

**PRESCRIBED FIRE PLAN**

**ADMINISTRATIVE UNIT(S): U.S. FWS – Eastern Massachusetts Refuge Complex  
Massasoit National Wildlife Refuge, Plymouth, MA**  
**PROJECT NAME: FY10 Massasoit Rx**  
**PRESCRIBED FIRE UNIT: Massasoit Unit 1**

**PREPARED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
John Meister, R5 North Zone Fire Management Specialist

**CONCURRENCE:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
LOCAL / REGIONAL BIOLOGIST

**SUBMITTED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
REFUGE MANAGER

**TECHNICAL REVIEW:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
FWS ZONE FMO

**TECHNICAL CONCURRENCE:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
REGIONAL FIRE MGT. COORDINATOR

**REVIEW BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
TNC FIRE MANAGER – PLYMOUTH, MA

**REVIEW BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
OTHER (MA DCR FIRE CONTROL, PLYMOUTH FIRE DEPT)

**COMPLEXITY RATING: MODERATE**                      **BURN BOSS LEVEL: RXB2**

**DOI:** The approved Prescribed Fire Plan constitutes the authority to burn. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Actions taken in compliance with the approved Prescribed Fire Plan will be fully supported. Personnel will be held accountable for actions taken that are not in compliance with elements of the approved plan regarding execution in a safe and cost-effective manner.

**APPROVED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
Refuge Supervisor - North

# AGENCY ADMINISTRATOR GO/NO-GO PRE-IGNITION APPROVAL CHECKLIST

## PRESCRIBED FIRE NAME: **Massasoit Unit 1**

Instructions: The Agency Administrator's GO/NO-GO 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 Go/No-Go Pre-Ignition Approval evaluates whether compliance requirements, Prescribed Burn Plan elements, and internal and external notifications have been completed and expresses the Agency Administrator's intent to implement the Prescribed Burn 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>
		Have all compliance requirements been 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>
		Are key agency staff fully briefed and understand prescribed fire implementation?
		Are there other extenuating circumstances that would preclude 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: TNC Assistance Agreement current; funding available?

Recommended by: \_\_\_\_\_ Date: \_\_\_\_\_  
FMO/Prescribed Fire Burn Boss

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Leader

Approval expires (date): \_\_\_\_\_

***This plan is valid for a period not to exceed three years from date of approval, subject to the following conditions:***

***The Agency Administrator Pre-ignition Approval Checklist must be approved by the Project Leader and the expiration date clearly indicated. The expiration date will not extend beyond December 31 of the year of approval. Any burn implemented the following year must be accompanied by a new, approved Pre-ignition Checklist. All Pre-ignition Checklists will be attached to the burn plan and placed in refuge files.***

***Any substantive alteration to the plan such as addition of a new burn unit, or changes in prescription parameters, holding/contingency resources, objectives, or complexity determination will require an amendment to the plan which must go through the same review and approval process as a full prescribed fire plan.***

## PRESCRIBED FIRE GO/NO-GO CHECKLIST

**PRESCRIBED FIRE NAME: Massasoit Unit 1**

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

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

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

\_\_\_\_\_

Burn Boss

\_\_\_\_\_

Date

\_\_\_\_\_

Project Leader

\_\_\_\_\_

Date

COMPLEXITY ANALYSIS SUMMARY ALL UNITS	Massasoit Unit 1		
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	Low	Low	Low
4 On-Site Values	Low	Low	Low
5. Fire Behavior	Low	Low	Low
6. Management organization	Moderate	Low	Moderate
7. Public and political interest	Moderate	Moderate	Moderate
8. Fire Treatment objectives	Low	Low	Low
9 Constraints	Low	Low	Low
10 Safety	Low	Low	Low
11. Ignition procedures/methods	Low	Moderate	Low
12. Interagency coordination	Moderate	Moderate	Low
13. Project logistics	Low	Low	Low
14 Smoke management	Moderate	Moderate	Moderate
COMPLEXITY RATING SUMMARY		OVERALL RATING	
<b>RISK</b>		Moderate (4/14)	
<b>CONSEQUENCES</b>		Moderate (4/14)	
<b>TECHNICAL DIFFICULTY</b>		Moderate (3/14)	
<b>SUMMARY COMPLEXITY DETERMINATION</b>		<b>MODERATE (5/14)</b>	
<p><b>RATIONALE:</b> While the risk of escaped fire in the direction of private lands is low due to the mechanical treatments previously conducted on the north boundary of Unit 1, the consequences of escaped fire to the north range from moderate to high, as would the consequences of significant smoke in that direction. Moderate complexity is also appropriate given that an escaped fire to the south would enter State Forest, and may result in interagency cooperation and media exposure consequences that could negatively impact the potential for future prescribed fire treatments in the refuge.</p> <p>Although this is a large unit, due to quick burn out time of the fuels it will have a relatively small perimeter susceptible to fire escape (less than 200 meters). Uniformity of fuel conditions and absence of laddering fuels lean to making these burns easy to predict, relatively simple to carry out, and of very little risk to public, firefighter, or resource safety. Prescription conditions will ensure minimal risk of escape or adverse impact on the surrounding area. Experienced fire personnel make the job of the burn boss much easier and allow personnel to fill more than one position as needed. Additionally, the refuge has a good relationship with the National Park Service whose fire employees can be drawn upon if conditions are near prescription limits and more help is deemed prudent to safely conduct the burn.</p> <p>Of the <b>42 elements</b> that are rated, there were <b>sixteen</b> that ranked initially as <b>moderate but seven were adequately mitigated to low</b> through the fire management process and strict adherence to the prescriptions laid out in this plan. Under “Public and Political Interest,” <b>one element initially ranked high, mitigated to moderate</b>. Also, under “Smoke Management”, <b>one ranked high and can be mitigated to moderate</b>. A total of <b>nine elements</b> dealing with “Management Organization”, “Public and Political Interest”, “Ignition Procedures”, “Interagency Coordination” and “Smoke Management” <b>could not be mitigated lower than moderate</b>, mostly due to Air Quality and smoke management concerns. Should this burn not be executed properly, adverse air quality impacts could have lasting affects on future burns for the Service and possibly other fire practitioners in Massachusetts.</p>			

<b>DESCRIPTION OF PRESCRIBED FIRE AREA</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>PHYSICAL DESCRIPTION</b>		
<p>Location: Massasoit NWR is located in Southeastern Massachusetts Plymouth County, in the town of Plymouth, and abuts the Myles Standish State Forest.</p> <p>Lat/Long: 41°53'25"N and 70°38'20"W</p> <p>Size: 50 Acres.</p> <p>Topography: The unit occupies much of the high ground in Massasoit NWR with elevation ranging between 155 and 240 feet. Relief within the unit includes several kettle holes, small knolls, plateaus and the draws between them. This unit is divided into two subunits, East (17 acres) and West (32 acres). The unit does not feature a prevailing aspect, though some locations have slopes steep enough to significantly influence fire behavior, such as the north-facing bowl near the intersection of the north fire break and the dividing line between East and West subunits. Several sections of the unit feature considerable boulders that would interfere with brush breaker passage, most notably in the south along and just north of the southern firebreak where it meets the dividing line between subunits. Sandy soils overlain by a variable though largely shallow duff layer are present throughout the unit.</p>		
<b>PROJECT OR BURN UNIT BOUNDARY DESCRIPTION</b>		
<p><b>Note: Reference Project maps, Appendix A</b></p> <p>East: A 150' wide transmission power line right-of-way (PROW) provides most of the eastern firebreak (D-F). The PROW is maintained by mowing, with often discontinuous low heath shrub surface fuels interrupted by a dirt road and frequent washouts on the steeper slopes. The length of the PROW is drivable from the southeast corner (F) to the most northeastern corner (D) where the boundary turns northwesterly away from the PROW to briefly follow a footpath (D-C). Further north from there, the PROW crosses a deep kettle hole, making passage by fire equipment difficult. <b>The drivable length of the PROW can be accessed via a dirt road connecting the west side from the south with Alden Road. Soils are sandy and access must be obtained carefully.</b></p> <p>South: The southern boundary (F-H) of the unit follows the property boundary between the refuge and the Myles Standish State Forest. The 5' wide break passes through low heath shrub, prepared by mowing and raking. White pine and snags posing challenges to fireline control will be removed prior to the burn. <b>The break is not wide enough to permit passage of Type Six engines.</b></p> <p>West: The western firebreak (H-J) follows an existing footpath that travels north from the State Forest boundary to intersect a dirt road (I) which completes the northerly 200 feet of the break. <b>The footpath has been improved to allow passage of Type Six engines</b>, and will be mowed and raked to reinforce the existing path of exposed mineral soil. White pine and snags posing challenges to fireline control will be removed prior to the burn.</p> <p>North: The northern firebreak (J-C) follows an existing mineral soil footpath that winds through a mechanically treated 100 ft. wide buffer area, reducing fuels between the residential neighborhood to the north and the main body of the unit. Within the buffer area (treated in Spring, 2006), understory vegetation was mowed, white pines (potential ladder fuels) were felled, as were snags, and mature pitch pine were limbed up to eight feet. <b>The north firebreak is not passable with engines.</b> The corner of the unit (Point C) is accessed from the end of Crabtree Road.</p> <p>Subunit Dividing Line: A firebreak (A-B) will be constructed to bisect the unit into eastern and western compartments, located in such a way as to maximize the ability of holding personnel to control fire at the break. The low heath shrub understory will be mowed prior to the burn. This line may be used to restrict fire to only one compartment, or as an ignition line for both compartments. <b>This break will not be passable with engines.</b></p>		

FUELS DESCRIPTION	
ON-SITE FUELS DATA	ADJACENT FUELS DATA
<p>Pitch Pine-Oak Forest:</p> <p>Generally closed canopy pitch pine-oak forest on sandy soils (species proportions variable, but overall with a higher proportion of dry oaks), with associated leaf litter and needle cast (FM 9) covers 100% of the unit. Mid-story white pine is scattered across the unit, as well as less common red maples. A mostly continuous low ericaceous shrub layer (FM 5) of primarily huckleberry covers &gt;90% of the unit. A small number of scattered scrub oaks are limited to a frost pocket in the extreme southeast corner of the unit. Herb layer across the unit is generally sparse.</p> <p>According to the Myles Standish Fire Warden, the last wildfire to consume the entire unit occurred in 1957.</p>	<p><u>East:</u> Across the power line right-of-way, the same pitch pine-oak forest community extends to Alden Road and beyond.</p> <p><u>South:</u> Directly south of the unit, the pitch pine-oak forest community extends to the PROW across MA State Forest land. Some sections of this area include relatively greater white pine regeneration than inside the unit. The frost pocket in the extreme southeast of the unit continues into the State Forest, and also contains scattered scrub oak. The trail serving as the unit's western firebreak continues across this area and connects to the south with the trail that meanders through the east compartment, the confluence of both connecting with the PROW. These trails would have limited use as firebreaks, but can serve as escape routes.</p> <p><u>West:</u> Across the western firebreak, the same pitch pine-oak forest community extends across the refuge, interrupted by several dirt roads and occasional ponds.</p> <p><u>North:</u> A residential development (lacking fire hydrants and Firewise practices) is directly north of the unit, beyond the mechanically treated buffer.</p>
<p><b>DESCRIPTION OF UNIQUE FEATURES</b> (hazards, regulations, issues, constraints, etc. Examples may include: fences to protect, power poles, historical/cultural sites, threatened and endangered species or habitat, etc.)</p>	
<p>The Northern red-bellied cooter, federally listed as an endangered species, is known to nest in the Massasoit NWR. The burn will be conducted after the Northern red-bellied cooter's June through July breeding season. The presence of the endangered turtle will be addressed during the pre-burn briefing, with personnel directed to take care to avoid harming any turtles discovered in the course of the burn day so long as doing so does not endanger crew safety.</p> <p>The proximity of high tension transmission power lines to the east side of the unit is cause for caution with respect to smoke management. Smoke will be monitored, and ignition coordinated to minimize putting smoke on the power lines that could result in arcing. The towers are founded on concrete footings, and given the sparse, discontinuous fuels in the PROW, the structures are not vulnerable to heat from surface fire.</p> <p>There are no known cultural sites located in the unit. Northern red-bellied cooters, federally endangered, are found in the vicinity of Crooked and Island (located ½ mile N of unit) Ponds. Proposed burn window and burn location should have little adverse impacts.</p> <p><b>Smoke Management</b> - Allowable winds are from the East, Northeast, North, or Northwest (If burning under a NW wind, ignition will be managed to prevent excessive smoke contact with the power lines on the eastern fire break). <b>No burning when a Red Flag Warning has been issued. No burning when Forecasted AGI for ozone is &gt;50; and for particulate (PM2.5) matter, if the AGI is &gt;75.</b></p> <p>Access: <a href="http://www.mass.gov/?pageID=mg2ozonepage&amp;L=1&amp;sid=massgov2&amp;U=airquality_ozone">http://www.mass.gov/?pageID=mg2ozonepage&amp;L=1&amp;sid=massgov2&amp;U=airquality_ozone</a></p> <p>Access: <a href="http://airnow.gov/index.cfm?action=airnow.showlocal&amp;cityid=38">http://airnow.gov/index.cfm?action=airnow.showlocal&amp;cityid=38</a></p>	

<b>GOALS AND OBJECTIVES</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>		
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>		
<b>PURPOSE AND RESOURCE MANAGEMENT GOALS:</b>				
<p>THE PURPOSE OF THE BURN IS TO IMPLEMENT THE NATIONAL FIRE PLAN FOR COMMUNITY ASSISTANCE FOR PROTECTION FROM WILDLAND FIRES WITHIN FEDERALLY DESIGNATED WILDLAND-URBAN INTERFACE COMMUNITIES-AT-RISK. THE BURN WILL REDUCE THE RISK AND CONSEQUENCES OF WILDFIRE, BOTH IN AND AROUND NEARBY COMMUNITIES AND WITHIN THE REFUGE.</p> <p>THE BURN WILL ALSO CONTRIBUTE TO THE RESTORATION OF THE SITE TO FIRE REGIME CONDITION CLASS 1.</p>				
<b>RESOURCE AND PRESCRIBED FIRE OBJECTIVES</b>				
<b>RESOURCE OBJECTIVES:</b>				
<p>Resource Fire Objectives:</p> <p>A. Mitigate wildfire hazard by reducing by 75 percent or more the accumulation of available fuel, using prescribed fire to reduce the buildup of leaf litter and deadwood over time. Ideally, consume 90% of fine dead fuels and 70% of 10 and 100 hour fuels.</p> <p>B. Promotion of forest regeneration and habitat preservation through reintroduction of fire into traditionally fire-adapted woodlands. Create a patchwork of early succession habitat consistent with pitch pine – oak forest communities functioning within a natural fire regime. Top kill 50% of the midstory white pine and red maple.</p> <p>C. Restore unit to Fire Regime Condition Class 1.</p>				
<b>PRESCRIBED FIRE OBJECTIVES:</b>				
<p>Fire Operations Objectives:</p> <p>A. Limit access to the burn units to fire personnel only on burn days.</p> <p>B. Safety compliance of all firefighters to include required PPE, NWCG qualifications standards, and operational understanding through briefings and questions. Utilize prescribed fire as training for TNC, state and local fire personnel; include trainee positions wherever possible without jeopardizing safety or objectives.</p> <p>C. No smoke related incidents in the adjacent residences of the Town of Plymouth through careful prescription monitoring and monitoring weather forecasts for changing conditions.</p> <p>D. Burn the units in such a matter as to limit scorch and mortality to the surrounding perimeter vegetation. Mortality levels greater than 10 percent in the area adjacent to the line are unacceptable. Limit heat stress and top kill to &lt; 10% of mature pitch pine and tree oaks.</p> <p>E. Determine, through test fire, potential visibility impact of smoke on perimeter roads or residences. No smoke related incidents; monitor as necessary, provisions made for traffic control, signing and outreach.</p>				
<b>OBJECTIVES ARE S.M.A.R.T.</b>				
<b>Specific</b>	<b>Measurable</b>	<b>Attainable</b>	<b>Reasonable</b>	<b>Time Related</b>
<b>CONSTRAINTS:</b>				
<p>The presence of volatile oils in the foliage of huckleberry can produce moderate fire behavior even during the growing season, though the generally higher humidity and slower wind speeds during that time produce lower rates of spread compared to the spring or fall. Growing season fire in these fuels is likely to produce some overstory mortality, creating snags that will provide habitat for a variety of flora and fauna while allowing more light to reach the forest floor. Ignition patterns will be managed to keep fire behavior low to moderate, thus limiting overstory mortality, thereby creating a modest degree of early succession habitat without producing excessive amounts of standing dead fuel.</p> <p>No burning to occur 12 hours in advance of a predicted cold front with forecasted wind speeds in excess of 25 mph. No burning will occur when the predicted <b>Class Day is V</b>, as determined by MA. DCR Fire Control or when the Atmospheric Mixing Height is less than 1500 ft.</p>				

Constraints that may effect the burning of the unit includes potential nesting by migratory songbirds within the burn unit. The Northern red-bellied cooter, federally listed as an endangered species, is known to nest in the Massasoit NWR. No burning will be conducted during the Northern red-bellied cooter's June through July breeding season.

**Regional and National Constraints** are addressed in the National Interagency Mobilization Guide, Chapter 20. For Preparedness **Level 4** the Mob Guide, Section 26.3.4B states:

Prescribed fire application can be continued or be initiated if the proposed action is approved by an agency at the Regional level. This approval must be based on an assessment of risk, impacts of the proposed actions on Area resources and activities, and include feedback from the GMAC (Geographic Multi-Agency Coordinating Group). The final decision to implement resides with the implementing agency.

