<https://www.frames.gov/smoke/management/smoke-contacts> National Smoke Contacts

<http://wrapair2.org/Map.aspx> Western Region Smoke Programs

<https://www.nwcg.gov/sites/default/files/publications/pms477.pdf> Smoke and Roadway Safety Guide

<https://www.nwcg.gov/sites/default/files/publications/pms477-1.pdf> Smoke and Roadway Pocket Card

Sample language for smoke in burn planning, including contingency plan, smoke element 19, and complexity analysis

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| **Element 17 Contingency Plan, Smoke MAPs –three examples** |

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| **Management Action Point** | **Management Action Point Narrative** |
| Designator and Description: | **Smoke impacting specific sensitive receptors.** |
| Condition: | Dispersion of smoke does not correlate with forecast and will not clear area. Smoke is impacting the SUFCO Mine air in-takes located in Link Canyon and North Fork Quitchupah Canyon. |
| Management Intent: | Minimize smoke impacts to sensitive smoke receptors (SUFCO Mine and associated air shafts). |
| Recommended Action(s) to Consider: | 1. Notification of relevant mine personnel of expected severity and duration of impacts, see element 9C. 2. Consider ceasing ignitions in afternoon to allow maximum amount of time for smoke to clear before diurnal effects cause smoke to settle into sensitive areas. 3. Consider modifying ignition techniques or patterns. 4. Consider ceasing ignitions, except as required to secure fire line. 5. Consider limiting fire spread. 6. Consider suppressing and/or mop-up of fire in critical areas. 7. Consider holding further ignitions until more favorable conditions. |
| Recommended Resources: | On scene resources + additional contingency resources appropriate to fire behavior and suppression tactics. |
| Time Frame: | As soon as actions can safely reduce smoke production. |
| Describe the consequences of not taking the recommended action(s) (Optional): | Potential shutdown of SUFCO Mine operations. Adverse effects to fire fighters and public. |
| Responsibility: | Burn Boss, Ignition Specialist, Holding Specialist. |
| Date Each Action is Initiated (Optional): | |
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| **Management Action Point -** | **Management Action Point Narrative** |
| Designator and Description: | **Smoke levels higher than expected in communities**  Should smoke in any adjacent community reach a level exceeding air quality standards, additional operational and communication actions may be taken to protect the public. |
| Condition: | Smoke is impacting monitors or sensors in Snyderville or other real-time monitors at “orange” or worse levels for more than two hours. -OR- The front desk is receiving significantly out of the ordinary complaints from nearby residents. -OR- Through observation, burn personnel determine these actions are wise or applicable. |
| Management Intent: | Impacts to the local area(s) are expected to be minimal and of short duration. If smoke becomes a nuisance or health hazard to nearby public, actions will be taken to reduce the impacts of smoke produced from the prescribed fire. |
| Recommended Action(s) to Consider: | In the event of significant smoke impact, the burn boss will make the decision as to whether ignition operations should be terminated, or altered. The burn boss, ignition specialist and FEMO will continually assess smoke impact throughout the duration of the burn. The overall smoke impacts are expected to be minimal and of short duration. If the smoke management objectives cannot be met, ignition operations may be terminated, except as needed to secure the burn, and mop-up may occur to minimize the impact.  Courtesy notifications of impacts and plans to mitigate may need to include:  Homeowner’s association  County commissioners  Air Regulators  Local health department |
| Recommended Resources: | Recommended resources will be determined based on needed action (mop-up, suppression, outreach). Recommended operational contingency resources could assist with smoke mitigation actions if appropriate. If deemed appropriate, additional or expedited mop up standards should be implemented by the burn boss to mitigate smoke impacts.  Notification of partners about smoke-specific impacts, especially those partners not usually included on the burn notification list, can be coordinated through the unit public affairs office. |
| Time Frame: | 2 hours |
| Describe the consequences of not taking the recommended action(s) (Optional): | In the event of significant smoke impact, consequences include souring of community relations and regulatory issues with DEQ. |
| Responsibility: | Burn Boss, and designated personnel. |
| Date Each Action is Initiated (Optional): |  |

