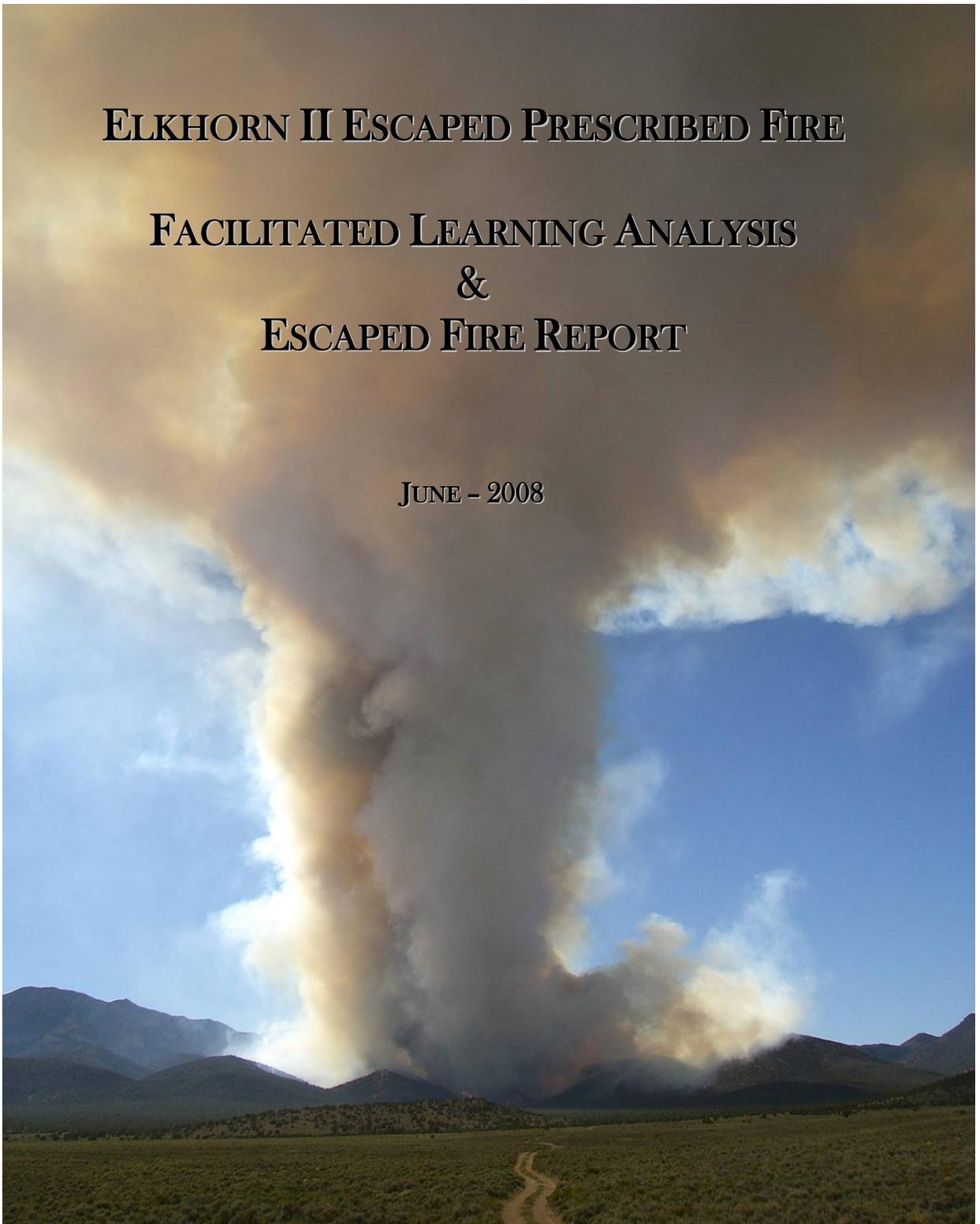


ELKHORN II ESCAPED PRESCRIBED FIRE

FACILITATED LEARNING ANALYSIS & ESCAPED FIRE REPORT

JUNE - 2008



U.S. Forest Service, Intermountain Region, Humboldt-Toiyabe National Forest,
Austin -Tonopah Ranger District.

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EXECUTIVE SUMMARY

On June 12, 2008, the Elkhorn 2, a prescribed fire, was ignited in the southern portion of the Monitor Range of the Austin-Tonopah Ranger District, Humboldt Toiyabe National Forest. On June 14 the prescribed burn was declared a wildfire. The planned 10,490 acre prescribed fire eventually burned 2475 acres within the original project area and 3724 acres outside the project area. No structures were involved, and no private, state or other agency land was involved.

On July 2, 2008, U. S. Forest Service Regional Fire Director, Mike Dudley assembled an interagency review team to investigate and review the planning and implementation of the Elkhorn 2 prescribed fire. The review team utilized a Facilitated Learning Analysis (FLA) approach, with the goal of improving future prescribed fire program actions by gathering lessons learned by the individuals involved. The FLA format was modified to incorporate the requirements of the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide and FSM 5140 for an escaped prescribed fire that has been declared a wildfire.

The review team conducted a site visit on July 6, 2008. A facilitated After Action Review (AAR) was held on July 7, 2008 at the Tonopah District Office. Most of the individuals who were directly involved in the prescribed burn participated in the AAR. The purpose of the AAR was to look at the planned actions, what actually happened, why it happened differently from what was planned and to develop lessons learned from the experience. Those involved were encouraged to be honest and frank in the discussions of actions and/or mistakes. Participants were assured that the intent of this report is to facilitate organizational learning from the event. In addition the team reviewed all pertinent documentation, including burn plans, weather forecasts, NEPA documents, maps and photographs.

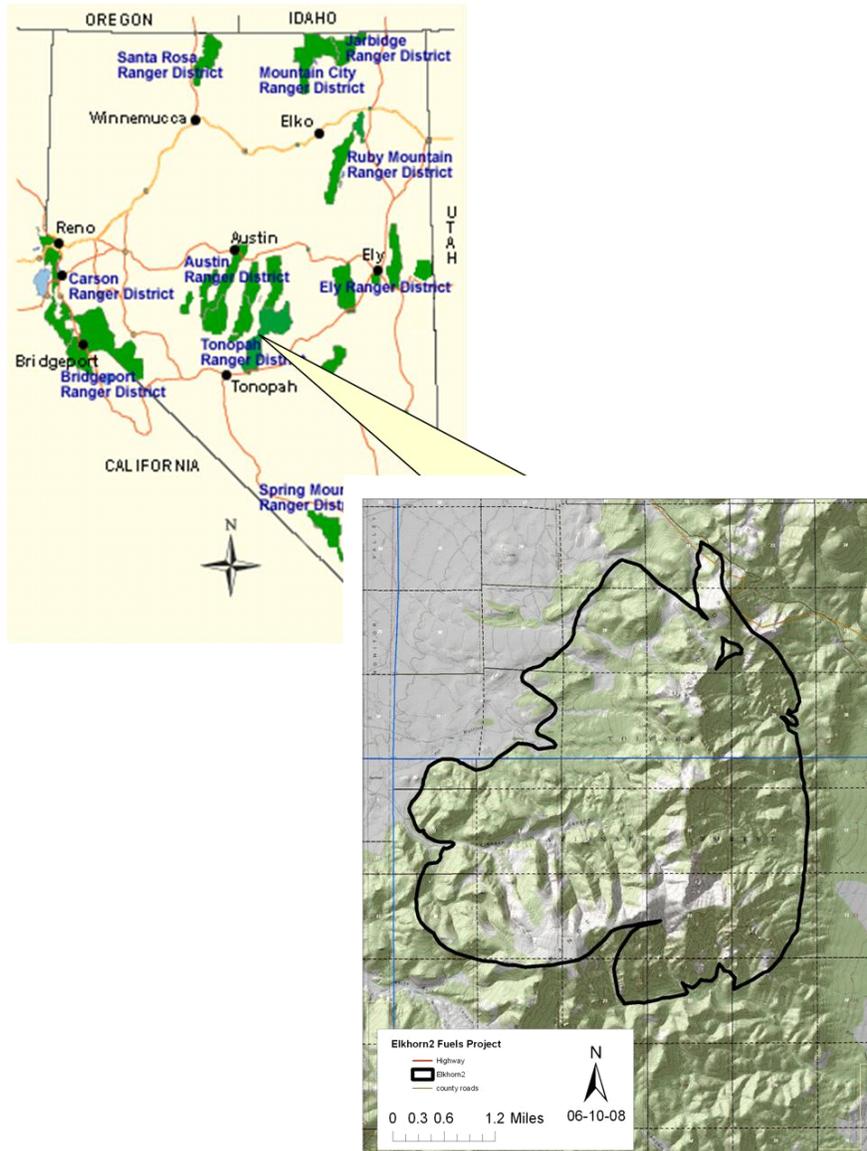
The Elkhorn 2 burn boss, burn boss trainee, and the AAR participants expressed numerous lessons that were learned from the events and the AAR process. These are described in detail in this document. The Review Team found that many of the lessons learned can be summarized into a few key findings related to Contingency Planning, the Project Boundary, The Test Fire, and Surprising Fire Behavior:

- An easily implemented contingency plan, with clear trigger points would have provided decision support which may have allowed the prescribed fire resources to bring the fire back into prescription without the need to declare it a wildfire.
- The boundary of the prescribed fire project area was difficult to defend because it utilized no natural barriers and the physical location was unclear to prescribed fire personnel.
- A better location for the test fire could have led to better decisions. In this case, the test fire location was not clearly visible to the burn boss and not in a location where it could be easily controlled.
- Fire behavior was beyond what was expected by all involved. Indications are that the heavier than average fuel loadings were extremely dry due to record low relative humidity levels for several days prior to the burn, even though the snow had melted only two weeks prior. The extended drought may have also been a contributing factor.

The Review Team Leader will retain a file that includes all documentation collected during the review.

Burn Narrative and Chronology

Vicinity Map



Elkhorn 2 Prescribed Burn

June 12, 2008

Resources arrived to the helibase just west of the burn site throughout the morning.

Prior to the burn initiation on site resources included:

Burn Boss, (RXB2)

Burn Boss Trainee (RXB2t);

Firing Boss (FIRB)

Firing Boss Trainee (RXB2t)

Holding Boss,

Mixmaster,

Helitack crew (module of 10)

Helitorch Manager,

Two Type 4 Engines,

One Type 6 Engine

Road guards.

In addition, one Fire use Module (with nine FFTRs) arrived that evening.

At approximately 0930 the RXB2, RXB2t, FIRB and FIRBt flew a reconnaissance flight over the burn area. They discussed the project boundary and agreed on the location to do the test fire. They also discussed where to begin burning operations if the test fire was successful. The burn boss decided to start on the far north end due to the forecasted northerly winds for that day.

RXB2, RXB2t, FIRBt, FIRB and the Agency Administrator reviewed and signed off on the Go/No-Go checklist.



At approximately 1200, the RXB2 and RXB2t briefed the crews. The briefing included forecasted weather, safety, helibase/mixing operations and operational assignments. The stated objective was to “punch holes into the PJ” meaning to create a mosaic of stand replacement fire with in the greater project area. Virtually all of the resources involved believed it would be difficult to get fire into the crown of the PJ.

Figure 1: general project area

The FIRB and FIRBt were then flown up to a lookout/observation point where they could direct helitorch operations.

At approximately 1430 the test firing began. The first barrel was dropped on a southwest facing slope in northeast corner of project area. The assessment of the test fire confirmed that the objectives could be met and the RXB2 issued the decision to continue burning onto west and north aspects. Later in the afternoon the RXB2 noted that the fire was burning better than expected and there was no longer any doubt they would meet the objectives.



Figure 2: Project Area Boundary. The Lightning bolt shows the approximately location of test fire.



Figure 3: Test fire June 12, 2008 at approximately 1420 ~ photographer looking west.

By approximately 1800, eight barrels of gel been used and ignition was suspended for the day. Resources were redeployed to the helibase for a debriefing and then to a base camp for the evening.



Figure 4: Fire activity at the end of ignitions June 12, 1800-1900 hrs looking west then east.

From 1800 to 2130 the RXB2 and RXB2t continued to monitor the fire. Their evaluation was that the fire was unexpectedly active during the day but they were confident the fire would die out over night.

June 13, 2008

An early morning reconnaissance flight with the RXB2, RXB2t, FIRB and FIRBt reconfirmed that the results of yesterday's ignitions were meeting objectives. The consensus of the leadership was that the area that was burned on the previous day looked good; there was a great mosaic pattern but there were as a few hot spots of concern.

One of the hot spots of concern was adjacent to the project boundary or possibly just outside of the project boundary. The RXB2t requested the Fire Use Module into the site to control this hotspot.

Briefing of resources began at approximately 1030. The briefing relayed the plan to continue burning operations once the hotspot in the northeast corner had been arrested.

At approximately 1200 the Fire Use Module reported that the fire intensity of the hotspot was too great and they could do nothing to arrest the spread.



Figure 5: Fire activity on north end by the time crews arrived June 13, 2008 1200.

Plans were revised and the helicopter was requested hook up the bucket to begin bucket work on the northeast corner. This was delayed for about an hour because the pumpkin had not yet been set up and filled. By this time there was some uncertainty but also a general agreement that the fire had likely crossed the project boundary in the northeast corner. {Though unknown to the firefighters, by the end of the first day the fire had breached the project boundary by nearly 1/3 mile along a one mile long front} This hot

spot was now exhibiting very active behavior with single tree torching becoming more and more frequent.

The RXB2 reorganized the burn organization to assign the Crew Boss of the Fire Use Crew as the holding boss and the planned holding boss would then work for the new holding boss. The Helitack Crew was also assigned to the new holding boss.

By approximately 1300 the northeast hotspot had become a flaming front moving northeast and a second front slightly farther south had also become active. This second front apparently also breached the project boundary and would likely threaten the House Canyon Road. An Air Tactical Group Supervisor was flying in the vicinity and assisted operations and oversight.



Figure 6: Fire activity when bucket operations began June 13, approximately 1300.



Figure 7: Fire making a run to the east at approximately 1400.



