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NATIONAL PARK SERVICE  
Pacific West Regional Office  
1111 Jackson Street, Suite 700  
Oakland, California 94607

November 9, 2009

Memorandum

To: Superintendent, Yosemite National Park

From: Acting Regional Director, Pacific West Region

Subject: Big Meadow Prescribed Fire Review

The final Big Meadow Prescribed Fire Review is enclosed. The document identifies lessons learned and methods for sustaining these lessons. Its purpose is to help Superintendents and fire managers minimize the potential for future escaped prescribed fires. The Review should be shared widely amongst fire managers and the public.

The regional fire management staff has worked with the review team to develop action items based on the Big Meadow Prescribed Fire Review. The park may resume its prescribed burning program. The bullets under action item #1 must be completed prior to each burn. The Deputy Fire Management Officer for Fuels will coordinate with the park staff on prescribed burns throughout the next year. At that time the park and regional office should meet to determine future actions.

#	Action Item	Assigned To	Target Date
1	Park will improve/ develop prescribed fire plans that address site specific conditions, prescriptions and contingencies. Regional office will perform Technical Review of all prescribed fire plans. The Park will consult with Regional Fire Management Staff prior to implementation of in-season prescribed burning.	Yosemite National Park/PWR Fire Management Staff	On-going
2	The complexity analysis process needs to be reviewed and made clearer on the delineation of moderate to high complexity ratings. The intent is to reduce subjectivity in the complexity process resulting in a better understanding of the risks and mitigations required for individual prescribed fires.	Make recommendation to FMPC that the complexity process needs review	TBD
3	Establish a process that tracks seasonal changes in fuel moisture, fire danger, fire behavior and weather. Assure that the information is readily accessible to park managers.	Yosemite Fire Management	TBD

4	Develop a five year strategic and tactical program of work. Build a schedule and prioritize projects to efficiently meet annual targets. Assure that the work load meets current workforce capabilities.	Yosemite Fire Management	TBD
5	Develop/improve prescribed fire objectives to clearly define resource concerns and mitigations to the Burn Boss (e.g. Snag Guidelines).	Yosemite Fire and Resource Management	On-going
6	The Agency Administrator(s) can improve knowledge of fire program management through formal training and interaction with fire management staff.	Park Superintendent	On-going
7	Fill key fire leadership vacancies in the Yosemite FAM program.	Yosemite Fire and Human Resources Management	On-going
8	Improve fire management coordination of fuels treatment and prescribed fire activities through better communication. Develop protocols for timely discussion among park managers of on-going projects and proposed prescribed fires. This discussion must include all components of the program: leadership, operations, fuels, resources management and ecology.	Yosemite National Park	On-going

Please prepare a detailed plan with responsible parties and due dates to address items assigned to Yosemite and submit as a response by December 31, 2009.

The park staff showed an extraordinary level of cooperation and honest self examination during the review process. We are confident that this experience will continue to improve the fire management program at Yosemite.

If you have additional questions please contact Regional Fire Management Officer, Sue Husari at 510-817-1371.

**Big Meadow Prescribed Fire Review**  
**National Park Service, Pacific West Region**



## **Executive Summary**

The Big Meadow prescribed fire was an 89 acre subunit of the Foresta Complex Prescribed Fire Plan. On August 26, 2009 after planning and preparing the prescribed fire unit Park personnel began implementation of the project. At 1015 hours a test fire was initiated and results were within prescription parameters. The Go/No Go Checklist was approved and ignition of the unit continued. Soon after multiple spot fires occurred outside of prepared firelines which included several burning snags. Personnel on scene were unable to contain the spot fires and the Burn Boss declared the prescribed burn a wildfire at 1210.

The Review Team determined the following:

- The Prescribed Fire Plan met policy but was inadequate as it included a large area with diverse fuel types, topography, and environmental factors that made it difficult to determine the site specific elements necessary to implement the Big Meadow Unit.
- The prescription, actions and procedures set forth in the Prescribed Fire Plan were followed but the prescription was inadequate.
- Overall policy, guidance and procedures relating to prescribed fire operations were adequate.
- Organizationally there was knowledge of the risks and hazard associated with the prescribed burn, several individuals had key information to share, but no one person had the complete picture.

The review of the Big Meadow Prescribed Burn was done 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 Big Meadow Prescribed Fire**

