

### **HOLDING ACTIONS:**

The holding team will secure the fireline using handtools, water unit ATV's, engines, possible hose lays and backpack pumps. No night operations are planned. Ignition of these units will be completed in less than eight hours. The holding resources will follow up the ignitors immediately mopping up the line creating a cold line. Once the burn has been completed, the lines will be mopped up interior to 100 feet.

### **MOP-UP OPERATIONS:**

The fire will be mopped up at least 100' in from the lines as soon as possible. This will be done before all resources are released from the incident. No night operations are planned or anticipated.

Burn unit boundaries will be hand ignited with drip torches or atv torches. The unit interior will also be hand ignited with drip torches or atv torches at the direction of the Burn Boss with coordination of the Ignition Specialist.

### **M. WILDLAND FIRE TRANSITION PLAN**

1. If spot fires or slopovers occur, the Holding Specialist will initially supervise suppression actions.
2. If spot fires and/or slopovers cannot be controlled within one burning period with on-site resources the Burn Boss will convert the prescribed fire to a wildland fire. A Wildland Fire Situation Analysis (WFSA) will be completed. Any suppression actions will be in accordance with the Ozark National Scenic Riverways Fire Management Plan.
3. If the burn is converted to a wildland fire, the Burn Boss will make the declaration and assume the role of Incident Commander until relieved by an Incident Commander Type III (ICT3). An Incident Commander Type III will be ordered and used in the organization of the burn. The I.C. will immediately notify **Mark Twain National Forest Dispatch (573-341-7455) and WICR Superintendent** of the change in status to a wildfire and will order the appropriate resources. The I.C. will also complete a WFSA. Dispatch will order additional resources specified by the I.C., and suppression actions on the escape fire will be conducted using the most appropriate suppression response. Any suppression actions will be in accordance with the Wilson's Creek National Battlefield Fire Management Plan. On-scene individuals will be utilized and assigned to suppression positions.
4. If the Burn Boss is occupied on the escaped fire, the Holding Specialist will assume command of the prescribed fire, and begin operations to hold and mop-up the prescribed fire.
5. Water sources will be identified on the project map.

## **N. PROTECTION OF SENSITIVE FEATURES**

- A. Archeological features should not be impacted by the project, as control lines will be raked or mowed, as often as possible utilizing existing roads and trails, as no soil disturbance is anticipated during project preparation. Any cultural sites discovered during the pending survey requiring mitigation would be identified and prepared prior to ignition.
- B. No foam concentrate or solution will be handled, mixed, or sprayed within 50 feet of any water source.

## **O. PUBLIC AND PERSONNEL SAFETY**

- A. "Prescribed Burn-Do Not Report" and/or "Smoke Ahead" signs will be posted along ZZ Highway and Route 182.
- B. Traffic control will be conducted by assigned burn personnel and/or Park Rangers along the park road if smoke emissions are impacting driving visibility.
- C. A safety briefing will be given at the pre-burn briefing and at the start of each operational period. An Incident Action Plan describing burn operations, objectives, personnel/division assignments, and radio frequency information will be distributed to all personnel. A project map and spot weather forecast will be distributed, as well. All personnel will be advised of Lookouts, Communications, Escape Routes, and Safety Zones. Any potential safety hazards (power lines) will be pointed out.
- D. All burn personnel will wear standard fire fighting leather boots, Nomex clothing, leather gloves, and a hard hat. They will carry a fire shelter and a fire tool at all times.
- E. All standard wildland fire fighter safety rules will be strictly enforced (ref: Fireline Handbook).
- F. Ensure safety of FEMO with Burn Boss and maintain effective communication with ignition and holding teams.
- G. The public will be kept at a safe distance from the firelines. Authorized personnel must accompany all visitors and press.
- H. In case of an accident or injury involving fireline personnel or the public, refer to the Medical Plan (Appendix #16).
- I. Only red-carded personnel or cooperators who meet their own agency's qualifications will be utilized during the burn.

## 1. EMERGENCY MEDICAL PROCEDURES:

- EMT or First Responder assigned the day of the burn.
- First Aid equipment available and location made known to all burn personnel.
- Burn Boss notified immediately of injury.
- Burn Boss will coordinate with EMT/First Responder.
- Burn Boss will notify Park Dispatch of an injury and will follow up with information as soon as the injury has been assessed.
- EMT/First Responder will assess injury and begin treatment.
- Once injury has been assessed, the Burn Boss or designee will activate the appropriate EMS response for evacuation of injured personnel.
- If personnel need to be evacuated, park dispatches will dispatch/contact EMS resources from the following table or the Medical Unit Plan (ICS-206) located in the Appendix.

RESOURCE	CONTACT PHONE NUMBER	LOCATION
Cox Air Care	911	Springfield, MO.
Brookline VFD	911	Springfield, MO.

## P. SMOKE MANAGEMENT AND AIR QUALITY

### COMPLIANCE:

In the state of Missouri, prescribed fire is considered to be agricultural burning and there are no burn or smoke permit requirements. The Air Pollution Control Dept. of the Missouri Dept. of Natural Resources will be notified prior to the burn.

### MODELING:

Weather and Smoke Management forecasts will be obtained from the National Weather Service Forecast Office in Springfield, Missouri. A Smoke Trajectory Map has been completed to show the preferred wind direction in relationship to the critical receptors listed below.

### MITIGATION:

- A. Moderate smoke volume and/or decreased visibility may occur along the ZZ Highway, immediately west of the project, as well as on the county road 182. Park personnel will

assist with traffic control if visibility poses a safety problem for road traffic. Highway warning signs will be posted along nearby public roads.

B. Critical receptor points are:

- |                         |                   |
|-------------------------|-------------------|
| • Battlefield, Missouri | 3 miles northeast |
| • Republic, Missouri    | 3 miles northwest |
| • Springfield, Missouri | 6 miles northeast |
| • Nixa, Missouri        | 6 miles southeast |

C. If enough smoke does drift towards across the ZZ Highway, or other roads near the park, to impact traffic safety, the Burn Boss will determine if further burning operations should be suspended, if smaller strips should be ignited, or if traffic control should be initiated.

