2009 Lava Point Prescribed Fire Review

Zion National Park

National Park Service, Intermountain Region

Executive Summary

The Lava Point Aspen Prescribed burn plan was written for a 151 acre treatment unit. After planning for and preparing the prescribed fire unit, park personnel began implementation of the project. On October 3, 2009 the Zion fire management program was planning to burn a smaller 45 acre subunit prior to a frontal passage. A cold front was moving in from the north and the decision was made to black line the south boundary of the unit prior to the frontal passage and then to burn the remainder of the unit after the front had passed. At 1100 hours a test fire was initiated. Acceptable results were not being achieved, the ignition team modified their tactics and at 1230 hours it was determined that results were within prescription parameters and met the resource objectives. The Go/No Go Checklist was approved and ignition of the unit continued. After progressing a quarter mile multiple spot fires occurred outside of the identified subunit. Firing operations were halted however; personnel on scene were unable to contain the spot fires. The Burn Boss requested that the contingency resources, which were not on scene; be dispatched to support operations. On October 4, 2009 with two uncontrolled spot fires, a forecasted cold front passage with high winds and no means to pay for assisting interagency resources, the Burn Boss declared the prescribed burn a wildfire at 0840 hours.

The Review Team determined the following:

- The Prescribed Fire Plan met policy but was inadequate as it was put together from a compilation of “cut and paste” portions from other plans and did not receive a thorough technical review due to time constraints.
- The prescription, actions and procedures set forth in the Prescribed Fire Plan were not followed, the prescription was inadequate, and had conflicting objectives.
- There was a failure to identify the need for, establish, and utilize necessary Agreements and Memorandum of Understandings with interagency partners to provide the ability to pay for shared resources.
- Organizationally there was knowledge of the risks and hazard associated with the prescribed burn however there was a failure to recognize and an underestimation of the potential consequences associated with attempting to burn prior to a frontal passage.

The review of the Lava Point Prescribed Burn was conducted in accordance with direction provided in the Interagency Prescribed Fire Planning and Implementation Procedures Guide (Page 29); National Park Service, Reference Manual 18, chapters 7 and 17; Interagency Standards for Fire and Fire Aviation Operations, chapters 17 and 18; and principles of Operational Leadership.

Description of the Lava Point Prescribed Fire

The Lava Point Prescribed Fire unit is a landscape prescribed burn located within the boundaries of the 151 acre Lava Point Aspen Restoration fuels treatment unit. The Lava Point Aspen treatment unit is located on the north central boundary of Zion National Park, a quarter mile from the rural community of Blue Springs in Washington County, north of Springdale and northeast of LaVerkin / Hurricane, Utah. (Figure 1).

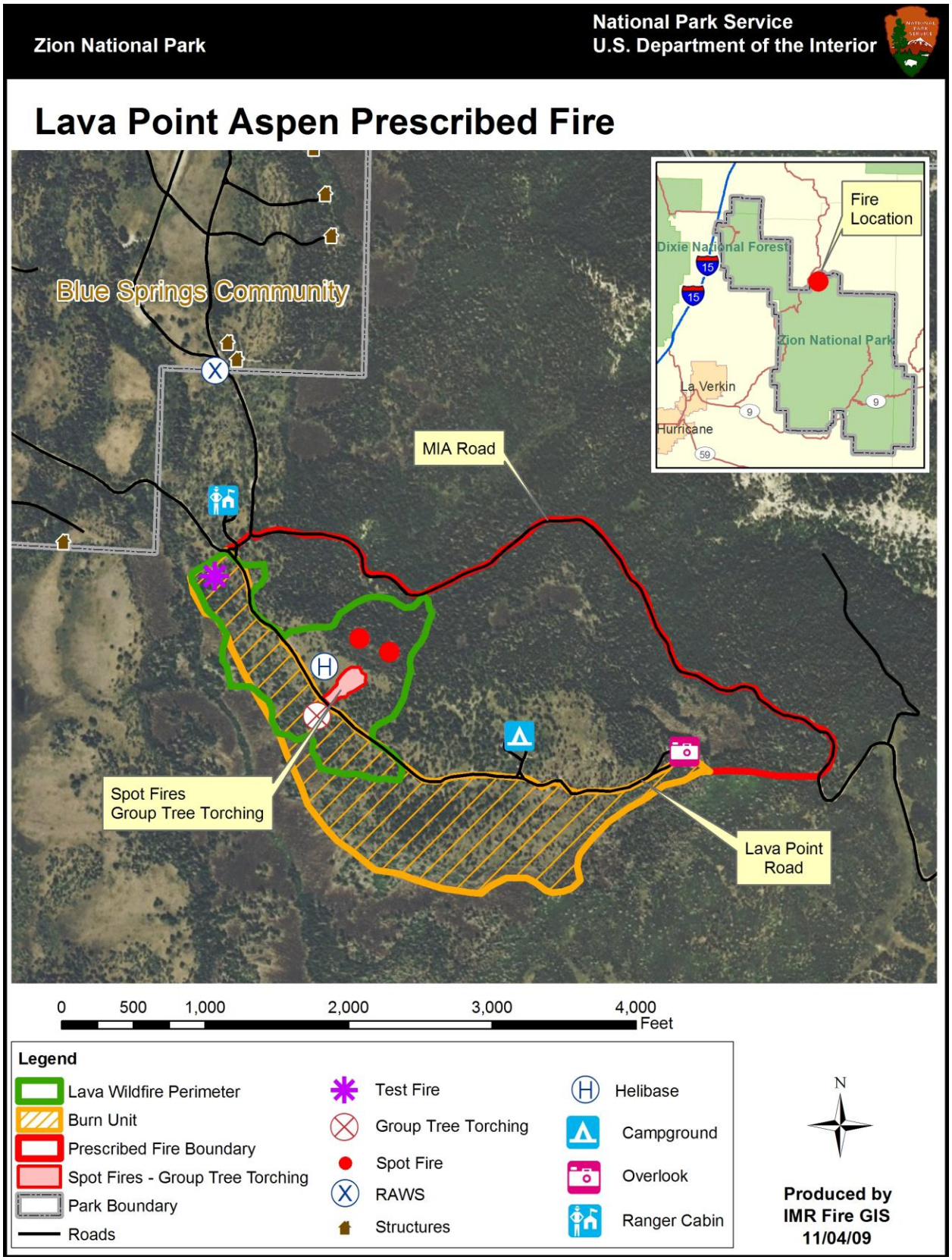


Figure 1: Lava Point Aspen Prescribed Fire Map.