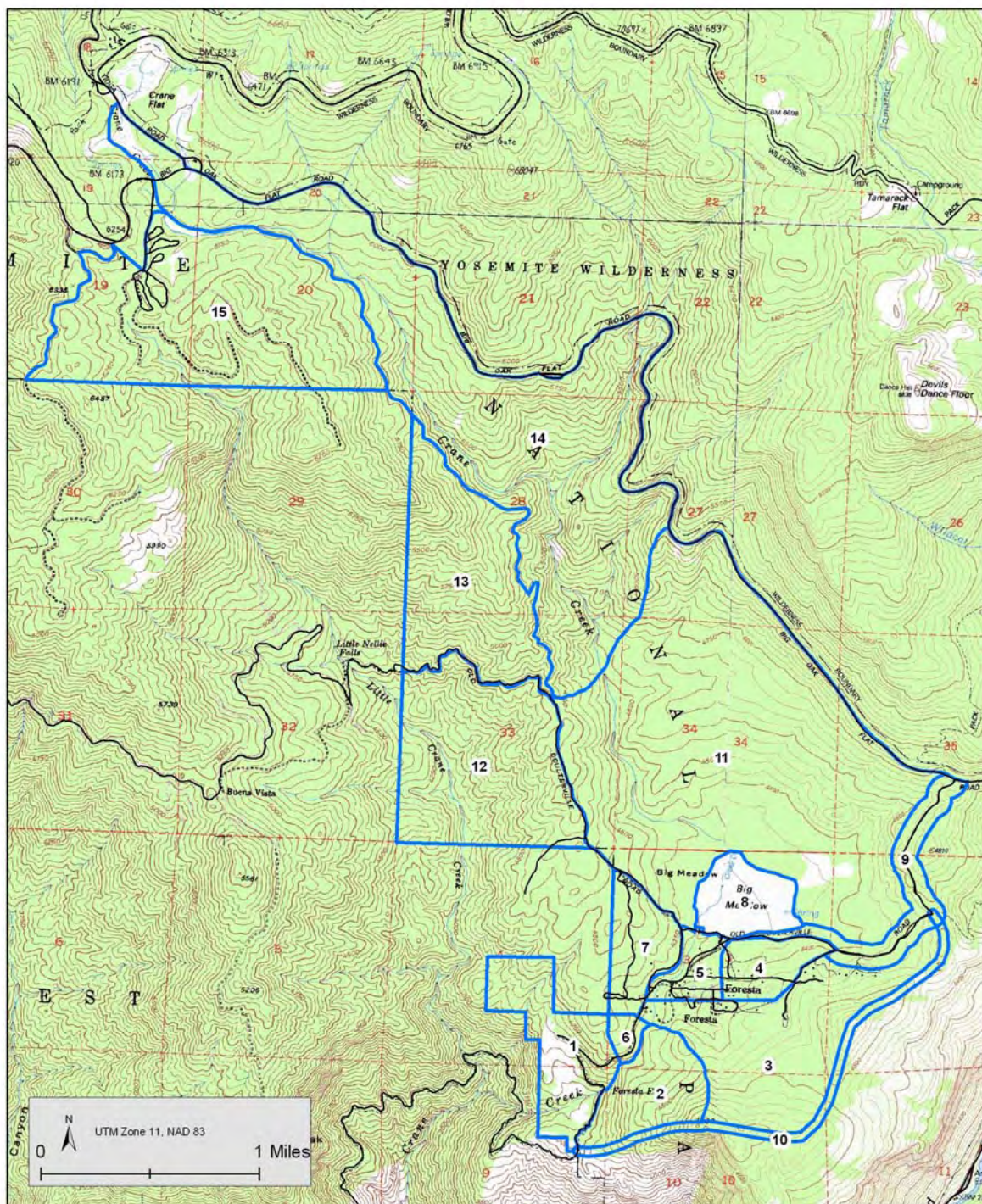
The Big Meadow prescribed fire unit is located within the boundaries of the 17,770 acre Arch Rock fire which occurred in 1990, a result of lightning. Numerous structures were destroyed as a result of this wildfire. Hazard tree and fuels reduction efforts have occurred post-fire to protect the public and reduce the potential for damage to structures in the advent of future wildfire. These treatments were completed within the community of Foresta as well as on adjacent National Park Service lands. Homeowners within the community have annually cleared flammable vegetation around private structures. They have also developed a Community Wildfire Protection Plan (CWPP) to address the risk of wildfire to the community. Approximately 250 acres of fuels reduction have occurred on National Park Service lands surrounding Foresta since 1990. These treatments consisted of thinning, hand piling and burning vegetation, broadcast burning and fuelbreak construction using mechanized equipment.

The 89 acre Big Meadow prescribed fire unit was a part of the Foresta Complex Prescribed Fire Plan a landscape project that consists of 15 individual prescribed fire units that total 4,567 acres. The Foresta

Complex is located within and surrounding the community of Foresta in Mariposa County, just northwest of Yosemite Valley within Yosemite National Park (Figure 1).

Goals and Objectives from the Big Meadow Prescribed Fire Burn Plan:

1. Provide for public and firefighter safety.
  - a) Ensure public safety by posting warning signs and/or restricting access.
  - b) Ensure all fire personnel are provided a safety briefing.
  - c) Base all strategy and tactical decisions on proven safe practices.
  - d) Manage smoke to avoid unhealthy and hazardous conditions.
2. Reduce fuels in all size classes in the inner Wildland Urban Interface (WUI) zone.
  - a) For first entry burns reduce fuels in all size classes by 30-70%.
  - b) For maintenance burns reduce and maintain dead and down fuel loadings to 5- 30 tons per acre.
3. Achieve restoration and maintenance target conditions outside the WUI zone through prescribed burning in at least the upper end (or on the low range of densities and fuel loadings) of the range of restoration target conditions as outlined in Yosemite's Fire Management Plan.
  - a) Maintain gap size distribution one year post burn of the unit at.
  - b) Maintain size and composition target conditions one year post burn.
4. Preservation of cultural and natural resources.
  - a) Protect all known features.
  - b) Reduction of fuel conditions around cultural resources.
  - c) Documentation of newly discovered cultural resources.
5. Monitor and record fire behavior, weather, smoke and fire effects plots through all stages of burning.
  - a) Ensure personnel are on site to conduct monitoring.
6. Provide opportunities for educating employees and the public about the role of fire in ecosystem management.
  - a) Develop information and outreach strategies that explain the need for prescribed burning in Yosemite National Park.