D. Considering the small area to be burned, little smoke impact to park neighbors and nearby communities is expected. Smoke along Highway ZZ is of greater concern than long-range smoke impacts; therefore the preferred wind direction is S to SW. Nighttime smoke will drift downstream along Wilson's Creek and the James River away from the critical receptors.

E. Smoke emissions and behavior will be continually monitored and documented on a smoke observation form. Any significant change in smoke emissions and/or column behavior will be reported to the Burn Boss.

F. All sensitive and critical areas were identified and smoke trajectories plotted. In the appendix a smoke trajectory map illustrates a smoke trajectory with the preferred north, west or east airflow.

G. Smoke concentrations will be minimized by burning with a daytime visibility of at least 15 miles, a minimum mixing height of 1100 feet, a transport wind speed of at least 9 mph, and a following nighttime forecast of no area fog.

## **Q. INTERAGENCY COORDINATION AND PUBLIC NOTIFICATION**

### **PRE-BURN COORDINATION ACTIONS & MEDIA RELEASES:**

A. Wilson's Creek National Battlefield staff will prepare a news release at least one week prior to the burn. A news release will be posted in nearby public places and will also be distributed to local media contacts.

B. Mandatory and optional notifications will be made on or prior to the day of the burn by the dispatcher as specified below.

C. The appropriate Sheriff's Offices will be notified on the day of the burn by the dispatcher.

D. The Missouri State Highway Patrol will be notified prior to the burn.

E. Affected adjacent landowners will be contacted the day before the burn by the dispatcher or Burn Boss.

- F. An Information Officer may be ordered for the burn if deemed necessary by the Fire Management Officer and/or Superintendent.
- G. Notify the Park Superintendent and/or Information Officer at least one week prior to the proposed ignition date.

**NOTIFICATIONS:** Located in the Appendix # 12

## **R. MONITORING AND EVALUATION PROCEDURES**

### **PRE-IGNITION:**

There are currently no fire effects plots utilizing NPS monitoring protocol located within the project boundary. The Prairie Cluster I & M Monitoring Crew are providing all long-term monitoring at this site.

### **DURING THE BURN:**

- A. During the burn, on site monitoring will be conducted by the lead FEMO and other assigned FEMO's. These people will be responsible for the collection and documentation of the following environmental parameters: temperature, relative humidity, mid-flame wind speed, flame length, flame height, flame zone depth, and rate of spread. These measurements will be made every 30 minutes or at the discretion of the Burn Boss.
- B. Fire monitoring on I & M Prairie Cluster plots will be conducted with the above information recorded. Fire monitor will take before and after photographs of plots at pre-determined photo points.
- C. I & M Prairie Cluster crew will monitor plots. Documentation of fire behavior will be included in post-burn summary. The fire monitor on the burn will prepare a fire monitor's report and submit to the Burn Boss or designated person.

**Transect Plots:** Established by Resource Management staff and/or the Prairie Cluster I & M crew.

**Photo Points:** Will be established by the Ozark fire effects crew.

- D. Monitors will maintain communication with the Burn Boss, Ignition, and Holding Specialists to ensure safe operations when working in the interior of the burn.

**POST-BURN:**

After the burn, a fire critique will be conducted by the Fire Management Officer, Burn Boss, selected members of the prescribed burn team, and the park staff to evaluate the level at which the burn objectives were accomplished.

**S. POST FIRE REHABILITATION**

- A. The fire staff will evaluate all temporary fire lines once the Burn Boss has declared the prescribed burn out. If it is determined that rehabilitation work is necessary, it will be completed with project funds within six months of burn completion.
- B. If any firelines are made barren of natural vegetation, leaves, needles, grass, or other native natural organic material will be replaced to encourage growth of vegetation.
- C. Branches will be placed across the lines in order to discourage their use as ATV or hiking trails.
- D. All flagging will be removed.