This fuels treatment unit was established by the park after a 2004 request from the Superintendent for a fuels and fire behavior assessment of the Upper Kolob Creek area. The determination of this assessment found that over the last century suppression efforts have led to a large buildup of fuels resulting in a change to the forests health and structure. The removal of fire from the ecosystem had led to an older denser vegetation structure with less species diversity; Seral Quaking Aspen have been replaced by conifers. The Lava Point Aspen prescribed burn treatment unit was established to use fire as a tool to enhance the ecosystem by promoting the health, growth and expansion of Quaking Aspen. A second priority which also contributed to the establishment of the Lava Point Aspen treatment was that the area had been identified by an Interagency fuels planning group as one of the original six critical Wildland Urban Interface focus areas in the Color Country Interagency Fire Management Zone. There are numerous scattered residences throughout the area immediately adjacent to the park boundary. The Lava Point Aspen prescribed burn is part of a series of treatments designed to provide boundary protection for the Blue Springs community as well as the Upper Kolob Terrace community.

Goals and Objectives: (From the Lava Point Aspen Prescribed Fire Burn Plan)

- Reduce Hazardous Fuels.
- Reintroduce fire.
- Stand maintenance.
- Boundary Protection.

Specifically; to apply fire to the landscape thus maintaining the natural role fire plays in the ecosystem and maintain boundary protection by reducing excess hazardous fuels.

Resource management objectives:

- Reduce white fir by 50-75%, < 15cm/dbh, 1 year post burn.
- Limit live ponderosa (>15 cm/dbh) mortality to under 25%.
- Reduce Surface fuel loads 50-75% especially were aspen are present immediately post burn.
- Monitor forest change with established fire effects plots.
- Discourage noxious weeds and evasive species with post burn herbicide treatments.

Operational Objectives*: (*From the Lava Point Aspen Prescribed Fire Incident Action Plan)

- Provide for firefighter and public safety.
- Utilize the risk management process and ensure LCES.
- Keep fire within prescribed fire boundaries.
- Minimize impacts (use MIST tactics and respect wilderness values).
- Use of Chainsaws and aircraft are approved for suppression actions.
- Protect park infrastructure (ranger cabin, RAWS, repeater site, campground facility, and day use area).
- Preserve cultural and natural resources (Mexican Spotted Owl, California Condor, Peregrine Falcon).
- Minimize the spread of exotic species.

Description of the Events

***Note: Time frames represented in this report reflect those reported in personal interviews as well as unit logs provided to the review team.

The planning process for the Lava Point Aspen Prescribed Fire began in October of 2008. Holding line preparation and construction of, and improvement of fire lines around the unit occurred throughout the summer months of 2009. On September 29th, 2009 the Lava Point Aspen Burn Plan as well as the Agency Administrator Go/No Go checklist was approved by the Zion National Park Superintendent. This allowed the prescribed burn to move forward, dependent upon the completion of a site specific Prescribed Fire Go/No Go checklist on the day of the burn. Preparations for burning the unit were finalized and public notifications were made. On the day of implementation October 3, 2009, the plan to burn the entire unit was modified due to an approaching cold front from the north, and the new plan was to only black line the southern boundary by burning a 45 acre subunit prior to the frontal passage.

Resources for the prescribed burn arrived on scene the morning of October 3rd and around 0900 hours were briefed on the day's activities. Everyone on scene was comfortable that they could accomplish the 45 acres early and quickly, before the frontal passage affected the operations.

The decision was made to stage two of the four burn plan required on scene engines at the ranger station located on the west side of the unit. Resources from these engines were to continue on foot. At 1100 hours the test burn was implemented.

At approximately 1130 hours, after not being able to get results to meet resource objectives, the Burn Boss, Ignition Boss and Holding Boss got together and decided to add additional burners to the ignition team in an attempt to generate enough fire behavior to achieve the objectives. As a result, at approximately 1230 hours the decision was made that they were meeting objectives and the Burn Boss elected to continue with implementation of the burn as planned.

Between 1230 and 1315 hours several small fir trees torched and resulted in several small spot fires outside of the identified 45 acre sub-unit, yet still within the overall Lava Point Aspen prescribed fire unit. These small spot fires were immediately suppressed. The Holding Boss advised the Ignition Boss that everything was OK and that ignition operations could continue.

At 1400 hours the Holding Boss and Burn Boss made an observation to each other that the forecasted frontal passage could now be observed based upon approaching cloud cover. The Burn Boss ordered the two USFS contingency engines for the prescribed burn from Color Country dispatch.

At approximately 1430 hours, a cluster of white fir trees torched out, lofting embers into the air. Their rise was sheared off between 20-50 feet up by stronger winds aloft, and the embers traveled north creating numerous spot fires outside of the planned 45 acre sub-unit. At the same time one of the two holding engines ran out of water and had to go refill. Ignition operations were stopped and all resources on scene became engaged suppressing spot fires. Holding resources quickly realized that there were

too many spot fires to handle with the two engines. The decision was made to re-staff the additional two engines which had been staged at the start of the day.

By 1445 hours the spot fires which had established themselves, continued to propagate creating additional torching, which led to more spot fires further to the north and over the rim edge.

