

**PRESCRIBED FIRE OPERATIONS GUIDE (PFOG)**

**SEQUOIA AND KINGS CANYON NATIONAL PARKS**



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March 11, 2008

MEMORANDUM OF COMMANDER'S INTENT

To: All Fire Staff  
CC: Chief Ranger, SEKI  
From: Fire Management Officer, SEKI  
Subject: Implementation of the Prescribed Fire Operations Guide, SEKI

The fire management program is committed to building and maintaining a High Reliability Organization. One of the hallmarks of an HRO is a pre-occupation with failure and an organizational structure attuned to listening for “weak signals.” These “Lessons Learned” lead the development of best practices that improve our safety and our operational efficiency.

In 2006, I commissioned a task group to analyze past lessons learned in the parks’ prescribed fire program and to compile a guide of best practices for prescribed fire planning and implementation. The work has been completed as the Prescribed Fire Operations Guide (PFOG)

It is my intention that all levels of the fire organization use this guide to direct prescribed fire planning and operations. The PFOG is an excellent resource to assist in preventing errors of the past from continuing into the future. However, in keeping with the standards of a High Reliability Organization, it is clearly not my intention that the guide relieve any of us in anyway of the need to be mindful and continuously sensitive to operations. Unless so stated in the guide, the PFOG is not policy and does not abrogate our individual responsibility and accountability. While the PFOG should inform decision making, it is not to serve as a substitute for good judgment and sound operational decisions.

All burn bosses operating in the park, whether or not they are employees of SEKI, are expected to be familiar with the document. Similarly, all SEKI fire personnel filling overhead and leadership positions should also be familiar with document.

It is my intent that the guide be implemented for all prescribed fires beginning with the 2008 CY operating season.

Sincerely,

David A. Bartlett

## II. Introduction

Prescribed burning at Sequoia and Kings Canyon National Parks (SEKI) has historically been highly productive. Over time, numerous lessons learned stemming from both successes and failures have provided unique opportunities through which future fire managers can gain knowledge. With the normal attrition of experienced Burn Bosses and fire managers, many lessons from the past have not been formally captured.

Included are several suggested “standard operating guidelines” (SOG’s) which Burn Bosses may choose to implement.

The intent of this guide is to capture lessons learned during prescribed burn operations prior to 2008. In section III there are “standard operating procedures” (SOP’s) required on all SEKI prescribed burns. Throughout section IV there are standard operating guidelines” (SOG’s) available for Burn Bosses to implement. This is not a comprehensive guide. As a high reliability learning organization, it is anticipated that this document will be updated as needed with new lessons learned. This guide will become part of the SEKI Fire and Aviation Management Operations Guide (FAMOG).

### A. Definitions

Duty Officer: The District Duty Officer has the responsibility to assess all reports of wildland fire within the district and determine, initiate, and oversee the appropriate management response. The District Duty Officer is responsible for assuring that all actions provide for wildland firefighter and public safety and address values to be protected, commensurate with the Park’s Fire Management Plan. (Source: SEKI Fire Management Officer memo dated May 3, 2007.)

Firing Boss: The Firing Boss reports to the Prescribed Fire Burn Boss and is responsible for supervising and directing ground and/or aerial ignition operations according to established standards in the Prescribed Fire Plan. (Source: Interagency Prescribed Fire Reference Guide, page 13; see Guide for additional information.) (See S-234 Ignition Operations – 1999 Instructor Guide, page 1.3 for a list of duties and responsibilities.)

Firing Methods: The means by which a prescribed fire is ignited, i.e. – hand and/or aerial ignition.

Firing Sequence: The order in which Firing Teams will begin and/or complete their firing assignments; this includes aerial ignition.

Firing Team: Given number of burners plus a Firing Team Leader. Firing Team specific responsibilities include:

- Evaluating fuels to be lit.
- Picking safe access routes before lighting and always having an escape route.
- Maintaining communication with adjacent burners and team leader.
- Lighting fire in a way that meets specific burn objectives.
- Not lighting underneath or upwind from other burners.
- Maintaining awareness of drip torch mix fuel levels.
- Drinking plenty of fluids and rotating out individual burners prior to them becoming fatigued.

Firing Team Leader: The Firing Team Leader (FTL) is a position that may be used when there is more than one firing team. The FTL works for the Firing Boss and supervises and manages a Firing Team to accomplish ignition objectives. All FTL's must be a qualified or trainee FFT1, possess a radio, and have previous firing experience. The FTL must coordinate with the appropriate Holding Supervisor, additional Firing Teams, and the Firing Boss.

