deployment and those circumstances that resulted in the positive outcome of the deployment.

Human Factors:

Situational Awareness: The Peer Review Team agrees with the individual firefighters' lessons learned about the importance of situational awareness on all wildland fire incidents at all times. From the interviews conducted with the involved individuals, it was apparent to the team that situational awareness was lacking to some degree at all levels of the organization managing the Little Venus Fire. Many individuals did not have a thorough understanding of the purpose and objectives of their fireline assignments; many did not have a good awareness of the weather, its influence on fire behavior, and resource disposition; an understanding of planned contingencies; working knowledge of personnel assigned to the fire and the chain of command; and assumptions were made that led to failure to realize deficiencies in the organization and implementation. As a result, this lack of situational awareness created instances of confusion, incomplete information sharing, and contributed to complacency.

Recommendations: Situational awareness needs to be emphasized on every wildland fire event. Managers should maximize the use of all available tools to support situational awareness (i.e., use of Safety Officers to monitor fire scene activities, utilizing an aircraft for both aerial observation and facilitating communications, and validating the Periodic Assessment for emerging incidents.)

- Post this report on the lessons learned web site.
- Develop national staff ride based on this incident.
- Use Little Venus compared to other significant fire events to learn similarities.
- Present Little Venus scenario and lessons learned at appropriate local, regional, and national meetings.
- Integrate Little Venus scenario and lessons learned into appropriate national training courses.

Wildland Fire Use – Suppression Perceptions and Understanding: Wildland Fire Use is a management action equal to wildfire suppression and thus, constitutes an emergency action. All wildland fires receive the same consideration, management attention, and management policies. It was apparent to the Review Team that during management of this fire, many personnel at all levels of the organization lacked a complete understanding of the various strategies involved in wildland fire management. There were numerous instances where personnel indicated their perceptions that wildland fire use and wildfire suppression were two separate events, even on a single wildland fire such as the Little Venus Fire. In fact, these are fire management strategies implemented with the full spectrum of appropriate management responses for wildland fires. They are not separate activities, do not function as separate, individual entities on a single fire, and all accepted fire management principles, standards, and rules of engagement apply equally. On any single fire, multiple operational activities can take place but still remain part of a single, integrated management response. Regardless of the strategy being implemented, all resources assigned to a wildland fire must have a clearly defined purpose and operational assignment, and work within the management organization and not be left or expected to function independently.

Recommendations: Agency Administrators, program managers, and training coordinators and cadres need to correct attitudes and beliefs that wildland fire use is a low-key, low-cost operation, and different from wildfire suppression.

- Managers need to eliminate the perception that wildland fire use is a separate operation from wildfire suppression and integrate both into a single fire management organization.
- Managers need to eliminate the perception that Fire Use Modules are independent and can function at a more self-sufficient level than other resources.
- Clarify the differences between the positions of FUM2, ICT3, FUM1, and ICT2 and how they are utilized.
- Clarify cost management implications on wildland fire use events. As this program has evolved from budget constrained prescribed natural fire, a tendency to limit cost expenditures has persisted. Costs of implementing the appropriate management response for wildland fire use as well as wildfire suppression must be understood and accepted.
- Clarify the role of wildland fire management in wilderness including operational needs and limitations.
- Work with national and regional training centers and discuss lessons learned from the Little Venus Peer Review to adjust training to reflect that all accepted fire management principles, standards, and rules of engagement apply equally to all wildland fire management operations, regardless of the strategy being implemented.
- Include Little Venus scenario and lessons learned at annual fire refresher training.

Organizational Integrity: During its existence, the complexity of the Little Venus fire ebbed and flowed. After the decision to manage it as a wildland fire use event, a Fire Use Management Team was assigned to manage the fire and developed the Stage 3 Wildland Fire Implementation Plan. As weather moderated the fire activity, the team was replaced by a smaller organization led by a Fire Use Manager Type 2 (FUM2). As the activity again increased, a Fire Use Manager Type 1 (FUM1) replaced the FUM2. Fire complexity escalated at a fast rate as evidenced by daily fire growth. The overhead organizational structure to manage the fire, while increasing, did not increase commensurately. On the morning of July 18, the command and operations staff for the Little Venus fire consisted of a FUM1, an Operations Section Chief, and a Division Supervisor trainee. One position, Fire Behavior Analyst, was being filled by the FUM1 as an additional duty. In addition, the FUM1 was overseeing a FUM2 trainee on another fire on the Forest. No one was functioning in the role of a Safety Officer. The management organization capability was limited due to the collateral assignments and total numbers of overhead personnel. These organizational limitations markedly affected the efficiency of the operation. Chain of Command and supervisory roles and individuals were not clearly understood by all personnel on the fire.

Recommendations: Managers must reinforce the importance of utilizing appropriate management organizations and understand how to determine what that organization is for all wildland fire incidents to ensure safe and effective accomplishment of objectives.

- Conduct review of wildland fire use management at local levels and clarify and reinforce the importance of organizational integrity for all fires.
- Reinforce the importance of continued evaluation and assessment of factors affecting fire growth and potential fire behavior and their influence on management action points, management actions, and resources needed to manage the fire as identified in the WFIP. This evaluation and assessment should be done on a daily basis during periods of high fire danger and during large fires.
- Reinforce the importance of understanding of organizational integrity and chain of command for all fireline personnel.

Planning: The Peer Review Team validates firefighters' lessons learned about the critical impact that inadequate planning played in this deployment incident. Insufficient planning contributed to reduced situational awareness.

Fire activity was not anticipated and recognized when:

- complexity levels exceeded or were about to exceed program capabilities. There was no anticipation of an increase in operational and managerial resource needs. (Safety Officer, Fire Behavior Analyst, etc.).
- Plans that have management action points needed to provide primary and contingency planned actions that are easily understood. These plans need to be updated as conditions warrant.
- ICP was located too far away from the incident, should be located closer for (communications, interactions with operations, ground personnel, helibase, sensitivity to fire weather conditions, availability to landowners, resources, etc.).
- Fire projections and forecasts needed to be accurate and conveyed properly to all firefighters. IAPs needed to be complete and display the organization and the incident accurately.

Recommendations: Utilize available tools to assess and analyze emerging fires in order to determine the level of management organization required to meet agency objectives, the priority being safety and then strategic issues requiring mitigation.

Cost Management: Individuals interviewed had a perception that fire use is always a low-cost decision and should be implemented as such; perception is that it is okay to cut corners on safety in order to save money. Concerns over cost management may have affected implementation actions. It may be that these perceptions come from individuals that have been involved in fire use modules and fire use events over time. Prior to the 1995 Federal Fire Policy, there were even greater cost controls for WFUs (prescribed natural fires) than now. Inherently fire use fires tend to be less costly, due to the fact that they are: normally located in areas with less urban interface, values at risk; smaller fires; areas that have large manageable areas; fewer organizational needs commensurate with the strategy and tactics.