Figure 8: Fire activity at approximately 1520.

Throughout the afternoon the RXB2 was in discussions with the Agency Administrator and the Dispatch Office concerning resources needed to contain this fire and

considerations of declaring it an escape. Because of a lack of an existing agreement with other land management wildland fire agencies, only Forest Service Resources were being considered for assistance at this time.

A reconnaissance flight at approximately 1700 revealed significant movement and intensity on several different flanks.

The forecast for 6/14/08 (next day) showed:

Sunny

Max Temp: 85-95

Max Temp Mid: 82-92

Min RH: 4-9

Min RH Mid: 6-11

20 ft. winds upslope SW 15 mph. Ridge tops 10-15.

Haines Index 6

At approximately 1800 the fire breached the House Canyon Road but then stopped unexpectedly. Engine crews were able to contain two to three acres of fire northeast of the road. The Agency Administrator and RXB2 discussed the need for more resources and the need to declare the fire an escaped fire. There was consensus that the fire's progression to the northeast had apparently been stopped indicating there was an opportunity to postpone the evaluation of a declaration until the following day.



Figure 9: Fire crossing House Canyon Rd June 13 2008, 1800.

June 14, 2008

Through the morning of June 14th, all actions were directed to contain spread to the east and north. Fire activity was minimal until approximately 1530 when activity picked up and crowning activity resumed. The helicopter malfunctioned that day and was unavailable.



Figure 10: Fire activity at approximately 1700.

At approximately 1800 the Agency Administrator, RXB2 and RXB3t advised the Forest Duty Officer that the fire had escaped and could not be returned to prescription. At this time it is estimated the fire was approximately 1600 acres in size; 600 acres of which were outside the project area.

The RXB2t then ordered a Type 3 Incident Management Team to take over the fire. The WFSA was initiated that evening. The planned 10,490 acre prescribed fire eventually burned 2475 acres within the original project area and 3724 acres outside the project area

Lessons Learned by Firefighters

When asked what you learned that you would do differently or what you learned that should be shared with other firefighters the following responses were given. These are categorized by the following themes: *Contingency Planning, Project Boundary, Test Fires, and Surprised by the Fire Behavior.*

Contingency Planning:

Ensure contingency plans are actually implementable. They should obviously be flexible but also specific enough to be meaningful if and when you need them.

Request RO and/or SO support in developing realistic contingency plans. Just because you're out in the middle of nowhere, or you're on a low priority district, doesn't mean that you should accept a lack of support on contingency preparation from the SO. If during the winter before, the Forest buys off on a plan that says you need XYZ available before you light; then, they must support you when the conditions are favorable but you say you're not going to light until XYZ becomes available.

Request SO and/or SO assistance in developing interagency agreements so that you can use other agency resources on Rx burns. Get agreements in place before doing a landscape burn.

Develop contingency plans that serve as trigger points. Be specific. For example think about and write out, if the fire crosses road Y, do this and order that; if it crosses ridge X, order this and do that. This isn't to say that you have to do exactly what your contingency plan says, but at least when you see what was thought about earlier it will help you transition from the tunnel vision of an Rx mentality a higher situational awareness of what your fire is really doing.

Develop contingency points or trigger points that will cause specific actions when your fire is doing things you know in foresight you do not want it to do. Otherwise the fire will gradually reach and cross these points and in the mean time you'll be talking yourself out of doing the aggressive necessary actions; and reassuring yourself that you're still in control.

Contingency planning should be thorough enough to make you prepared for the worst case.

There is a danger in a slow transition between an Rx organization and a suppression organization. Don't just gradually modify the Rx organization to become a modified suppression organization. When you make changes to the organization keep it within the ICS structure. For example, if you take a monitoring module that works for the Burn Boss, and turn them in to a holding

crew you must keep the organization clean and put that crew under the holding boss.

Establishing a predetermined suppression organization is very important for the transition from RX to suppression. When an escape is declared the holding boss in the RX organization may not always be the IC in the suppression organization. Having these roles, responsibilities and protocols in place and communicated clearly ensures a fast and smooth transition.

Use normal fire behavior for normal planning but extreme fire behavior for contingency planning.

Have the pumpkin set up and ready to go before doing the test burn.

Project Boundary

Make sure the project boundary is a boundary that you can realistically defend.

Make sure your holding and lighting bosses know exactly where that boundary is.

An arbitrary project boundary will set you up for failure. Think about the reason for having a boundary. It is a place you don't want fire to go. The boundary or somewhere between your burn and the boundary has to be a place you can and would feel good about trying to defend if necessary.

Test Fire

Make your test fire a real "test" of the burning conditions. Put it in a place where it represents worst case burning and in a place where you can put it out if the test tells you the fire will exceed your prescription.

For PJ test burns, do test fires 24 hours in advance so you can see how they behave overnight and the next morning. Make another go-no/go the following day. What it does at 1000 the next morning will tell you if you've got more than you can handle.

In PJ burns we are starting a fire that by definition is one that we firefighters aren't going to do much to stop (that is, a crown fire). Shouldn't we then put the test fire in a location where we can "test-the-fire" to show that the fire will stop on its own?

Look really hard at the test fire before deciding to accept it as a go.

Surprised by Fire Behavior

The fire was consistently inconsistent.

The fire kept lying to us.... It would keep giving us little bits of hope. Hope that we could keep from calling this an escape and hope that it would behave like a PJ burn.

In 30 years of burning and fighting PJ, I've never seen it get up and go in the morning like it did; and with no wind.

The fire would stop where you think it should go and go way beyond where it should have stopped.

I'll never believe anyone that says, "It'll stop when it hits the rocks"

My slides failed me. We can no longer rely on RPD {RPD stands for Recognition Primed Decision-making}.

The principle that says base actions on current and expected fire behavior should be restated to say, base actions on current behavior because your expectation is probably going to be wrong.

A good snow pack does not mean high spring fuel moisture. Don't trust the snow to wet your dead fuels.

When a PJ backing fire looks like a flanking fire, you've got trouble

~ ~ ~ ~ ~

Lesson Learned Evaluation by the Escaped Prescribed Fire Review Team.

During the After Action Review the firefighters identified multiple *lessons learned* which could otherwise be defined as factors which contributed to the eventual outcome. With an outsiders perspective, the Review Team listened carefully to these lessons learned and developed the following analysis and conclusion.

Contingency Planning:

The team agrees with the firefighters that the contingency planning needed to be strengthened and the planning that was done may have contributed to the escape by creating confusion over what suppressions options were available and when actions

needed to be taken. The lack of adequate contingency planning fostered an atmosphere of indecision on when to declare the prescribed fire a wildfire.

The fire behavior narrative in the plan described a desired fire behavior to be of high intensity with torching trees producing flame lengths greater than what would be modeled by BEHAVE. When this behavior was demonstrated by the test fire, firefighters were reassured they were “in” prescription. The prescription didn’t address probability of ignition parameters, spotting potential, and nighttime or morning holdover activity. These elements, while not required by policy, assists the preparer develop complete holding and contingency plans. They may also have triggered the preparer to identify the need to relocate the project boundary to a location that would facilitate holding operations and mitigate spotting consequences.

The firefighters expressed the need to develop better contingency planning. The review team agrees finding that the holding and contingency plans were not coordinated. For example, spotting is mentioned in the contingency plan but specific actions in response to spotting are not. The team believes it would have been helpful to identify a spotting distance threshold or an accumulated number of spots threshold, and then state what actions (thought out in advance) would be implemented to mitigate the spotting and what extra resources would be needed to accomplish this. Further, the contingency plan could have identified the tactical use of bucket drops from the helicopter in case of spotting over the project boundary. This level of preplanning could have triggered the helicopter bucket preparation to have been preplanned, thus eliminating the delay when it was needed.

In summary, contingency plans should be developed describing reasonably foreseeable events and the contingency resources required and actions needed to mitigate those events. Contingency resource needs should be based on fire behavior outputs tied to worst case fire behavior as identified in the prescription element.

Project Boundary:

In hindsight virtually everyone involved in Elkhorn II identified the need to have clear defensible project boundaries. The project boundary for this prescribed fire was identified in the EA and through an interdisciplinary team project development process. The boundary was located along contour lines corresponding with archeological survey requirements and in some cases vegetation changes (Pinyon-Juniper to Sage). Consequently in many areas the boundary was located at mid slope in dense continuous Pinyon-Juniper stands. The boundary did not consider a road (nearby to the north and east), natural barriers or afford the ability to prepare the areas of continuous dense vegetation crossing project boundaries.

From an outsider’s perspective it seemed odd that experienced burners would accept a boundary that had no consideration for fire behavior. However, according to the prescribed fire plan preparer, previous experience with prescribed fires in the area have shown that Pinyon/Juniper fires do not burn into these vegetation change areas; they do

not back down through the Pinyon/Juniper vegetation and they go out over night. Based on this past experience, (validated by several reviewers) essentially everyone involved with the planning of the burn felt the boundary was effectively irrelevant because the burn could easily be kept well away from it. Therefore they were comfortable with the boundary that was defined entirely by archeological interests. With the mindset that the boundary really didn't matter as an area that must be defended, there was little need to precisely identify the boundary to those executing the burn plan.

The lack of a defensible boundary contributed to the escape in two ways:

- (1) The Prescribed Fire Burn Boss, Burn Boss trainee, Firing Boss and Holding specialist all wished they had known exactly where the project boundary was when on the ground implementation began. As it turned out, the test fire was ignited very close to the boundary and in an area that was not accessible by holding resources. The surprisingly extreme fire behavior and unanticipated downhill spread that they experienced on the first day threatened and may have even crossed the project boundary by that first evening.
- (2) The location of the boundary did not afford any opportunities for quick suppression operations when it was decided on the morning of the 13th that fire had crossed the boundary. By the time ground personnel could get to the slop over, it had become active and could not be safely contained by on the ground resources.

Test Fire

The firefighter's lesson learned concerning the test fire are valuable and certainly worth consideration in future prescribed burning. Interagency policy directs that the test fire be in a location where the test fire "...can be easily controlled" (Element 14, Interagency Prescribed Fire Guide). In retrospect, the Elkhorn II, test fire was actually designed *only* to test to see if the conditions would allow the initiation of (at least) short duration crown runs. Since there was no reasonable way to stop or contain the Elkhorn II test fire if it proved to be too intense, one could not say the test fire served the purpose of *testing* to see if fire behavior conditions were too extreme to be in compliance with the prescription. Technically therefore, the test fire was out of compliance with the Interagency Prescribed Fire Guide. Nevertheless, the test fire did not contribute to the escape.

One firefighter suggested the best use of a test burn in these conditions would be to evaluate if the fire would hold through the night and resume active spread by late morning. This is an excellent recommendation for large landscape burns where there are indicators the intensity may be too high. Importantly however, all test fires need to be ignited in locations where they can be contained without a declaration of escape.

Surprised by Fire Behavior

The firefighters recommended that in the future, burn day preparations should expect or at least plan for the worst case. The review team concurs with the firefighters. Certain

preparation such as setting up bucket drop capabilities prior to ignition should even be standard operating procedure.

In analyzing the pre-burn consideration elements, the review team found that pre-burn considerations were adequate for the project when related to the project boundary and fire behavior as identified in the plan. However, the following day's surprises of early high intensity fire and the troubling realization that the fire may already be outside of the project boundary removed any doubt that opportunities to contain any escape was severely limited and more energy *should* have been put in planning for the worst case. In the hindsight of this event, it is clear that while we don't have the capability to always predict fire behavior, we can always make it easier to manage the unexpected with good contingency planning.

Human Factors and Reluctance to Declare an Escape.

Interagency Prescribed fire policy states: *A prescribed fire must be declared a wildfire by those identified in the plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period by on-site holding forces and any listed contingency resources. In addition, an escaped prescribed fire must be declared a wildfire when the fire has spread outside the project boundary, or is likely to do so, and cannot be contained by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than an escape.*

In the opinion of the review team and in the hindsight the personnel involved in the burn, the Elkhorn 2 prescribed fire conversion to wildfire *clock* began on the morning of June 13th when the Agency Administrator, RXB2 and Trainee found the fire had likely exceeded the project boundary; also, the fire was so active early in the morning that their objective for the day changed from ignition to containment. They eventually declared it a wildfire very late in the afternoon of the 14th. While this declaration was within the time frame allowed by policy, most all the participants involved with the burn said that in hindsight there were enough indicators early on that should have led to the declaration of a wildfire even by the morning of June 13th. These indicators included: (1) High intensity fire behavior that lasted longer than expected into the night of June 12th and a backing fire in the Juniper, both indicators of above normal dryness. (2) Fire behavior was beyond what anyone had expected to see and many of the most experienced firefighters stated they had never before seen this type of behavior in PJ. The holding specialist commented “that as soon as I saw the fire behavior I knew something was not right”.

There is perverse incentive to delay declaration of an escape; that is, every acre burned prior to declaration counts towards target accomplishment. The review team explored this issue and concluded that additional target accomplishment did not influence their delayed decision to declare the fire escaped.

Similarly, a second external influence was speculated to have played a factor in delaying the decision to declare the burn escaped. A letter issued just one day prior to the burn by the Forest Supervisor gave very strong emphasis to meeting burning targets even if that means canceling individual participation in incident management team assignments. The letter had been read by key leadership involved with Elkhorn II but the review team does not believe this letter influenced the managers to delay the declaration. One way to make sense of the delay in declaring the burn an escape is alluded to in the Lessons Learned section of this report. A comment given by one of the firefighters during this review sets the stage, “*my slides failed me*”.

In the landmark Text, *Human Error*, by Psychologist James Reason (© Cambridge University Press 1990) defines *skill-based errors*; that is, decision making that is impaired or at least hampered by past experiences. On Elkhorn II, very skilled and experienced firefighters saw fire behavior they had never seen before. It didn't match their slides (previous and extensive experience). In *Human Error*, Dr. Reason states,

“When confronted by a problem humans are strongly biased to find a prepackaged solution rather than resort to the cognitive strain... and anxiety of learning and analysis. In short, the more complex the situation the more furious the pattern matching”.