For Preparedness **Level V** the Mob Guide, Section 26.3.5E states:

Rx applications can be initiated or continued if the proposed action is approved by an agency at the Regional level and local resources are available to carry out the application without additional outside resource needs. This approval must be based on an assessment of risk, impacts of the proposed actions on Area resources and activities, and include feedback from the GMAC.

For Rx applications to be initiated or continued that requires additional support of resources from outside the local unit or require resource ordering of an IMT or FUMT, a National MAC representative must assess risk and impacts of the proposed action and present to NMAC for review prior to proceeding. The final decision to implement resides with the implementing agency.

Any Rx actions at PL V must first have a PL5 Rx Request form completed and sent to the Regional Fire Management Coordinator for review and forwarding to the Branch office at NIFC.

Also, within the Mob Guide, under Section 26 it states, "at any preparedness level, NMAC may request that proposed new prescribed fire (Rx) applications be curtailed to meet national resource needs for emergency operations."

**Number of active fires burning at one time:** If a wildfire is in progress on or in close proximity to the refuge, no prescribed burning will take place until it is fully contained or no longer a threat.

**Drought indices (KBDI)** are monitored on a daily basis; no burning will take place under severe drought conditions. No burning will occur above a KBDI value of 400 for the summer and fall and KBDI value over 200 for the spring burn season, which in this area is an indicator that drought conditions may be imminent. This value is the 90th percentile for our most common fuel models.

<b>FUNDING - FALL 2009</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAMES:</b>	<b>Massasoit Unit 1</b>

**A. Cost:** Experience from previous prescribed fire seasons has shown that this type of burning costs between **\$200.00 and \$300.00 per acre**. The cost for implementing each individual unit will vary based on difficulty, number of people required, and how many are on the FWS payroll. Most of the FWS/ TNC contracted funds were spent for fuel break and other site preparation costs as well as a Rx burn of the eastern part of the unit in April, 2007. While TNC will cover their costs, there is the probability of additional costs for the presence of structural fire equipment and line personnel from several surrounding towns. These costs are inclusive of planning, preparation and implementation of a typical unit plus per diem, travel costs, and salary. The total estimated cost to carry out this project is \$10,000 to \$15,000.

**B. Funding Source:** The primary sources of funding for project implementation will be provided from hazard fuels reduction, either 9263 or 9264, and will be discussed with the Regional Fuels Coordinator.

**Note:** All but hazard fuel funds are already budgeted, including base 8 FFTR and other Refuge Staff. For costs exceeding base 8, hazard fuel funds will be used to cover OT costs, travel, fuel / equipment expenses. A project code will be opened within FMIS by the Zone FMO after Oct. 1 to activate this project. There are NFPORS projects specific to Eastern Mass NWR Complex and Rx burning. Expenditures within this Plan and any other PBP approved for FY10, will not exceed the ceiling level funded **and must target hazard fuel reduction or native ecosystem maintenance**, with a accomplishment target of 50 acres in FY10. Funds expended will be as they are incurred, and not directly targeted to the Refuge as a lump sum. Should additional funds be required beyond this ceiling threshold, consult the Zone FMO.

<b>PRESCRIPTION: ENVIRONMENTAL PARAMETERS</b>  <b>Custom Fuel Model 60% TL 9 / 40% SH 4</b>	<b>PROJECT NAME:</b>		<b>FY10 Massasoit RX</b>	
	<b>BURN UNIT NAME:</b>		<b>Massasoit Unit 1</b>	
	<b>PRESCRIPTION COVERAGE: (Rx type &amp;/or ignition method and season should be covered when multiple Rx included)</b>		<b>Broadcast burn – Strip Head Fire Fall or Spring Season as applicable Fall Burn: Sept. 15 – Nov. 30 Spring: February 15 – May 15 Time: 09:30 – 18:00</b>	
<b>ENVIRONMENTAL PARAMETERS NEEDED TO PRODUCE THE DESIRED FIRE BEHAVIOR:</b> Fill in applicable environmental parameters (weather, topography, fuels, etc.) for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions, seasonal differences and/or types of ignition (black lining, broadcast, aerial ignition, etc.)	<b>Fuels Within the Project or Burn Unit Boundary</b>		<b>Fuels Outside of The Project or Burn Unit Boundary</b>	
	<b>Low Fire Intensity</b>	<b>High Fire Intensity</b>	<b>Adjacent</b>	<b>Max. Spot Distance</b>
Temperature	40° F	79° F	See below	See below
Relative Humidity	79 %	25 %		
Wind Speed (20' Forecasted)	4 mph	28 mph		
Wind Speed (mid-flame)	1 mph	7 mph		
Wind Direction (mid-flame)	See below			
Cloud Cover (%)	75 %	0 %		
Soil Moisture	300	<100		
1 Hr. Fuel Moisture (%) *	14	6		
10 Hr. Fuel Moisture (%)		8		
100 Hr. Fuel Moisture (%)		14		
Live Fuel Moisture (%) **	125	75		
Litter/Duff Moisture (%)	200	100		
Probability of Ignition (%)	> 13	< 56		
Other - No. drying days	2	8		
-Forecasted AGI for ozone- limit		50		
-Forecasted AGI for PM2.5- limit		75		
- Atmospheric Mixing Height min.	1500'			
<b>Environmental parameters discussion, or description of empirical evidence utilized:</b>				
<p>* A correction factor for FDFM of 3 was used to represent mostly, but not completely, shaded shrubs and litter prior to fall leaf drop. Use a factor of 1 to recalculate if spring burning.</p> <p>** A Live Fuel Moisture of 75 represents shrubs almost in dormancy, not quite yet colored or starting leaf drop.</p> <p>Fuels outside the burn unit are the same as the interior. Potential spotting is predicted at up to 0.3 miles from any torching white pines in the midstory. The flanks of the unit are blacklined and secured ahead of the strip firing, so any spots that are generated usually land within the unit. The Burn Boss will discuss the location of natural barriers and secondary lines that could be used to stop an escape during the pre burn briefing. Fire behavior of an escape would be much more than within the unit due to it being a head fire. A combination of 2 or more high intensity parameters will require the Burn Boss to examine the Behave runs closely and then look at all factors (contingency forces, ignition techniques, weather forecast, etc.) before deciding to proceed. POI not exceeding 56% further minimizes risk.</p>				

<b>PRESCRIPTION: FIRE BEHAVIOR PARAMETERS OUTPUTS</b>  <b>Custom Fuel Model</b> <b>60% TL 9 / 40% SH 4</b>	<b>PROJECT NAME:</b>		<b>FY10 Massasoit RX</b>	
	<b>BURN UNIT NAME:</b>		<b>Massasoit Unit 1</b>	
	<b>PRESCRIPTION COVERAGE:</b> (Rx type &/or ignition method and season should be covered when multiple Rx included)		<b>Broadcast burn – Strip Head Fire</b> <b>Fall or Spring Season as applicable</b> <b>Fall Burn: Sept. 15 – Nov. 30</b> <b>Spring: February 15 – May 15</b> <b>Time: 09:30 – 18:00</b>	
<b>DESCRIPTION OF PRESCRIBED FIRE BEHAVIOR CHARACTERISTICS NEEDED TO MEET THE RESOURCE MANAGEMENT OBJECTIVES STATED IN THE OBJECTIVES SECTION:</b> Fill-in all applicable fire behavior parameters (flame lengths, rate of spread, scorch height, ERC, etc.) for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions, seasonal differences and/or types of ignition (black lining, underburning, broadcast, aerial ignition, etc.*	<b>Fire Behavior For Fuels Within the Project or Burn Unit Boundary</b>		<b>Fire Behavior For Fuels Outside the Project or Burn Unit Boundary</b>	
	<b>Low Fire Intensity (Backing)</b>	<b>High Fire Intensity (Flanking)</b>	<b>Adjacent (Head fire)</b>	<b>Max. Spot Distance</b>
Rate of Spread (chs. /hr.)	0.5 – 1.2	0.8 – 2.2	1.9 – 26.6	
Fireline Intensity (BTU/ft/sec)	5 - 27	8 – 52	19 – 623	
Flame Length (ft.)	0.9 – 2.1	1.1 – 2.8	1.8 – 8.7	
Burning Index (BI) NFDRS FM E - Fall Hdwd NTE 90 <sup>th</sup> percentile Source: Sig Rachel Carson and Ninigret RAWs.	4	≤ 30	≤ 30	
Fire Behavior outputs may be derived from BEHAVE models, nomograms, or historical/empirical evidence. Include modeling and/or empirical evidence documentation as an appendix or in the fire behavior narrative.				
<b>Fire Behavior Narrative or description of empirical evidence:</b>				
<p>* Allowable winds are such as to blow smoke away from the housing development and roads. East, Northeast, North, and Northwest are allowable.</p> <p>Note: Rate of spread and flame length is controlled through ignition technique, allowing fire to spread back against the wind as much as possible (backing fire), and using strips only to keep flaming front “squared” up or where more fire behavior is needed to kill midstory pine and maple. <b>Strip width is not to exceed 60 feet</b> and is used only after an adequate black line of 30 feet is established on the downwind side of the units.</p> <p>See Appendix – Behave Runs for further discussion and fire escape predictions. Any escape will be relatively easy to catch but will probably involve going indirect and backfiring off a wet line or trail. Leaf blowers may prove very useful in constructing secondary containment lines.</p> <p>Note: Fuel Models and Fire Behavior Modeling based in part on work done by Dave Crary, NPS, Cape Cod National Seashore, showing a fuel loading of 5.48 Tons / acre for &lt; 1” and a fuel bed depth of 0.59’ for the Pitch Pine/ Oak Woodland Habitat.</p>				

<b>SCHEDULING</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>IGNITION TIMEFRAMES:</b>		
<p>Burning will be done during the spring (February 15 – May 15) and/or fall (Sept. 15 – Nov. 30). Ignition time frames will be between 09:30 to 18:00. Fine fuels are generally too wet to burn prior to 09:00, and the humidity usually rises, increasing the fuel moistures by 18:30.</p>		
<b>PROJECT DURATION:</b>		
<p>This unit can in all probability be completed in one burn period with no residual smokes. Exact duration depends on the number of personnel on the burn crew, and weather conditions.</p> <p><b>Burn execution will require commitment for full day for 3 person crew prior to burn day for unit prep (hose lay, line raking/leaf blowing).</b></p> <p><b>On burn day briefing must begin at 08:30 and be concise to allow time for the burn execution and mop up.</b></p> <p><b>Unit treatment schedules are flexible, +/- a year, to allow for variables such as weather, funding, manpower, etc.</b></p>		
<b>CONSTRAINTS:</b>		
<p><b>Smoke Management</b> - Allowable winds are from the <b>East, Northeast, North, or Northwest</b>. (If burning under a NW wind, ignition will be managed to prevent excessive smoke contact with the power lines on the eastern fire break).</p> <p><b>No burning when a Red Flag Warning has been issued. No burning when Forecasted AGI for ozone is &gt;50; and for particulate (PM2.5) matter, if the AGI is &gt;75.</b></p> <p>Access: <a href="http://www.mass.gov/?pageID=mg2ozonepage&amp;L=1&amp;sid=massgov2&amp;U=airquality_ozone">http://www.mass.gov/?pageID=mg2ozonepage&amp;L=1&amp;sid=massgov2&amp;U=airquality_ozone</a></p> <p>Access: <a href="http://airnow.gov/index.cfm?action=airnow.showlocal&amp;cityid=38">http://airnow.gov/index.cfm?action=airnow.showlocal&amp;cityid=38</a></p> <p>Should conditions not permit the entire unit to be ignited in one day, the two compartments may be treated on separate days in order to comply with the 0930-1800 ignition window.</p> <p><b>It is a goal of the regional fire program not to have inadequate funding as a limiting factor. There are fund ceilings that must not be exceeded. Should additional funds beyond this ceiling level be needed, consult with Zone FMO.</b></p>		

<b>PRE-BURN CONSIDERATIONS</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>ON AND OFF-SITE CONSIDERATIONS</b>		
<p><b>ON SITE:</b> Ensure firebreaks prepared in advance, including the break dividing the two compartments, which allow for easy foot travel. <b>Verify that all escape routes are flagged, safety zones marked/mapped and communicated during briefing.</b> Use brush saw, leaf blowers, mower, or hand tools as necessary. The ignition sequence will be modified to allow for adequate extinguishment and cold trailing along unit perimeter, based on the fire behavior.</p> <p>Fire fighters are to establish pump drafting sources and install hoselays, if required, in advance of ignition on burn day(s). Deploy and fill Port-A-Tanks as needed. Stage additional backpack pumps at key holding spots. Ensure tanks and pumps are operational in advance of ignition on burn day.</p> <p>The Burn Boss is expected to walk the perimeter of each unit prior to ignition, to identify any potential problem areas (such as corners with swirling winds, patches of heavy fuels adjacent to the line, etc.) requiring special holding needs. This information will be discussed during the pre-burn briefing.</p> <p>Burn Boss, Holding Specialist, and Ignition Specialist, if used, are responsible for reviewing prescription parameters and verifying with on site weather and fuel observations.</p>		

**OFF SITE:** Prior to burn season, and **again on the day before the burn**, the refuge will issue a news release to the media. **See table below for notification names and schedule to be followed pre burn.** On burn day, be certain all access gates are unlocked, smoke and traffic signs are deployed as needed based on wind directions, and immediate neighbors are personally notified.

Burn Boss to procure Burn Permit from appropriate Municipal Fire Department on burn day.

**METHOD AND FREQUENCY FOR OBTAINING WEATHER FORECAST(S):**

Wind direction is a critical limiting factor for burning these units. Local forecasting (NOAA weather channel and interactive weather products available via internet) provide adequate forecasting and “real time” conditions to determine a potential burn day. Burn Boss is to monitor this, along with other prescription elements. He is also monitoring weather issued by the Massachusetts Department of Environmental Management Fire Control Division, and a fire weather forecast issued by the National Weather Service. In addition, The FMO will monitor 1300 hour fire weather observations and associated fire danger indices (ERC, BI, etc.) from an automated weather station located at the Cape Cod National Seashore, NPS. Palmer Drought Index and Keetch Byram Drought Index (KBDI) are also monitored and no burning is to occur when these indexes indicate severe or extreme drought conditions. KBDI value over 400 is considered dry for the fall and KBDI value over 200 is considered dry for the spring burn season in this area. The zone FMO will determine a starting KBDI value around February 15. No site specific weather is necessary prior to burn day, however the FMO may assign fire fighters the responsibility of collecting weather data, using a belt weather kit or Kestrel, for comparison purposes to readings obtained at this office.

1) On the burn day(s) the Burn Boss (or as assigned) is to obtain a **Spot Weather Forecast** from the Taunton, MA office (508- 823- 1983) of the National Weather Service. The web site for Taunton National Weather Service Fire Weather Forecast and spot weather forecast submission is: <http://www.erh.noaa.gov/er/box/firewx.shtml>. Current site conditions for the spot forecast request, if actual on site readings unavailable, may be obtained from the internet using conditions at the CACO weather station for real time conditions in representative unit.

2) **In addition, a Tabular Point Forecast** from the above NWS site will be generated to display hourly forecasted weather parameters: temperature, wind speed and direction, Rh, sky cover, and precipitation probability. By entering Lat/ Long, a point forecast is generated within a five mile radius.

3) **No burning when Forecasted AGI for ozone is >50; and for particulate (PM2.5) matter, if the AGI is >75.**

**Access:** [http://www.mass.gov/?pageID=mg2ozonepage&L=1&sid=massgov2&U=airquality\\_ozone](http://www.mass.gov/?pageID=mg2ozonepage&L=1&sid=massgov2&U=airquality_ozone)

**Access:** <http://airnow.gov/index.cfm?action=airnow.showlocal&cityid=38>

**Assigned FOBS (qualified trainee minimum)** will monitor and record (on **Test Fire** page) site specific weather, using a belt weather kit or Kestrel, prior to ignition time and throughout duration of the burn and mop up operations, every 30 minutes. On-site fire weather will be recorded and broadcast via radio to all firefighters. **Fire behavior observations and measured ROS will also be taken (see Monitoring)** to correlate later with weather and verify prescription validity. The fire weather monitor is to monitor the Boston, MA NOAA weather channel (162.4000) every two hours to ensure conditions are as forecasted or planned for. Additional fire weather updates can be obtained through the Northeast Coordination Center (NECC) at Bolton Hill Headquarters (contact is Calvin Miller, shared FWS dispatcher, (207)624-3724).