Recommendations: While efficient cost management is an important concern in all fire management activities, cost management can never be as high of a priority as public and firefighter safety and must reflect the costs of the appropriate management response.

Public Safety: Through interviews it was determined that attention to public safety and contractor safety should always be a priority. Wranglers were put into the fire area to retrieve their cattle but with no communications, personal protective equipment, or escorts and/or contingency planning if the fire should make a run into their position given to them. Packers went into an area without personal protective equipment, communications, training, contingency planning, and guidance to ensure timely and appropriate decisions.

Recommendations: At least one person, operationally qualified at a level commensurate to the complexity of the incident, should be assigned the responsibility for safety oversight. Additional safety oversight may be requested with emerging fires. A wide range of fire and non-fire personnel may visit or occasion incidents or firelines. There are standards in place for these visits need to refer to the interagency standards for fire and aviation operations.

Fire Shelter Training: The Peer Review Team agrees with the lessons learned from the individual firefighters interviewed. There is conclusive evidence from this incident that repetitive fire safety training will create an ingrained behavior. While hiking up the trail during the day, several members of the module noticed possible but marginal topographical alternatives and locations that may have functioned as safety zones or deployment sites. Once the crew reversed direction back down the trail, as the fire was spotting and running towards them, they re-identified the Anderson Creek and Greybull confluence as a preferred deployment site. The crew prepared the area and deployed their shelters several times. The positive outcome of the event is attributed by the crew to several elements: quick deployment; their position and location of the deployment site; focus on breathing techniques; digging a shallow hole in the sand for their faces; the repetitive training that they received over the years. A direct result of the

outcome of 10 firefighters walking away from such a significant event demonstrates the benefit of the fire shelter training used by the wildland fire community.

Recommendations: To continue to use the Fire Shelter Training.

- Gather input and suggestions to improve the training.
- Integrate input on development and performance evaluation of the shelter from individuals that have experienced fire shelter deployments.
- Integrate the Little Venus Fire Shelter Deployment into the Annual Fireline Refresher/Fire Shelter Training exercises.

Equipment Factors

Radio and phone systems: Communication system problems had been identified from the start of the incident. A repeater was installed on Irish Rock, but did not function. A replacement for this repeater was scheduled to be installed on July 19. Most communications were being conducted through Carter Mountain, a permanent Forest Service repeater. Carter Mountain was marginal at best for the resources deployed on the fire and for the helibase. Being at the bottom of Greybull Canyon further exacerbated the communication difficulties, with the ability to transmit through Carter Mountain being hit and miss. Satellite phones were considered to be an acceptable alternative to a fully functional radio system, yet satellite phones do not function well in a narrow canyon or with the sky obscured by a timber canopy. Direct implications of the communications situation include:

- Poor communication capability led to uncertainty as to whether Unawep had received information in regard to having them and the packer stage downstream from the fire.
- Poor communication capability led to fire managers being given erroneous information concerning the disposition of Unawep during the fire's major run.
- Poor communication capability prevented the fire managers from knowing about the shelter deployment until after the firefighters had emerged from their shelters.
- Poor communication capability caused a high level of confusion after the deployment concerning the disposition of all of the firefighters.

The Peer Review Team validates the individual firefighters' lessons learned about the critical impact that inadequate communications played in this deployment incident. Further, the Peer Review Team perceives that a major reason why the communication deficiencies were not quickly corrected is because a *'do more with less'* attitude developed. Wildland fire use incidents have often been low priority in receiving requested resources and over time this may have resulted in a *'make do with what you have'* and a *'lean and mean'* philosophy.

Recommendations: Appropriate communications must be established and maintained on all wildland fires, regardless of the strategy being utilized (i.e., wildland fire use, suppression). The elements of LCES form a safety system used by firefighters to protect themselves. This system is put into place before fighting the fire, setting up a communications system is key to firefighter safety.

- Re-emphasize the importance of adequate communications on all wildland fires.
- Emphasize that all firefighters have communication responsibilities: inbriefing/debriefing others as needed; communicate hazards; acknowledge messages and ask if you don't know.
- Before engaging in an assignment ensure that communications are in place and/or there are adequate mitigations. Radio frequencies have been confirmed, backup procedures and check-in times established, updates on situational changes, contact with adjoining resources, contact with command, use of aircraft for communication platforms, and firefighters need to continuously monitor and evaluate communications as conditions change.

Fire Shelters: See Appendix D. Fire Shelter Analysis.

Recommendations:

- Continue to fund and replace the change over in fire caches across the country from the old generation fire shelters to the new generation fire caches.
- Increase the size of the new generation fire shelters.

Environmental Factors

The environmental factors are discussed in Appendix C. Little Venus Fire Behavior. Fire behavior was under predicted by the fire behavior analyst for the day of July 18, 2006, and the fire spread surprised most of the people involved. Current fire behavior models do not accurately reflect rate of spread in standing dead timber or in conditions of high winds and high probability of ignition which results in spread by spotting.

Recommendation:

- Develop a strategy to increase awareness throughout the fire behavior community of the limitations of fire spread models, consider adding a Little Venus Fire lesson plan into case studies for S-390 and S-490 courses.

FACTORS CONTRIBUTING TO THE SURVIVAL OF THE MODULE MEMBERS AND PACKERS

On the Little Venus Fire, a number of circumstances, decisions, and operating principles resulted in the survival of all individuals in the Greybull River drainage on the afternoon of July 18. These are:

- the poise, grounded thought process, and maintaining self control by the Unawep Module throughout the entire event,
- the attention to and concern for the safety of the packers and the desire to keep all personnel together,
- the instinctive awareness of safety zones and potential deployment sites by module members,
- training in shelter use and selection of deployment sites,
- selection of excellent, protected deployment sites that limited exposure of direct flame and radiant heat:
 - The Greybull River site was at the bottom of a scree slope on the west edge of the Greybull River. Heavy timber was on the east edge of the Greybull River. A small amount of dry grass was near the deployment site, but it did not burn, indicating very little, if any, flame impingement. One firefighter deployed at this site.
 - The Anderson Creek deployment site featured a 35-foot-tall rock wall to the south and the 15-foot-wide Anderson Creek to the north. Heavy timber was north of Anderson Creek. The deployment site was sand and gravel with very little vegetation. The dry grass on the site was burned only in a few, very small (12-inch-diameter) spots, indicating very little flame in the site. Nine firefighters deployed at this site.
- the ability to deploy shelters efficiently and rapidly,
- fire shelter performance in protecting individuals from radiant and flames,
- the continued safety awareness when leaving the canyon through an area of serious snag hazard, and
- the skill of the packers in herding their stock and evacuating the drainage.