**T. POST FIRE REPORTS**

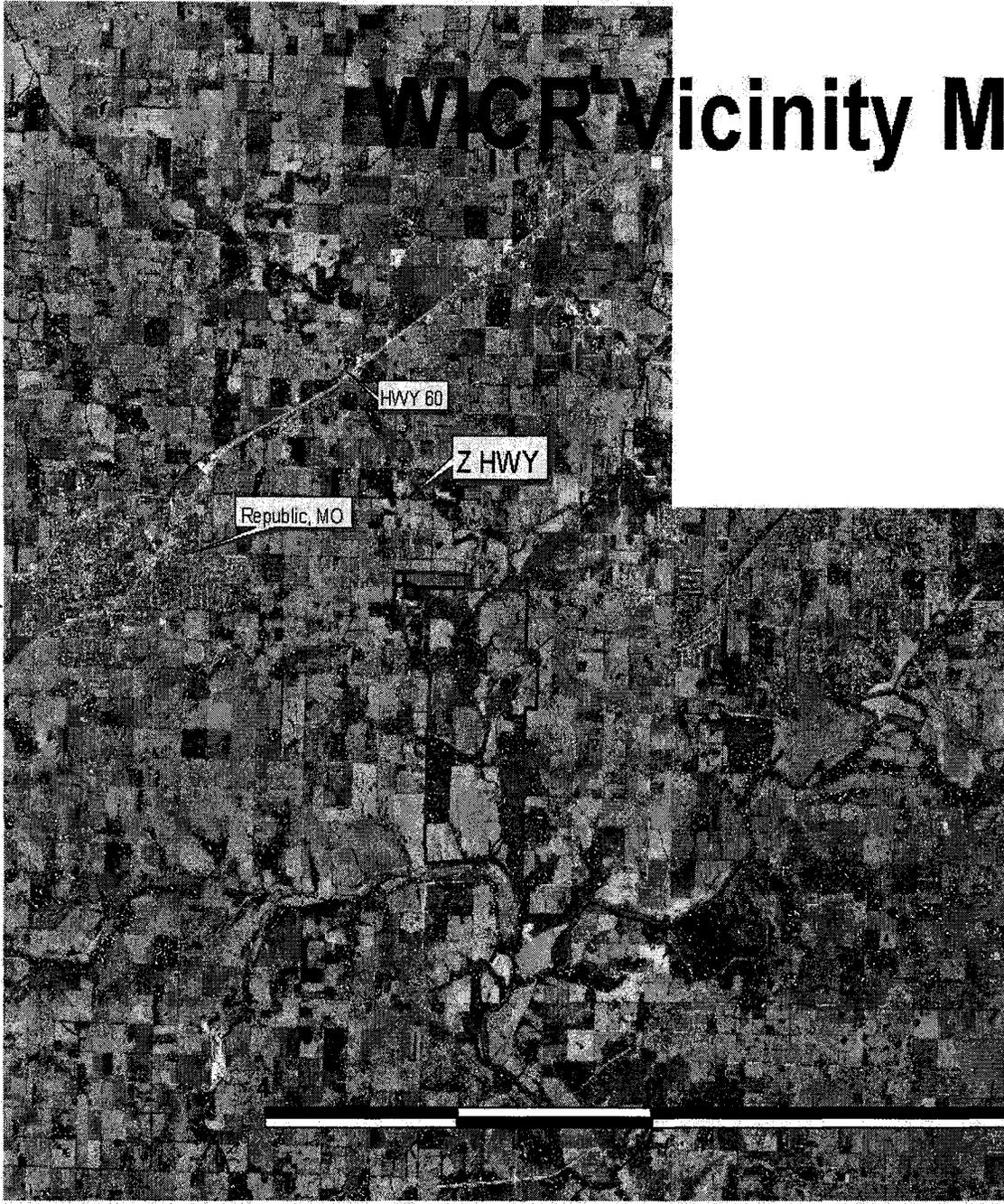
- A. The Burn Boss/I.C. and Lead FEMO will maintain an ICS-214's (Unit Logs) throughout each operational period.
- B. The Lead FEMO will prepare and submit an individual report that includes hourly weather, fire behavior and smoke observation data to the Ozark Fire Management Officer.
- C. The Burn Boss will prepare an Individual Fire Report, DI-1202, within five days of declaring the fire out.
- D. The Burn Boss will prepare a post burn report and submit a copy to the FMO along with a copy of the Fire Monitor report.
- E. The FMO will prepare a project accomplishment report in NFPORS and SACS.
- F. Ozark Fire Management staff will maintain a project file that includes the burn unit plan, spot weather forecasts, and all required reports.

<b>Documentation</b>	<b>YES</b>	<b>NO</b>	<b>N/A</b>
1. Original Signed Plan			
2. All Reviewer Comments			
3. All Maps			
4. Notification Checklist			
5. Permits			
6. Weather Forecast			
7. Smoke Forecast			
8. Agency Administrator Go/No Go Checklist			
9. Operational Go/No Go Checklist			
10. Daily Validation			
11. Unit Logs			
12. Enter into Prescribed Files by FPA			
13. 1202 Completed and Entered into SACS			
14. Other			

## **U. APPENDICES**

1. Maps (Vicinity and Project)
2. Smoke trajectory Map
3. Complexity Assessment
4. BEHAVE Projections
5. Agency Administrators GO/NO-GO
6. Operational GO/NO-GO
7. Job Hazard Analysis
8. IAP/Briefing Guide
9. Adequate Holding Resources Worksheet
10. Post Project Evaluation
11. Prescribed Monitoring Form
12. Pre-burn Notification List
13. Prescribed Fire Risk Analysis Worksheet
14. Hazard Rating Guide
15. Prescribed Fire Risk Mitigation Table
16. Medical Unit Plan
17. Communication Unit Plan