**NOTIFICATIONS:**

Who	When*	Phone Number	Responsibility	Date Done	Method
Cape Cod Chronicle (Tim Wood)	PreSeason	508-945-2220	Refuge Personnel		News Release
Cape Codder (Carol Dumas)	PreSeason	508-247-3255	Refuge Personnel		News Release
Cape Cod Times (Paul Provost)	PreSeason	508-862-1166	Refuge Personnel		News Release
WQRC (Sarah Colvin)	PreSeason	508-771-1224 x104	Refuge Personnel		News Release
Old Colony Memorial (Tamson W. Burgess)	PreSeason	508-591-6615	Refuge Personnel		News Release

NOTIFICATIONS (continued):					
<b>E. Mass Refuge Manager (L. Herland)</b>	<b>36-48 hrs prior</b>	<b>978-443-4661 x11</b>	<b>Burn Boss or designee</b>		<b>Phone/email</b>
<b>FWS North Zone FMO (Rick Vollick)</b>	<b>36-48 hrs prior</b>	<b>973-702-7266 x19</b>	<b>Burn Boss or designee</b>		<b>Phone/email</b>
<b>FWS North Zone FMS (John Meister)</b>	<b>36-48 hrs prior</b>	<b>207-944-9167 (cell)</b>	<b>Burn Boss or designee</b>		<b>Phone/email</b>
Cape Cod Chronicle (Tim Wood)	<b>Day Before Ignition</b>	508-945-2220	<b>Burn Boss or designee</b>		<b>Phone</b>
Cape Codder (Carol Dumas)	<b>Day Before Ignition</b>	508-247-3255	<b>Burn Boss or designee</b>		<b>Phone</b>
Cape Cod Times (Paul Provost)	<b>Day Before Ignition</b>	508-862-1166	<b>Burn Boss or designee</b>		<b>Phone</b>
WQRC (Sarah Colvin)	<b>Day Before Ignition</b>	508-771-1224 X104	<b>Burn Boss or designee</b>		<b>Phone</b>
Old Colony Memorial (Tamson W. Burgess)	<b>Day Before Ignition</b>	508-591-6615	<b>Refuge Personnel</b>		<b>News Release</b>
<b>Town of Plymouth F.D.</b>	<b>Day Before Ignition</b>	<b>508-830-4213</b>	<b>Burn Boss or designee</b>		<b>Phone</b>
<b>MA-DEP SE Regional Office</b>	<b>Day Before Ignition</b>	<b>V 508-946-2700 F 508-946-6557</b>	<b>Burn Boss or designee</b>		<b>Fax</b>
<b>Neighbor Notifications (Refuge Abutters)</b>	<b>Day Before Ignition</b>	<b>See list below</b>	<b>Burn Boss or designee</b>		<b>Phone</b>
<b>MassDEP Air Quality</b>	<b>Pre Ignition</b>	See Air Quality Permit	<b>Refuge Mgr or Burn Boss</b>	<b>NTE 48 hrs</b>	<b>Email</b>
National Park Service, Cape Cod National Seashore	<b>Pre Ignition</b>	508-957-0718	<b>Burn Boss or designee</b>		<b>Cell Phone</b>
MA Dept. Conservation and Recreation, Forest Fire Protection	<b>Pre Ignition</b>	508-888-1149	<b>Burn Boss or designee</b>		<b>Cell Phone</b>
<b>DCR Fire Control District 2</b>	<b>Pre Ignition</b>	<b>508-866-4996</b>	<b>Burn Boss or designee</b>		<b>Cell Phone</b>
<b>Neighbor Notifications (Refuge Abutters)</b>	<b>Pre Ignition</b>	<b>See list below (Anyone missed previously)</b>	<b>Burn Boss or designee</b>		<b>In Person</b>

**Table 1. Adjacent Land Owners Contact List.**

<b>Address</b>	<b>Owner</b>	<b>Phone</b>
244 LONG POND RD	REH REALTY TRUST HOLMES, RICHARD E and CAROLYN G	Holmes RE Pumping Service (508) 746-7989
55 STRAWBERRY HILL RD	SAKWA, J	(508) 830-1739
51 STRAWBERRY HILL RD	HUNTER, RONALD H and CYNTHIA L	(508) 746-5867
24 WILDCAT LN	NATURAL ORDER	(508) 746-2617
18 WILDCAT LN	LANDRY, DEBRA A	(508) 746-1723
16 WILDCAT LN	BOUDREAU KEVIN and JOANNA	(508) 747-0817
14 WILDCAT LN	MCNICHOLAS, JOHN S and PAMELA J	(508) 746-5821
12 WILDCAT LN	SULLIVAN, THOMAS K and MAUREEN	(508) 746-9869
10 WILDCAT LN	HENDRIX, DOUGLAS L and ELAINE E	(508) 747-5837
8 WILDCAT LN	STANELY, GEORGIA L	(508) 747-2645
6 WILDCAT LN	HUGHES, I	(508) 747-6345
4 WILDCAT LN	FIOCCHI, PETER J and CYNTHIA J	(508) 746-4409

2 WILDCAT LN	MACMILLAN, JOSEPH A and MAUREEN	(508) 746-9147
80 CRABTREE RD	GORMAN, CHARLES F JR STAPPEN, DAWN M	(508) 747-0954
76 CRABTREE RD	COOK, CRAIG and DONNA	(508)747-1451

Meister Note: Outreach and notification should be expanded to include lot 29 (see tax map detail in Appendix) and also 16 more landowners (count northward 4 lots on west side of Strawberry Hill, draw line east to corresponding lot on east side Crabtree, notify all landowners south of that line. Also, are there homes SE of the Alden Road/ Long Pond intersection that may be impacted with NW wind? UPDATE AND VERIFY ABOVE CONTACTS!

PRESCRIBED FIRE BRIEFING CHECKLIST	(PLACE CHECKMARK WHEN COMPLETE)
( ) 1) Burn Organization and Assignments (p. 14, 15)	( ) 9) Wildfire Conversion (p. 23)
( ) A) Burn Organizational chart (Appendix F)	( ) 10) Safety and Medical Plan (p. 17, 18)
( ) B) <u>(Validate individual fire qualifications)</u>	( ) <u>Designate Divisional EMTs,</u>
( ) 2) Burn Objectives and Prescription (p. 7, 9, 10)	( ) <u>Review emergency procedures in Med. plan</u>
( ) 3) Description of Burn Area (p. 5, 6)	( ) 11) Job Hazard Analysis (Appendix D)
( ) 4) Expected Weather & Fire Behavior (Appendix E)	( ) 12) Site Specific Hazards, Endangered Species Concerns
( ) 5) Communications (p. 16)	( ) 13) Verify NWCG qualifications and Technical Specialist certifications (ENOP, PUMP, FALB), <u>Certified ATV training</u> , other operating equipment
( ) A) Ensure all radios have common frequency, and work properly	( ) 14) All resources above FFT2 must turn in Unit Log (Have copies available for distribution)
( ) 6) Ignition plan (Firing sequence) (p. 20)	
( ) A) Critical firing transition points (if applicable)	
( ) 7) Holding Plan (p. 21)	
( ) A) Critical holding points (Refer to maps)	
( ) B) Water Source / Draft Locations	
( ) 8) Contingency Plan and Assignments (p. 22)	
( ) A) Trigger points	
<b>On burn day briefing must begin at 08:30 and be concise to allow time for the burn execution and mop up!</b>	
A complete briefing covering <b>escape routes, safety zones, water sources, weather</b> , etc. will be conducted by the Burn Boss. A drawn to scale map representation will be used to identify the above items and given to each member of the burn team if deemed necessary by the Burn Boss. Team member rotation, in and out of heavy smoke areas, will occur as monitored by the Burn Boss. <b>The Prescribed Fire Burn Boss, or designee, will ensure that any new personnel arriving to the prescribed fire receives a briefing prior to assignment.</b>	

ORGANIZATION AND EQUIPMENT	PROJECT NAME:	FY10 Massasoit RX
	BURN UNIT NAME:	Massasoit Unit 1
Specify the minimum required implementation organization to meet the capabilities by position, equipment, and the supplies needed for the prescribed fire until declared out. Different organizations may be identified for different stages of implementation (i.e. holding v. mop-up and patrol, different ignition operations, different prescriptions).		
Minimum organizational needs for this burn must include an RXB2 Burn Boss, FIRB Ignition specialist, SRB Holding specialist, and at least 10 FFT2 plus an Observer/Spotter. One person may fill more than one role; suggested minimum staffing is listed below. At least one FFT2 should also be S- 211 pump operator certified if possible. <b>See Appendix F for organizational chart.</b>		
Additional assistance from the local Fire Department or Massachusetts Forest Fire Control may be available and utilized in hose/pump movement and holding along the perimeter. Further help may also be requested from Cape Cod National Seashore. The role of the Observer/Spotter is important, as this person could perform a host of non-line related tasks, such as weather/fire behavior observer, public safety monitor, monitoring smoke column, or taking photos. Assistance may also be called upon if needed from the Nature Conservancy office in Massachusetts.		

NOTE: Departmental policy requires all personnel engaged in interagency wildland fire and/or prescribed fire operations to meet or exceed standards set by the National Wildfire Coordinating Group (NWCG). The Fish and Wildlife Service accepts NWCG standards for interagency operations. All employees will be qualified within the NWCG system for the position assigned, unless assigned as trainees. It is the responsibility of the Burn Boss to ensure compliance with this policy.

### **Suggested Minimum Personnel :**

#### **Overhead (9):**

- RXB2 burn boss, RXB2(t) (2) – **Mark Teixeira, DCR or Bob Bale, TNC, and ---**
- one FIRB, two person ignition crew (3) – **John Meister, FWS and ---**
- one FEMO/FOBS (trainee OK) (1) – **Brett Gore, FWS**
- one LE / smoke spotter with vehicle (1) – **Chris Kelly, FWS (LE)**
- one PIO with vehicle, one PIO(t) (2) – **Catherine Hibbard, FWS and --- Tom Eagle as a Refuge local resource to assist PIO.**

#### **Holding (18):**

- one Single Resource Boss (1) – **DCR**
- one Breaker – East (3) – **DCR Breaker 1-6**
- one Type 6 – West (2) – **TNC Engine MA-2**
- one FFT1 + 5 FFT2 – South (6) – **Brian Willard, or TNC FFT1, or Brandon Harriman**
- one FFT1 + 5 FFT2 – North (6) – **Brian Willard, or TNC FFT1, or Brandon Harriman**

#### **Contingency (14):**

- one STEN leader with vehicle (1) – **Plymouth Fire Dept.**
- one Tender (2) – **DCR Tanker 1**
- one Type 2 or 3, Strawberry Hill Rd (3) – **Plymouth Fire Dept.**
- one Type 4, Crabtree Road (3) – **DCR Engine 3-6**
- one Breaker, Powerline/ Trail intersection south of unit (3) – **DCR Breaker 2-5**
- one Type 6, Alden Road Patrol (2)- **DCR Engine 2-1**

### **Suggested Crew Size: 41**

Actual minimum staffing will be no less than 26 qualified firefighters (eliminate RXB2(t) and PIO(t) positions, all on scene contingency resources, and some dual function positions, to be determined by RXB2 based on current conditions)

### **Equipment Needs:**

- Kawasaki Mule w/ tank to be operated by Holding Boss to refill bladder bags or for suppression needs. – **FWS or ---**
- ATV to be operated by FOBS to allow quick repositioning as needed. – **FWS or ---**
- Pumpkin, Hose & Appliances sufficient to deploy a progressive hose lay to secure the unit's southern boundary using the DCR tender for supply prior to ignition. - **TNC**
- Backpack pumps: 6 + 4 spare on Mule - **TNC**
- Misc. hand tools: 12 minimum
- Belt weather kit for FOBS: 1- **FWS**
- Two-way radios: 12 portables minimum plus vehicle mobiles – **FWS can supply 8 if needed**
- First Aid kits: 2 (one per division)
- Leaf Blowers: 2, one on each Type 6 Contingency – **TNC or DCR**

### **CHANGES TO ORGANIZATION DURING IMPLEMENTATION:**

Any changes to the organization during implementation must be documented. These are changes that may reflect assignments to other personnel not changes to the capabilities, equipment or supplies which would require an amendment.

See Individual Unit Burn Report, Organizational chart (Appendix F).

<b>COMMUNICATIONS</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
Identify and assign command, tactical and air operations frequencies as needed.		

SYSTEM	RX FREQ.	RX TONE	TX FREQ.	TX TONE	ASSIGNMENT	REMARKS
MENWR	164.6250	Csq	164.6250	NA	On-site communication	Direct Analog
COMPACT	159.2850	csq	159.2850		Contingency Command	Analog, Wide
Ch 1	151.625	203.5	151.625	203.5	TNC 1	
Ch 2	151.625		151.625		TNC 2	
Ch 13	151.235	71.9	151.235	71.9	DCR 13	
Ch 14	151.310	71.9	151.310	71.9	DCR 14	
Plymouth Fire	154.430	173.8	154.430	173.8	Plymouth Fire	Analog, Wide

Exact channels to be used will be determined on scene based on what resources are present or en route as well as expected incident complexity and duration. All Massachusetts DCR Rangers should have COMPACT in their radios.

**Contingency communication channels, and procedures, with Fire Departments will be identified when the burn permit is picked up, recorded above, and made known to all team members during briefing.**

The Refuge will provide at least one cell phone (978-460-5597) for office contact and coordination with local fire protection cooperators. Burn Boss will be responsible for having a second cell phone and making the number known.

#### PROJECT PHONE NUMBERS

PERSONNEL NAME:	PHONE NUMBER:
Libby Herland, Refuge Manager, Eastern Mass. NWR	Office (978) 443-4661 Ext. 11, Cell (978) 460-4731
Tom Eagle, Deputy RM, Eastern Mass. NWR Complex	Office (978) 443-4661 Ext. 12, Cell (978)580-0183
Rick Vollick, North Zone FMO, USFWS	Office (973)702-7266 Ext. 19, Cell (207)944-4967
John Meister, Fire Management Specialist, USFWS	Office (207)454-3847, Cell (207) 944-9167
Catherine Hibbard, Refuge Specialist, PIO, USFWS	Office (413) 253-8569, Cell (413) 531-4276
Cape Cod National Seashore, Dave Crary, FMO	Office (508)957-0718 Ext. 247, Cell (508)274-5221
Mark Teixeira, RXB2, Mass. DCR	Cell (508)889-1739
Mass. DCR Bureau of Fire Control (Joshua Nigro)	Office (508)888-1149, Nextel (508)889-4094
Bob Bale, RXB2, Fire and Restoration Manager, TNC	Office (508) 732-0300 Ext. 24, Cell (508) 208-3798
MassDEP, SERO Air Quality (John Paino)	Office (508)771-6056
MassDEP, SERO Air Quality (Christopher Tilden)	Office (508)946-2823
Northeast Coordination Center, Augusta	Office (207)624-3724
Plymouth Fire Dept., Chief Bradley	Office (508)830-4213

<b>PUBLIC, PERSONNEL SAFETY</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>GENERAL PUBLIC AND PERSONNEL SAFETY MESSAGE:</b>		
<p>Given the burning conditions described in this plan, there is a low probability of fire escape. Public safety is a potential issue, given the close location of the subdivision, and Alden road. <b>Smoke signs will be posted along this road to warn the public of potential impact.</b> While wind direction minimizes the adverse impact from smoke blowing across the road, having a Public Information Officer available to answer questions is recommended. Additionally, this individual can document and take photos of smoke, while monitoring the flow of traffic and subdivision contacts.</p> <p>The remaining safety considerations (<u>see Job Hazard Analysis, Appendix D</u>) are related to the individuals conducting the burns. Every person involved in a prescribed fire is responsible for identifying safety issues and concerns. It is the responsibility of each individual participating in prescribed fire activities to notify assigned supervisor or burn boss of any possible misunderstanding of assigned tasks or safety concerns related to the assignment.</p> <p>Medical and Evacuation Plans are prepared, and will be included in the briefing prior to ignition. EMT's and the location of first aid kits will be identified. Burn crew members will be reminded to use their Incident Response Pocket Guides as references in the event of a medical emergency.</p>		
<b>SPECIFIC SAFETY DISCUSSION INCLUDING UNIQUE HAZARDS AND CONCERNS: (To be discussed as part of Prescribed Fire Briefing)</b>		
<p>Working with any fire is always inherently dangerous. All personnel will have full PPE and meet NWCG qualifications for the position they are assigned to as well as having had annual safety refresher training and physical fitness testing. Team member rotation, in and out of heavy smoke areas, will be considered and monitored by the Burn Boss.</p> <p>Maintain LCES at all times. Stay ahead of the hydration curve to prevent dehydration/heat exhaustion. Inform your squad boss if you need to rotate out of smoke or take a break to cool down. Report any injury/illness immediately to next in command.</p> <p>Be mindful of hazardous footing on firebreaks, and particularly inside the unit (stump holes, animal dens). Conduct a thorough tick-check after the burn due to Lyme disease hazard.</p> <p>Brush breakers, tenders and engines will be on site, all of which have limited visibility, so care must be taken when working near this equipment.</p> <p>With northwest winds, the power lines could be impacted if smoke density is high, creating the potential for arcing from smoke. If burning under a NW wind, ignition will be managed to prevent excessive smoke contact with the power lines on the eastern fire break.</p> <p>Topography will influence fire rate of spread, as well as impact crew fatigue levels. Maintain situational awareness. Line Boss', Firing Boss and Engine Bosses must confirm that their personnel are maintaining adequate water and food intake, and taking needed rest breaks to prevent fatigue caused mishaps.</p>		

<b>EMERGENCY MEDICAL PLAN</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>DIVISION NAME:</b>	<b>Massasoit Unit 1</b>

**EMERGENCY FACILITIES:**

Name	Address	Travel Time		Phone	Helipad	Burn Center
		Air	Ground			
Jordan Hospital Emergency Department 275 Sandwich St., Plymouth, MA 02360			1 hour	<b>(911)</b> / (508) 746-9161	No	No
MA General Hospital	55 Fruit Street, Boston	1 hr	no	(617)726-3712	Yes	Yes

**EMERGENCY EVACUATION:**

Emergency Evacuation will be determined by on site EMT qualified personnel. If EMS is required they can be reached at **911**, if they are not required the Burn Boss will determine if the injured party shall be transported to the nearest medical facility by the use of a government vehicle.

