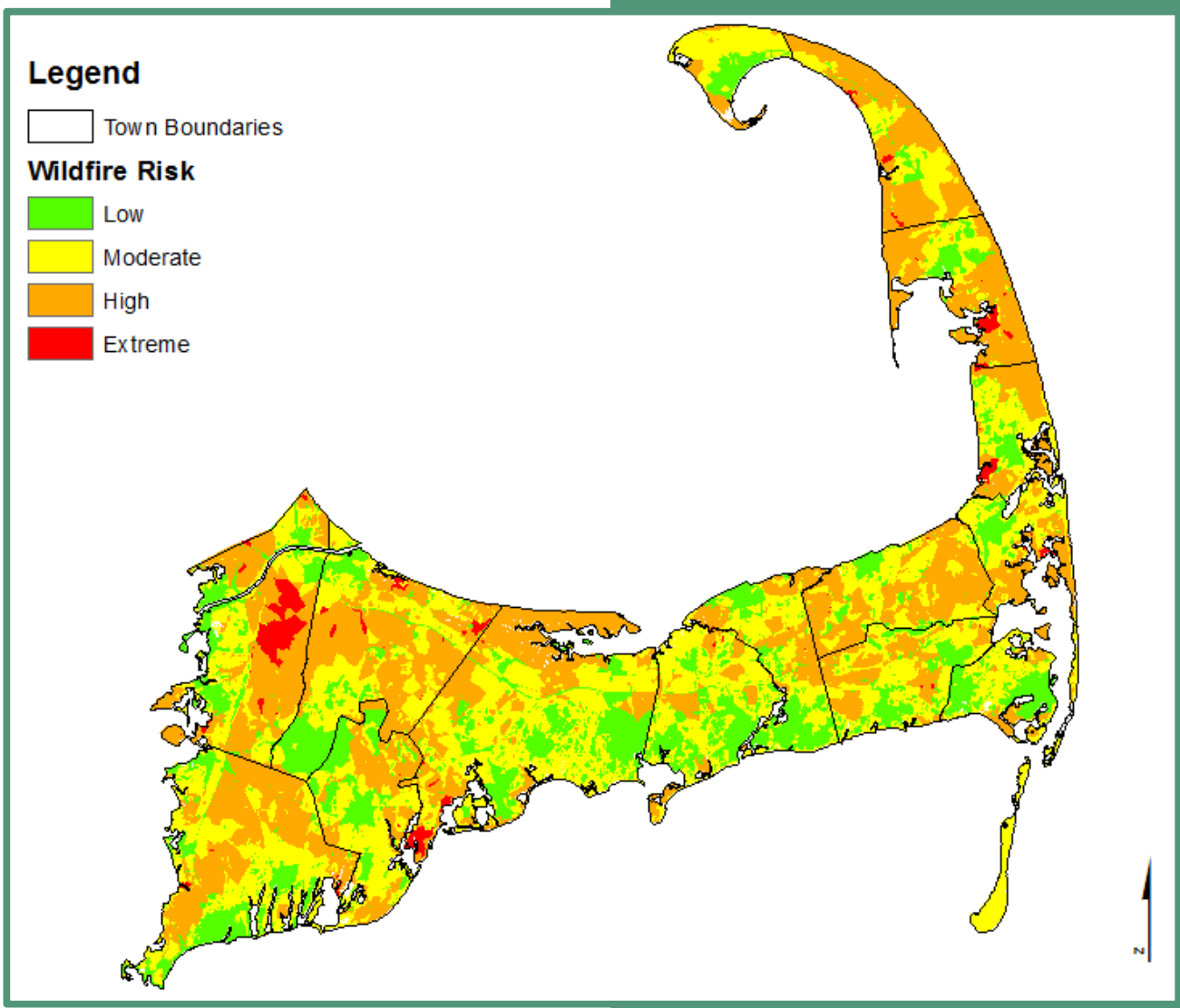
Cape Cod Cooperative Extension

BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN

Community Wildfire Protection Plan



2012

EXECUTIVE SUMMARY

Wildfire has played a role in shaping the landscape of Barnstable County for thousands of years, resulting in the abundance of fire-adapted ecosystems. The predominance of fire-adapted species combined with its climate and current development pattern puts Barnstable County at risk for wildfire.

The Barnstable County Wildfire Preparedness Plan was developed to address wildfire risk by mapping wildfire hazard and identifying the level of threat for the entire county. The plan is designed to enable municipal natural resource managers, planners, and fire departments to collaborate in addressing wildand fire risk. The risk assessment can be used as a guide for the prioritization of site-specific wildfire preparedness planning and to outline strategies to reduce wildand fire hazards.

Spatial data was used to conduct the risk analysis, classifying Barnstable County into four categories of wildland fire risk (percent of land area); low (14.7%), moderate (42.1%), high (41.2%), and extreme (2.0%). Recommendations for reducing wildland fire risk include conducting fuel management treatments on lands with a 'high' or 'extreme' wildland fire risk ranking and increasing education and public outreach efforts on Firewise and defensible space treatments.

General descriptions of fuel treatments and a site implementation plan template to aid in creating treatment prescription are presented to aid natural resource managers in designing fuel mitigation projects. In addition, strategies for homeowners to reduce the risk of wildfire to structures are presented.

Results of a county-wide survey of fire departments indicated that more wildland fire training opportunities such as county or state-run classes and participation on prescribed burns would be the most effective in increasing wildand fire preparedness. Many departments indicated that more firefighters would be beneficial to increasing suppression capabilities.

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The plan was produced at the request of the Barnstable County Cape Cod Cooperative Extension program and funded by Barnstable County.

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The information presented in this plan is intended to identify potential areas requiring further verification of wildfire risk. As a result of the course scale of the data used for analysis of risk, recommendations and findings should be field verified prior to any policy implementation or management actions. At no times should fire behavior predictions presented in this plan be used in place of site specific and event specific predictions and professional judgment.

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For copies of Barnstable County Wildfire Preparedness Plan - CWPP or GIS layers contact the Cape Cod Cooperative Extension at P.O. Box 367, Barnstable, MA 02630 or go to http://www.capecodextension.org .

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INTRODUCTION

Barnstable County's Cape Cod Cooperative Extension has conducted a Wildfire Preparedness Planning program for Barnstable County municipalities since 2005. The program is designed to reduce wildfire hazards on municipal lands and educate the public about the risk of wildland fires on Cape Cod. To date, wildfire preparedness plans have been developed for priority properties in twelve of the fifteen Barnstable County towns (Figure 1 and Table 1). The majority of these plans have been recognized by the Massachusetts Department of Conservation and Recreation (DCR) and the United States Forest Service (USFS) as Community Wildfire Protection Plans (CWPP). All completed plans are available at the Cape Cod Cooperative Extension's Natural Resource web page (www.capecodextension.org).

After working with Barnstable County municipalities, it has been observed that many towns lack the information required to identify and prioritize town and private lands that could benefit from the Wildfire Preparedness Planning program. This plan is designed to address information gaps and provide Barnstable County municipalities with information to better prioritize and plan for future wildfire mitigation projects across multiple property ownerships by meeting the following goals;

- Identify wildland fire hazard areas in Barnstable County and rank their level of threat.
- Assess current wildland fire suppression capacities and identify areas needed to increase effectiveness.
- Establish a guide for site-specific wildfire preparedness planning and outline various strategies appropriate for reducing wildland fire hazard common to conditions found throughout Barnstable County.
- Summarize strategies and methods for educating the public, land managers, and officials about methods to reduce the incidence of fire and the threat of wildland fire to structures.

The "2003 Healthy Forest and Recreation Act" states that a CWPP must include three features. First, the plan should be a product of collaboration between state, local and federal agencies. Second, the plan must identify and prioritize areas for hazardous fuel reduction treatments, in addition to recommending methods of treatments that will protect at-risk communities and essential infrastructure. Third, the plan must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan. The Barnstable County Wildfire Preparedness Plan meets these federal requirements of a CWPP.

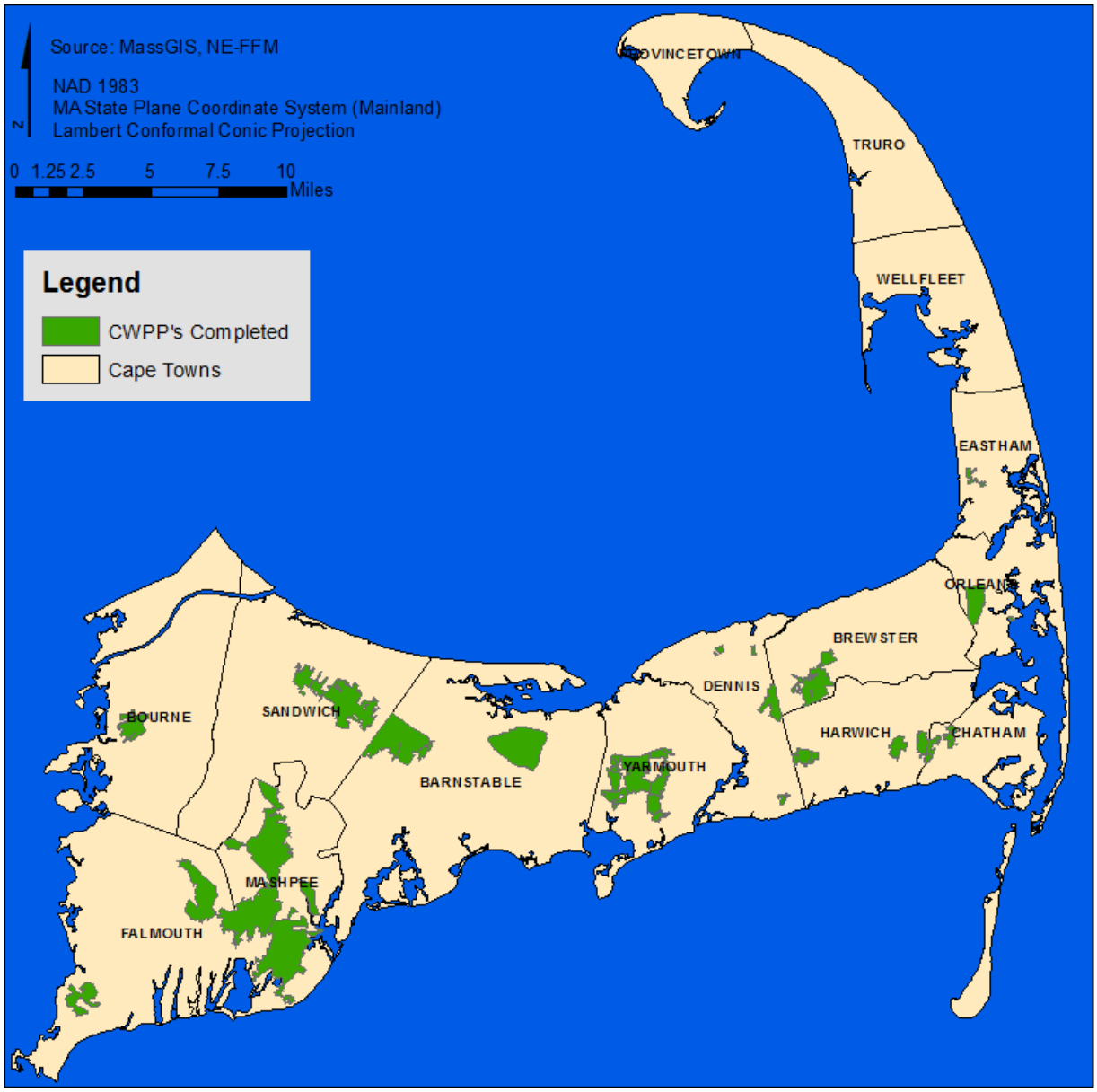

Figure 1: Barnstable County Towns and Existing CWPPs.

Table 1: Existing Barnstable County CWPPs.

Town	Plan Location
Barnstable	Old Jail Lane Conservation Area and Adjacent Town Land
Barnstable	West Barnstable Cons. Area & Adjacent Open Space Lands
Bourne	Bourne Town Forest, Four Ponds Cons. Area, & Water Dis. Lands
Brewster	Punkhorn Parklands
Chatham/Harwich	Chatham Town Forest and Harwich Water Department Lands
Chatham	The Goose Pond Tract
Dennis	Princess Beach Conservation Area and Adjacent Scargo Hill
Dennis	Green Belt Well Field
Dennis	Plashes Conservation Area and Surrounding Open Space Tracts
Dennis	Ralph and Florence Shoop Memorial Conservation Lands
Eastham	Wiley Park, The Nickerson Property, and Cottontail Acres
Falmouth	Beebe Woods and Peterson Farm Conservation Areas (Draft)
Falmouth/Mashpee	Wildland Fuel Hazard Assessment for Mashpee National Wildlife Refuge
Harwich	Thompson's Field Conservation Area and Adjacent Water District Lands
Harwich	Bell's Neck
Mashpee	The Town of Mashpee River Woodlands
Orleans	Orleans Watershed Lands
Orleans	Paw Wah Point
Sandwich	Maple Swamp and Discovery Hill Sandwich Town Lands Complex
Yarmouth	Yarmouth Town Lands

COMMUNITY BACKGROUND

The county of Barnstable, Massachusetts comprises 15 towns on Cape Cod (Figure 1). The 2010 U.S. Census identifies the total land area as being 393.72 square miles. The year-round population of Barnstable County is 215,888 with a total of 160,281 total housing units, 34.4% being classified as seasonal or recreational. Barnstable County is comprised of 15 towns, whose individual demographics are shown in Table 2. From 2000-2010, Barnstable County experienced a negative growth rate of 2.9%, as the 2000 population was 222,230. Population density is 548.3 persons per square mile (U.S. Census Bureau). Median household income for Barnstable County is $55,294. Per capita income is $33,435. The county wide median single-family home sale price in 2008 was $438,544, according to data from The Warren Group.

Table 2: Town populations, size, housing density, and population density.

Town	Population	Land Area ($mi.^2$)	Population Density (persons/$mi.^2$)	Home Density (housing units/$mi.^2$)
Barnstable	45,193	60.0	753.2	439.1
Bourne	19,754	40.9	482.9	264.2
Brewster	9,820	23.0	426.9	345.6
Chatham	6,125	16.2	378.1	453.3
Dennis	14,207	20.6	689.7	756.6
Eastham	4,956	14.0	354.0	425.7
Falmouth	31,531	44.2	713.4	497.0
Harwich	12,243	21.0	583.0	775.5
Mashpee	14,006	23.5	596.0	420.1
Orleans	5,890	14.2	414.8	376.7
Provincetown	2,942	9.7	303.3	463.2
Sandwich	20,675	43.0	480.8	220.3
Truro	2,003	21.2	94.5	145.8
Wellfleet	2,750	19.8	138.9	217.4
Yarmouth	23,793	24.3	979.1	718.7

There is approximately 100,720 acres of protected open space in Barnstable County according to the MassGIS Open Space data layer. The state owns and manages approximately 34,988 acres of this open space, the three largest being the Massachusetts Military Reservation, Nickerson State Park, and the Frances A. Crane Wildlife Management Area. The federal government owns or manages approximately 28,596 acres in Barnstable County, with the three largest being Cape Cod National Seashore and the Monomoy and Mashpee National Wildlife Refuges. Municipal open space landholdings account for approximately 23,379 acres across Barnstable County. Barnstable County owns approximately 145 acres and the remaining 13,612 acres is owned by private nonprofits, public nonprofits, private for profits, land trusts, conservation organizations, and other nongovernmental entities.

WILDFIRE PROBLEM STATEMENT AND FIRE HISTORY

Paleo-ecological records show fire has played a large role in affecting the landscape of Cape Cod for thousands of years (Winkler 1985, Patterson and Sassman 1988, and Patterson 1999). As a result of this process, fire-adapted ecosystems predominate most of the area. Sediment cores from Duck Pond at Cape Cod National Seashore that date back 12,000 years before present and 4,800 years before present contain abundant charcoal, suggesting that fire has shaped and maintained pine and oak forests on Cape Cod throughout the Holocene era (Winkler 1985, Clark 2002, Patterson and Crary 2004), indicating that fire has been an important influence on the pre and post European settlement landscape of Cape Cod.