At 1500 hours all resources were trying to use a direct attack strategy on every spot fire, but they were falling behind due to the increasing number of growing spot fires. At 1530 hours for safety considerations, the Holding Boss reconfigured his resources and switched to an indirect attack strategy. All four engines as well as the water tender were engaged in attacking the larger spot fires while the remaining holding resources began constructing an indirect hand line on the east side of the spot fires from the Lava Point road north to the rim edge.

Between 1530 and 1600 hours the Burn Boss also located two "10 feet by 10" feet spot fires to the north and below the rim edge (still within the overall 151 acre Lava Point Aspen unit boundary). At 1630 hours the two larger spot fires to the north and below the rim edge were still growing unchecked, and the Holding Boss instructed his resources to continue the containment line they had constructed from the Lava Point road north to the rim edge, north down to the MIA road.

At 1700 hours one of the crew members from an engine became incapacitated with smoke inhalation/heat exhaustion. The Engine boss communicated the incident to the Burn Boss who followed procedure and ordered an ambulance through dispatch. The Engine boss took over the medical incident and did not wait for the ambulance but proceeded to take his crewmember to the hospital for treatment. This resulted in the loss of the engine for holding operations.

At 1930 hours the indirect hand line was completed thus containing the fire. Although the fire behavior had moderated and additional spot fires were no longer being created, the established spot fires continued to grow and spread within the unit. Between 2000-2100 hours the Burn Boss made contact with the Park Superintendent, Park Fire Management Officer, National Park Service Intermountain Region Duty Officer, and neighboring USFS and State Fire Management programs informing them of the situation. The State Fire Management program offered to provide resources and assistance for the burn on October 4th.

On October 4th at 0840 hours the Burn Boss declared the Lava Point Aspen Prescribed Burn a wildfire based upon predicted high winds, the amount of active and potentially active fire, and values at risk. The decision was further supported by the perception that he had no means to reimburse the interagency resources who responded to assist.

Figure 2: Early fire behavior as ignitions move into a White Fir stand.

Figure 3: Spot fires north of Lava Point road.

Chronology of Events

Table 1

October 03, 2009	
0900	All resources on scene and present for morning operational briefing. Prescribed Fire Burn Boss (RXB2) conducts the operational briefing.
0930	Firing Boss (FIRB) and trainee Firing Boss (FIRB-t) scout unit South of Lava Pt. Road to recon area and determine suitable location for test fire. Holding Boss (HOLDB) assigns resources to snag road. Engines 611 and 612 are assigned to work the prescribed burn and Engines 663 and 811 are parked at briefing spot and will be staffed only if needed.
1100	Test fire is ignited. Fire behavior is noted as very low and resource objectives are not being met.
1130	FIRB, FIRB-t, HOLDB discuss fire behavior with RXB2 make decision to increase the number of lighters. As igniters move from grass and oak litter into more of a pine litter fuel bed with residual activity fuels, fire effects are noted as getting better.
1200	Fire behavior is still below desired levels needed to reach objectives. Holding resources notice a steady increase in wind speeds but do not communicate this information through the chain of command. Smoke is lying over the road, reducing visibility.
1230	Fire behavior is now producing desired effects, producing mortality in fir trees. Operational Go/No Go is approved and ignitions continue. Several small fir trees torch producing several spot fires.
1310	Spot fires continue to be found and suppressed. Smoke is heavy over road.
1400	RXB2 ordered contingency engines through Color Country Interagency Dispatch Center (CCIDC), 2 T4 engines, T6 will also work.
1410	RXB2 and HOLDB discuss options of halting ignition since they have already exceeded initial expectations of only a couple hours to complete the burn. The decision was made to continue operations and finish the 45 acre sub-unit.
1430	Engine 611, runs out of water trying to cool burning fuels near the road. Winds have increased and contribute to group torching of conifers. Holding resources realize there are more spot fires than can be handled with 2 engines. Engine 663 is requested to be staffed to assist in engaging spots. Firing operations are stopped. RXB2 reassigns all resources to holding and are to engage in extinguishing spot fires. Smoke remains heavy, hindering resources from locating the numerous spot fires.
1445	Spot fires north of the road continue to propagate creating more torching, leading to more spot fires further to north and over the rim edge.

1530	RXB2 is informed that responding contingency resource engines are not available overnight and will need to be released. 2 large spot fires are discovered further North below the rim edge. HOLDB reassess the situation and determines that with the number of spot fires, the safest approach will be to switch to an indirect attack strategy to incorporate all of the spot fires rather than to line them individually.
1630	One spot fire is discovered below the MIA road. Outside of the 151 acre Lava Point Aspen prescribed burn unit.
1700	Engine 663 alerts the RXB2 of a medical issue(smoke inhalation/heat exhaustion) which results in the loss of Eng 663. RXB2 contacts CCIDC and Zion Park Dispatch to request ambulance and Park Ranger to be sent to the project site. FIRB -t takes over medical incident.
1734	First contingency engine arrives on scene.
1848	Second contingency engine arrives on scene.
1930	Resources finish constructing indirect hand lines, successfully containing all of the spot fires.
2000	An After Action Review (AAR) is conducted. The plan is to have all resources to return by 0700 on October 4th. RXB2 begins making contacts with the Park Superintendant, Zion Acting Fire Management Officer, NPS Intermountain Region Duty Officer, and Neighboring USFS and State Fire Management employees.
2200	RXB2 is the last one to leave the project site.
October 04, 2009	
0600	RXB2 on scene
0630	State fire management resources arrive on scene.
0700	RXB2 submits spot forecasts to CCIDC, Zion Module back on scene.
0730	Engines 611 and 612 arrive on scene, return to locating and lining spots.
0745	State Area Fire Management Officer on scene, discus options with RXB2.
0840	Lava Point Aspen Prescribed burn is declared a wildfire.