The natural human tendency to avoid this anxiety, especially under the stress of managing a fire may have led to what Dr. Reason refers to as the *“The illusion of control... the irrational influence caused by the knowledge of a previous outcome of a perceived similar situation; causing one to overestimate confidence in the forecast.”* Virtually every experienced firefighter (in spite of abundant disconfirming evidence) clung to the belief that the fire would change behavior and become the type of PJ fire they were expecting at the outset. The natural human tendency in these situations is what Dr. Reason termed, *“confirmational bias”*; defined as, *“Satisficing (a) situation into a previously learned situation... instead of mastering the ability to understand the situation... your understanding masters the situation”.*

The value in this discussion is that it presents another lesson to be learned to enhance situational awareness. To the extent managers are aware of the natural and inevitable human inclination towards confirmational bias; it will increase their situational awareness of this potential decision trap.

Appendix A:

Required Review Elements (by Interagency Prescribed Fire Policy)

Seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.

Central Nevada has been in a prolonged drought. The PJ was drought stressed and a cooler than normal spring resulted in a delayed green-up and growth of the PJ. Weather was not unusual for the time of year even though ERCs and 1000h TLF were in the 90th percentile. There were no significant or unusual winds observed between the time of ignition, throughout the implementation and to wildfire declaration.

Actions taken leading up to the wildfire declaration for consistency with the Prescribed Fire Plan. On the morning of the 13th a reconnaissance flight showed that the fire had gone outside of the project boundary but was not showing appreciable active fire behavior. A decision was made to hike people in to the slop-over and secure it as required by the holding and contingency plan. The RXB and trainee did not declare an escape since they felt confident that with some hand work the slop over could be put out. By the time a crew was able to get into the area the fire outside of the project boundary became active. The holding specialist requested bucket drops but there was a delay since the water source had not been prepared. The RXB2, RXB2t and FIRB decided that there was still not a need to declare the prescribed fire a wildfire because in their experience it was likely the fire would die overnight. The sentiment expressed by the comment, “The fire kept giving us hope, every time you thought it was done it became active again” was pervasive. They discussed the possibility of using the House Canyon Road as a contingency to burn off from, a concept that had not been developed as part of the contingency plan. The RXB checked on availability of a hotshot crew and requested an additional engine as identified in the contingency plan.

Through the morning of June 14, contingency actions continued. Assignments were given to secure slop-overs. At 1600 the fire was active outside of the project boundary. The RXB2 conferred with the District Ranger about converting it to a wildfire due to location and not having enough resources. The fire was declared a wildfire at approximately 1900.

An analysis of the Prescribed Fire Plan for consistency with Interagency Policy

The Elkhorn II Escaped Prescribed Fire Review Team reviewed the Prescribed Fire Burn Plan and National Environmental Policy Act documentation completed July 27, 2007. The plan was developed by an RXB2 trainee and signed by a qualified RXB2. These persons also implemented the prescribed fire as the Burn Boss and Trainee.

The team found that the plan met most policy requirements with 2 exceptions:

- 1) The plan had a project map but did not include a vicinity map. The Interagency Prescribed Fire Guide requires a project map and a vicinity map.
- 2) There is no documentation on the results of the test fire. The Interagency Prescribed Fire Guide requires the test fire results be recorded.

The Elkhorn 2 prescribed fire plan (in line with IA prescribed fire policy) required that the test fire be located in a representative location and in an area that can be easily controlled. The review team found that the decision by implementation personnel to place the test fire where they did was based on vegetation which most represented the project area, predicted wind direction and subsequent desired ignition pattern. There was some confusion by the FIRB and trainee as to where the project boundary was. They consequently ignited the test fire very close to the project boundary in an area that could not be easily controlled.

An analysis of the prescribed fire prescription and associated environmental parameters.

Prescription parameters included low, desired and high ranges of weather, fuel moisture conditions and fire behavior parameters consistent for prescribed fires in Pinyon/Juniper. The fire behavior narrative addressed the inability of the BEHAVE modeling program to accurately predict fire behavior in Pinyon Juniper by describing a fire behavior that would exhibit flame lengths greater than predicted and torching of trees.

The fire was ignited under high fire intensity environmental and fire behavior prescription parameters. The Ignition and resulting fire behavior allowed met the prescribe fire plan objectives.

During ignition operations on the 12th the prescribed fire stayed within the environmental prescription parameters. On the 13th of June the minimum humidity reached 5% which was 3% below prescription parameters. The duration was short (1hr) and ignition operations had not been implemented for that day.

Approving line officer's qualifications, experience, and involvement.

The review team found the District Ranger was qualified to sign the Elkhorn 2 prescribed fire plan

Qualifications and experience of key personnel involved.

The team found that all personnel involved in the Elkhorn 2 prescribed fire were qualified for the positions held during implementation.

The burn plan preparer and technical reviewers were qualified at least at the complexity level of the prescribed fire.

Summary of causal agents contributing to the wildfire declaration.

Lack of a clearly defined defensible boundary described in lessons learned section of this report.
Unexpected fire intensity and behavior as described in the Fire Behavior Analysis in Appendix B.

Appendix B Elkhorn 2 Fire Behavior Analysis

Summary: The Elkhorn 2 Prescribed Fire was ignited on June 12, 2008. The purpose of the project was to improve wildlife habitat through the burning of old-growth pinyon-juniper (PJ). The objective was to remove 30-80% of the PJ canopy through the use of uphill fire runs using a helitorch as an ignition source. The total project size was 10,490 acres.

The fire burned more active than anticipated, and burned outside of the project area. On June 14th the fire was declared escaped. A Type 3 Incident management team was brought in and the fire was contained two weeks later at 6,200 acres.

Fuels: The primary fuel types were pinyon-juniper with some small pockets of sagebrush on the slopes and larger stands of sagebrush in the flats. No live fuel moistures were taken prior to the project. The project was delayed two weeks due to a four inch snow in late May.

The cooler than normal spring resulted in a delayed growth of the PJ. Estimates range from a two to four week delay in green-up and initiation of plant growth. The late May snow would have contributed to the delay of the trees coming out of dormancy. This would cause decreased foliar moisture from what would be expected for that time of year. There were a number of pitch-outs observed on some of the pinion trees. This type of pitch-out is normally associated with a bark beetle attack on the tree and tends to weaken the tree, decreasing foliar moisture content. These scattered trees would result in pockets of higher fire intensities.



Pitchouts observed on the boles of the pinion trees at Elkhorn 2

Sub-drainages with a north or northeast aspect contained the highest fuel loadings in the unit. This increased surface fuel loading allowed for surface fire spread in some areas.

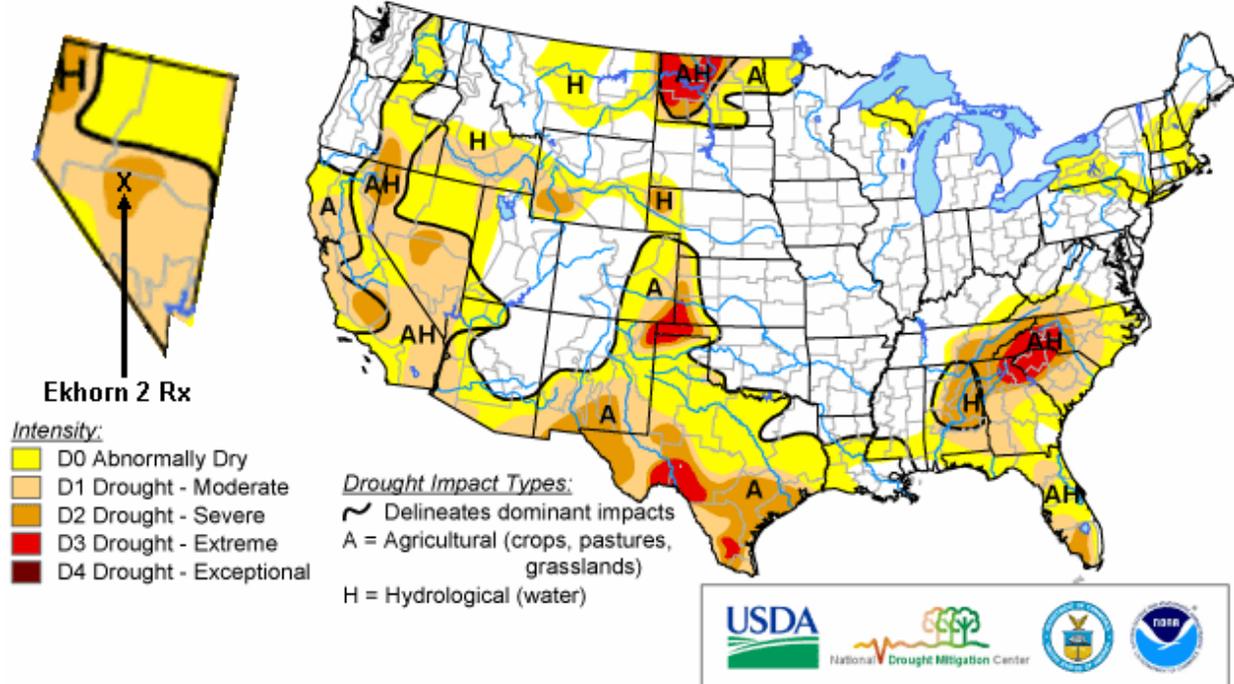
Weather: The weather patterns were not unusual for the time of year. Weather was warm and dry with an unstable atmosphere, common for central Nevada in mid-June. During the prescribed fire and Type 3 wildfire the weather was dominated by a strong ridge of high pressure which kept temperatures warm, humidities high, the atmosphere unstable, and winds light. There were no significant or unusual winds observed between

the time of initial ignition and the project being declared escaped. Winds measured at the Pancake RAWS were lighter than average during that time.

Central Nevada has been in a prolonged drought for the past five to seven years. The precipitation during the 2007/8 winter was close to normal, but not enough to off-set the effects of the prior years' drought. The live fuels were still drought stressed coming into the 2008 growth season.

U.S. Drought Monitor

June 10, 2008
Valid 8 a.m. EDT



Topography: The project is located in the Monitor mountain range, which runs north to south. The project is on the east side of the crest, and has an east aspect. This aspect allows for an increase in vegetation and, in the case of Elkhorn 2, an increase in available fuels. Elevations range from 9,200' to 7,000' and slopes range from flat to 80%. Aspects include north, northeast, east, and southeast.



Monitor Range topography

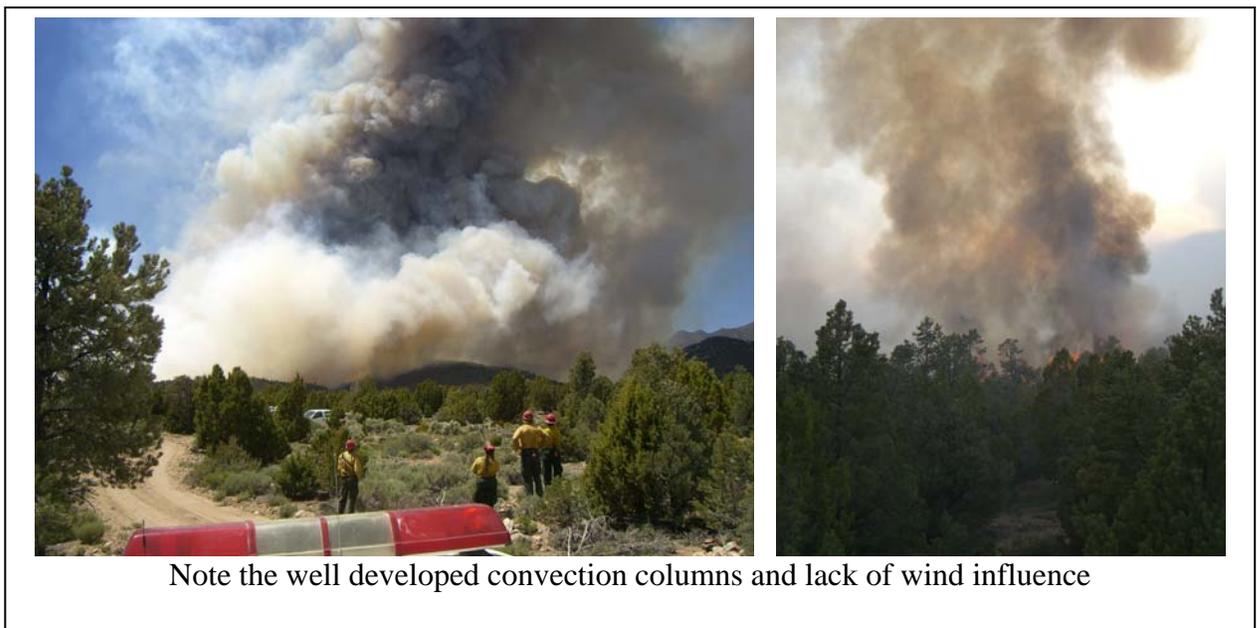
Anticipated vs. Observed Fire Behavior: The desired and anticipated fire behavior was for short duration, high intensity crown fires that would be five to five hundred acres in size. The following fire behavior characteristics for PJ fires were a part of the thought process, project design, and implementation for the Elkhorn 2 prescribed fire.

1. The ignitions would not last through the night and would require ignitions each day during the fire spread portion of the project.
2. That fire spread would only be uphill.
3. The factor that would have the greatest influence on fire spread would be the wind.
4. The fire activity would be limited to daylight hours and there would be no spread after dark.
5. Because the fire would only spread uphill with the wind, there could only be one head on the fire.
6. Pinyon-Juniper fires are wind driven and not convection dominated.
7. Flanking and backing spread should not be anticipated.

While these general rules concerning fire behavior in pinyon-juniper are valid, they are not absolute. Above average fire indices can negate any and all of these assumptions and in the case of Elkhorn 2 none of the above assumptions were correct.

1. There was only one day of ignition. The fire held through for two weeks.
2. The fire spread was uphill, downhill, and cross-slope.
3. There were no significant winds, yet fire spread was active.
4. The fire was documented to have spread both day and night; with most of the spread occurring late afternoon, evening, and early night time.
5. Multiple heads were reported on several days.
6. The columns observed were primarily convection driven (plume dominated) as opposed to wind driven.
7. Flanking and backing fire was observed and contributed significantly to the overall fire spread.