In the early 1800's, fires were extensive, often thousands of acres, as a result of land use practices. Expanding railroad activities in this time period also increased the occurrence of forest fires. Drifting embers from locomotives were responsible for most fires (Thompson 1928). Only 44% of current forests on the outer Cape were wooded between 1848 and 1856

(Eberhardt et al 2003). Fires continued to be abundant on Cape Cod through the early 1900's. Thompson (1928) reported an average of 8,500 acres of woodlands burned annually. Only 12.6% of the current houses in Barnstable County were present before 1940 (Cape Cod Commission). Although fewer fires occur now, Barnstable County has considerably more houses and more values at risk.

As tourism became an important economic activity, public opinion began to favor the suppression of all fires. The first fire tower on Cape Cod was erected in Barnstable in 1913. The predecessor agency of the Massachusetts Department of Conservation and Recreation started patrolling Cape Cod in the 1920's. By the 1930's, Cape Cod developed the first brush breakers to fight forest fires (Crosby 2003). After this period, forest fires tended to burn fewer acres and for shorter periods.

Although much of Massachusetts and the surrounding New England states contain similar amounts of forested lands to Barnstable County, they lack the fuel types that elevate wildfire risk on Cape Cod. Pitch pine barrens, which cover most of Cape Cod, are a disturbance dependent community and contain many fire adapted species. Barnstable County and other coastal areas have the most frequent fire return interval in southern New England (Figure 2), an average of 1-7 years between two successive fire events for a given area. Conditions like climate, topography, soils, existing vegetation, storm events, and human activities govern the fire regime on Cape Cod.

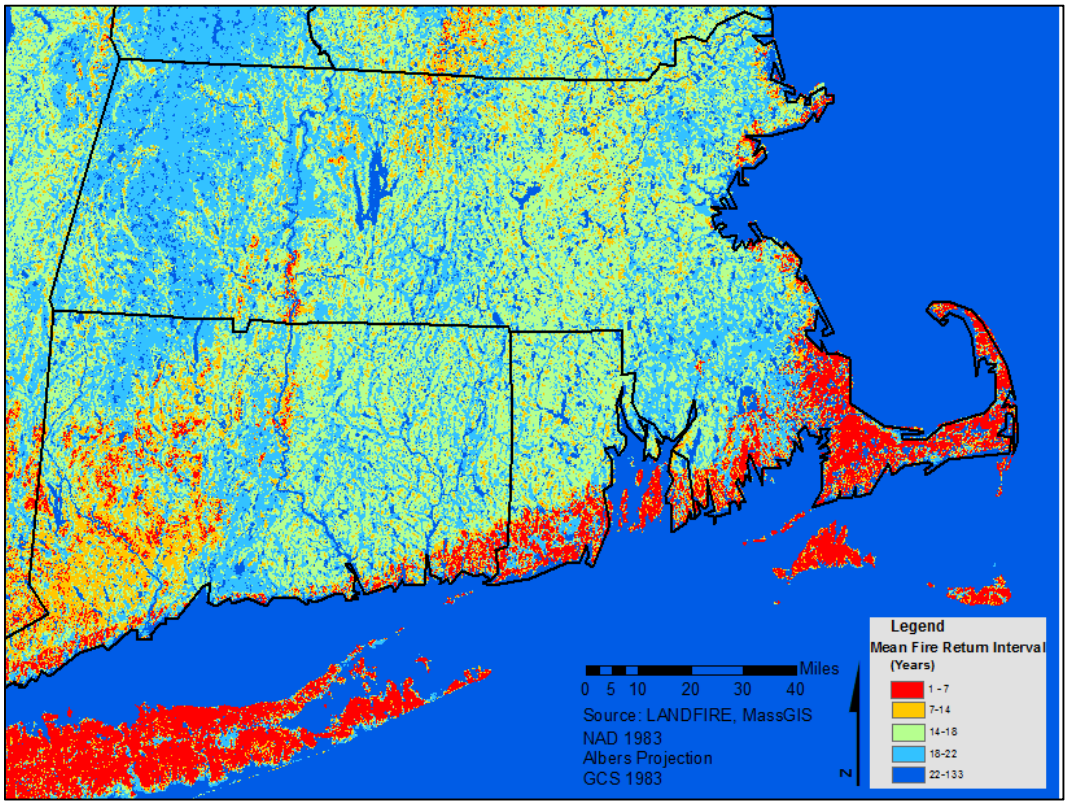

Figure 2: Mean Fire Return Interval map for Southern New England (source LANDFIRE).

Common Vegetation and Fuel Types

Pitch Pine Barrens are the dominant vegetative community on Cape Cod. Pine Barrens are home to several highly flammable plant species that are adapted to survive or regenerate post fire. This is a disturbance-dependent community type created by wildfires and historic logging, grazing and agriculture (Motzkin and Foster 2002). Pine Barrens Systems are a mosaic of pitch pine and scrub oak, typically located on nutrient-poor, acidic, drought-prone soils. Dominant vegetation in pine barrens systems include woodlands and shrublands with an overstory of pitch pine and an understory of scrub oak and heath species. Open grasslands and heathlands are also common (Ciaranca et al 2005).

The majority of plant communities across Barnstable County contain fire-adapted species and are prone to burning. Common plants such as huckleberry, scrub oak, and pitch pine produce volatile substances in their leaves and stems, which can contribute to the spread of fire. A dense shrub understory combined with ladder fuels like greenbrier or scrub oak can increase the possibility of fires reaching the forest canopy allowing for crown fire initiation and propagation. Pitch pines in the overstory contain highly flammable compounds and are more likely than other trees to carry a crown fire (Cauljow 2005). Fuels created by xeric vegetation like pitch pine, scrub oak, and ericaceous shrubs dry rapidly and can create flammable conditions in the forest (Patterson and Sassman 1988). This increased fire behavior combined with a large population living in the Wildland Urban Interface (WUI) further increase the threat of catastrophic wildfire.

The potential of large wildfires occurring on Cape Cod every 30-50 years exists (Patterson and Ruffner 2002). Long intervals between fires may increase fuel loads and the ultimate threat from severe wildand fire behavior. Additionally, populations may become complacent about controlling flammable fuels around dwellings and other structures. Different fire frequencies and intensities are responsible for variations in forest composition. Periodic severe wildfires with 40-100 year intervals have created oak-pine forests in the uplands. More frequent, severe fires (5-25 year intervals) have produced mixtures of pitch pine and scrub oak. The most frequent and severe fires (2-3 year intervals) have created the pine plains (Ciaranca et al 2005).

Wildfires most often occur in Barnstable County from late March to early June, corresponding with the driest live fuel moisture periods of the year. The prevailing direction of fire spread is southwest to northeast. Severe fall fires can follow periodic summer and fall droughts, as seen in 1947, 1995, and 1999.

Barnstable County's natural environment is adapted to fire and many forest ecosystems need a regular cycle of fire to maintain their structure and species composition for rare species and wildlife habitat. Efforts to eliminate wildfires from the natural environment may make these events much more severe when they do occur due to accumulated vegetative fuels. More severe fires harm the health of the ecosystem and put neighboring developments in danger. The role of wildfires in the natural environment of Barnstable County needs to be integrated into public education programs, planning for development within the WUI, and prioritizing fuel reduction treatments to reduce wildfire risk.

Weather

A humid, moderate climate with ample precipitation exists on Cape Cod as a result of the influence of the Atlantic Ocean. Prevailing winds are out of the southwest from April-October and out of the northwest from November-March. Precipitation maximums occur during December, January, and February, and minimums usually occur in late May through July (Fletcher 1993).

Generally, fires occur during periods of the year when southwest winds are most likely. However, fire can occur from any other wind direction, although east component winds are either associated with precipitation arriving or a precipitation event taking place.

The following tables summarize the ten year average weather patterns recorded at Barnstable Airport (Table 3) and the Coast Guard Air Station at the Massachusetts Military Reservation (Table 4) (Weather Underground).

Table 3: Barnstable Airport 10-year average weather data (2001-2011).

Month	Max Temp (°F)	Min Temp (°F)	Avg. Temp (°F)	Relative Humidity (%)	Total Precipitation (in.)	Avg. Wind Speeds (mph)
January	53	5	30	74	3.42	9
February	52	9	31	67	2.74	10
March	59	14	37	70	4.36	10
April	73	27	46	72	4.09	9
May	79	32	55	75	3.5	9
June	85	45	64	78	3.41	8
July	88	53	71	81	2.76	8
August	87	51	71	79	3.26	8
September	81	41	63	82	3.92	7
October	75	29	54	77	4.01	9
November	65	22	45	77	3.9	9
December	58	14	36	75	3.98	10

Table 4: Coast Guard Air Station 10-year average weather data (2001-2011).

Month	Max Temp (°F)	Min Temp (°F)	Avg. Temp (°F)	Relative Humidity (%)	Total Precipitation (in.)	Avg. Wind Speeds (mph)
January	55	4	29	75	4.52	11
February	53	6	30	72	4.51	11
March	61	11	37	71	5.34	11
April	76	26	47	70	3.89	10
May	81	33	56	73	2.92	9
June	86	45	65	79	3.35	8
July	89	52	71	79	2.94	8
August	88	51	71	78	3.33	7
September	82	42	63	79	4.32	8
October	75	29	53	76	3.81	10
November	67	20	45	80	4.4	10
December	59	11	35	76	7.74	11

The National Fire Danger Rating System (NFDRS) is a system used by wildland fire management agencies to assess current fire danger at local and national levels. It consists of a variety of indices that portray current potential fire danger conditions (NWCG 2005). NFDRS uses daily weather observations and forecasts to produce indexes and maps that indicate fire potential or fire danger for large areas. This provides uniform standards for local fire suppression agencies to apply and interpret and is currently used by Cape Cod National Seashore.

The Massachusetts Bureau of Fire Control uses the Keetch-Byram Drought Index (KBDI) and the spread index to predict current fire danger. In District 1, fire officials will calculate the KBDI and spread index for Shawme Crowell State Forest in Sandiwch (District 1's headquarters) and use this to assess fire danger for the rest of the district (Josh Nigro, personal communication, May 2012).

Wildland Urban Interface Types

Many residents of Barnstable County reside in the WUI. The National Wildfire Coordinating Group (NWCG) defines the WUI as "the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel."

The 2001 Federal Register further divides the WUI into three categories:

Category 1 - Interface Community:
The Interface Community exists where structures directly abut wildland fuels. There is a clear line of demarcation between residential, business, and public structures and wildland fuels. Wildland fuels do not generally continue into the developed area. The development density for an interface community is usually 3 or more structures per acre, with shared municipal services. Fire protection is generally provided by a local government fire department with the responsibility to protect the structure from both an interior fire and an advancing wildland fire. An alternative definition of the interface community emphasizes a population density of 250 or more people per square mile.

Category 2 - Intermix Community:
The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. An alternative definition of intermix community emphasizes a population density of 28-250 people per square mile.

Category 3 - Occluded Community:
The Occluded Community generally exists in a situation, often within a city, where structures abut an island of wildland fuels (e.g., park or open space). There is a clear line of demarcation between structures and wildland fuels. The development density for an occluded community is usually similar to those found in the interface community, but the occluded area is usually less than 1,000 acres in size. Fire protection is normally provided by local government fire departments (USDA and USDI 2001).

Development in the WUI can increase wildfire risk to structures. Fires that ignite in wildlands can move into surrounding developments, putting homes or other structures at risk for ignition. WUI residents and municipalities must realize this increased risk, plan for responding to fires accordingly, and work to reduce wildland fire risk. The University of Wisconsin Silvis Lab has mapped the WUI intermix, interface, and occluded (urban/no vegetation) communities. Uninhabited areas like the outer part of Provincetown, the Monomoy Wilderness, and parts of the Massachusetts Military Reservation meet the criteria of ‘wildlands’ (See Figure 3).

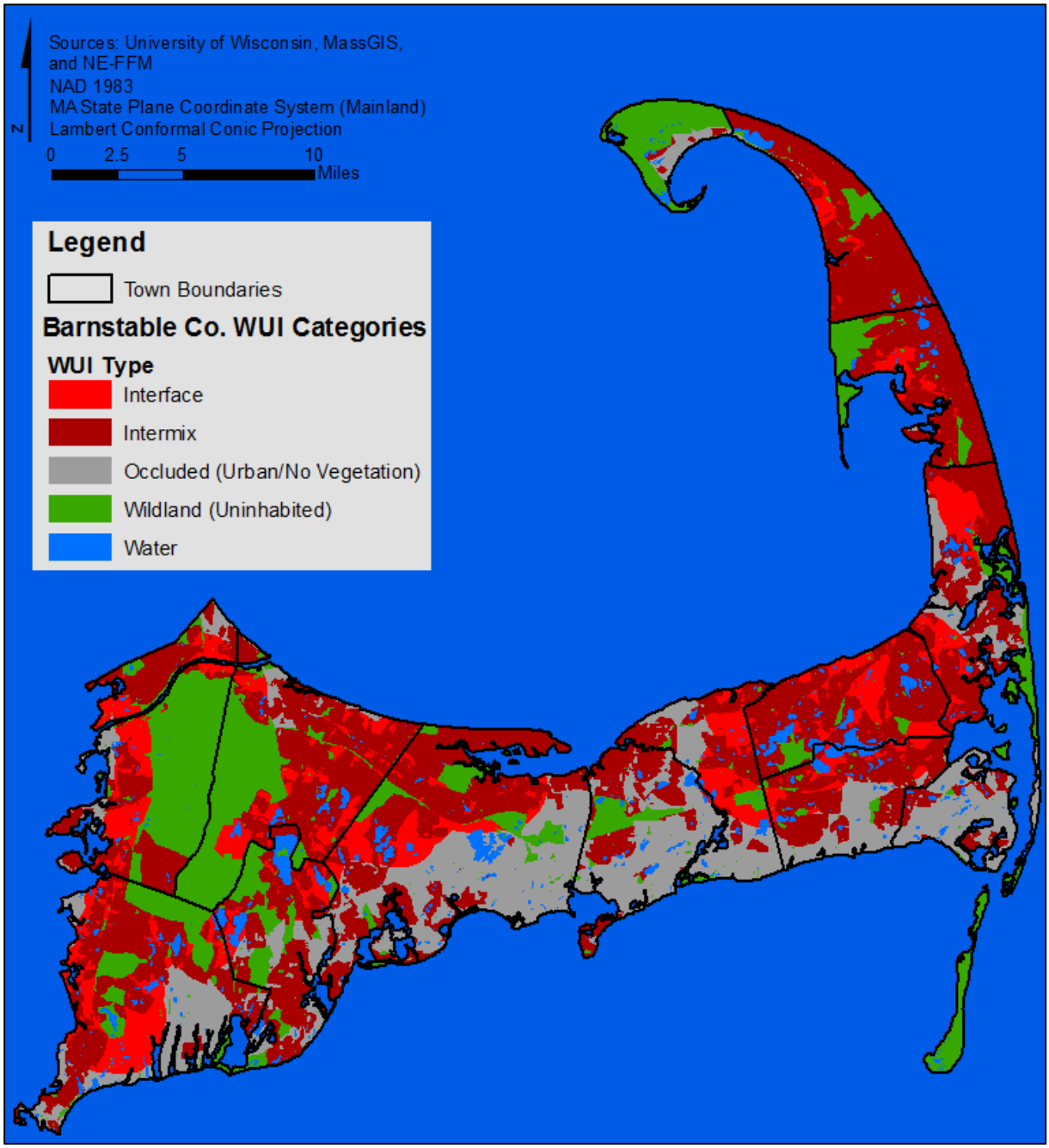

Figure 3: WUI categories across Barnstable County.

COMMUNITY RISK ASSESSMENT

Risk Assessment Process

A community risk assessment aids natural resource and fire managers in identifying areas at high risk of wildfire. In this way, managers can prioritize the locations of fuel treatments to achieve maximum effect in reducing wildfire behavior.

The Barnstable County wildfire risk assessment process began with gathering data on wildfire behavior and county infrastructure from LANDFIRE and MassGIS. The fire behavior simulator FlamMap was used to create data on flame length, rate of spread, and crown fire potential across Barnstable County. These data layers were combined with data on population density from the 2010 U.S. Census and proximity to fire stations to create a final risk assessment map.