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Yosemite Fire GIS kww 13 May 2008

Figure 1 Foresta Complex Map

## Operational Objectives

From the Big Meadow Prescribed Fire Incident Action Plan (August 25, 2009):

1. Ensure firefighter and public safety
2. Keep fire east of Crane Creek
3. Keep fire south and east of weed-eater line
4. Keep fire north of Old Coulterville Road
5. Reduce hazardous fuels around the Foresta Wildland urban interface
6. Utilize prescribed burning to mimic the historical natural role of fire in meadow ecosystems
7. Develop and implement actions that accomplish resource benefit objectives as well as providing for protection of wilderness, natural and cultural resources
8. Manage incident operations in a cost effective and efficient manner
9. Coordinate incident activities and provide information updates daily or as needed with the Stanislaus and Sierra National Forests, other cooperators and affected county air resource boards
10. Provide information updates daily or as needed to the media and interested publics

## Description of the Events

The Foresta Complex Burn Plan was approved by the Yosemite National Park Superintendent on May 21, 2008. The Big Meadow segment was an 89 acre subunit of the 4567 acre complex.

The process for implementation of the Big Meadow prescribed fire began on August 1, 2009 with construction of firelines and installation of equipment around the site. On August 21<sup>st</sup> the Prescribed Fire Burn Boss briefed the Acting Yosemite National Park Superintendent and the Acting Superintendent approved the Agency Administrator Go/No Go Checklist. This allowed the prescribed fire to move forward towards ignition, dependent on completion of a site specific Go/No Go Checklist on the day of the burn. Preparations of the unit continued and public notifications were made and included discussions with the Mariposa County Air Pollution Control District (Air District).

On August 25<sup>th</sup> the local Air District approved a variance to burn on the following day. Resources required for the prescribed burn arrived on scene the morning of August 26<sup>th</sup> and were briefed on the day's activities. At 1015 a test burn was implemented. At approximately 1100 hours, group torching of a thicket of small diameter ponderosa pines occurred. As a result, several spot fires occurred and were suppressed (Figure 2). At 1115 the Prescribed Fire Burn Boss, Firing Boss and Holding Boss agreed to proceed with caution. Soon after at 1120 a spot fire was detected outside the fireline and in the next 30 minutes additional spot fires occurred (Figure 3). At 1155 the Burn Boss ordered helicopter 551 for bucket support. At 1210 the Burn Boss declared the Big Meadow prescribed fire a wildfire and aggressive suppression action began.



Figure 2 Early spotfire becomes established in heavy fuels outside NE perimeter of burn unit.