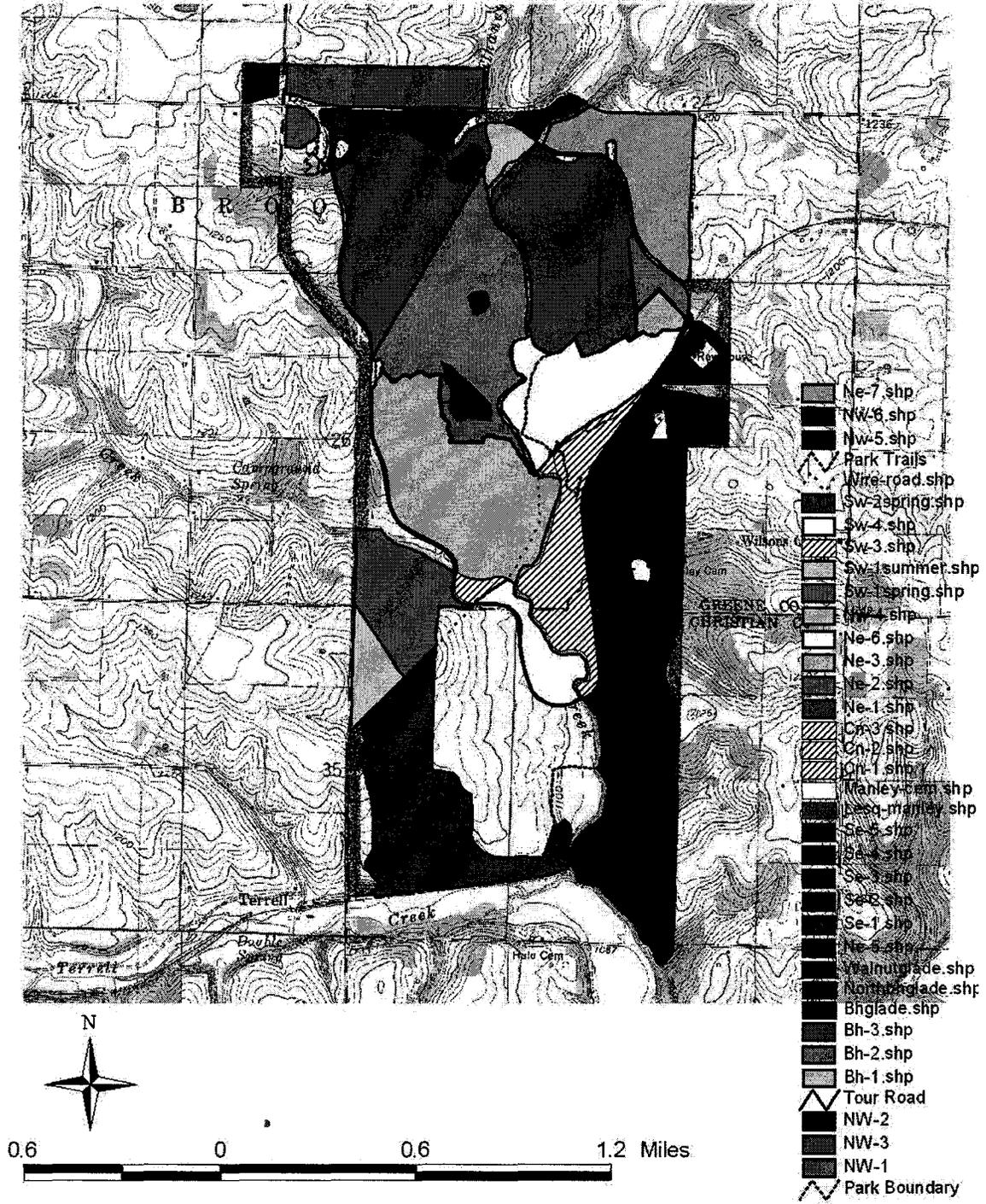
# WICR Vicinity Map



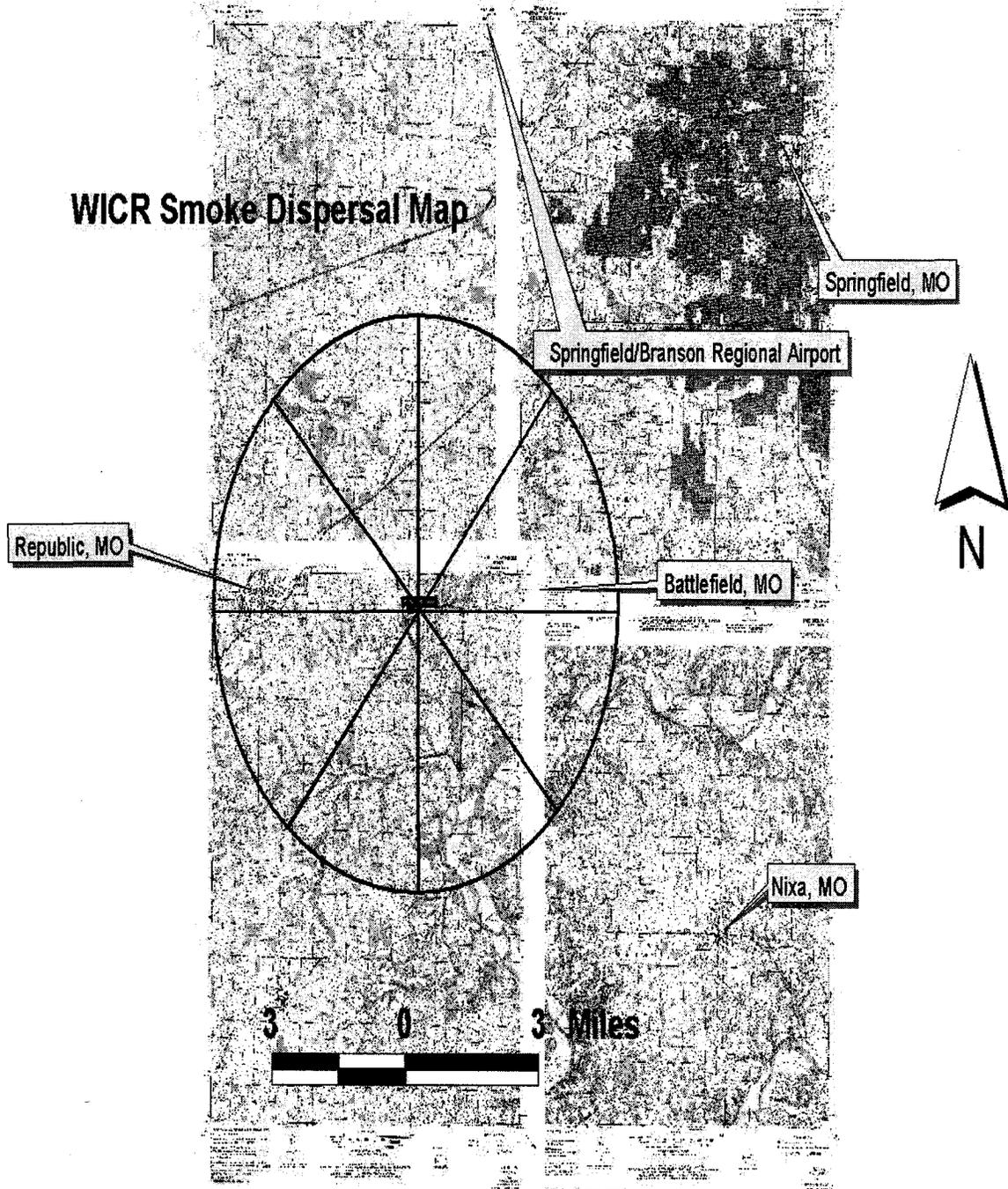
**APPENDIX #1**

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Prescribed Fire Units  
Wilson's Creek National Battlefield



**WICR Smoke Dispersal Map**



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**Appendix #3**  
**PRESCRIBED FIRE COMPLEXITY RATING WORKSHEET**