Five data sets were combined in this plan to yield the final risk assessment map. Three of these maps were fire behavior outputs from the fire behavior model FlamMap. The other two layers were population density, acquired from 2010 U.S. Census data, and proximity to fire stations, created from MassGIS data.

GIS Analysis

Each of the three FlamMap layers (flame length, rate of spread, and crown fire potential) were produced using the national LANDFIRE data sets. LANDFIRE is an interagency vegetation, fire, and fuel characteristics mapping program that covers the entire United States (LANDFIRE). It is sponsored by the United States Department of the Interior and the United States Forest Service. LANDFIRE data products are designed to facilitate regional-level planning by providing landscape-level geospatial products.

Because of the large-scale focus of LANDFIRE, data products are created at a 30-meter grid spatial resolution. This coarse scale does lead to discrepancies and error when looking at small areas, so use of LANDFIRE in individual pixels is not recommended. However, for the scale of modeling done in this plan, LANDFIRE data is sufficient. Additionally, geospatial data on vegetation characteristics for all of Barnstable County does not exist outside of LANDFIRE data.

LANDFIRE data layers used to produce fire behavior predictions for Barnstable County include Scott and Burgan's (2005) 40 fuel models, slope, aspect, elevation, canopy base height, canopy bulk density, canopy cover, and canopy height. These layers were produced in 2008.

LANDFIRE data layers served as inputs to the fire behavior modeling program FlamMap. FlamMap is a fire behavior mapping and analysis program that computes potential fire behavior characteristics for an entire landscape under constant weather and fuel moisture conditions (U.S. Forest Service 2011). FlamMap requires inputs of weather and fuel data to model fire behavior. The fuel data comes from the LANDFIRE data set, and the non-spatial weather data used (Table 5) was based on conditions recorded during the 1957 Plymouth wildfire, a mid-late spring fire, when most local wildland fires occur.

Table 5: Design criteria used to model fire behavior for Barnstable County.

Design Variable	Design Condition
20' Wind Speed:	25 mph
1-hour Fuel Moisture:	5 %
10-hour Fuel Moisture:	8 %
100-hour Fuel Moisture:	12 %
Live Herbaceous Fuel Moisture:	30 %
Live Woody Fuel Moisture:	30 %
Foliar Fuel Moisture:	100 %

FlamMap generated three potential fire behavior layers; flame length (Figure 5), rate of spread (Figure 6), and crown fire potential (Figure 8). Flame lengths (Figure 4), defined as the distance between the flame tip and the midpoint of flame depth at the base of the flame (generally the ground surface), are broken up into four categories according to the wildland fire haul chart. Rate of spread is the relative activity of a fire in extending its horizontal dimensions. Rate of spread is measured in chains per hour (1 chain = 66 feet). This layer is divided into 4 categories. 'No data' represents areas that have an extremely low probability of carrying a wildfire, such as sand pits or heavily developed areas. 'Surface Fire' represents areas that can sustain a wildland fire but have a low probability of transitioning into a crown fire (Figure 7). The passive crown fire category corresponds to areas where multiple tree torching is possible but is not independent of a surface fire. The active crown fire category represents areas where solid flames develop in the crowns of trees.

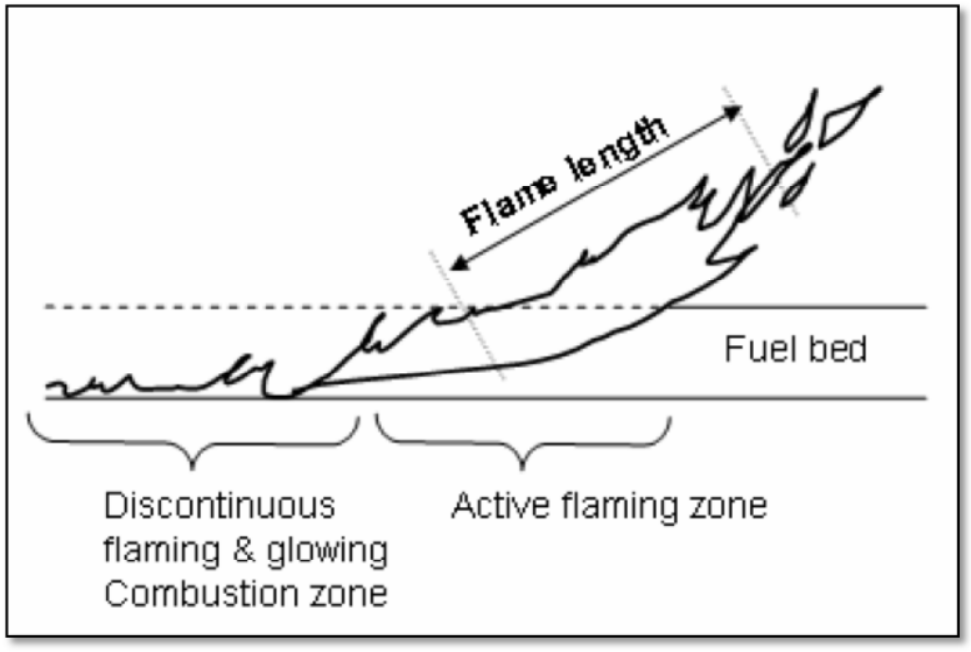

Figure 4: Flame Length (from BehavePlus Fire Modeling System, Version 4.0: Variables).

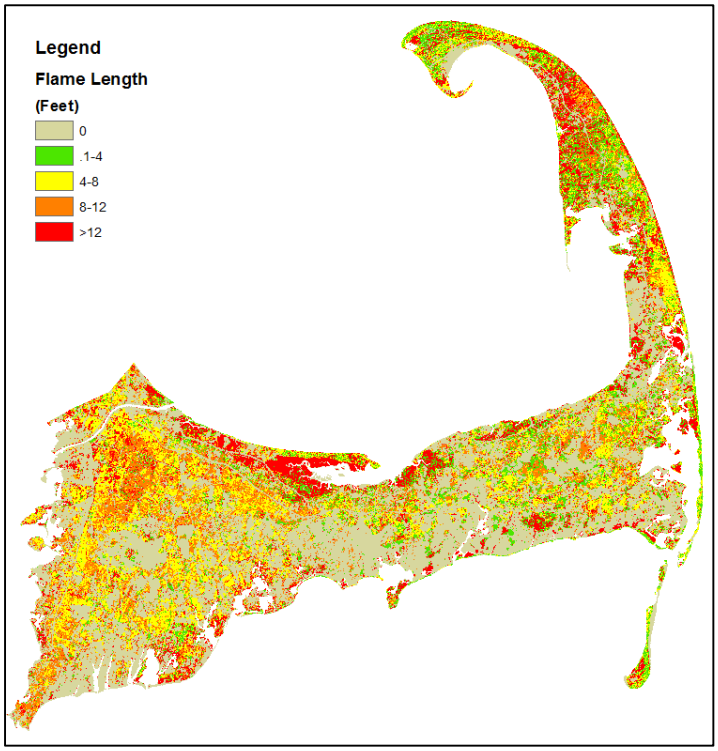

Figure 5: Modeled flame lengths for Barnstable County.

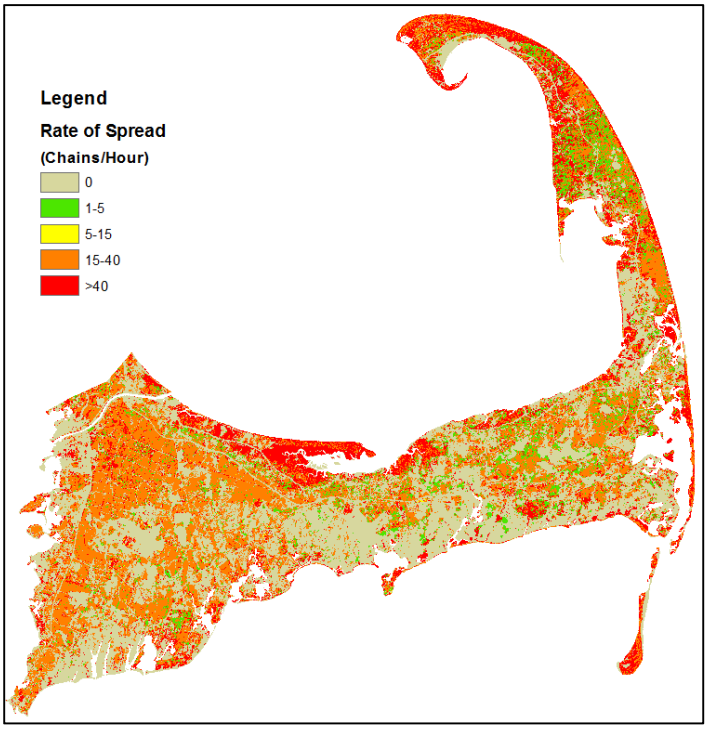

Figure 6: Modeled rate of spread for Barnstable County.

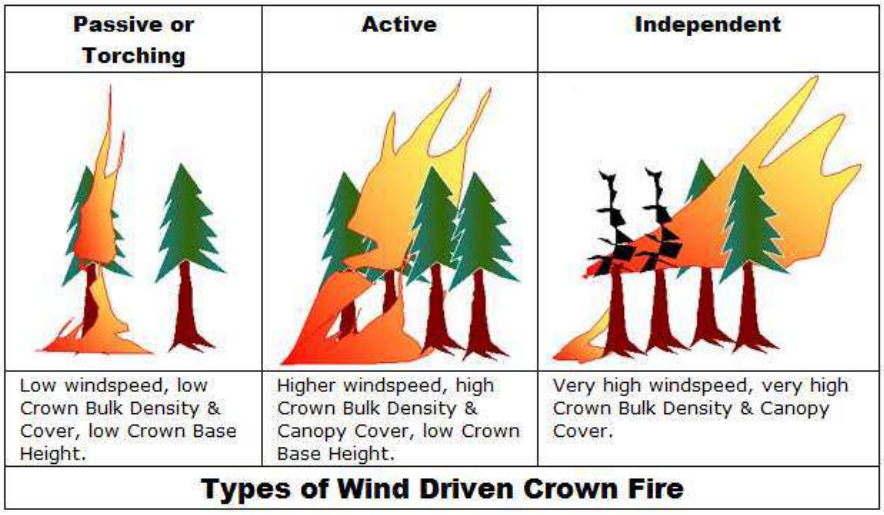

Figure 7: Three Types of Wind Driven Crown Fires (U.S. Forest Service 2011).

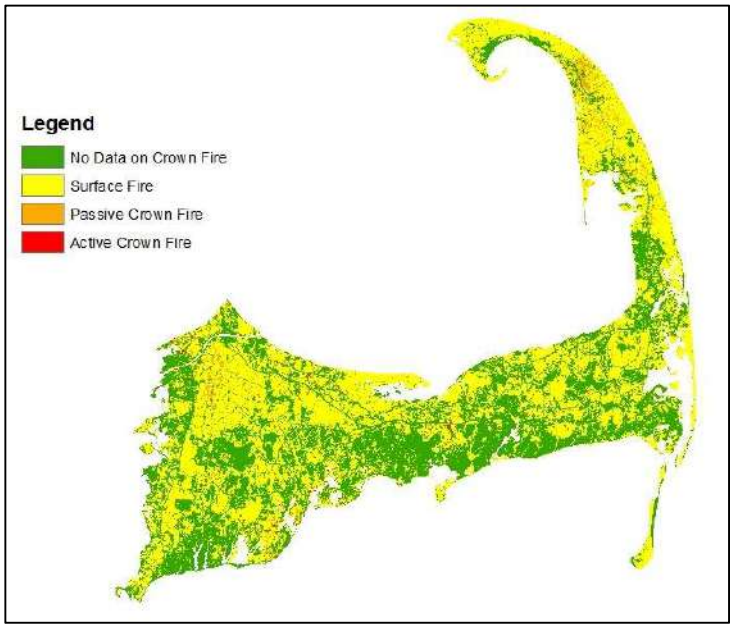

Figure 8: Modeled fire type for Barnstable County.

The population density in persons per square mile (Figure 9) by U.S. Census block for Barnstable County were calculated using 2010 U.S. Census blocks, the smallest geographic area for which the U.S. Census Bureau collects and tabulates data. Census blocks can be neighborhoods or other areas formed by streets, railroads, streams, or other physical or cultural features. There are approximately 12,000 census blocks in Barnstable County. Census block data for Massachusetts was acquired from the MassGIS website. This layer was converted into a raster data set in creating the final risk assessment map. For this analysis, higher population densities correspond to increased wildfire risk because a higher concentration of people represents more values at risk.

Barnstable County fire stations and their associated buffers were calculated (Figure 10). The closer an area is to a fire station corresponds to lower wildland fire risk because of the more rapid response time. Areas furthest from fire stations were rated as being higher risk. The fire station data set was downloaded from the MassGIS website and the appropriate buffers were added during the analysis. This layer was also converted into a raster data set for creating the final risk assessment map.

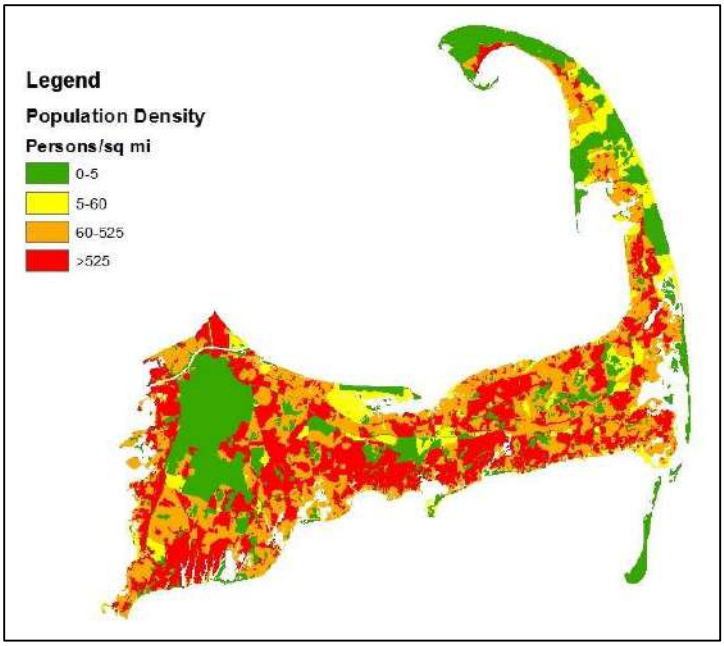

Figure 9: Population density calculated by U.S. Census block for Barnstable County.

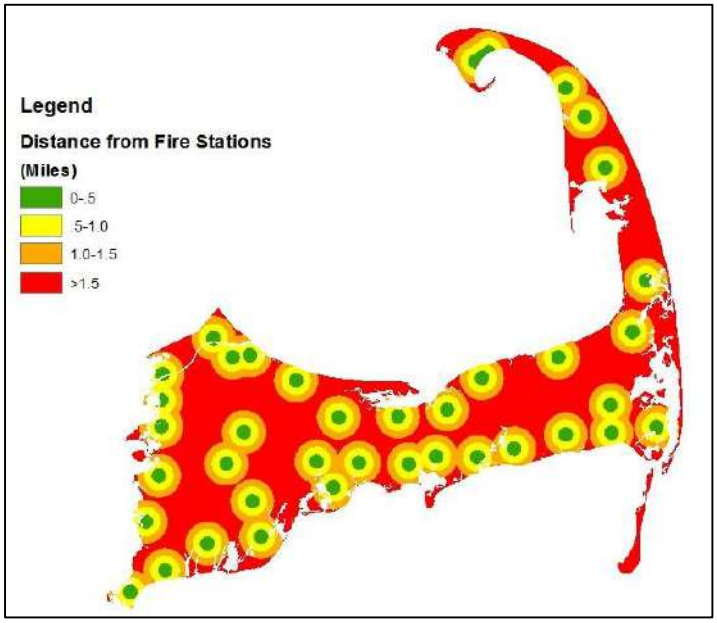

Figure 10: Buffered distance from fire stations for Barnstable County.