COMMENDATIONS

Commendations Go To: The Unawep Fire Use Module for keeping their wits about them through the course of this event and having a high amount of concern and regard for the packers and later their missing crewmember. Commendations go to the module for the following reasons: identifying the Anderson Creek/Greybull River confluence area as a potential deployment/safety zone area, during their hike up canyon; taking the time to assist the packer in controlling his mules and moving them down canyon to the trailhead, as spot fires were occurring all around them. Commendations go to the module for selecting maybe the best and only sites in the area, instead of trying to outrun the fire down canyon. Commendations go to the module for the method in which they deployed their shelters, placing the ripped shelters in the middle of the rest to help deflect heat away from the weaker shelters, and arranging everyone so their heads were pointing away from the heat source. Module members talked to each other to calm and support each other as well to keep everyone in their shelters until it was safe to leave the shelters. Once they emerged from their fire shelters the module members were anxious to locate the missing firefighter (who had deployed up river), as well as learn the fate of the packers. Commendations for the safety awareness they utilized to move out of the canyon through a high snag hazard area (use of two spotters, one on each side of the module as lookouts as they progressively moved out of the area).

Commendations Go To: Forest Supervisor: Becky Aus and Staff - During the course of the Little Venus Wildland Fire Use Fire and the shelter deployment event, Becky, took her role seriously as evidenced by her staying on her unit during the fire use fire instead of attending the regional leadership

team meeting. She personally participated in all approval steps. Becky displayed concern for the Unawep FUM after the shelter deployment, by waiting for their return at Jack Creek Trailhead and scheduling a critical Incident Stress Defusing session. Becky provided counsel and support to Forest employees as well to crews and overhead regarding the Little Venus Fire. Becky made herself constantly available not only to the employees but also to the Peer Review Team. Becky's staff was personable and supportive of the review team and provided great assistance to the team. District Ranger Terry Root, provided assistance, and support to the Unawep crew once they returned to Cody after their hike out of the Greybull and through the next several days before they traveled back to Colorado.

Commendations and Thanks Go To: The Pilot of Helicopter 8CC, Al Blain for his willingness to put himself at risk during a search to locate two reported Unawep module members believed to be missing after the Little Venus Shelter Deployment. On July 18th Pilot Al Blain was notified by Dennis Shultz at the helibase that there had been a fire shelter deployment by the Unawep module in the Anderson Creek area. Shultz asked the pilots of Helicopters 8CC and 720 if they could launch their aircraft and help locate the missing firefighters, aid and assist as possible. The winds earlier in the day had been strong and variable in the river drainage and air operations were assessed to be hazardous, prompting all helicopter operations to be grounded until conditions improved. Pilot Al Blain felt compelled to fly into this area if at all possible and attempt to help find the missing firefighters and assist in extrication of the firefighters out of the river drainage. As Pilot Al Blain flew up river, there loomed a thick smoke cloud over Anderson Creek and the Greybull River area, minimizing visibility. Pilot Al Blain hovered in this area trying to discern firefighters and the deployment site. The pilot tried to relay to the crew that the conditions were too smoky and he had very poor visibility. Finally the firefighter that deployed along the Greybull River contacted the helicopter and said she was alright. With this, Pilot Al Blain lifted out of the smoky area and flew to the Jack Creek Trailhead where he landed to determine if the packers were alright. The packers were at the trailhead and in good shape. The helicopter then lifted off and flew to helibase to await further orders.

Commendations and Thanks Go To: Pilot Of Helicopter 720, Wade Green, for his willingness to put himself at risk during a search to locate two reported Unawep module members, believed to be missing after the Little Venus Shelter Deployment. On July 18th Pilot Wade Green was notified by Dennis Shultz at the helibase that there had been a fire shelter deployment by the Unawep module in the Anderson Creek area. Shultz asked the pilots of helicopters 8CC and 720 if they could launch their ships and help locate the missing firefighters, aid and assist as possible. The winds earlier in the day had been strong and variable in the river drainage and air operations were assessed to be hazardous prompting all helicopter operations to be grounded until conditions improved. Once Pilot Wade Green heard that the Unawep module had deployed shelters and that there maybe missing module members, Pilot Wade Green offered up his services to help locate the missing module members. As he launched he filled his water tank thinking he could use the water to cool any continuing fire risks threatening the firefighters. As Helicopter 720 approached Anderson Creek and Greybull River, he heard the radio conversations between the missing firefighter and H8CC confirming the firefighter's status. As well Pilot Wade Green heard radio transmissions that the rest of the module was alright. Pilot Wade Green then departed the fire area and returned to the helibase awaiting further orders.

Commendations Go To: Wade Wyman, while serving as manager for a type one helicopter Wade was informed of a shelter deployment of 10 firefighters on the Little Venus Fire and the need to support these firefighters. Wade conversed with the pilots of the two helicopters at helibase about a support mission, the prevailing conditions, a risk assessment was conducted and a determination was made that helicopter flight could be conducted safely to aid and assist the firefighters. Wade took the co-pilot seat in the type two helicopter 8CC to provide assistance to the pilot, operate radios and be an extra set of eyes during the mission. Once helicopter 8CC was airborne Wade was able to establish communications with the one missing firefighter who was just upstream from the rest of the crew. Wade was able to relay to the rest of the Unawep module that the one missing firefighter had been talked to and had no injuries. Wade also talked with Unawep and determined that all members of the module were safe and

injury free. There were still reports of two missing packers, Wade and helicopter 8CC flew to the Jack Creek Trailhead, landed and located the two packers who were loading up their mules and gear. The status of the Unawep Module, the missing firefighter and the packers was relayed to the Unawep module and to ICP. Wade's actions are commendable for assessing the risks and the benefits of the flight, being instrumental in adding to the safety of the type two helicopter flight, in locating and determining the status of the Unawep module and the packers.

Commendations Go To: Dennis Shultz for just after the fire shelter deployment event, Dennis took the initiative to drive to the helibase and urge the helicopter pilots to launch their helicopters to aid in the search and rescue of the missing firefighters and lend any assistance possible to any injured firefighters. Dennis then drove to the Jack Creek Trailhead to determine the fate of the two packers that had been up river with the Unawep Module several hours before. Noteworthy is Dennis' concern and compassion for the well being of the firefighters and the packers, but more importantly Dennis' willingness to take action at a critical moment to coordinate a search effort, to find and assist the firefighters and packers.

SUMMARY

The Little Venus Fire began as a naturally ignited wildland fire that was managed for resource benefits under a wildland fire use strategy. Fire behavior and growth responded to the ebb and flow of weather over the early stages of the fire but around the middle of July, fire activity began to steadily increase.

