

HOPEWELL CULTURE NATIONAL HISTORICAL PARK

HOPEWELL MOUND GROUP PRAIRIE



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HOPEWELL MOUND GROUP PRAIRIE

PRESCRIBED FIRE PLAN

ADMINISTRATIVE UNIT: HOPEWELL CULTURE NHP

PRESCRIBED FIRE NAME: HOPEWELL MOUND GROUP PRAIRIE

PREPARED BY: Paul Mancuso RXB2 (T) **DATE:** 1/11/07

Name & Qualification

TECHNICAL REVIEW BY: /s/ Neal Mulconrey **DATE:** 3/29/07

Neal Mulconrey – RXB2
Indiana Dunes National Lakeshore

REGIONAL REVIEW BY: /s/ Scott Beacham **DATE:** 3/30/07

Scott Beacham – RXB2
Midwest Regional Office

COMPLEXITY RATING: LOW

APPROVED BY: _____ **DATE:** _____

Dean Alexander
Hopewell Culture National Historical Park Superintendent

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ELEMENT 1: 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/Prescribed Fire Burn Boss

Approved by: _____ Date: _____
Dean Alexander
Hopewell Culture National Historical Park Superintendent

Approval expires (date): _____

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ELEMENT 2: PRESCRIBED FIRE GO/NO-GO CHECKLIST

<p>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.</p>	YES	NO
<p>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.</p>		

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 the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results

 Burn Boss

 Date

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ELEMENT 3: COMPLEXITY ANALYSIS SUMMARY

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

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	Low
CONSEQUENCES	Low
TECHNICAL DIFFICULTY	Low
SUMMARY COMPLEXITY DETERMINATION	Low
RATIONALE: The burn area is a small acreage area with one continuous fuel type there are good natural and man made fire breaks surrounding the unit and the plan calls for adequate resources to handle the burning of the unit under the prescribed conditions. If the unit is burned with an east wind there are Fuel Model 3 fuels to the west and northwest which would require a cautious approach to attempting to burn and would bring the burn closer to the moderate threshold.	

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ELEMENT 4: DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description:

1. **Location:** Hopewell Mound Group (Hopewell) is located at 4731 Sulphur Lick Road, Chillicothe. An intermittent stream, Sulphur Lick, runs near the northern and eastern boundary of this 310 acre site, with the North Fork Paint Creek bordering the southern edge. Currently the property is composed of 180.4 acre of fallow fields. The northern portion of the property includes 83.0 ac of semi-mature mixed mesophytic forest with a 1/3-acre impoundment located on the western edge within these woods.

Location:	Easting:	320,370.11
	Northing:	4,358,801.14

2. **Size:** The prescribed fire unit is 6 acres in size, and is adjacent to an active erosion site along the southern border of Hopewell, where the North Fork Paint Creek flows. Approximately 4 acres of native grasses and forbs were planted in the area in the spring of 2004, with a 2-acre buffer.

3. **Topography:** The Hopewell prairie burn unit extends 6 acres, and was converted from fallow fields to native grassland in 2004. Mowing has been the primary management tool for the site. The soil is Eldean loam. Elevation: 690' to 700', 701' at road. Slope: No significant drop, however there is a swale.

4. **Project Boundary:** The northern boundary of the burn unit is bordered by the paved Adena Recreational Trail and Sulphur Lick Road. The eastern edge borders the riparian woods of Sulphur Lick Creek, while the North Fork Paint Creek flows along the southern edge. To the west is a fallow field. In most places the boundary will be delineated by a mowed hand line, a minimum of 10 feet wide to prevent the ignition of adjacent vegetation. In other places where there is sparse or no vegetation a mow line will be put in. Along the river the mow line will not be necessary.

B. Vegetation/Fuels Description:

1. **Vegetation Types:** Fuel model 3. Native prairie grasses and forbs were planted at this site in the spring of 2004 (Table 1). The custom seed mix was selected based on minimal root length and girth to avoid potential impact to cultural resources underground (Photo 1). In addition to the plants listed in Table 1, other plants have volunteered in the plot and include red foxtail, Queen Anne's lace, scarlet pimpernel, evening primrose, morning glory vine, Johnson grass, daisy fleabane, chicory, big bluestem, and Canada thistle. To the west of the burn unit most of the site had been planted in winter wheat in 2002, however has been left fallow, therefore a mix of shepherds purse, common goldenrod, eastern daisy fleabane, and Canadian horseweed are evident. Along the riparian edge there is some white oak that make up the canopy, with hackberry in the sub-canopy (see photos 2 and 3).

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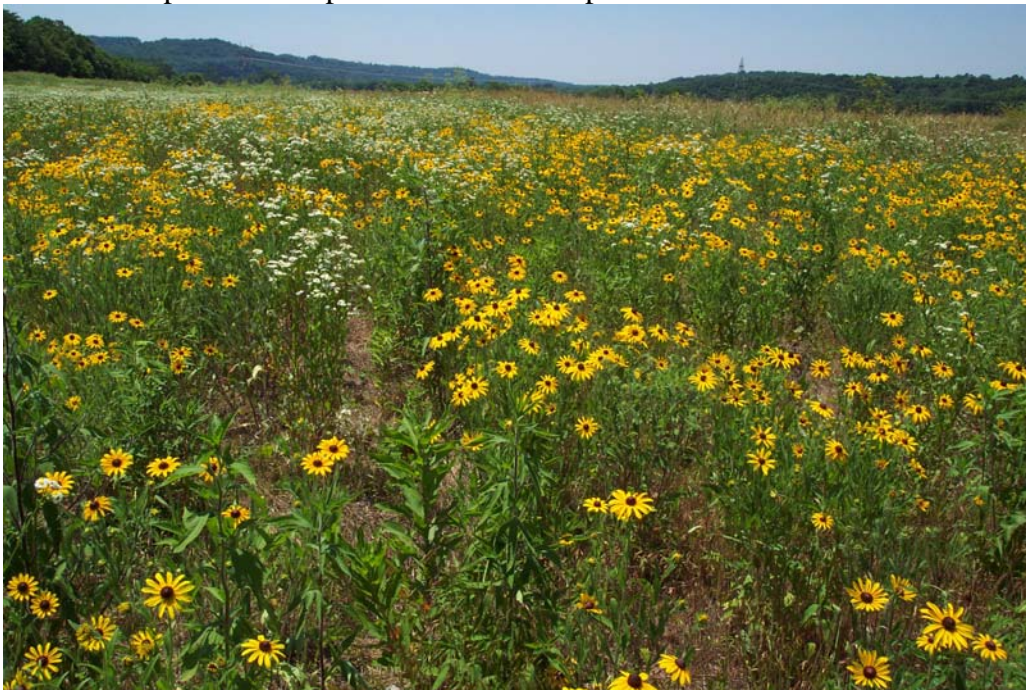
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Fuels Characteristics: Grasses in the prairie will provide fuel for burning with minimal contribution from the forbs. The rate of spread can be fast when a strong wind is present inducing fire in the seed heads. When the wind is light the fire will have to be sustained in the old dead and down matter below the dormant vegetation. The amount of new growth, soil moisture, and wind speed will dictate fire behavior for this site. During spring there will usually be more water and moisture in the prairie than the fall fire season. An early spring burn will not have any new growth while a late spring season burn may.

Table 1: Species list of native prairie grasses and forbs planted at Hopewell Prairie.

Species name	Common name
Bouteloua curtipendula	Side-Oats Grama
Sporobolus heterolepis	Prairie Dropseed
Echinacea purpurea	Purple Coneflower
Lobelia siphilitica	Great Lobelia
Monarda fistulosa	Bergamot
Penstemon digitalis	Beardtongue
Pycnanthemum virginianum	Virginia Mountain Mint
Rudbeckia hirta	Black-eyed Susan
Rudbeckia submentosa	Sweet coneflower
Rudbeckia triloba	Thin-leaved Coneflower
Solidago rigida	Stiff Goldenrod

Photo 1: Native prairie at Hopewell Mound Group in 2005.



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2. **Adjacent fuels data:** To the west of the burn unit, most of the site had been planted in winter wheat in 2002, and has been left fallow since so some of the above species are established there. Along the riparian edge there are some white oaks that make up the canopy, with hackberry in the sub-canopy (Photos 2 and 3).

Project Map (appendix 1)

Vicinity Map (appendix 2)

Photo 2: Northern edge of native prairie at Hopewell Mound Group in 2005. Sulphur Lick Road and Adena Recreation Trail evident in image.



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Photo 3: Southeastern edge of native prairie at Hopewell Mound Group in 2005. Riparian area evident in image.