Figure 3: Spot fires north of Lava Point road.

Underlying Reasons for the Prescribed Fire Escape

Determine if the Prescribed Fire Plan was adequate for the project and complied with policy and guidance related to prescribe fire planning and implementation.

The prescribed fire plan met policy but was inadequate as it was put together from a compilation of "cut and paste" portions from other plans and did not receive a thorough technical review due to time constraints.

The Lava Point Aspen Prescribed Fire Plan complied with National Park Service policy found in Wildland Fire Management, Reference Manual 18 (National Park Service 2008). The Prescribed Fire Plan was developed in accordance with direction found in the Interagency Prescribed Fire Planning and Implementation Procedures Guide (USDA & USDI 2008). The Lava Point Aspen Prescribed fire plan contained language and references taken from other plans, which were not edited or customized for the planned unit. The review process for the plan was not conducted thoroughly with reviewers referencing the Interagency Prescribed Fire Planning and Implementation Procedures Guide, nor the Prescribed Fire Complexity Rating System Guide.

Complexity Analysis: The complexity analysis portion of a burn plan provides managers with a relative ranking of the complexity of a specific prescribed fire project. The process can be used to identify special

problems and concerns and develop mitigation activities to reduce risk and hazard. While the complexity analysis of the Lava Point Aspen prescribed burn plan may have reflected the complexity associated with burning the identified unit under ideal burning conditions, it did not reflect the risk and complexity of burning the Wildland-urban interface (WUI) unit prior to the passage of a cold front, nor did it adequately address the risks associated with potential spot fires resulting from torching conifer components, specifically at the high end of the prescription.

The final Complexity Analysis Summary of the Lava Point Aspen burn plan ranked 7 of the 42 elements as "moderate", where as the initial ranking had 21 of the 42 elements ranked as "moderate". The final summary complexity rating for the plan was "low". Mitigation actions were not clearly stated in the summary paragraph of Appendix C describing why or how the overall complexity was reduced from a moderate to low complexity.

Guidance for completing both the Interagency Prescribed Fire Planning and Procedures Guide and the Prescribed Fire Complexity Rating Guide are not clear on the criteria for determining a moderate or low complexity burn. This may have led to under-rating the complexity of the Lava Point Aspen prescribed burn.

Determine if the prescription, actions and procedures set forth in the Prescribed Fire Plan were followed.

The prescription, actions and procedures set forth in the Prescribed Fire Plan were not followed, the prescription was inadequate, and had conflicting objectives.

Prescription Elements: A prescribed fire prescription is the measurable criteria used to define a range of conditions during which a prescribed fire may be ignited and held as a prescribed fire. The Lava Point Aspen Prescribed Fire Plan utilized a broad set of prescription parameters that involved multiple fuel types in varying topography. The plan lacked site specific detail for burning individual sub units; the Lava Point prescribed burn plan references FM 9 and 10 within the unit with some FM 6 outside of the unit. The plan identifies that FM 6 was used to determine resource needs in that it was the most volatile fuel model referenced and would best model the expected fire behavior during ignition. The review team found that on the day of ignition, using the spot forecast as received from the National Weather Service, predicted fire behavior was going to be greater than that manageable for the resources on hand.