Other layers were considered for analysis but were not used in creating the final map due to data gaps, increased complexity, or irrelevance. Data on fire occurrence would be a valuable addition to this assessment to see where fires commonly start, but currently no usable geospatial data for Barnstable County on wildland fire occurrence exists. The use of distance to roads, rail beds, or schools was considered as a substitute for fire occurrence. Given that these areas are may increase the occurrence of fire starts it was determined that these data layers would detract from the clarity of the final analysis due to the amount of buffers required, additionally though fires may start near roads, they would also be easier to access and suppress.

Analysis Steps

Each of the five data layers were classified using ArcMap (Table 6) into four categories that correspond to risk values. New values between 1 and 4 were assigned to rank each parameter in terms of fire risk (1 = lowest risk 4 = highest risk). The risk assessment process combines data on fire behavior (flame length, crown fire potential, and rate of spread) with data on community values at risk (population density and distance from fire stations) (Figures 11 and 12). For example, a densely populated area with moderate fire behavior would have comparable risk to an uninhabited area with extreme fire behavior. A weighted overlay analysis in ArcMap was used to add each layer and create a new data set representing fire risk for Barnstable County (Figure 13). Weights were chosen relative to their importance to overall wildfire risk. Resulting raster data sets were applied to the census block data layer, showing wildland fire risk for each census block in Barnstable County. The zonal statistics tool was used to average raster values for each census block. Raster cells in each census block were averaged and then classified as low, moderate, high and extreme according to the average.

Table 6: Barnstable County risk assessments inputs, weights, and rankings/reclassifications.

Layer	Weights (%)	Ranks
Flame Length (LANDFIRE data)	30	1: 0-4 feet
		2: 4-8 feet
		3: 8-12 feet
		4: Greater than 12 feet
Rate of Spread (LANDFIRE data)	20	1: 0-5 chains/hour
		2: 5-15 chains/hour
		3: 15-40 chains/hour
		4: Greater than 40 chains/hour
Crown Fire Potential (LANDFIRE data)	20	1: No data
		2: Surface fire
		3: Passive crown fire
		4: Active crown fire
Population Density (US Census data)	20	1: 0-5 people/square mile
		2: 5-60 people/square mile
		3: 60-525 people/square mile
		4: Greater than 525 people/square mile
Proximity to Fire Station (MassGIS data)	10	1: 0-0.5 miles
		2: 0.5-1.0 miles
		3: 1.0-1.5 miles
		4: Greater than 1.5 miles

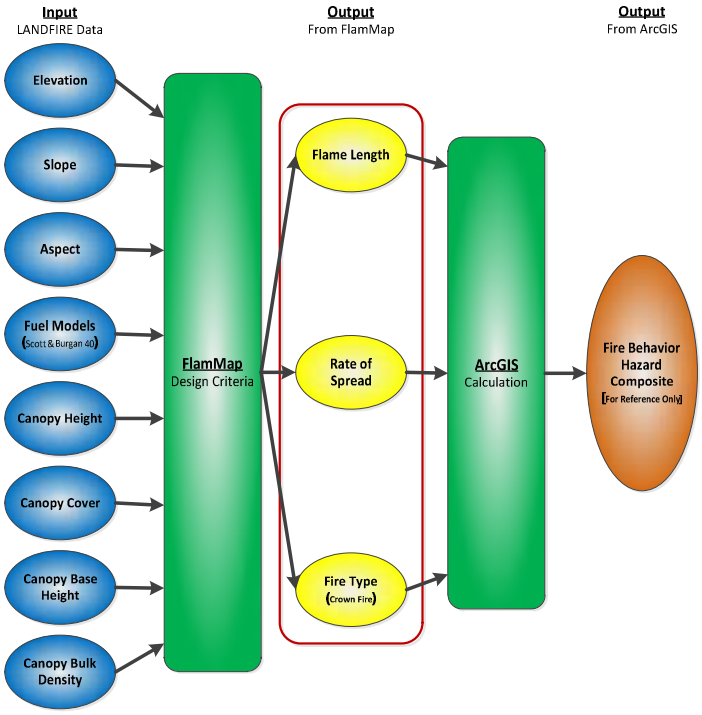

Figure 11: Fire behavior spatial model steps.

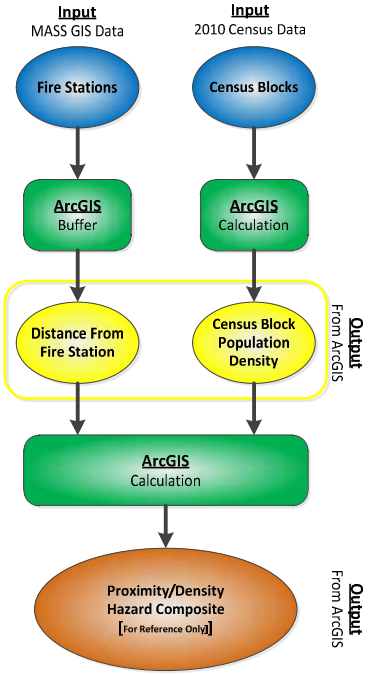

Figure 12: Proximity/density spatial model steps.

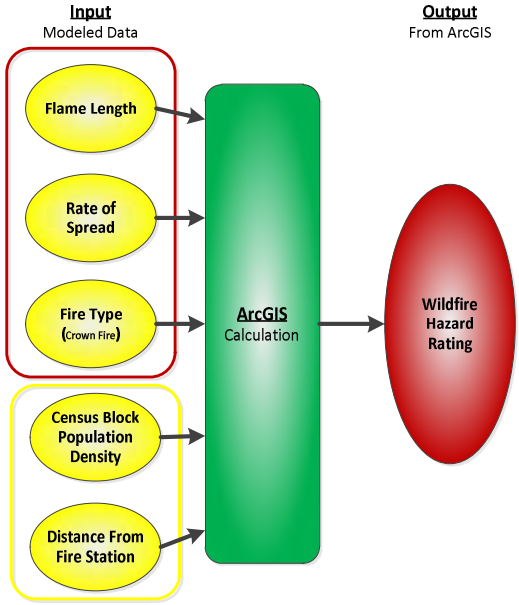

Figure 13: Final wildfire risk spatial model steps.

Table 7: Spatial layers used in creation of wildfire risk assessment.

Data Source	Data Layers	Location
Risk Analysis Layers	Flame Length, Rate of Spread, Crown Fire Potential, Population Density, Proximity to Fire Stations	Barnstable County Cooperative Extension
LANDFIRE (inputs to FlamMap)	Elevation, Slope, Aspect, Fuel Models, Canopy Height, Canopy Cover, Canopy Base Height, Canopy Bulk Density	http://landfire.cr.usgs.gov/viewer/
MassGIS	Town and State Boundaries, Open Space, Roads, Streams and Ponds	http://www.mass.gov/mgis/laylist.htm
U.S. Census	2010 Census Blocks	http://www.census.gov/cgi-bin/geo/shapefiles2010/main

Analysis Results

The final wildfire risk assessment provides a snapshot of wildfire risk for Barnstable County under the specified weather design criteria. Areas of Barnstable County that have a greater relative wildfire risk than other areas are identified. Wildfire risk has been calculated by combining data on fire behavior and data on community values at risk. Areas with the greatest fire behavior risk may have a lower overall risk as a result of being an unpopulated area or close to a fire station. Figure 14 shows the final wildfire risk assessment for Barnstable County by census block. Appendix B contains the risk assessment maps for each town in Barnstable County. The GIS layers used in this analysis and their location are listed in Table 7.

Where possible results presented in the fire behavior and final risk assessment were compared to existing assessments and antidotal observations at various sites across Barnstable County. At the scale that the plan is intended to be used results were found to be reliable and accurate.

Data resolution is coarse and there is always a margin of error in modeling fire behavior, but the high or extreme risk polygons should be considered first when prioritizing detailed field assessments or potential mitigation work. Results are for general planning purposes only and are not intended to serve as the sole basis for decisions on locating fuel treatments or implementing defensible space projects. Because these maps are not designed to pinpoint exact locations for fuel treatment or fire hazard reduction work, a field inventory and more site-specific work is required.

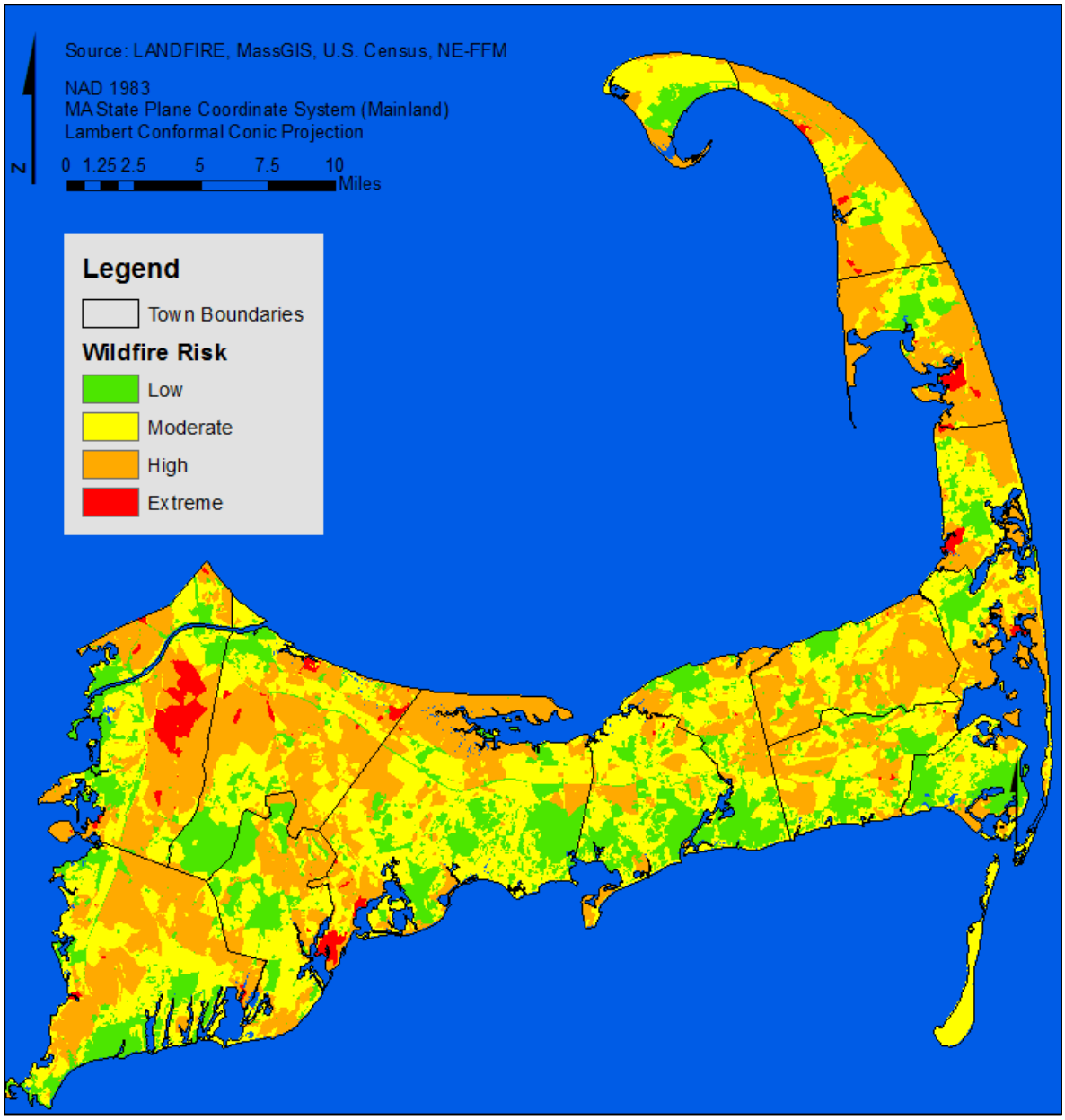

Figure 14: Barnstable County Wildfire Risk Assessment.

Local Preparedness Assessment

A goal of the Barnstable County Wildfire Preparedness Plan was to assess current wildland fire suppression capacities and identify areas to increase effectiveness. This was accomplished with a county-wide fire department survey completed by municipal fire departments, Cape Cod National Seashore, and DCR Bureau of Forest Fire Control District 1. A copy of the survey is in Appendix C. The survey asked questions pertaining to wildland fire trainings and equipment and solicited ideas from fire officials on how to increase wildland fire suppression capabilities and preparedness. Seven out of 21 surveys were completed and analyzed. Summaries of wildland firefighting equipment by town are available with the town risk assessment maps in Appendix B.

Training

Of the 181 firefighters among the responding departments, 119 had some form of wildland fire training. The majority of the municipal firefighters had taken a 2-hour DCR wildfire class and some had taken a 2-hour DCR sponsored fire shelter class. No municipal departments indicated that their firefighters had taken Firefighter Training/Introduction to Wildland Fire Behavior (S130/S190), the National Wildfire Coordinating Group (NWCG) courses for basic wildland firefighting (see Figure 15).

Figure 15: Wildland fire training classes attended.

All but one department reported that they conduct wildfire drills or training scenarios, spending an average of 3 hours per year on wildland fire drills. Only one department surveyed had participated on a prescribed burn, but 6 of the 7 indicated a desire to do so.

Increasing wildland fire training opportunities was ranked as the most important for increasing wildfire preparedness in Barnstable County. The fire departments surveyed indicated that a county or state run wildfire training academy would benefit them the most. Live fire exercises, greater access to NWCG online trainings, and participation on prescribed burns also rated highly for increasing wildland fire training.

Equipment

All departments surveyed had equipment specific to wildland firefighting, whether it be brush breakers or wildland fire engines, chainsaws, or porta-tanks. Only one department required their firefighters to carry fire shelters when fighting wildfires. Two departments did not have any fire shelters, and the remaining departments only had enough fire shelters for an average of 21% of their firefighters. Only one department requires chaps to be worn during wildland fire chainsaw operations, and majority of departments did not have any chaps. Survey responses ranked

additional equipment as the second most important factor to increasing wildland fire suppression capabilities and wildfire preparedness.

Barnstable County has 62 structural engines, 32 wildland engines, and 11 water tenders available for fire suppression in its 15 towns, Cape Cod National Seashore, DCR District 1, and the Massachusetts Military Reservation (See Figure 16). This data was summarized from town survey responses and DCR District 1 information.

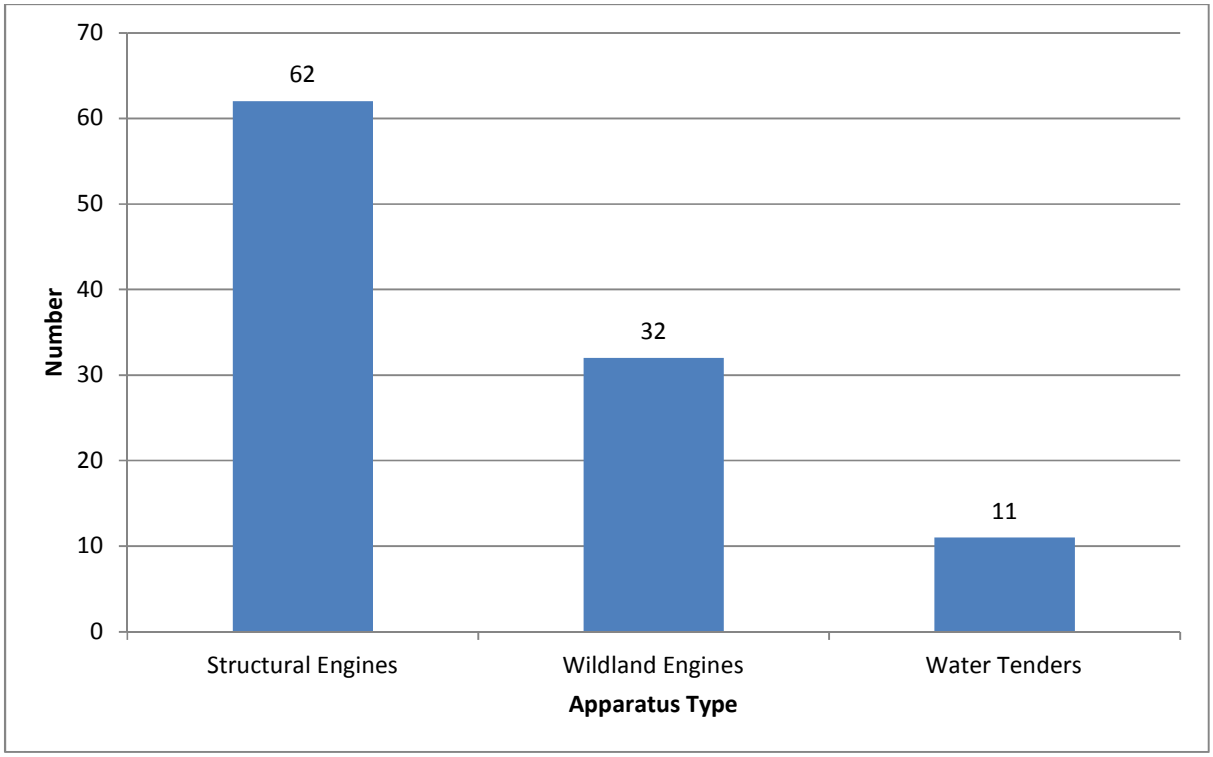

Figure 16: Fire suppression resources for Barnstable County.