Complexity Element		Complexity Value		
		L	M	H
Primary Factors	1. Life and Safety	X		
	2. Threats to Boundaries	X		
	3. Management Organization	X		
	4. Political Concerns	X		
	<b>SUBTOTAL OF PRIMARY FACTORS</b>	<b>4</b>		
Secondary Factors	5. Objectives	X		
	6. Fuels and Fire Behavior	X		
	7. Air Quality Values	X		
	8. Improvements		X	
	9. Logistics	X		
	10. Natural, Cultural and Social Values		X	
	11. Tactical Operations	X		
	12. Interagency Coordination	X		
<b>SUBTOTAL OF SECONDARY FACTORS</b>		<b>6</b>	<b>2</b>	
<b>TOTAL COUNT OF COMPLEXITY VALUES</b>		<b>10</b>	<b>2</b>	

**QUALIFICATIONS DETERMINATION TABLE:**

	Prescribed Fire Burn Boss Type 2 (RXB2)	Prescribed Fire Burn Boss Type 1 (RXB1)
Primary Factors rated "H"	Less than 2	2 or more
	AND	OR
Total Count rated "H"	Less than 4	4 or more
		OR
	<b>Minimum</b> required on all prescribed fires.	When deemed appropriate by the agency administrator or unit Fire Management Officer.

<b>Prescribed Fire Burn Boss Level Indicated (check one):</b>	<b>RXB1</b>		<b>RXB2</b>	<b>X</b>
---	-------------	--	-------------	----------

PREPARED BY:  /s/ Bobby Bloodworth

DATE:  3/18/05

APPROVAL BY: \_\_\_\_\_  
Agency Administrator

DATE: \_\_\_\_\_

REVIEWED BY: \_\_\_\_\_  
(Burn Boss immediately prior to burning)

DATE: \_\_\_\_\_

Appendix #4  
Behave Projections  
Fuel Model 3

WELCOME TO THE BEHAVE SYSTEM  
 BURN SUBSYSTEM  
 FIRE1 PROGRAM: VERSION 4.4 -- FEBRUARY 1997

DEVELOPED BY: THE FIRE BEHAVIOR RESEARCH WORK UNIT  
 INTERMOUNTAIN FIRE SCIENCES LABORATORY  
 MISSOULA, MONTANA

YOU ARE RESPONSIBLE FOR SUPPLYING VALID INPUT AND FOR  
 CORRECTLY INTERPRETING THE FIRE BEHAVIOR PREDICTIONS.

ASSUMPTIONS, LIMITATIONS, AND APPLICATION OF MATHEMATICAL  
 MODELS USED IN THIS PROGRAM ARE IN:

Andrews, Patricia L. "BEHAVE: Fire behavior prediction and  
 fuel modeling system--BURN subsystem, Part 1", INT-GTR-194, 1986  
 Andrews, Patricia L., and Chase, Carolyn H. "BEHAVE: Fire  
 behavior prediction and fuel modeling system--BURN  
 subsystem, Part 2", INT-GTR-260, 1989

DIRECT

1--FUEL MODEL -----	3 -- TALL GRASS, 2.5 FT (75 CM)
2--1-HR FUEL MOISTURE, % --	4.0 5.0 6.0 7.0 8.0 9.0 10.0
7--MIDFLAME WINDSPEED, MI/H	.0 2.0 4.0 6.0 8.0 10.0
8--TERRAIN SLOPE, % -----	5.0
9--DIRECTION OF WIND VECTOR	.0
DEGREES CLOCKWISE	
FROM UPHILL	
10--DIRECTION OF SPREAD ----	.0 (DIRECTION OF MAX SPREAD)
CALCULATIONS	
DEGREES CLOCKWISE	
FROM UPHILL	

=====  
 RATE OF SPREAD, CH/H (V4.4)  
 =====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
	I	.0	2.0	4.0	6.0	8.0	10.0
(%)	I-----						
	I						
4.0	I	6.	47.	108.	180.	260.	346.
	I						

5.0	I	5.	43.	98.	163.	235.	313.
	I						
6.0	I	5.	39.	89.	149.	215.	286.
	I						
7.0	I	5.	36.	83.	138.	199.	265.
	I						
8.0	I	4.	34.	78.	129.	186.	248.
	I						
9.0	I	4.	32.	73.	122.	176.	234.
	I						
10.0	I	4.	30.	70.	116.	168.	223.

=====

FIRELINE INTENSITY, BTU/FT/S (V4.4)

=====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
	I	.0	2.0	4.0	6.0	8.0	10.0
(%)	I	-----					
	I						
4.0	I	91.	722.	1657.	2756.	3977.	5297.
	I						
5.0	I	77.	612.	1404.	2335.	3369.	4487.
	I						
6.0	I	67.	531.	1218.	2025.	2922.	3892.
	I						
7.0	I	59.	471.	1081.	1797.	2593.	3454.
	I						
8.0	I	54.	427.	980.	1629.	2350.	3131.
	I						
9.0	I	50.	394.	905.	1504.	2171.	2891.
	I						
10.0	I	47.	370.	848.	1410.	2035.	2711.

=====

FLAME LENGTH, FT (V4.4)

=====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
	I	.0	2.0	4.0	6.0	8.0	10.0
(%)	I	-----					
	I						
4.0	I	3.6	9.3	13.6	17.2	20.4	23.2
	I						
5.0	I	3.3	8.6	12.6	15.9	18.9	21.5
	I						
6.0	I	3.1	8.1	11.8	14.9	17.7	20.2
	I						
7.0	I	2.9	7.6	11.2	14.1	16.7	19.1
	I						

8.0	I	2.8	7.3	10.7	13.5	16.0	18.2
	I						
9.0	I	2.7	7.0	10.3	13.0	15.4	17.6
	I						
10.0	I	2.6	6.8	10.0	12.6	15.0	17.1

SIZE-LINKED-TO-DIRECT

1--RATE OF SPREAD, CH/H --- OUTPUT FROM DIRECT. RANGE= 4. TO 346.  
 2--EFFECTIVE WIND, CH/H --- OUTPUT FROM DIRECT. RANGE= .1 TO 10.0  
 3--ELAPSED TIME, HR ----- .1