C. Description of Unique Features:

Hopewell culture is characterized by the construction of enclosures made of earthen walls, often built in geometric patterns, and mounds of various shapes. Visible remnants of Hopewell culture are concentrated in the Scioto River valley near present-day Chillicothe, Ohio. The most striking Hopewell sites contain earthworks in the form of squares, circles, and other geometric shapes. Many of these sites were built to a monumental scale, with earthen walls up to 12 feet high outlining geometric figures more than 1000 feet across. Conical and loaf-shaped earthen mounds up to 30 feet high are often found in association with the geometric earthworks. The park contains nationally significant archeological resources including large earthwork and mound complexes that provide an insight into the social, ceremonial, political, and economic life of the Hopewell people.

Sulphur Lick Road borders the northern edge of the burn unit, and Maple Grove Road lies parallel to the eastern edge. There is a kiosk and bench near the burn site, about 20

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feet away. A bike trail runs along the entire site. The town of Chillicothe may be impacted.

There are mounds in the area but not in the project area. The project area contains an archeological site associated with the mounds but most of the site was excavated in summer 2006. A feature containing human remains is intact at about 30 cm below surface within the project area. A paved trail, bench, and kiosk/sign are adjacent to project area.

The plan is to limit any heavy equipment to the existing parking lot across the road from the burn unit. The park service does not want any heavy equipment in the area with the intact feature. Since the area is so small we will only use ATV to suppress spots over the control lines.

ELEMENT 5: GOALS AND OBJECTIVES

A. Goals:

- Reduce the accumulation of hazardous fuel adjacent to the residential see (vicinity map)
- Reduce accumulated dead fuel on the ground and standing material.
- Suppress tree and shrub encroachment on the native prairie.
- Re-establish the dominance of native species.
- Preserve natural processes for native prairie.
- Reduce the build-up of accumulated organic matter and stimulate prairie growth by recycling essential nutrients such as nitrogen, phosphate, potassium and trace minerals.
- Promote the growth of plant species with minimal root length and girth to avoid potential impact to cultural resources underground and stabilize the site with appropriate ground cover.
- Keep the woody species from encroaching on the grassland areas that contain the earthworks.

B. Objectives:

1. Resource objectives:

SPECIFIC RESOURCE OBJECTIVES:	PROPOSED REDUCTION WITHIN ONE YEAR	ACTUAL RESULTS
Reduce fine fuels	50-100%	
Reduce shrub and small tree encroachment on site	0-25%	
Reduce non-native plant species; Japanese honeysuckle, Canada thistle, garlic mustard, and Johnson grass	10-50%	

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2. Prescribed fire objectives:

- Provide for visitor and firefighter safety, including zero traffic accidents due to smoke and no injuries to personnel.
- Burn 90 to 100% of the project area.
- Limit smoke impacts to area residents to 8 hours.

ELEMENT 6: FUNDING

A. Cost (non-base, other agency, contract):

Costs will be primarily for personnel and equipment preparing and conducting burn operations. The unit requires some preparation. Firing operations and post firing patrols should be of short duration with the goal of keeping overall costs low.

FUNCTION	Projected Work Hours/ Description of Activities	PROJECTED COSTS*
Planning	10 hours (base salary paid) Rx Fire Plan development	\$0.00
Unit Preparation	20 hours brush hog line and remove thatch	\$1200
Operations (including burning, holding, mop-up)	110 hours	\$4000
Travel	NPS personnel of 7 people	\$3000.00
Monitoring & Evaluation	1 (collateral assignment) site visit coordination between the Area (INDU) FMO and Park coordinator.	\$0.00

TOTAL PROJECTED COST \$7200.00 divided by 6 acres = \$1200.00 PER ACRE

*Required information in final report: ACTUAL COSTS, COST PER ACRE, WORK HOURS PER ACRE.

B. Funding Source:

Hazardous fuels

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ELEMENT 7: PRESCRIPTION

A. Environmental Prescription:

The prescription parameters are broad to allow burning in a variety of weather conditions. However, burning should not occur at the extreme end of the prescription, such as with a low humidity, low fuel moistures, high temperatures, and high winds, as this would produce intense unwanted fire behavior characteristics. Burning should only occur within the weather AND fire behavior characteristics listed below. Behave fire modeling outputs for fuel models 1 and 3 are attached in the appendix section E. FBPS fuel model 3 is used for tall grasses averaging 2.5 to 3 feet in height, and is representative of the prairie in the park. Fuel model 1 was chosen for the model outside of the unit because the area is mostly tilled fields and this model is the closest one to representing the vegetation there.

Prescription:

- | | |
|--------------------------|--|
| a. Relative humidity | 20 to 75% |
| b. Wind direction | a northeast or southeast or east wind direction is preferred however this burn can also be executed with a north or south wind direction |
| c. Mid-flame wind speed | 1 to 8 miles/hour |
| d. Mixing height | 1600 feet |
| e. 1 hr. fuel moisture | 6 to 14% |
| f. 10 hr. fuel moisture | 7 -15% |
| g. 100 hr. fuel moisture | 10 – 20% |
| h. Live fuel moisture | 50 to 200% |

B. Fire Behavior Prescription:

- | | |
|---|-----------------|
| a. Fire behavior characteristics within the burn unit (appendix E): | |
| b. Rate of spread | 214 chains/hour |
| c. Flame length | 18 feet |
| d. Probability of Ignition | 54% |

BURNING PRESCRIPTION AND OBSERVED CONDITIONS:

A prescribed fire prescription containing those key parameters needed to achieve desired results. Prior to ignition, compare prescription elements, both individually and collectively, against local weather forecasts and any other predicted conditions. During implementation of the burn, if objectives are not being met, further ignition shall be evaluated; therefore, prescription parameters must be wide to accommodate established objectives while staying within fire personnel capabilities. All changes to the prescription parameters must be approved with same level of authority required for the plan approval.

The prescription is based on fuel moisture, wind speed and relative humidity. Temperature ranges will not be used as a constraint. The behave runs in appendix E were based on all of the above parameters at the maximum levels for fire behavior in Fuel Models 1 and 3. If on the day of the burn

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wind speeds above 8 mph mid flame length, 1 hour fuel moisture is near 6, and relative humidity is low, then the fire behavior will be hot. With roads, a creek and farmed fields abutting the unit it is most likely the fire will not escape containment, as each one of the three parameters above approaches its limit for maximum fire behavior a degree of caution should be executed by the burn team. It may not be a good idea to execute the burn on a day when all three approach their respective limits for maximum fire behavior.

ENVIRONMENTAL VARIABLES	HOT	OPTIMUM	COOL	OBSERVED*
Temperature (dry bulb %):	75	60	30	
Relative Humidity (%):	25	30 to 40	60	
Wind Direction:	Any	Any	Any	

ELEMENT 8: SCHEDULING

A. Ignition Time Frames/Season(s):

Prescribed fires may be conducted at any time of the year when conditions are within prescription and operations will not conflict with wildland fire suppression activities. Most prescribed burns in Ohio are conducted during the spring months of March, April, and May or during the autumn months of October and November.

B. Projected Duration:

The duration of the project is expected to be one day for ignition and mop-up.

C. Constraints:

Due to unfavorable weather conditions and the threat of uncontrolled wildland fires a prescribed fire will not take place on days when a “red flag” warning is predicted. The National Weather Service criteria for a red flag warning include:

1. Sustained 20 foot winds of 20 mph or higher.
2. Afternoon relative humidity less than 25%.
3. 10 hour fuel moisture at 8% or less for one day

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Proposed Ignition Date:	Spring 2007
Projected Burn Duration:	1 day total
Actual Ignition Date:	
Date Declared Out:	
Date DI-1202 Submitted:	

ELEMENT 9: PRE-BURN CONSIDERATIONS

A. Considerations:

1. **On Site:** Construct a minimum impact fireline approximately 5 to 10 feet wide, within the prairie so as not to impact surrounding vegetation.
2. **Off Site:**
 1. Complete MOU with Union Township Fire Department.
 2. Prepare an Incident Action Plan. Identify an Incident Commander Type IV or most qualified person who could assume command of an escaped wildfire.
 3. Purchase needed equipment and supplies. Mix drip torch fuel and store in hazardous fuel cabinet. Load all needed supplies such as tools, backpack pumps, drip torches, and fuel onto trucks the morning of the prescribed fire.
 4. Request additional personnel and resources from other parks or agencies if needed. Ensure that all personnel required by this prescribed fire plan are present at the time of the burn.
 5. Distribute an informational flyer to residences and businesses in the area and issue a news release to inform the public about the fire.
 6. Notify local fire departments and/or dispatch center(s) of the scheduled prescribed fire. For Union TWP dispatch is the Ross County Sheriff's office. We will have the local fire Dept on hand just in case which is Union Twp.
 7. Notify Cuyahoga Valley NP dispatch, Hopewell Cultural Site has no dispatch, but uses Cuyahoga Valley NP when needed for LE matters.
 8. Need to contact to OEPA before burning to acquire a permit before burning. 740-385-8501 Lisa Duvall.
 9. Notifying passing motorists of the prescribed fire and possible smoke ahead will be accomplished through signage.
 10. Special Precautions/Regulations (utility lines, historical sites, safety)

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11. Care should be taken and foot traffic limited near sensitive vegetation around the perimeter of the burn.
12. Notify nearby homes of any impact the burn will have on them.
13. Operations will take place along several roadways. Vehicles and sightseeing individuals should be expected and precautions taken.
14. There are known archeological sites within the prescribed fire unit they do not have to be delineated prior to the burn.