Detection

Barnstable County is part of District 1 for the DCR - Bureau of Forest Fire Control. DCR manages 9 fire detection towers in DCR District 1, 8 of which are located in Barnstable County in the towns of Bourne, Sandwich, Falmouth, Barnstable, Dennis, Brewster, Wellfleet, and Yarmouth. On any given day depending on the expected fire danger, 3 to 4 towers are staffed from 1000 to 1800 during April to October. Typically, DCR staffs a 'triangle' of towers in the towns of Falmouth, Sandwich, and Barnstable.

MANAGEMENT RECOMMENDATIONS

Fuel Treatment Introduction

Fuel management treatments can alter fuel loads to reduce wildfire hazard by changing fire behavior. These actions can increase public and firefighter safety while also reducing fire response and suppression costs.

Landscape-level fuel treatments have been shown to be effective at reducing the impacts of wildland fire (Finney 2001, Stratton 2004, and Finney et al. 2007). Fire behavior at the landscape scale maybe addressed through the application of fuel treatments in a strategic pattern (Finney 2001). The treatments are not designed to stop fires, but to reduce the intensity of the fire in the treated areas. Fuel treatments that disrupt the continuity of fuels reduce the rate of spread and flame lengths of the fire, which slows the growth of the fire and increases the suppression efficiency of firefighters.

Wildland fuels that are capable of producing fire behavior beyond suppression capabilities are best mitigated through fuels management treatments, rather than with an increase in suppression forces (Finney and Cohen 2003). Most fires that escape initial attack burn under conditions that are too extreme for suppression regardless of the availability of suppression resources (Finney and Cohen 2003). Fuels management at the WUI is especially important as the complexity of suppressing structure fires that transition from the wildland, as well as providing for firefighter and public safety, can quickly exceed the capabilities of local firefighting resources (Finney and Cohen 2003, National WUI Fire Program). Fuels management is most effective at preventing structure loss when applied to the immediate surroundings.

Conducting fuel treatments is good strategy to increase preparedness and reduce future wildfire hazard. The goals of a fuels management program in Barnstable County should be to increase suppression capabilities and provide for greater firefighter and public safety.

Issues that a landowner or manager might consider when deciding on a treatment strategy might include:

- Treatment Objectives – i.e. reduce crown fire potential, reduce flame lengths or rate of spread, provide for wildlife habitat
- Site Conditions – access, topography, fuel type and distribution, soils, crown fire potential, existing development
- Cost of Treatment or Source of Funding
- Time Available to Complete the Project
- Size of Treatment Area
- Concerns About Resources and Other Values – i.e. residual tree damage, condition, wildlife habitat, recreation, wetlands, threatened/endangered species, permits

Fuel Treatment Options

In forest stands that have not experienced fire or fuels reduction management in several decades, multiple and/or combinations of treatments that address changes in surface fuel and/or crown fuels may be necessary. The fuel treatments presented in this plan will reduce flame lengths from surface fires and minimize the potential for surface fires to transition to the crown fuels. Additionally, the treatments will reduce flame lengths and fireline intensity to levels that will better facilitate suppression actions. In most cases in Barnstable County a net benefit will also be achieved for wildlife habitat management and the maintenance of ecosystem integrity.

The application of a particular treatment or combination of treatments to an area will depend on the specific conditions of the fuels in that area (Fitzgerald 2002) and general land management goals. The interval at which subsequent treatments will be applied to maintain the desired condition depends on the initial treatment employed and how the fuels respond to that treatment. Some treatment options that may be applicable to areas of Barnstable County include forest thinning, surface fuel mastication, prescribed burning, and mechanical pruning (Table 8).

Table 8: Example of fuels mitigation treatment options.

Treatment	Target Layer	Maintenance Interval	Logistical Constraints
Thinning From Below	Crown	10 - 20 years	Slash treatments
Surface Fuel Mastication	Surface	5 - 10 years	Seasonality of treatments
Prescribed Burning	Surface/Crown	5 - 10 years	Weather parameters, smoke management
Mechanical Pruning	Crown	10 - 20 years	Heights above 10 ft. impractical
Prescribed Grazing	Surface	5 - 10 years	Animal care, availability of animals

Information on specific costs, availability of machinery, production rates, strategies for locating treatments, and their effectiveness is not included in this plan due to the variability that exists related to season of treatment, current conditions, management objectives, restrictions on implementation, and funding sources. However, all these factors and variables need to be considered when designing a fuel treatment. A template for fuel treatment prescriptions can be found in Appendix A. This form can aid natural resource managers in creating a treatment prescription, although consulting with capable technical experts may still be necessary.

Thinning:

Thinning treatments cut whole trees and remove crown fuels, which reduces the potential for an active crown fire by decreasing canopy bulk density (CBD) and increasing canopy base height (CBH) (Figures 17 and 18). If trees with suppressed and intermediate canopy positions are removed (thinning from below), ladder fuels will be removed and CBH will increase. This will increase the flame length required from a surface fuel to transfer fire to canopy fuels. Thinning from below also helps prevent opening up the canopy to an extent where fire behavior will

increase due to increased surface midflame wind speed and an increase in the drying rate of surface fuels.

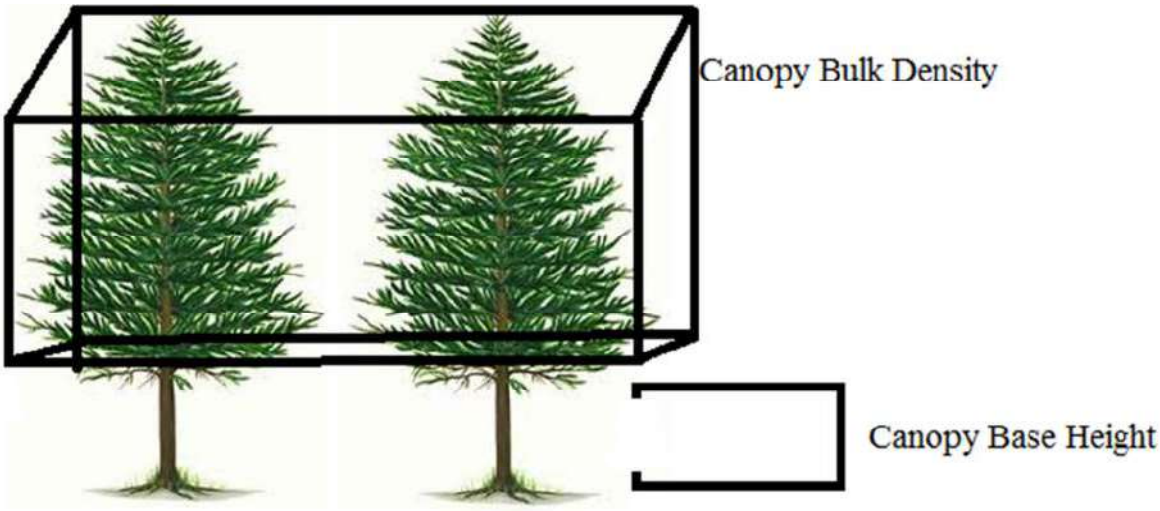

Figure 17: Canopy Base Height and Canopy Bulk Density.

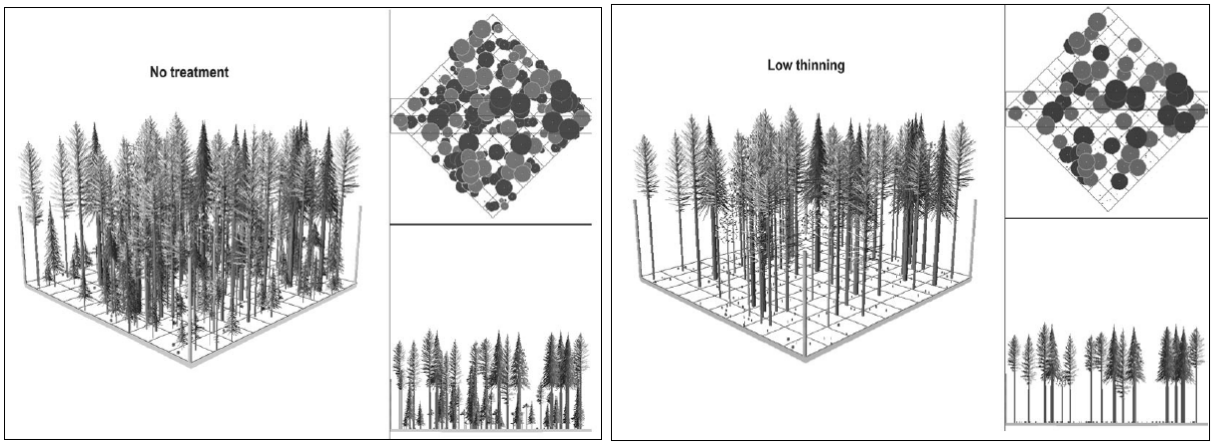

Figure 18: Thinning from below (low thinning) example (from Peterson et al. 2005).

Dense conifer stands with some element of crown fire are candidates for this type of treatment. Because CBD and CBH are difficult to estimate in the field and apply to treatment objectives, stand metrics such as stems per acre, basal area, or canopy position are often used as surrogates in forming stand treatment prescriptions (Scott and Reinhardt 2006). A thinning treatment can increase surface fire behavior if the whole trees or tree crowns are left intact in the surface fuel layer. The whole trees should be removed from the site completely, compacted through chipping on-site to prevent an increase in potential surface fire behavior, or piled and burned.

Thinning is done with hand tools or heavy equipment. A skid steer chassis is adaptable to this type of treatment because it can maneuver in tight spaces and minimize damage to residual trees. A masticating cutting attachment on skid steers and excavators can handle the small to medium diameter trees targeted by thinning. A masticating attachment can also be used to treat surface

fuels (see Surface Fuel Mastication below). Larger diameter trees would need to be cut by hand or with a tree shear attachment on more traditional timber harvesting equipment.

The cost for thinning materials depends on site access, the size and amount of material to thin, treatment area size, and current markets for products being removed. Slash must be considered; it could be piled and burned, scattered, or chipped and hauled away. Additionally, mechanical treatments can serve as a source of invasive species if equipment is not cleaned prior to treatments.

Surface Fuel Mastication:

Surface fuel mastication compacts the surface fuels, lowering flame lengths, rate of spread, and the probability of a surface fire transitioning into a crown fire. Local research has shown that flame lengths from shrub fuels are reduced significantly with surface fuel mastication (Patterson and Clarke 2007) (Figure 19). The seasonality and interval of this treatment can greatly influence its effectiveness. Two successive treatments within the same growing season (first in June and again in September) will be most effective at limiting the amount of re-growth.

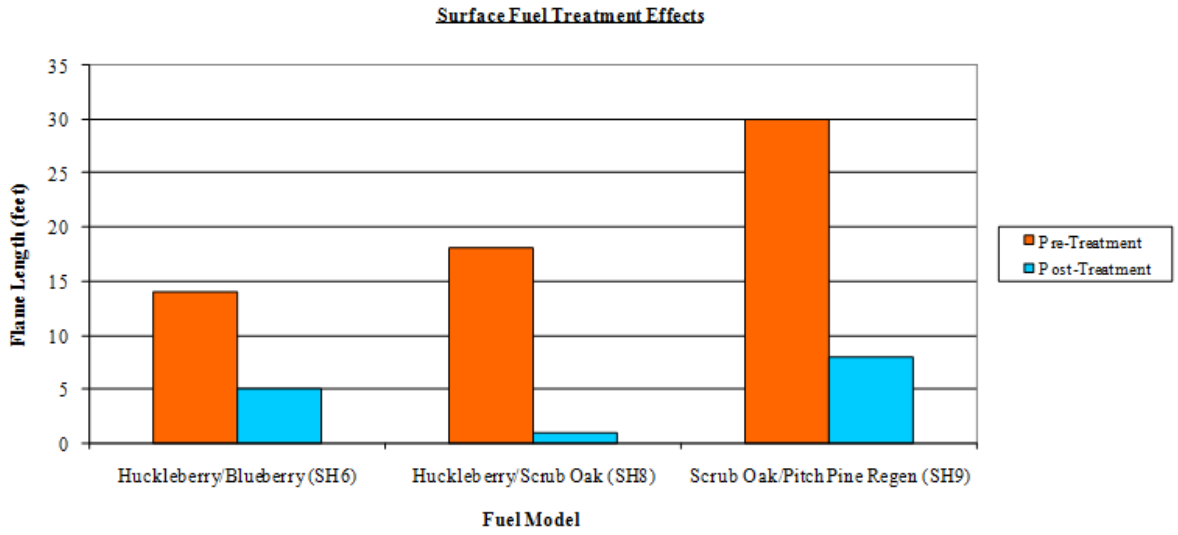

Figure 19: Flame length reduction associated with fuel mastication (Patterson & Clarke 2007).

A flail mower or similar attachment for a tractor or skid steer mows over the surface fuel, cutting the bases of small trees and shrubs with a set of rotating knives or similar blades. It then pulls the cut material through the mower knives, producing mulch. All the cut material is left on site. This treatment reduces fuel bed depth and leaves behind smaller pieces that could be burned later or left to decompose. Costs depend on size of treatment area, accessibility, and any post-treatment projects. Surface fuel mastication is suitable when the objective is to lower flame lengths from surface fuels or in treatments designed to help prevent crown fire or create defensible space around a structure.

Mechanical Pruning:

Pruning, the removal of lower branches to a specified height, increases canopy base height, decreasing the potential for fire to spread up ladder fuels and into the crown. The pruned branches are usually chipped or piled and burned to avoid adding surface fuels.

Mechanical pruning is usually done with chainsaws. Because of height limitations for safe chainsaw use, pruning above 10 feet is impractical (Scott 2006). Mechanical pruning is very labor intensive.

This treatment can be effective in areas where the objective is to reduce crown fire potential by increasing canopy base height. Pruning can increase canopy base height to a maximum of 12 feet. This treatment is most often used in combination with a surface fuel treatment.

Prescribed Burning:

Prescribed burns can mimic a natural regime and return fire to its vital role in certain ecosystems in a controlled fashion. It is also a tool for hazard fuel reduction to reduce the risk of catastrophic wildfires.

Depending on the condition when an area is burned, prescribed fire can address both surface and crown fuels. The fire consumes surface fuel loads, which will reduce fire behavior (flame length and rate of spread) post-burn. A prescribed burn can also increase the height required for a surface fire to transition to a crown fire by scorching lower branches. These scorched branches will eventually fall off, effectively pruning the tree and raising canopy base height.

While prescribed fires have been shown to be more efficient at thermal pruning and treating surface fuels than mechanical treatments (Scott 2006), it is not applicable to areas where there is a crown fire risk without a mechanical treatment pre-burn.