In the event of severe injuries, Burn Boss shall consult with local EMS to arrange medivac by air.

**MEDICAL EMERGENCY PROCEDURES:**

In the event of an emergency all fire personnel have been trained to follow this 5 step approach:

- 1) **Secure the scene** to prevent further harm and ensure responders safety. **Immediately notify Burn Boss.**
- 2) Assess the victim, **refer to Incident Response Pocket Guide.**
- 3) Burn Boss will call for help (refer to Medical Plan for reporting procedures).  
 Consider qualified EMT's that may be on-site as part of the resources from Plymouth Fire Department before calling 911.  
 Make decision on transport method.
- 4) Administer First Aid, monitor patient status until fit or released to EMS personnel. Keep written record of treatments and send copy with patient.  
**Burn Boss to assign FFT1 to accompany patient.**
- 5) Have someone locate helispot if necessary.

As soon as the situation is stabilized, Burn Boss should notify Service FMO or Agency Administrator. If unable to contact either one then notify dispatch at NECC.

**DIRECTIONS FROM NEAREST EMS TO PROJECT VIA GROUND TRANSPORTATION:**

Take a left out of **Jordan Hospital**, take next left onto Obery Street, go one mile and go left to travel south on Long Pond Road. Travel three miles, and go right onto Marion Way, then take first left onto Crabtree Road, with access via Wildcat Road to Strawberry Hill Road **OR** go right off of Long Pond Road .5 mile south of Marion Way onto Alden Road, and travel .5 mile to access from PROW on right.

<b>TEST FIRE</b>	<b>PROJECT NAME:</b>				<b>FY10 Massasoit RX</b>				
	<b>BURN UNIT NAME:</b>				<b>Massasoit Unit 1</b>				
<b>PLANNED LOCATION &amp; SPECIFIC INSTRUCTIONS:</b>									
<p>The test fire will be ignited on the downwind side of the burn unit adjacent to a suitable anchor point. This will usually be the most downwind corner of the unit. Holding personnel will have water and hand tools available to suppress the test fire should that be necessary. All water handling equipment will be tested prior to ignition.</p> <p>A small area will be ignited, and the time of ignition will be documented by the burn boss or other individual assigned to take periodic weather measurements. Fire behavior will be observed for a long enough period of time for the burn boss to determine if the burn can be safely conducted, that smoke is adequately venting, and in a desired direction downwind, and if fire and resource objectives are being met. If the decision is positive the burn will proceed according to the ignition plan discussed during the pre-burn briefing. If the burn cannot be safely conducted, the test fire will be extinguished, the area mopped up, and the prescribed burn postponed.</p>									
<b><u>BURN DAY DOCUMENTATION</u></b>									
<b><u>Previous Day</u></b>			<b><u>Burn Day</u></b>				<b><u>Post Burn Day</u></b>		
<b><u>AOI Ozone value:</u></b>									
<b><u>AOI PM2.5 value:</u></b>									
<b>WEATHER CONDITIONS ONSITE:</b>									
<b>Area/Unit</b>	<b>Date:</b>	<b>Time:</b>	<b>Temp:</b>	<b>RH:</b>	<b>WS:</b>	<b>WD:</b>	<b>Sky Cond.</b>	<b>ROS</b>	<b>FL</b>
<b>RESULTS OF TEST FIRE:</b>									
<b>YES</b>	<b>NO</b>	<b>QUESTIONS</b>							
		Are fire objectives being met?							
		Are smoke management objectives being met?							
		Is fire behavior within predicted parameters?							
		In your opinion, can the burn be safely carried out according to the Prescribed Fire Plan and current and predicted conditions?							
<b>Does the test fire meet prescription parameters?</b>			<b>YES</b>		<b>NO</b>		<b>If all the questions were answered "YES" proceed with burn operations</b>		
<b>COMMENTS:</b>									

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<b>IGNITION PLAN</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>NARRATIVE FOR IGNITION PLAN:</b>		
<p><b>On Burn day:</b></p> <p><b>1) Ensure compliance with all stipulations within the approved Mass DEP issued Permit.</b></p> <p><b>2) Notify MA-DEP Air Quality Control</b> by email of the intent to conduct the burn prior, but not in excess of 48 hours to any ignition. Send emails to the following individuals:  <a href="mailto:Christopher.Tilden@state.ma.us">Christopher.Tilden@state.ma.us</a>  <a href="mailto:Gregg.Hunt@state.ma.us">Gregg.Hunt@state.ma.us</a>  <a href="mailto:John.B.Mclaughlin@state.ma.us">John.B.Mclaughlin@state.ma.us</a>  <a href="mailto:John.Paino@state.ma.us">John.Paino@state.ma.us</a></p> <p><b>3) Obtain a burning permit from the appropriate Fire Department, Determine status for contingency purposes.</b></p> <p><b>4) Burn Boss and Refuge Manager (or Acting RM) will complete Go / No Go Checklist.</b></p> <p>Once the above conditions have been met, all resources are onsite, briefed, holding resources are in place, and Test Fire is favorable, proceed with Ignition. Individual site maps are included in this plan and copies will be available to the burn crew during the pre-burn briefing. Any unusual ignition techniques or concerns will be noted on these maps.</p> <p><u>Ignition Technique</u> – The unit will be ignited on the down wind side, burning back against the wind. Ignition will commence by lighting a narrow strip, one to three feet from the containment line. One person with a drip torch will suffice, with the remaining individuals securing the line as it burns out. Additional narrow passes will continue, timing them so that the heat from the preceding pass does not make a run to the control line. Once the down wind side is secure, strip width can be increased if that ignition technique is desired, depending on fuel and weather conditions at the time as well as time constraints.</p> <p>Care will be taken in how much of an active fire perimeter there is on the flanks. A backing fire increases the heat duration over a given area, while reducing emission outputs, and visible smoke. Some modification may occur during the ignition sequence that may achieve better results or timeliness. The primary ignition techniques will be backing fires, flanking fires, and point source ignitions. Head fires may be used if needed to create effective fire behavior, and done so within secured, blacklined firebreaks. Strip flanks, strip heads and point-source ignitions may be used to generate moderate flame lengths and rates of spread to minimize overstory mortality while producing effective fire behavior. Point-source ignitions may be used in “jackpot” areas, accumulations of cured dead woody debris, and under pitch pine seed trees. Topography within the unit will be used to advantage, so as to expedite ignition application while maintaining the safety of the internal ignition and holding forces.</p> <p>SEQUENCES: Depending on the prevailing wind direction, one compartment or the other will be ignited first. Should progress on igniting and securing the first compartment advance early enough in the day to permit successful ignition and securing of the second compartment given current and predicted fire weather and behavior, and within the constrained ignition period, the second compartment will also be treated. The fire break dividing the two compartments therefore may serve as a fire break or an ignition line for both compartments, depending on how the burn progresses.</p> <p><u>The following is suggested NWR Prescribed Fire Protocol:</u>  It is the responsibility of the Burn Boss to notify the appropriate local and/or State cooperators when a burn is initiated. It is also good to let them know when burning is over on a given day.</p>		

<b>HOLDING PLAN</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>GENERAL PROCEDURES NARRATIVE FOR PRESCRIBED FIRE HOLDING:</b>		
<p>Equipment minimums for these burns shall consist of having on site a portable pump with sufficient hose and fittings for at least 1500 feet, a second back up pump, and sufficient hand tools for everyone involved. 12 to 18 bladder bags should also be filled and available on site prior to ignition. A fold-a-tank should be set up in the southwest corner and filled prior to ignition day if possible.</p> <p>General tactics will be to ensure all water handling equipment is positioned and functioning. Ensure that hand tools are readily available, (for Lighters too). As the perimeter is fired, cool the perimeter along the fuel break edge and watch for spots, outside and downwind of the unit. Once this line is extinguished, developing black line devoid of fuel will contain fire spread. Holders must also be aware of those areas outside the unit (the green) where fire can creep past the holding line or spot across the line. Holders must communicate the discovery of any spots to the burn boss and then aggressively attack fires outside the unit. The burn boss will determine if additional resources are required beyond the initial responders and if ignition should be suspended.</p> <p>At a minimum, the north firebreak will be held by a hand crew using hand tools and backpack sprayers. The east firebreak will be held by a Breaker engine and the west firebreak by a Type 6. The south firebreak will be held by a hand crew with a hose lay as back-up. That hose lay will be supplied by a port a tank staged at the southeast corner.</p> <p>Should the compartment dividing line be used as a fire break, the line will be held by hand crew using hand tools and backpack sprayers</p>		
<b>CRITICAL HOLDING POINTS AND MITIGATION ACTIONS:</b>		
<p>The northern firebreak is a critical holding point given the proximity of subdivision residences. Mechanical fuel reduction there has reduced holding hazards and potential for fire escape.</p> <p>Topography within the unit may create “squirrely” winds which may push fire in directions other than that of the prevailing 20 ft. winds. This is acceptable provided holding forces are aware and the change in direction/fire intensity will not increase the potential for escape and compromise individual safety.</p> <p>Should fire behavior on the various firebreaks be observed to exceed that which can be safely managed by their respective assigned forces, the burn boss will consider options such as temporarily ceasing ignition until weather conditions moderate, reallocating holding resources, adjusting ignition patterns and pacing, and/or suppressing the fire in the unit if safely practicable.</p> <p>Critical control problems are associated immediately along fuel breaks. Where foam or water serves as a holding line, special attention will focus on these areas, to ensure no escape. Water will always be available; sources are close by. If refilling is necessary, the firing sequence will be slowed or stopped completely until water supplies are replenished and available. Holding Boss will have a Kawasaki Mule which can be used to shuttle fresh bladder bags to the holding crew as water supplies are exhausted.</p>		
Critical holding points and safety zones will be identified on the project map.		

<b>PRESCRIBED FIRE</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
<b>MOP-UP &amp; PATROL</b>	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>GENERAL PROCEDURES NARRATIVE FOR PRESCRIBED FIRE MOP-UP AND PATROL:</b>		
<p><b>Mop up will require that all smokes be extinguished within the unit.</b> 100% mop up is required to ensure no fire escape. After perimeter is mopped up, attention is focused on the interior to ensure all woody debris, such as top killed brush, roots, and associated duff/ litter, is completely extinguished. Once the last few residual smokes have been extinguished, equipment breakdown can occur. Several people are typically assigned to make a patrol sweep through the area downwind of the burn unit to verify there are no hidden spot fires. Burn units will be checked 1-2 days after ignition as a precaution.</p> <p>If deemed prudent by the burn boss, engines will be staged overnight where Crabtree Road and Strawberry Hill Road abut the refuge, with crew available to patrol the unit and communicate with curious neighbors. Crew cell phone numbers will be provided to the Fire Chief/Fire Dispatch to allow for direct contact should smoke/fire complaints be called in overnight.</p>		
<b>PRESCRIBED FIRE DECLARED OUT BY:</b>		
<p>After the prescribed fire is completely cold trailed (Burn Boss determination), it is the responsibility of the burn boss to declare that the unit is out.</p>		

<b>CONTINGENCY PLAN</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>TRIGGER POINTS:</b> Determine trigger points that indicate when additional holding resources and actions are needed.	<b>ACTIONS NEEDED:</b> Describe actions to be taken to ensure the prescribed fire stays within prescription.	
1) Wind shifts of 90-180 degrees that result in undesirable fire behavior, or becomes a threat to the safety of personnel and/or property.	If it appears shift is temporary, move personnel off of affected flank until safe to resume. If wind or fire behavior does not change back and fire escapes, suppress, starting from safe anchor point.	
2) Eye level wind speed increases, humidity drops, or the prescribed burn is otherwise out of prescription.  3) Resource objectives not being achieved by fire behavior.	Suppress Fire. If more resources are required to implement this action, a call will be placed by the Burn Boss for assistance from available State, NPS or the appropriate local Fire Dept.	
4) There are too many spots that are igniting fuels outside the unit for the holding crew to put out and still maintain the integrity of the fire line.	Burn Boss will evaluate if burning out or suppression using barriers and crew is required to stop the spread. If more resources are required to implement this action a call will be placed by the Burn Boss for assistance from the State, NPS, or the appropriate local Fire Dept.	
5) Smoke impacts to roads or residences.	Burn Boss to notify Refuge LE Officer and local Police of smoke impacts. Response is determined by the agency with impacted jurisdiction. Burn Boss will evaluate if burn completion or suppression will be quickest way to reduce smoke impact.	
6) An escaped fire (area burning outside defined project area) that cannot be extinguished with on-site resources within a reasonable length of time, depending on fuel type and weather conditions.	In the event of an escape the holding crew will begin suppression activities utilizing direct attack. The closest resources not committed to an area or in a previously burned area cooled enough to be released (discretion of the Holding Boss) will be directed to direct attack the fire and held there until no further threat exists. Firing Boss may be requested to halt ignition sequence; Ignition team may be reassigned to holding actions or suppression. If direct attack is impossible, indirect attack and burnout will be utilized with secondary lines taking advantage of natural barriers. <b>Secondary lines will be noted on the detailed map of each burn unit, and discussed during the pre-burn briefing.</b> At all times, firefighter and public safety shall come before resource considerations during attack. However, it should be attempted to keep resource damage to a minimum by using Minimum Impact Suppression Tactics (MIST).	
7) <b>Any escape greater than 2 acres and/or crown fire activity threatening the subdivision.</b>	<b>Immediate call out of contingency structure protection engines.</b>	
<b>MINIMUM RESOURCES AND MAXIMUM RESPONSE TIME(S):</b> Describe personnel needed to ensure the prescribed fire stays within prescription. Plans may identify different levels of contingency staffing needed for different stages of the burn, ignition through patrol. Verify availability of identified contingency resources on day of implementation.		
See "Organization and Equipment" for minimum required resources for each individual unit. If additional resources are required due to an escape the local fire departments will be relied upon. <b>Local offsite resources would come from Plymouth F.D. Within a five minute response time are stationed (in two stations), two engines, one ladder, three breakers, and one tanker.</b>  If contingency resource availability falls below plan levels for that stage of the burn, actions must be taken to secure operations until identified contingency resources are replaced. With the ordering and/or deployment of contingency resources, the burn boss will notify the Agency Administrator through the appropriate chain of command.		

<b>WILDFIRE CONVERSION</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<p>A prescribed fire must be declared a wildfire by those identified in the plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated within the next burning period by on-site holding forces and any listed contingency resources. In addition, an escaped prescribed fire must be declared a wildfire when the fire has spread outside the project boundary, or is likely to do so and cannot be contained within the next burning period.</p>		
<b>WILDFIRE DECLARED BY:</b>		
Who will make the decision that the fire has escaped		
<p>An escape will be declared a wildfire by the <b>Burn Boss</b>, if it is burning outside the project area, is threatening houses, or if it cannot be controlled within a reasonable length of time, depending on the fuel type and weather conditions. This length of time will definitely end prior to the next burning period. The incident will be turned over to an identified Incident Commander. A WFSA, or WFDSS will be developed if the wildland fire is expected to go beyond the first burning period.</p>		
<b>IC ASSIGNMENT:</b>		
Identify who will be the IC		
<p>The Burn Boss shall assume the role of Incident Commander (ICT3 or ICT4) during incident transition to wildland fire. Size-up, Initial response checklists, and other site specific information will be gathered by the IC to determine incident complexity and the suppression organization level needed, most likely a Type 3 or 4 organization. The primary role is gathering information, fire fighter and public safety, control of fire resources arriving and deployed, and immediate threats to high value resources.</p> <p>The incident complexity determines the minimal IC qualifications. If organizational needs exceed the IC qualifications of the burn boss, then the appropriate Local Fire Departments usually can meet the need. The next logical progression is for the Massachusetts Bureau of Fire Control to assume command. At this point joint command may be established with the Burn Boss filling line and agency advisor roles.</p> <p><b>If the escape is burning on refuge land</b>, the initial IC remains in control until Refuge Manager, or FMO acting in absence of line officer authority, delegates IC responsibility to the local Fire Dept or Mass Fire Control Warden.</p> <p>The initial IC will brief the in-coming IC, and communicate to all initial attack and NECC that a change in command has occurred. The relieved IC will then become an available resource either filling a line role or other function upon consultation with the Refuge Manager or FMO.</p>		
<b>NOTIFICATIONS:</b>		
Identify the notifications to be made and who will make them.		
Burn Boss/IC will notify refuge manager and FMO. Town of Plymouth F.D. and DCR Fire Control District 2 will be notified as to situation even if not requested to respond.		
<b>EXTENDED ATTACK ACTIONS AND OPPORTUNITIES TO AID IN SUPPRESSION EFFORTS:</b>		
<p>The status and availability of local and/or State fire suppression resources will be ascertained when courtesy contacts are made each burn day. This information will be used in the GO/NO-GO Checklist.</p> <p>If wildfire incident complexity transitions to a type 3 organization (beyond capabilities above) then additional resources will be ordered (including ICT3) through the local Fire Department or NECC. This will be approved by the Refuge Manager or FMO acting on his behalf. A WFSA (or other comparable system such as WFDSS if Service policy changes) will be developed by the FMO, assisted by the relieved IC and approved by Refuge Manager. Current on scene personnel shall be deployed into the ICS organization based on individual qualifications and organizational needs.</p> <p>Excellent contingency firebreak opportunities are provided by the PROW (east and south), and beyond that Alden Road. To the west, the unnamed cart path leading from the northwest unit corner to Snake Hill Road, plus Gunner's Exchange Pond and Crooked Pond also provide contingency firebreaks.</p> <p><b>Note: For extended attack responses (beyond first burning period) on USFWS lands, all deployed resources must meet NWCG position standards per Departmental policy. See policy note in "Organization and Equipment".</b></p>		