Hopewell Culture National Historical Park's archeological and historical resources are a limited, fragile, and nonrenewable part of the environment that must be protected; when disturbed, the scientific information they provide is often lost forever. Public concern for cultural resources protection and preservation is contained in numerous pieces of legislation that have been passed since the Antiquities Act in 1906. Great care will be taken during fire suppression and prescribed fire activities not to destroy or disturb important cultural resources. Although a complete ground survey and inventory with detailed maps of sites, features, and environmental data are the best sources of cultural resources information for fire management planning, archeological and historical site surveys in the park are still incomplete. Completion of these surveys is of the greatest importance.

Soil disturbance will be avoided whenever possible, particularly near archeological sites. Fire management activities that disturb the ground in any way, such as fireline construction using hand tools or heavy equipment, will involve professional archeologists working in cooperation with firefighters and pre-burn crews to prevent needless damage to cultural resources. It must be recognized that during a wildfire the highest priorities are safety and controlling the fire; if the fireline cannot be diverted, cultural resources may occasionally have to be sacrificed. In most cases, however, damage can be averted. During fire suppression, prescribed fire, and rehabilitation activities:

Compliance with the National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) is required for each burn plan, based on the FMP. Prescribed burns may be conducted in relation to scientific studies to determine the potential effects to cultural resources. In addition, compliance from the Ohio State Historic Preservation Office will be obtained.

B. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s):

Smoke management is an important consideration of this prescribed fire as there are numerous sensitive and critical targets within a few miles. These include residential areas, secondary and primary roads, and recreation areas. Although smoke production is inevitable with any prescribed fire, visitor and resident safety must be taken into consideration in the decision to go ahead with a prescribed fire.

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The preferred wind directions for this burn are north or northwest but can be accomplished with any wind direction. The smoke trajectory for these preferred wind tracks will disperse the smoke over less populated areas and will affect a minimal number of sensitive areas. The residential areas northwest of the area are partly within the one mile buffer of the unit.

To the maximum extent possible, fires will be ignited when the National Weather Service dispersal index is good or better. At a minimum the fire will be conducted under unstable atmospheric conditions with a mixing height of at least 1600 feet causing the smoke to rise, not degrade visibility, and mitigate health issues. No night firing will occur. Dry fuel conditions with a low relative humidity will be preferred to produce the lowest possible emissions. Smoke emissions will be monitored during the fire to ensure that nearby businesses and communities will not be markedly affected. Roads will be posted warning motorists of smoke, and if smoke does cause a visibility problem on roads, Hopewell Culture National Historical Park staff will be requested to direct traffic and ignition temporarily stopped or altered until conditions improve. Firefighters will be rotated off firelines or to another section of the holding line when needed due to smoke exposure.

There is a State of Ohio operated RAWs station in Chillicothe:
ID: CHEO1
NAME: CHILLICOTHE
WIMS STATION NUMBER: 337301

This station will be monitored in the days prior to the burn to predict fire behavior and fuels characteristics for the burn unit.

C. Notifications:

A news release will be prepared by Hopewell Culture Park staff at the beginning of each prescribed fire season stating which prescribed fires are planned for that season, their locations, and other general information about prescribed fires. The release is given to the Interpretation Division who distributes it to local television stations, radio stations, and newspapers in central Ohio as well as several government offices. The Hopewell Culture National Historical Park's office phone number will be included for people requesting additional information.

Before the prescribed fire is conducted, informational flyers are distributed to nearby residences to inform them of the planned prescribed fire. The flyer includes a map of the fire area and some of the goals and expected effects of the fire. The Hopewell Culture National Historical Park's office phone number is also included for those residents with further questions. In addition, flyers will be placed at the Visitor Center and Administration Building at Mound City Group.

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Local fire department dispatch centers, the park superintendent, park dispatch, OI DC, the NPS Regional Fire Management Office, and the Ohio Environmental Protection Agency (OEPA) will be notified the day before or the morning of a prescribed fire OI DC will also be notified when the prescribed fire is completed.

The Ohio Interagency Dispatch Center (OIDC) may be contacted to order resources, if any, required to accomplish the prescribed fire. Assistance from other agencies providing personnel and equipment will reduce fatigue of personnel and reduce the number of collateral firefighters needed from HOCU.

Ohio Interagency Dispatch Center 740-753-0546
13700 US Highway 83 Nelsonville, OH 45764 740-373-9055

ELEMENT 10: BRIEFING

Briefing Checklist

- Burn Organization
- Burn Objectives
- Description of Burn Area
- Expected Weather & Fire Behavior
- Communications
- Ignition plan
- Holding Plan
- Contingency Plan
- Wildfire Conversion
- Safety

ELEMENT 11: ORGANIZATION AND EQUIPMENT

A. Positions:

The total number of personnel needed to execute the burn is 12.

Burn Boss RXB2 (1)

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FEMO (1)
Holding Specialist (FFT1)
FFT2 (8)

B. Equipment:

Type 6 Engine (1), ATV with water (1)

C. Supplies:

Batteries, Flagging, Administrative needs, CTR, OF288 etc

ELEMENT 12: COMMUNICATION

A. Radio Frequencies:

This Park Unit does not have a radio system. These frequencies are Boise's tactical frequencies and the frequency that is assigned to the Park Unit:

1. Command Frequency(s): Hopewell RX/TX 166.37500 (frequency assigned wide band analog)
2. Tactical Frequency(s): RX 168.20000 TX 168.20000 wideband analog.
Tactical Frequency(s): RX 168.05000 TX 168.05000 wideband analog
3. Air Operations Frequency(s): If needed one will be established otherwise it will default to the AIRGUARD frequency 168.62500

B. Telephone Numbers:

Union Township VFD	740-775-8004	12034 Pleasant Valley Road Chillicothe, OH 45601
Ohio Interagency Dispatch Center	740-753-0546 740-373-9055	13700 US Highway 83 Nelsonville, OH 45764
Mike Bowden Ohio Department of Natural Resources Division of Forestry	614-265-1088	2045 Morse Road, H1 Columbus, OH 43229
National Weather Service Weather Forecast Office Wilmington, Ohio	937-383-0031	1901 S. State Route 134 Wilmington, OH 45177
Steve Alspach Ohio Department of Air Pollution Control Ross County, Ohio	740-380-5424	2195 Front Street Logan, OH 43138

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Scott Beacham NPS Regional Fuels Management Specialist	402-661-1768	601 Riverfront Drive Omaha, Nebraska 68102
Liberty Township VFD	740-887-4774	34568 US Highway 50 Chillicothe, OH 45601
Springfield Township VFD	740-775-9900	60 Firehouse Drive Chillicothe, OH 45601
Twin Township VFD	740-626-2686	11521 US Highway 50 Bourneville, OH 45617

ELEMENT 13: PUBLIC AND PERSONNEL SAFETY, MEDICAL

A. Safety Hazards: See Appendix (D) Job Hazard Analysis

B. Measures Taken to Reduce the Hazards:

The public will be kept at a safe distance from the fire lines. Any visitors approaching the prescribed fire will be asked to stay at a safe distance or directed to the Burn Boss. Any media or visitor authorized to observe the fire by the Burn Boss or Fire Management Officer will be accompanied by the Burn Boss, Fire Management Officer, or designee.

A news release is issued and informational flyers are distributed to notify the public of the planned prescribed fire. Flyers will be placed at the Visitor Center at Mound City Group and in the kiosk at Hopewell Mound Group. Nearby roads will be posted with signs to warn motorists of smoke concentrations. Hopewell Culture National Historical Park staff may be requested to direct traffic if necessary. The park's Public Information Officer may be utilized if the level of public interest is very high or if the Superintendent or burn boss thinks it is necessary.