These conditions have been observed and documented on other Pinyon-Juniper fires in Nevada and other Great Basin states.

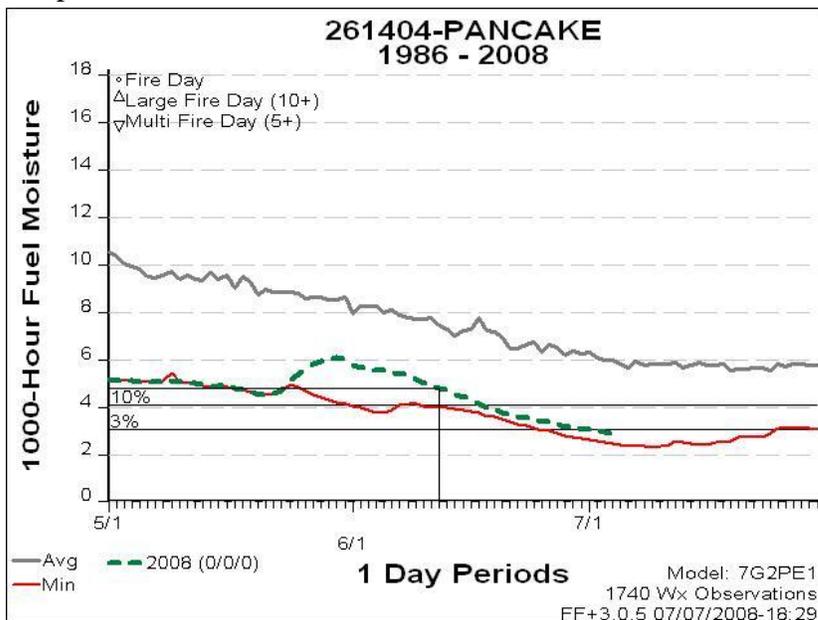
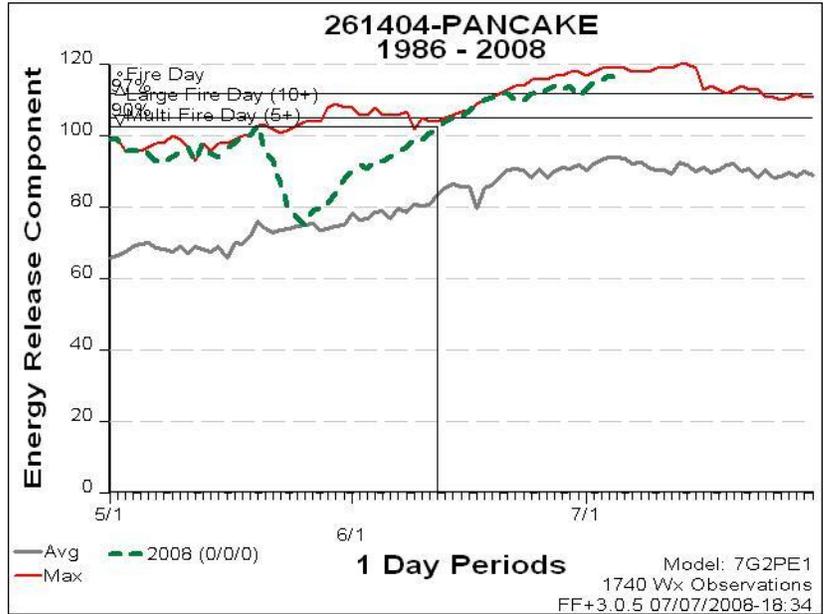


Contributing Factors to the Extreme Fire Behavior: The closest Remote Automated Weather Station (RAWS) to the Elkhorn 2 project is Pancake. Data from the Pancake RAWS, thirty miles south of the project, was used to analyze weather data from 1986 to the present. The Pancake RAWS is lower than the project site, but is the best RAWS for trend analysis available. This data, when combined with on-site observations, give an indication of why the extreme fire behavior occurred.

Energy Release Component

(ERC): The ERC is a measure of overall moisture content in a fuel complex and how much energy is available for release by combustion. ERC is a good trend indicator for how the fire potential is progressing. It does not take into account wind, so it is not a good indicator on fire severity on a day to day basis.

The ERC was 103 on the day of ignition. It was trending upward and soon went on to set all-time highs around the time the project was declared escaped.

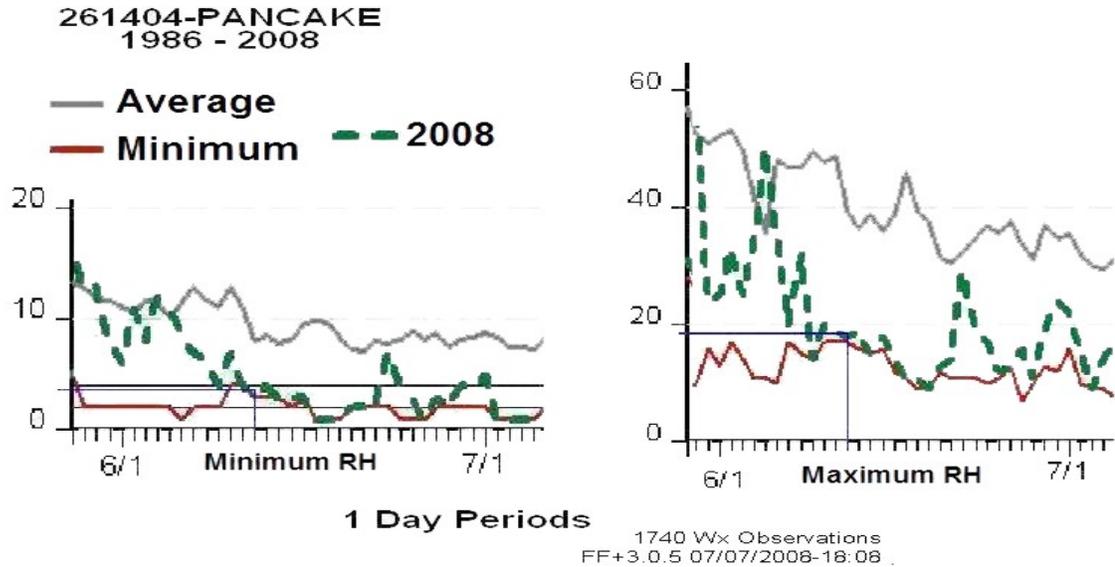


1,000 Hour Fuel Moistures (1,000 HR):

1,000 HRs are also a good indicator of long-term fire danger.

1,000 Hrs had been setting all-time lows prior to the May snow event. There was a slight recovery but the fuel moisture was still well below average. The 1,000 HR was in a downward trend and was at 4.5% at the time of ignition.

Relative Humidity: RH has a major impact on the intensity of burning in the smaller dead fuels. Line crews often measure RH on an hourly basis in order to anticipate changes in fire activity.



Minimum RHs at the Pancake RAWS were down below 5% for the duration of the project. Humidities never recovered to over 20% during the duration of the Prescribed and Type 3 fire. An onsite RAWS indicated a higher RH trend onsite than the Pancake RAWS, but lacks the historical data to use as an analysis.

Onsite RAWS	June 12	June 13	June 14	June 15
Minimum RH	7%	5%	5%	3%
Maximum RH	29%	24%	18%	23%

Fuel Loadings: The moister aspects allowed for better plant growth and a heavier fuel accumulation. This fuel profile allowed for surface spread and residual heat holding overnight, both of which are unusual in pinyon-juniper stands.



Conclusion: The combination of drought stress live fuels, a two to four week delay in the growing season flush, decreased foliar fuel moisture in trees with pitchouts, high ERCs, low large size class dead fuel moisture contents, unstable atmospheres, dry days, poor humidity recovery during nights, and concentrations of down dead fuels on east, northeast, and north aspects combined to allow for dynamic fire behavior. These factors combined develop a fuel driven fire which had intensities beyond direct control capabilities of the resources on hand.

There was not a single critical factor that caused the surprising fire behavior. The lesson to be learned here is that fire behavior in Pinyon-Juniper is very difficult to predict. Modeling has not emphasized this fuel type and the existing fire behavior prediction systems do not address the “all or nothing” spread and fire intensity that is associated with PJ.

The assumptions made for the Elkhorn 2 Prescribed Fire were not unreasonable based on past history and experience in this fuel type.

Appendix C

PRESCRIBED FIRE PLAN

ADMINISTRATIVE UNIT(S) Austin-Tonopah Ranger District
Humboldt-Toiyabe National Forest

PRESCRIBED FIRE NAME Elkhorn 2/Savory

PREPARED BY /s/ **DATE** 08-24-2007

ADDITIONAL PREPARER /s/ **DATE** 08-24-2007

TECHNICAL REVIEW **DATE** 09-17-2007
09-24-2007

FIRE MANAGEMENT OFFICER REVIEW /s/ **DATE** 09-21-2007

DATE

DATE

COMPLEXITY RATING Moderate

EA NAME	ELKHORN 2	PROJECT	Elkhorn 2
CE NAME	SAVORY	NAME	Savory

APPROVED BY /s/ **DATE** 09-21-2007
10/10/07

Agency Administrator



Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 2 - AGENCY ADMINISTRATOR PRE-IGNITION APPROVAL CHECKLIST

Instructions: The Agency Administrator’s Pre-Ignition Approval is the intermediate planning review process (i.e. between the Prescribed Fire Complexity Rating System Guide and Go-No-Go Checklist) that should be completed before a prescribed fire can be implemented. The Agency Administrator’s Pre-Ignition Approval evaluates whether compliance requirements, Prescribed Fire Plan elements, and internal and external notifications have been or will be completed and expresses the Agency Administrator’s intent to implement the Prescribed Fire Plan. If ignition of the prescribed fire is not initiated prior to expiration date determined by the Agency Administrator, a new approval will be required.

YES	NO	KEY ELEMENT QUESTIONS
		Is the Prescribed Fire Plan up to date? <i>Hints: amendments, seasonality.</i>
		Will all compliance requirements be completed? <i>Hints: cultural, threatened and endangered species, smoke management, NEPA.</i>
		Is risk management in place and the residual risk acceptable? <i>Hints: Prescribed Fire Complexity Rating Guide completed with rational and mitigation measures identified and documented?</i>
		Will all elements of the Prescribed Fire Plan be met? <i>Hints: Preparation work, mitigation, weather, organization, prescription, contingency resources</i>
		Will all internal and external notifications and media releases be completed? <i>Hints: Preparedness level restrictions</i>
		Will key agency staff be fully briefed and understand prescribed fire implementation?
		Are there any other extenuating circumstances that would preclude the successful implementation of the plan?
		Have you determined if and when you are to be notified that contingency actions are being taken? Will this be communicated to the Burn Boss?
		Other:

RECOMMENDED BY _____ **DATE** _____
FMO/Fuels Specialist/Prescribed Fire
Burn Boss

APPROVED BY _____ **DATE** _____
Agency Administrator

Project Name:	Elkhorn 2/Savory	Unit Name:	
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APPROVAL _____
EXPIRES (date) _____

ELEMENT 2 - PRESCRIBED FIRE GO-NO-GO CHECKLIST

	YES	NO
A. Has the burn unit experienced unusual drought conditions or contain above normal fuel loadings which were not considered in the prescription development? If <u>NO</u> proceed with checklist, if <u>YES</u> go to item B.		
B. If <u>YES</u> have appropriate changes been made to the Ignition and Holding plan and the Mop Up and Patrol Plans? If <u>YES</u> proceed with checklist below, if <u>NO</u> STOP.		

YES	NO	QUESTIONS
		Are ALL fire prescription elements met?
		Are ALL smoke management specifications met?
		Has ALL required current and projected fire weather forecast been obtained and are they favorable?
		Are ALL planned operations personnel and equipment on-site, available, and operational?
		Has the availability of ALL contingency resources been checked, and are they available?
		Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?
		Have all the pre-burn considerations identified in the Prescribed Fire Plan been completed or addressed?
		Have ALL the required notifications been made?
		Are ALL permits and clearances obtained?
		In your opinion, can the burn be carried out according to the Prescribed Fire Plan and will it meet the planned objective?

If ALL answers are YES, proceed with the test fire. Document the conditions, location and results on the Test Fire Provision Worksheet and Unit Log. Concurrence is documented by the signatures below. The Go-No-Go Checklist will be completed each day of active ignition. The separate Agency Administrator Pre-Ignition Approval Checklist is required to document the agency administrator's final approval.