=====  
 AREA, ACRES

(V4.4)  
 =====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
	I	.0	2.0	4.0	6.0	8.0	10.0
(%)	I	-----					
	I						
4.0	I	.1	1.5	5.3	11.1	18.7	28.0
	I						
5.0	I	.1	1.2	4.3	9.0	15.3	22.8
	I						
6.0	I	.1	1.0	3.6	7.6	12.8	19.1
	I						
7.0	I	.0	.9	3.1	6.5	10.9	16.4
	I						
8.0	I	.0	.8	2.7	5.7	9.6	14.4
	I						
9.0	I	.0	.7	2.4	5.1	8.6	12.8
	I						
10.0	I	.0	.6	2.2	4.6	7.8	11.7

=====  
 PERIMETER, CHAINS

(V4.4)  
 =====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
	I	.0	2.0	4.0	6.0	8.0	10.0
(%)	I	-----					
	I						
4.0	I	3.	14.	28.	43.	60.	77.
	I						
5.0	I	3.	13.	25.	39.	54.	70.
	I						
6.0	I	3.	12.	23.	36.	49.	64.
	I						
7.0	I	2.	11.	21.	33.	46.	59.
	I						
8.0	I	2.	10.	20.	31.	43.	55.
	I						

9.0	I	2.	10.	19.	29.	40.	52.
	I						
10.0	I	2.	9.	18.	28.	38.	50.

CONTAIN-LINKED-TO-DIRECT-AND-SIZE

1--RUN OPTION -----	1.=COMPUTE LINE BUILDING RATE
2--MODE OF ATTACK -----	2.=REAR
3--RATE OF SPREAD, CH/H ---	OUTPUT FROM DIRECT. RANGE= 4. TO 346.
4--INITIAL FIRE SIZE, AC --	OUTPUT FROM SIZE. RANGE= 0. TO 28.
5--LENGTH-TO-WIDTH RATIO --	OUTPUT FROM SIZE. RANGE= 1.0 TO 3.5
6--BURNED AREA TARGET, AC -	10.0

=====

TOTAL LENGTH OF LINE, CHAINS (V4.4)

=====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
	I	-----					
4.0	I	40.	41.#	41.#	-1.#	-1.#	-1.#
	I						
5.0	I	41.	42.#	41.#	-1.#	-1.#	-1.#
	I						
6.0	I	41.	43.#	42.#	42.#	-1.#	-1.#
	I						
7.0	I	41.	43.*	43.#	43.#	-1.#	-1.#
	I						
8.0	I	42.	44.*	43.#	44.#	-1.#	-1.#
	I						
9.0	I	42.	44.*	44.#	44.#	45.#	-1.#
	I						
10.0	I	42.	45.*	44.#	45.#	45.#	-1.#
	I						

-1 = INITIAL AREA IS EITHER LARGER THAN OR NEARLY EQUAL TO THE BURNED AREA TARGET.

\* = FIRE IS TOO INTENSE FOR DIRECT ATTACK BY HAND CREWS. EQUIPMENT SUCH AS DOZERS, PUMPERS, PLOWS, AND RETARDANT AIRCRAFT CAN BE EFFECTIVE.

# = CONTROL EFFORTS AT THE HEAD OF THE FIRE WILL PROBABLY BE INEFFECTIVE.

=====

TOTAL CONTAINMENT TIME, HOURS (V4.4)

=====

1-HR	I	MIDFLAME WIND, MI/H
MOIS	I	

(%)	I	.0	2.0	4.0	6.0	8.0	10.0
	I						
	I						
4.0	I	2.7	.3#	.1#	-1.0#	-1.0#	-1.0#
	I						
5.0	I	3.1	.3#	.1#	-1.0#	-1.0#	-1.0#
	I						
6.0	I	3.5	.4#	.1#	.0#	-1.0#	-1.0#
	I						
7.0	I	3.8	.4*	.1#	.0#	-1.0#	-1.0#
	I						
8.0	I	4.1	.5*	.1#	.0#	-1.0#	-1.0#
	I						
9.0	I	4.4	.5*	.2#	.1#	.0#	-1.0#
	I						
10.0	I	4.7	.6*	.2#	.1#	.0#	-1.0#
	I						

-1 = INITIAL AREA IS EITHER LARGER THAN OR NEARLY EQUAL TO THE BURNED AREA TARGET.

\* = FIRE IS TOO INTENSE FOR DIRECT ATTACK BY HAND CREWS.  
EQUIPMENT SUCH AS DOZERS, PUMPERS, PLOWS, AND RETARDANT AIRCRAFT CAN BE EFFECTIVE.

# = CONTROL EFFORTS AT THE HEAD OF THE FIRE WILL PROBABLY BE INEFFECTIVE.

=====

TOTAL LINE BUILDING RATE, CH/H (V4.4)

=====

1-HR MOIS	I	MIDFLAME WIND, MI/H					
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
	I						
4.0	I	15.	151.#	717.#	-1.#	-1.#	-1.#
	I						
5.0	I	13.	128.#	516.#	-1.#	-1.#	-1.#
	I						
6.0	I	12.	112.#	407.#	1963.#	-1.#	-1.#
	I						
7.0	I	11.	100.*	340.#	1221.#	-1.#	-1.#
	I						
8.0	I	10.	91.*	295.#	908.#	-1.#	-1.#
	I						
9.0	I	9.	84.*	264.#	738.#	3971.#	-1.#
	I						
10.0	I	9.	79.*	241.#	631.#	2391.#	-1.#
	I						

-1 = INITIAL AREA IS EITHER LARGER THAN OR NEARLY

EQUAL TO THE BURNED AREA TARGET.

\* = FIRE IS TOO INTENSE FOR DIRECT ATTACK BY  
HAND CREWS.  
EQUIPMENT SUCH AS DOZERS, PUMPERS, PLOWS,  
AND RETARDANT AIRCRAFT CAN BE EFFECTIVE.