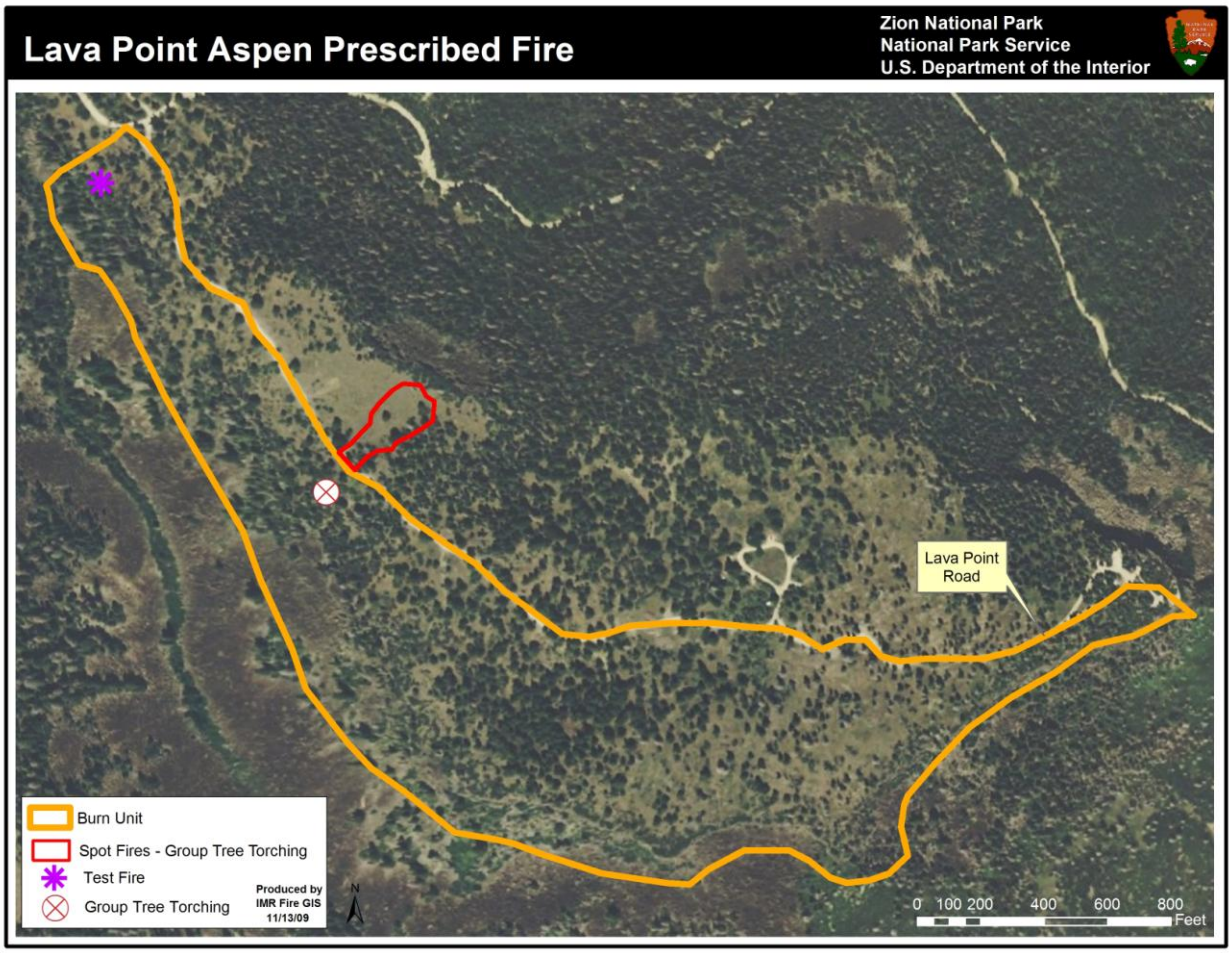


Figure 4: Lava Point Aspen Prescribed Fire Map (45 acres Planned for October 3rd, 2009)

The burn plan did not specifically address the impacts of burning pockets of conifer trees. To meet the resource objectives of eliminating conifers and promoting aspen growth, the plan implied the use of intense fire, as fire managers had discussed with resource managers during the planning phase. The plan stated "Expect moderate fire intensity within the brush and grass fuel types, and low to moderate burn intensity with intermittent torching in the white fir and ponderosa pine stands." (element 7). Resources on hand observed very low to moderate intensity fire behavior in the grass and brush fuels and moderate to high intensity in the white fir. Several of the plans objectives contradict each other; in order to reduce white fir by 50-75%, < 15cm/dbh, 1 year post burn and to reduce surface fuel loads 50-75%, it would be difficult to limit live ponderosa (>15 cm/dbh) mortality to under 25%.

Although, conditions in the morning on the day of the burn were within the identified prescription parameters; those identified in the spot weather forecast for later in the day identified that they would be out of prescription in the afternoon. All resources on scene felt that they could complete the identified 45 acre sub-unit of the Lava Point Aspen prescribed burn early in the day prior to the frontal passage. Actual implementation was much slower than expected, taking 3 ½ hours and was affected by the frontal passage.

Contingency Resources: Resources on site for the burn met the requirements of the burn plan for a low intensity fire however; they were inadequate for a moderate to high intensity fire situation. Holding resource calculations relied heavily upon the production rates of the wildland engines on scene. The decision to reconfigure resources by parking two of the engines and utilizing the crews on foot further contributed to this shortage of resources as did the medical incident late in the afternoon, resulting in the loss of one engine. The plan stated that appropriate contingency resources would be on site for the burn (element 3); they were not and had to be ordered resulting in a time delay before they could be utilized.

Contingency resources listed in the plan (element 17) included three local/state engines. There was no formal agreement in place to utilize their services, which became an issue when they were called upon when needed. As previously stated the engines contributed heavily to the line construction capability calculations in the burn plan, showing that committed resources would be able to contain and control a spot fire should one occur.

The escape resulted from embers igniting pockets of mixed conifer which resulted in spread and fire behavior which the resources on hand were not prepared to deal with. Conditions on the day of ignition placed the burn on the high end of the prescription to exceeding the prescription. Although, the number of resources on hand met the need required at the low end of the prescription, they did not have enough resources on hand for the mid range or for the high end of the prescription.

There was a failure to identify the need for, establish, and utilize necessary Agreements and Memorandum of Understandings with interagency partners to provide the ability to pay for shared resources.

Element 17 of the Lava Point Prescribed burn plan stated; "If the contingency actions are successful at bringing the project back within the scope of the prescribed fire plan, the project may continue. If contingency actions are not successful by the end of the next burn period, then the prescribed fire will be converted to a wildfire." The Lava Point Aspen Prescribed fire was declared a wildfire on October 4th, day 2 of the project. A contributing factor to the decision to transition the Lava Point Aspen prescribed fire to an escaped wildland fire was an inability to pay for the state resources which responded to assist the burn organization when things got more intense than they had predicted. Zion National Park fire management staff has no formal agreement or Memorandum of Understanding in place to support exchange of funds between agencies during a prescribed fire event.

Organizationally there was knowledge of the risks and hazards associated with the prescribed burn however there was a failure to recognize and an underestimation of the potential consequences associated with attempting to burn prior to a frontal passage.

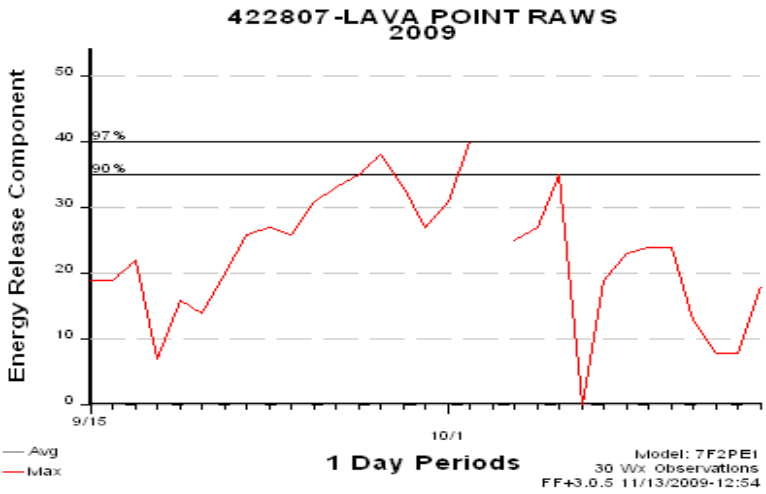
Throughout the review process each of the review team members found that resources on scene the day of the burn commented on their surprise that the burn had gone forward considering the forecast and the fact that they were observing high speed wind indicators and winds aloft early in the day. Not one of these resources voiced their concerns prior to ignitions on October 3rd.

