Long Jim III Prescribed Fire
After Action Review

Grand Canyon National Park
Grand Canyon, Arizona

May 21, 2004

LONG JIM III PRESCRIBED FIRE AFTER ACTION REVIEW	
	Page

I. EXECUTIVE SUMMARY

On May 5, 2004, the Long Jim III prescribed fire was ignited on the south rim of the Grand Canyon National Park (NP). The prescribed fire escaped the burn unit the same day and was declared a wildland fire. After the prescribed fire was declared a wildland fire, the burn boss assumed the role of the Incident Commander, and the burn boss trainee assumed the role of operations chief. The Grand Canyon NP Superintendent, as required by National Park Service policy, requested a review be conducted of this prescribed fire and assembled a review team for that purpose. The review was conducted from May 19-21, 2004 at Grand Canyon National Park.

The team developed a report that details Findings, and Best Management Practices High Reliability Organizations, Lessons Learned, and Recognition. In addition, recommendations are provided in response to some of the findings and best management practices (BMP).

II. INTRODUCTION and BACKGROUND

As part of the Grand Canyon National Park, USDI National Park Service, fuel treatment program, a prescribed fire was planned for an area south and east of the Grand Canyon Village, totaling 5050 acres. The 5050 acres was divided into 3 separate burn units, including the 1618 acre Long Jim III unit. The entire 5050 acres had not been subject to treatment for at least 25 years. The area is considered to be in a Condition Class 3. The Long Jim III was the first of the three burn blocks identified in the Long Jim Prescribed Fire Plan slated to be burned. One goal of implementing this burn was to help protect Grand Canyon Village from catastrophic wildland fire.

The goals of the Long Jim III Prescribed Fire were:

1. Utilize fire as a tool to decrease risks to safety, life, property and resources.
2. Use fire to mimic natural fire events in ponderosa pine forests, starting the process of returning these forests towards pre-European conditions.
3. Reduce accumulations of forest fuels that exist in the area.
4. Prevent adverse impacts to cultural and natural resources, and
5. Aid in the preservation of historic structures and archeological sites through reduction of fuel accumulations, resulting in a reduced threat of wildland fire.

This Long Jim Prescribed Fire Plan is guided by the following land and resource management planning documents; The Grand Canyon NP General Management Plan, Grand Canyon NP Resource Management Plan, and Grand Canyon NP Fire Management Plan. The detailed implementation procedures were described in the site specific burn plan for the Long Jim prescribed fire plan.

The Long Jim III Prescribed Fire was planned and implemented under an approved Prescribed Fire Burn Plan by qualified personnel. Approximately one week prior to the ignition of the Long Jim III unit, black lining operations were completed on the northeast boundary of the burn where the powerline crossed the E1 road southeast to DP3

(vicinity map and Incident Action Plan (IAP) map see Appendix A). Approximately one week later, on the morning of May 5th, a pilot weather balloon (PIBAL) was released with satisfactory results and the test burn was initiated. Upon discussing the results of the test burn the decision to proceed was made collectively between the burn boss, burn boss (t), ignition specialist, and holding specialist. During the briefing it was clearly emphasized to all resources the need to have ignition operations completed by 0900. Ignition operations were not completed by 0900 and at approximately 1143 multiple spot fires were detected north of the E1 road. The burn boss and burn boss (t) directed resources to take action at the first identified contingency line (powerline road). This tactic was abandoned when the fire spotted over the powerline road and resources were redirected along Highway 64. At 1517 the Long Jim III prescribed burn was declared a wildland fire.

Specific objectives for the review given to the team included:

- Identify lessons learned to reduce the potential for future escapes.
- Determine if the prescribed fire plan was adequate
    - Determine if the prescription, actions, and procedures set forth in prescribed fire plan were followed
    - Determine if overall NPS guidance and procedures relating to prescribed fire operations are adequate
    - Determine the level of awareness and understanding of procedures and guidance of the personnel involved, and
    - Determine the extent of prescribed fire training and experience of personnel involved (see Appendix B).