Restrictive weather parameters under which a burn can be conducted, additional planning requirements, smoke management problems, and increased liability risks make this treatment option more difficult to employ then mechanical treatments. Costs depend on the time of year because it determines the amount of mop-up needed. Other factors influencing cost are unit size, type of equipment needed, number of experienced personnel required, and the cost of preparing firelines or firebreaks.

Prescribed Grazing:

Prescribed grazing can be a type of fuel treatment where animals consume vegetation and reduce fuel loads and/or fuel density. Grazing is most effective in grasslands where goats, sheep, horses or cattle can consume the fine fuels. Because each animal grazes differently, not all animals will be suited to all areas. Plants and conditions like unit size and shrub density must be suited to the grazing species.

Grazing can be used annually in grasslands as a tool to reduce fine fuels and fire hazard. It is a relatively inexpensive treatment method. However, negative effects of overgrazing like soil compaction or increased erosion are possible. Grazing can also result in an influx of invasive

species. Additional controls like fencing off sensitive or riparian areas may be required to achieve a successful treatment.

Generic Treatment Objectives

Due to the scale of the Barnstable County Wildfire Preparedness Plan and the complexity of the information that must be conveyed, specific treatment prescriptions are not presented in this plan. A Site Implementation Plan (see Appendix A) should be prepared using concepts presented in this plan and adapting generic treatment prescriptions to specific site conditions and property management goals. The following paragraphs contain possible objectives for fuel treatments.

Active Crown Fire Reduction:

Treatments can eliminate the potential for the occurrence of active crown fire by decreasing predicted flame lengths from surface fuels and/or decreasing CBD to a level where an active crown fire cannot be sustained (i.e. crowns are further apart).

Treatment recommendations include surface fuel treatments (mastication or prescribed burning) and thinning from below by diameter and/or canopy position. Surface fuels should be masticated to within 3' of the boles of all trees with the intent of reducing average surface fuel depths. Mastication should include all herbaceous vegetation, shrubs, and small conifer trees. Crown fuel thinning treatments should select suppressed and intermediate trees and trees with a high crown ratio. If trees were not masticated during felling, they should be removed from the site, piled and burned, or chipped with the resulting material spread out or removed from the site.

When possible, stand level plot data should be acquired and analyzed to model existing conditions and to identify target thresholds for fuel removal. This analysis can be achieved by using software such as Fuels Management Analyst 3.

Firefighter Access/Egress:

Finding suitable places for fire engines to turn around in high-risk areas can aid in increasing suppression capabilities. Aerial photos and field inspections should be used in combination with existing spatial databases of roads to identify roads that are suitable places for a fire engine to turn around. Larger wildland fire apparatus have a turning radius of approximately 65 feet, so a minimum space of approximately 35 feet by 35 feet is required for a 3-point turn. These areas should be clear of trees and shrubs and have no obstacles or holes greater than 8 inches in depth to avoid ground clearance issues associated with smaller engines.

Safety Zones:

Available safety zones, locations where firefighters and apparatus are clear of wildland fire threats, are crucial in enabling wildland fire suppression. Aerial photos and field inspections should be used in combination with existing spatial databases of roads to identify road and trail junctions where safety zones can be established. Although these junctions usually have areas free of combustible material, the surrounding fuels need treatments that will provide firefighters a buffer of 4 times the surrounding flame lengths.

Identifying stand fuel models and fire behavior specific to a site is more beneficial for designing specific treatments than using the coarse scale flame length data presented in this plan. This analysis can be achieved by using software such as BehavePlus.

Strategic Road Buffers:

Creating buffers along important roads may help control the spread of wildland fire. For example, a road that separates a housing development from a wildland can be buffered with a firebreak to slow fire spread or reduce fire intensity. Aerial photos and field inspections should be used in combination with existing spatial databases of roads to identify roads that may be used to control the spread of a wildland fire. Surface fuels should be treated for a minimum of 10 to 30 feet on both sides of any road and limbs should be trimmed to a height so as not to impair emergency vehicle passage.

Landscape Fuel Treatments:

Fire behavior at the landscape scale may be addressed through the application of fuel treatments in a strategic pattern (Finney 2001). Surface fuel treatments should be applied in a staggered, overlapping pattern, perpendicular to the prevailing southwest wind (Finney 2001). Irregularly shaped treatments would still achieve treatment objectives as long as they are placed in a staggered and overlapping manner. Treating a small fraction of the landscape using this treatment method would reduce the rate of spread associated with a large wildfire (Finney 2001).

The landscape fuel treatment option is not always feasible depending on the configuration and condition of the property being considered and the capacity of the managing entity. However, this option is best suited to create resilient and healthy ecosystems in the fire adapted landscape that covers much of Barnstable County.

Prioritizing Fuel Reduction Treatments:

The Barnstable County Wildfire Preparedness Plan is unique in that it attempts to address fire risk for many private ownerships and land management agencies across Barnstable County. Given its complex nature, it is impossible to lay out a comprehensive treatment prioritization and scheduling outline for the entire county. However, it is possible to lay out a hierarchy of actions to be evaluated and addressed in an opportunistic and strategic manner as resources, organizational goals, and needs all unite to present management opportunities. Generally, the highest priority should be given to management actions on areas that are rated as ‘High’ or ‘Extreme’ in the Barnstable County Wildland Fire Risk Assessment. Additionally areas with a “Low” or “Moderate rating containing improvements (developments or infrastructure) or important natural resources that are potentially sensitive to fire impacts, immediately adjacent to areas rated as ‘High’ or ‘Extreme’ should also be given a high priority for management actions. Treatment actions on these lands will be the most effective in reducing overall wildland fire risk.

Measures to Reduce Structural Ignitability

Many houses throughout Barnstable County are located next to or among areas of undeveloped or preserved lands. Houses in this zone, the WUI, become vulnerable to wildfires that may ignite in the surrounding area. However, homeowners can take simple actions to reduce the potential ignition of their homes. A home’s exterior and yard characteristics can greatly influence its ignitability and chances for survival (Cohen 2000).

For a home to ignite, all three sides of the fire triangle, heat, fuel and oxygen, must be present. In the WUI, a house may be the fuel. Flames from burning material like firewood piles, vegetation, and neighboring structures supply heat. Firebrands, or floating embers, can also supply heat when they collect on a house or nearby flammable materials like shrubs or firewood piles. Home ignitions depend on the characteristics of the home and its immediate surroundings, particularly the vegetation in the home ignition zone (Figure 20).

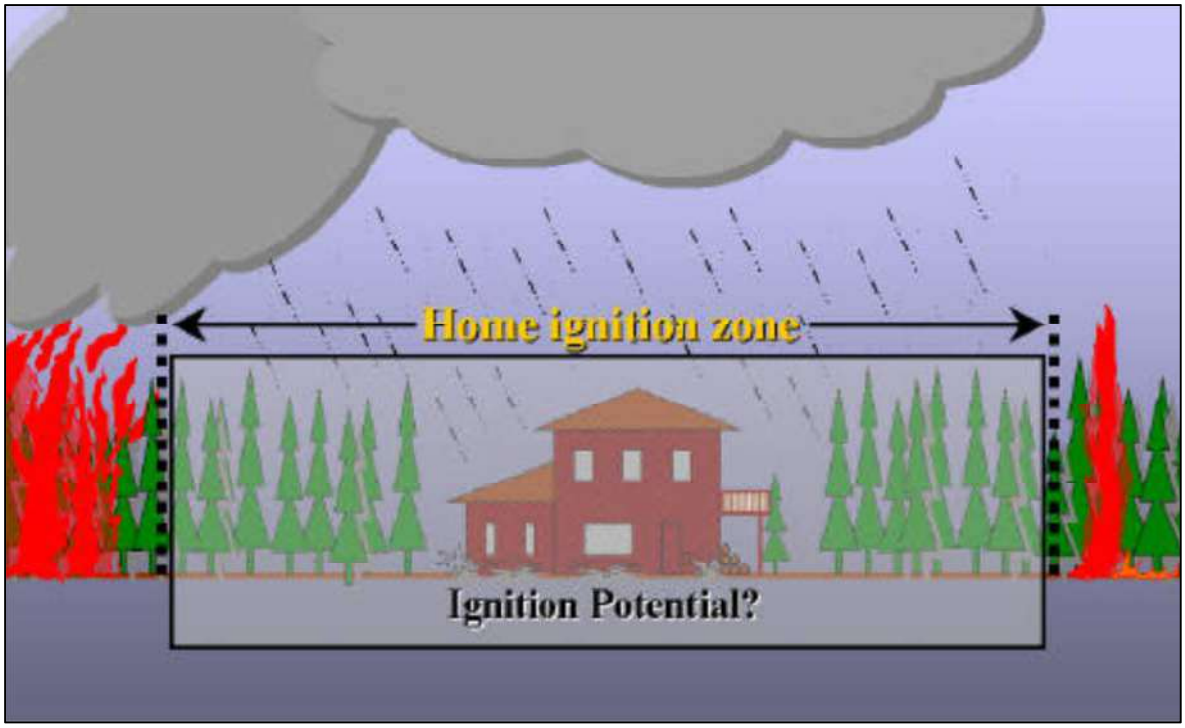

Figure 20: The home ignition zone (from Cohen 2000).

According to a 2003 investigation of structure ignition mechanisms by Blanchi and Leonard following a WUI fire, 50% of home ignitions were from firebrands only, 35% from firebrands and radiant heat, and 10% from radiant heat alone. This means that the flaming front of high intensity fires had less of an effect on home ignition then embers. The fire did not need to continuously burn through vegetation to ignite homes.

Because most home ignitions in the WUI occur from lofted firebrands, measures to reduce home ignitability involve managing adjacent fuels and adjusting home design and building materials (Cohen 2000). Clearing the home ignition zone of vegetation or other flammable material and using non-flammable roofing material can greatly reduce the ignition of homes in the WUI. Howard et al. (1973) observed 95 percent survival for homes with non-flammable roofs and a vegetation clearance of 10 to 18 meters. Foote (1994) observed 86 percent survival for homes with non-flammable roofs and a clearance of 10 meters or more.

Homeowner initiatives to reduce the potential of home ignitions from wildland fire can be very successful. Many resources exist to aid homeowners in reducing structural ignitability from

wildland fire. The National Fire Protection Association (NFPA) started the Firewise Communities initiative in 1997 to teach people how to adapt and live with wildfire while encouraging local solutions for wildfire safety and increased preparedness. The Firewise initiative has published many strategies to reduce the risk of structures burning in the WUI during a wildfire. Guides for landscaping and construction, as well as many other resources for homeowners, are available on the Firewise website, www.firewise.org.

Firewise has created guides and tools for homeowners, firefighters, and planners to aid in improving wildfire preparedness and reducing WUI fire hazards. For homeowners, they address strategies to reduce home ignition risk in two categories, landscaping and construction.

Landscaping:

Firewise landscaping focuses on removing or limiting flammable vegetation in the home ignition zone. The home ignition zone can extend up to 200 feet surrounding the house in high risk areas. Firewise divides the home ignition zone further into 3 zones: Zone 1 (30 feet adjacent to home and outbuildings), Zone 2 (30-100 feet from home), and Zone 3 (100-200 feet from the home) (Figure 21).

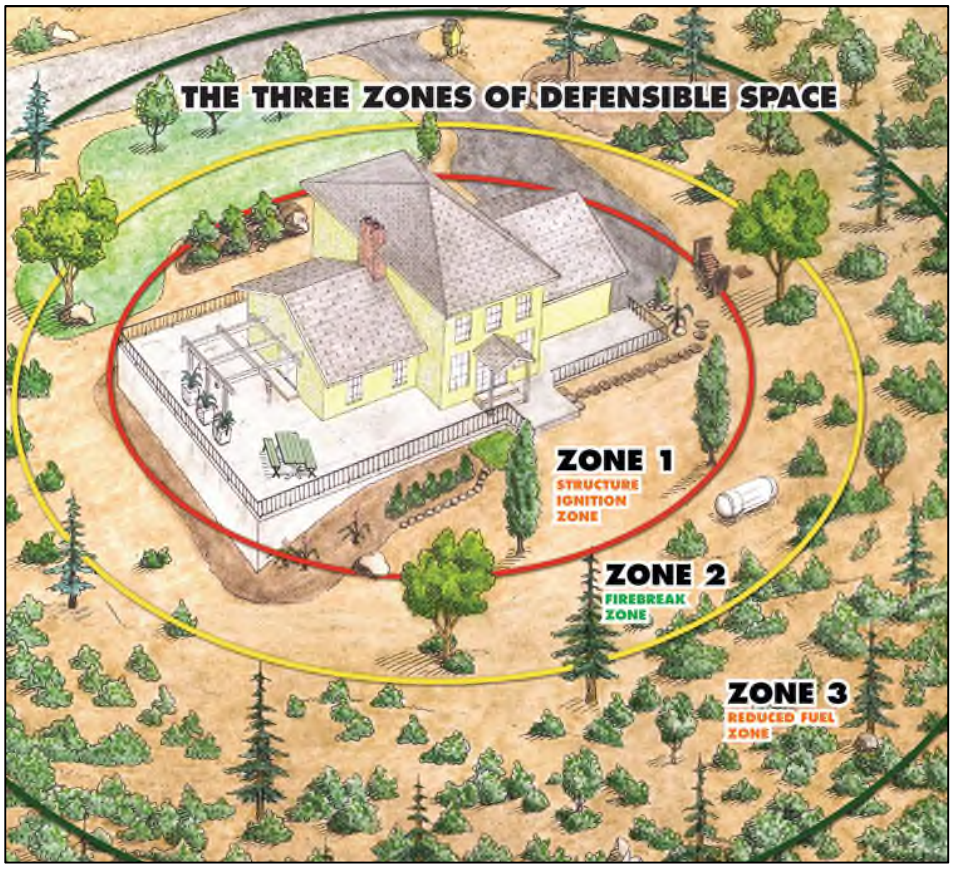

Figure 21: Defensible Space Zones (from Firewise).

Maintaining a firewise area in the 30 feet surrounding the home can reduce the risk of structural ignition from firebrands. Zone 1 should be a well-irrigated area free of dense vegetation. The

Firewise Guide to Landscape and Construction makes the following recommendations for landscaping to reduce fire risk in Zone 1:

- Space plants carefully, choose low-growing plants free of resins, oils, and waxes that burn easily.
- Keep grass short by mowing the lawn regularly.
- Prune trees up to 6-10 feet from the ground, trimming trees that overhang the house.
- Space conifer trees 30 feet between crowns.
- Within 5 feet of the home, create a 'fire-free' area using non-flammable landscaping material like pebbles and/or high-moisture content plants (Figure 22).
- Remove dead vegetation from under the deck and within 10 feet of the house.
- Store firewood away from the home.
- Water plants, trees, and mulch regularly.

Figure 22: Non-flammable materials near the home's foundation (from Firewise Guide).

If the home is in a moderate or high risk area for wildland fire, the next 30-100 feet should also be maintained to reduce fuel. Plants in Zone 2 should also be low-growing, well-irrigated, and less flammable. The Firewise Guide suggests the following:

- Leave 30 feet between clusters of 2-3 trees, or 20 feet between individual trees.
- Encourage a mixture of deciduous and coniferous trees.
- Use driveways, gravel or rock walkways, and lawns to create fuel breaks (Figure 23).
- Prune trees up 6-10 feet from the ground.

Figure 23: Fuel breaks between vegetation and the house (from Firewise Guide).

In high risk areas, vegetation up to 200 feet from the home will also need to be maintained to reduce fire hazard. The Firewise Guide recommends thinning in Zone 3. Removing smaller conifers that are growing between taller trees, reducing the density of tall trees so that their canopies are not touching, and removing heavy accumulations of woody debris are all steps homeowners can take to reduce the risk of structural ignition from wildland fire.