Resources on hand for the burn had all burned previously in similar fuels and were familiar with the fire behavior, torching and spotting which could occur with white fir/ mixed conifer fuel types, however they underestimated the risk of burning under high end prescription parameters and windy conditions.

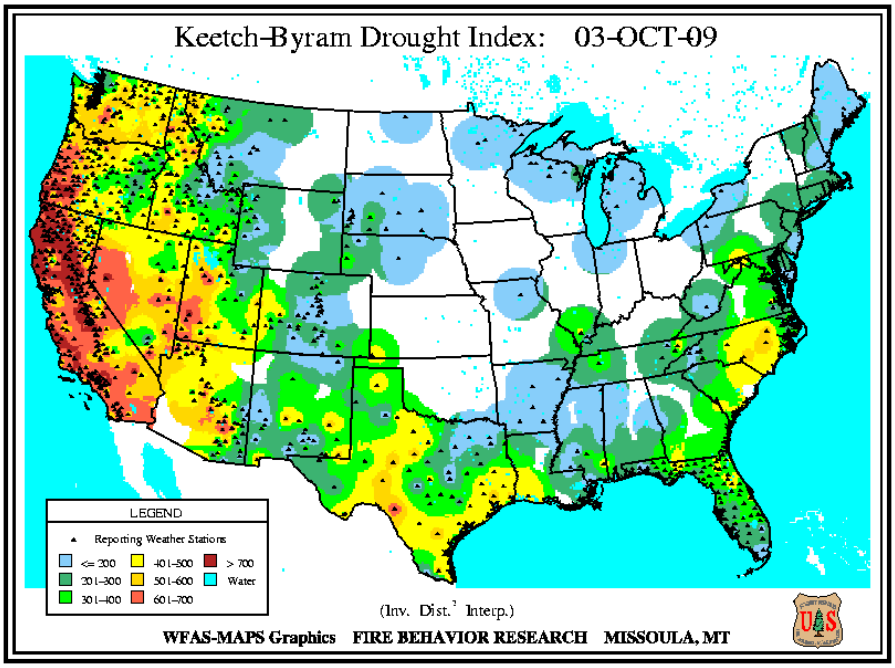
Figure 5: ***View of fire climbing into White fir stand.***

Analysis of seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration:

Note: ***WIMS data for October 3rd the day of ignition is missing, however it can be seen that at the start of the day prior to the passage of the cold front, the area was at the 97th percentile.***



The Keetch-Byram Drought Index (KBDI) values indicated that the area was experiencing normal typical late summer; early fall to moderate drought conditions (between 600 and 700). KBDI values ranging from 600-700 tend to see Intense, deep burning fires with significant downwind spotting. (USFS-Wildland Fire Assessment System)



Drought Monitor, October 3, 2009

On October 1st, two days before the burn, fuel moistures in the burn area were surveyed and showed that shrubs (Manzanita and Juniper) had live fuel moistures in the 85-92% range, Ponderosa Pine had live fuel moisture in the 106-110% range, White Fir in the 115-117% range, surface litter was at 13% and the duff layer at 26%. Dead fuel moistures 1 hour, 10 hour and 100 hour were not recorded. On September 20th the unit had received 0.31 inches of precipitation. No other precipitation was recorded after that up until the burn day.

Immediately prior to and on burn day, the area was under the influence of an approaching storm system with a cold front moving in from the north.

The spot weather forecast for burn day indicated that all prescription weather parameters at the planned ignition time would be met. The relative humidity and 20' winds would however, be at the high end of the prescription and that the winds would increase during the day and would exceed the prescription.

The prescription indicated that any wind direction was acceptable for burning. It did not consider any concerns of possible smoke impacting the seasonal community of Blue Springs.

Due to numerous delays ; gathering of resources on site, a late briefing, reorganization of holding resources, felling of snags along the fire line, ignition teams scouting the planned unit the morning of ignition due to a trainee Firing Boss, modification of ignition patterns due to resource objectives not being met, by the time the fire was producing desirable effects, it had gotten late enough in the day that the predicted frontal passage and associated stronger winds had begun and conditions were out of prescription.

Figure 6: ***Observed fire behavior during test fire.***

Analysis of the prescribed fire prescription and associated environmental parameters: The burn plan addressed all the required elements according to interagency policy. The burn plan was written as a general burn plan which included the entire 151 acres of the Lava Point Aspen prescribed burn unit, it did not consider burning the unit in sub-units. The Lava Point Road which bisected the unit from west to east was chosen as a dividing line for the planned 45 acre sub-unit which was the focus on October 3rd.

Fuels associated with the Lava Point Aspen prescribed burn treatment unit consisted of mixed conifer, ponderosa pine, open sparse grass and mixed Manzanita/oak brush. The target objective identified by the burn plan was to kill off the mixed conifer species and to promote the proliferation of the Quaking Aspen.

The burn plan described the fuels adjacent to the burn unit as continuous white fir, aspen, gamble oak, big tooth maple and ponderosa pine to the north best represented by fuel models 9, 10, and TU1. To the south they consisted of mainly gamble oak, pinyon/juniper and ponderosa pine best represented by fuel models 6, 9, and 10. The park did not have site specific fuel loading information for the unit and the plan was written and fire behavior modeled off of generic fuel loading numbers obtained from Hal E. Andersons, *Aids to Determining Fuels Models for Estimating Fire Behavior*.