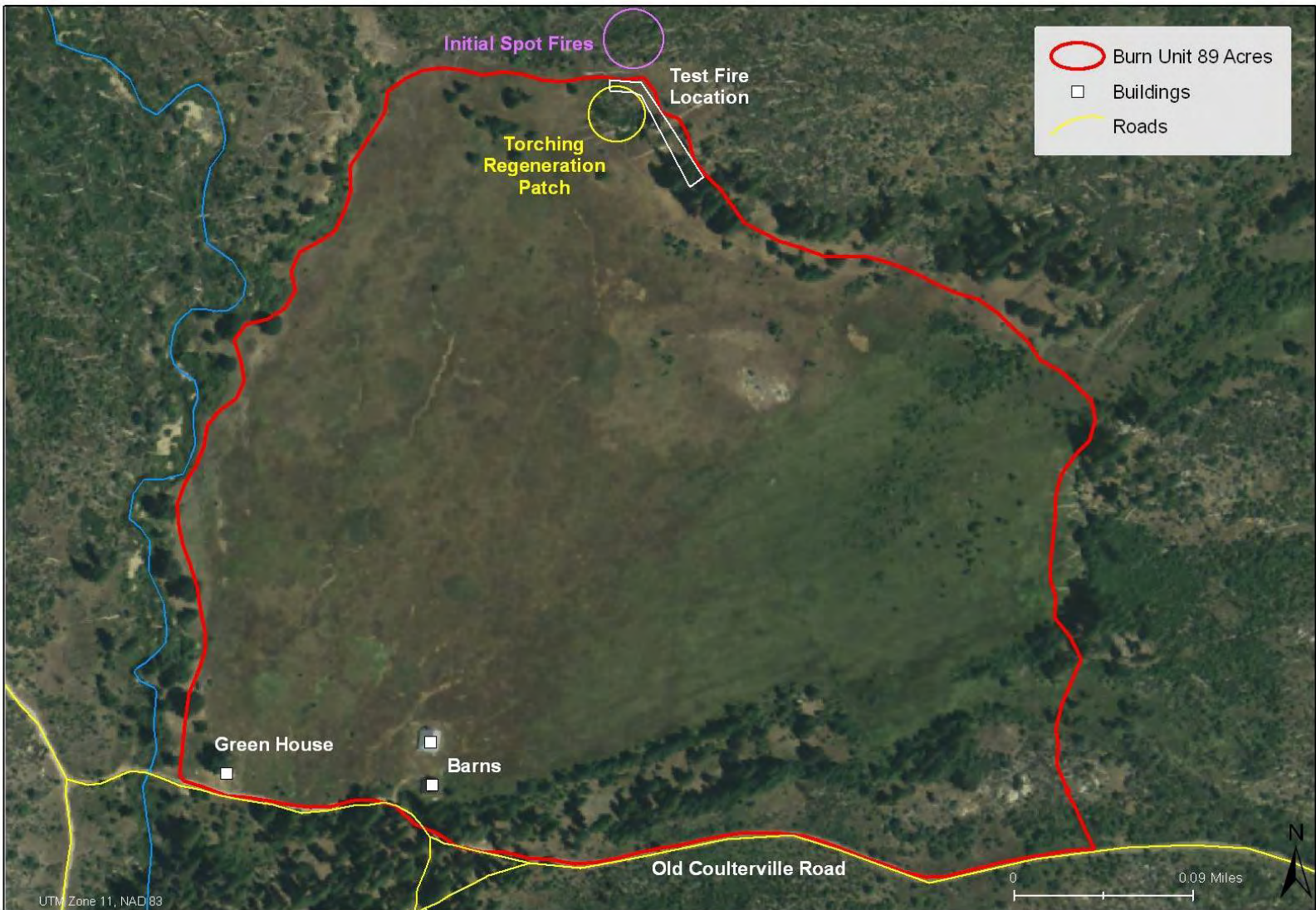


Figure 3 Snag-to-snag fire spread outside of NE perimeter during Big Meadow prescribed burn.

## Chronology of Events

Table 1

<b>05/21/2008</b>	The Foresta Complex Burn Plan was approved by the Yosemite National Park Superintendent. The Big Meadow segment was an 89 acre subunit of a 4,567 acre Complex.
<b>08/01/09 – 08/25/09</b>	Big Meadow burn unit preparations are conducted. Actions include lop and scatter of pine tree reproduction, fireline construction, installation of fold-a-tanks, obtain burn permit from the Air District, hoselays, and limited snag removal.
<b>08/18/09</b>	Live fuel moistures are measured at Foresta. 1000 hour fuel moisture is 5.3%, live woody fuel moisture in old brush is 64% and 70% in new brush.
<b>08/21/09</b>	The Burn Boss briefs the Acting Park Superintendent who approves the Agency Administrator Go/No Go Checklist.
<b>08/22/09</b>	The Big Meadow burn unit receives 0.20 inches of precipitation.
<b>08/24/09</b>	Big Meadow prescribed fire is discussed at the Yosemite Fire Staff planning meeting. The Fire Management Officer approves going forward with the burn. A portable weather station (Micro RAWS) is installed on site at Big Meadow.
<b>08/25/09</b>	The Burn Boss obtains a variance to burn on marginal burn day. One of the conditions is an Air District representative must be on-site and approve the burn based on local meteorological conditions. The briefing was rescheduled from 6:00 am to 8:00 am to accommodate this requirement.
<b>08/25/09</b>	Spot forecast for the Big Meadow prescribed fire is requested and received from the National Weather Service, Hanford, CA.
<b>8/26/09</b>	<b>Burn day</b>
<b>08:00</b>	Big Meadow prescribed fire briefing is conducted on site.
<b>09:15</b>	Fire Monitor records the wind direction shifts from down slope to upslope.
<b>10:15</b>	Test fire begins in NE corner of burn unit. <b>See Map (Figure 4)</b>
<b>11:00</b>	A small spot fire is located 2 feet outside the fireline near a thicket of pine regeneration. <b>See Map (Figure 4)</b>
<b>11:15</b>	Air District official gives approval for burn to proceed. The Burn Boss, Holding Boss, and Firing Boss determine the test burn was successful and agree to proceed cautiously. <b>See Map (Figure 4)</b>
<b>11:20</b>	A spot fire is found 10 feet outside the fireline in an area of pine regeneration. Ignition ceases and some holding forces are redeployed into the “green” area in the vicinity of the test fire.
<b>11:40</b>	Two burning snags are identified outside the fireline.
<b>11:45</b>	The bulldozer is instructed to walk to the test fire site, but is not deployed tactically.
<b>11:55</b>	Multiple spot fires outside of the fireline are discovered. Yosemite helicopter 551 is ordered with a bucket.
<b>12:10</b>	The Burn Boss declares the prescribed fire a wildfire.



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Yosemite Fire GIS kww 15 Oct 2009

Figure 4 Big Meadow Prescribed Fire Map

## 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 prescribed fire planning and implementation.**

*The prescribed fire plan met policy but was inadequate as it included a large area with diverse fuel types, topography, and environmental factors. This made it difficult to determine the site specific elements necessary to implement the Big Meadow Unit.*

The Foresta Complex 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).

**Complexity Analysis:** The complexity analysis 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 may have reflected the complexity associated with burning the majority of the segments identified in the burn plan, it did not reflect the complexity of burning a WUI unit, during peak fire season conditions, with a large amount of down/dead and snags outside of the burn unit.

The Complexity Analysis Summary of the Big Meadow ranked 6 of the 42 elements as “high”. The summary complexity rating was “moderate”. Mitigation actions were stated in the summary paragraph of Appendix C, as required in the Interagency Prescribed Fire Planning and Implementation Guide, “At a minimum, those risks from the complexity analysis that are rated high and cannot be mitigated will be identified with a discussion of the risks associated in the Summary Complexity Rating Rationale.” (p. 20). In the NWCG Prescribed Fire Complexity Rating Guide, January 2004 (PFCRG), it states “Generally, since all mitigating measures have been applied, the highest rating from any single element may provide the foundation for the individual rating of Risk, Potential Consequences, and Technical Difficulty. The Summary Complexity Rating should take into account the individual single element ratings and agency policies” (p.4). But the PFCRG also states that ratings that “appear as high” for the individual element Technical Difficulty ratings, “may indicate that high levels of skill are needed, or may be reviewed and found to be routine business for local fire managers, allowing the fire to be ranked lower than its highest individual entry” (p.4).