On July 18, 2006, a fire use module of 10 individuals traveled by foot into the fire area with plans to make contact with another module, de-brief them and replace them. A chain of events caused the module to be in the Greybull River drainage at the peak of the burning period and eventually, became entrapped by the fire. Unable to escape the oncoming fire, they deployed their fire shelters at two locations: one in the Greybull River canyon and another at the confluence of the Greybull River and Anderson Creek.

All personnel survived with no significant injuries and no hospitalization; all were safely evacuated from the fire area. While this event had a very positive outcome, it represents a significantly critical event that very easily could have had a dramatically different outcome. A specific set of circumstances resulted in the module being in the canyon at the particular point in time and a set of circumstances resulted in the fire behavior and spreading throughout the canyon that afternoon. An additional set of circumstances that unfolded during the incident, were directly responsible for the positive outcome and resulted in the survival of all individuals in the canyon on July 18.

It is vitally important to identify the lessons learned from this incident for two purposes. First, lessons learned should illustrate circumstances, situations, and decisions that we do not want to be duplicated by others so that incidents of this nature can be avoided during all future wildland fire management activities. Second, lessons learned regarding the circumstances, situations, decisions that contributed to success need to be provided to all fire management personnel in the hope that they may help others make the right moves if ever encountering this type of situation.

Wildland fire management can never retreat from its primary focus and objective of providing for firefighter and public safety. Wildland fire management agencies must treat this as a dynamic situation and never cease to learn to better prepare managers and firefighters to safely meet all objectives.

The Peer Review Process utilized for this deployment was a viable process that facilitated accomplishment of all desired objectives. It provided an opportunity to evaluate individuals' decisions and behaviors and contributing factors in terms of human, equipment, and environmental factors. The outcome of this process imparted much less stress and anxiety to firefighters interviewed resulting in more open and candid discussions of the event. It also provided an opportunity to formalize a process that will help to reduce future errors by correcting or reinforcing behaviors and providing a foundational basis for accelerating fire management organizational learning.

APPENDIX

A. PEER REVIEW – PURPOSE AND PROCESS



USDA Forest Service Fire and Aviation Management Briefing Paper



Date: May 1, 2006

Topic: Peer Review - Purpose and Process

Issue: Implement a post-event process that evaluates workforce performance and safety, with intent to gain lessons learned in an unobtrusive yet timely manner.

Background: Implementation of a doctrinal approach to fire management requires performance management and error reduction systems that are designed to improve workforce decision-making. Reviews or investigations of accidents or other significant events provide opportunities to improve organizational learning toward this end.

Peer Reviews will provide a framework to assist the evaluation of individuals' decisions and behaviors, and contributing factors (organizational, environmental, social...).

Our purpose for developing this process is to reduce errors by correcting or reinforcing upstream behaviors and other factors. Peer reviews provide a means to learn from a variety of situations, including close calls, significant events, and routine performance evaluations. The objective is to create a culture that expects and values peer reviews as an important means to discover subtle indicators of potential future errors and as a catalyst for positive change.

Implementation:

Peer Review Panels should be used following near-miss events and close calls, and significant events, regardless of outcome. Individuals may request peer review of their personal performance; Unit and/or individual performance may be evaluated through the peer review concept; and line officers should consider using peer review to perform their annual 10% review of Type 3, 4, and 5 fires.

A Peer Review may be conducted concurrently with accident investigation activities when desired by the convening line officer. This approach allows the evaluation of decisions that may have led to the outcome, in terms of operating principles, leader intent, situational awareness, etc., and not simply as relates to the momentary violation of a rule. This approach helps to segregate human error from intentional disregard of rules and gives the opportunity to identify positive behaviors and decisions even when a bad outcome occurs.

Peer Review may be used to highlight systems and organizational issues that affect performance and safety.

Process:

Peer Review Panel Composition... The process centers around convening a small panel of respected operators, known for their ability to perform the particular mission in the particular environment, and also known to be insightful, fair, just, and honest. It is imperative that the panel and its members be able to create an open 'listening' environment.

Peer Review Panels are an opportunity to involve future leaders to help them expand their understanding of the diversity and complexity of fire operations, and broaden their vision of the fire program they will eventually inherit.

Questions... are designed to ascertain each interviewee's perspective. The panel will combine a number of these perspectives to develop a picture of the event, internal and external influences, and the decisions and behaviors involved.

1. What was planned? What was your leader's intent?
2. What information were you provided? What did you feel was missing? Why couldn't you get it?
3. What was the situation? What did you see? What were you aware you couldn't see?
4. What did you do? Why did you do it? What didn't you do? Why didn't you do it?
5. What did you learn? What might you do differently the next time? What can we learn as an organization? What might we do differently?

The Panel should continue questioning in areas where the reviewers feel disconnect, discomfort, confusion, or curiosity.

There will be occasions when the process of peer review unintentionally reveals evidence of misconduct. At this point it is the obligation of the Peer Review Panel to immediately terminate its activities and inform the delegating line officer of the potential need for administrative or other review / investigation.

It is important to understand that Peer Review Panel activities are entirely focused on developing lessons learned, and not to contribute to other investigations or reviews.

Potential Products of the Peer Review Process

While based on the same premise as the After Action Review (AAR), the peer review process is a look from outside the team, unit, or event, while the AAR is internal. Lessons learned by the Peer Review Panel will be made available beyond the team, unit, or event.

The immediate product of Peer Review Panel activity is a written disclosure of lessons learned, including the story of the event and the reasons it unfolded the way it did. Benefits of the Peer Review Panel's process and report include:

- providing feedback on performance, possibly including areas of potential improvement
- assisting the supervisor, program manager, and line officer in the evaluation and improvement of employee development efforts
- helping in the amendment of training strategies and materials, policy (principles and rules), and operating procedures
- supplying subject matter for presentations, briefings, job hazard analyses, safety alerts, and other communication opportunities
- contributing with other information, to a higher level lessons-learned analysis
- promoting long-term positive shifts in the organization and the culture