Construction:

In addition to maintaining or removing vegetation surrounding a home, fire resistant building materials and home design can also reduce a home's ignition potential. Many lofted firebrands collect on roofs and are responsible for igniting structures (Cohen 2000). Roof ignitions commonly result in total home destruction. The Firewise Guide recommends using Class A, B, or C rated fire resistant roofing material. Fire resistant building materials like cement, stucco, plaster, or masonry on exterior walls retard fire spread. Although vinyl is difficult to ignite, it is not preferred because it can melt or fall away when exposed to extreme heat. The Firewise Guide also makes the following suggestions to building or retro-fitting a Firewise home:

- Use double-paned or tempered glass: This reduces the risk of fracture or collapse during an extreme wildfire. Glass skylights are a better choice than fiberglass or plastic, which could melt and allow embers to enter the home (Figure 24).
- Enclose eaves, fascias, soffits and vents: Enclosing eaves or vents with metal screens or boxing them in will prevent firebrands from collecting or entering the home through vents (Figure 24).
- Protect overhangs and other attachments: Remove vegetation from overhangs, room additions, bay windows, decks, or fences. Boxing in the undersides of decks or balconies with noncombustible or fire resistant materials prevents firebrands from collecting underneath (Figure 24).
- Separate wooden fences from the house: Do not attach fences of flammable materials like wood directly to the house because they act as fuel bridges. Instead, separate the fence from the house with a masonry or metal barrier.

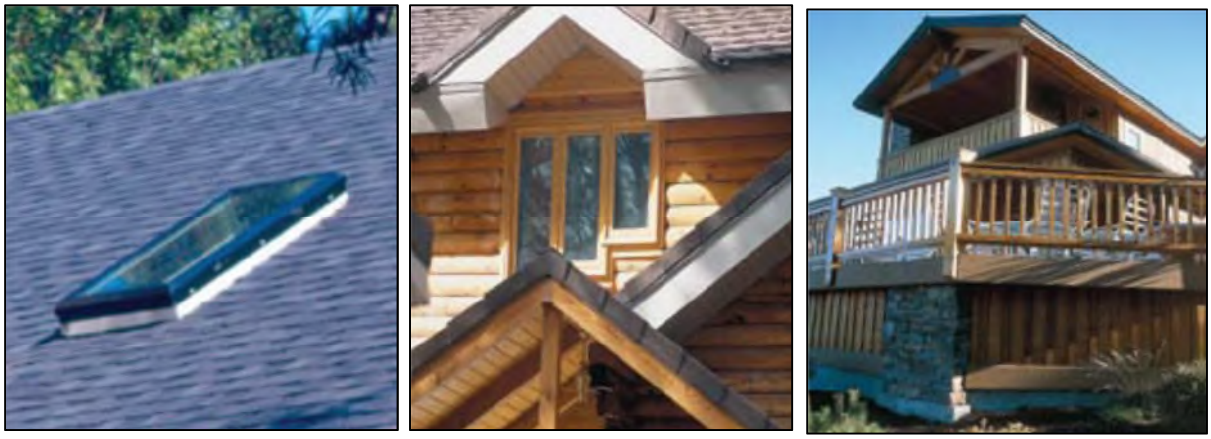

Figure 24: Home construction that reduces the ignition potential (from Firewise Guide).

Firewise Communities:

The Firewise program has a mechanism for certifying Firewise Communities. Communities, such as subdivisions, villages, or whole towns, can go through the process of becoming a certified Firewise Community. Benefits to the program include increased public knowledge and awareness about wildfire, a plan of action to reduce wildfire hazard, and greater access to grant funding for wildfire safety or fuel mitigation.

There are currently 7 Firewise Communities in New England; 4 in Maine, 2 in Massachusetts (Turkey Hill Community in Holbrook and Hopps Farm Road Association in Vineyard Haven), and 1 in New Hampshire. Nationally, there are 707 communities across 40 states (Firewise 2012).

The five basic steps to becoming a nationally-recognized Firewise Community are as follows:

1. Obtain a wildfire risk assessment from the state forestry agency or fire department
2. Create an action plan based on the assessment that includes 3 steps to improve wildfire preparedness
3. Conduct a "Firewise Day" event to publicize the cause, educate the public, and do work such as clearing debris
4. Invest a minimum of $2 per capita in Firewise work each year, which could be through grants or volunteer hours (20 people volunteering 2.5 hours equates to nearly a $1,000 investment)
5. Submit an application to the state Firewise liason

If a community meets the criteria and follows the steps to become a Firewise Community, Firewise will present them with plaques and signs to display in the community. Becoming a Firewise Community can improve wildfire prevention education and increase wildfire preparedness. The certification also helps when applying for grants for fuel treatments. Barnstable County could benefit from having multiple Firewise Communities, particularly in areas with a high wildfire risk.

Strategies to Increase Preparedness

Research indicates that the most effective ways to increase wildland fire preparedness in Barnstable County include:

- Applying fuel treatments to areas of high or extreme wildland fire risk
- Increasing education and public outreach efforts on Firewise/defensible space treatments and fire prevention
- Increased wildland fire training opportunities for Barnstable County firefighters

Fuel treatments can be implemented on high-priority lands (those with high or extreme fire risk) to reduce the threat of wildland fire. Properties or housing developments adjacent to high-risk areas could conduct Firewise work and create defensible space to reduce the threat of wildland fire to structures. Fuel treatments combined with Firewise projects can be very effective at reducing wildland fire risk and increasing wildfire preparedness.

Residents of Barnstable County need to be aware of wildfire risk and educated about the steps they can take as homeowners to reduce fire hazard. Two fire departments surveyed indicated that they conduct site visits and discuss defensible space with homeowners. Fire departments, town officials, state agencies, or other professionals can use the risk assessment presented in this plan for prioritizing neighborhoods that may require site visits or Firewise work. This will increase overall wildfire preparedness for Barnstable County.

Increasing public outreach and education on wildland fire prevention is equally important on reducing wildfire risk. Common wildfire start occurrences as identified in the fire department survey include careless disposal of smoking materials, permit burns getting out of control, and children playing with fire. Educating the public on safe ways to conduct pile burns or increasing fire awareness during periods of high fire danger can be effective. Additionally, having Smoky the Bear visit Barnstable County schools can help educate children on wildfire prevention.

A challenge that Barnstable County faces is the increased population during the summer, which often corresponds with periods of high fire danger. People who are not full-time residents may be unaware of wildfire danger on Cape Cod. If Cape Cod encountered a severe drought or other factors that greatly increased fire danger, public service announcements or other forms of outreach would be important in educating visitors.

Expanding opportunities for wildland fire training for town fire departments would increase wildland fire suppression capabilities and wildfire preparedness. Courses in wildland fire at Cape Cod Community College could benefit potential firefighters or serve as continuing education for those already in the fire service. More county or state-run wildfire classes would also benefit town firefighters. Participation on prescribed burns and live fire exercises would provide training opportunities for town departments.

The establishment of a county-wide natural communities map would enable detailed wildland fuel model mapping. The county-wide natural community and wildland fuels map would establish a baseline to track landscape level change overtime as a result of disturbance, development, or management actions.

A county-wide atlas of fuel treatments or prescribed burns across Cape Cod would greatly assist land managers and aid in wildfire planning. A county-wide database of the location, size, and date of any fuel treatment work would assist town planners in prioritizing future treatments and following up on past work. A log of wildfire mitigation projects would also aid in assessing the Barnstable County Wildfire Preparedness Plan, as future risk assessments may adjust wildfire risk (i.e. a red polygon goes to a yellow) based on work that has been done. Creating a county-wide database would require collaboration between the towns, Barnstable County offices, the state, and federal agencies with land on Cape Cod. Although creating this database would require effort and diligence, keeping a record of mitigation projects would strengthen wildfire preparedness and direct future work.

SOURCES OF FUNDING FOR MITIGATION WORK

Wildfire hazard reduction funding is available from numerous grant sources (see Appendix D: Sources of Funding). Many of the grants are specifically designed to address planning and implementation for fuel hazard reduction, equipment acquisition, training, public education, and disaster response. A number of the grant programs provide assistance with planning and implementation on projects related to forestry, wildlife habitat, and endangered species management. In many cases in Barnstable County both fire risk and forestry, wildlife habitat, and endangered species management can be addressed at the same time, enabling well planned programs to be funded by these non-specific fire funding sources.

FRAMEWORK TO EVALUATE PLAN

Evaluating the Barnstable County Wildfire Preparedness Plan at regular intervals would strengthen its implementation and keep it up to date with current conditions. As community demographics and forest conditions change, so will wildfire risk. The plan and its assessments can be repeated to adapt to these changes.

Annual progress reports should be written each year. These brief reports would contain descriptions of what has been done in Barnstable County will keep a record of any projects done relating to the plan. Summaries of any fuel treatments, Firewise work, or major wildfires in Barnstable County would aid greatly in keeping the plan up to date.

Full evaluations should be conducted on a periodic basis. Every 5-10 years, the community risk assessment should be repeated as conditions change. This evaluation would identify changes in wildfire risk- such as more development in high-risk areas. This assessment would incorporate the most recent data sets. Additionally, if fuel treatments have been applied and tracked, wildfire risk may be reduced (i.e. an area would shift from red to yellow on the map) and documented.

A periodic evaluation would update the Barnstable County Wildfire Preparedness Plan to ensure CWPP goals and objectives are being met and to identify areas for further action. Many resources are available for communities to develop a framework for evaluating their plans, such as the CWPP Evaluation Guide created by the University of Oregon, which contains questionnaires and surveys and is available at the school's website.

COLLABORATIVE PROCESS

The Barnstable County Wildfire Preparedness Plan is a product of collaboration between the Cape Cod Cooperative Extension, Massachusetts Department of Conservation and Recreation, and the Barnstable County Fire Chiefs. Meetings to provide stake holders with the planning process and to receive process input were held with Cape Cod Cooperative Extension officials, the guidance committee (listed on page ii), municipal natural resource managers, Barnstable County Fire Chiefs, the Barnstable County Regional Emergency Planning Committee, and federal and state land managers in Barnstable County.

A project summary was presented in a poster board format at the Cape Cod Natural History Conference in March 2012. The County Extension Director for Cape Cod Cooperative Extension provided a project overview during an interview with WQRC 99.9 FM radio and Ocean 104.7 FM radio in April 2012.

GLOSSARY

(Modified from the National Wildfire Coordinating Group Glossary of Wildland Fire Terminology)

Active Crown Fire - A fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other.

Activity Fuels - Fuels resulting from, or altered by, forestry practices such as timber harvest or thinning, as opposed to naturally created fuels.

Aerial Fuels - Standing and supported live and dead combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, cones, bark, and vines.

Ambient Air - Air of the surrounding environment.

Aspect - Cardinal direction toward which a slope faces.

Available Fuel - That portion of the total fuel that would actually burn under various environmental conditions.

Backing Fire - Fire spreading, or ignited to spread, into (against) the wind or downslope. A fire spreading on level ground in the absence of wind is a backing fire.

Barrier - Any obstruction to the spread of fire. Typically an area or strip devoid of combustible fuel.

Behavior - An observable activity or action demonstrated by an individual in a particular context.

Bole - The trunk of a tree.

British Thermal Unit (Btu) - Amount of heat required to raise 1 pound of water 1 degree Fahrenheit (from 59.50 to 60.50 F), measured at standard atmospheric pressure.

Broadcast Burning - Prescribed burning activity where fire is applied generally to most or all of an area within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.

Brush - A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low growing trees, usually of a type undesirable for livestock or timber management.

Brush Breaker – A combination of an all-terrain vehicle and fire engine often used to fight wildfires.

Brush Fire - A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Brush Management - Manipulation of stands of brush by manual, mechanical, chemical, or biological means or by prescribed burning for the purpose of achieving land management objectives.

Build-up - The cumulative effects of long-term drying on current fire danger.

Burn Patterns - The characteristic configuration of char left by a fire. In wildland fires burn patterns are influenced by topography, wind direction, length of exposure, and type of fuel. Definitions are scale-dependent: (1) They can be used to trace a fire's origin; (2) They are influenced by severity and intensity within a stand; (3) They describe the landscape mosaic.

Burning Conditions - The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

Canopy - The stratum containing the crowns of the tallest vegetation present (living or dead), usually above 20 feet.

Canopy Base Height – The average height from the ground to a forest stand's canopy bottom.

Canopy Bulk Density – The density of available canopy fuel in a stand, or the mass of available canopy fuel per canopy volume unit.

Cardinal Directions - North, south, east, west; used for giving directions and information from the ground or air in describing the fire (e.g., the west flank or east flank, not right flank or left flank).

Carrier Fuels - The fuels that support the flaming front of the moving fire.

Chain - Unit of measure in land survey, equal to 66 feet (20 M) (80 chains equal 1 mile). Commonly used to report fire perimeters and other fireline distances, this unit is popular in fire management because of its convenience in calculating acreage (e.g., 10 square chains equal one acre).

Char - Carbonaceous material formed by incomplete combustion of an organic material, most commonly wood; remains of burned materials.

Char Height - The vertical distance above ground scorched or blackened on a tree bole.

Climate - The prevalent or characteristic meteorological conditions of any place or region, and their extremes.

Community Wildfire Protection Plan (CWPP) - A plan developed in the collaborative framework established by the Wildland Fire Leadership Council and agreed to by state, tribal, and local government, local fire department, other stakeholders and federal land management agencies managing land in the vicinity of the planning area. A Community Wildfire Protection Plan (CWPP) identifies and prioritizes areas for hazardous fuel reduction treatments and

recommends the types and methods of treatment on Federal and non-Federal land that will protect one or more at-risk communities and essential infrastructure and recommends measures to reduce structural ignitability throughout the at-risk community. A CWPP may address issues such as wildfire response, hazard mitigation, community preparedness, or structure protection – or all of the above.

Condition Class - Depiction of the degree of departure from historical fire regimes, possibly resulting in alternations of key ecosystem components. These classes categorize and describe vegetation composition and structure conditions that currently exist inside the Fire Regime Groups. Based on the coarse-scale national data, they serve as generalized wildfire rankings. The risk of loss of key ecosystem components from wildfires increases from Condition Class 1 (lowest risk) to Condition Class 3 (highest risk).

Condition of Vegetation - Stage of growth or degree of flammability of vegetation that forms part of a fuel complex. Herbaceous stage is at times used when referring to herbaceous vegetation alone. In grass areas minimum qualitative distinctions for stages of annual growth are usually green, curing, and dry or cured.

Conduction - Heat transfer through a material from a region of higher temperature to a region of lower temperature.

Conflagration - A raging, destructive fire. Often used to connote such a fire with a moving front as distinguished from a fire storm.

Consumption - The amount of a specified fuel type or strata that is removed through the fire process, often expressed as a percentage of the preburn weight.

Control Line - An inclusive term for all constructed or natural barriers and treated fire edges used to control a fire.

Convection - The transfer of heat by the movement of a gas or liquid; convection, conduction, and radiation are the principal means of energy transfer.

Coordinates - The intersection of lines of reference, usually expressed in degrees/minutes/seconds of latitude and longitude, used to determine or report position or location.

Cover - The area on the ground covered by the combined aerial parts of plants expressed as a percent of the total area.

Cover Type - The designation of a vegetation complex described by dominant species, age, and form.

Creeping Fire - Fire burning with a low flame and spreading slowly.

Crown Consumption - Combustion of the twigs, and needles or leaves of a tree during a fire.

Crown Cover - The ground area covered by the crown of a tree as delimited by the vertical projection of its outermost perimeter.

Crown Fire - A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.

Crown Out - A fire that rises from ground into the tree crowns and advances from tree top to tree top. To intermittently ignite tree crowns as a surface fire advances.

Crown Ratio - The ratio of live crown to tree height.

Crowning Potential - A probability that a crown fire may start, calculated from inputs of foliage moisture content and height of the lowest part of the tree crowns above the surface.

Curing - Drying and browning of herbaceous vegetation due to mortality or senescence, and also loss of live fuel moisture content of woody fuel following mechanically-caused mortality (e.g., woody debris slash.)

Dead Fuels - Fuels with no living tissue in which moisture content is governed almost entirely by absorption or evaporation of atmospheric moisture (relative humidity and precipitation).

Debris Burning Fire - In prescribed fire terminology, a fire used to dispose of scattered, piled, or windrowed dead woody fuel, generally in the absence of a merchantable overstory. Its purpose is to reduce unsightly fuel concentrations, or consume unwanted natural fuels to facilitate subsequent resource management or land use actions on the area.