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 complex burn. This may have led to under-rating the complexity of the Big Meadow prescribed fire.

**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

Foresta Complex Prescribed Fire Plan utilized a broad set of prescription parameters that involved multiple fuel types in complex topography. The plan lacked the site specific detail for individual units.

**Contingency Planning:** The contingency portion of the prescribed fire plan considered possible and unlikely events and actions and resources needed to mitigate those events. The contingency plan and associated worksheets for the Big Meadow Prescribed fire were overly optimistic for an in season prescribed burn. Actions were modeled based on a single spot fire and the use of bulldozers to construct containment lines and helicopters to assist in holding constructed fireline. Multiple spot fires occurred and exceeded resource capabilities on scene.

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

*The prescription was followed, but it was inadequate.*

**The prescription was followed but it was inadequate for the unit burned.** The burn plan did not specifically address the extremely heavy loading of 100 and 1,000 hour fuels as well as large numbers of standing snags that were immediately adjacent to and upslope of the burn unit (Figure 5). The heavy fuel load and snags were the result of the Arch Rock fire in 1990.

The escape resulted from embers igniting snags and other heavy fuels outside the burn area and was perpetuated by snag to snag spotting, often at distances over 100'. The burning snags created an extremely difficult and hazardous situation for firefighters attempting to contain this fire, resistance to control was high.

All actions and procedures specified in the burn plan were followed. Resources on site for the burn met the requirements of the burn plan including contingency resources. The burn boss responded to spot fires, and declared an escaped fire according to procedures established in the burn plan.

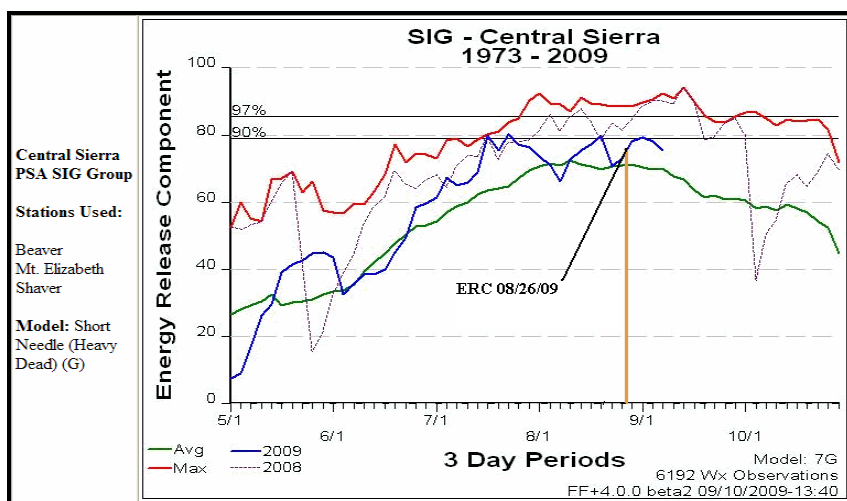
Contingency resources included a bulldozer on site. The bulldozer contributed heavily to the line construction capability calculations in the burn plan, showing that committed resources would be able to contain and control a spot fire should one occur. The approved burn plan described that the incident commander reserved the right to utilize the bulldozer to attack an escape as aggressively as possible.

However, prior to ignition, park administrators made it clear to the Burn Boss that the use of the bulldozer was discouraged and was not to be used without permission due to concerns with potential impacts to cultural and other resources. When the escape occurred, the Burn Boss was unable to contact the individual that could grant authority to use the tool, and subsequently there was a delayed decision to use the bulldozer.



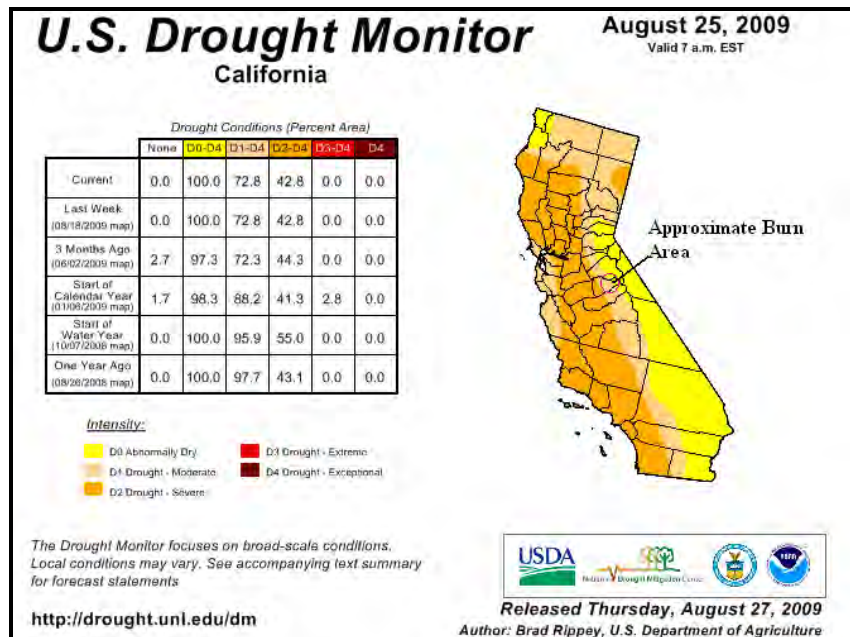
Figure 5 View of initial escape area showing large numbers of snags outside burn unit, several with fire in them.

