

Protecting nature. Preserving life[™]



Why Do We Burn?









- Critical to monitor
- Can be manipulated by firing techniques
- Slower moving fires consume more fuel- produce less smoke
- Increase convection to lift smoke
- Smoke plume often determines technique
- Complete firing early in WUI



Three Basic Goals

- Identify and avoid smoke sensitive areas
- Disperse and dilute smoke before it reaches smoke sensitive areas
- Reduce total emissions from the burn





Smoke Screening

- Downwind smoke sensitive areas
- Down drainage at night
- Distance from fire



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Reduce

- Small burn units
- Ignition technique
- Weather conditions
- Mechanical treatments
- Burn more frequently





Redistribute



Manage the Convection





Factors Influencing Firing Choice

- Tactical gains
 - Speed, efficiency
 - Safety
- Resultant fire behavior
 - Control
 - Effect on resource
- Resource availability
 - Tools
 - Crew



The key to successful firing is to regulate the heat from the firing operation.













Backing Fire

- Reduces emissions
- Low smoke





Flanking Fire



















Concentric and Ring Firing







Point Source Ignitions and Interior Ignition





Dot Firing























Managing Smoke and Making Quick Black





Planning For Firing Operations

- Safety
- Tools required
 - Devices
 - Personnel
- Weather prescriptions: do you have a choice?
 - Rx or Burn-out
- Sequences
- Fire Effects



Weather Parameter	Acceptable Range	Forecast	Pre-burn	Mid-burn	Post-burn
Temperature	50 – 80 F	F	F	F	F
Relative Humidity	35 – 55 %	%	%	%	%
Mid-Flame Wind Dir	SE - SW				
MFWS	5 – 10 mph	mph	mph	mph	mph
20' Wind Direction	SE - SW				
20' Windspeed	10 – 20 mph	mph	mph	mph	mph
Transport Wind Dir	SE - SW				
Transport Windspeed	15 – 35 mph	mph	mph	mph	mph
Mixing Height	> 2000 feet	feet	feet	feet	feet
Haines Index	4 - 5				

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Fire Prediction Tools Appendix B and Behave

- Fine Dead Fuel
 Moisture
- Probability of Ignition
- Rates of Spread
- Flame Length





Atmospheric Stability

- Stable
- Unstable
- Inversions





Dispersion Index-on line weather forecast

- Greater than 100
- 61-100

- **41-60**
- 21-40
- **1**3-20

Very good

- Good, typical burning weather parameters are in this range
- Generally good
- Fair, stagnation if low wind speeds
- Generally poor



Wind

- Eye Level
- 20' Winds
- Transport Winds





Mixing Height and Transport Winds

- 3000' mixing height in the midwest
- 1700' in the southeast US (regional)
- Minimum transport wind of 9 mph
- Dispersion Index



Impacts to Fireline Personnel?

- Aldehydes

 (formaldehyde and acrolein
- Carbon Monoxide
- Benzene (found in drip torch fuel)





Symptoms of Overexposure (firefighter down)

- Headache, nausea, vomiting, impaired judgement, slowed reaction time
- Irritation of mucous membranes (snot)
- Extreme eye irritation, dizziness





Florida Fires

- Fatalities
- High traffic and interstate
- WUI





Mississippi Bus Crash



Fog not forecasted Signs were posted Chain reaction involving school bus and six other vehicles Poor communication between law enforcement and National Forest



Smoke Management Resources

- Iowa DNR-Excellent
 Smoke Management
 Guidelines
- NWCG
- TNC
- NWS-fire weather forecasts