III. AFTER ACTION REVIEW (AAR) and PROCESS

Members of the Review Team included:

Roy Hall	Team Member	Assistant Director, Fuels	USDA Forest Service Southwest Region Albuquerque, NM
Scott Birch	Team Member	Western Region Aviation Meteorologist/IMET	Western Region National Weather Service Salt Lake City, UT
Jim “JP” Mattingly	Team Member	Wildland Fire Management Specialist	USDI, National Park Service Midwest Region Omaha, NE
Emily Irwin	Team Member	Lead Coordinator, Fire Use Training Academy	USDA Forest Service Southwest Region Albuquerque, NM

The Review Team was convened on May 19, 2004, at 0800 in the Grand Canyon Fire Management Conference Room, Grand Canyon NP, Arizona. The Team was briefed by the Assistant Park Superintendent, Chief Ranger, Park Fire Management Officer, Fire Use Manager, and Fire Suppression Manager. The Team completed interviews by phone and in person. Team members were involved in an on-site review of the burn area to observe topography, fuel conditions, burn intensity and severity, road network, and values at risk. The Team reviewed information from several agency policy guides and the Long Jim Prescribed Fire Plan. The review Team then developed this report and presented findings and lessons learned to the Chief Ranger, Park FMO, Fire Use Manager, Fuels Specialist, Fire Information Officer, and Fire Suppression Manager.

IV. FINDINGS and RECOMMENDATIONS

Planning/Policy:

- The Long Jim III Prescribed Fire Plan met the requirements outlined by NPS Reference Manual 18 (RM-18), including a thorough technical review.
- Current interagency expectations and accountability for fuels treatment programs is extremely high. The identified annual program of work in prescribed fire activities for Grand Canyon NP is approximately 7000 acres. Approximately mid way through the fiscal year, 60 acres had been accomplished.
- While not slated as a FY04 project, Grand Canyon NP Fire Management Staff felt they had an opportunity to complete a high priority wildland urban interface (WUI) project before the Spring burn window closed. The NPS Intermountain Regional Office (IMRO) was fully supportive of the effort and indicated funding would be attainable.
- The Park provided the Team a complete documentation package including; prescribed fire burn plan, IAP, unit logs, fire monitoring report, weather monitoring report, incident status summary, and fire information and press releases.
- The pre-burn considerations section of the Burn Plan stated weather and fuel conditions would be monitored seven days prior to the day of ignition. Weather observations were not recorded and communicated until the day prior to the burn (see Lessons Learned).
    - *Recommendation: The pre-burn consideration of the Burn Plan, regarding weather and fuel conditions in the two to seven day period, is important because it increases situational awareness and supports decision making for the meteorologists and burn boss respectively. Furthermore, it is useful during the post fire verification process to aid in the development and improvement of future burn plans.*
- During the planning process, significant emphasis and concern was placed on smoke management and avoiding impact of smoke into the Tusayan community. Relatively strong southwest winds, especially at night, were desirable to avoid smoke impacts in Tusayan. The smoke impact and intrusion concern was coordinated with the Weather Forecast Office (WFO) in Flagstaff many days before the burn (see Lessons Learned).