**An analysis of seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration:** The burn area was approaching the 90<sup>th</sup> percentile Energy Release Component (ERC) at the time of the burn.



ERC on Ignition Day

The US Drought Monitor indicated that the area was experiencing abnormally dry to moderate drought conditions.



Drought Monitor, August 25, 2009

On August 18<sup>th</sup>, approximately a week before the burn, fuel moistures in the burn area were surveyed and showed that shrubs (manzanita) had live fuel moistures in the 64-70% range and that 1,000 hour fuels were approximately 5.3%. These fuel moistures were significantly dryer than nearby sites such as El Portal and Wawona. On August 22<sup>nd</sup> the unit received 0.20 inches of precipitation.

The spot weather forecast for burn day indicated that all prescription weather parameters would be met, but that both relative humidity and temperature would be at the high end of the prescription.

Immediately prior to and on burn day, the area was under the influence of a building high pressure system. With the high pressure, smoke dispersal was becoming more of an issue, contributing to perceived pressure to accomplish the burn on the 26<sup>th</sup>. There was the concern that not burning on that day would mean that the burn window would be missed due to a Great Basin high pressure system setting up, resulting in prolonged and subsequent no burn days.

The prescription indicated that any wind direction was acceptable for burning any “segment” covered by the burn plan.

The onsite RAWS validated the burn boss’s assumption that due to the high pressure, the burn site would be influenced by downslope/down drainage winds in the early morning on burn day. This downslope wind condition provided more favorable holding conditions than would exist once the

winds shifted to upslope/up drainage. The burn boss intended to take advantage of the downslope winds to burn a small patch (.1 acre) of ponderosa pine regeneration in the most upslope portion of the burn (Figure 6). It was anticipated that there would be torching in the pine but with downslope winds, embers would be carried further into the unit rather than outside.



Figure 6 Patch of Ponderosa-pine that torched and established spot fires outside of unit.

Due to the numerous delays; holding equipment (pumps and hose), preparation of control plots, and accommodation of pollution control board official's required and scheduled arrival, by the time the test fire was lit, the favorable downslope winds to create a deep blackline had been replaced by unfavorable upslope winds.

**Analysis of the prescribed fire prescription and associated environmental parameters:** The burn plan was written as a general burn plan that included a number of ignition areas identified as segments. The 15 segments included a wide range of aspects, fuel types, and elevations for a total of 4567 acres. The burn plan addressed all the required elements according to interagency policy.

The Big Meadow, segment 8, was 89 acres and primarily a meadow with pine reproduction on its fringes. The burn plan did not include a target condition for the meadow or include a prescription for a grass fuel model. Goals and objectives were broad and not specific to any burn plan segment.

The burn plan described the condition of the adjacent area, and that of the post Arch Rock (1990) fire area as a montane chaparral, SH-7, and described measured fuel loading of 80 tons per acre.

The burn plan described the majority of the fuel load being “1000 hour plus logs” but did not include 1000 hour fuel moistures in this fuel model prescription.

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 ponderosa pine stand resulted in numerous spot fires in a short time in the heavy fuels and snags adjacent to the unit.

❖ **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 park’s fire management staff independently tracked and reviewed relative fire danger indices, fire behavior indices, and fuel moisture values as it pertained to or influenced their specific program of work. The organization does not have a programmatic monitoring process or protocol for regular tracking, posting and educating staff of current conditions, to support fire management decision making. Field validation of values and indices is conducted on an irregular and unscheduled basis.

**Multi-year Strategic Program of Work:** The park manages a year round, complex fire management program that has a long, storied history of wildland fire and fuels management project implementation. Annually the park attempts to maximize prescribed fire and fuels management opportunities, in addition to the wildfire workload. The acre targets and budget caps associated with the fuel project authorizations add a level of pressure and are magnified by perceived expectations and stressors. The targets can force decisions regarding projects that are situational and not comprehensive as related to the whole of the program complexity and workload.

**Snag Management and Direction:** Yosemite National Park has a comprehensive snag management statement that incorporates avoidance, mitigation, and elimination factors. The guidelines were included in the prescribed burn plan. Snag mitigation was completed on a limited basis prior to the burn and the snags proved to be critical receptors to burning embers. The guidelines however proved confusing and conflicting for the project. The in season burning, where snags are abundant and significant to the resistance to control, are mitigation considerations.

**Review of the approving line officers qualifications, experience, and involvement:** The Acting 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. The Acting Superintendent actively participated in the project briefing on the day of ignition. The Acting Superintendent has limited wildland fire and prescribed fire experience and has not attended the Fire Management Leadership curriculum.

**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.

- ❖ **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 fire, several individuals had key information to share, but no one person had the complete picture.*

**Vacancies/Cumulative Fatigue:** The Yosemite National Park organization had several permanent staff vacancies on the date of the Big Meadow prescribed fire. The Acting Park Superintendent and the Acting Deputy Superintendent were detailed into their positions. Several key leadership positions were vacant in the fire management program, which impacted the planning and implementation of the project. Although California had experienced a below average fire season, the Yosemite fire staff had been busy throughout the season with several large fires including the Cottonwood, Grouse, Harden, and Wildcat.