Firing Team Stagger: How burners of a Firing Team will be placed so they do not lay fire underneath or upwind from one another or lay fire in a way that may increase the possibility of spotting. Stagger is further defined as either 1-2-3 or 3-2-1 with the number 1 burner closest to the line. (See S-234 Ignition Operations – 1999 Instructors Guide, page 3.10 for additional information.)

Firing Techniques/Firing Patterns: Lighting techniques used to create head, backing, and/or flanking fire spreads to accomplish specific firing objectives, i.e. – strip lighting, spot lighting, ring firing, etc.

Holding Supervisor: Individual responsible for supervising the holding operations along a portion of the prescribed fire perimeter. Fireline qualifications may range from a Firefighter Type 1 to a Division Supervisor.

Prescribed Fire Burn Boss Type 3: Burn Boss who is only allowed to implement low complexity prescribed fires where the possibility of spread or spotting outside the project area is negligible to non-existent; multiple fuel models are not involved and aerial operations are not involved. An example of a Type 3 burn is piles surrounded by snow or in wet conditions. (Source: Interagency Prescribed Fire Reference Guide, page 9; see Guide for additional information.)

Prescribed Fire Manager: Responsible for implementing and coordinating assigned prescribed fire activities. May be assigned during periods when multiple simultaneous prescribed fires are being conducted; when multiple

prescribed fires will be conducted within a short time frame; or where there is complex interagency involvement. (Source: Interagency Prescribed Fire Reference Guide, page 13; see Guide for additional information.)

Management Action (Trigger) Points: A geographic, temporal, or environmental point which triggers a specific action(s) to mitigate a circumstance, either foreseen or unforeseen.

- III. SEKI Prescribed Burn Standard Operating Procedures (SOP's) Required for All Burns
- A. Required operational overhead positions on all Type 1 and 2 burns.
    - 1. Prescribed Burn Boss
    - 2. Firing Boss
    - 3. Holding Supervisor(s)
  - B. The Prescribed Burn Boss will work for the Duty Officer.
  - C. The Prescribed Fire Manager position will be filled at the discretion of the Fire Management Officer and Duty Officer in coordination with the Burn Boss.
  - D. The Prescribed Fire Manager will work for the Duty Officer.
  - E. The Prescribed Fire Manager and the Duty Officer can be the same individual at the discretion of the Fire Management Officer and Duty Officer in coordination with the Burn Boss.
  - F. If the position is utilized, the Prescribed Fire Manager will be the primary smoke call participant. In the event the Prescribed Fire Manager position is determined to not be needed, the Duty Officer, Smoke Technician, or an appropriate designee will be the primary smoke call participant.
  - G. All prescribed burns will have a Firing Boss and there will be only one Firing Boss on each prescribed burn. The Firing Boss may directly supervise a Firing Team when there is only one team.  
**PITFALL: WHEN USING AERIAL IGNITION, ANY FIRING TEAM LEADER IN THE HELICOPTER MUST BE QUALIFIED AS A FIRING BOSS. (SEE THE AERIAL IGNITION ISSUE BELOW.)**
  - H. While not a required SOP, the use of Firing Team Leaders is highly recommended when there is more than one Firing Team. All aerial Firing Team Leaders will work for the Firing Boss.

- I. The Firing Boss will work directly for the Burn Boss.  
**PITFALL: THERE IS THE POSSIBILITY OF FIRING TEAMS RECEIVING TWO SETS OF POTENTIALLY CONFLICTING INSTRUCTIONS FROM EITHER THE FIRING TEAM LEADER OR THE APPROPRIATE HOLDING SUPERVISOR.**
- J. There will only be one overhead (Burn Boss, Firing Boss, or Holding Supervisor) trainee per burn.
- K. While not a required SOP, a copy of the burn plan should always be on scene during all prescribed burn operations.

IV. List of Issues

A. Issue #1 – Pre-Season Training

1. Issues

- a. Most returning firefighters are rusty from having a winter off.
- b. Most new firefighters are very inexperienced.