Public and firefighter safety is the number one concern of all prescribed fire operations at Hopewell Culture National Historical Park. The pre-fire briefing will include a discussion on LCES, the 10 standard firefighting orders, and the 18 watch-out situations, the dangers associated with burning near or under power lines, and on other hazards specific to this prescribed fire unit.

All fire personnel will wear standard firefighting personal protective equipment including leather boots, nomex pants and shirt, leather gloves, and hard hat. They will carry a fire shelter and a fire tool or backpack pump at all times.

C. Emergency Medical Procedures:

Every person also carries a personal first aid kit. Several of the fire personnel are either EMT qualified, First Responders or trained in first aid. If an injury does occur during the

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prescribed fire the person closest to the individual with the highest level of emergency medical training will evaluate the injury. If more aid is needed than can be provided on the fire ground, Ross County dispatch by radio or 911 will be notified immediately to activate the Emergency Medical.

D. Emergency Evacuation Methods:

Report emergency to the Burn Boss, burn boss will call Ross County Dispatch.

E. Emergency facilities: Clinics Hospitals

Adena Regional Medical Center Hospital
272 Hospital Road
Chillicothe, Ohio 45601
Telephone 740-779-7500

ELEMENT 14: TEST FIRE

A. Planned location:

A test fire will be ignited along the down wind fire-line the exact location to be determined by the Burn Boss on the day of ignition based on the observed and forecasted winds on that day.

B. Test Fire Documentation:

1. Weather conditions On-Site:
2. Test Fire Results:

ELEMENT 15: IGNITION PLAN

A. Firing Methods: Backing fire will be used initially in order to build suitable black-line in the downwind section of the burn area. Once initial black-line is built the burn-boss can adapt to the burning conditions and use any firing deemed necessary to meet the objectives of this burn.

B. Devices: Drip torches, fusees.

C. Techniques: backing fire, flanking fire strip, dot firing, ringing the unit. The two teams will start positioned on the perimeter opposite of the wind direction commonly known, as the leeward side (i.e. if the wind direction is blowing from the south then black lining will

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begin on the north perimeter). The two segments will proceed in opposite directions along the perimeter creating a blackline using drip torches to light a backing fire from the fireline. If conditions allow so that the fire behavior is manageable and within prescription the unit may be ringed so that the fire is pulled into the center of the unit.

D. Sequences: Backing fire will be used initially in order to build suitable black-line in the downwind section of the burn area. As black-line is built the burn-boss can adapt to the burning conditions and use any firing deemed necessary to meet the objectives of this burn.

Patterns: Whatever patterns necessary to meet objectives.

E. Ignition Staffing: Burn Boss will direct 2-4 igniters, two firing teams of 1-2 igniters.

ELEMENT 16: HOLDING PLAN

A. General Procedures for Holding:

The boundaries described in section element 4 (Description of Prescribed Fire Area) will be used as prescribed fire unit boundaries for holding operations.

The vegetation is a mix of prairie species and non-native plants, which may produce high flame lengths and heavy smoke. The rate of spread is generally not great unless a strong wind is present. A mowed fire line in the burn unit will be used to keep the fire from spreading into nearby trees and other vegetation.

Due to the possibility of high flames lengths and intense heat a hose line from an engine parked on a nearby road will most likely be used to wet down fire lines, protect vegetation and prevent the spread of fire outside the unit.

As described above, in the firing and ignition section, fire personnel will be split into two segments, each with an ignition crew, and a holding crew. The holding crew on National Historical Park property will consist of 2 to 6 firefighters and will follow the ignition crew around the exterior of the prescribed fire to ensure the fire is contained within the set boundaries and to watch for and extinguish ignitions outside of the fire lines or spot fires. A hose line from an engine or ATV will be utilized by the holding crew. The exact number of holding crewmembers in each segment may vary throughout the fire, depending on the need. Each holding crewmember will carry either a backpack pump or hand tool or will be assigned to an ATV or engine. The number of backpack pumps on each segment will be determined by the Holding Specialist and will depend on fuel moistures, weather conditions, and the fireline being held. Additional backpack pumps and tools will be available on the engines and other fire support vehicles. Wildland fire engines will be used as water sources. The NPS will have at least one Type 6 engine on

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scene and the Park contact has said that the local VFD wants to have one of their Type 3 engines on scene.

B. Critical Holding Points and Actions:

Critical holding areas are any areas near high value resources such as residences or businesses, or at locations where it would be difficult to hold a fireline.

Critical holding areas for the Hopewell Mound Group Prairie prescribed fire unit include:

- Due to high flame lengths all down wind sides of the fire perimeter will be a holding concern.

Mitigation of critical holding

- Engine(s) with hose lines will support holding actions the Park Service prefers that engines, ATV, and heavy equipment be kept out of the burn unit unless absolutely necessary for firefighter and public safety.

Mop-up

Because this vegetation is primarily made up of 1 hour fuels there should not be extensive mop-up. If there are any areas that need to be mopped-up hose lays around the burn could be used. The use of class A foam should try to be avoided in wet areas.

ELEMENT 17: CONTINGENCY PLAN

A. Trigger Points: Getting frequent and or multiple spot fires across fire-line.

B. Actions Needed: Ignition operations will be halted. On site resources will suppress spot fires aggressively until controlled. Updated on site weather observation may be taken.

C. Additional Resources and Maximum Response Time: Local Volunteer fire department response (some will be staged at the burn) additional resources have a response time of less than 15 minutes.

ELEMENT 18: WILDFIRE CONVERSION

A. Wildfire Declared By: RXB2

B. IC Assignment: A qualified ICT4 on scene

C. Notifications:

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Hopewell Culture National Historical Park Superintendent, Dean Alexander	740-774-1126	Home 740-779-3584 Cell 740-703-2835
NPS Midwest Region FMO	402-661-1754	Cell 402-630-0685
NPS Midwest Region Suppression Specialist	402-661-1762	Cell 402-250-7844
NPS INDU FMO	219-926-7561 X333	Cell 219-406-6111
Ohio Interagency Dispatch Center	740-753-0571	

D. Extended Attack Actions and Opportunities to Aid in Fire Suppression:

When safe and appropriate, direct attack will be used to suppress all spot fires and escapes. Suppression activities will take advantage of the **many** natural fuel barriers outside of the project area.

Roads in conjunction with natural barriers may be used to aid suppression action.

ELEMENT 19: SMOKE MANAGEMENT AND AIR QUALITY

A. Compliance:

The Ohio Department of Natural Resources-Division of Forestry (ODNR) and the Ohio Environmental Protection Agency- Division of Air (OEPA) has regulations governing "open burning." A waiver for prescribed burn will be obtained from the ODNR once this completed burn plan is submitted to their office. The OEPA will grant permission for prescribed burns pending submittal of this plan, and at least two weeks to review.

B. Permits to be Obtained: The OEPA will grant permission for prescribed burns pending submittal of this plan, and at least two weeks to review.

C. Smoke Sensitive Areas/Receptors: Residential areas northeast and south of burn.

D. Impacted Areas: Sulphur Lick Road, Maple Grove Road, Anderson Station Road, the town of Chilicothe is several miles away.

E. Mitigation Strategies and Techniques to Reduce Smoke Impacts:

To the maximum extent possible, fires will be ignited when the National Weather Service dispersal index is good or better. At a minimum the fire will be conducted under unstable atmospheric conditions with a mixing height of at least 1600 feet causing the smoke to rise, not degrade visibility, and mitigate health issues. No night firing will occur. Dry fuel conditions with a low relative humidity will be preferred to produce the lowest

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possible emissions. Smoke emissions will be monitored during the fire to ensure that nearby businesses and communities will not be markedly affected. Roads will be posted warning motorists of smoke, and if smoke does cause a visibility problem on roads, Hopewell Culture National Historical Park staff will be requested to direct traffic and ignition temporarily stopped or altered until conditions improve. Firefighters will be rotated off firelines or to another section of the holding line when needed due to smoke exposure.

ELEMENT 20: MONITORING

A. Fuels Information (forecast and observed) Required and Procedures:

Weather will be monitored to establish a trend for acceptable conditions. Monitoring will be initiated 2 weeks before the anticipated prescribed fire date using the Chillicothe RAWS weather station and will include wind direction and speed, temperature, relative humidity, fuel moistures, and precipitation.