**Effective Communication:** Planning and implementation of any prescribed burn operation requires a large group of people. Fire management personnel, agency administrators, planners, cooperators, resource management staff, dispatchers all have critical roles. On the Big Meadow prescribed fire various individuals had knowledge of particular risks and hazards associated with the burn but no one individual had the complete picture. Some fire staff had awareness that fuels within the 1990 Arch Rock fire had a high resistance to control due to the heavy down/dead fuels and snags which made fire control difficult in the Arch Rock fire scar.

The Yosemite fire management staff is spread over a large area of the park which makes comprehensive communication difficult. Key staff is located in Yosemite Valley, Wawona, and El Portal. This geographic separation degrades communication.

**Competing objectives:** The various objectives of this fire may have directly increased the relative risk of the project. The objectives of minimizing smoke impacts, minimizing snag removal, reducing impacts to resource sensitive sites, maximizing desired fire effects and excluding research plots were all important objectives. But these competing objectives caused an increase in relative risk and complicated control objectives. For example, the original plan was to burn the northeast corner with favorable down slope winds. However, firing operations were delayed and the winds shifted. Firing under up-canyon winds was a higher risk operation, which compromised control objectives. Additionally, park staff were still preparing to protect resource sensitive sites on the morning of the burn. Crews were prepping exclusion areas around grass research plots right up to ignition time.

**Work load and Span of Control:** The Big Meadow prescribed fire was a complex prescribed fire requiring coordination with cooperators, air quality regulators, resource advisors, park staff, and the community of Foresta. Holding resources consisted of eight single resources: two hand crews, three engines, one dozer, one water tender, and one helicopter. The holding organization exceeded the recommended span of control per Incident Command System (ICS) organization guidance.

## Lessons Learned

**Table 2**

Lesson Learned	Potential Method for Sustaining
<p><b>Complexity Analysis</b> Developing a single burn plan for a large multi-unit prescribed fire project is an efficient and effective strategy. Thorough consideration of fuels, weather and topography is critical when analyzing fire behavior and potential outcomes on large scale projects. Individual units require detail specific to the site to identify problems and concerns and develop the appropriate mitigations. Addressing specifics at the unit level improves the agency administrator's and the burn boss understanding of environmental conditions and the associated risks. This results in improvement of the Go/No Go processes for the agency administrator and the burn boss.</p>	<p>Interagency prescribed fire policy allows for the development of multiple complexity analyses and ratings. Development of these ratings in the field using an inter-disciplinary approach will improve unit specific analysis and mitigations. Clearly documenting the ratings and mitigations in the burn plan will improve the burn boss's understanding and improve implementation.</p> <p>On a national level, the interagency prescribed fire complexity analysis needs to be reviewed and made clearer on the delineation of moderate to high complexity ratings.</p>
<p><b>Prescription Elements</b> Developing detailed, clear and concise prescriptions based on unit specific conditions for landscape prescribed fire plans is critical. This improves implementation resulting in better achievement of the prescribed objectives.</p> <p>When developing prescriptions, do not limit the analysis to just those 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 snag-to-snag fire progression).</p> <p>While a burn plan covering multiple ignition blocks may be entirely appropriate, the various ignition blocks should be fairly similar. Consider including only like fuel types, aspects, and elevations in these types of plans. In addition, burn plans covering multiple ignition blocks need to have unit specific analysis and</p>	<p>Schedule workshops to improve prescription development and prescribed fire plan preparation. Utilize experienced prescribed fire planners and Burn Bosses from around the region in the development and instruction of these workshops.</p> <p>This specific analysis should include discussion of 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 in any likely direction. Consider a sliding scale type prescription that reflects changing conditions as the fire season progresses.</p> <p>Share experience, knowledge and concerns during pre-planning, planning, and implementation process. Seek advice and speak up.</p>

Lesson Learned	Potential Method for Sustaining
complexity analysis included.	
<p><b>Contingency Planning</b> Site specific contingency plans are necessary to address the range of weather, fuel conditions and associated fire behavior for complex multi-unit prescribed burns. Understanding what resources are appropriate and their capabilities is essential to developing adequate site specific plans.</p> <p>Clear written guidance and verbal understanding of the use and limitations of holding and contingency resources are necessary prior to ignition.</p>	<p>Develop contingency plans using all available local fire management knowledge. Use an interdisciplinary process in the field to identify concerns (e.g. fuel loading, structures, and smoke management) and prescribe actions and resources necessary to mitigate concerns.</p>
<p><b>Fuels, Weather, and Fire Behavior</b> Comprehensive monitoring of fuels, fire danger, fire behavior, and weather elements is critical to decision making and management of fire. Field monitoring along with the modeling enhances the validation of these elements and better supports field operations and situational awareness.</p> <p>Burning at the high end of the prescription or in peak fire season conditions provides little margin for error. Re-verify adequacy of the prescription, re-evaluate the complexity analysis, and affirm the status of fuels and local drought conditions. The measured fuel moistures need to be carefully considered.</p>	<p>Establish a scheduled process to regularly track, monitor, post, and make known the current state and condition of the various fuel types, fire danger, fire behavior, and weather factors, including drought.</p> <p>If wind direction is critical to a successful burn, ensure the prescription specifies the required wind direction.</p>
<p><b>Multi-year Strategic Program of Work</b> Complex, year round fire management programs offer a full range of project options throughout the year. Approved plans are ready and waiting, on the shelf, for implementation. Thorough planning, budgeting, and holistic evaluation of potential multi-year project accomplishment based on seasonal environmental factors, is required to sustain the active programs, and the staffs that carry them out.</p>	<p>Establish a planning process that evaluates the multi-year projects for planning, compliance, budget, staffing, and environmental conditions. The annual program of work should deliver the project priorities, sequence for implementation, and cost accountability for all fiscal considerations.</p>
<p><b>Snag Management and Direction</b> Management guidelines that include a full range of opportunities need to be evaluated and implemented based on the current situation, with safety and incident objectives as the priority.</p>	<p>Clarify incident objectives, review established plan direction, and implement the appropriate guideline to maximize success and safety.</p>
<p><b>Agency Administrator Participation</b> Agency policy requires management oversight by personally visiting</p>	<p>Agency Administrators should maximize opportunities to experience prescribed fire and wildland fire events</p>