2. SOG's

- a. Incorporate an annual pre-season prescribed fire operations overview with permanent employees.
- b. Conduct a pre-season firing training module for all SEKI fire employees annually.
- c. Review and document the specific prescribed fire and drip torch Job Hazard Analyses at the module level to every employee prior to their first prescribed burn of the season. (This is a Module Leader responsibility.)
- d. Review the “Overhead Expectation Statement” with all permanent fire employees annually.

3. Overhead Expectation Statement

All SEKI Fire Management employees who are qualified for burn overhead positions (i.e. – Burn Boss, Firing Boss, or Holding Boss at the appropriate qualification), should be able to fill that position similar to any other fire management assignment. This includes proper readiness in case of “sudden burn windows” or unplanned substitution for an individual in a primary overhead position who is unable to attend the burn. Burn bosses should try and identify their overhead team as early as possible and provide ample time for unit recons. Non-emergency leave, including that which is pre-approved, for burn overhead

may be denied or cancelled by the Fire Management Officer if necessary.

## B. Issue #2 – Burn Unit Layout

### 1. Issues

- a. Error chains leading to escapes and other unwanted consequences can begin in the burn planning phase.
- b. Midslope lines, both over and underslung, have led to significant control problems and past escapes.

### 2. Case Examples

- a. Tar Gap Burn – 2002. A narrow underslung trail used as a timber burn boundary proved to be indefensible. While not converted, the resulting roll out eventually went all the way to the East Fork of the Kaweah River and more than doubled the size of the original unit.
- b. Lookout Burn – 1998. Excessive heat build up in chaparral below a midslope overslung road resulted in a declared escape above the road.
- c. Amphitheater Burn – 1997. Torching of shrubs below a midslope overslung road ignited flashy grass fuels above the road resulting in an escape.

### 3. SOG's

- a. Burn Bosses should always consider firefighter safety first when laying out burn units (or dividing them up for smoke management purposes).
- b. Use favorable terrain for boundaries by avoiding midslope lines where possible.
- c. Take advantage of roads versus trails when possible if midslope boundaries are unavoidable.
- d. Consider fuel types when laying out burn units (e.g. – midslope grass units can be more forgiving than shrub or timber).
- e. Cut back brush along overslung roads in timber and chaparral to reduce fire intensities and spotting potential.
- f. Burn units should be laid out sequentially (usually high to low and/or east to west) and build off previous burns as anchor points.

### C. Issue #3 – Commander's Intent

#### 1. Issues

- a. Unclear or lack of commander's intent has contributed either to unwanted fire behavior/effects or control problems.

#### 2. Case Examples

- a. Valley View Burn – 2006. Little to no clear intent was communicated to ground burners from the Firing Boss throughout the day. This resulted in negative fire effects in the test burn and then later along the Panorama Point Road.
- b. Cabin Meadow Burn – 2006. Failure of the Burn Boss to clearly communicate intent resulted in ground forces turning the southwest corner and getting ahead of the aerial ignition. The consequence was unwanted fire intensities in mixed conifer.
- c. Sherman Creek Burn (fall segments) – 2001. Vague commander's intent from the Burn Boss was not clarified by the Firing Boss. This lack of interpretation resulted in fire intensities that produced spot fires and unwanted tree mortality.

#### 3. SOG's

- a. Commander's intent must be communicated at all levels of the operation.  
**PITFALL: NEVER ASSUME COMMUNICATION CAN BE IMPLIED. BURN OVERHEAD MUST BE CAREFUL TO NEVER ASSUME THAT SUBORDINATES UNDERSTAND ANYTHING THAT IS UNSPOKEN. REFER TO THE "COMMUNICATION RESPONSIBILITIES" IN THE INCIDENT RESPONSE POCKET GUIDE.**
- b. The Burn Boss must clearly communicate commander's intent during the briefing. This may include specifics on the firing sequence or areas of holding concern.  
**PITFALL: SUBORDINATES MAY FEEL MICRO-MANAGED. HOWEVER, BURN BOSSES MUST REALIZE THAT THEY ARE ULTIMATELY RESPONSIBLE FOR THE ENTIRE OPERATION.**

- c. Briefings must not be rushed regardless of target pressures, environmental discomfort (i.e. – extreme cold, heat, etc.).

**PITFALL: BRIEFINGS THAT DRAG ON TOO LONG WILL LOSE THE ATTENTION OF THE PARTICIPANTS.**

- d. Whenever possible, face to face communication of commander’s intent is preferred.
- e. Utilize planning meetings with key overhead personnel prior to operational briefings to clarify procedures and operational sequences.