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| **Management Action Point - Documentation Element** | **Management Action Point Narrative** |
| Designator and Description: | **Smoke causing road/highway visibility concerns**  Public and firefighter transportation safety could be at risk due to reduced roadway visibility on Hwy 6, I-15, or surface streets. |
| Conditions: | Consider taking actions if any of the following are true:  A road 10 miles or less from the fire perimeter has smoke being transported towards it at ground level (via drainage or direct transport).  Smoke is beginning to impact a roadway.  Nighttime inversion conditions are forecasted or anticipated.  Fire is burning adjacent to a road.  Weather conditions are approaching thresholds that support smoke induced fog/superfog formation.  There are cumulative impacts of multiple fires on roadways in the area. |
| Management Intent: | It is mandatory to maintain roadway safety by evaluating reduced roadway visibility and implementing actions to reduce driving hazards. |
| Recommended Action(s) to Consider: | Possible actions: additional signs, use of occupied or unoccupied lighted fire/emergency/LE vehicles.  The following additional actions may be necessary but require coordination with local law enforcement: reduced speed limits, pilot car systems, partial lane closures, road closures, |
| Recommended Resources: | Recommended resources will be determined by the burn boss or designated personnel, based on needed actions. Examples:   * Four road monitors with radios. * Two pilot cars and road guards. * Two electronic message signs.   If deemed appropriate, additional or expedited mop up standards could be implemented by the burn boss to mitigate smoke impacts. Utah Highway Patrol may need to be involved if smoke is impacting visibility on Hwy 6 or I-15, and Union Pacific if the railroad is impacted. |
| Time Frame: | Situational, could require urgent/ASAP actions. |
| Describe the consequences of not taking the recommended action(s) (Optional): | Serious potential safety hazard for public and fire personnel. |
| Responsibility: | Burn Boss, who may possibly designate FEMO, Ignition Specialist, Holding Specialist, or others in the burn organization for specific roles. |
| Date Each Action is Initiated (Optional): |  |

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| **Element 19 E Mitigation Strategies to Reduce Smoke Impacts –examples in paragraph form** |

Transport winds are generally out of the Southwest and will be acceptable for this project if smoke is lifting at least 2,000 ft. above ground level. Other transport directions (northerly component) will also be acceptable but are rare events. Notifications would include all three Class I areas within the general vicinity of burn (Bryce, Zion and Grand Canyon National Parks). Ignition operations will occur with a clearing index of 500, although an index over 1000 is desirable. De minimus burning involving the blacklining phase (20 acres or less) can be conducted with a clearing index of 400 and additional smoke management approval from the State of Utah. To create conditions called for in the prescription, stable air will not meet objectives. Burn Boss will be in communications with the Salt Lake National Weather Service to determine conditions needed for ignition and smoke dispersion over the length of the project

Some residual smoke issues may develop in the evenings with cold air drainage and down slope winds. This is anticipated to be of short duration and very light due to the small size of the burn units. Most of the fuels will be consumed during the initial burning period because of the small fuel size class that makes up the dominant fuel type. Residual smoke should dissipate within 12 hours. The Utah Highway Patrol, Beaver County and Garfield Sheriff are included on the notification list and will be notified prior to the burn by CCIFC. Fire information personnel will maintain contact with the burn boss during ignition operations and through any activity that generates smoke in the area.

If the smoke is compromising road visibility, or dispersal is unfavorable the burn boss will coordinate with the firing and holding bosses and discuss possible solutions. The burn boss will resume firing operations when smoke dispersal has returned to a favorable condition. One possible solution in dealing with unfavorable smoke dispersal would be to slow ignitions operations and/or cease ignitions until conditions become more favorable. If conditions warrant, the burn boss may contact a law enforcement officer or other party and have that person monitor the road and warn travelers of the associated safety hazards.

Prescribed fire vehicles will be required to travel with their lights (red overheads if available) on during the burn to minimize the risk of collision. “Smoke ahead” signs will be posted along Highway 16 and 39 during ignition to warn drivers of the potential for reduced visibility. Ignition will cease and extensive mop-up will commence if conditions create an environment that is not safe for traffic on Highway 16 and 39 (if visibility estimates are less than 500 feet). Rich County Dispatch will be contacted through the Northern Utah Interagency Fire Center if road closures are deemed necessary. Smoke production and drift will be monitored by the FEMO and observations will be broadcast to the burn boss as needed. The observations of the smoke plume will also be recorded on the fire behavior and weather observation form and kept as part of the project file.

Smoke risk assessment/mitigations: Ignition day dispersion will be good or better. Clearing index forecasts indicating diminishing clearing will be assessed and cease ignition time frames will be adjusted when practical to avoid impacts. General cease firing timeline considerations are:

(Excellent ventilation) 1-2 hrs,

(Good ventilation) 2-3 hrs,

(Fair ventilation) 3-4 hrs

before sundown each shift. General timelines will vary by fuel type, consumption rates, season and objectives for each project.

Daily pre-burn evaluation includes the predicted clearing index for the following days. If forecast is calling for diminishing clearing, evaluate smoke patterns, current clearing, unit size, and fuel loading for smoke production overnight. If needed (and feasible) bone pile smoldering fuels to increase flaming stage therefore reducing smoldering emissions.