B. Weather Monitoring Required and Procedures: The day before the prescribed fire, a weather forecast will be obtained from a National Weather Service Fire Weather Forecaster. A spot fire weather forecast will be obtained from the National Weather Service, Wilmington, Ohio prior to ignition of the prescribed fire. At least one firefighter, designated as the fire monitor, will record on-site weather hourly or more often if conditions warrant.

C. Fire Behavior Monitoring Required and Procedure: The fire monitor will also record fire behavior data, including manner and rate of spread, flame length, and flame zone depth and smoke observations. Photographs will also be taken to document the fire behavior. The fire monitor(s) will advise and remain in communication with the Burn Boss whenever working within the burn.

D. Monitoring Required To Ensure That Prescribed Fire Plan Objectives Are Met: Photographs will also be taken to document the fire effects.

E. Smoke Dispersal Monitoring Required and Procedure: The fire monitor will also monitor smoke observations and communicate these observations to the burn boss.

ELEMENT 21: POST-BURN ACTIVITIES

Post-burn Activities That Must be Completed:

On-site:

1. Patrol fire area and report updates to the Burn Boss. Declare the burn out.

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Off-site

1. Prescribed fire accomplishment report completed and submitted to MWRO.
2. Accumulate all observation forms and complete monitoring report.
3. Complete WFMI entry.
4. Complete NFPORS entry.

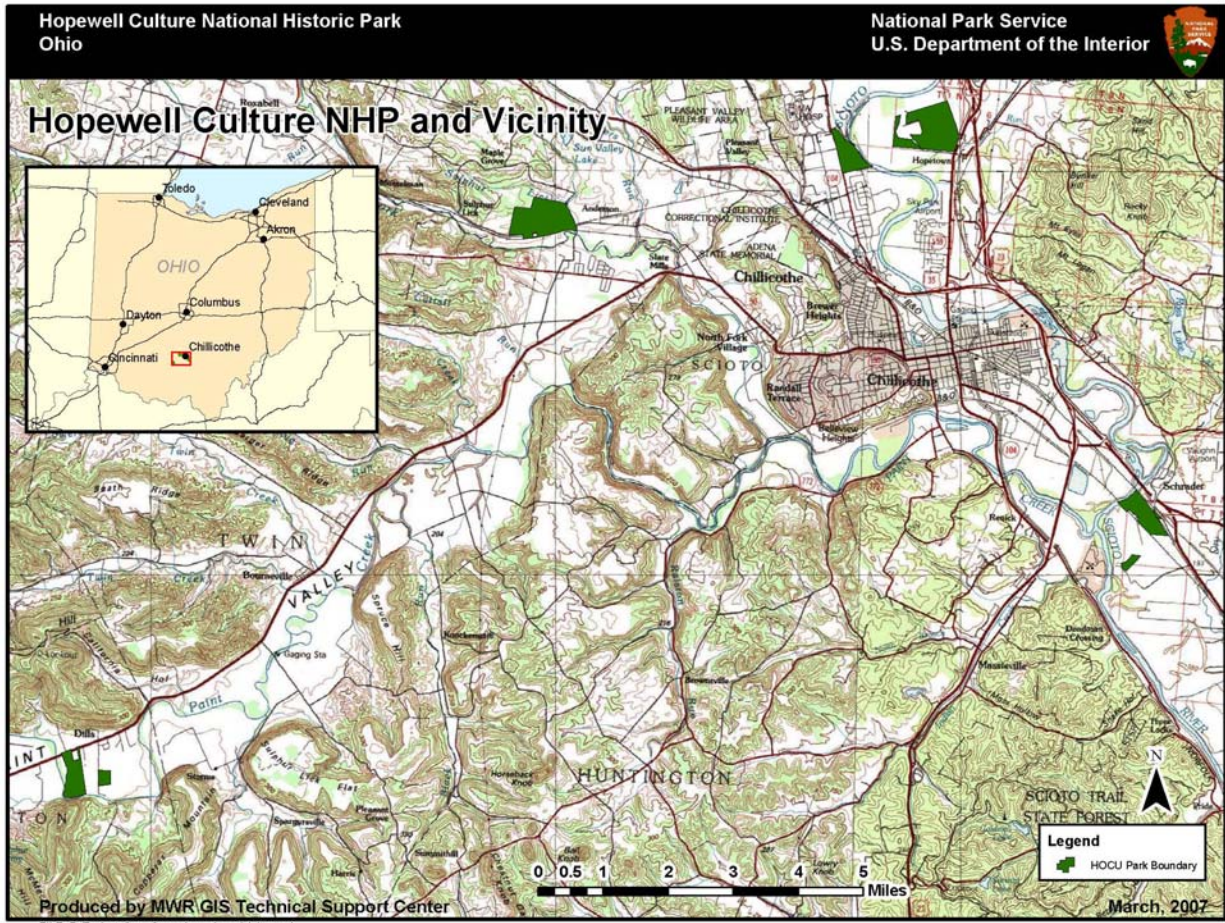
Project Name: HOPEWELL MOUND GROUP PRAIRIE

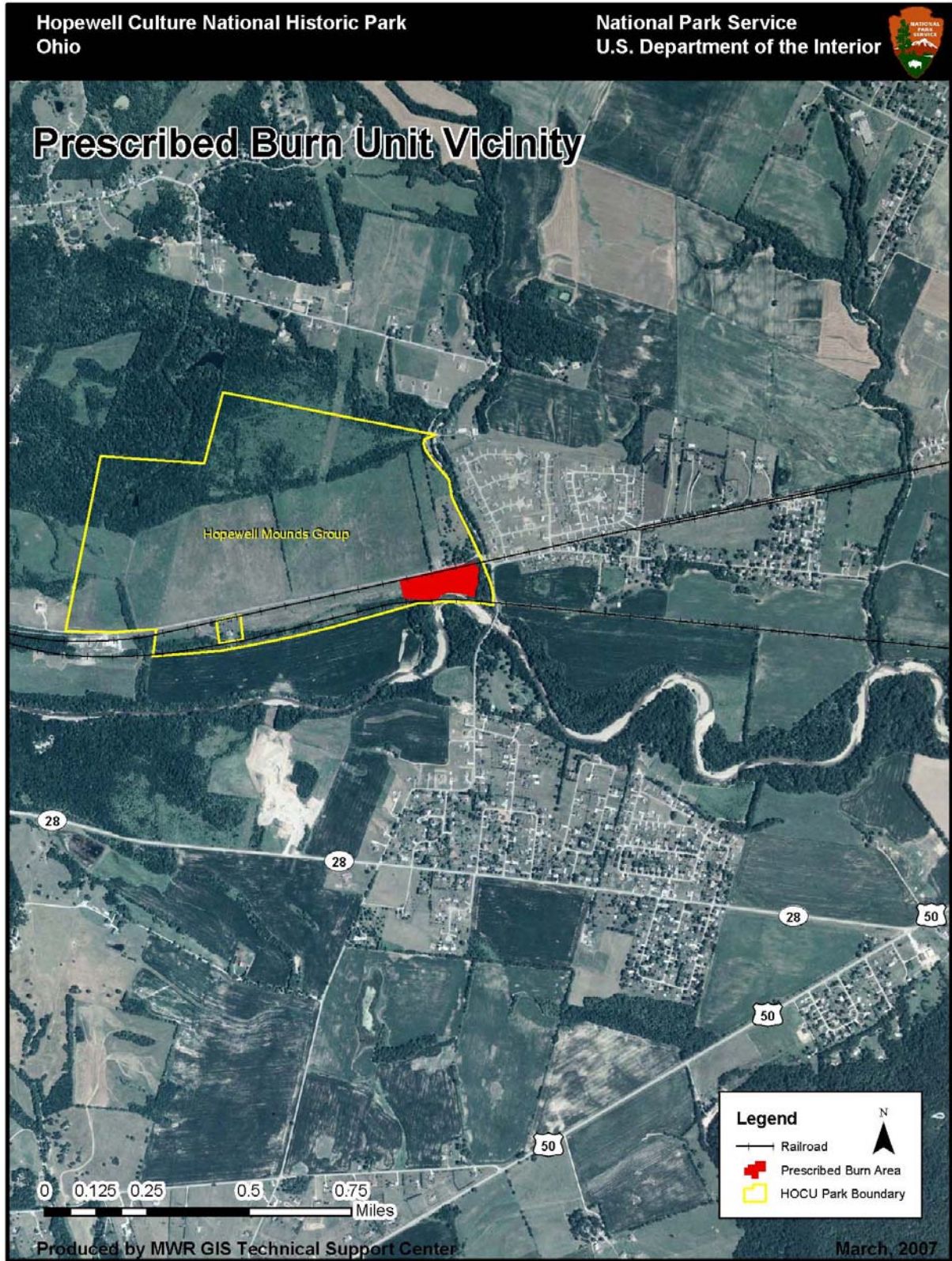
Unit Name: HOPEWELL CULTURE NATIONAL HISTORICAL PARK