- The IAP for the May 5th operational period was adequate. However, no references to aerial ignition operations or contingency actions were included, despite the fact that the burn was being conducted in a highly sensitive WUI area with multiple and extensive values at risk (see Lessons Learned).
- An Ignition Plan was discussed.
- The Grand Canyon NP has an Evacuation Plan for the Grand Canyon Village, but the Long Jim III burn plan made no reference to it. In conjunction with the escaped burn declaration, the undefined terms of "precautionary" and "advisory" were used to describe the level of evacuation being ordered. Though confusing, this was quickly mitigated by successful suppression of the escaped fire (see Lessons Learned).
    - *Recommendation: Regularly update and validate Grand Canyon Village Evacuation Plan. Reference in prescribed burn plan and ensure it is available for use.*
- Hazard Analysis and Risk may have been underrated as "moderate" for the Public Safety element referenced in the Prescribed Fire Risk Mitigation Table (Appendix 5 in the burn plan). The mitigation and control measures did not address Evacuation Plans or protocols.
- This plan, though not written nor supported with specific ignition sequence maps, was communicated verbally to all assigned resources. A full understanding of the planned methods and sequence was evident from interviews with the burn resources.
- Contrary to statement in the Burn Plan, all fuels adjacent to the Long Jim III unit had not been treated. The area north of Long Jim III and east of Grand Canyon Village was considered to be priority WUI, but was deferred from prescribed fire treatment during planning due to limited burn window opportunity and time necessary for required consultation.
- The burn prescription was appropriate for desired objectives.
- Fire behavior modeling was adequate for the purposed burn. Further validation of the fire behavior modeling, based on fire behavior observations during black-line operations about a week prior to aerial ignitions provided a tool for intensifying situational awareness (see Lessons Learned).
- Fire behavior modeling did not attempt to display crown fire behavior.
- All resources assigned to the Long Jim III Prescribed Burn received multiple pre-burn briefings. Site tours and simulated operations (i.e. potential spot fire gridding) provided invaluable opportunity for resource to become familiar with the burn area. Briefings included verbal discussion of immediate area hazards, public safety concerns, traffic control, evacuation plans, etc. (See BMP's)
- Escape contingency or fall-back lines were discussed amongst burn operations overhead but were not communicated to all burn-day resources, either verbally or through written documentation in the IAP (see Lessons Learned).

<u>Implementation/Operations:</u>

- The goal to complete ignition operations before 0900 was well communicated by the burn boss during the morning briefing. Timeframes to complete the aerial

ignition were underestimated and were further compromised by a combination of factors including strong winds (resulting in one-way ignition passes from the northwest to the southeast only), a different pilot than is normally used for ignition operations, several short-duration problems with the PSD equipment, and longer than anticipated refueling breaks. Additionally, drip torch fuel logistics and mechanical difficulty with dispensing pump further delayed ignitions being completed within the objective time frame. (See Lessons Learned)

- Fire behavior was more active than expected during pre-burn black-lining operations and test fire operations on May 5th. Observations were communicated and utilized for situational awareness update. Additionally, these observations contributed to ignitions on May 5th being initiated early in the morning in order to complete ignitions by 0900, before peak burning conditions could negatively affect fire behavior (see Lessons Learned).
- Energy Release Component (ERC) was above average, but below the 90th percentile.
- Thousand hour fuel moisture was below average, but within the approved prescription range.
- Updated weather information was not easily communicated from WFO Flagstaff to burn personnel. The emergency contact phone number, supplied by Grand Canyon NP on the spot forecast web page, was not a true emergency number since no one was available at the number during implementation of the burn (see Lessons Learned).
    - *Recommendation: The NWS should consider adding to the spot forecast web page, multiple sections including: (1) emergency contact phone number, and (2) a phone number for spot forecast questions and feedback preferably from the requestor. The fire agencies should make sure the emergency contact phone number is available for immediate response (preferably an available dispatch office).*
- An adequate number of qualified resources were available and ordered to support the burn project. These resources were in significant excess of the minimum staffing required by the approved burn plan. A Public Safety Specialist was assigned to deal with non-fireline safety issues such as signing and traffic control. A qualified Fireline Safety Officer was not ordered or assigned.
- The RXI1 was serving in this position for only the second time. He stated feeling comfortable managing the firing activities of three ground ignition teams while also directing the aerial ignition operations from aboard the helicopter. Some concern was expressed by the RXB1 and RXB1(T) that they may have overloaded the RXI1 a bit with the responsibility of controlling several ignition teams on the ground while simultaneously conducting the aerial ignition tasks.
- Aerial ignitions were completed at approximately 1110, and the spot fires that resulted in the escaped fire declaration were first reported at 1143. On site resources transitioned safely and efficiently into suppression mode and the burn boss trainee monitored the situation and ordered additional resources in a timely manner. Adequate resources were maintained to hold and monitor the activity on the burn unit. The slopover was declared an Escaped Fire at 1517. The use of the dozer and aerial retardant contributed significantly to ultimately containing