D. Issue #4 – Spring Grass Burning

1. Issues

- a. The spring grass prescribed burns are usually the first burns executed each year. All personnel regardless of experience are out of practice. Many new SEKI fire personnel are generally inexperienced.
- b. Many fire employees have minimal experience in the grass fuel type.
- c. Frequently inexperienced personnel are put on firing teams on grass burns to gain experience.
- d. The spring grass burns frequently have different Burn Bosses, Firing Bosses, and Holding Supervisors due to the small segments and the opportunities to provide trainee assignments.
- e. Burning in the low elevation front country can expose firefighters to heat stress and related injuries.
- f. One of the primary benefits of the grass burns is to serve as training exercises to all fire management personnel.
- g. Part of the training component of the grass burns is heat acclimatization and physical conditioning which can create the feeling of a rushed atmosphere (similar to wildfires) to inexperienced firefighters.
- h. Burning off wetlines requires an enhanced level of communication and coordination versus burning off handlines. This is compounded with inexperienced personnel.
- i. Working in the grass fuel type is a common denominator for fatality fires due to flashy fuels.
- j. Grass fires are particularly susceptible to wind shifts.

## 2. Case Examples

- a. Helibase segment – 2006. During the test burn prior to laying down an adequate wetline, poor communication between the Holding Supervisor and an engine resulted in a complete loss of water pressure to the holders. This caused the test burn to run outside the unit before being contained.
- b. Research segment – 2004. A sudden wind shift in grass near the southeast corner caused one overhead to run through the flames and another to run uphill to safety. The situation was compounded by the presence of a fenced in corner. The fence has subsequently been removed.

## 3. SOG's

- a. Incorporate an annual pre-season prescribed fire operations overview with permanent employees.
- b. Burn overhead should plan accordingly with specific assignments.
- c. Continue to weed eat all firelines.
- d. On critical pieces of line, construct fireline to mineral soil and/or place laterals every 100 feet.
- e. No grass burns should be conducted until fire personnel have attended the annual Firing Review Module.

**PITFALL: FIRING REVIEW MODULE MUST BE SCHEDULED EARLY ENOUGH IN THE SEASON TO NOT IMPACT BURN WINDOWS. THIS REQUIREMENT MAY COMPROMISE THE ABILITY TO CONDUCT EARLY SEASON TIMBER BURNS IN EXCEPTIONALLY DRY YEARS (EXAMPLE: QUAIL FLAT – 2004).**

- f. Use only nozzles which have fog capability (i.e. – KK nozzles).

## E. Issue #5 – Sudden Burn Windows Opening and Closing

### 1. Issues

- a. Sudden burn windows provided by the Air District can lead to rushed planning (taken from the 2006 Fire Management Safety Committee Notes).  
**NOTE: THIS IS NOT AN UNUSUAL OCCURRENCE ON MANY BURNS AT SEKI AND IS NORMALLY MITIGATED.**

- b. Sudden closing of burn windows due to weather, air concerns, politics, etc, has led to accelerated firing and at times to undesired fire effects.

## 2. Case Examples

- a. Silver Burn – 2006. The Holding Supervisor felt he did not have adequate time to recon the burn unit prior to ignition.
- b. Highbridge East Burn – 2005. Aerial stripping in the brush in the eastern portion of the unit resulted in unwanted mortality in high elevation conifers.

## 3. SOG's

- a. Refer to the above “Overhead Expectation Statement” (item III.A.3).
- b. Burn unit planning should try to incorporate cut off contingency lines where barriers, topography, or operations permit.
- c. Burn Bosses need to avoid being overly mission focused by completing a unit at the expense of undesired fire effects.

**PITFALL: BURN BOSSES MUST WEIGH THE CONSEQUENCES OF NOT COMPLETING A UNIT (AND POSSIBLY HAVING AN UNSECURED PERIMETER) VERSUS BURNING AN AREA EITHER TOO HOT OR TOO COLD.**

## F. Issue #6 – Aerial Ignition

### 1. Issues

- a. There have been miscommunications between aerial and ground ignition teams which have led to undesired fire effects.
- b. Unfamiliarity with judging distances from the air combined with a lack of patience after doing a test strip has led to unwanted fire intensities. There is a lag time between dropping ignition devices and the subsequent fire behavior.
- c. Not all predetermined aerial ignition plans have been followed which have led to confusion among the ground forces.
- d. Not knowing the location of or getting fire too close to the unit boundaries has the potential to cause either spot fires or slopovers.