SIGNED _____ **DATE** _____

Project Name:	Elkhorn 2/Savory	Unit Name:	
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	Prescribed Fire Burn Boss	
CONCURRENCE		DATE
	Prescribed Firing Boss Function	
CONCURRENCE		DATE
	Holding Specialist Function	

ELEMENT 3 - COMPLEXITY ANALYSIS SUMMARY –ELKHORN 2

ELEMENT	RISK	POTENTIAL CONSEQUENCE	TECHNICAL DIFFICULTY
1. Potential for escape	M	M	M
2. The number and dependence of activities	M	M	M
3. Off-site Values	L	M	M
4. On-Site Values	M	M	M
5. Fire Behavior	M	M	M
6. Management organization	M	M	M
7. Public and political interest	L	L	L
8. Fire Treatment objectives	M	M	M
9. Constraints	M	M	M
10. Safety	M	M	M
11. Ignition procedures/ methods	M	M	M
12. Interagency coordination	L	L	L
13. Project logistics	M	M	M
14. Smoke management	M	M	M

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	Moderate
POTENTIAL CONSEQUENCES	Moderate
TECHNICAL DIFFICULTY	Moderate
SUMMARY COMPLEXITY DETERMINATION	Moderate
Rationale	
<p>The moderate rating for this project was developed: due to location of project, type of burning that will be done, the seasons when the burning will take place, vegetation to be treated, no structures in area, no smoke sensitive areas and experience level required for this type of project. Use of helicopter does increase the complexity but with small numbers of personnel required the numbers of personnel that are exposed to this are less than hand ignition type burn. The skill level on the Humboldt-Toiyabe has increased so fewer outside resources are required to complete the burn project.</p>	

ELEMENT 3 - COMPLEXITY ANALYSIS SUMMARY -SAVORY

ELEMENT	RISK	POTENTIAL CONSEQUENCE	TECHNICAL DIFFICULTY
1. Potential for escape	M	M	M
2. The number and dependence of activities	M	M	M
3. Off-site Values	L	M	L
4. On-Site Values	M	M	M
5. Fire Behavior	M	M	M
6. Management organization	M	M	M
7. Public and political interest	L	L	L
8. Fire Treatment objectives	M	M	M
9. Constraints	M	M	M
10. Safety	M	M	M
11. Ignition procedures/ methods	M	M	M
12. Interagency coordination	L	L	L
13. Project logistics	L	M	M
14. Smoke management	M	M	M

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	Moderate
POTENTIAL CONSEQUENCES	Moderate
TECHNICAL DIFFICULTY	Moderate
SUMMARY COMPLEXITY DETERMINATION	Moderate
Rationale	
<p>The moderate rating for this project was developed: due to location of project, type of burning that will be done, the seasons when the burning will take place, vegetation to be treated, no structures in area, no smoke sensitive areas and experience level required for this type of project. Use of helicopter does increase the complexity but with small numbers of personnel required the numbers of personnel that are exposed to this are less than hand ignition type burn. Hand ignition will be utilized in the research plot but this area is only 50 acres and the ignition pattern will be bush to bush type of ignition due to very little understory. The skill level on the Humboldt-Toiyabe has increased so fewer outside resources are required to complete the burn project.</p>	

ELEMENT 4 - DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description- Elkhorn 2 Unit

Legal description:	T	8N	R	47 E	S	2-11
	T	9 N	R	47 E	S	15,16,21,22, 26-29, 32-36
Latitude	38° 34'		Longitude	115° 42'		
Project Acres	10,490		County	Nye		
Primary Unit Acres	6,700		Drainage	Wildcat south boundary South fork Barley on the North boundary		
Low elevation	7500'		Average aspect	East		
High elevation	9200'		Average slope	50 %		

Project Boundary

The Elkhorn 2 Unit follows the House Canyon road as the northern boundary, Wildcat Canyon the southern boundary, the western boundary is the main ridge line of the Monitor range and the east boundary is at the 7,200 foot elevation line were there is as a vegetation type (low sage) and slope change. These boundaries were designed with the change in vegetation and topography.

The target areas to burn will be the Phase II pinyon/juniper expansion areas, north slopes and designated drainages.

ELEMENT 4 - DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description- Savory Unit

Legal description:	T	13N	R	49E	S	6
	T	13.5N	R	49E	S	19,23-26,30-31,36
	T	14N	R	49E	S	23,25-26,34-36
	T	14N		50E	S	30-31
Latitude	39° 02' 30		Longitude	116° 25' 00		
Project Acres	5,642		County	Nye		
Primary Unit Acres	1,693-3949		Drainage	Savory, Little Savory		
Low elevation	7,200		Average aspect	Varying		
High elevation	9,400		Average slope	Flat-80%		

Project Boundary

The East boundary runs along Savory Creek, the west boundary is Little Savory Creek, the bottom of the project area is at the junction of Savory and Little Savory Creeks and north end boundary is the ridge lines that tie into Savory and Little Savory Creeks. Areas that will be targeted within the project area are the Phase II pinyon/juniper expansion areas, north slopes and designated drainages.

Within the Savory project area there is a research plot. This plot is approximately 50 acres and is located in the bottom part of the project area along the road that runs along Savory Creek. This is a priority area to burn.

An amendment to the burn plan is not required for minor changes in burn unit boundaries to facilitate holding and/or ignition, as long as the area in question has been in the NEPA document, requires no change in holding or ignition resources and is within the project boundaries. Changes to project area boundaries resulting in either an increase or decrease in area requires an amendment to the burn plan

B. Vegetation/Fuels Description

On-Site Fuels Data			Adjacent Fuels Data		
FBPS Fuel Model(s)	6		FBPS Fuel Model(s)	6	
NFDRS Fuel Model(s)	A,G,T		NFDRS Fuel Model(s)	A,G,T	
Fire Regime(s)	3		Fire Regime(s)	3	
Fire Condition Class(es)	2		Fire Condition Class(es)	2	
Fuel Loading	1 hour tlf	.10 tons/acre	General Description of Adjacent Fuels The fuels outside the unit consist of Pinyon-Juniper woodlands with grass/sage brush understory.		
	10 hour tlf	2 tons/acre			
	100 hour tlf	.5 tons/acre			
	1000 hour tlf	.75 tons/acre			
	Litter depth	1 in.			
	Duff depth	.23 in.			
	Live woody	7.0			
	Live herbaceous				
	Total fuel loading	6-10 TPA			
Comments					
<p>The majority of the drainages fall within the pinyon-juniper elevation zone. This is fairly typical of the Great Basin areas where single-leaf pinyon is intermixed with lower densities of Utah juniper. At the lower elevations, Wyoming and low sagebrush dominates the canopy. At the highest elevations, snowberry and other typical mountain brush species occur with mountain big sagebrush. Mountain mahogany is also present at the highest elevations. In some drainages and spring sites there are stands of aspen. These aspen stands range in size and condition.</p> <p>Utilized Aids to Determining Fuel Models for Estimating Fire Behavior: Hal E. Anderson and Photo Series for Quantifying Natural Fuels Volume IV: Pinyon-Juniper, Chaparral, and Sagebrush types in the Southwestern United States.</p>					

C. Description of Unique Features

These projects have cultural sites that the Burn Boss and Firing Boss will have knowledge of. The project archeologist will identify these sites and advice type of preparation that is needed to protect these sites.

Savory- No burning within the 200 acre zone that was identified by the wildlife biologist. This site is a goshawk nest within a small stand of aspen. UTM 550,522-4320578 (NAD83)

ELEMENT 5 - GOALS AND OBJECTIVES

A. Goals:

B. Objectives:

Resource Objectives	Fuels Treatment Objectives
Reduce fuel loading to lower the possibility of large scale fires. Excessive pinyon-juniper fuel loadings have created a moderate-high risk of losing key ecosystem components from fire.	Elkhorn 2 Unit -Apply prescribed fire to 30-80% (2,500 – 6,700 acres.) within the 10,490 acres project area. Savory Unit -Apply prescribed fire to 30-70% (3,823-1,639 acres) within the 5,642 acre project area.
Reduce tree density to minimize the risk of epidemic insect and disease outbreaks. Competition for water in overcrowded stands of pinyon-juniper increases susceptibility to insects and disease.	Create mosaic openings by applying prescribed fire. Opening sizes can range from 5-500 acre or larger.
Restore mountain shrub and sagebrush habitats to increase wildlife habitat diversity. Improve rangeland health and productivity.	Create mosaic openings by applying prescribed fire. Opening sizes can range from 5-500 acre or larger.

Objectives Are S.M.A.R.T.

**Specific
Measurable
Attainable
Reasonable
Time Related**

Tolerable deviation from objectives:

A tolerable deviation of + or – 20 percent for each of the above objectives is the acceptable range for treatment over the project area.

If using hand ignition on the pinyon/juniper woodlands, a mosaic burn pattern will be harder to achieve on the sparse and steep slopes, therefore it is acceptable for firing operations to ignite and create a mosaic pattern starting in the drainages burning uphill into the pinyon-juniper stands.

Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 6 - FUNDING

Funding Source(s)							
Phase	Fuels WFHF17	Wildlife NFWF17	Range	Recreation	Timber	Other	Subtotal
Planning							
Clearances							
Burn Plan Preparation							
Site Preparation							
Ignition & Holding	120,000	16,500					
Mop-up & Patrol	16,500						
Subtotal	136,500	16,500					
Grand Total		* Enter Subactivity code at top of column (i.e. Wildlife-1050). These estimated costs are for the entire burn implementation and could be in one or more subactivities.					\$153,000

Narrative: WHFH17 and NFWF17 with override of 0417 are the job code for these two projects. The approximately cost per acre runs between 30-45dollars/ac. The cost/ac varies due to the set up cost for helicopter, fuel tender and resources.

ELEMENT 7 - PRESCRIPTION

A. Environmental Prescription	Acceptable Prescription Range			Outside area at critical holding point minimum acceptable moisture
	Low Fire Intensity	Desired Fire Intensity	High Fire Intensity	
Temperature (°F)	45-60	60-75	70-85	
Relative humidity (%)	20-35	12-20	8-14	
Mid-flame wind speed	5	8-15	12-25	
Wind direction (azimuth°)	South East to North East	South East to North East	West	
1-hr fuel moisture (%)	N/A	N/A	N/A	N/A
10-hr fuel moisture (%)	10-14	6-10	3-6	5
100-hr fuel moisture (%)	11-15	8-10	5-8	6
1000-hr fuel moisture (%)	N/A	N/A	N/A	N/A
Live fuel moisture (%)	N/A	N/A	N/A	N/A
Duff moisture (%)	N/A	N/A	N/A	N/A
Soil moisture (%)	N/A	N/A	N/A	N/A

Additional Information

A spot weather forecast will be requested and used prior to burning operations, and twice during the day(s) of burning operations. The forecast will be received from the National Weather Service for this area by Central Nevada Interagency Dispatch Center (CNIDC). Information received from the mixing heights, transport winds, max and min temperatures; Haines index, night time down slope wind speed and the probability of adverse weather conditions including frontal passages, high winds, and thunderstorm activities. CNIDC will use the standard spot weather forecast form to provide appropriate information to NWS-Elko. The closest permanent RAWS station is H-T portable #5 located at the base of Dansville Canyon at 38 45.32 116 29.48 at 7,007 foot elevation. This station is located to represent both project areas.

B. Fire Behavior Prescription	Acceptable Fire Behavior Range			Outside area at critical holding points
	Low Fire Intensity	Desired Fire Intensity	High Fire Intensity	
Fuel Model(s)	6	6	6	6
Rate of Spread (chains/hour)	10-40	33-100	100-246	100-246
Flame Length (in feet)	4-6	6-11	11-16	11-16
Scorch Height (in feet)	N/A	N/A	N/A	
Probability of Ignition (%)	N/A	N/A	N/A	N/A
Spotting Distance (in miles)	N/A	N/A	N/A	N/A
<p>Prescription is defined as the measurable criteria that define a range of conditions during which a prescribed fire may be ignited and held as a prescribed fire. The plan prescription will describe a range of low to high limits for the environmental (weather, topography, fuels, etc.) and fire behavior (flame lengths, rate of spread, spotting distance, etc.) parameters required to meet Prescribed Fire Plan objectives while meeting smoke management and control objectives. Parameters are quantitative variables expressed as a range that result in acceptable fire behavior and smoke management.</p> <p style="text-align: center;">Attach BehavePlus Worksheets</p>				
Fire Behavior Narrative				

Project Name:	Elkhorn 2/Savory	Unit Name:	
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Fire Behavior was modeled using BehavePlus 3.0.1. See attached runs.
Past experience has shown that the BehavePlus model over predicts ROS in the Pinyon/Juniper (PJ) fuel type. The Pinyon-Juniper stands do not have sufficient surface fuels to promote the predicted rates of spread. The desired fire behavior is high intensity and torching trees may temporarily produce flame lengths greater than 12.5 feet for short durations.
These burns have the flexibility to mix and match the weather parameters to generate the intensity and fire behavior to achieve the resources and prescribed fire objectives. Burning when all weather elements are at the high intensity level should be done with extreme caution and all holding forces will be on site and contingency forces available

ELEMENT 8 - SCHEDULING

A. Ignition Time Frames/Season(s)	Spring-Summer-Fall.
B. Projected Duration	Estimated time to ignite each project is two days to five days, utilizing 8-14 hours days; Smoke may be visible for several days or up to a week.
C. Constraints	
<p>If burning while in fire season then equipment may not be available due to fire activity.</p> <p>Equipment or personnel not available due to these resources committed to other prescribed fire projects.</p>	

ELEMENT 9 - PRE-BURN CONSIDERATIONS

A. Considerations

1. On Site
<p>Elkhorn 2: Fuels that are in this project area are heavy pinyon-juniper (PJ) woodlands. (Phase II pinyon/juniper). At the higher elevations the PJ breaks into low sage and mountain brush types. The east flank turns into Wyoming sage when breaking into the flats of west Stone Cabin Valley. If the Burn Boss feels that road guards are necessary they will be placed on the roads in the project area. A portable RAWS station has been placed north of the project at the base of Dansville Canyon. If necessary it can be moved to the project site to collect data during project implementation.</p> <p>Savory: Fuels in this project area are pinyon/juniper (PJ) woodlands. (Phase II P/J). At the higher elevations it breaks into low sage, mahogany with some patches of aspens.</p> <p>Make sure that the Burn Boss, Firing Boss and the helicopter pilot are aware of goshawk nest (UTM 550,522, 4,320,578 NAD83) to avoid and any cultural sites that also need to be avoided.</p> <p>Program radios to have the required frequencies required.</p>
2. Off Site
<p>Staging areas and helibase's will need to be located before the project can begin.</p> <p>Elkhorn 2 helispot is located at the same spot that was utilized for the Elkhorn 1 burns.</p> <p>Prep work to be completed on cultural sites that have been designated to the Burn Boss.</p> <p>Notify any permittee that is affected by these burns.</p> <p>Variance from Nevada Division of Environmental Protection, Bureau of Air Quality Planning.</p> <p>Prior to implementing the prescribed fire, the responsible dispatch office will be given a complete copy of the Prescribed Fire Plan.</p>

Project Name:	Elkhorn 2/Savory	Unit Name:	
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B. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s)