# = CONTROL EFFORTS AT THE HEAD OF THE FIRE  
WILL PROBABLY BE INEFFECTIVE.

SIZE-LINKED-TO-DIRECT

1--RATE OF SPREAD, CH/H --- OUTPUT FROM DIRECT. RANGE= 4. TO 346.  
2--EFFECTIVE WIND, CH/H --- OUTPUT FROM DIRECT. RANGE= .1 TO 10.0  
3--ELAPSED TIME, HR ----- .1

SIZE-LINKED-TO-DIRECT

1--RATE OF SPREAD, CH/H --- OUTPUT FROM DIRECT. RANGE= 4. TO 346.  
2--EFFECTIVE WIND, CH/H --- OUTPUT FROM DIRECT. RANGE= .1 TO 10.0  
3--ELAPSED TIME, HR ----- 1.0

=====  
AREA, ACRES (V4.4)  
=====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
4.0	I	8.	152.	527.	1107.	1870.	2799.
5.0	I	6.	124.	430.	904.	1526.	2285.
6.0	I	5.	104.	360.	756.	1277.	1912.
7.0	I	5.	89.	309.	648.	1095.	1639.
8.0	I	4.	78.	271.	568.	960.	1437.
9.0	I	4.	70.	242.	508.	858.	1285.
10.0	I	3.	64.	220.	462.	780.	1167.

=====  
PERIMETER, CHAINS (V4.4)  
=====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
	I						

4.0	I	31.	143.	281.	432.	595.	770.
	I						
5.0	I	28.	129.	254.	390.	538.	695.
	I						
6.0	I	26.	118.	232.	357.	492.	636.
	I						
7.0	I	24.	109.	215.	331.	456.	589.
	I						
8.0	I	22.	102.	201.	310.	427.	551.
	I						
9.0	I	21.	97.	190.	293.	403.	521.
	I						
10.0	I	20.	92.	181.	279.	385.	497.

CONTAIN-LINKED-TO-DIRECT-AND-SIZE

1--RUN OPTION ----- 1.=COMPUTE LINE BUILDING RATE  
 2--MODE OF ATTACK ----- 2.=REAR  
 3--RATE OF SPREAD, CH/H --- OUTPUT FROM DIRECT. RANGE= 4. TO 346.  
 4--INITIAL FIRE SIZE, AC -- OUTPUT FROM SIZE. RANGE= 3. TO 2799.  
 5--LENGTH-TO-WIDTH RATIO -- OUTPUT FROM SIZE. RANGE= 1.0 TO 3.5  
 6--BURNED AREA TARGET, AC - 100.0

=====

TOTAL LENGTH OF LINE, CHAINS (V4.4)

=====

1-HR	I	MIDFLAME WIND, MI/H					
MOIS	I						
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
	I	-----					
4.0	I	117.	-1.#	-1.#	-1.#	-1.#	-1.#
	I						
5.0	I	118.	-1.#	-1.#	-1.#	-1.#	-1.#
	I						
6.0	I	118.	-1.#	-1.#	-1.#	-1.#	-1.#
	I						
7.0	I	119.	116.*	-1.#	-1.#	-1.#	-1.#
	I						
8.0	I	120.	117.*	-1.#	-1.#	-1.#	-1.#
	I						
9.0	I	120.	117.*	-1.#	-1.#	-1.#	-1.#
	I						
10.0	I	121.	118.*	-1.#	-1.#	-1.#	-1.#
	I						

-1 = INITIAL AREA IS EITHER LARGER THAN OR NEARLY EQUAL TO THE BURNED AREA TARGET.

\* = FIRE IS TOO INTENSE FOR DIRECT ATTACK BY HAND CREWS. EQUIPMENT SUCH AS DOZERS, PUMPERS, PLOWS, AND RETARDANT AIRCRAFT CAN BE EFFECTIVE.

# = CONTROL EFFORTS AT THE HEAD OF THE FIRE  
WILL PROBABLY BE INEFFECTIVE.

=====

TOTAL CONTAINMENT TIME, HOURS (V4.4)

=====

1-HR MOIS	I	MIDFLAME WIND, MI/H					
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
4.0	I	5.8	-1.0#	-1.0#	-1.0#	-1.0#	-1.0#
5.0	I	6.7	-1.0#	-1.0#	-1.0#	-1.0#	-1.0#
6.0	I	7.7	-1.0#	-1.0#	-1.0#	-1.0#	-1.0#
7.0	I	8.6	.1*	-1.0#	-1.0#	-1.0#	-1.0#
8.0	I	9.4	.2*	-1.0#	-1.0#	-1.0#	-1.0#
9.0	I	10.2	.3*	-1.0#	-1.0#	-1.0#	-1.0#
10.0	I	10.9	.4*	-1.0#	-1.0#	-1.0#	-1.0#

-1 = INITIAL AREA IS EITHER LARGER THAN OR NEARLY  
EQUAL TO THE BURNED AREA TARGET.

\* = FIRE IS TOO INTENSE FOR DIRECT ATTACK BY  
HAND CREWS.  
EQUIPMENT SUCH AS DOZERS, PUMPERS, PLOWS,  
AND RETARDANT AIRCRAFT CAN BE EFFECTIVE.

# = CONTROL EFFORTS AT THE HEAD OF THE FIRE  
WILL PROBABLY BE INEFFECTIVE.

=====

TOTAL LINE BUILDING RATE, CH/H (V4.4)

=====

1-HR MOIS	I	MIDFLAME WIND, MI/H					
(%)	I	.0	2.0	4.0	6.0	8.0	10.0
4.0	I	20.	-1.#	-1.#	-1.#	-1.#	-1.#
5.0	I	17.	-1.#	-1.#	-1.#	-1.#	-1.#
6.0	I	15.	-1.#	-1.#	-1.#	-1.#	-1.#

7.0	I	14.	1301.*	-1.#	-1.#	-1.#	-1.#
	I						
8.0	I	13.	584.*	-1.#	-1.#	-1.#	-1.#
	I						
9.0	I	12.	389.*	-1.#	-1.#	-1.#	-1.#
	I						
10.0	I	11.	298.*	-1.#	-1.#	-1.#	-1.#
	I						

-1 = INITIAL AREA IS EITHER LARGER THAN OR NEARLY  
EQUAL TO THE BURNED AREA TARGET.