APPENDICES

- A. Maps: Vicinity and Project**
- B. Technical Review Checklist**
- C. Complexity Analysis**
- D. Job Hazard Analysis**
- E. Fire Behavior Modeling Documentation or Empirical Documentation (unless it is included in the fire behavior narrative in Element 7; Prescription)**

A: MAPS





Hopewell Culture National Historic Park
Ohio

National Park Service
U.S. Department of the Interior

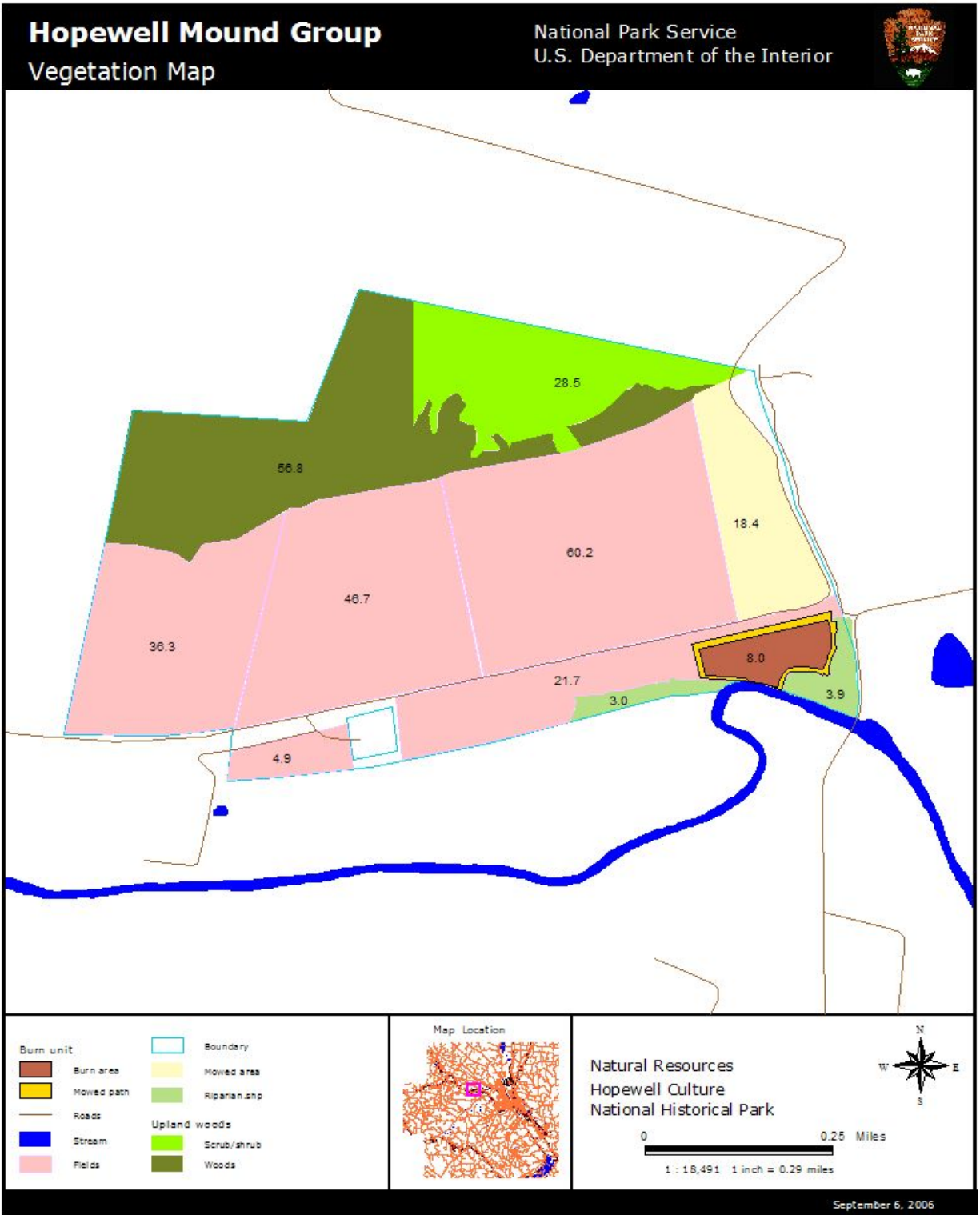


Prescribed Burn Project Area



Produced by MWR GIS Technical Support Center
FILE: D:/Projects/hocu/hocu_burn_projectarea.mxd

March, 2007



COMPLEXITY ANALYSIS

Appendix C

PRESCRIBED FIRE PLAN ELEMENTS:	S /U	COMMENTS
1. Signature page	S	
2. GO/NO-GO Checklists	S	
3. Complexity Analysis Summary	S	
4. Description of the Prescribed Fire Area	S	
5. Goals and Objectives	S	
6. Funding	S	
7. Prescription	S	
8. Scheduling	S	
9. Pre-burn Considerations	S	
10. Briefing	S	
11. Organization and Equipment	S	
12. Communication	S	
13. Public and Personnel Safety, Medical	S	
14. Test Fire	S	
15. Ignition Plan	S	
16. Holding Plan	S	
17. Contingency Plan	S	
18. Wildfire Conversion	S	
19. Smoke Management and Air Quality	S	
20. Monitoring	S	
21. Post-burn Activities	S	
Appendix A: Maps	S	
Appendix B: Complexity Analysis	S	
Appendix C: JHA	S	
Appendix D: Fire Prediction Modeling Runs	U – On the Adequate Holding Resource Worksheet the Burn Boss is the only one slated to remain during a spot fire. At least two other personnel should remain to manage the prescribed fire.	
Other		

S = Satisfactory

U = Unsatisfactory

Recommended for Approval:

Not Recommended for Approval:

/S/ Neal Mulconrey
Technical Reviewer

RXB2 - Currently qualified
Qualification and currency (Y/N)

3/29/07
Date

X - Approval is recommended subject to the completion of all requirements listed in the comments section, or on the Prescribed Fire Plan.

Prescribed Fire Complexity Rating System Guide Worksheet

Instructions: This worksheet is designed to used with the Prescribed Fire Complexity Rating descriptors on Page 6.

Project Name Hopewell Mound Group Prairie Number _____

Complexity elements:

1. Potential for Escape

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	All unit boundaries are good natural or man made barriers to fire, Sulphur Lick Road and the north fork of Paint Creek. An escape would end up in hardwood litter or agricultural fields.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Any escape will result in little damage to resources. Hardwood areas and tilled fields will slow the fire spread compared to the grass model in the unit. The mowed fire break will be raked so the creeping will be minimized.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Local VFD will be on the scene and will be able to provide local knowledge and expertise and provide a water source.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

2. The Number and Dependency of Activities

Risk	Rationale
Preliminary Rating: Low Moderate High	There are few resource and unit prep duties the activities to execute this burn are very straightforward.
Final Rating: Low Moderate High	No change
Potential Consequences	Rationale
Preliminary Rating: Low Moderate High	The low complexity of this project, the small size of the unit, the dedication and commitment of the local unit to prep the burn unit and coordinate with local authorities will alleviate the burn crew from these activities.
Final Rating: Low Moderate High	No change
Technical Difficulty	Rationale
Preliminary Rating: Low Moderate High	Coordination is expected to be of low complexity because the prep will be handled by the local unit, and the burn plan will be executed by trained professional personnel used to working in the local fuel types.
Final Rating: Low Moderate High	No change

3. Off-Site Values

Risk	Rationale
Preliminary Rating: Low Moderate High	The nearest values are the homes located in the subdivision to the northeast, across Sulphur Lick Road from the burn unit. These homes have manicured lawns and the subdivision appears to have been built in abandoned agricultural fields so there is no canopy to spread fire. The homes appear to be firewise.
Final Rating: Low Moderate High	No change
Potential Consequences	Rationale
Preliminary Rating: Low Moderate High	Due to the tilled fields, mowed lawns, and the manmade and natural fire breaks the off site values have an extremely low chance of being compromised by this fire. However because of the cultural significance of the mounds it ranks moderate
Final Rating: Low Moderate High	No change
Technical Difficulty	Rationale
Preliminary Rating: Low Moderate High	Protection of offsite values will require standard fire management practices.

Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
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4. On-Site Values

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	There are few values on-site, there is a kiosk and bench near the burn site, about 20 feet away. A bike trail runs along the entire site. The kiosk and these trails will require minimal or zero prep to protect them from this prescribed fire
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Avoiding the use of engines, ATV, and other heavy equipment will require supporting this burn with back-pack pumps and hose-lays. The burn should be easily executed with these hydraulic resources.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Standard fire management practices will be sufficient to protect on-site values.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

5. Fire Behavior

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Fuels are uniform throughout the unit so they ought to be predictable and similar to the behavior observed during the test fire. Outside the unit mowed or tilled areas and hardwood litter areas should not be a fire behavior problem.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Fuels outside the unit are sparse and already mitigated by agricultural practices or a change to a less volatile fuel except to the west and northwest.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Technical Difficulty	Rationale

Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	The uniformity of the fuels in the unity although thick prairie in type should be predictable based on the test fire.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

6. Management Organization

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Fire personnel will have to be brought in from other park units because the are few or no fire qualified personnel at the park unit.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Few problems are expected because the personnel that execute this burn will be used to working with each other in the fire environment in these very same fuel types.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <i>Low</i> <input checked="" type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Limited number of local NPS fire personnel available means that trained fire personnel will have to be brought to the burn unit from other NPS units.
Final Rating: <i>Low</i> <input checked="" type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

7. Public and Political Interest

Risk	Rationale
Preliminary Rating: <i>Low</i> <input checked="" type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	This is the first burn in this NPS unit, it is an opportunity to educate the community by getting it correct the first time.
Final Rating: <i>Low</i> <input checked="" type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

Potential Consequences	Rationale
Preliminary Rating: <i>Low</i> <input checked="" type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Unexpected or adverse events would attract negative attention from the public and the local community this can be mitigated be properly executing the burn and properly notifying the public and the local community.
Final Rating: <i>Low</i> <input checked="" type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Routine press releases and contacts will be needed.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

8. Fire Treatment Objectives

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Fuel reduction and ecosystem maintenance.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Failure to meet objectives would not adversely impact resources in a manner that they would not recover.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Techniques will not restrict achievement of the objectives of this burn.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

9. Constraints

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No scheduling restrictions. No significant restraints on access or tactics. We would like to avoid using vehicles in the unit but we can use them to avoid an escaped fire.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Vehicle traffic or line construction in the unit could impact archeological resources, therefore these techniques should only be used as a last resort. Hose lays, back-pack pumps and flappers are preferred.

Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Constraints do not make the project substantially more difficult from a technical aspect.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

10. Safety

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Standard firefighter operational guidelines will be implemented to mitigate potential risks to safety.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	There is minimal potential for accidents and injuries and all standard mitigation techniques will be in place.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Standard safety mitigation will be in place. LCES, safety briefing, no special mitigation to protect the public.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

11. Ignition Procedures/Methods

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No unusual or extraordinary techniques, or timing needed.
Final Rating: <input type="checkbox"/> <i>Low</i> <input type="checkbox"/> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale

Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No unusual risks to igniters. All safety procedures will be observed.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change.
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Drip torch by hand simple and effective.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change.

12. Interagency Coordination

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Local VFD will be on scene, radio communication will be confirmed prior to briefing.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No interagency issues.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change.
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No difficulty anticipated.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change.

13. Project Logistics

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	Getting fire ready red carded fire personnel, and fire equipment to the incident will require travel, and overnight stays.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <input type="checkbox"/> <i>High</i>	No change

Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	Risk associated with traveling.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	Coordinating travel logistics will require communication between Park units and the MWRO.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	No change.

14. Smoke Management

Risk	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	The grass fuel model should produce low volumes and densities of smoke, with little or no heavy fuels available to smolder after the flame front passes.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	No change.
Potential Consequences	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	Northwest wind preferred, however due to the small scale of the project and the grass fuel type the project could be executed with any wind direction with minimal smoke impact.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	No change
Technical Difficulty	Rationale
Preliminary Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	Fire techniques and the small unit acreage should present little technical difficulty.
Final Rating: <input type="checkbox"/> <i>Low</i> <i>Moderate</i> <i>High</i>	No change

COMPLEXITY RATING SUMMARY

RISK	OVERALL RATING	<u>LOW</u>
POTENTIAL CONSEQUENCES	OVERALL RATING	<u>LOW</u>
TECHNICAL DIFFICULTY	OVERALL RATING	<u>LOW</u>
SUMMARY COMPLEXITY RATING		<u>LOW</u>

RATIONALE: This project rates at a low complexity due to the fuel type and low complexity organization needed to implement the burn. Concerns are associated with the local community and their acceptance of fire. Consequences of a large escaped fire could hinder progress of the HOCU burn program. There are nearby public residence in the subdivision northeast of the burn, the risk of fire reaching those residences is low due to the natural and man made barriers and the discontinuity fuels. Overall Safety and risk of escaped fire of the projects are mitigated by solid unit boundaries, roads and agriculture in the surrounding area that would assist in any escaped fire suppression efforts.

Prepared by: Paul Mancuso Date: 3/22/2007

Approved by: _____ Date: _____
(Agency Administrator)

JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1. WORK PROJECT/ACTIVITY Prescribed Fire	2. LOCATION Hopewell Culture National Historical Park	3. UNIT Hopewell Prairie
JOB HAZARD ANALYSIS (JHA)	4. NAME OF ANALYST P. Mancuso	5. JOB TITLE Fuels Management Spec.	6. DATE PREPARED 3/21/2007
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINISTRATIVE CONTROLS - PPE	
1. Ignition Operations	<p>A. Proximity to intense heat and erratic fire behavior.</p> <p>B. Noise of fire obscures verbal warnings.</p> <p>C. Ignition sources.</p> <p>D. Incorrect ignition locations. Careless ignition use.</p> <p>E. Poor footing, heavy fuels accumulation.</p> <p>F. Poor visibility due to smoke.</p>	<p>A. Use Personal Protective Equipment (PPE), maintain close supervision, and lookouts. Thorough briefing on expected fire behavior. Adjust ignition patterns as needed to reduce exposure and fire behavior.</p> <p>B. Handheld radios for all ignition personnel.</p> <p>C. Use only qualified personnel for ignition operations. Igniters stay alert to location of torch flame. Close air vent when not igniting. Make sure that target area is clear before using hand flares or very pistols. Wear proper PPE.</p> <p>D. Thorough briefing of ignition plan. Follow Burn Boss's instructions. Know location of other igniters and personnel. Radios for all igniters. Close supervision.</p> <p>E. Be constantly aware; identify hazard areas; slow down.</p> <p>F. Post lookouts on roads to gauge visibility. Stage emergency vehicles with headlights and emergency lights on along roads to alert traffic. Use law enforcement to control traffic.</p>	
2. Motor Vehicle Operation	<p>A. General operations and public traffic.</p> <p>B. Secure loads.</p> <p>C. Hauling flammable substances.</p>	<p>A. Defensive driving techniques. Observe posted speed limits and obey all driving laws and regulations. Use spotter when backing.</p> <p>B. Check loads for security before departing – use tie downs.</p> <p>C. Use appropriate containers for hauling drip torch fuels and gasoline. Secure containers on vehicle.</p> <p>D. Use guards and secure tools in engine</p>	

	D. Transporting sharp tools.	compartments or on vehicles.
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JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1. WORK PROJECT/ACTIVITY Prescribed Fire	2. LOCATION Hopewell Culture National Historical Park	3. UNIT Hopewell Prairie
JOB HAZARD ANALYSIS (JHA)	4. NAME OF ANALYST P. Mancuso	5. JOB TITLE Fuels Management Specialist	6. DATE PREPARED 3/28/2007
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINISTRATIVE CONTROLS - PPE	
2. Motor Vehicle Operation (Cont.)	E. Loading vehicles. F. Trailer use.	E. Use of proper lifting techniques. F. Use safe loading and operation procedures. Refer to Job Hazard Analysis on trailer use.	
3. ATV Operation	A. Operation accidents	A. Proper ATV procedures. Refer to Job Hazard Analysis on ATV operations for more detail.	
4. Holding Operations	A. Proximity to intense heat and erratic fire behavior. B. Fatigue C. Excessive Smoke Exposure D. ATV Operations E. Poor visibility due to smoke.	A. Use Personal Protective Equipment (PPE), maintain close supervision. Thorough briefing on expected fire behavior. Use appropriate tactics to ensure personnel are not subjected to unnecessary heat. B. Rotate personnel on different tasks. Limit smoke exposure. Take adequate breaks. Drink plenty of water. C. Rotate personnel so that one group is not always in the smoke. D. Stay alert and watch for ATV traffic on fireline. E. Stay alert. Watch for tripping and overhead hazards, sudden drop-offs, and ATV traffic.	
5. Mop-up Operations	A. Poor footing B. Falling snags	A. Be constantly aware; identify hazard areas; slow down. B. Be alert, post lookouts when necessary. Flag off dangerous areas. Watch for strong winds.	