Lesson Learned	Potential Method for Sustaining
prescribed fires each year. This level of engagement facilitates better communication and understanding with the field and operational resources.	in person and attend agency required training specific to wildland and prescribed fire management programs. Continue to assure that incident personnel are qualified and experienced for their assigned task(s).
<b>Vacancies/Cumulative Fatigue</b> Vacancies impact an organization's ability to complete work. Covering work load expectations for vacant positions contributes to cumulative fatigue. Departure of key personnel represents a loss of institutional knowledge and local expertise.	Match the workload to the available workforce considering the skills and capabilities of individuals and the organization. Decrease workload if staffing is not sufficient to meet objectives.
<b>Effective Communication</b> The cause for an escaped prescribed fire does not reside with any one person. Comprehensive and effective communication in the planning and preparation stages can significantly lessen the probability of escape.	<p>Plan a site visit with key management and operational personnel at least 7-10 days prior to ignition.</p> <p>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.</p> <p>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.</p>
<b>Competing Objectives</b> Fire management organizations must balance attaining objectives so <b>all</b> can be attained. In the event objectives conflict with each other, the fire management organization must develop new objectives, reprioritize objectives or disengage. Issues of resource protection must be mitigated well in advance of project implementation. Air quality regulations have the potential to increase the risk of a prescribed fire operation.	A risk assessment should be completed to determine if a resource value can be safely protected without compromise to firefighter safety and control.
<p><b>Workload and Span of Control</b> Burn Bosses can become overloaded with operational and administrative tasks on more complex prescribed Burns.</p> <p>The holding organization for prescribed fires should consider the needs of operational, as well as reserve,</p>	<p>Utilization of the Prescribed Fire Manager position to handle administrative duties (e.g. air quality, public information) decreases the work load of the burn boss.</p> <p>Additional fireline supervision decreases the span of control, improving the ability to supervise and manage</p>

Lesson Learned	Potential Method for Sustaining
and contingency actions.	operations. Holding functions will be managed by personnel qualified at the appropriate Incident Command System (ICS) wildland fire operations standard, and as required by the prescribed fire complexity.
<b>Real or perceived pressure to meet targets</b> Pressure to complete projects and produce acres may be more perceived than real, but does exist. Although program leaders and managers feel safety and control is the number one priority, strong cultural and self-imposed pressures to burn do exist and have the ability to influence decision making.	Managers must develop obtainable annual treatment targets based on workforce capacity, budget, and other considerations. They must also work with staff in making good decisions when executing prescribed fire based on the operational environment and not administrative targets.

## 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:** The Burn Boss was 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. The plan included multiple units for treatment, all with the same level of detail. All critical information was available to the fire management team; individually, no one person had all the information to evaluate the situation leading up to, and on the scheduled burn day.

**Contingency Resources:** Were planned for and available. There was a delay in mobilizing the dozer which was a critical line production resource according to the plan.

**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 position. Permanent vacancies within the fire management organization made it necessary that the prescribed fire leadership positions be filled by other staff members. The prescribed fire organization did not include operations branch leadership personnel.

**Team Fitness:** The fire management organization had a high tempo and active season to-date. The prescribed fire team was physically fit and ready for the project. The hubris of success affected the mental state of the team for the Big Meadow prescribed fire.

**Environment:** The prescribed fire was conducted at the upper end of the prescription. Favorable and targeted downwind conditions were not present because of delays. A high pressure system was setting up over the area.

**Complexity:** The complexity of the prescribed fire was at the type 2 level and consistent with other projects and units within the park.

## **Positive Factors**

- The fire staff at Yosemite demonstrates strong mindfulness and attention to safety
- The fire management team at Yosemite is very productive and has a passion for what they do
- The long-term fuels treatment and prescribed fire strategy of Yosemite is sound
- The structural preparation in and around Foresta was very effective
- The reaction to the escape was very professional. The firefighters on scene conducted a safe, organized, and effective transition from prescribed fire to wildfire
- The public information actions were commendable both before and after the incident
- Incident qualification reports and record keeping are outstanding

## References

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[http://www.nps.gov/fire/download/fir\\_wil\\_rm18.pdf](http://www.nps.gov/fire/download/fir_wil_rm18.pdf)

Foresta Complex Prescribed Fire Plan

[InciWeb the Incident Information System: Big Meadow Wildfire Announcement](#)

## Review Team

Len Dems, National Park Service Intermountain Region, Fire Management Officer- Team Leader

Jim Hutton, National Park Service National Office, Wildland Fire & Fuels Specialist– Technical Expert

Dave Allen, National Park Service Sequoia & Kings Canyon, District Fire Management Officer – Technical Expert

Glenn Gibson, U.S. Fish & Wildlife Service Nevada Operations, Fire Management Officer– Technical Expert

Sid Beckman, National Park Service Pacific West Region, Deputy Fire Management Officer– Technical Expert