## 2. Case Examples

- a. Silver Burn – 2006. Aerial ignition got ahead of the ground ignition on the west flank. The ground firing team rapidly fired the line to even out the burn. This resulted in unwanted fire effects in a stand replacement patch in mixed conifer.
- b. Cabin Meadow Burn – 2006. Ground burners got out of the firing sequence by turning the southwest corner and getting ahead of the aerial ignition. The consequence was unwanted fire intensities in mixed conifer and the production of too much smoke which modified the original ignition plan for the helicopter.
- c. Castle Burn – 1995. Inadequate aerial scouting led to fire being ignited outside the planned unit boundary. This resulted in a long term smoke episode negatively impacting Three Rivers.
- d. Suwanee Burn – 1992. Helicopter drift during ignition put fire in several unwanted places resulting in a wildfire conversion.

## 3. SOG's

- a. The Firing Boss will stay on the ground during aerial ignition operations.
- b. Pertinent overhead (Burn Boss, Firing Boss, etc.) should turn off their radio scan and only monitor the air-to-ground frequency when aerial ignition is taking place.

**PITFALL: THE BURN BOSS COULD MISS ESSENTIAL OR EMERGENCY RADIO TRAFFIC DURING THIS TIME. THIS CAN BE MITIGATED IF THE BURN BOSS NOTIFIES ALL RESOURCES ON THE BURN WHERE THEY CAN BE CONTACTED IN THE EVENT OF EMERGENCY TRAFFIC.**

- c. The minimum staffing on a helicopter will be three people. This includes the pilot, a plastic sphere dispenser operator (PLDO), and a firing team leader. **NOTE: THE FIRING TEAM LEADER IN THE HELICOPTER MUST BE QUALIFIED AS A FIRING BOSS PER THE INTERAGENCY AERIAL IGNITION GUIDE.**
- d. The aerial firing team leader needs to understand the ignition sequence and must communicate it to the pilot and PLDO.

- e. The aerial firing team leader must maintain communication with ground forces (Burn Boss, Firing Boss, Holding, etc.) and know their location. Feedback from ground forces should be obtained prior to continuing with each additional strip.
- f. The aerial firing team leader must be experienced enough to be able to judge distance from the air (i.e. – exactly what a 100 foot strip looks like).
- g. The aerial firing team leader must be patient after doing a test strip. Fire behavior must be observed and objective attainment must be confirmed by the burn overhead prior to additional ignition.
- h. Do not change pre-determined aerial ignition plans without the concurrence of all pertinent burn overhead.
- i. Aerial firing personnel should do a reconnaissance to make sure all on board know the boundaries of burn unit. If necessary, have ground personnel mark boundaries with signal fires or flagging.
- j. Do dry runs while in communication with ground personnel prior to all active igniting.

#### G. Issue #7 – Smoke and Traffic Control

##### 1. Issues

- a. Smoke has repeatedly impacted park roads during burn operations. The worst impacts have occurred during blacklining on units below the road.
- b. While nighttime smoke from burns above the road has not been as much of a problem, the potential still exists for road impacts under those circumstances.

##### 2. Case Examples

- a. Silver Burn – 2006. Impacts were experienced to a narrow section of the Mineral King Road during blacklining operations.
- b. Quail Flat Burn – 2004. Impacts were experienced along the Generals Highway during blacklining operations. There was a delay in implementing traffic control.
- c. Sherman Creek #3 and 4 Burn – 2002. Heavy smoke was experienced across the Generals Highway before traffic control was implemented.

### 3. SOG's

- a. Prescribed fire warning sign caches should be inspected and inventoried by the appropriate designee at the start of each fire season.
- b. Warning signs must meet Department of Transportation standards.
- c. On all burns below a road, a traffic control plan should be in place and attached to the Incident Action Plan.
- d. When feasible on burns below a road, the vegetation should be brushed back ten feet or more to reduce the spotting potential.
- e. On burns below a road, Fire Management should work with the Air District to try and get permission to blackline the road at night.
- f. On all burns above a road, a night shift should be available to monitor smoke and roadway safety.
- g. During each briefing, resources should be pre-identified as a traffic control group with an appropriate chief-of-party.
- h. The traffic control group should be positioned on burns as to be available for immediate activation of the traffic plan.
- i. The traffic control group should use a separate line-of-sight radio frequency as to not interfere with burn operations.
- j. Once the traffic control plan is implemented, the traffic control group should be dedicated to traffic control and only traffic control.
- k. Traffic control groups should make use of a pilot car.
- l. Burn Bosses must notify dispatchers when traffic control has been implemented.
- m. Traffic control must be coordinated with the appropriate Sub-district Ranger and/or law enforcement personnel.