	C. Fatigue	C. Rotate personnel on different tasks. Take adequate breaks. Drink plenty of water.
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JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1. WORK PROJECT/ACTIVITY Prescribed Fire	2. LOCATION Hopewell Culture National Historical Park	3. UNIT Hopewell Prairie
JOB HAZARD ANALYSIS (JHA)	4. NAME OF ANALYST P. Mancuso	5. JOB TITLE	6. DATE PREPARED
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINISTRATIVE CONTROLS - PPE	
6. Monitoring Operations	A. Possibility of entrapment B. Proximity to intense heat and erratic fire behavior.	A. Stay in communication and relay location to Burn Boss and Ignition Specialists. B. Use Personal Protective Equipment (PPE), maintain close supervision. Thorough briefing on expected fire behavior. Use appropriate tactics to ensure personnel are not subjected to unnecessary heat.	
10. SUPERVISOR'S SIGNATURE		11. TITLE	12. DATE



BehavePlus 3.0.2 (Build 265)

HOPEWELL MOUND GROUP PRAIRIE fuel model 3_3222007

Wed, Mar 28, 2007 at 12:37:56

Input Worksheet

Modules: SURFACE, SIZE, CONTAIN, IGNITE

Input Variables	Input Value(s)	Units
Fuel/Vegetation, Surface/Understory		
Fuel Model	3	
Fuel Moisture		
1-h Moisture	6	%
10-h Moisture	7	%
100-h Moisture	10	%
Live Herbaceous Moisture	200	%
Live Woody Moisture	200	%
Weather		
Midflame Wind Speed	8	mi/h
Direction of Wind Vector (from upslope)	0	deg
Air Temperature	65	oF
Fuel Shading from the Sun	0	%
Terrain		
Slope Steepness	0	%
Fire		
Elapsed Time	0.5	h
Suppression		
Suppression Tactic	Head	
Line Construction Offset	0	ch
Resource Line Production Rate	155	ch/h
Resource Arrival Time	0	h
Resource Duration	10	h

Notes

Run Option Notes

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always

for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from upslope [SURFACE].

Direction of the wind vector is the direction the wind is pushing the fire [SURFACE].

Suppression input is for a single resource [CONTAIN];

multiple values can be entered for any input variable.

Results

Output Variable	Value	Units
Surface Rate of Spread (maximum)	214.3	ch/h
Heat per Unit Area	742	Btu/ft2
Fireline Intensity	2916	Btu/ft/s
Flame Length	17.7	ft
Direction of Maximum Spread (from upslope)	0	deg
Max Eff Wind Exceeded?	No	
Area	318.4	ac
Perimeter	246	ch
Time from Report	0.0	h
Contain Status	Escaped	
Contained Area	-1.0	ac
Fireline Constructed	0.0	ch
Probability of Ignition from a Firebrand	54	%

End



BehavePlus 3.0.2 (Build 265)

HOPEWELL MOUND GROUP PRAIRIE fuel model 1_3222007

Wed, Mar 28, 2007 at 12:44:24

Input Worksheet

Modules: SURFACE, SIZE, CONTAIN, IGNITE

Input Variables	Input Value(s)	Units
Fuel/Vegetation, Surface/Understory		
Fuel Model	1	
Fuel Moisture		
1-h Moisture	6	%
10-h Moisture	7	%
100-h Moisture	10	%
Live Herbaceous Moisture	200	%
Live Woody Moisture	200	%
Weather		
Midflame Wind Speed	8	mi/h
Direction of Wind Vector (from upslope)	0	deg
Air Temperature	65	oF
Fuel Shading from the Sun	0	%
Terrain		
Slope Steepness	0	%
Fire		
Elapsed Time	0.5	h
Suppression		
Suppression Tactic	Head	
Line Construction Offset	0	ch
Resource Line Production Rate	155	ch/h
Resource Arrival Time	0	h
Resource Duration	10	h

Notes

Run Option Notes

Calculations are only for the direction of maximum spread [SURFACE].

Fireline intensity, flame length, and spread distance are always

for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from upslope [SURFACE].

Direction of the wind vector is the direction the wind is pushing the fire [SURFACE].

Suppression input is for a single resource [CONTAIN];

multiple values can be entered for any input variable.

Results

Output Variable	Value	Units
Surface Rate of Spread (maximum)	241.6	ch/h
Heat per Unit Area	91	Btu/ft2
Fireline Intensity	402	Btu/ft/s
Flame Length	7.1	ft
Direction of Maximum Spread (from upslope)	0	deg
Max Eff Wind Exceeded?	No	
Area	405.0	ac
Perimeter	277	ch
Time from Report	0.0	h
Contain Status	Escaped	
Contained Area	-1.0	ac
Fireline Constructed	0.0	ch
Probability of Ignition from a Firebrand	54	%

End

ADEQUATE HOLDING RESOURCES WORKSHEET FOR PRESCRIBED FIRE

Project Name: Hopewell Prairie
 Area: 3
 Prepared By/Date: Paul Mancuso
 Area: 1

Fuel Models Inside Project

Fuel Models Outside Project

Characteristics	Output Type	Modeling Predictions Inside Project Area	Modeling Predictions Outside Project Area	Unit of Measure
CRITICAL FIRE INPUTS	1 Hr Fuel Moisture	6	6	%
	Wind Speed	8	8	MPH
	Slope	0	0	%
KEY FIRE BEHAVIOR OUTPUTS	Rate of Spread	214	242	Ch/hr
	Fire Line Intensity	2916	402	BTU/ft/sec
	Flame Length	17.7	7.1	Feet
	POI	54	54	%
	Spotting Distance	n/a	n/a	Miles
	Scorch Height	n/a	n/a	Feet
FIRE SIZE	Projection Time	n/a	n/a	Hours
	Forward Spread	n/a	n/a	Chains
	Backward Spread	n/a	n/a	Chains
FIRE CONTAINMENT	Method of Attack	Head	Head	Head/Rear
	Max Escape Target	50	31	Acres
	Max Containment Time	0.8	0.5	Hours
	Total Line Building Rate	428	483	Ch/hr

- Choose worst case total line building rate above that is needed for containment of slop over or spot fire: 483ch/r
- Estimate potential number spot fires or slop-overs at a time: 1
- TOTAL LINE BUILDING RATE NEEDED (multiply line 1 times line 2) 483ch/hr
- Production Rates: Ease of Access: POOR-FAIR-GOOD-**EXCELLENT**
 Fuel Resistance to Control LOW-MODERATE-HIGH-EXTREME
 (refer to fireline handbook) Hand Crew production 4ch/person/hr
 Engine Production (Crew of 3) 24ch/hr
 ATV with & pump (see below*) 6ch/hr

On Site Organization	Total # Planned On Burn	Total # Available for Spot Fire or Slop Over Control		Line Building Production Rates		Spot Fire or Slop Over Line Building Capacity
Overhead	1	0	X	4	ch/hr	0
Firing Crew	2	0	X	4	ch/hr	0
Holding	4	4	X	4	ch/hr	16
Fire Monitor	1	1	X	4	ch/hr	4
Engine (Crew of 3)	1	1	X	24	ch/hr	24
ATV w water/pump	1	1	X	6	ch/hr	6
Total	12				ch/hr	58

- TOTAL SLOP OVER OR SPOT FIRE LINE BUILDING RATE CAPACITY 50 ch/hr
- DETERMINATION OF ADEQUATE HOLDING RESOURCES (Line 5 minus Line 3) -433 ch/hr

If number on line 6 is positive then adequate holding forces will be available. If number is negative, more holding resources are needed to control potential spot fires or slop-overs.

Justification for quantity of holding resources: More Holding resources are not anticipated an escape will result in little damage to resources. Hardwood areas and tilled fields will slow the fire spread compared to the grass model in the unit. The unit is surrounded by man made fire barriers railroad beds converted to trails, roads, and the creek. The mowed fire break will be raked so the creeping will be minimized.

* An ATV fitted with a water tank and pump can build line at a higher rate than personnel with hand tools or backpack pumps.