Containment calculations in the burn plan indicated that under upper end prescription conditions, resources on hand could contain one spot fire. The fire in the White Fir stand resulted in numerous spot fires in a short time which given the indirect suppression strategy taken these spot fires were allowed to propagate and contributed to generating more spot fires.

Determine if overall policy, guidance and procedures relating to prescribed fire operations were adequate.

Prescribed fire operations were adequate. The following are key discussion items related to local procedures and guidance.

Fuels, Weather, and Fire Behavior: The Parks fire management staff independently tracked and reviewed relative fire danger indices, fire behavior calculations, and fuel moisture values as they pertained to the Lava Point Aspen prescribed burn area. For the Lava Point Aspen prescribed burn unit, the fire organization did not identify any established fire monitoring plots to support fire management decision making. An established Remote Automated Weather Station (RAWS) is located just north of the unit and was utilized for weather data (Station id 422807), and fuels samples were manually taken from within the unit on October 1, 2009.

Multi-year Strategic Program of Work: The Park manages a year round, complex fire management program that has a long, successful history of wildland fire and fuels management project implementation. Annually the Park attempts to maximize prescribed fire and fuels management opportunities, in addition to their wildfire workload. Zion is one of the larger contributors to the Intermountain Regions annual fuels target. At the time of implementation of the Lava Point Aspen prescribed burn, the Zion fire management program was without a full time Fire Management Officer and Assistant Fire Management Officer to manage this workload. The parks past successful

performance in regards to acre targets and budget caps associated with the parks fuel project authorizations add a level of pressure and expected success.

Review of the approving line officers qualifications, experience, and involvement: The Superintendent was actively involved in the planning of the prescribed fire project, engaged directly with the Burn Boss, and approved the burn plan and go-no-go checklist. He however was away from the park the weekend the burn was planned, and the Acting Superintendent on the day of ignition was unaware that the fire program was conducting a prescribed burn, until after ignitions had already occurred. Although the Superintendent has attended the Fire Management Leadership curriculum, his acting has not.

Review of the qualifications and experience of key personnel involved: All key personnel involved in the prescribed burn met qualifications and were experienced for the assigned positions. The Burn Boss assured and confirmed the qualifications and experience level of assigned personnel during the planning phase of the project. On October 3, 2009 the burn organization was utilizing several trainees in key positions such as Firing Boss and Holding Boss. Each of these positions had an appropriately qualified mentor in the trainer position.

Determine the level of awareness and understanding of the personnel involved in regards to procedure and guidance.

Organizationally there was knowledge of the risks and hazard associated with the prescribed burn however there was a failure to recognize and an underestimation of the potential consequences associated with attempting to burn prior to a frontal passage.

Program Management: The Zion National Park Fire organization had two key permanent staff vacancies on the date of the Lava Point Aspen prescribed fire. The Superintendent was away from the park with a division chief acting on his behalf. The Park Fire Management Officer and Assistant Fire Management Officer positions were vacant and occupied by detailed personnel. These key leadership positions being vacant in the fire management program impacted the planning and implementation of the project. The Zion fire staff had been busy throughout the summer with several fires occurring such as the Bridge, Horse and Cliffs.

Effective Communication: On the Lava Point Aspen prescribed fire various individuals had knowledge of particular risks and hazards associated with the burn but failed to voice their concerns. For example, most fire staff had an awareness that strong winds were predicted later in the day with the forecasted frontal passage, and even commented that they did not think ignitions would occur on the morning of October 3rd, however no one discussed this during the briefing, and as a group they decided that they could successfully complete the planned 45 acre sub-unit.

Competing objectives: The objectives of reducing white fir and reducing surface fuels required a high intensity fire; where as the objective to limit ponderosa mortality required a lower intensity fire. All three objectives were important to the success of the burn however, these competing objectives caused an increase in relative risk which was overlooked and when associated with the approaching frontal passage, complicated control objectives.

Lessons Learned

Table 2

Lesson Learned	Potential Method for Sustaining
Complexity Analysis A complexity analysis needs to be thoroughly developed for site specific issues for each and every burn plan. Failure to clearly discuss mitigation factors when down grading the complexity of a burn unit hinders the Agency Administrator's and the Burn Boss's ability to fully grasp the complexities of implementing a burn. Review of the Complexity Analysis portion of a burn plan is the responsibility of everyone who signs off on the plan and should be thoroughly gone through to ensure all aspects are considered.	The complexity analysis portion of a plan should be developed by an inter-disciplinary team so as to consider all aspects of risk within a planning unit. When developing a complexity analysis a justification for any change in complexity should be clearly documented. Line Officers and Technical re-viewers need to be familiar with and refer to the guidelines found in the Interagency Prescribed Fire Planning and Implementation Procedures Guide as well as the Prescribed Fire Complexity Rating System Guide when reviewing a Prescribed fire burn plan.
Prescription Elements Clear non-competing objectives are required for a successful burn plan. Developing detailed, clear and concise prescriptions based on unit specific conditions for landscape prescribed fire plans is critical in meeting desired resource management objectives. When developing prescriptions, do not limit the analysis to just the criteria needed to run fire behavior/containment models. Often, factors that are not reflected in fire spread models are extremely important to actual fire spread (models do not accurately predict multiple spotting and spread through propagation). Burning at the high end of the prescription provides little margin for error. Re-verify the adequacy of the prescription, re-evaluating the complexity analysis, and affirming the status of fuels and local drought conditions is a must.	Ensure to use an interdisciplinary approach when developing burn plan objectives; include participation from Resource Management, Fire Ecology and the Fire Management staff. When developing prescriptions and objectives be sure to include discussions on fuels surrounding the ignition block, resistance to control issues, potential problem areas, and a description of actions to be taken in the event of an escape Remember to consider changing conditions as the fire season progresses. Share experience, knowledge and concerns during the pre-planning, planning, and implementation process. Seek advice and speak up. Make sure to verify prescriptions and do not proceed if you are predicted to be out of prescription. If there are critical timing factors involved during a burn, identify this as a watch-out situation and