## H. Issue #8 – Snags and Hazardous Trees

### 1. Issues

- a. There is a high volume of snags in the tussock moth kill zone in the Grant Grove area.
- b. A shortage of qualified Class C Fallers frequently leads to last minute snagging the day of the burn.
- c. Snags are one the biggest safety hazards faced by firefighters on prescribed burns.

- d. The presence of large amounts of snags magnifies holding concerns.

## 2. Case Examples

- a. Buena Vista Burn – 2004. Last minute snagging during the actual burn along the Generals Highway put a falling team in a potentially compromised situation.
- b. Grant West Burn – 2004. Firefighter sustained fatal injuries after being struck by the top of a burning snag.

## 3. References

- a. There are numerous references available to firefighters pertaining to safety around hazardous trees. Some of the more common ones are listed below.
- b. The National Interagency Job Hazard Analysis Template, “Working in the Vicinity of Hazard Trees”, available at <http://www.nifc.gov/safety/ffast.htm>
- c. The SEKI Job Hazard Analysis for “Working in the Vicinity of Hazard Trees”, available at <https://cms.pwr.nps.gov/seki/naturescience/job-hazards.htm>
- d. “Hazard Tree Safety” located in the Incident Response Pocket Guide, “Other References” section.
- e. The Forest Service Safety Alert for “Snag/Green Tree Hazards”, available at [http://www.fs.fed.us/r1/people/jha/fire/s/FS\\_Snag\\_Hazard\\_SAFETY\\_ALERT.doc](http://www.fs.fed.us/r1/people/jha/fire/s/FS_Snag_Hazard_SAFETY_ALERT.doc)

## I. Issue #9 – High Energy Slopes

### 1. Issues

- a. Burning on high energy slopes (defined primarily as south and west facing aspects in the mixed conifer/chaparral zones) has led to control problems or unwanted fire effects in the form of excessive tree mortality.
- b. Burning on high energy slopes is especially compounded during restoration burns and/or dry years.

- c. The potential for undesired fire intensities is magnified on these slopes when using aerial ignition.

## 2. Case Examples

- a. Silver Burn – 2006 (south aspect). Despite burning after receiving autumn rain, high fire intensity and tree mortality was experienced during aerial and ground ignition.
- b. Highbridge East Burn – 2005 (south aspect). Despite burning in early November, high fire intensity and tree mortality were experienced during aerial ignition.
- c. Grant G Burn – 2004 (west aspect). A test burn conducted in the second half of June during a dry year produced unwanted fire intensities. This contributed to control problems and the burning of a minor power line.
- d. Wye Burn – 1995 (south aspect). Head fire was ignited in a manzanita field off Highway 180. This resulted in the mortality of several large, old growth sugar pines located immediately above the brush. Being visible from the road, the mortality caused a significant negative reaction both among the public and NPS employees.

## 3. SOG's

- a. Where terrain permits, consider using ground rather than aerial as the preferred ignition method.
- b. Experiment with alternative ignition patterns such as chevrons and spot lighting, versus straight strip lighting.
- c. Burn high energy slopes as early in the year as possible to reduce fire intensities.

**PITFALL #1: BURNING EARLY IN THE YEAR ON HIGH ENERGY SLOPES WILL INCREASE THE NEED FOR LONGER THAN NORMAL PATROLS.**

**PITFALL #2: BURNING CHAPARRAL EARLY IN THE YEAR COULD HAVE AN ADVERSE EFFECT ON SEED BANKS DUE TO HIGH SOIL MOISTURES.**

**PITFALL #3: MOST HISTORICAL AND/OR ECOLOGICAL BURN WINDOWS DID NOT OCCUR PRIOR TO MAY OR JUNE.**

- d. Burn high energy slopes late in the year or after receiving precipitation.  
**PITFALL: WAITING TO BURN LATE IN THE YEAR RISKS NOT BEING ABLE TO DO THE BURN AT ALL DUE TO RAIN, SNOW, AND/OR LACK OF RESOURCES.**
- e. Jack pot larger fuel concentrations during the shoulder seasons.  
**PITFALL: BURNING IN THE SHOULDER SEASON RISKS BURNING WHEN FUELS ARE WET. THIS CAN LEAD TO POOR FUEL CONSUMPTION AND EXCESSIVE SMOKE PRODUCTION.**
- f. Fire Management should work with the Air District to try and get permission to blackline at night to reduce control problems.