the escape one hour later, and no Wildland Fire Situation Analysis (WFSA) was initiated.
- Burn operation personnel expressed uneasiness when ignitions were not completed by 1100. Increasing winds and temperatures, along with resulting single digit relative humidity were discussed and communicated as the prime reasons for concerns (see Lessons Learned).
- Fire Dispatch for the Grand Canyon NP was merged with the Grand Canyon Zone Dispatch Center in Williams, Arizona. This merge occurred in March, 2004, in order to increase the efficiency of resource ordering and status tracking. The benefits of the merge were readily apparent and increased the safety and efficiency of transitioning from a prescribed fire to a wildland fire suppression mode.

V. BEST MANAGEMENT PRACTICES (BMP)

The review Team identified the following BMPs exhibited in the planning and implementation of the Long Jim III prescribed fire.

- The Long Jim III Prescribed Fire Plan and IAP were clearly communicated to all assigned resources.
    - *Recommendation: IAPs should be developed for all prescribed fires.*
- Ordering and using additional resources including a dozer, air tanker, and Interagency Hotshot Crew (IHC) as warranted by threats to existing values at risk.
- Timely AAR, documentation, and evaluations.
    - *Recommendation: The Grand Canyon NP should work with The Lessons Learned Center to post the lessons learned and any applicable findings from this report to the Lessons Learned website.*
- Clear command and safe transition from the prescribed fire to a wildland fire suppression mode.
- Interagency coordination with National Weather Service, Williams Interagency Zone Dispatcher Center, assigned resources, Arizona Department of Environmental Quality, and Grand Canyon NP resource specialists.
- The Grand Canyon NP use of PIBALs before ignition to determine wind direction above the burn site for smoke management validation.
    - *Recommendation: Grand Canyon NP should consider calculating the wind speeds from the PIBALs and providing this information to WFO Flagstaff. PIBAL information is important to meteorologists because it allows verification of the weather forecasts and supports decision making in the forecast process.*

VI. HIGH RELIABILITY ORGANIZATIONS

A recent workshop held in Santa Fe, New Mexico was entitled “Managing the Unexpected in Prescribed Fire and Fire Use Operations: A Workshop on the High

Reliability Organization". This workshop focused on exploring the concepts of 'high reliability organizations' and 'managing the unexpected' in order to better secure a successful future in prescribed fire and wildland fire use. The review team has attempted to employ some of the concepts of this workshop within the framework of current emphasis relative to After Action Reviews and Lessons Learned. There are five basic processes that characterize high reliability organizations that operate in high risk – high consequence environments. High reliability organizations are attentive to failures, simplifications, operations, resilience, and distributed expertise. The five processes can be thought of as hard-won lessons in the continuing "struggle for alertness" that high reliability organizations face every day. The After Action Review has identified significant lessons learned and Best Management Practices (BMPs). These BMP's have, in turn, been categorized under the five processes that characterize high reliability organizations, where appropriate.

The five processes are;

1. PREOCCUPATION WITH FAILURE

HRO's treat near misses and errors as information about the health of their system and try to learn from them.

BMP: Timely AAR, documentation, and evaluations.

The Park and overhead associated with prescribed burns recognize the need to identify problem areas. This reference is used to effectively concentrate efforts to improve their fuels management program. Several AAR's occurred immediately after the Long Jim III prescribed fire. The holding boss conducted an AAR the evening of May 6th, Park Fire Management Staff involved in the prescribed fire conducted an AAR and documented their finding (see Appendix C), and the Park Superintendent requested an AAR with concurrence of the Regional Director, Intermountain Region, NPS.