Contact: Ron Hanks – National Risk Management Group – (208) 387-5607

B. CHRONOLOGY OF EVENTS

Date (2006)	Time (all times approximate)	Event
June 19	1736	Little Venus Fire ignites.
June 23	1500	Discovery date and time.
	2100	Fire Use Management Team ordered – fire size 100 acres.
	2209	WFIP Stage I prepared.
July 5		FUMT released – fire size was 646 acres.
July 6		FUM1 and OSC arrive.
		FUM1 and OSC assigned to Bomber Basin Fire, OSC released to take T1 IMT assignment in Eastern Montana.
July 16		FUM1 called back to Cody to manage Little Venus Fire, left a FUM2 at Bomber Basin Fire – fire size was 1781 acres.
July 16		Fire activity increases, Shoshone NF orders T1 helicopter.
July 17	1730	Unawep Fire Use Module arrives at S.O. Receives initial briefing and buys groceries – fire size is 5917 acres.
	2100	T1 helicopter, 720 arrives.
	NT	FUM1 assumes management of Little Venus Fire.
	NT	FUM2 transitions to Operations Section Chief.
July 18	0730	Unawep FUM receives further briefing at S.O. Includes bear safety and pepper-spray training.
	0830	Two Shoshone NF employees join Unawep FUM for briefing.
	0930	Wranglers (man and woman) meet Division Supervisor trainee on ridge and are briefed on removing some stock. Do not have radio so are given one from IHC.
	1030	Unawep FUM leave S.O., make purchases in town and pick up equipment at cache.
	1115	Unawep FUM departs Cody for Jack Creek Trailhead.
	1200	Wranglers are out of fire area on the east side.
	1309	DIVS (T) calls ICP and asks about Unawep’s status. Told that they are in route and may be already hiking.
	1313	DIVS (T) asks if Unawep can give the packer a radio. Unawep says they are still at the trailhead and will loan the packer a radio.
	1315	Unawep FUM meet packer at Jack Creek Trailhead. Group helps load livestock. Lead packer, and a 14 year old boy, prepare to depart, check radio and batteries nearly drained, inform crew that he would keep radio turned off unless he needed to contact someone.
	1345	Helicopter 720 arrives on fire.
	1400 - 1415	Unawep FUM and packers depart for 8 mile hike to Venus Cabin
	1418	Black Hills FUM suggest to ICP that Unawep FUM be sent to Anderson Lodge to prep the structure.
	1429 -1435	Black Hills suggests to ICP that Unawep and the packers be turned around. Much difficulty in the transmission, a human repeater from Black Hills helps out. ICP asks if Unawep should stage down river from the fire. Black Hills says yes. Black Hills contacts Unawep and relays from ICP that Unawep is to find the packers and stage in the canyon downstream from the fire. Black Hills is unable to confirm that the message was received by Unawep.
	1435	Unawep FUM continues up Greybull River to contact the packers and find a safety zone in which to stage.

	1545	Craig IHC and Southwest Wyoming crews abandon eastside ridgeline, thought fire was coming up ridge toward them.
	1550	Unawep FUM arrives at turnaround point, about 4 miles in from trailhead. Takes pictures of fire. Puts on fire clothing. Makes decision to turnaround and move back down the trail. Remain there 5 – 10 minutes. Unawep senior leadership tells module to begin moving, three will wait for packer.
	1550	One module member begins moving back down the trail.
	1555	First pack train comes back down trail (14 year old boy), passes module and then passes single module member.
	1600	Both helicopters on ground at helibase, having left fire area at around 1530.
	1600 - 1605	Second pack train comes back down trail and single module member becomes separated from remainder of module.
	1605	Lead packer and pack train join Unawep, they begin to move toward Anderson Creek and join together.
	1605 - 1609	Mules become tangled, rest of remaining module assist packer with cutting mules loose, pull from river, and herd them down canyon. Ember fall overtakes module, spot fires become established all around them, one module member jumps into river to help remove one mule, crew continuity becomes disrupted, module members focus on supporting livestock movement.
		Single module member ahead of rest of module, hears yelling about pack trains, moves down the trail, drops pack, takes shelter and gloves and crosses river, stops at a scree slope above river. It is too steep and rocky, sees a rock sandbar along river and deploys there.
	1609 - 1613	Unawep FUM moves down trail toward confluence with Anderson Creek.
	1614	Unawep FUM deploys fire shelters at site next to Anderson Creek near confluence Greybull River, with the exception of one member (8 of 9 at this location went into shelters).
	1618	ICP calls Black Hills and asks if they have comms with Unawep. Black Hills state that they had earlier comms with Unawep and that Unawep was headed down the river. No recent contact with Unawep.
	1619 - 1627	People get out of shelters, do some preparation and rearranged shelter sites. Two module members do some burnout up Anderson Creek on same side as them and throw fusees across the creek.
	1628	All module members at the Anderson Creek site enter their fire shelters.
	1630	Craig IHC and SW Wyoming back at vehicles.
	1628 - 1715	Anderson Creek site module members remain in fire shelters for passage of two - three heat pulses.
	1610 - 1710	Single module member deploys fire shelter and remains inside at Greybull River deployment site.
	1630 - 1700	OSC leaves ICP for trailhead after radio traffic from Black Hills FUM reporting increased fire activity.
	1708 - 1716	Module member attempts to contact ICP. Logistics steps in and serves as a radio relay. Due to bad communication, it takes 8 minutes to convey that there had been a deployment and that he is requesting a helicopter to look for missing firefighter. Requests a Lifeflight be launched from Casper, WY and also ground ambulances be dispatched to Jack Creek Trailhead.
	1723	Helicopters 8CC and 720 launch.
	1730	OSC calls DIVS (T) and requests that he go to Jack Creek Trailhead and

		establish control.
	1730	Logistics arrives at helibase and advises the Helicopter Manager that there was a shelter deployment. Helibase manager and helicopter 8CC depart for recon, helicopter 720 also departs with load of water but does not enter the scene because of smoke and concerns with two helicopters in same area. Helicopter 8CC makes contact with module member who reports he can not make contact with two people.
	1740-1744	UnawEEP attempts to contact single module member, search down canyon. The single module member makes contact with the helicopter by radio. Another module member then made contact with the separated individual, but since that person's radio batteries were running low, used click sequences for positive and negative responses. 8CC landed at Jack Creek and Manager made contact with packer. Helicopter 8CC reports that they could not see shelters, did make radio contact with single module member and confirmed individual's status, confirmed that packer was second person.
	1755	OSC relays to DIVS (T) that fire was now a wildfire, FUM1 is ICT3, OSC remains OSC, and DIVS (T) becomes SOFR.
	1810	Module members radio OSC - location at mouth of Anderson Creek.
	1845	All module members reunited at the Anderson Creek site. Conduct a mini-AAR, welfare check, evaluate the safety of hiking out.
	1911	Module radios OSC – all individuals accounted for and together. Life support not needed.
	2000	Module radios OSC – asks about trailhead conditions.
	2010	Module members (10) begin to hike out to trailhead.
	2105	UnawEEP FUM arrives at Jack Creek Trailhead. Ambulance personnel provide examinations of crew members and determine they did not need immediate hospitalization. Forest Supervisor talks with crew members and ascertained that they were okay to drive their vehicles to town. Crew departs for town and motel rooms. Fire size is 20,868 acres.
July 19	1800	Critical Incident Stress Management defusing for UnawEEP FUM and Shoshone employees involved in shelter deployment.