J. Issue #10 – Pile Burning

1. Issues

- a. Pile burning has been traditionally treated as a low complexity operation when in fact numerous escaped prescribed burns have been attributed to pile burning nationwide regardless of agency.
- b. Pile burning has been historically perceived as a routine off-season operation which has contributed to a certain degree of complacency among fire personnel.
- c. There have been several instances of pile creep and one pile burn escape in SEKI since 2002. Pile creep is not unusual and has been routinely experienced similar to slopovers/spot fires on broadcast burns. If uncontained, pile creep can potentially lead to an escape.
- d. Most pile burn units are located in the wildland/urban interface in close proximity to structures.
- e. In the absence of post-ignition moisture, piles have a long heat residence time similar to early season broadcast burns. This requires long term patrols and careful monitoring of changes in long term weather patterns and drying trends.
- f. Pile burn complexity can be compounded by the lack of SEKI fire personnel staffing during winter months and the uncertain availability of contract crews.

- g. Pile burn complexity can be compounded by difficult project access during winter months.
- h. The timing of pile burning is critical, usually entailing an early spring cut off date which shortens the window for completion. The best windows for pile burning routinely occur during the holidays.
- i. Pile burning requires labor intensive chunking to reduce the risk of creep/escape.
- j. Accessing and chunking piles in snow loads greater than one foot is difficult. This typically leads to a ring of unburned fuel around the pile after the snow melts.
- k. The current pile burn prescription is not adequate and a new one will need to be developed for SEKI. There are very few existing examples of a good pile burn prescription to use as an example.
- l. There are unique safety problems associated with pile burning such as winter driving, hypothermia, PPE (including cold weather gear), disposing of old fuel, etc.
- m. The Burn Boss Type 3 position is new to the NPS and there is not yet a clear procedure for qualifying and using personnel in this position for pile burning at SEKI.
- n. Pile burning is the most expensive per acre prescribed burning done at SEKI due to the use of contract crews and the shoulder season funding of subject-to-furlough employees.
- o. Pile burning in Cedar Grove and on high energy slopes such as below Silver City and Wuksachi present unique challenges.
- p. Untreated piles can have an aesthetic impact on interface areas to visitors, residents, and employees.

## 2. Case Examples

- a. Cedar Grove piles– 2007. Piles were ignited in the spring after 0.75 inches rain. The following day in between patrols, fire escaped from a pile ignited the day before. This resulted in the destruction of an NPS outhouse and a concessionaire trailer.
- b. Cedar Grove piles– 2005. A test burn was conducted under dry conditions in the spring. Firefighters immediately had to go into suppression mode and contain around 10 piles which had all burned together.

- c. Wilsonia piles – 2003. Approximately 300 piles were ignited in the fall after a snowfall. These piles were not chunked. After the snow melted firefighters had to contain several areas of creep right adjacent to structures. Firefighters also needed to go back and reconstruct and reignite most of the original piles.
- d. Silver City piles – 2003. Piles which were buried under snow in the winter were discovered in the spring. Piles were in close proximity to Silver City and needed to be burned per the Superintendent and to meet targets. Although the project was successful, firefighters spent several days just prior to the opening of the Mineral King Road containing around three acres of creep.

### 3. SOG's

- a. Ensure mechanical plan specifications are followed for pile construction. This includes teepee shaped piles to facilitate easier chunking, papering piles to ensure dryness, not placing piles directly adjacent to snags and jackpots, etc.
- b. To meet NPS policy, a fully qualified Burn Boss must be on site for all pile burns regardless of complexity.  
**PITFALL: THIS COULD STRETCH QUALIFIED BURN BOSSES THIN DURING WINTER MONTHS WHEN EMPLOYEES ARE ON FURLOUGH.**
- c. The Burn Boss can designate a chief of party and depart the scene only after ignition has been completed each day of the burn and personnel are well into a chunking mode.
- d. It is the responsibility of the Burn Boss to ensure there are adequate patrols and that long term weather forecasts are being monitored.
- e. Burn unit boundaries in the pile burn plan should incorporate the entire mechanical project boundary.
- f. Using the mechanical project boundary, Burn Bosses should consider broadcast burning a pile burn unit when feasible.
- g. Pile creep may be acceptable within a mechanical unit boundary.
- h. The Burn Boss will determine the level of control action necessary on all creep based on values at

risk, personnel on site, weather forecasts, fuel conditions, etc.