2. RELUCTANCE TO SIMPLIFY INTERPRETATIONS

Systems with HRO's restrain temptations to oversimplify.

BMP: Ordering and using additional resources including a dozer, air tanker, and Interagency Hotshot Crew (IHC) as warranted by threats to existing values at risk.

During planning phase the suggestion was made by subordinate fire staff to consider ordering an IHC. Following discussion this recommendation was approved.

3. SENSITIVITY TO OPERATIONS

Everyone, no matter what his or her level, values organizing to maintain situational awareness.

BMP: The Long Jim III Prescribed Fire Plan and IAP were clearly communicated to all assigned resources.

During the implementation and planning of the Long Jim III burn, all levels of the prescribed fire organization valued and maintained good situational awareness. Personnel associated with the burn demonstrated operational leadership through clear verbal and written communication of the IAP and burn plan. Information exchange was validated through briefings and on-site field trips. Resources clearly understood the objectives, their assignment, and command structure. When the burn was declared a wildland fire, the transition of command, tactics, and assignments was clearly communicated and understood by all assigned resources.

4. CULTIVATION OF RESILIENCE

Most organizations try to anticipate trouble spots, but HRO's also pay close attention to their capability to improvise and act without knowing in advance what will happen.

BMP: Ordering and using additional resources including a dozer, air tanker, and Interagency Hotshot Crew (IHC) as warranted by threats to existing values at risk.

Once the fire crossed Highway 64, the burn boss, burn boss (t), and Assistant Park Superintendent quickly recognized the urgency of containing the fire east of Highway 64 due to proximity of the Grand Canyon Village. Based on experience, deference to expertise, and the flexibility to improvise, the decision was made to order a dozer and air tankers to secure suppression success and further protect values at risk. Improvising and using good sense assisted in successful fire suppression actions.

5. WILLINGNESS TO ORGANIZE AROUND EXPERTISE

HRO's allow critical decisions to "migrate" to those with the expertise and qualifications to make them during high tempo periods.

BMP: Interagency coordination with National Weather Service, Williams IA Zone Dispatcher Center, assigned resources, ADEQ, and Park resource specialists.

During the planning and implementation phases of the Long Jim III Prescribed Burn Plan, decision making, collaboration, and coordination was clearly demonstrated. This HRO process intensified as necessary decisions were made in transitioning from prescribed to wildland fire suppression.

VII. LESSONS LEARNED

The following lessons learned were developed by the review Team. Lessons learned were also identified and documented by Grand Canyon NP Fire Management Staff through immediate AAR process and are located in Appendix C.

- Smoke management and the possible intrusion of smoke into the Tusayan area was a huge concern for the Long Jim III prescribed fire. The elevated concern with smoke created a management focus on strong southwest winds, and an urgent need to complete the burn under critical Spring fire behavior conditions. It is important that all disciplines involved with prescribed fire planning (fire management, natural and cultural resource management, National Weather Service, etc) do not allow smoke management to overshadow other significant planning, operational, and safety considerations.
- Timeframes for critical operations and events must be realistic and attainable. If activities rely on mechanical equipment (helicopters, PSD machines, engines, heavy equipment, etc) for completion, reasonable consideration must be paid to the logistics of travel times, refueling requirements, operator expertise, and the chance of breakdowns to plan effectively for the operational period. For example, something as seemingly insignificant as a fuel pump that was needed to refuel drip torches malfunctioning could result in unacceptable delays and possible failure of the activity or project.
- Preplanned management commitment and decisions which rely upon vulnerable support mechanisms (i.e. aerial ignition and logistical re-supply where timing is critical), necessitate in-depth and realistic contingency planning. The tighter the window of opportunity, the more attention is required to address logistical details.
- Critical timelines that are established to ensure success of operations need be tracked and reassessed frequently so that adjustments or mitigations (i.e. ignition pattern or method) can be made early enough in the operation period to secure successful completion.
- An accessible and user friendly data base documenting actual weather and fuel conditions observed on prescribed burns should be developed and maintained by the units with prescribed fire programs in order to better predict and validate prescriptions for future burn projects. Grand Canyon NP has been collecting and cataloging prescribed burn related data for years and has a system for utilizing it in order to help them meet their resource management and operational goals. In the case of the Long Jim III project, the burn was being conducted at the high end of the prescription in order to obtain better results. This was a departure from past burns that had been conducted under more moderate fuel and weather conditions. Two facts emerged from post burn interviews with the burn participants. First of all, RXB1/ICT3, a Grand Canyon NP employee for 17 years, indicated having ever seeing such extensive crown fire behavior and crown consumption in Pinyon/Juniper fuels during either a wildland or prescribed fire at the park. More knowledgeable and extensive institutional memory and documentation is not readily available. Also, the Lead Fire Monitor stated that preliminary observations indicate notable success with regard to the stated dead