C. FIRE BEHAVIOR SUMMARY

Fuels: Conifer timber stands were the primary fuel type during the July 18th fire run. These stands have had a severe bark beetle infestation, which has resulted in an approximate 50% mortality in the last 5 years. Trees that were killed are in differing stages of mortality, varying from dead trees still retaining needles to snags having dropped needles but retaining heavy loadings of dead twigs and branches in the one hour fuel size class. The high percentage of dead and dying trees in the conifer stands resulted in an altered fuel complex where conventional methods of fire hazard assessment (Energy Release Component, Burning Index, etc.) significantly under-predicted fire behavior potential.



Topography: The Little Venus fire shelter deployments occurred next to the Greybull River. Very steep canyon slopes with many secondary and tertiary canyons characterize this area.



Weather:

The weather leading up to July 18th was a drying trend with increasing temperatures and decreasing relative humidities. The entrapment took place during a Red Flag warning for high temperatures, low relative humidities, and high winds. The spot weather forecast predicted:

- Maximum Temperature: 76-82°
- Minimum Humidity: 8-14%
- 20 Foot Winds: SW 15-20, gusts to 35, shifting to NW at 1400 hrs
- Ridge Top Winds: SW 20-25

The Grass Creek Divide Remote Automatic Weather Station (RAWS) observations measured the maximum temperature to be 91° F, minimum relative humidity 11%, maximum sustained winds of 20 mph, and maximum gusts of 39 mph. The narrow canyons had the effect of constricting the surface flow, and accelerating the wind velocity in the canyon bottoms. Winds were estimated to be 30-40 mph by an observer on a ridge top near the fire, and 40-50 mph down-canyon by one of the helicopters in Greybull Canyon.

Fire Behavior, General:

The fire behavior had been steadily increasing in intensity since July 15th. This was due to the drying that was occurring from the early July rains. On July 18th the fire became active early in the afternoon. The activity was in the bottom of Greybull Canyon on both sides of the river. The fire activity increased in intensity and was documented by fire monitors in the Venus Cabin area.

By 1500 hours the fire had progressed one and a half miles downstream, primarily through crown fire runs. By 1600 hours the fire had progressed two more miles. The recent mortality increased the firebrand production and the dry conditions resulted in a high probability of ignition. Between 1545 and 1605 hrs winds intermittently laid down the column, which allowed the winds to be channeled through the canyon, causing prolific long range spotting. By 1605 hrs the down-canyon winds became firmly established resulting in sustained long-range spotting, higher intensities, and increased spread rates. Spotting distances were estimated to be one half to three quarters of a mile. This process continued until the fire reached the mouth of the canyon where crews conducted a burnout to protect structures.



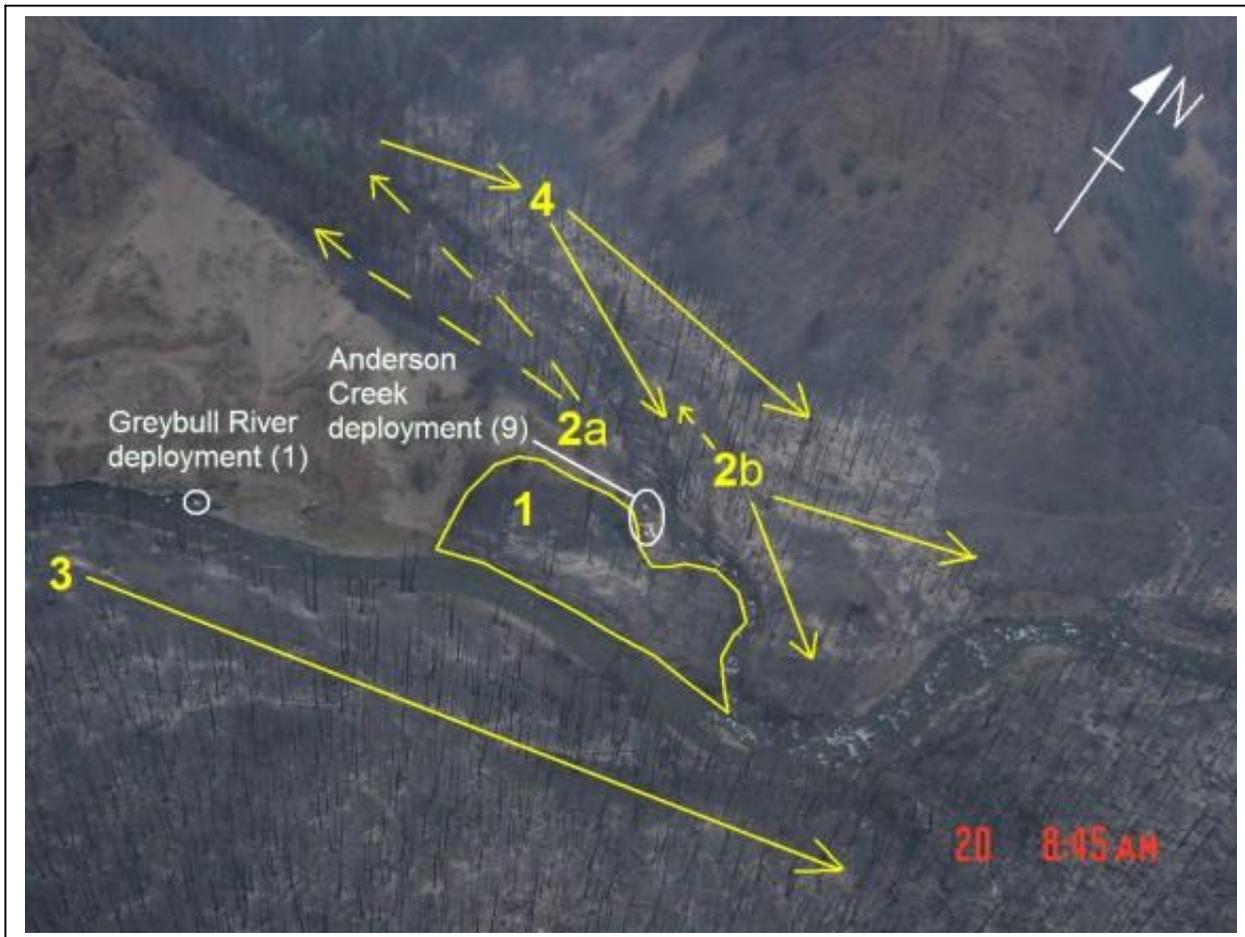
Looking West 1548 hours



Looking SSW 1600 hours

Fire Behavior, Entrapment Site:

The following fire behavior progression estimates are based on burn indicators and witness statements.