- i. Structures located within a pile burn unit boundary present a special case where pile creep is unacceptable.
- j. All piles will be chunked.
- k. The number of piles ignited must be commensurate with the number of personnel on site.
- l. Avoid burning piles with too much snow on the ground to avoid labor intensive digging and chunking.
- m. Disposal of old fuel is best accomplished on either the pile at the auxiliary helispot or the Grant Grove dump.
- n. PPE should be commensurate with the environmental conditions.

#### K. Issue #11 – After Action Review's (AAR's)

##### 1. Issues

- a. There is no clean avenue for Module Leader input to overhead AAR's.

##### 2. Case Examples

- a. Cabin Meadow Burn – 2006. Despite multiple AAR's being conducted, some Module Leaders felt their input was not solicited during the overhead AAR.

##### 3. SOG's

- a. At the discretion of the Burn Boss there will be either one AAR for everyone or different levels of AAR's depending on the complexity of the operation.
- b. There will be a seasonal AAR on prescribed burning at the end of each season.
- c. Firing Bosses/Holding Supervisors need to debrief and solicit input from their resources through the chain of command prior to an overhead AAR. Module Leaders have an equal responsibility to provide input.
- d. AAR's should be conducted at the end of each shift.  
**PITFALL: AAR'S CAN GET STALE IF DONE DAILY WHEN NO SIGNIFICANT EVENTS OCCUR.**

## V. Conclusion

The Prescribed Fire Operations Guide was developed to be a reference for Burn Bosses, Firing Bosses, Holding Supervisors, and Fire Managers. The intent was not to create new policy or another checklist of items that a Burn Boss “absolutely” has to do. Its function is to strive for a more standardized, efficient, and safer operation/organization, while still allowing for flexibility in how a Burn Boss executes a given prescribed burn.

It is also important to note that since the onset of prescribed burning four decades ago at SEKI; the majority of burns have been successful. Examples include the successful restoration and maintenance of fire in the giant sequoia groves of Giant Forest and the multi-year development of reduced fuel buffers protecting the communities of Silver City and Wilsonia.

As a high reliability organization, when one or more of the above identified issues leads to a significant negative outcome, such as an escape, SEKI fire management should consider the development of a staff ride to formally capture the lessons learned. This was done in 2006 and 2007 for the Amphitheater Burn escape.

In summary and as previously stated, the above list of “issues” and “standard operating guidelines” are by no means comprehensive. As annual prescribed burn After Action Reviews become institutionalized at SEKI, it can be reasonably expected that new issues will arise. As new issues arise or as the “standard operating guidelines” evolve, this guide should continue to evolve as well and serve SEKI for years to come.

### A. PFOG Task Group Members

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2. Brit Rosso, Kings Canyon District Fire Management Officer
3. Greg Ver, Engine 72 Captain
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## B. Reference Material

1. Wildland Fire Qualification System Guide, 310-1
2. Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide
3. NWCG Prescribed Fire Complexity Rating System Guide
4. RM-18, Chapter 10, Fuels Management – version from 9/10/06 (as of 2008, this is now Chapter 7)
5. NWCG RXB3 Position Taskbook
6. Lessons Learned Center – Ignition/Firing Techniques Information Collection Report
7. Lessons Learned Center – Escape Prescribed Fire Reviews and Near Miss Incidents Report
8. SEKI Fire Management Safety Committee Meeting Minutes – 11/14/06
9. S-234 Ignition Operations – 1999 Instructors Guide
10. 2004 Grant Grove Prescribed Fire Review
11. Interagency Aerial Ignition Guide
12. Incident Response Pocket Guide, January 2006 version
13. Federal Fire and Aviation Safety Team (FFAST), Hazard Tree JHA Template
14. Sequoia and Kings Canyon National Parks, Job Hazards
15. National Interagency Fire JHA Database
16. Cedar Grove Pile Incident Report, version 3.0-draft
17. Sequoia and Kings Canyon National Parks, Fire and Fuels Management Plan