<b>SMOKE MANAGEMENT AND AIR QUALITY</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>COMPLIANCE:</b>		
Describe how the project will comply with local community, County, State, Tribal, and Federal air quality regulations.		
<p>The FWS complies with all federal, state, and any local air quality regulations and permitting requirements related to prescribed fire management. Also, the FWS is committed to minimizing air pollution emissions associated with prescribed fires.</p> <p>A permit to burn is required from the Town of Plymouth. In addition, MADEP requires an Air Quality Permit, which specifies specific smoke management constraints. <b>TNC currently has an active, or open permit from which we can conduct this burn, and will be contacted to initiate the DEP contacts specified in this Plan as well as the Air Quality Permit.</b> The Burn Boss is responsible for ensuring this step is completed prior to burn day. Current MA DEP requirements include an informal permit request that outlines specific air quality, transport / smoke dilution and other mitigating actions, outlined below. A more formal permitting process is expected in the near future. <b>The Refuge Manager and Burn boss must ensure stipulations within the Permit issued to TNC and other smoke management mitigation measures within this Plan are met before any ignition.</b></p>		
<b>IMPACTED AREAS:</b>		
Identify Class I air sheds, restricted areas, non-attainment areas (designated areas), and population centers that may be impacted.		
There are no Class I air sheds, restricted or non-attainment areas (particulate matter) designations.		
<b>SENSITIVE FEATURES AND RECPTORS:</b>		
<p><b>Refer to Smoke Impact map for smoke sensitive sites within .5 and 5 mile buffers.</b></p> <p><b>Sensitive features include the residential neighborhood to the north of the unit, Long Pond Road to the east of the unit, and power lines east of the unit. The Plymouth South Middle School is located 1.1 miles southeast from the unit, and Plymouth South High School is located 1.5 miles northeast of the unit. At its closest point to the unit, Rt. 3, a major divided highway, is one mile to the east.</b></p>		
<b>MITIGATION STRATEGIES AND TECHNIQUES TO REDUCE IMPACTS (If Applicable):</b>		
<p><b>Air Quality Standards:</b> Air quality indices (ozone, particulate matter, CO) are standardized on a scale of 0 to 500. All three values use this same Air Quality Index (AQI). This burn will not be conducted when AQI values for ozone are greater than 50; for PM2.5, greater than 75. The Burn boss is responsible for verifying and documenting the previous day, burn day, and post burn day AQI for Fairhaven, Truro, and Martha's Vineyard.</p> <p><b>Access:</b> <a href="http://www.mass.gov/?pageID=mg2ozonepage&amp;L=1&amp;sid=massgov2&amp;U=airquality_ozone">http://www.mass.gov/?pageID=mg2ozonepage&amp;L=1&amp;sid=massgov2&amp;U=airquality_ozone</a></p> <p><b>Access:</b> <a href="http://airnow.gov/index.cfm?action=airnow.showlocal&amp;cityid=38">http://airnow.gov/index.cfm?action=airnow.showlocal&amp;cityid=38</a>. Also, the burn boss can call toll free: <b>1-800-882-1497</b>. This is an excellent verbal climate / forecast summary product.</p> <p><b>Visibility and dispersion:</b> A minimum <b>transport windspeed of 9 mph</b> is desired, along with a minimum mixing height of <b>1500 feet</b>. This information is now available through the daily Fire Weather Forecast issued by the National Weather Service. In addition, a dispersion index is listed; <b>no burning will occur under fair and poor</b> dispersion conditions (&lt;25,000) as forecasted. Site specific conditions at time of ignition will be monitored through a test fire. Our goal is to minimize adverse impacts resulting from poor smoke dispersion that affect the public and burning team members. Complaints will be monitored and documented at the refuge office for future needs.</p> <p>The preferred surface wind directions were chosen specifically to minimize associated visibility hazards. Due to the light fuels, visibility should not be a problem over one mile down wind of any burn location. Burn Boss will obtain the Tabular Point forecast for Plymouth, MA and verify there is no forecasted wind direction change outside of allowable prescription parameters, less than two hours upon completing the ignition phase. This should allow enough time not to get caught with changing conditions, but continual monitoring for updated conditions and on-site monitoring is very important.</p> <p>The ignition methods selected and the prescribed range of fine fuel moisture are designed to consume over 70 percent or more of the available fine fuels. Larger fuel loading is light, with high moisture content (20%+). Very little residual smoke will be present, once the flaming front passes. Any lingering unburned pockets within any unit will be extinguished, prior to leaving the site. The units will be completely extinguished by 1800 hours if at all possible.</p>		

The ignition phase of this prescribed fire will be conducted between the hours of 09:30 to 18:00. Barring any escape, the unit will be 100% mopped up, or notification made to MASDEP if there is an exception.

The burn will be conducted when winds have a northerly or easterly component, and atmospheric conditions favor good lift. Ignition patterns and pacing may be adjusted to influence lift and the quantity of smoke produced at any given time. **If good lift cannot be maintained, the burn will be terminated in the fastest and safest possible way, with the understanding that sometimes the best way is to complete unit ignition.**

**A roving smoke spotter equipped with a radio and cell phone will be assigned to patrol roadways and smoke sensitive areas to assure that road visibility is not compromised and that smoke does not settle and concentrate in smoke sensitive areas. The smoke spotter will also be equipped with a camera to document any smoke impact or lack of impact on roads and smoke sensitive areas.**

**Personnel Exposure:** to smoke, CO, and particulates during prescribed fire operations are a significant safety, and health concern. Research has shown that exposure to smoke on prescribed fires, especially in holding and ignition positions, often exceeds that on a wildfire (CH5: Safety, Prescribed Fire Implementation Procedures Reference Guide). Burn crew members are reminded of the hazards of smoke exposure during the pre-burn briefing. All personnel will be rotated out of heavier smoke concentrations and if excess exposure (> 2 hours) is unavoidable the burn will be terminated. It is the responsibility of each burn crew member's supervisor and the burn boss to rotate individuals out of heavy smoke as necessary to limit exposure. This issue is also addressed in the Job Hazard Analysis appended to this plan.

The safety and health of the general public is just as important. Given the general atmospheric conditions listed above, and smoke venting away from more densely populated areas, there should be no concern, unless there is an unforeseen shift in wind direction. Should this happen, contingency measures will be implemented, as previously discussed.

<b>MONITORING</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>MONITORING:</b>		
Describe the monitoring that will be required for the prescribed fire. At a minimum specify the weather, fire behavior and fuel s information (forecast and observed) and smoke dispersal monitoring required during all phases of the project and the procedures for acquiring it, including who and when.		
Habitat conditions pre, post, and 6 month post burn, should be documented photographically if at all possible.		
The Burn Boss is responsible for prescription verification. He will be responsible for advising the Refuge Manager of current and forecasted weather conditions, and how they fit into prescription limits, and complying with the "Go No Go" procedure and documentation.		
Throughout the ignition phase of the burn operation, the <b>fire effects monitor</b> will observe and record observations of fire weather and behavior, while the <b>smoke spotter</b> will observe and record smoke behavior. The frequency of readings will depend on the length and complexity of a given burn.		
Fire Weather: dry & wet bulb temp, relative humidity, 1-hour fuel moisture, probability of ignition, mid-flame wind speed & direction, wind shifts, state of the weather.		
Fire behavior: flame lengths and rates of spread for backing, flanking and head fires. The rate of spread will be monitored using the following method: Mark off a 33-foot (or other appropriate distance) length using stakes. Using a stop watch, time the interval between the base of the flaming front reaching the first stake and the time the flaming front reaches the second stake. The ROS may then be calculated in appropriate units. Field observations will preferably be recorded on the Test Fire Sheet.		
Smoke behavior: smoke lift quality, direction of column travel.		

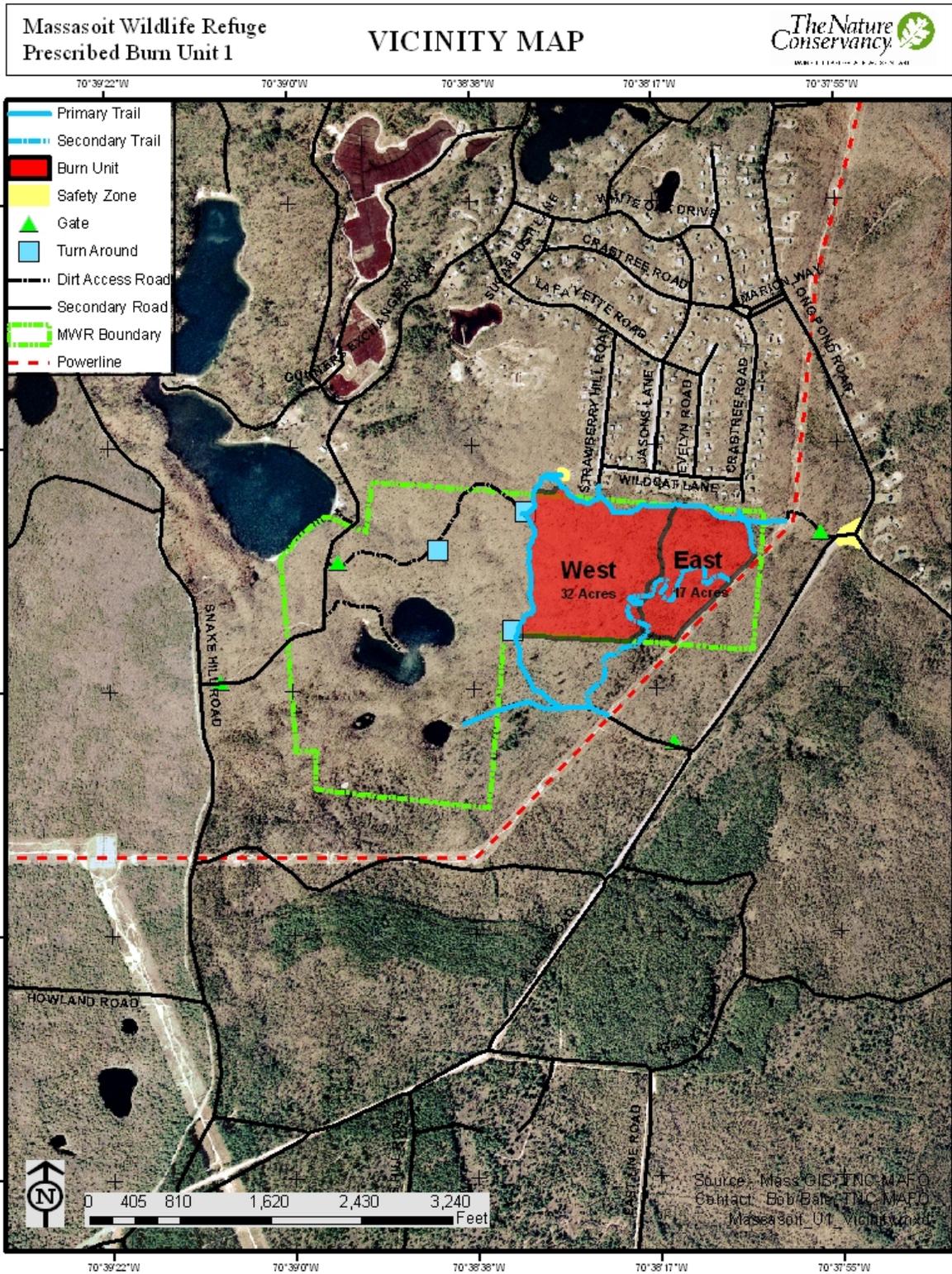
<b>POST-BURN ACTIVITIES</b>	<b>PROJECT NAME:</b>	<b>FY10 Massasoit RX</b>
	<b>BURN UNIT NAME:</b>	<b>Massasoit Unit 1</b>
<b>POST-BURN REPORT:</b>		
<p>Prescribed fire reporting will include: burn day conditions, fire behavior, smoke dispersal, and first order fire effects.</p> <p><b>As a courtesy to local fire departments, all issued Burn Permits will be closed out by refuge staff.</b></p> <p><b>A post-burn briefing or After Action Report (AAR) is held by the Burn Boss, and documented.</b> Items to discuss are objective accomplishment (Were they within acceptable range of results?), burn implementation (What could be done different to get better results?), deviations from the plan (Must be documented in burn report) individual evaluations (particularly for trainees), and recommendations and adjustments for future burns. Post burn photos will be taken, and other evaluation documentation completed supporting an acceptable or unacceptable range of objective achievement.</p> <p><b>The Burn Boss will insure that all information necessary</b> for the Prescribed Fire Treatment Report, as well as a narrative of the burn day events, <b>are prepared and submitted to the Zone FMS</b>, within 5 days of burn execution such that the Treatment Report may be done and submitted to the zone FMO within 10 days of execution. This responsibility may be delegated to other staff, but the Burn Boss is required to review both documents.</p> <p><b>Burn Boss</b> is responsible for ensuring that any information required to comply with the following is collected:  <b>PFPI Procedures Reference Guide : Chapter 7 - Project File</b>  All prescribed fire project files will contain the following information. Agencies and/or administrative units may require additional information.</p> <ol style="list-style-type: none"> <li>1. Prescribed Fire Plan</li> <li>2. Monitoring data including weather, fire behavior, fire effects and smoke dispersal observations</li> <li>3. Weather forecasts</li> <li>4. Notifications</li> <li>5. Documented prescribed fire organization(s)</li> <li>6. Ignition patterns and sequences</li> <li>7. Any agreements related to implementation</li> <li>8. Re-validation of the agency administrator Go/No-Go checklist</li> </ol> <p>Depending on the scope and complexity of the prescribed fire, optional information and or further documentation that may be included in the Project File include:</p> <ol style="list-style-type: none"> <li>1. After Action Review (see Chapter 8)</li> <li>2. Incident Action Plans, Unit Logs</li> <li>3. Press releases, etc</li> <li>4. Implementation costs</li> <li>5. Agency individual fire occurrence form</li> <li>6. Detailed Post Burn Report</li> <li>7. NEPA Documentation</li> </ol>		
<p><b>OTHER:</b> Describe other post-burn activities that must be completed. This may include: safety mitigation measures, and rehabilitation needs including those as a result of pre-burn activities undertaken.</p>		
<p>A follow up evaluation will be conducted in the fall to further review habitat conditions. Photos will again be taken and any additional monitoring needs specified within this plan will be completed at this time.</p>		

## **APPENDICES**

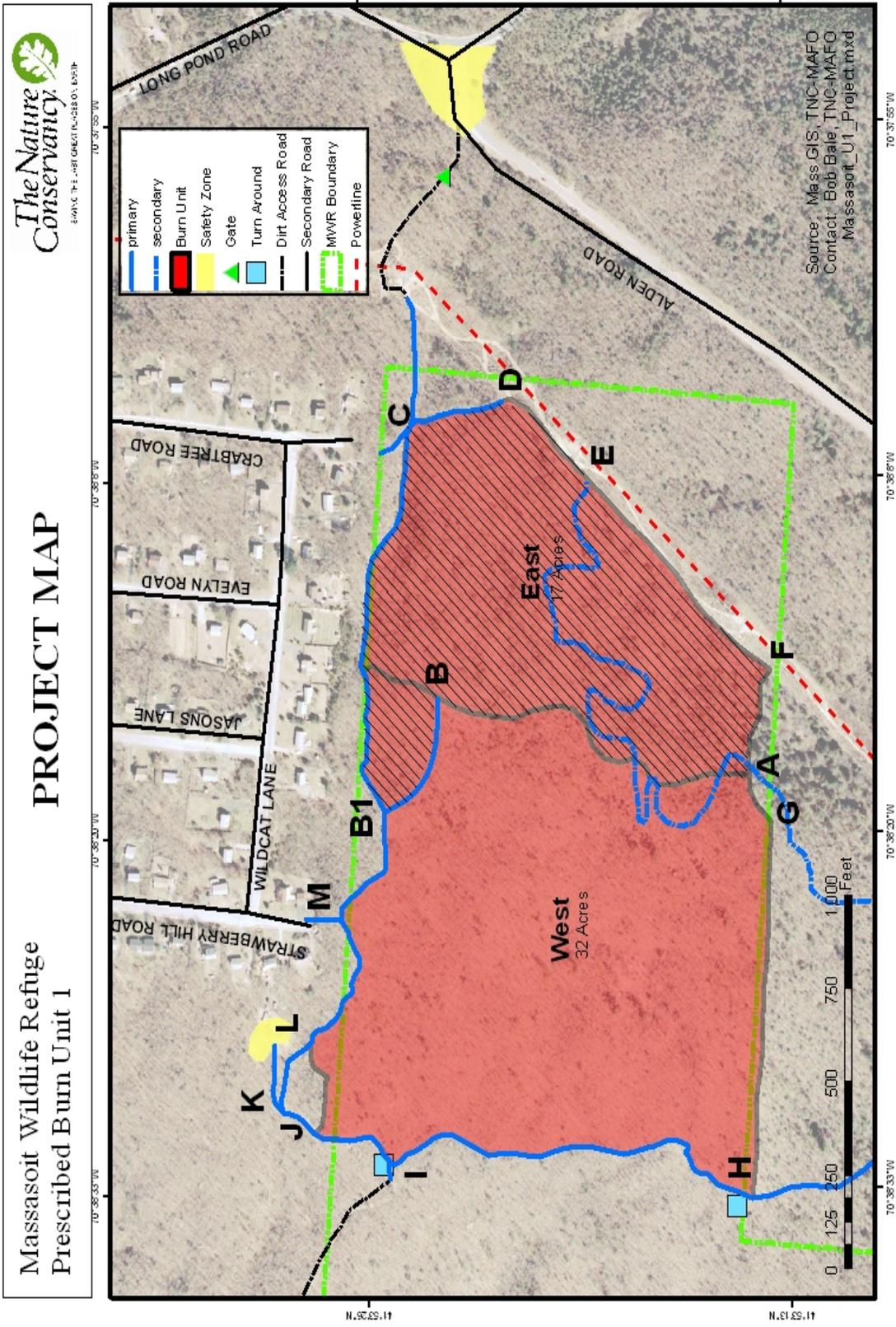
- A. Maps
- B. Technical Review Checklist
- C. Complexity Analysis
- D. Job Hazard Analysis
- E. Fire Behavior Modeling Documentation or Empirical Documentation (unless it is included in the fire behavior narrative in Element 7; Prescription)
- F. Organizational Chart