1. At 1615 hours multiple spot fires were occurring around the deployment sites. The spot fire at #1 caused the personnel at Anderson Creek to deploy in their shelters for the first time.
2. Between 1625 and 1630 hours, a burnout was conducted to reduce fuels above the Anderson Creek site, 2a, and results in a backing fire. Just prior to re-entering their shelters, fuses thrown across Anderson Creek, 2b, which resulted in a head fire that moved down canyon and a backing fire that moved slightly up-canyon.
3. Between 1620 and 1630 hours the main fire progressed down Greybull Canyon past the Greybull River deployment to the mouth of Anderson Creek in the form of a high intensity head fire. (It should be noted that by this time multiple spot fires have established fire well down-canyon from the site.)
4. Between 1645 and 1700 hours the backing fire transitioned to a high intensity, down-canyon head fire on the other side of Anderson Creek.

The intersecting canyons caused the winds to develop an eddy effect, which caused trees to be blown down in different directions.



1. 1615 hrs, spot fire that causes the group to enter shelters at the Anderson Creek Deployment site.



2. 1625-1630 hrs, burnout conducted to reduce fuels up-canyon from the deployment site in Anderson Creek, results in backing fire.



3. Main fire progresses down Greybull Canyon.



4. Backing fire transitions to a down-canyon head fire on the other side of Anderson Creek.

C. FIRE BEHAVIOR SUMMARY – CONTINUED

Potential Fire Blow-up Modeling for the Little Venus Fire

Prepared by the Fire Behavior Assessment Team

July 22, 2006

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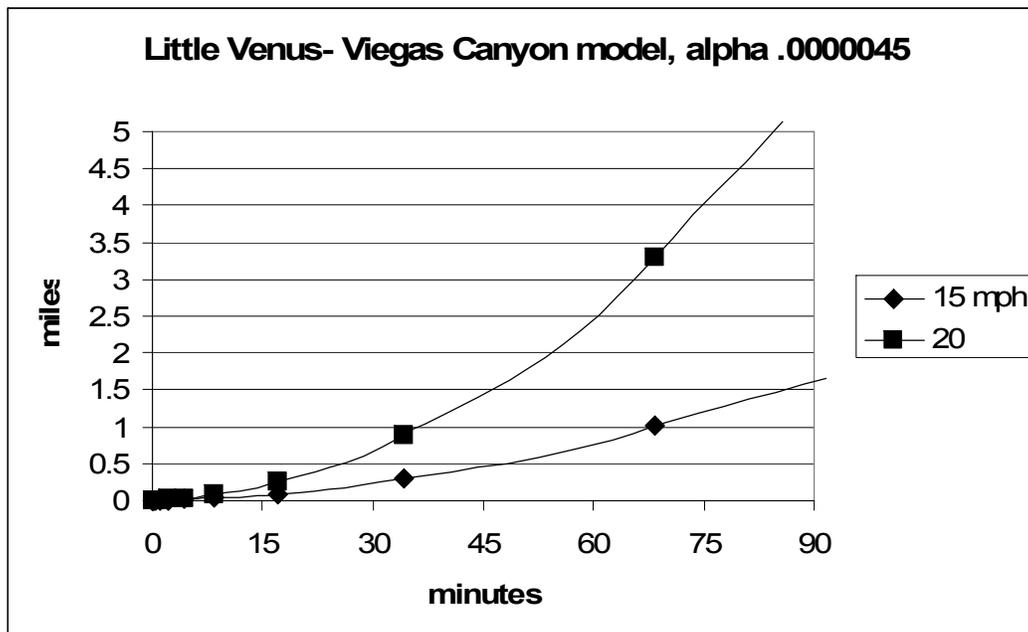
Background

Acceleration of fire in canyons or chimneys pose grave safety threats to firefighters and communities. Fires can accelerate rapidly, often with little warning or wind. Canyons can also funnel winds and increase convective interaction of heat from fire and atmosphere, increasing wind and fire acceleration.

We applied the Viegas canyon blow-up model to the canyon in the Little Venus Fire where the fire accelerated rapidly on July 18th. Initial winds of 15 to 20 miles per hour were applied. Although winds reported in the helicopter in the canyon shortly after the fire began accelerating were estimated as high as 40 to 50 miles per hour, the winds were likely not initially as great.

Findings

The model runs showed that the modeled fire progression is similar to that reconstructed for the fire on July 18th, when initial winds of 15 to 20 miles per hour were input. This shows that the fire could have traveled the estimated 2.5 miles in 75 minutes with initial winds of 17 miles per hour.



Limitations and Appropriate Application of the Model

This model can be applied with more careful measurements of canyon geometry but the results would not likely vary much. Here the canyon slope and angle was estimated visually from topographic maps.

This model does not specifically address spotting or mechanism of spread but is based on laboratory and field measurements where acceleration of fire occurs due to convective driven processes. In these convective driven processes, it is likely that spotting is also important but is not implicitly addressed by this model.

Currently, the Fire Behavior Assessment Team is working on collecting monitoring data to validate the model in the field.

D. FIRE SHELTER ANALYSIS/EQUIPMENT REPORT

EQUIPMENT REPORT
LITTLE VENUS SHELTER DEPLOYMENT
JULY 18, 2006

This equipment report is based on personal interviews with 10 firefighters who deployed shelters on July 18, 2006, and on examination of the deployment site and inspection of the equipment (performed between July 20 and July 27, 2006.)

Injuries:

- One firefighter received a 1-inch diameter second degree burn on the left front knee. The firefighter could not recall when the injury occurred, but assumed it was caused by a hot ember during the deployment.
- One firefighter received a 1/2-inch diameter second degree burn on the left elbow. This firefighter had an old-style shelter with a large tear. The firefighter gathered the shelter material underneath him to close the hole created by the tear and received the burn where the fire shelter material was pressed against his elbow.
- All firefighters were treated at the trailhead for smoke. Three firefighters received medical treatment at the hospital. All were released later that day.

Personal Protective Equipment: According to the crew boss of the Unawep crew, all firefighters were appropriately equipped with personal protective equipment per their agency's direction.

- The BLM employees were equipped with old-style fire shelters.
- The USFS firefighters were equipped with New Generation Fire Shelters.
- When the firefighters reached the fire area, they donned fire shirts and hardhats.

Clothing:

- The clothing of eight firefighters showed no signs of heat damage.
- The pants of the firefighter who received a burn to the left knee had corresponding dye sublimation (turning orange) 1 inch in diameter.
- The fire shirt of the firefighter who sustained a burn to the elbow had corresponding dye sublimation (turning grey) 1/2 inch in diameter.