The burn boss will assign specific personnel to monitor smoke columns and direction. Public notifications, warning signs and ceasing ignitions earlier within the burn period during higher smoke emissions to allow for better smoke clearing will help mitigate possible nighttime smoke impacts on communities listed above and the Richfield and Sevier Valley areas. If smoke becomes an issue, rapid mop-up may be employed to reduce community impacts.

The Bum Boss will take into account dispersion forecast, fuel loading, and time of day before ignition.

Adjacent landowners will be contacted prior to burning and informed of potential smoke accumulation. Spot weather forecasts will be requested to determine the potential and duration of smoke in the area.

Ignition will end as early as possible in the day to allow for the best dissipation before the evening cooling period.

Visibility hazards could occur on the roads associated with the Flaming Gorge National Recreation Area, during both project implementation and during diurnal down slope/down canyon wind events. A southwest flow aloft and up canyon/up slope winds during project implementation would limit these aforementioned effects. Flaming Gorge Reservoir is the main concern with smoke settling into the canyon and lake after the burn is completed for the day.

Signs notifying both travelers and residences of smoke impacting the roads and airshed will be placed on all roads entering the project area. These signs will be posted during all times of project implementation and for the remainder of time in which residual smoke is in area. Public notification will be established, generally via radio and newspaper. When possible, ignition operations will be stopped early to allow smoke to dissipate prior to development of evening down canyon winds.

Smoke production will be monitored for safety concerns and appropriate tactics used to manage smoke will be determined by the burn boss. Mass ignition of piles may be employed in order to lift the smoke as high into the transport winds as possible. Chunking will be employed in order to keep the piles burning hot and reduce the likelihood of smoldering. In order for piles to completely consume and reduce the smoldering phase the Burn Boss will ensure that ignitions stop early enough to allow the active piles to be monitored and chunked. Aggressive mop-up of smoke producing piles may occur to mitigate the smoke hazard. Weather and the smoke dispersal may limit the amount of piles ignited at any one time or on any one day to minimize the intensity and duration of smoke and to provide for public safety. Past experience has shown that residual smoke is not an issue due to the nature of the fuel itself.

Spring Burn will occur before new fuels establish. The area has been mechanically treated reducing the

number of acres to be burned. The Forest Roads in the immediate area of the burn will most likely

experience some sort of impact. Roads will be monitored for smoke impacts and effects on health and

safety. Mitigations for smoke may include warning signs in the immediate area, public notification, temporary closure. The project area will be burned in the spring during the daytime lift to enhance transport and mixing. Most residual smoke will flow (daytime) towards Daniels Summit. Nighttime flow will be down Hobble Creek drainage.

To help reduce smoke impacts to the possible impacted areas, it is planned to increase combustion efficiency through the piling of activity fuels, and if possible that the piles are covered to keep dry.

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| **Appendix C Complexity Analysis Smoke Section – Two Examples** |

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| 6. Smoke Management | • Noticeable smoke will be produced creating at least some public concern. • Short-term health or safety concerns related to smoke exposure may occur if actual weather deviates from forecasted. • Nearby communities are highly conscious of smoke from wildland fire. • Some possibility for a NAAQS exceedance violation. • The prescription or ignition portions of the plan need to consider smoke management. |
| Smoke concerns are moderate but can be mitigated. Road signs will be posted in the vicinity of the burn warning of smoke in the area. Immediate area is behind a gated road with limited public access.  Normal coordination with air quality officials will be completed and some mitigation measures will be utilized. Smoke monitoring (ocular) will be required to determine smoke plume heights and directions. |

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| Element | Preliminary Risk | Post-Plan Risk | Risk Rating Descriptors | Elements and Actions in the RX Fire Plan that Address Risk Mitigation |
| Smoke Management | **Mod** | **Mod** | • Noticeable smoke will be produced creating at least some public concern. • Short-term health or safety concerns related to smoke exposure may occur if actual weather deviates from forecasted. • Nearby communities are highly conscious of smoke from wildland fire. • Some possibility for a NAAQS exceedance violation. • The prescription or ignition portions of the plan need to consider smoke management. | See element 19 for Smoke Management. Additional information for smoke modeling can be found in Appendix A (maps) and Appendix F (smoke modeling). |
|  |  |  | Smoke modeling using SASEM shows no exceedance of PM 2.5 or PM 10. BlueSky modeling shows that smoke will be noticeable throughout Emery county and will typically disperse to the north. Smoke is not expected to impact any Class 1 air-sheds or non-attainment areas. Smoke is not expected to negatively impact nearby communities for long duration. Smoke is expected to be light due to low intensity re-entry ground fire. Short duration smoke impacts to local communities of Emery and Ferron are anticipated. Careful consideration of wind direction will be required to minimize smoke impacts to the nearby SUFCO mine. |  |