Proximity to nearest RAWS	H-T Portable #5 RAWS		
Need for on-site RAWS		Yes	X No
Additional Information			
<p>A Spot Weather Forecast from the National Weather Service will be requested prior to ignition, for each day active ignition is occurring on the burn.</p> <p>A portable RAWS station in place at the base of Dansville Canyon which is located approximately 30 miles north of the Elkhorn 2 project area and approximately 34 miles south of Savory project. Weather data maybe pulled off of the NOAA website. The location of portable station is Lat. 38° 45 32.54 Long 116° 29 47.53 Elevation 7,007’.</p> <p>On-site weather will be taken before ignition and then throughout the implementation phase. The Burn Boss will set the timeframe for weather observations.</p> <p>Daily communications with Air Quality Agency.</p>			

C. Notifications

Who	When ¹	Phone Number and/or e-mail	Responsibility	Date	Initial
Nye County Commissioner	B,A	XXX-XXX-XXXX	Austin/Tonopah D.R.		
Belmont VFD-Rich Sauer Elkhorn 2	B	XXX-XXX-XXXX	Austin/Tonopah D.R ZFMO		
Belmont Residents- Elkhorn 2	B	XXX-XXX-XXXX	Austin/Tonopah D.R.		
Battle Mt. BLM office	B,D	XXX-XXX-XXXX	Austin/Tonopah D.R.		
NV Environmental Protection Air Quality-Sig Jaunarajs	B,D,A	XXX-XXX-XXXX	Zone Fuel Specialists		
Nye County Sheriff	B,D	XXX-XXX-XXXX	Austin/Tonopah D.R.		
CNIDC-Dispatch	B,D,A	XXX-XXX-XXXX	Zone Fuels Specialists		
Fallon NAS	B	XXX-XXX-XXXX	CNIDC-Dispatch		
FAA	B	XXX-XXX-XXXX	CNIDC-Dispatch		
Forest Aviation Officer	B,D,A	XXX-XXX-XXXX	Zone Fuels Specialists		
Forest Fire Staff (Duty Officer)	B,D,A	XXX-XXX-XXXX	Zone Fuels Specialists		
Range Specialist	B,D	XXX-XXX-XXXX	Zone Fuels Specialists		
Lander County Sheriff	B	XXX-XXX-XXXX	Austin/Tonopah D.R.		
Eureka County Sheriff	B,D	XXX-XXX-XXXX	Austin/Tonopah D.R.		
Forest Supervisor-Ed Monnig	B,D,A	XXX-XXX-XXXX	Austin/Tonopah D.R.		
Tom Gardner- Segura Ranch- Savory	D	XXX-XXX-XXXX	Range Specialists		
Roy Cliffords- Elkhorn 2	D	XXX-XXX-XXXX	Range Specialists		
¹ When to Notify	Before (B): Prior to burn day. Day of (D): Prior to ignition on burn day. After (A): After burn is completed.		² Contact Type	Phone Contact (PC) Phone Message (PM) Direct Contact (DC) E-mail (EM)	

ELEMENT 10 - BRIEFING

Operational Briefing (Responsibility – Prescribed Fire Burn Boss)

- Introduction of Burn Organization
 - Make Crew and Equipment Assignments
- Provide Maps
- Review Burn Objectives and Constraints
- Review Spot Weather Forecast
- Discuss Weather Data Collection Procedures
 - Make Weather Observer Assignment and Set Collection Schedule
- Review Predicted Fire Behavior
- Review Burn Prescription and Critical Weather that Will Terminate Burn
- Review Ignition Plan and Possible Problems
- Review Aerial Ignition Plan and appropriate safety procedures (if applicable)
- Review Holding Plan and Possible Problems
- Review Contingency and Wildfire Conversion Plan
 - Identify High Value and Areas of Special Concern
 - Identify Mitigation Measures, Procedures, Project Boundary, Etc.
- Review Safety Plan, Risk Assessment/JHA and Medical Evacuation Plan
 - Identify On-Site Personnel with Medical and Helitack Qualifications
- Review LCES and Identify Lookout Assignments
- Discuss Communication Plan

Crew Briefing (Responsibility - Ignition Specialist and Holding Specialist Functions)

- Make Crew Assignments, Record Names, and Review Chain of Command
- Make Equipment Assignments and Physically Test Equipment Prior to Ignition
- Assign Radio Frequencies and Physically Test All Radios Prior to Ignition
- Review Contingency Plan, Wildfire Conversion, Procedures, and Mitigation
- Review Everyone's Personal Protective Equipment
- Discuss Probable Starting and Ending Times
- Assure Everyone Knows Position, Responsibility, and Procedures

SIGNED

DATE

Prescribed Fire Burn Boss

ELEMENT 11 - ORGANIZATION AND EQUIPMENT

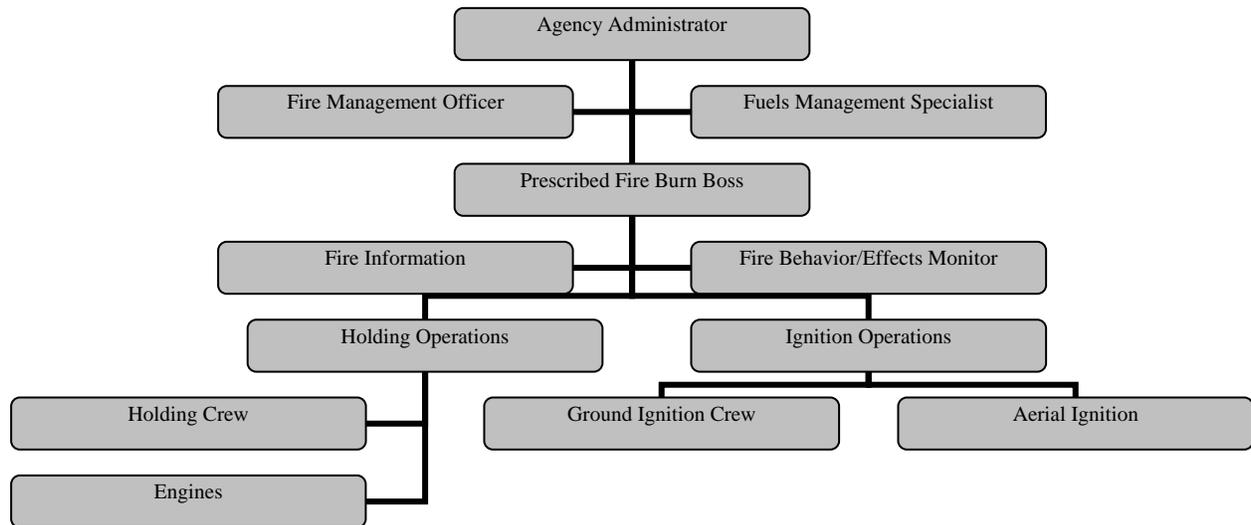
Minimum Workforce & Equipment Needed to Conduct Burn							
A. Positions							
Position	ICS Code or Unit of Measure	Low		Desired		High	
		Total Amount	Line Building Rate	Total Amount	Line Building Rate	Total Amount	Line Building Rate
Prescribed Fire Burn Boss	RXB2	1	0	1		1	
Firing Specialist Function	FIRB	*1		1		1	
Holding Specialist Function	Single Resource Boss	1		1		1	
Fire Effects Monitor	FEMO	0		1		1	
Lookout	Specify Qual.	0		0		0	
Engine Boss, Operator, and Crew	ENGB/ENOP	0		0		0	
Ignition Crew	FFT2	*2	6	*5	15	*5	15
Holding Crew	FFT2	2	0	5	15	5	15
B. Equipment							
Engine (VI)		1	10	2	20	2	20
Engine (IV)		0		1	10	1	10
Helicopter		0		1		1	
Helitorch		0		1		1	
C. Supplies							
Drip Troches		5		5		5	
Chain Saws		2		2		3	
Hand Tools		5		5		5	
Fuel-Hand ignition		25 gals.		50 gals.		50 gals.	
Portable		0		1		1	

Project Name:	Elkhorn 2/Savory	Unit Name:	
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Water Tanks						
Total Line Production Rate		16		60		60

Fuel Model (FM 6), the resources production rates will not be sufficient during the burning phase due to type of fire behavior that is required to achieve objectives in the pinyon/juniper crowns. FM 6 may over predict the Rates of Spread (ROS) due to in most places there is not sufficient surface fuels to promote the predicted ROS. Flame lengths would be averaged; as desired fire behavior is high intensity (crowning and torching) may temporarily produce flame lengths greater than 12 feet for short durations. Ignition Crew will be utilized as holding crew as needed. Calculations were taken from the Fireline Handbook Appendix A based on Fuel Model 6. Ignition crew will also be holding crew.
 *If burning in low end of prescription then Burn Boss can act as Firing Boss also.

Organization Chart



The positions that will be required for implementation of these projects from the Burn Boss and down are TBA.

The organization to be utilized each day will be documented by the Burn Boss.

Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 12 – COMMUNICATION-Elkhorn 2 Unit

A. Radio Frequencies

Channel	Function	Frequency	Band Width	Assignment	Remarks
COMMAND					
1	TOF	RX: 169.875 TX: 169.875 Tone:	Narrow	Command	
1	TOF RPT	RX: 169.875 TX: 170.475 Tone: 167.9	Narrow	Command RPT	
TACTICAL					
	R4 SOA	RX: 168.775 TX: 168.775	Narrow	Holding	
	Crew	RX: 168.200 TX: 168.200	Narrow	Ignitions	
		Tx: Rx:			
AIR OPERATIONS					
	Primary A2G	RX: 163.175 TX: 163.175	Narrow	Discrete	Burn Boss, Firing Boss and air operations only
	2 nd A2G	RX: 170.000 TX: 170.000	Narrow		Use if primary is tied up with other incidents.
OTHER					
		RX: TX:			
		RX: TX:			
REMARKS					
<p>If aerial ignition is used, assign a specific radio frequency for use between aircraft and Prescribed Fire Burn Boss and/or Firing Boss.</p> <p>Designated A/G frequency will be utilized only by the helispot crew, Burn Boss, Firing Boss and in case there is an emergency with the aircraft.</p>					

Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 12 – COMMUNICATION-Savory Unit

B. Radio Frequencies

Channel	Function	Frequency	Band Width	Assignment	Remarks
COMMAND					
1	BLM	RX: TX: Tone:		Narrow	Command
1	BLM RPT	RX: TX: Tone:	171.725 168.275 203.5	Narrow	Command RPT Prospect
TACTICAL					
	R4 SOA	RX: TX:	168.775 168.775	Narrow	
	Crew	RX: TX:	168.200 168.200	Narrow	
		TX: RX:			
AIR OPERATIONS					
	Primary A2G	RX: TX:	163.175 163.175	Narrow	Discrete Burn Boss, Firing Boss and air operations only
	2 nd A2G	RX: TX:	170.000 170.000	Narrow	Use if primary is tied up with other incidents.
OTHER					
		RX: TX:			
		RX: TX:			
REMARKS					
<p>If aerial ignition is used, assign a specific radio frequency for use between aircraft and Prescribed Fire Burn Boss and/or Firing Boss.</p> <p>Designated A/G frequency will be utilized only by the helispot crew, Burn Boss, Firing Boss and in case there is an emergency with the aircraft.</p>					

Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 13 - PUBLIC AND PERSONNEL SAFETY AND MEDICAL

A. Safety Hazards

Firefighter

These projects will meet all Forest Service safety guidelines. The Burn Boss will monitor compliance to safety standards. A Job Hazard Analysis and Project Aviation Safety Plan's for these projects are included in the appendix of this plan and will be reviewed by personnel on site. All personnel in the project area will wear PPE, carry a fire shelter and will be qualified for the position they are holding on the projects.

Public

If it is deemed necessary by the District Ranger and/or Burn Boss, road guards will be placed on the roads that lead into project. The road guards will make contact with any public coming into the area and inform them of the project and where the burning is taking place. They will record all contacts and where these people are planning to go. The public will be informed of the project and the hazards associated with the burn through the local public information officer. Prior to ignition the Burn Boss will do a thorough recon of the project area to insure that there are not people within the project and surrounding areas.

B. Measures Taken to Reduce the Hazards

Fire personnel will follow the **Ten Standard Fire Orders and 18 Situations That Shout Watch Out** and will be redcarded for the position that they are working in.

Road guards at roads leading into the project areas.

Public will not be allowed in project areas during the ignition phase or areas that are deemed unsafe for their travel.

Project Name: Elkhorn 2/Savory	Unit Name:
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C. Emergency Medical Procedures

In the event of serious accidents or injuries, the Burn Boss shall be notified immediately. Individuals with medical qualifications (i.e. First Responder, EMT, and Paramedic) and helitack qualified should be identified at the pre-burn briefing. The Burn Boss will initiate on-site response (if not already in progress) and coordinate additional response needs (listed below) through:

D. Emergency Evacuation Methods

FIELD SITE

MEDICAL EMERGENCY AND EVACUATION PLAN

Project Name: Elkhorn 2/Savory

Work Site Location (*include legal description*) Elkhorn 2; Helispot location on road that runs along the base of the west side of the Monitor range. T9N R47E Section 20 Savory; Junction of Savory and Little Savory Creeks- T13.5 R50E Section 31 _____

To prepare for an emergency which requires first aid, and/or immediate evacuation of personnel due to serious illness or injury, the following information should be predetermined, and available to all crew members:

DESIGNATED FIRST AID PROVIDER(S):

(*At least one person on each crew should be designated to provide first aid*)

TBA on day of burning

COMMUNICATION PROCEDURES TO FOLLOW IN THE EVENT OF AN EMERGENCY:

MEANS OF COMMUNICATION: Radio, cell phone or Sat. phone.

RADIO CHANNEL: TBA on day of project PHONE NUMBER: 775-623-1555 _____

HOME BASE: TBA

HOME BASE EMERGENCY COORDINATOR: CNIDC: 775-623-1555

EMERGENCY SERVICES: See attached medical contact sheets.

PHONE NUMBER: 911

HOSPITALS: Determined by project area that implementation is taking place.

PHONE NUMBER: Nye County Sheriffs 775-482-6233

(Air evacuation should be obtained through the SO dispatcher, if needed.)

EMERGENCY EVACUATION TRAVEL ROUTES: Helispots designated- Elkhorn 2: Lat. 38.34.24 Long. 116.41.50

Savory: Lat. 38 56.54 Long. 116 19.50

Travel route will be determined on type of injury and location of facility to treat injury.