Fire Shelters: Fire shelters were inspected July 21 at the deployment sites, July 23 in Cody, WY, and on July 27 at MTDC. They were examined for heat and structural damage.

Old-style fire shelters:

- The heat delaminated one shelter over a 30-inch by 8-inch area. The foil remained in place and the firefighter was not injured.
- Three out of the five old-style shelters had rips up to 43-inches long when they were opened. All three were heavily abraded and would not have met current inspection standards.
- A fourth old-style fire shelter was torn by the firefighter during the deployment. The shelter had a 14-inch tear on its side, a 34-inch tear of the sod cloth from the side of the shelter, and numerous smaller tears.

New Generation Fire Shelters:

- The New Generation Fire Shelters showed very little heat damage. Several small (<1-inch diameter) spots of de-lamination occurred when burning embers landed on the outer shells of the shelters during the deployment. The inner shells were not affected.
- In two of the New Generation Fire Shelters, foil at the foot end was abraded off by the firefighters' boots during deployment on the gravel and rock at the site.
- The yellow pull strap on one shelter PVC bag was torn from the bag during the escape from the fire.

- The New Generation Fire Shelters showed very little structural damage. Some of the shelters had small tears (<3 inches) in the inside corners of the openings in the floor material. These tears did not increase exposure of the firefighters and the shelters were no more difficult to hold in place.

Training: All firefighters reported that they had received the required fire shelter training.

Deployment Sites: Review of the area surrounding both deployment sites showed that the firefighters selected the best sites for deploying fire shelters to limit exposure of direct flame and radiant heat.

- The Greybull River site was at the bottom of a scree slope on the west edge of the 35-foot-wide Greybull River. Heavy timber was on the east edge of the Greybull River. A small amount of dry grass was near the deployment site, but it did not burn, indicating very little, if any, flame impingement. One firefighter deployed at this site. The firefighter's line pack sustained damage from radiant heat and burning embers.
- The Anderson Creek deployment site measured 37 feet in length and 25 feet in width, it featured a 35-foot-tall rock wall to the south and the 15-foot-wide Anderson Creek to the north. Heavy timber was north of Anderson Creek. The deployment site was sand and gravel with very little vegetation. The dry grass on the site was burned only in a few, very small (12-inch-diameter) spots, indicating very little flame in the site. Nine firefighters deployed at this site. Packs and tools sustained damage from radiant heat and burning embers.

Before deployment:

- Some firefighters noted the Anderson Creek deployment site as they were walking up the trail earlier that day, and remembered the location of the site when it was needed for deployment.
- Near the turnaround many of the firefighters assisted the mules which caused delay in some of the firefighters' escape.
- Heavy ember fallout and spot fires were forming before all the firefighters began their escape to the deployment sites.
- Some firefighters chose to keep packs for the entire escape, while others chose to drop packs during their escape.
- The distance between the turnaround and the deployment sites is between 400 and 550 yards.

During deployment:

Greybull River site:

- At about 1613, one firefighter deployed a fire shelter on the west edge of the Greybull River 45 to 60 seconds before the arrival of the first major fire pulse.
- The firefighter felt this site was the safest and closest site available.
- The firefighter was buffeted by 4 or 5 fire pulses; the first was the worst.
- High amounts of radiant heat, high winds, and loud fire noise were present during the deployment.
- The firefighter exited the shelter at approximately 1715.

Anderson Creek site:

- At 1614, eight of nine firefighters at the Anderson Creek deployment site deployed shelters for 5 to 7 minutes. The fire passed the site on the Greybull River (east) side.
- After the first pulse of fire, the firefighters did a better job of preparing themselves; some moved their shelters to better spots within the site, dug up some vegetation, burned out the west side of the site with fusees, and threw ignited fusees to the north side of Anderson Creek.
- At 1628 all firefighters redeployed shelters for the second fire pulse.
- During the second pulse, estimated 60 mph winds broke tree tops and toppled a few trees. Winds at the site were estimated to be 30 mph. There was a heavy ember shower with some embers as large as baseballs. Because of the noise, firefighters needed to shout to communicate with the firefighter next to them.

- Three pulses of heat went through the site. The site experienced a high amount of radiant heat for much of the hour the firefighters were deployed.
- All firefighters exited the shelters at 1715.

Discussion:

- Judging from firefighters' reports and evidence gathered at the deployment site, the entrapment was life threatening. Melted PVC bags, hard plastic liners, and nylon packs indicated that the highest temperatures were between 270 and 410 degrees Fahrenheit.
- Before that day all the firefighters thought that they would never need to deploy a fire shelter during their career.
- Some firefighters reported that they had not inspected their shelters previously.
- Most areas outside the deployment site were black and appear to have burned in a high-intensity crown fire.
- The Anderson Creek deployment site offered very good protection from the first fire pulse due to the rock wall on the south side of the site and the creek on the north side.
- The Greybull River deployment site offered very good protection from the fire because it had little vegetation and was located across the river from thick timber.
- Most of the firefighters reported deploying twice which caused more tears and physical damage to the shelters.
- One firefighter waited for the second fire pulse to deploy his fire shelter.
- Crew overhead rearranged firefighters for the second fire pulse. Firefighters with damaged shelters were offered more protective deployment placements.
- Crew members worked to improve the site between the first and second deployment by clearing vegetation, and packs, and burning out more of the area.
- Information gathered from the firefighters showed no great temperature difference between the old-style shelter and the New Generation shelter. This would be expected, both shelters perform similarly in a primarily radiant exposure.
- Information gathered from the firefighters showed a marked difference in the amount of smoke that entered shelters during the deployments. Firefighters were able to limit the smoke entering New Generation shelters.
- The "rodeo" of mules caused confusion and delay during the escape. Some firefighters thought it aided in the success of the deployment; if the firefighters had had more time for escape they may have passed the good deployment sites and may have had to shelter at a less favorable location.
- All the firefighters felt that the fire shelter training that they had received proved valuable during this deployment.

While the decisions the firefighters made clearly led to the positive outcome of this incident, the following are reminders to all firefighters:

- Firefighters should follow the fire shelter inspection criteria outlined in the fire shelter training booklets.
- Whenever in a fire situation, firefighters should take notice for escape routes, safety zones, and deployment sites.
- Personal protective equipment should be worn during a deployment.
- Firefighters should train with fire shelters as if their lives could depend on them.
- Firefighters may need to do extra practice deployments in order to become as proficient as possible with the New Generation Fire Shelter.
- Firefighters should deploy their shelters before the flame front arrives if time permits; do not delay deployment.
- While the shelter is considered a last resort, firefighters should not hesitate to deploy a shelter if it is needed for protection. Firefighters should not worry about the cost of the fire shelter or a possible investigation. Their safety is always the highest priority.

/s/ Tony Petrili

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Date