and live fuels reduction objectives. Unless the conditions that have resulted in such success are store-housed in an acceptable format and location, such information could be lost in the transition of employee and management regimes over time. The value of such documentation, and the avoidance of having to re-discover the weather and fuel condition parameters that produce such successes, cannot be overstated.

- Updated or critical weather information must flow easily from the National Weather Service to fireline personnel and visa versa. It is paramount that emergency contact phone numbers are available, twenty-four hours a day, seven days a week during prescribed and wildland fire season, in the event severe weather threatens firefighter safety.
- A significant emphasis was placed on pre-burn public education and notifications. It was critical, after the burn escaped, to maintain a high level of honest communication with the public. A number of community meetings and media interview took place immediately after the burn, to specifically address the escape. The Grand Canyon NP willingness to step forward and accept responsibility for the outcome led to enhanced credibility.

VIII. RECOGNITION

- The Grand Canyon NP staff is to be commended for its willingness to accept the level of risk involved with prescribed fire in these fuel types and conditions.
- The fire effects monitoring program at the Grand Canyon NP is a model for all land management agencies to consider incorporating into their fuels management programs.

IX. CONTACTS

The review Team met with numerous individuals and discussed information relevant to the planning, implementation, and communication of the prescribed fire. The following individuals participated in discussions with the review Team:

Dan Oltrogge	Fire Management Officer	USDI, National Park Service, Grand Canyon NP
Craig Letz	Fire Use Manager	USDI, National Park Service, Grand Canyon NP
Jim Kitchen	Fire Suppression Manager	USDI, National Park Service, Grand Canyon NP
Chris Marks	Fuels Specialist	USDI, National Park Service, Grand Canyon NP
Li Brannfors	Lead Fire Effects Monitor	USDI, National Park Service, Grand Canyon NP

Ken Daniel Dan LeBlanc Ben Peterson Brian Klimowski George Howard Mike Staudenmaier	Flagstaff Weather Forecast Office	NOAA, National Weather Service, Flagstaff
Ryan Swartz	Smoke Jumper In-Charge	USDI, Bureau of Land Management, Boise, ID
Kim Brown	Engine Foreman Eng-14	USDA, US Forest Service, Kaibab NF
Gabe Ruiz	Engine Foreman Eng-13	USDA, US Forest Service, Kaibab NF
Larry McCoy	Assistant Fire Management Officer	USDA, US Forest Service, Kaibab NF

The Team attempted to contact the superintendent of the Geronimo ICH. The crew was on a fire assignment and was not reached.