CREW MEMBERS SHOULD PROVIDE THE FOLLOWING WHEN CALLING FOR ASSISTANCE:

- nature of injury or accident (do not broadcast victim(s) name(s);
- type of assistance needed;
- number, and (for air transport) estimated weight, of persons to be transported;
- location of injured, using landmarks identifiable on ground and/or map;
- current information about weather and travel hazards/obstacles;
- (Crew should remain in contact with home unit until evacuation team arrives, if possible.)
- Copies of this plan should be provided to crew leader(s) and Home Base Coordinator(s), prior to beginning work;

E. Emergency Facilities

Medical Emergency

This is a life threatening injury or illness. One or more major body systems (Respiratory, Circulatory, and Neurological) are involved. This patient needs advanced life support (ALS). Definitive care for this patient is a Trauma or Burn Center. TIME IS OF THE ESSENCE! Air transportation should be considered early.

ALS Air Transport

Other criteria for air medical transport is: lengthy extrication of the patient from the accident site, terrain or road conditions restrict ground transportation.

Rotor Wing: Rotor wing air ambulances have a 150 mile response area based on one fuel cycle. If injury location is outside of response area helicopter will have to refuel en-route.

■	Access Air	Elko	775-777-7300	1 Patient	Night Capability
■	REMSA Careflight	Reno, Nv	775-858-6000	1 Patient	Night Capability
■	LDS Life Flight	Salt Lake City	801-321-1234	2 Patient	Hoist & Night Capability
■	Med Flight	Las Vegas	800-842-4431	2 Patient	Night Capability
	*Military	Nellis, NAS Fallon	800-851-3051	Multiple	Hoist & Night Capability

*Military does not require pre-approval, call Fallon direct.

Project Name: Elkhorn 2/Savory	Unit Name:
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Fix Wing: Fix wing air ambulances have a large response area and fuel is not normally a factor. Consider ordering a fix wing along with a rotor wing if more than one patient.

- | | | | | | |
|----------------------|----------------|--------------|---------------|-----------|-------------------|
| ▪ University of Utah | Salt Lake City | 800-453-0120 | Pilatus PC-12 | 3 patient | Dirt Runway |
| | Salt Lake City | 801-321-1234 | King Air B200 | 1patient | Paved Runway Only |
- | | | | | | |
|----------------------|-----------|--------------|-----------------------|----------|-------------------|
| ▪ American Medflight | Reno, Nv | 775-856-2003 | Cheyenne King Air 20, | 1patient | Paved Runway Only |
| | Las Vegas | 800-842-4431 | Learjet 35A, 35B | | Paved Runway Only |
- | | | | | | |
|---------------|-------|--------------|--------------------|----------|-------------------|
| ▪ Life Flight | Boise | 800-521-2444 | Piper Cheyenne III | 1patient | Paved Runway Only |
|---------------|-------|--------------|--------------------|----------|-------------------|

Airports:

- | | | | |
|---------------------------|------|-----------------------------|--------------------|
| ✈ Battle Mountain Airport | KBAM | 40° 35' 57"N, 116° 52' 27"W | Paved Runway, Fuel |
| ✈ Tonopah Airport | KTPH | 38° 03' 37"N, 117° 05' 15"W | Paved Runway, Fuel |
| ✈ Eureka Airport | O5U | 39° 36' 15"N, 116° 00' 18"W | Paved Runway, Fuel |
| ✈ Austin Airport | 9U3 | 38° 28' 05"N 117° 11' 43"W | Paved Runway |

Definitive Care

Definitive care is the most appropriate place a patient has to go. Medical emergencies need to go to trauma centers and burn patients to burn centers.

Trauma Centers

- | | | | |
|-------------------------|----------------|--------------|-----------------------------|
| ▪ University Med Center | Las Vegas | 702-383-2000 | 36° 09' 36"N, 115° 09' 56"W |
| ▪ University of Utah | Salt Lake City | 801-581-2121 | 40° 46' 34"N 111° 50' 24"W |
| ▪ LDS Hospital | Salt Lake City | 801-408-1181 | 40° 46' 6" N 111° 52' 70"W |
| ▪ Renown Health Care | Reno | 775-982-1181 | 39° 31' 02"N 119° 47' 25"W |

Burn Center

- | | | | |
|----------------------------------|----------------|--------------|-----------------------------|
| ▪ University of Utah Burn Center | Salt Lake City | 801-581-2700 | 40° 46' 34"N, 111° 50' 24"W |
| ▪ University Medical Burn Center | Las Vegas | 702-383-2268 | 36° 09' 66"N, 115° 10' 77"W |

Poison Control

- | | | |
|------------------------|-----------|--------------|
| ▪ University Hospital | Salt Lake | 801-581-2151 |
| ▪ Washoe Poison Center | Reno | 775-982-4129 |

Non Emergency Medical Transport

This is a non life threatening injury or illness. No major body systems (Respiratory, Circulatory, and Neurological) are involved. This patient can be handled with Basic (BLS), Intermediate (ILS), or Advanced life support (ALS). Definitive care for this patient is a local hospital or clinic. You have the luxury of time. Ground transportation is appropriate. If available and properly equipped, agency helicopters could be utilized for both treatment and transportation.

BLS, ILS, or ALS Ground Transport

Non Emergency Medical Patients can appropriately be transported to definitive care by Basic (BLS), Intermediate (ILS), or Advanced (ALS) life support units listed below.

● Battle Mountain Ambulance Service	Battle Mountain	3 units	BLS	775-635-9111
● Austin Ambulance	Austin	2 units	BLS	775-964-2870
● Eureka County	Eureka	2 units	BLS	775-237-5330
● Nye County	Tonopah	2 units	BLS	775-482-3501
● Elko County	Elko	4 units	ALS	775-738-4011
▪ Clark County Dispatch	Multiple Locations	Multiple	ALS	702-384-3400

Project Name:	Elkhorn 2/Savory	Unit Name:	
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Definitive Care

Definitive care is the most appropriate place a patient has to go. Non Emergency Medical Transports can be treated at local hospitals or clinics.

+	Renown Health Care	Reno, Nevada	775-982-4100	39° 31'02"N, 119° 47'25"W	Land @ helipad
+	University of Utah	Salt Lake City, Utah	801-581-2121	40° 46'34"N 111° 50'24"W	Contact SLC Tower 118.3
▪	Battle Mountain General	Battle Mountain	775-635-2550	40° 35'56"N 116° 52'27"W	Land @ airport (BAM)
▪	Nye County Regional	825 South Main Tonopah	775-482-6233	38° 03'37"N 117° 05'14"W	Land @ airport (TPH)
▪	Elko General	2001Errecart BL Elko	775-738-5151	40° 49'47"N, 115° 43'8"W	Land @ helipad
▪	Banner Community Hospital	Fallon, Nevada	775-423-7888	39° 28'03"N, 118°46'00"W	Land @ helipad

Law Enforcement

Highway Patrol

- Elko 775-753-1298
- Las Vegas 702-486-4100

Search and Rescue

- Lander County Sheriffs Office 775-635-5161
- Nye County Sheriffs Office 775-482-8101
- Eureka County Sheriffs Office 775-237-5252
- Elko County Sheriffs Office 435-882-5600
- Military Search and Rescue Langley (Requests can go
direct through this number no additional approval needed) 800-851-3051

ELEMENT 14 - TEST FIRE

A. Test Fire Provisions and Planned Location

Central Nevada Interagency Dispatch Center (CNIDC) will be notified of ignition of test fire. Upon dissemination of test fire results the Burn Boss will inform CNIDC as to whether the burn will be implemented or cancelled for the day.

A test fire will be used to verify that the fire behavior will achieve the objectives. The test fire will be located in a place in which the fire behavior can be measured against acceptable results. It will be done in a location which can easily be controlled or extinguished and should be representative of the general type of fuel and other conditions in the burn block under the actual weather conditions on the day of the burn. After ignition of the test fire the Burn Boss will assess the results, if **NOT** within parameters of the prescriptions, the Burn Boss will notify CNIDC, the District Ranger or Acting and Zone FMO of the determination **Not** to proceed with the burn and implement the necessary strategies and tactics for securing and holding the test fire. The Burn Boss will document as part of the project file: location, date, time, fuels at site, weather conditions, results, and whether the test fire meets the prescription parameters.

B. Test Fire Documentation

Location:

Date and Time:

Weather/Fuels Conditions	
Cloud Cover %	
Temperature	
Relative Humidity	
Fine Dead Fuel Moisture	
Wind Speed	
Fuels	

Test Fire Results	
Flame Length	
Rate of Spread	
Smoke Dispersion	
Other	

The test fire meets the prescription parameters	Yes		No	
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Project Name:	Elkhorn 2/Savory	Unit Name:	
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SIGNED

[Redacted Signature Area]

DATE

[Redacted Date Area]

Prescribed Fire Burn Boss

Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 15 - IGNITION PLAN

<p>A. Firing Methods & Devices</p> <p>Aerial ignition with helitorch is the first choice of ignition devices. If this method of ignition is not possible or desired, hand ignition can be used. The Burn and Firing Bosses will determine the appropriate method, procedures and patterns prior to ignition, based on the current conditions. The desired burn pattern will be documented and crews will be briefed on the specifics of the firing. Methods and procedures will be updated daily or as otherwise needed.</p>
<p>B. Ignition Techniques</p> <p>A combination of aerial and hand ignition techniques can be used to meet objectives. This will be determined by the Firing Boss and Burn Boss on the day of the burn.</p> <p>Savory-Hand ignition will be done in the Research plot. Technique would be to ignite all burnable vegetation within the research plot. Pattern will be determined day of burn due to wind and burning conditions.</p>
<p>C. Patterns & Sequences</p> <p>Elkhorn 2-The Burn Boss and Firing Boss will determine the best patterns and sequences to meet the objectives of the burn. The upper 2/3 of the slope is the main target areas, the desired patterned will be to start at the ridgelines and carry fire down slope to the east. This will minimize the chance of spots across the ridge to the west. No direct lighting will take place in the sage and mahogany stands.</p> <p>Savory-The research plot is the first priority to burn. Next area would be bringing fire from the north-northeast and work back to the south.</p>
<p>D. Ignition Staffing</p> <p>For aerial ignition; mixing crew, helicopter manager, Firing Boss, Burn Boss and Holding Boss. If utilizing hand ignition the number of lighters will be identified by the Firing Boss on the day of the burn. Once the Firing Boss has assessed the conditions on the day of the burn then the number of lighters will be identified.</p> <p>See Air Operations Plan for more information.</p>

ELEMENT 16 - HOLDING PLAN

A. General Procedures for Holding

Holding forces should be placed where they can monitor the fires progression and spots across the line. If fire crosses the project boundary then resources will observe the fire behavior and notify the Holding Boss who will come up with a plan of action. Due to the steep and inaccessible terrain resource will most likely just observe until fire behavior decreases and then an assessment will be made by the Holding and Burn Boss on a course of action.

B. Critical Holding Points and Actions

If spots occur across the line, resources will use an anchor and flanking tactic while keeping one foot in the black.

Elkhorn 2-House Canyon Rd. Crews will observe the fire in these areas and take anchor/flanking actions if needed.

Savory- Little Savory Creek, in meadow areas along creek edge. Crews will observe the fire in these areas and take anchor/flanking actions if needed.

C. Minimum Organization or Capabilities Needed

Minimum capabilities needed for holding are identified under Element 11 - Organization and Equipment. On burn day and subsequent days of the prescribed fire, a mix of the number and kinds of hand crews and engines may be modified as long as stated production capabilities are not compromised.

As the prescribed fire progresses from ignition to holding to mop up and patrol, specified capabilities and/or types of resources may be adjusted.

D. Mop-up and Patrol

This project is a category 3 mop-up (FSM Chapter 5140 – Fire use)

Definition of category 3 mop-up: Category 3 mop-up applies when the potential for an escape is extremely low. Category 3 mop-up standards are: Patrol and monitor until weather conditions eliminate the need or the burn is declared out.

Ultimately, the Burn Boss is responsible for this fire until declared out, however the mop-up responsibility can be delegated to the Holding Boss or other qualified person. The Holding Boss or designee and Burn Boss will evaluate, establish standards and prioritize burned areas for Mop-up, as needed. On a daily basis the Holding Boss or delegated person is responsible for evaluation of the escape potential, mop-up assignments (plan), and patrols until the burn is declared out by the Burn Boss. This information will be relayed to the Burn Boss at the end of shift. Use the daily Mop up shift plan form the documentation of weather, personnel, and equipment and daily events.

Burn units will be patrolled until the Holding Boss or designee and Central Nevada Zone FMO is satisfied that there are no potential for escape from the treated area or the fire is declared out.

The Holding Boss following completion of primary ignition in each area will use engine and or hand crew patrol in conjunction with aerial patrol as deemed necessary.

CONDITIONS FOR LEAVING PRESCRIBED FIRE UNSTAFFED:

1.

- If a wetting rain/snow have been received on site.
- High relative humidity recoveries (40-60%) overnight for 2 days
- No smokes have been seen for 2 days
- Pinyon/Juniper burning at high elevations has little to no smoke showing after day of burning.
- No active flame front, crowning or torching occurring.
- No negative smoke impacts.

2.
 - Pull onsite weather from weather stations(s) or sling weather. Continue to talk with NWS for short/long term trends.
 - Onsite observation on existing fire behavior and weather for 2 days after burning is complete.
3.
 - Pull current weather observations for 3 days after burning is completed and continue to talk with NWS for weather data and trends. If wetting rain/snow has been received, then the amount of days to be left unstaffed can increase until drying or wind events are predicted. At this point the need to re-access staffing will occur.

The burn unit should be checked on a regular basis following active ignition until declared out. Documentation of conditions should be made in a Unit Log with the below filled out following each check of the burn unit.