\* = FIRE IS TOO INTENSE FOR DIRECT ATTACK BY  
HAND CREWS.  
EQUIPMENT SUCH AS DOZERS, PUMPERS, PLOWS,  
AND RETARDANT AIRCRAFT CAN BE EFFECTIVE.

# = CONTROL EFFORTS AT THE HEAD OF THE FIRE  
WILL PROBABLY BE INEFFECTIVE.

### Fuel Model 1

WELCOME TO THE BEHAVE SYSTEM

BURN SUBSYSTEM

FIRE1 PROGRAM: VERSION 4.4 -- FEBRUARY 1997

DEVELOPED BY: THE FIRE BEHAVIOR RESEARCH WORK UNIT  
INTERMOUNTAIN FIRE SCIENCES LABORATORY  
MISSOULA, MONTANA

YOU ARE RESPONSIBLE FOR SUPPLYING VALID INPUT AND FOR  
CORRECTLY INTERPRETING THE FIRE BEHAVIOR PREDICTIONS.

ASSUMPTIONS, LIMITATIONS, AND APPLICATION OF MATHEMATICAL  
MODELS USED IN THIS PROGRAM ARE IN:

Andrews, Patricia L. "BEHAVE: Fire behavior prediction and  
fuel modeling system--BURN subsystem, Part 1", INT-GTR-194, 1986  
Andrews, Patricia L., and Chase, Carolyn H. "BEHAVE: Fire  
behavior prediction and fuel modeling system--BURN  
subsystem, Part 2", INT-GTR-260, 1989

DIRECT

1--FUEL MODEL -----	1	--	SHORT GRASS, 1 FT (30 CM)
2--1-HR FUEL MOISTURE, % --	5.0	6.0	7.0 8.0 9.0 10.0
7--MIDFLAME WINDSPEED, MI/H	.0	2.0	4.0 6.0 8.0 10.0
8--TERRAIN SLOPE, % -----	5.0		
9--DIRECTION OF WIND VECTOR	.0		
DEGREES CLOCKWISE			
FROM UPHILL			
10--DIRECTION OF SPREAD ----	.0		(DIRECTION OF MAX SPREAD)
CALCULATIONS			

DEGREES CLOCKWISE  
FROM UPHILL

=====

RATE OF SPREAD, CH/H (V4.4)

=====

1-HR MOIS	I	MIDFLAME WIND, MI/H					
		.0	2.0	4.0	6.0	8.0	10.0
(%)	I	-----					
	I						
5.0	I	5.	19.	65.	143.	256.	297.*
	I						
6.0	I	5.	18.	61.	135.	242.	270.*
	I						
7.0	I	4.	17.	58.	128.	228.	242.*
	I						
8.0	I	4.	16.	53.	117.	199.*	199.*
	I						
9.0	I	3.	13.	46.	101.	136.*	136.*
	I						
10.0	I	3.	10.	35.	65.*	65.*	65.*

\* MEANS YOU HIT THE WIND LIMIT.

=====

FIRELINE INTENSITY, BTU/FT/S (V4.4)

=====

1-HR MOIS	I	MIDFLAME WIND, MI/H					
		.0	2.0	4.0	6.0	8.0	10.0
(%)	I	-----					
	I						
5.0	I	8.	32.	110.	243.	434.	504.*
	I						
6.0	I	8.	30.	102.	225.	402.	449.*
	I						
7.0	I	7.	28.	93.	207.	370.	392.*
	I						
8.0	I	6.	24.	81.	180.	305.*	305.*
	I						
9.0	I	5.	18.	62.	138.	186.*	186.*
	I						
10.0	I	3.	11.	38.	70.*	70.*	70.*

\* MEANS YOU HIT THE WIND LIMIT.

FLAME LENGTH, FT

(V4.4)

```

=====
1-HR   I      MIDFLAME WIND, MI/H
MOIS   I
      I      .0    2.0    4.0    6.0    8.0    10.0
(%)    I-----
      I
5.0    I      1.2    2.2    3.9    5.6    7.4    7.9*
      I
6.0    I      1.1    2.2    3.8    5.4    7.1    7.5*
      I
7.0    I      1.1    2.1    3.6    5.2    6.8    7.0*
      I
8.0    I      1.0    1.9    3.4    4.9    6.3*   6.3*
      I
9.0    I      .9    1.7    3.0    4.3    5.0*   5.0*
      I
10.0   I      .7    1.4    2.4    3.2*   3.2*   3.2*
=====
    
```

\* MEANS YOU HIT THE WIND LIMIT.

SIZE-LINKED-TO-DIRECT

- 1--RATE OF SPREAD, CH/H --- OUTPUT FROM DIRECT. RANGE= 3. TO 297.
- 2--EFFECTIVE WIND, CH/H --- OUTPUT FROM DIRECT. RANGE= .4 TO 8.6
- 3--ELAPSED TIME, HR ----- 1.0

AREA, ACRES

(V4.4)

```

=====
1-HR   I      MIDFLAME WIND, MI/H
MOIS   I
      I      .0    2.0    4.0    6.0    8.0    10.0
(%)    I-----
      I
5.0    I      3.    25.   188.  701.  1816. 2319.
      I
6.0    I      3.    22.   168.  627.  1625. 1943.
      I
7.0    I      3.    20.   149.  557.  1443. 1590.
      I
8.0    I      2.    17.   125.  468.  1116. 1116.
      I
9.0    I      2.    12.   93.   348.  566.  566.
      I
10.0   I      1.    7.    55.   153.  153.  153.
=====
    
```

PERIMETER, CHAINS

(V4.4)

```

=====
1-HR   I      MIDFLAME WIND, MI/H
MOIS   I
=====
    
```