# Appendix A – Maps

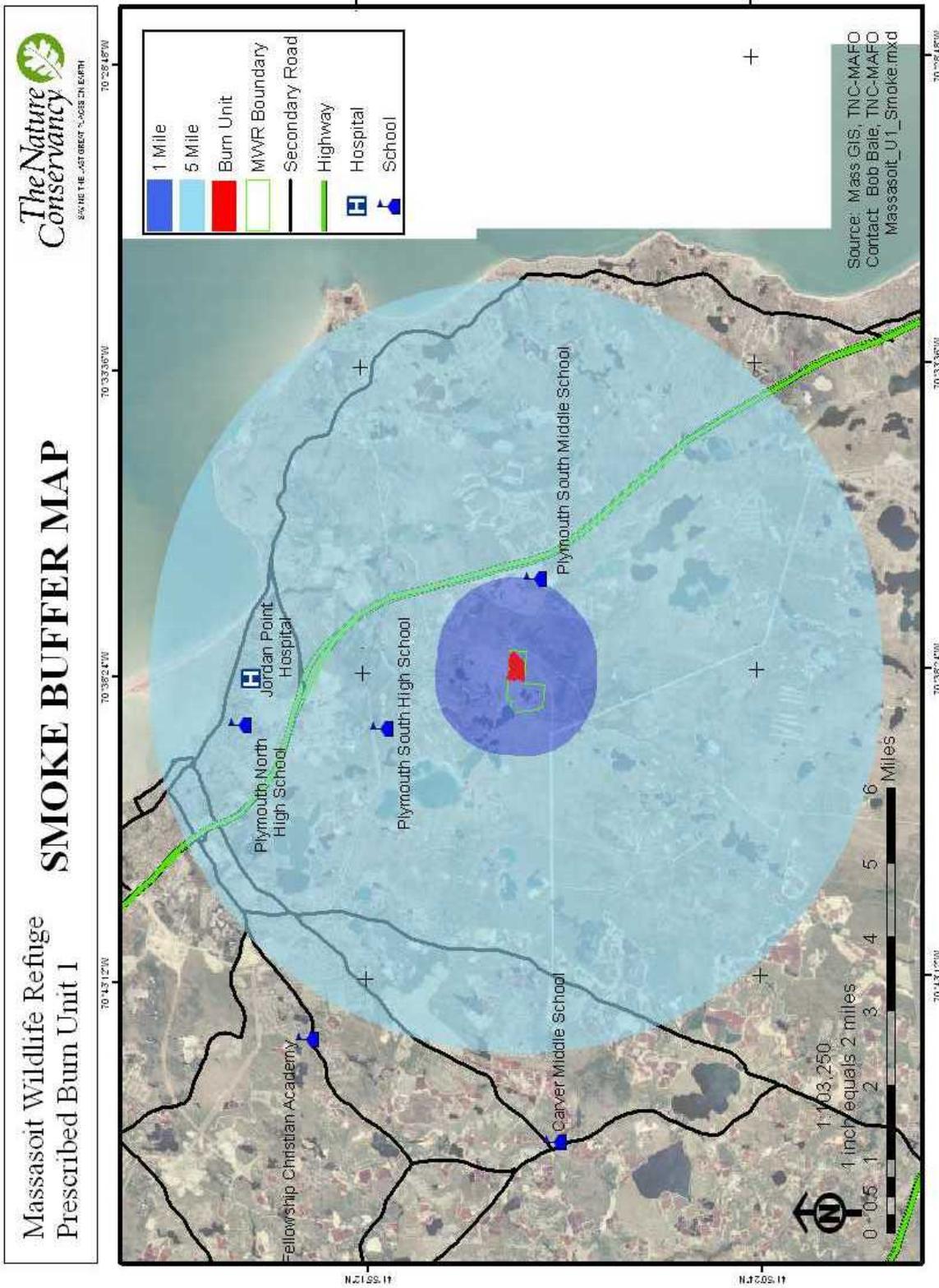
## Map 1 – Massasoit Vicinity Map



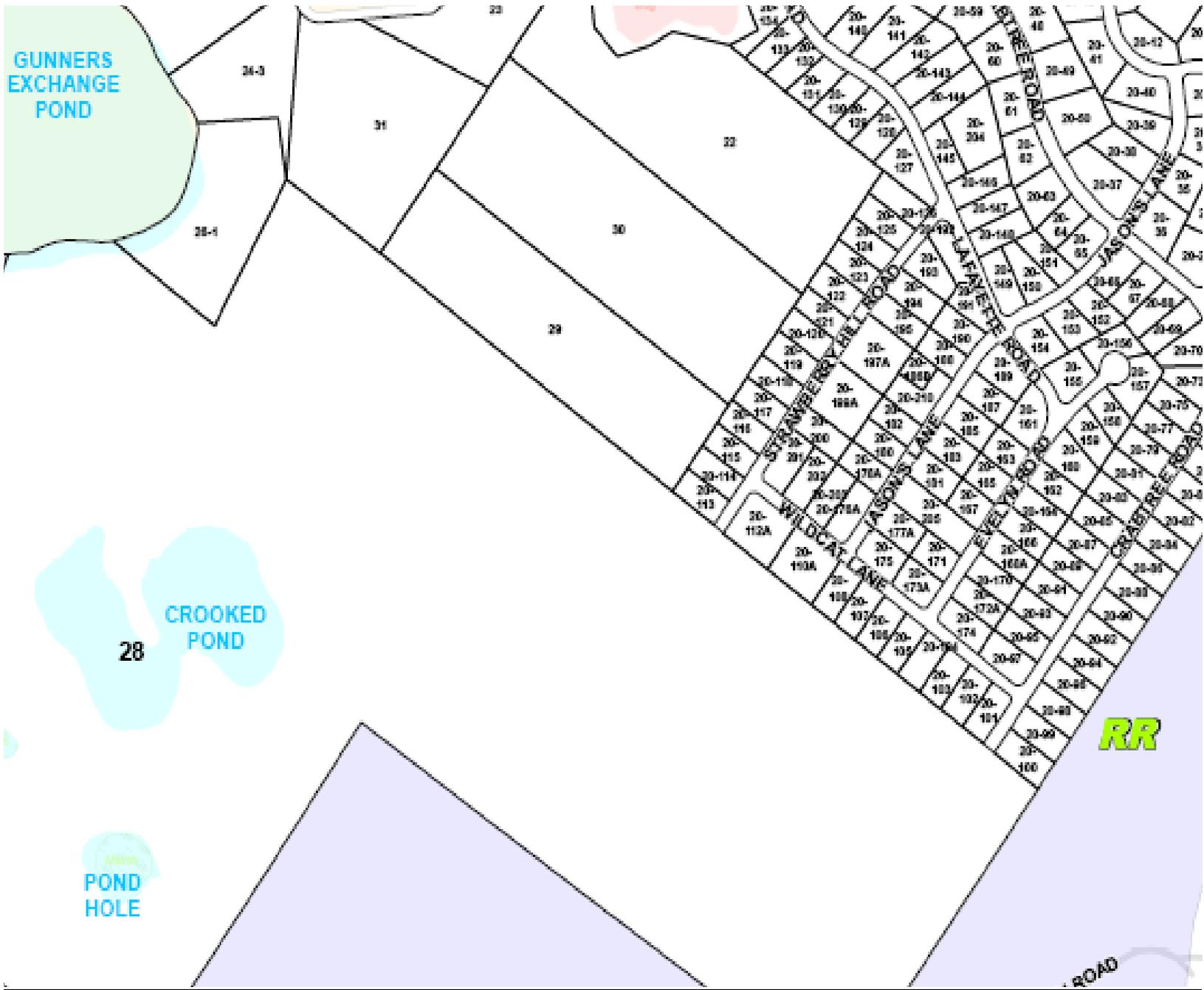
# Map 2 – Burn Location



# Map 3 – Smoke Targets



## Map 4 – Adjoining Landowners



## APPENDIX B

TECHNICAL REVIEWER CHECKLIST - USFWS		
PRESCRIBED FIRE PLAN ELEMENTS:	S /U	COMMENTS
1. Signature page	S	No need for TNC review or concurrence to approve this Plan. Copy sent to partners.
2. GO/NO-GO Checklists	S	Renew Agency Admin Go/No Go if spring burn.
3. Complexity Analysis Summary	S	Concur w/ Mod Complexity, actual burn is not difficult, but complicated by political / Air Quality.
4. Description of the Prescribed Fire Area	S	Changes to Text made by Refuge Staff
5. Goals and Objectives	S	Changes to Text made by Refuge Staff
6. Funding	S	Inclusive of Plymouth FD presence and Region's way of allocating funds as they are incurred.
7. Prescription	S	Concur, mod to low fire behavior w/ variables.
8. Scheduling	S	Adjusted window to be consistent for the spring (2/15-5/15) if not a fall accomplishment.
9. Pre-burn Considerations	S	Section is good, covering outreach, air quality, unit prep, and private contacts. Contact information is updated. Reference Track ownership map attached.
10. Briefing	S	Briefing to be concise, but ensure good information transfer – LECS and organization. Print maps.
11. Organization and Equipment	S	Names are suggested and may change. Organizational chart to serve as official documentation of burn execution.
12. Communication	S	Updated local and partner frequencies.
13. Public, Personnel Safety and Medical Procedures	S	
14. Test Fire	S	
15. Ignition Plan	S	Based on a previous burn in 2007, good plan.
16. Holding Plan	S	Based on a previous burn in 2007, good plan.
17. Contingency Plan	S	Stand-by resources, including FD presence adequate.
18. Wildfire Conversion	S	
19. Smoke Management and Air Quality	S	MA DEP defined very specific criteria in Air Quality Permit that must be met. Plan captures these elements and will be followed.
20. Monitoring	S	FOFE done by burn team; longer term falls to Refuge and Refuge Biologist.
21. Post-burn Activities	S	
22. Maps	S	These are good maps, including smoke impact. Only suggestion is to identify FWS ownership on the Track Map.
23. Complexity Analysis	S	Reviewed for recent air quality and other mitigation concerns. Otherwise similar to 2007 burn.
24. JHA	S	Standard, emphasis to be placed on ATV use on slopes, and personnel working around rolling stock.
25. Fire Prediction Modeling Runs	S	
26. Other	S	See remarks at end, but Section 7 is complete, attached to this Plan. Please do the outreach to the public and cooperators. This is a true WUI burn.



## APPENDIX C

### Prescribed Fire Complexity Rating System Guide Worksheet

Project Name FY 10 Massasoit RX Number Massasoit Unit 1

Complexity elements:

#### 1. Potential for Escape

Risk	Rationale
<b>Preliminary Rating:</b> <del>Low</del> Moderate High	Some likelihood of a few small spot fires, mostly from blowing leaves, that are easily detected and controlled. Ignition procedures do not create intense fire. No residual fire beyond day of ignition.
<b>Final Rating:</b> <del>Low</del> Moderate High	Wet lines along downwind perimeter and constant patrols will catch any small spots. Ignition techniques will limit amount of perimeter exposed at any given time. Potentially, lines may also be hand cleared prior to burn day if feasible.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> Low <del>Moderate</del> High	Moderate threat to the public. A housing development is located just upwind from the unit. Other homes are located ½ mile downwind but there are several good secondary line locations in between.
<b>Final Rating:</b> <del>Low</del> Moderate High	The prescriptions are written to keep fire behavior within manageable levels of a hand crew. Prescribed wind directions are such as to keep fire away from development. Contingency line locations and engine support will be identified for unit during briefing. Behave runs indicate easy containment of escape.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <del>Low</del> Moderate High	Holding and ignition methods are simple when conducted as outlined in the plan. Unit has some topography but is relatively flat overall. Ignition methods allow for maximum control by holding personnel.
<b>Final Rating:</b> <del>Low</del> Moderate High	No Change

#### 2. The Number and Dependency of Activities

Risk	Rationale
<b>Preliminary Rating:</b> Low <del>Moderate</del> High	Multiple burns are not conducted simultaneously. Burns are adequately staffed and are not initiated when safety is an issue or completion is questionable. Ignition and holding activities are dependent upon a reliable source of water for containment but only until the south line is blacklined. Establishing and maintaining good communications between burn crew members is critical.
<b>Final Rating:</b> <del>Low</del> Moderate High	Back up pump and spare hoses will be on scene prior to ignition. All personnel will have radio communications or visual with someone who does. Close attention will be paid to ensuring uninterrupted availability of water to the line.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <del>Low</del> Moderate High	Water supply problems could result in increased risk of escape, and threaten project completion, however fire behavior low enough that line should be able to be held by hand tools.

<b>Final Rating:</b> <i>Low Moderate High</i>	Supply problems mitigated by adjusting firing to coordinate with refill needs so no active line is left unprotected. Second pump on site for backup and additional back pack pumps will be staged for contingency.
<b>Technical Difficulty</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low Moderate High</i>	A qualified pump operator is part of the burn team. Small holding force requiring little supervision. The small length of the active fire edge in this quick burning fuel type will enable constant interaction and communication.
<b>Final Rating:</b> <i>Low Moderate High</i>	No change

### 3. Off-Site Values

<b>Risk</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low Moderate High</i>	Large housing development to the north, more homes further to the SE. The Refuge is closed to the public on a permanent basis. Several nearby roads but burn will have only temporary if any smoke impact.
<b>Final Rating:</b> <i>Low Moderate High</i>	Risk to homes and public is minimal given prescribed wind directions, contingency resources, and expected fire behavior.
<b>Potential Consequences</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low Moderate High</i>	Visitor use to the area would not be restricted except during actual burn inception. Any escape will be limited to a ground fire and do no resource damage of a permanent nature. Largest public inconvenience should be smelling smoke in homes if column collapses.
<b>Final Rating:</b> <i>Low Moderate High</i>	No Change. Massachusetts DCR has pulled off several large burns in the adjoining area this year so public tolerance is high. Plymouth Fire Dept. will be on scene and actively promotes lowering the fire danger in town through Rx.
<b>Technical Difficulty</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low Moderate High</i>	Containment can be accomplished with hand tools or by installing hoselays if necessary. A major escape would involve mobilizing the on site contingency engines to one of the predetermined secondary lines and probably backfiring off a wetline or leaf blower line.
<b>Final Rating:</b> <i>Low Moderate High</i>	Several secondary locations are available allowing option of choosing one that allows time to install hoselay and ignite before flame front hits.

### 4. On-Site Values

<b>Risk</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low Moderate High</i>	There are no known significant on-site values for the unit. The unit serves as critical habitat for the Federally endangered Northern red-bellied cooter, but there are no known T&E species present at this time of year. Timing of the burns is selected to avoid the June – July breeding season.

<b>Final Rating:</b> <i>Low</i> Moderate High	Light fuels, prescription, and having water readily available minimizes escape and adverse site impact. The burn is scheduled only for outside of the breeding season. An escape to the west would move closer to the ponds and turtle habitat but cause no long term damage. Unit contains an unauthorized hiking trail which will not be affected by the burn.
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Potential Consequences	Rationale
<b>Preliminary Rating:</b> <i>Low</i> Moderate High	Implementation will not damage special features since none are known. If any are identified that area will not be treated until concerns are mitigated.
<b>Final Rating:</b> <i>Low</i> Moderate High	No change.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <i>Low</i> Moderate High	No special skills or operating procedures are required other than basic pump skills. Resource values within the units (if any) are easy to protect.
<b>Final Rating:</b> <i>Low</i> Moderate High	No change.

### 5. Fire Behavior

Risk	Rationale
<b>Preliminary Rating:</b> <i>Low</i> Moderate High	Rx calling for back and flank ignition; strip head only if fire does not carry well or to speed consumption up. Flame lengths NTE 4 feet at unit perimeter. Fuels are fairly uniform, terrain is rolling but overall flat, winds and other fire conditions uniform. Fire primarily two dimensional and predictable.
<b>Final Rating:</b> <i>Low</i> Moderate High	Prescription values and ignition techniques will all mitigate potential problems. As with all prescribed fire there is a danger to personnel. Using LCES these hazards can be mitigated.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> Low <del>Moderate</del> High	Fire outside the unit would end up as a head fire with potentially significant rate of spread, but large contingency force and availability of secondary containment lines should easily catch.
<b>Final Rating:</b> <i>Low</i> Moderate High	Fuels are light, quickly burn out. All resources are local and know secondary lines, topographic features, and the characteristics if fire in this fuel type.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <i>Low</i> Moderate High	Discussion during briefing to address contingency and proper attack of an escape. Standard fire safety precautions are adequate to ensure personnel safety. Escape routes are numerous and clear. Adequate safety zones are available in several locations. Very few, or no spot fires are expected, given the fuel type. Expected fire behavior is such that holding forces can control most or all spot fires using direct attack with hand tools and no additional resources.