Date/Time Lines Checked	Who Checked	Method (air/ground)

Project Name:	Elkhorn 2/Savory	Unit Name:	
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ELEMENT 17 - CONTINGENCY PLAN

A. Trigger Points				
If any of the following situations occur, contingency action will take place:				
<ol style="list-style-type: none"> 1. Fire threatens the project boundary. 2. The fire behavior exceeds limits described in the prescribed burn plan. 3. Smoke impacting sensitive areas. 4. Fire effects are unacceptable. Objectives not being met. 				
B. Actions Needed				
<p>If threat to project boundary then a change in the firing pattern or stop ignition. If the fire behavior is exceeding the limits of the plan then change firing patterns and/or stop ignition or wait for different time of day continue ignition. If smoke is impacting sensitive areas then ignition maybe stopped, slowed down or a wait for change in the wind direction. If project objectives are not being met then ignition will cease until conditions are more conducive.</p> <p>If the contingency actions are successful at bringing the project back within the scope of the Prescribed Burn Plan, the project may continue. If contingency actions are not successful the end of the next burning period, then the prescribed fire will be converted to a wildfire.</p>				
C. Additional Resources and Maximum Response Time(s)				
Resource	Agency & Location	Maximum Response Time	Conformation of Availability*	
			Yes/No	Date
NDF Hand Crew	Tonopah	1.5 hrs		
Ely/ Interagency personnel	Ely	3 hrs		
H-T personnel		4 hrs		
Engine	BLM Austin	2 hrs		
Engine	BLM Eureka	2 hrs		
<p>* To be completed within one day of the burn and adjusted during course of extended burning conditions. Burn Boss and Firing Boss will make adjustments to contingency resources during low, moderate, high burning conditions.</p>				

ELEMENT 18 - WILDFIRE CONVERSION

<p>A. Wildfire Declared By</p> <p>An escape will be declared if on site holding forces cannot contain the fire within the project boundaries in the next burning period. Once an escape is declared, primary ignition will either cease until conditions moderate or ignition may continue as a suppression tactic in an attempt to influence the fire behavior and draw the fire intensity away from areas of concern.</p> <p>The Burn Boss will make the decision on whether to declare an escape within the next burning period. Any fire moving outside the designated block boundaries will be evaluated by the Burn Boss and Holding Boss to determine the potential for growth outside the project area and determine if suppression actions are necessary. If the fire is moving towards natural barriers or it is felt that it will not threaten the boundary of the project, then it will be allowed to burn itself out. The Burn Boss will advise the Zone Duty Officer and they will make this decision.</p>
<p>B. IC Assignment</p> <p>Should a wildfire be declared, the Prescribed Fire Burn Boss or Holding Boss will become the Incident Commander depending upon the complexity of the escape until relieved or replaced. The IC will organize all resources on-site for a safe and aggressive response. Personnel within the prescribed fire organization will transition into ICS wildfire positions they are qualified to carry out. The IC will order additional suppression resources identified in the Contingency Plan as well as any other required resources necessary to support the suppression effort.</p> <p>Upon a wildfire conversion occurring, all overhead personnel will begin to document actions taken on a Unit Log. After the incident is contained, the Prescribed Fire Burn Boss will submit a post fire report documenting weather, resources on site, ignition operations, holding actions, and other pertinent data.</p>
<p>C. Notifications</p> <p>The Prescribed Fire Burn Boss/IC will notify Central Nevada Interagency Dispatch Center (CNDIC) and the Central Nevada Zone Fire Management Officer (FMO) of the escape and identify himself/herself as the IC. FMO will then notify the District Ranger. Dispatch Center will notify contacts listed on the notification plan of the escape and the current situation.</p> <p>Burn Boss will notify Forest Duty Officer within 24 hours of an escape, threat of an escape, or activation of contingency resources identified in the plan, or any prescribed fire that requires additional resources.</p>
<p>D. Extended Attack Actions and Opportunities to Aid in Fire Suppression</p> <p>The appropriate management response will be used in order to stop the forward rate of spread. Containment strategy will be to utilize to identify safe anchor points, create direct fire line where feasible, indirect fire line as needed, including burning out, depending upon location of natural barriers, vegetation changes and roads. The FMO and/or IC, Resource Advisor, and Agency Administrator may develop a WFSA which will determine the appropriate management response to the escaped fire. The Wildland Fire Situation Analysis (WFSA) process is required when a wildfire escapes initial attack.</p> <p>Opportunities to aid in fire suppression include: utilize existing roads in the vicinity of the burn unit, moist drainages, and changes in fuel types.</p>

ELEMENT 19 - SMOKE MANAGEMENT AND AIR QUALITY

A. Compliance					
This burn plan complies with the Nevada Smoke Management Plan which is designed to meet the requirements of NRS445B. 100 through 445B.845, inclusive which deal with air pollution, and the requirements of the EPA Interim Air Quality Policy on Wildland and Prescribed Fire (May 1998).					
B. Permits to be Obtained					
Smoke Management Number:					
Nevada State Air Quality Documentation: Two Weeks Prior – Request for permit. Two Days Prior Notify Air Quality Division and received final approval before burn can be ignited.					
C. Smoke Sensitive Areas					
Identify any non-attainment or Class I airsheds within 15 miles:		Table Mountain Wilderness Area-Class 2 airshed			
Receptor	Direction	Distance	Receptor	Direction	Distance
Elkhorn 2- Belmont	E	7 mi	Savory-Eureka	NE	30
Elkhorn 2- Table Mt Wilderness	S	3-4 mi	Savory-Table Mt. Wilderness	SE	8-10 mi
D. Impacted Areas					
Elkhorn 2- Table Mountain Wilderness is 3-4 miles north of the project boundary. Belmont 9-10 miles west of project area with population of 12 permanent residences. Savory- Table Mountain Wilderness is 8-10 miles south-southwest of this project. The town of Eureka is approximately 30-35 miles southeast of this project.					
E. Mitigation Strategies and Techniques to Reduce Smoke Impacts					
Residual smoke from smoldering vegetation may continue into the evening and early morning hours. Residual smoke has the potential to be transported down slope as the air mass cools and when there is little to no mixing height (common at night). Most of the fuel (P/J, sagebrush and grass) will be consumed during the ignition phase. Some residual burning may occur but should be of short duration and should dissipate within approximately 12 hours or less. If residual smoke significantly impacts sensitive receptors the Burn Boss will implement mitigation measures to reduce or eliminate the problem. Mitigation measures may require reducing the number of acres burned per day, adjusting ignition timing/duration, moving ignition to more desirable burn units and/or waiting for more favorable atmospheric conditions.					
SASEM smoke dispersion computer model results: The SASEM model was run for a burn of approximately 2,500 acres per day. To accomplish project objectives burning will be conducted over several days to accomplish up to approximately 10,500 acres. At 2,500 acres per day there was no exceedence of the PM-10 standard (150 micrograms per cubic meter) except on stable days. There will be limited or no burning on stable days. Total PM-10 emissions per day would be approximately 193 tons or approximately 811 tons for approximately 10,500 acres. Due to the mosaic type of pattern for this burn, our range is 30-80% or 2,500 to 6,700 acres burned within the 10,500 acre unit. With this type of burn pattern our emissions will be lower than the model shows.					

Project Name:	Elkhorn 2/Savory	Unit Name:	
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Alternatives to burning were considered for this project. Mechanical treatment using equipment to masticate vegetation was considered as a possible alternative to prescribed burning and has been an accepted treatment method on many fuels reduction projects. For the following reasons prescribed fire was considered a more appropriate method of treatment on the Elkhorn Fuels project.

- 1.) The project area is within an ecosystem where wildfire has historically played a natural role. The use of prescribed fire is considered a more natural treatment than mechanical treatments.
- 2.) The cost difference is substantial especially for large acreage projects like the Elkhorn project. Approximately \$250.00 or more per acre for mechanical mastication compared to approximately \$100.00 per acre for prescribed burning.
- 3.) Mechanical treatments using tractors or heavy equipment are much more ground disturbing than prescribed fire. Due to the many prehistoric cultural resource sites (lithic scatters, etc.) within the project area prescribed fire was considered more desirable because there would be less impact to these sites.
- 4.) Much of the project area is mountainous with steep slopes. Tractors and heavy equipment have safety limitations on steep slopes (they roll over). The steeper areas could not be treated mechanically due to safety concerns. Prescribed fire can be effectively and safely used on steeper slopes.

Prescribed fire was considered a good alternative compared to other treatments and with proper implementation and compliance with the requirements of the Clean Air Act this alternative should meet the Forest's goals and objectives and have minimal impact to the States air quality.

Project Name: Elkhorn 2/Savory	Unit Name:
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ELEMENT 20 - MONITORING

<p>A. Fuels Information (forecast and observed) Required and Procedures</p> <p>Monitoring of the live fuel moistures, we will utilize the Nevada BLM Fuel Moisture website. During the implementation, observations will be documented on the weather, fire behavior, and smoke dispersion. Fly over and walk through of burned area after implementation to see the effects to the vegetation, cultural sites and soils. The burned area will be monitored by the fuels/vegetation specialists yearly. Throughout the project areas there are heat sensor tiles to monitor the effects of heat to the soil.</p> <p>Savory project there is a research plot that has pre-burn data and it will be monitored post fire for 5-7 yrs. Also within Savory, plot data was taken for the effects of burning to insect/disease infestations. Following the burn the plots will be inventoried.</p>
<p>B. Weather Monitoring Required and Procedures</p> <p>Weather observations will be taken and recorded on site by a FEMO throughout the implementation of the burn. Weather will be taken hourly or as directed by the Burn Boss. Weather will be monitored after the burn, utilizing onsite and/or portable RAWS located at Dansville Canyon.</p>
<p>C. Fire Behavior Monitoring Required and Procedures</p> <p>Fire behavior will be monitored and recorded by a FEMO throughout the implementation of the projects. Fire behavior will be recorded every hour or as directed by the Burn Boss.</p>
<p>D. Monitoring Required To Ensure That Prescribed Fire Plan Objectives Are Met</p> <p>Actual treated areas will be mapped and put into GIS. This may be done using on the ground Global Positioning System (GPS) units or unit within the helicopter.</p> <p>The thermal measurements will be documented by a designated person and the information gained from these will be shared with all necessary Humboldt-Toiyabe NF affected specialists.</p> <p>Photo points will be taken in the places that they were taken during the pre-burn and placed in the burn folder for documentation.</p>
<p>E. Smoke Dispersal Monitoring Required and Procedures</p> <p>Smoke dispersal will be observed and recorded by a FEMO during the implementation phase of the project and for a couple of days after the burn has been completed.</p>

ELEMENT 21 - POST-BURN ACTIVITIES

<p>Post-Burn Activities that Must be Completed</p> <p>Burned declared out.</p> <p>Mapping of treated areas and put into GIS layer. Yearly monitoring of effects to the watersheds.</p>

**PRESCRIBED BURN
DECLARED OUT**

**DATE
TIME**

RXB1, RXB2, RXB3
(circle appropriate Qualification)

Project Name:	Elkhorn 2/Savory	Unit Name:	
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APPENDICES

- A. Maps - Vicinity and Project**
- B. Technical Review Checklist**
- C. Complexity Analysis**
- D. Risk Assessment - Job Hazard Analysis**
- E. Fire Behavior Modeling Documentation or Empirical Documentation (unless it is included in the fire behavior narrative in Element 7; Prescription)**
- F. Air Operations Plan (if applicable)**
- G. Prescribed Fire Post Burn Evaluation**
- H. Weather / Fuels / Fire Behavior / Smoke Observations**

Project Name:	Elkhorn 2/Savory	Unit Name:	
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APPENDIX A - MAPS

1. Vicinity Map

Project Name:	Elkhorn 2/Savory	Unit Name:	
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2. Project Map

APPENDIX B - TECHNICAL REVIEWER CHECKLIST

Project Name:	Elkhorn 2/Savory	Unit Name:	
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APPENDIX D - RISK ASSESSMENT / JOB HAZARD ANALYSIS

**APPENDIX E - FIRE BEHAVIOR MODELING DOCUMENTATION OR
EMPIRICAL DOCUMENTATION**

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APPENDIX F - AIR OPERATIONS PLAN

DRAFT

APPENDIX G - WEATHER / FUELS / FIRE BEHAVIOR / SMOKE OBSERVATIONS

Weather and Fuels										
OBSERVATION TIME (24 HR)										
SLOPE (%)										
ASPECT										
ELEVATION (FEET)										
FUEL MODEL (1-13)										
SHADING (<50% or >50%)										
DRY BULB TEMPERATURE (°F)										
WET BULB TEMPERATURE (°F)										
RELATIVE HUMIDITY (%)										
EYE LEVEL WIND SPEED (MPH)										
WIND DIRECTION										
CLOUD COVER (%)										
1-HR FUEL MOISTURE (%)										
Fire Behavior										
FIRE (HEAD, FLANK, BACKING)										
AVERAGE FLAME LENGTH (FT)										
MAX. FLAME LENGTH (FT)										
RATE OF SPREAD (CH/HR)										
TORCHING/CROWNING (Y or N)										
FIRE WHIRLS (Y or N)										
SPOTTING (Y or N)										
SMOKE DIRECTION										
SMOKE RISE										
Notes:										
OBSERVER NAME:							DATE			

APPENDIX H - PRESCRIBED FIRE POST BURN EVALUATION				
Burn Unit	Date(s) Burned		Acres Burned	Ignition Start Time
Weather and Fuel Conditions				
	Time of Ignition	Low	High	
Temperature				
Relative Humidity				
1-hr Fuel Moisture				
10-hr Fuel Moisture	100-hr Fuel Moisture	1000-hr Fuel Moisture	Days Since Significant Precipitation	
Wind Direction (Average)	Wind Speed (Average)	Percent of Fuel Consumed	Ignition Duration (min.)	
Accomplishment of Fuels Treatment Objectives				
Overall Objectives Achieved:		Yes		No
Short Term Results (include changes in fuel profile and fire regime condition class)				
Cost Evaluation				
Burn Plan Preparation	Site Preparation	Burn Operation	Total Burn Costs	Cost/Acre
\$	\$	\$	\$	\$
Narrative – Prescribed Fire Burn Boss Comments				
i.e. operations, safety, fire behavior, personnel & equipment performance, logistics, smoke management				

Prescribed Fire Burn Boss		Date	

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