REFERENCES

Grand Canyon National Park Fire Management Plan, 1998

Grand Canyon National Park General Management Plan, 1995

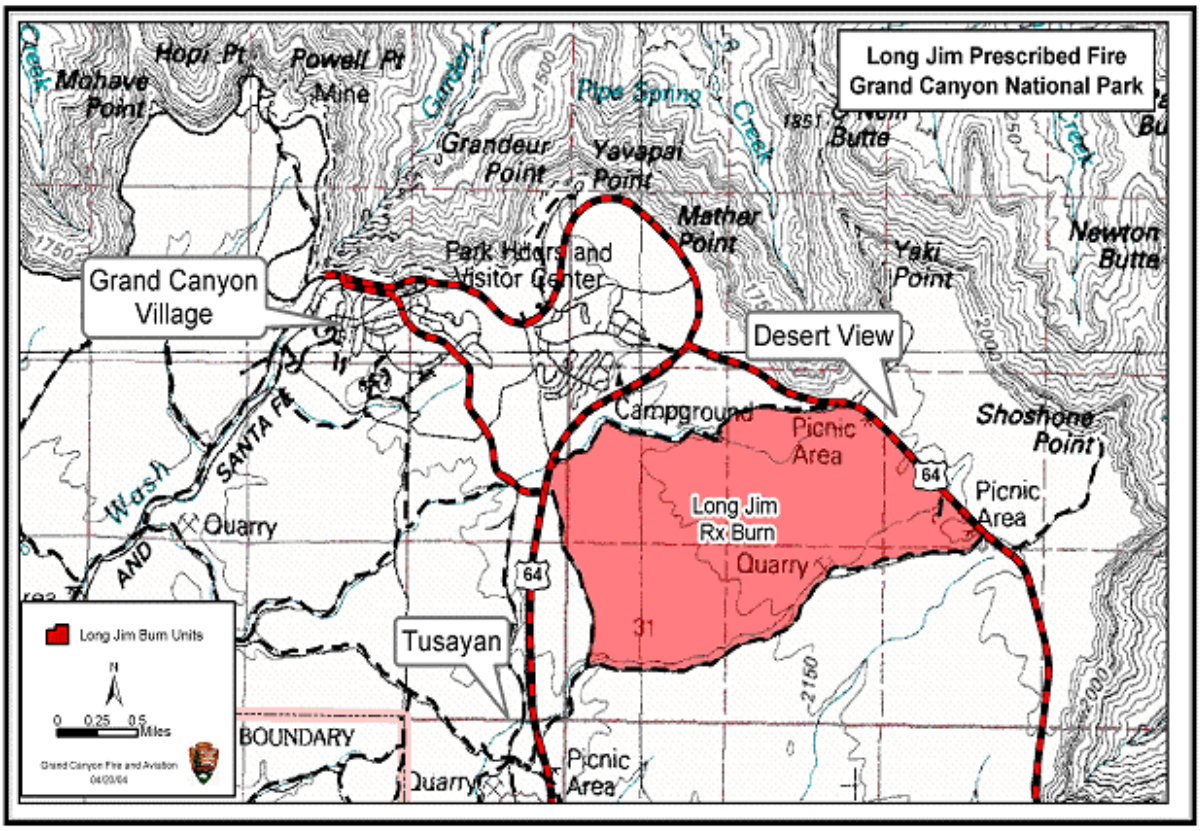
Grand Canyon National Park Resource Management Plan, 1997

Interagency Standards for Fire and Fire Aviation Operations, 2004

NPS Wildland Fire Management Reference Manual -18, 2001

Weick, Karl and Kathleen Sutcliffe, 2004, Managing the Unexpected Workshop. Santa Fe, NM

Appendices


Long Jim Prescribed Fire
Grand Canyon National Park
Hopi Pt
Powell Pt
Mine
Mohave Point
Pipe Spring
Creek
Grandeur Point
Yavapai Point
Mather Point
Yaki Point
Newton Butte
Park Headquarters and Visitor Center
Grand Canyon Village
Desert View
Campground
Picnic Area
Shoshone Point
Long Jim Rx Burn
Quarry
Wash
SANTA FE
AND
64
Tusayan
BOUNDARY
Picnic Area
Long Jim Burn Units
N
0 0.25 0.5 Miles
Grand Canyon Fire and Aviation
04/03/04