<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	No change
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### 6. Management Organization

Risk	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	<b>Absolute minimum staffing of 26 people</b> required to successfully complete this burn, however, <b>suggested actual minimum is 41</b> . The Zone FMS, or a minimum FWS Single Resource Boss in absence of Zone FMS, will be present. Massachusetts DCR will provide RXB2 Burn Boss plus engines specified on page 15. Plymouth Fire personnel and specified equipment must be present and in FWS AD pay status.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	No change
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Burn team is made up of local resources within the New England area, all of which are familiar with local conditions. Minimal supervision and communication problems expected. All key positions are qualified and experienced personnel. Trainee positions may be filled where applicable without affecting management.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	All resources adequately briefed on contingency roles and actions. All cooperative agreements in place prior to burn.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Sufficient experienced personnel to handle key contingency positions. Span of control not an issue but coordination of multiple agencies and skill levels will require diplomacy skills in job assignments, responsibilities, etc.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	No change. Coordination of this burn will require considerable refuge staff time investment prior to burn day getting all parties on board and details worked out.

### 7. Public and Political Interest

Risk	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	The prescribed fire is visible to some portions of the public. There is expected to be some news media interest. There may be some public interest and concern about smoke. It is hoped that representatives from MA DEP may be present.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Press releases and an established history of both a successful NPS program on the Cape and MA DCR on the Myles Standish State Forest will help mediate these concerns to an acceptable level.
Potential Consequences	Rationale

<b>Preliminary Rating:</b> <i>Low Moderate <b>High</b></i>	Given the general location of the unit and the local culture, any problems with execution of this plan would not go unnoticed. Unexpected or adverse events would attract some public, political or media attention This is the second time for burning on the refuge, and may affect future opportunities. Currently, all smoke management in Massachusetts is under strict scrutiny.
<b>Final Rating:</b> <i>Low <b>Moderate</b> High</i>	Following the burn plan, staffing adequate resources, and smoke management will all help mitigate the potential consequences of an adverse event. Given the potential sensitivity of an adverse outcome, the burn will be conducted with proper advanced notice, a qualified PIO present during inception, and with follow-up information release as necessary to minimize adverse outcomes.
<b>Technical Difficulty</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low <b>Moderate</b> High</i>	Requires a FWS special fire information officer function and zone fire staff involvement. Refuge staff involvement is also needed to communicate message to public. On burn day, a staff member will be at the Refuge office in Sudbury to answer calls from the public concerning the burn, log in any complaints, etc.
<b>Final Rating:</b> <i>Low <b>Moderate</b> High</i>	No Change. Scheduling prospective burn window (based on weather) far enough in advance to allow personnel from outside local area to travel will be a challenge.

### 8. Fire Treatment Objectives

<b>Risk</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i><b>Low</b> Moderate High</i>	Easily achieved fuel reduction objectives. Less important objective to attempt to crown scorch midstory pines may be more challenging. The necessary fire behavior is easily created, managed, and monitored.
<b>Final Rating:</b> <i><b>Low</b> Moderate High</i>	No change
<b>Potential Consequences</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i>Low <b>Moderate</b> High</i>	Given the cost of labor intensive alternatives, other opportunities to meet objectives are very limited. Failure to meet objectives may result in adverse impacts to a Federal Endangered Species (Turtle) through habitat change. The fire behavior itself is not a major factor influencing objective accomplishment, just the timing and available burn windows.
<b>Final Rating:</b> <i><b>Low</b> Moderate High</i>	Habitat change is a long term condition. If objectives are not achieved this year, unit could be reburned in 2 years as soon as the Huckleberry grows back.
<b>Technical Difficulty</b>	<b>Rationale</b>
<b>Preliminary Rating:</b> <i><b>Low</b> Moderate High</i>	Objective achievement is relatively easy to complete using wet containment lines and is easily observed. Large burn team but span of control is addressed so should not be an issue.
<b>Final Rating:</b> <i><b>Low</b> Moderate High</i>	Containment lines and contingencies have been addressed in burn plan and will be sufficient.

### 9. Constraints

Risk	Rationale
<b>Preliminary Rating:</b> <del>Low</del> <i>Moderate High</i>	Logistically, the site is easy to access and in event of a need, contingency resources will be already on scene. Uninterrupted water supply at the nozzle will be a minor factor. Second pumping system needed for contingency backup. Impact of Air Quality constraints on burn window will remain to be seen.
<b>Final Rating:</b> <del>Low</del> <i>Moderate High</i>	No change.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <del>Low</del> <i>Moderate High</i>	Project can be implemented whenever it is in prescription. Wind direction and smoke constraints are the primary concern for these units.
<b>Final Rating:</b> <del>Low</del> <i>Moderate High</i>	Close attention will be paid to wind directions and potential for sea breeze shifts. Smoke monitor assigned to patrol roads for any smoke impacts.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <del>Low</del> <i>Moderate High</i>	Prescription allows for a fairly wide window of acceptable wind directions, temperature and Rh range. Smoke management should primarily be controlled through ignition patterns and techniques.
<b>Final Rating:</b> <del>Low</del> <i>Moderate High</i>	No change.

### 10. Safety

Risk	Rationale
<b>Preliminary Rating:</b> <del>Low</del> <i>Moderate High</i>	This is a straight forward burn with very predictable fire behavior outcomes. Access away from the burn unit is not restrictive; there are several quality safety zones. Safety issues are straight forward and easily addressed within the briefing. Terrain will require caution with ATV operation.
<b>Final Rating:</b> <del>Low</del> <i>Moderate High</i>	No change. ATV operation and load securement will be stressed during briefing.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <del>Low</del> <i>Moderate High</i>	Minimal potential for serious injuries to firefighters. All PPE to be worn and safety zones are easily accessible. All personnel required to meet NWCG qualifications. No publics will be allowed anywhere in the unit during the burn phase; all media or other non fire personnel will be escorted.
<b>Final Rating:</b> <del>Low</del> <i>Moderate High</i>	No change. By adhering to the 10 standard fire orders, 18 watch outs, implementing LCES, and receiving a good briefing, all hazards to firefighters can be mitigated.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <del>Low</del> <i>Moderate High</i>	Safety concerns are easily mitigated through LCES and pre-burn briefings. Special mitigation to protect public health and safety are not needed.
<b>Final Rating:</b> <del>Low</del> <i>Moderate High</i>	No change.

### 11. Ignition Procedures/Methods

Risk	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Firing sequence and timing are not critical to meet project objectives or complete the burn. The entire unit is not visible to the burn boss and/or ignition team but will have radio communications. Firing methods will limit fireline intensities and threat to control.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	No change.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Firing methods and procedures do not pose a safety concern to personnel or increase the risk of an unexpected or adverse event. Escaped fire would be easily caught and have no long term impact to the resource but could have major consequences if threatening structures.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	No change. Any escape that threatens structures, even if caught with no damage done, will have long term public and political consequences.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Simple firing procedure, small ignition team, no special equipment or techniques and whole ignition is controlled by a designated Firing Boss position. All ignitions done with drip torches.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	No change.

### 12. Interagency Coordination

Risk	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Even though the project is wholly on FWS land, there are multiple (5+) interagency partners involved and there is overall interest to conduct burning with minimal adverse impact to public and air quality. There are new state air quality standards and a permitting process. A less than successful outcome could adversely affect other fire practitioners in the area.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Open communication with the local fire department, our state and Federal partners well prior to the burn date is planned. This includes involving State Air Quality specialists, to ensure all are informed. The refuge has burned successfully in the past (April, 2007) with no issues. Given the importance of this element, there is no change to this rating.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	The project can be completed as planned. Some consequences of interagency, such as varying degrees of training, communications, and understanding of our wildfire conversion plan, have been identified. An adverse outcome, such as a smoke event, not following the burn plan or air quality permit stipulations, could directly influence other fire practitioners statewide.
<b>Final Rating:</b> <i>Low</i> <i>Moderate</i> <i>High</i>	Imperative to follow burn plan direction air quality permit stipulations. Contact and notification procedures are specified and arrange a face to face meeting with local fire Chief to establish purpose and proper notification procedures prior to burn date. <b>Send copy of Burn Plan to the Chief for review and comment.</b> If not a requirement, invite Air Quality specialists to observe on burn day. Maintain a professional burn organization image.
Technical Difficulty	Rationale

<b>Preliminary Rating:</b> <i>Low</i> <b>Moderate</b> <i>High</i>	Project will encounter town / state / federal regulations. Zone FMO can advise or facilitate a meeting as necessary should issues not be resolved at the local level. Otherwise no special agreements are needed. Other interagency resources (NPS and State) are available as needed.
<b>Final Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	Refuge staff and DCR/ TNC Burn Bosses should be able to resolve most issues and establish good working relationships with each other and the town of Plymouth.

### 13. Project Logistics

Risk	Rationale
<b>Preliminary Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	Burning to be completed in one operational period and does not require any special logistic function. Supplies needed for burn units are readily available in zone or from burn cooperators and no special equipment or communications are needed.
<b>Final Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	No change.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	Problems related to logistics would all be pre-ignition and should not increase the risk of escape or create a safety concern. Briefing on any logistic procedures is conducted before ignition.
<b>Final Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	No change.
Technical Difficulty	Rationale
<b>Preliminary Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	All burn team members are equipped to meet their own needs and PPE. <b>An additional supply run and prep work day before burning may be required.</b>
<b>Final Rating:</b> <b>Low</b> <i>Moderate</i> <i>High</i>	No change. Ensuring a common radio frequency and any associated frequency programming needs will be a most important pre-burn day issue.

### 14. Smoke Management

Risk	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <b>Moderate</b> <i>High</i>	Air Quality Permit obtained prior to the planned burn. Fuels are 1 and 10 hour, consumption is quick and mop up minimal. No major downwind targets within smoke plume trajectory other than possibly one school. No other visibility issues expected. Smoke exposure to the public, firefighter health and safety a concern. This project is visible to the public.
<b>Final Rating:</b> <i>Low</i> <b>Moderate</b> <i>High</i>	Burn prescriptions are written to disburse smoke in directions with no or few public impacts. Firefighters will be rotated out of heavy smoke concentrations as needed. Efforts to inform the public in advance through news releases, and staffing the Refuge office in Sudbury on burn day are built into this burn plan.
Potential Consequences	Rationale
<b>Preliminary Rating:</b> <i>Low</i> <b>Moderate</b> <i>High</i>	No major impacts to residences, roads or other facilities expected, provided the burn plan is followed. Firefighter exposure to smoke is expected to be moderate during the initial blacklining phase but minimal during the backing/holding phase of ignition. If the wind changes abruptly, there is potential for minor smoke intrusions before contingency actions can be employed.

<p><b>Final Rating:</b>  <i>Low</i> <b>Moderate</b> <i>High</i></p>	<p>No Change. Even unavoidable smoke impacts will still have major public and political repercussions not only for FWS but also for our cooperating partners.</p>
<p><b>Technical Difficulty</b></p>	<p><b>Rationale</b></p>
<p><b>Preliminary Rating:</b>  <i>Low</i> <i>Moderate</i> <b>High</b></p>	<p>New requirements are in effect for Ozone and PM2.5 and are included as part of this Plan and permit stipulations. Burn window opportunities are reduced and are much more difficult to predict in advance. More coordination with MA DEP than just the permit is now in effect. No major issues as long as the wind direction and dispersion remain acceptable. <b>AQI is not posted until 11:00 AM which will delay ignition time unless that can be negotiated in permitting process somehow.</b></p>
<p><b>Final Rating:</b>  <i>Low</i> <b>Moderate</b> <i>High</i></p>	<p>Given new air quality concerns and requirements, considerable attention will be focused on this project. By following the Plan, and no unforeseen event, it is the best we can do. Air quality and smoke issues will always remain an important consideration, even when things go right, and for every burn in the future. Weather forecasts will be closely monitored, all units will be 100 % mopped up so there is no residual smoke. There is no technical difficulty involved to protect personnel safety conducting this burn from adverse smoke impacts.</p>

COMPLEXITY RATING SUMMARY

RISK	OVERALL RATING	<u>Mod (4 / 14)</u>
POTENTIAL CONSEQUENCES	OVERALL RATING	<u>Mod. (4 / 14)</u>
TECHNICAL DIFFICULTY	OVERALL RATING	<u>Mod. (3 / 14)</u>
<b>SUMMARY COMPLEXITY RATING</b>		<b><u>MODERATE</u></b>

RATIONALE: While the risk of escaped fire in the direction of private lands is low due to the mechanical treatments previously conducted on the north boundary of Unit 1, the consequences of escaped fire to the north range from moderate to high, as would the consequences of significant smoke in that direction. Moderate complexity is also appropriate given that an escaped fire to the south would enter State Forest, and may result in interagency cooperation and media exposure consequences that could negatively impact the potential for future prescribed fire treatments in the refuge.

Although this is a large unit, due to quick burn out time of the fuels it will have a relatively small perimeter susceptible to fire escape (less than 200 meters). Uniformity of fuel conditions and absence of laddering fuels lean to making these burns easy to predict, relatively simple to carry out, and of very little risk to public, firefighter, or resource safety. Prescription conditions will ensure minimal risk of escape or adverse impact on the surrounding area. Experienced fire personnel make the job of the burn boss much easier and allow personnel to fill more than one position as needed. Additionally, the refuge has a good relationship with the National Park Service whose fire employees can be drawn upon if conditions are near prescription limits and more help is deemed prudent to safely conduct the burn.

Of the **42 elements** that are rated, there were **sixteen** that ranked initially as **moderate but seven were adequately mitigated to low** through the fire management process and strict adherence to the prescriptions laid out in this plan. Under "Public and Political Interest," **one element initially ranked high, mitigated to moderate**. Also, under "Smoke Management," **one ranked high and can be mitigated to moderate**. A total of **nine elements** dealing with "Management Organization," "Public and Political Interest," "Ignition Procedures," "Interagency Coordination" and "Smoke Management" **could not be mitigated lower than moderate**, mostly due to Air Quality and smoke management concerns. Should this burn not be executed properly, adverse air quality impacts could have lasting affects on future burns for the Service and possibly other fire practitioners in Massachusetts.

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
John R. Meister, USFWS R5 North Fire Management Specialist 08/26/09

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_  
(A \_\_\_\_\_ gency Administrator)

**APPENDIX D**  
**JOB HAZARD ANALYSIS for PRESCRIBED BURNING**

<b>ACTIVITY</b>	<b>HAZARDS</b>	<b>ACTION TO ELIMINATE HAZARD</b>
<b>Driving to work site</b>	General operations and public traffic.	Defensive driving techniques. Use seat belts and headlights. Perform pre-use inspections on equipment. Provide road maps if needed, scout roads prior to burn day.
	Winding, narrow roads. Soft shoulders.	Drive slow, be able to stop in ½ usual distance. Lights on.
	Hauling flammable substances.	Use appropriate containers, well secured in vehicle.
	Transporting sharp tools and equipment.	Use guards, cages, boxes or tool mounts. Tie down all loads.
<b>Flammable Materials</b>	Loading vehicles.	Check load security before departing. <b>The driver is responsible.</b>
	Exposure to sparks, embers, and heat.	Use proper containers, move away from hot areas, no smoking. Provide pour spouts. Containers to be filled must be on the ground.
	Leaking containers or torches.	Empty and tag in field, have repairs made before next use. Do not get fuel on clothing or PPE.
	Improper gas/diesel ratios for slash fuel.	Use labels on containers, field test small amounts before use.
<b>Driving at or near work site</b>	Backing or turning around in small areas.	Use spotters or get out and check personally. Face the hazard while turning around.
	Smoke, poor visibility.	Place a guide on foot ahead of the vehicle. Wait until smoke is less dense. Lights on. Use light bars and/or warning lights. Use radio communication.
	Parking near a prescribed burn.	Use parking brake and wheel chocks. Leave keys in ignition, avoid leaving exposed combustible materials in bed of vehicle. All windows closed.
	ATV's	Operated by trained and licensed drivers only. Lights on. Avoid steep slopes. Full PPE, hard hat not helmet due to hearing ability.
	Public safety and smoke on road.	Post signs and/or use road blocks or road guides if needed.
<b>Equipment set-up</b>	Operating pumps and saws.	Tuck in shirt tails, remove scarfs and jewelry. Proper clothing, PPE, gloves and boots, and hearing protection.
	Operating high pressure nozzles.	Maintain visual contact with pump operator and other crew members. Use goggles. Mark defective equipment.
<b>Hand ignition</b>	Close proximity to intense heat and erratic fire behavior.	Use PPE, keep sleeves rolled down. Maintain radio communication. Know escape route.
	Smoke, sparks, and cinders.	Avoid very dense smoke. Wear PPE, alter firing patterns. Rotate personnel out of worst areas.
	Poor footing, steep slopes, heavy fuels.	Constant awareness, learn to identify hazard area. Slow down. Communicate problem areas between burn crew members.
	Burning fuel dripping from torches.	Know location of others. Extinguish when not inside burn unit. Be aware of spurting from drip torch.
	Misguided lighter lighting wrong area. Inadvertent firing over/under shot.	Post lookouts. Notify ignition spec. and holding spec. Holding crews extinguish spot, subsequent to further ignition.
	Risks associated with firing projectiles or flares.	Basic firearm safety. Be aware of the target and the device. Hand and eye protection a must.