Lesson Learned	Potential Method for Sustaining
	establish trigger points and resultant actions needed. Plan for the ability to stop burning with little notice.
Planning To support Interagency cooperation of fuels treatment projects, Interagency Agreements and Memorandum of Understandings need to be established and put in place to exchange resources and funds if necessary on fuels treatment projects. Contingency planning needs to consider; ensuring that there is a mechanism to pay for the resources identified in your plan and that they are available. Confirmation with contingency resources needs to occur to ensure that they are available to respond and be on scene in the identified response time. Site specific contingency plans should address the full range of possible outcomes and results of implementing a prescribed burn. They need to consider the full range of weather, fuel conditions and associated fire behavior for all prescribed burns.	Ensure that appropriate agreements are in place prior to project implementation. Develop and adhere to contingency plans using all available local fire management knowledge. Use an inter-disciplinary process in the field to identify concerns (e.g. fuel loading, structures, and smoke management) and prescribe actions and resources necessary to mitigate concerns. If you do not have contingency resources on site as stated in your plan then do not proceed with ignitions. Establish an annual program of work which includes a planning process that evaluates staffing, compliance, environmental factors, project priorities, sequence for implementation, and cost accountability for all fiscal considerations. Educate staff on the use of and consider the National “Service First Agreement” or the State of Utah “Cooperative Fire Management Agreement and Stafford Act Response Agreement”.
Effective Communication All individuals involved in operations have a shared responsibility and need to voice any concerns, hazards or issues they perceive when they recognize them at any point throughout an operational period.	Critical questions need to be asked such as: What could go wrong here? What am I not seeing that you might be seeing? Who holds the “big picture” of what is going on? This “disconfirming process” would have helped detect or anticipate problems. Not all risks and hazards of a prescribed fire may be identified in the burn plan. The information needed to successfully plan and implement a project often lies with an individual person who spots a subtle problem. Therefore, an organizational cultural that encourages comprehensive communications is critical.

Lessons Learned: Operational Leadership

Operational Leadership identifies key risk factors that affect individual and team performance. It has been designed to provide a standardized approach that will assist employees in assessing and managing risk throughout the organization.

In Operational Leadership, the eight components of Effective Mission Analysis help employees identify those human factors in the workplace and provide tools for individuals and teams to use in assessing and mitigating risks. The primary intent is to examine the event details with consideration for the principles of operational leadership, to learn from the near misses as well as the successes.

Supervision: Several key burn organization positions (Firing Boss and Holding Boss) were being performed with trainees. Initially the Burn Boss was actively engaged with operations on the burn, however as the incident escalated the Burn Boss became actively involved with completing multiple tasks and thus, was not as able to regularly observe and check on the burn team and project details. Operational and administrative tasks made it easy to be distracted and overloaded. The Burn Boss communicated directly with the Agency Administrator on the project.

Planning: An approved plan was completed and implemented. There was no mechanism (Agreement) put in place to reimburse state resources which were relied upon heavily to support the prescribed burn. Previous successes of the program contributed to the overall attitude that the burn would only take a couple of hours and could be completed before the frontal passage affected their fire.

Contingency Resources: Were planned for but not on scene as required by the burn plan. Furthermore, response times exceeded the Color Country 2 hour response time commitment. They were a critical line production piece of equipment according to the plan. There was no formal mechanism in place to pay for the identified resources.

Communication: On site radio communication was established, it was technically sound and resources were knowledgeable of the systems.

Team Selection: Personnel were qualified and experienced for their assigned prescribed fire positions.

Team Fitness: The fire management organization had an active season to-date. The prescribed fire team was physically fit and ready for the project.

Environment: The prescribed fire was conducted at the high end of the prescription. Conditions associated with the predicted frontal passage arrived as predicted. Prescription elements were exceeded.

Complexity: The complexity of the prescribed burn was originally identified as moderate and subsequently reduced to a low complexity burn without adequate justification. Other similar burns in the park have a moderate complexity rating and are at the type 2 Burn Boss level. A low complexity burn would indicate that a type 3 Burn Boss (RXB3) would be sufficient to implement the burn.

Positive Factors

- The Lava Point Prescribed Fire Burn Boss completed a thorough operational briefing to all resources. All resources stated that they fully understood the change in operational tactics, to treat the smaller portion of the burn unit as opposed to treating the entire unit, and how the predicted weather forecasts impacted that decision.
- Good communications were occurring throughout the incident, i.e., face-to-face meetings and clear communication via radio traffic.
- The decision to stop firing tactics after profuse spotting occurred and the ability of the organization to quickly reconfigure to meet holding needs.
- Willingness and timeliness of the State Fire Program Management staff to support and assist Zion National Park with decision making and tactical resource needs.

References

Interagency Prescribed Fire Planning and Implementation Procedures Guide. July 2008. 50 pages.

http://www.fs.fed.us/fire/fireuse/rxfire/rxfireguide.pdf

Prescribed Fire Complexity Rating System Guide. January 2004. 43 pages.

http://www.nwcg.gov/pms/RxFire/complexity_analysis.pdf

Wildland Fire Management Reference Manual 18. National Park Service. U.S. Department of Interior, Branch of Wildland Fire. 396 pages.

http://www.nps.gov/fire/download/fir_wil_rm18.pdf

Lava Point Aspen Prescribed Fire Plan

Review Team

Andy Bundshuh,
National Park Service Intermountain Region, Fuels Management Specialist- Team Leader

Justin Johnson,
Bureau of Land Management, Central Utah Fuels Program Manager– Technical Expert

Art Gonzales,
National Park Service Grand Canyon, South District Fire Management Officer – Technical Expert