<b>ATV Ignition</b>	Rough terrain, heavy ground fuels, side hills and slopes.	Scout and locate accessible routes, make dry run, experienced operator or supervised trainee. Fire by hand if necessary. Be aware of torch arm when making turns near the line at the end of a strip.
	Noise of ATV and fire obscures verbal warnings.	Hand held radios required of all ignition personnel. Hard hats instead of helmets to facilitate communication.
<b>Holding</b>	Tool use.	Proper training. Keep tool guards on while traveling, remove only when in use. Keep tools properly sharpened.
	Burned off snags or widow-makers.	Avoid entering burned over areas. Post lookout, flag, or fall..
	Burns from radiant heat and hot embers.	Nomex clothing, hard hats and gloves required. Use ignition techniques that minimize impacts on line. Rotate crewmembers to cooler areas. Stay well hydrated.
	Rolling debris.	Post lookouts, brief crew as to potential hazard areas.
	Erratic fire behavior.	To be covered by burn boss in pre-burn briefing, escape route shall be known by everyone.
<b>Mop-up</b>	Snag falling.	Falling and bucking to be done only by trained personnel. No other personnel within 2 tree lengths.
	Smoke inhalation.	Crews will be rotated in and out of dense smoke.
	Fatigue, long hours of work.	Shifts of duty shall not exceed 12 hours, except in emergencies. Crews will work no longer than 7 days on with 1 day off or 14 on with 2 off. Work in pairs, have rested drivers available.
	Heat	Drink adequate fluids to maintain hydration. Maintain high level of aerobic fitness as prevention.
	Venomous insects	Stay Alert for bees, and hornets. Flag all nests encountered.

## APPENDIX E

### Behave Runs

The following runs model fire outputs that are expected under the given prescription (fine fuel moisture and mid-flame wind speed as the major variables). The combination of wind and fuel moisture outside an acceptable range are driven by a "what if" thought process relating to a head fire. Again, ROS and intensity levels are to be controlled by strip firing and allowing a fire to back on it's own. Due to Behave program limitations, strip firing is not easily modeled. However, a maximum ROS is not to exceed 30 ch/hr (60' strip closure is not less than 2 minutes). On the average, flame lengths will be kept less than 4 feet, especially near unit perimeter.

In FM TL 9 (60%) / SH 4 (40%), given a backing fire under the influence of a 6 mph mid-flame wind speed, and a 8% fine fuel moisture, we can expect a backing ROS of 1.1 ch/hr. Running strips through will cut the firing time by more than half, be much more cost effective, while still providing a wide margin of safety and minimal risk of escape. As an option if time is a constraint, perimeter firing can occur once 50% of the unit is completed on the downwind side. To best meet resource objectives, as much of the unit as possible should be allowed to burn under a backing fire to maximize heat exposure to the rhizomes.

Regardless of the ignition method chosen, the firing progression through the units is dictated by how long the flanks take to burn out, and how much active perimeter the holding forces can patrol, secure, and cold trail before more fire is applied.

A flanking fire is also modeled, as a certain amount of this firing technique is used to tie the perimeter flanks between strips. This is done to prevent "bumping" the flanks with the flaming front of a new strip, and to ensure that the flanks are burned out to the control line. As with a backing fire, ROS, intensity, and flame lengths are much less than with a head fire.

Any escape from the unit will be burning in the same fuel model but under head fire conditions which once established will still be within firefighter capabilities to catch from the rear or flanks or may necessitate repositioning ahead of the fire front and igniting a backfire.

**Inputs SURFACE SPOT**

Description		Mixed Fuel 60% TL9 / 40% SH4, Fall - Head Fire
Administrative Unit		(WAF = 0.25, Semi Full She.
Prescribed Fire Name		Massasoit
Prepared By		John Meister, FMS, RXB2
<b>FuelVegetationSurfac#Understory</b>		
First Fuel Model		t19
Second Fuel Model		sh4
First Fuel Model Coverage	%	60
Fuel Model Type		S
<b>FuelVegetationOverstory</b>		
Canopy Height	ft	50
Tree Height	ft	25
Spot Tree Species		PINMON
D.B.H.	in	6
<b>FuelMoisture</b>		
1-h Moisture	%	6, 8, 10, 12, 14
10-h Moisture	%	8
100-h Moisture	%	14
Live Herbaceous Moisture	%	
Live Woody Moisture	%	75
<b>Weather</b>		
20-ft Wind Speed (upslope)	mi/h	4, 8, 12, 16, 20, 24
Wind Adjustment Factor		0.25
<b>Terrain</b>		
Slope Steepness	%	0
Ridge-to-Valley Elevation Difference	ft	0
Ridge-to-Valley Horizontal Distance	mi	
Spotting Source Location		
<b>Fire</b>		
Spread Direction (from upslope)	deg	0
Number of Torching Trees		1

**Surface Rate of Spread (ch/h)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	3.6	7.1	11.3	16.0	21.2	26.6
8	3.3	6.5	10.3	14.6	19.2	24.2
10	2.9	5.8	9.2	13.1	17.3	21.7
12	2.5	5.0	7.9	11.2	14.8	18.6
14	1.9	3.7	5.9	8.4	11.1	14.0

**Fireline Intensity (Btu/ft/s)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	71	152	251	364	488	623
8	62	132	219	317	426	544
10	51	109	180	261	350	447
12	36	77	127	184	248	316
14	19	36	59	85	115	147

**Flame Length (ft)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	3.2	4.5	5.7	6.8	7.8	8.7
8	3.0	4.3	5.4	6.4	7.3	8.2
10	2.7	3.9	4.9	5.8	6.7	7.5
12	2.3	3.3	4.2	5.0	5.7	6.4
14	1.8	2.3	2.9	3.5	4.0	4.5

**Inputs SURFACE, SPOT**

Description		Mixed Fuel 60% TL9 / 40% SH4, Fall - Flanking
Administrative Unit		(WAF = 0.25, Semi Full She
Prescribed Fire Name		Massasoit
Prepared By		John Meister, FMS, RXB2
<b>FuelVegetationSurfaceUnderstory</b>		
First Fuel Model		t19
Second Fuel Model		sh4
First Fuel Model Coverage	%	60
Fuel Model Type		S
<b>FuelVegetationOverstory</b>		
Canopy Height	ft	50
Tree Height	ft	25
Spot Tree Species		PINMON
D.B.H.	in	6
<b>FuelMoisture</b>		
1-h Moisture	%	6, 8, 10, 12, 14
10-h Moisture	%	8
100-h Moisture	%	14
Live Herbaceous Moisture	%	
Live Woody Moisture	%	75
<b>Weather</b>		
20-ft Wind Speed (upslope)	mi/h	4, 8, 12, 16, 20, 24
Wind Adjustment Factor		0.25
<b>Terrain</b>		
Slope Steepness	%	0
Ridge-to-Valley Elevation Difference	ft	0
Ridge-to-Valley Horizontal Distance	mi	
Spotting Source Location		
<b>Fire</b>		
Spread Direction (from upslope)	deg	90
Number of Torching Trees		1

**SurfaceRate of Spread(ch/h)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	1.4	1.8	2.0	2.1	2.2	2.2
8	1.3	1.6	1.8	2.0	2.0	2.0
10	1.2	1.5	1.7	1.8	1.8	1.8
12	1.0	1.3	1.4	1.5	1.5	1.6
14	0.8	0.9	1.1	1.1	1.2	1.2

**FirelineIntensity(Btu/ft/s)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	71	39	45	49	51	52
8	25	34	39	42	44	45
10	20	28	32	35	36	37
12	14	20	23	25	26	26
14	8	9	11	11	12	12

**FlameLength(ft)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	3.2	2.4	2.6	2.7	2.7	2.8
8	2.0	2.3	2.4	2.5	2.6	2.6
10	1.8	2.1	2.2	2.3	2.4	2.4
12	1.5	1.8	1.9	2.0	2.0	2.0
14	1.1	1.2	1.3	1.4	1.4	1.4

Inputs SURFACE SPOT

Description   
 Administrative Unit   
 Prescribed Fire Name   
 Prepared By

FuelVegetationSurfaceUnderstory

First Fuel Model   
 Second Fuel Model   
 First Fuel Model Coverage %   
 Fuel Model Type

FuelVegetationOverstory

Canopy Height ft   
 Tree Height ft   
 Spot Tree Species   
 D.B.H. in

FuelMoisture

1-h Moisture %   
 10-h Moisture %   
 100-h Moisture %   
 Live Herbaceous Moisture %   
 Live Woody Moisture %

Weather

20-ft Wind Speed (upslope) mi/h   
 Wind Adjustment Factor

Terrain

Slope Steepness %   
 Ridge-to-Valley Elevation Difference ft   
 Ridge-to-Valley Horizontal Distance mi   
 Spotting Source Location

Fire

Spread Direction (from upslope) deg   
 Number of Torching Trees

SurfaceRate of Spread(ch/h)

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	0.9	1.0	1.1	1.2	1.2	1.2
8	0.8	0.9	1.0	1.0	1.1	1.1
10	0.7	0.8	0.9	0.9	0.9	0.9
12	0.6	0.7	0.8	0.8	0.8	0.8
14	0.5	0.5	0.6	0.6	0.6	0.6

FirelineIntensity(Btu/ft/s)

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	28	22	25	26	27	27
8	16	19	22	23	23	24
10	13	16	18	19	19	19
12	9	11	13	13	14	14
14	5	5	6	6	6	6

FlameLength(ft)

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	2.1	1.9	2.0	2.0	2.0	2.1
8	1.6	1.8	1.8	1.9	1.9	1.9
10	1.5	1.6	1.7	1.7	1.8	1.8
12	1.2	1.4	1.4	1.5	1.5	1.5
14	0.9	1.0	1.0	1.0	1.0	1.1

**Inputs SURFACE SPOT**

Description		Mixed Fuel 60% TL9 / 40% SH4, Fall - Head Fire
Administrative Unit		(WAF = 0.25, Semi Full She.
Prescribed Fire Name		Massasoit
Prepared By		John Meister, FMS, RXB2
<b>FuelVegetationSurfaceUnderstory</b>		
First Fuel Model		t19
Second Fuel Model		sh4
First Fuel Model Coverage	%	60
Fuel Model Type		S
<b>FuelVegetationOverstory</b>		
Canopy Height	ft	50
Tree Height	ft	25
Spot Tree Species		PINMON
D.B.H.	in	6
<b>FuelMoisture</b>		
1-h Moisture	%	6, 8, 10, 12, 14
10-h Moisture	%	8
100-h Moisture	%	14
Live Herbaceous Moisture	%	
Live Woody Moisture	%	75
<b>Weather</b>		
20-ft Wind Speed (upslope)	mi/h	4, 8, 12, 16, 20, 24
Wind Adjustment Factor		0.25
<b>Terrain</b>		
Slope Steepness	%	0
Ridge-to-Valley Elevation Difference	ft	0
Ridge-to-Valley Horizontal Distance	mi	
Spotting Source Location		
<b>Fire</b>		
Spread Direction (from upslope)	deg	0
Number of Torching Trees		1

**Mixed Fuel 60% TL9 / 40% SH4, Fall - Head Fire  
Flat Terrain Spot Dist from Torching Trees (mi)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	0.0	0.1	0.1	0.2	0.2	0.2
8	0.0	0.1	0.1	0.2	0.2	0.2
10	0.0	0.1	0.1	0.2	0.2	0.2
12	0.0	0.1	0.1	0.2	0.2	0.2
14	0.0	0.1	0.1	0.2	0.2	0.2

**Inputs SURFACE, SPOT, IGNITE**

Description   
 Administrative Unit   
 Prescribed Fire Name   
 Prepared By   
**FuelVegetationSurfaceUnderstory**  
 First Fuel Model   
 Second Fuel Model   
 First Fuel Model Coverage %   
 Fuel Model Type   
**FuelVegetationOverstory**  
 Canopy Height ft   
 Tree Height ft   
 Spot Tree Species   
 D.B.H. in   
**FuelMoisture**  
 1-h Moisture %   
 10-h Moisture %   
 100-h Moisture %   
 Live Herbaceous Moisture %   
 Live Woody Moisture %   
**Weather**  
 20-ft Wind Speed (upslope) mi/h   
 Wind Adjustment Factor   
 Air Temperature °F   
 Fuel Shading from the Sun %   
**Terrain**  
 Slope Steepness %   
 Ridge-to-Valley Elevation Difference ft   
 Ridge-to-Valley Horizontal Distance mi   
 Spotting Source Location   
**Fire**  
 Spread Direction (from upslope) deg   
 Number of Torching Trees

**Probability of Ignition from a Firebrand (%)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	56	56	56	56	56	56
8	42	42	42	42	42	42
10	31	31	31	31	31	31
12	23	23	23	23	23	23
14	17	17	17	17	17	17

**Weather**

20-ft Wind Speed (upslope) mi/h   
 Wind Adjustment Factor   
 Air Temperature °F   
 Fuel Shading from the Sun %

**Terrain**

Slope Steepness %   
 Ridge-to-Valley Elevation Difference ft   
 Ridge-to-Valley Horizontal Distance mi   
 Spotting Source Location

**Fire**

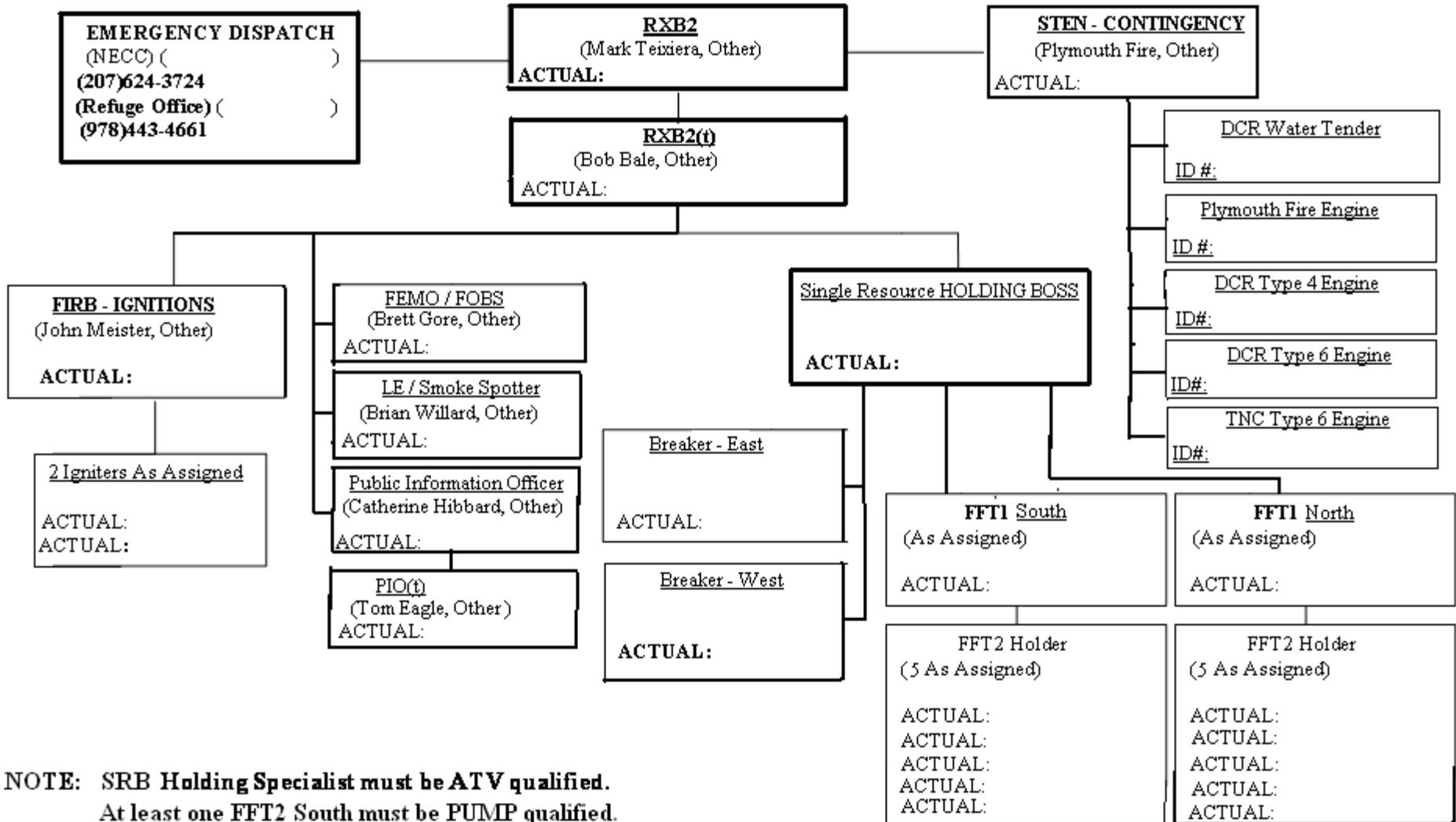
Spread Direction (from upslope) deg   
 Number of Torching Trees

**Probability of Ignition from a Firebrand (%)**

1-h Moisture %	20-ft Wind Speed (upslope) mi/h					
	4	8	12	16	20	24
6	48	48	48	48	48	48
8	35	35	35	35	35	35
10	26	26	26	26	26	26
12	18	18	18	18	18	18
14	13	13	13	13	13	13

Appendix F.

**PRESCRIBED FIRE ORGANIZATIONAL CHART**  
**BURN UNIT NAME: Massasoit Unit 1**



**NOTE: SRB Holding Specialist must be ATV qualified.**  
**At least one FFT2 South must be PUMP qualified.**