Dew Point - Temperature to which a specified parcel of air must cool, at constant pressure and water-vapor content, in order for saturation to occur. The dew point is always lower than the wet-bulb temperature, which is always lower than the dry-bulb temperature, except when the air is saturated and all three values are equal. Fog may form when temperature drops to equal the dew point.

Digital Elevation Model - A set of points which defines the terrain as numbers for computer applications. This data may be used to draw contours, make ortho photos, slope maps, and drive fire models.

Direct Attack - Any treatment applied directly to burning fuel such as wetting, smothering, or chemically quenching the fire or by physically separating the burning from unburned fuel.

Direct Protection Area - That area for which a particular fire protection organization has the primary responsibility for attacking an uncontrolled fire and for directing the suppression action. Such responsibility may develop through law, contract, or personal interest of the firefighting agent (e.g., a lumber operator). Several agencies or entities may have some basic responsibilities

(e.g., private owner) without being known as the fire organization having direct protection responsibility.

Dormant Season Burning - Prescribed burning early in the dry season before the leaves and undergrowth are completely dry or before the leaves are shed, as an insurance against more severe fire damage later on.

Draped Fuels - Needles, leaves, and twigs that have fallen from above and have lodged on lower branches or brush. Draped fuels are part of aerial fuels.

Drought - A period of relatively long duration with substantially below-normal precipitation, usually occurring over a large area.

Drought Index - A number representing the net effect of evaporation, transpiration and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

Dry Bulb Temperature - The temperature of the air measured in the shade 4-8 feet above the ground.

Duff - The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.

Ecosystem - An interacting natural system including all the component organisms together with the abiotic environment and processes affecting them.

Ecosystem Sustainability - A concept that promotes the use of natural resources to benefit humans while conserving and wisely managing natural ecosystems for the future.

Edge - The boundary between two fairly distinct fuel types.

Effective Windspeed - The midflame windspeed adjusted for the effect of slope on fire spread.

Emission - A release of combustion gases and aerosols into the atmosphere.

Engine - Any ground vehicle providing specified levels of pumping, water, and hose capacity but with less than the specified level of personnel.

Entrapment - A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses."

Environment - The complex surroundings of an item or area of interest, such as air, water, natural resources, and their physical conditions (temperature, humidity).

Escape Route - A preplanned and understood route firefighters take to move to a safety zone or other low-risk area. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

Escaped Fire - Fire which has exceeded or is expected to exceed initial attack capabilities or prescription.

Evacuation - An organized, phased, and supervised withdrawal, dispersal, or removal of civilians from dangerous or potentially dangerous areas, and their reception and care in safe areas.

Exposure - Property that may be endangered by a fire burning in another structure or by a wildfire.

Extreme Fire Behavior - "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

Fine Fuel Moisture - The probable moisture content of fast-drying fuels which have a timelag constant of 1 hour or less; such as, grass, leaves, ferns, tree moss, pine needles, and small twigs (0-1/4").

Fine Fuels - Fast-drying dead or live fuels, generally characterized by a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

Fire - Rapid oxidation, usually with the evolution of heat and light; heat fuel, oxygen and interaction of the three.

Fire Behavior - The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Behavior Prediction Model - A set of mathematical equations that can be used to predict certain aspects of fire behavior when provided with an assessment of fuel and environmental conditions.

Fire Behavior Prediction System - A system that uses a set of mathematical equations to predict certain aspects of fire behavior in wildland fuels when provided with data on fuel and environmental conditions.

Fire Benefits - Fire effects with positive monetary, social, or emotional value or that contribute, through changes in the resource base, to the attainment of organizational goals.

Fire Damage - Detrimental fire effects expressed in monetary or other units, including the unfavorable effects of fire-induced changes in the resource base on the attainment of organizational goals.

Fire Danger - Sum of constant danger and variable danger factors affecting the inception, spread, and resistance to control, and subsequent fire damage; often expressed as an index.

Fire Dependent - Plants and vegetation communities which have evolved adaptations such as a reliance on fire as a disturbance agent, protection as a species against the effects of wildland fire, or even a strengthening or enhancement by it.

Fire Ecology - The study of the effects of fire on living organisms and their environment.

Fire Effects - The physical, biological, and ecological impacts of fire on the environment.

Fire Environment - The surrounding conditions, influences, and modifying forces of topography, fuel, and weather that determine fire behavior.

Fire Frequency - A general term referring to the recurrence of fire in a given area over time.

Fire Front - The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire Hazard - A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.

Fire Hazard Index - A numerical rating for specific fuel types, indicating the relative probability of fires starting and spreading, and the probable degree of resistance to control; similar to burning index, but without effects of wind speed.

Fire Hazardous Areas - Those wildland areas where the combination of vegetation, topography, weather, and the threat of fire to life and property create difficult and dangerous problems.

Fire Interval - The number of years between two successive fire events for a given area; also referred to as fire-free interval or fire-return interval.

Fire Management - Activities required for the protection of burnable wildland values from fire and the use of prescribed fire to meet land management objectives.

Fire Management Area - One or more parcels of land having a common set of fire management objectives.

Fire Management Objective - Planned, measurable result desired from fire protection and use based on land management goals and objectives.

Fire Management Plan (FMP) - A plan which identifies and integrates all wildland fire management and related activities within the context of approved land/resource management plans. It defines a program to manage wildland fires (wildfire, prescribed fire, and wildland fire use). The plan is supplemented by operational plans, including but not limited to preparedness plans, preplanned dispatch plans, and prevention plans. Fire Management Plans assure that wildland fire management goals and components are coordinated.

Fire Perimeter - The entire outer edge or boundary of a fire.

Fire Planning - Systematic technological and administrative management process of designing organization, facilities, and procedures, including fire use, to protect wildland from fire.

Fire Potential - The likelihood of a wildland fire event measured in terms of anticipated occurrence of fire(s) and management's capabiltiy to respond. Fire potential is influenced by a sum of factors that includes fuel conditions (fuel dryness and/or other inputs), ignition triggers, significant weather triggers, and resource capability.

Fire Presuppression - Activities undertaken in advance of fire occurrence to help ensure more effective fire suppression. Activities includes overall planning, recruitment and training of fire personnel, procurement and maintenance of firefighting equipment and supplies, fuel treatment and creating, maintaining, and improving a system of fuelbreaks, roads, water sources, and control lines.

Fire Prevention - Activities such as public education, community outreach, law enforcement, and reduction of fuel hazards that are intended to reduce wildland fire and the risks it poses to life and property.

Fire Progression - The progress of the fire outwards from the point of origin.

Fire Regime - Description of the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects as well, in a given area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval.

Fire Regime Current Condition Class - A qualitative measure classified into three classes describing the relative degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings.

Fire Resistant Tree - A species with compact, resin-free, thick corky bark and less flammable foliage that has a relatively lower probability of being killed or scarred by a fire than a fire sensitive tree.

Fire Resources - All personnel and equipment available or potentially available for assignment to incidents.

Fire Risk - The chance of fire starting, as determined by the presence and activity of causative agents.

Fire Season - Period(s) of the year during which wildland fires are likely to occur, spread, and affect resources values sufficient to warrant organized fire management activities.

Fire Sensitive Tree - A species with thin bark or highly flammable foliage that has a relatively greater probability of being killed or scarred by a fire.

Fire Severity - Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time.

Fire Shelter - An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life threatening situations, as a last resort.

Fire Spread Model - A set of physics and empirical equations that form a mathematical representation of the behavior of fire in uniform wildland fuels.

Fire Storm - Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

Fire Suppression - All work and activities connected with control and fire-extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

Fire Treatment - The use of fire to accomplish a specified objective.

Fire Triangle - Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire Weather - Weather conditions which influence fire ignition, behavior, and suppression.

Firebrand - Any source of heat, natural or human made, capable of igniting wildland fuels. Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or by gravity into unburned fuels.

Firebreak - A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fireline - The part of a containment or control line that is scraped or dug to mineral soil.

Fireline Intensity - The product of the available heat of combustion per unit of ground and the rate of spread of the fire, interpreted as the heat released per unit of time for each unit length of

fire edge. The primary unit is Btu per second per foot (Btu/sec/ft) of fire front. The rate of heat release per unit time per unit length of fire front. Numerically, it is the product of the heat yield, the quantity of fuel consumed in the fire front, and the rate of spread.

Firewise - A national program designed to reach beyond the fire service by involving homeowners, community leaders, planners, developers, and others in the effort to protect people, property, and natural resources from the risk of wildland fire before a fire starts.

Flame - A mass of gas undergoing rapid combustion, generally accompanied by evolution of sensible heat and incandescence.

Flame Depth - The depth of the fire front.

Flame Height - The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

Flame Length - The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity.

Flammability - The relative ease with which fuels ignite and burn regardless of the quantity of the fuels. Preferred to "inflammability."

Flammable - Easily ignitable and capable of burning and producing flames.

FlamMap - A fire behavior mapping and analysis program that computes potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.) over an entire landscape for constant weather and fuel moisture conditions.

Flank Fire - A firing technique consisting of treating an area with lines of fire set into the wind which burn outward at right angles to the wind.

Flare-up - Any sudden acceleration in rate of spread or intensification of the fire. Unlike blowup, a flare-up is of relatively short duration and does not radically change existing control plans.

Flash Fuels - Highly combustible fine fuels such as grass, leaves, draped pine needles, fern, tree moss and some kinds of slash, which ignite readily and are consumed rapidly when dry.

Foliar Moisture Content – The probable moisture content of live foliage in the canopy.

Forest Fire - Variously defined for legal purposes (e.g., the State of California Public Resources Code: uncontrolled fire on lands covered wholly or in part by timber, brush, grass, grain, or other flammable vegetation). Types of fires are ground, surface, and crown.

Forest Residue - Accumulation in the forest of living or dead (mostly woody) material that is added to and rearranged by human activities such as harvest, cultural operations, and land clearing.

Forward Rate of Spread - The speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour or feet per minute.

Free Burning - The condition of a fire or part of a fire that has not been slowed by natural barriers or by control measures.

Frequency of Occurrence - A quantitative expression of the presence or absence of individuals of a species in a population; the ratio between the number of sample units that contain a species and the total number of sample units.

Fuel - Any combustible material, especially petroleum-based products and wildland fuels.

Fuel Arrangement - A general term referring to the spatial distribution and orientation of fuel particles or pieces.

Fuel Bed - An array of fuels usually constructed with specific loading, depth, and particle size to meet experimental requirements; also, commonly used to describe the fuel composition.

Fuel Bed Depth - Average height of surface fuels contained in the combustion zone of a spreading fire front.

Fuel Characteristics - Factors that make up fuels such as compactness, loading, horizontal continuity, vertical arrangement, chemical content, size and shape, and moisture content.

Fuel Class - Part of the National Fire Danger Rating System (NFDRS). Group of fuels possessing common characteristics. Dead fuels are grouped according to 1-, 10-, 100-, and 1000-hour timelag, and living fuels are grouped as herbaceous (annual or perennial) or woody.

Fuel Condition - Relative flammability of fuel as determined by fuel type and environmental conditions.

Fuel Continuity - The degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed thus affecting a fire's ability to sustain combustion and spread. This applies to aerial fuels as well as surface fuels.

Fuel Depth - The average distance from the bottom of the litter layer to the top of the layer of fuel, usually the surface fuel.

Fuel Group - An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics. General fuel groups are grass, brush, timber, and slash.

Fuel Loading - The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area. This may be available fuel (consumable fuel) or total fuel and is usually dry weight.

Fuel Management - Act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire, in support of land management objectives.

Fuel Model - Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel Modification - Manipulation or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control (e.g., lopping, chipping, crushing, piling and burning).

Fuel Moisture Content - The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees F.

Fuel Reduction - Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Fuel Size Class - A category used to describe the diameter of down dead woody fuels. Fuels within the same size class are assumed to have similar wetting and drying properties, and to preheat and ignite at similar rates during the combustion process.

Fuel Treatment - Manipulation or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control (e.g., lopping, chipping, crushing, piling and burning).

Fuel Type - An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause a predictable rate of spread or resistance to control under specified weather conditions.

Fuelbreak - A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled.

Fuelbreak System - A series of modified strips or blocks tied together to form continuous strategically located fuel breaks around land units.

Geographic Information System (GIS) - A system for storing and manipulating geographical or spatial information on computer.

GIS Layer - A collection of specific elements, such as trees, roads, or buildings that can be viewed together with other layers for a complete overview of the area, or separately to give a more specific indication of the presence of that particular element.

Global Positioning System (GPS) - A system of navigational satellites operated by the U.S. Department of Defense and available for civilian use. The system can track objects anywhere in the world with an accuracy of approximately 40 feet.

Grass Fire - Any fire in which the predominant fuel is grass or grasslike.

Greenbelt - Landscaped and regularly maintained fuelbreak, usually put to some additional use (e.g., golf course, park, playground).

Ground Fire - Fire that consumes the organic material beneath the surface litter ground, such as a peat fire.

Ground Fuel - All combustible materials below the surface litter, including duff, tree or shrub roots, punky wood, peat, and sawdust, that normally support a glowing combustion without flame.

Ground Truth - Verification at the site of what has been observed and/or measured from aircraft, satellites, other aerial platforms, aerial photographs, or maps.

Growing Season Burning - Prescribed burning or wildland fire use during the photosynthetically-active growing season, where live fuel moistures are relatively high and the dominant vegetation, grasses, forbs, and herbaceous vegetation are fully greened.

Gust - Rapid fluctuations in wind speed with a variation of 10 knots (11.5 mph) or more between peaks and lulls.

Handline - Fireline constructed with hand tools.

Hazard - Any real or potential condition that can cause injury, illness or death of personnel, or damage to, or loss of equipment or property.

Hazard Assessment - Assess hazards to determine risks. Assess the impact of each hazard in terms of potential loss, cost, or strategic degradation based on probability and severity.

Hazard Fuel - A fuel complex defined by kind, arrangement, volume, condition, and location that presents a threat of ignition and resistance to control.

Hazard Map - Map of the area of operations that shows all of the known aerial hazards, including but not limited to power lines, military training areas, hang gliding areas, etc.

Hazard Reduction - Any treatment of living and dead fuels that reduces the potential spread or consequences of fire.

Head Fire - A fire spreading or set to spread with the wind.

Head of a Fire - The most rapidly spreading portion of a fire's perimeter, usually to the leeward or up slope.

Healthy Forests Restoration Act (HFRA) – A 2003 law enacted to expedite high-priority fuel reduction and forest restoration on public lands. This act also contains the three requirements for a Community Wildfire Protection Plan (CWPP).

Heat - Temperatures higher than that of the normal atmosphere, produced by the process of burning or oxidation.

Heat Content - The net amount of heat that would be given off if fuel burns when it is absolutely dry, noted as Btu per pound of fuel.

Heat Transfer - Process by which heat is imparted from one body to another, through conduction, convection, and radiation.

Heavy Fuels - Fuels of large diameter such as snags, logs, large limbwood, which ignite and are consumed more slowly than flash fuels. Also called coarse fuels.

Height - The vertical measurement of vegetation from the top of the crown to ground level.

Herb - A plant that does not develop woody, persistent tissue but is relatively soft or succulent and sprouts from the base (perennials) or develops from seed (annuals) each year. Includes grasses, forbs and ferns.

Herbaceous Fuel Moisture - In NFDRS, a calculated value representing the approximate moisture content of the live herbaceous vegetation in the rating area expressed as a percentage of the oven dry weight of the sample.

Home Assessment - Evaluation of a dwelling and its immediate surroundings to determine its potential to escape damage by an approaching wildland fire. Includes the fuels and vegetation in the yard and adjacent to the structure, roof environment, decking and siding materials, prevailing winds, topography, fire history, etc., with the intent of mitigating fire hazards and risks.

Humidity - General term referring to the moisture content of the atmosphere.

Ignition Factor - The conditions, subsequent actions, and sequence of events that bring a competent ignition source into contact with the materials first ignited. Also referred to as the cause of the fire.

Ignition Probability - Chance that a firebrand will cause an ignition when it lands on receptive fuels.

Implementation Plan - The design and definition of all the activities, resources, limitations, and contingencies required for successful wildland fire management.

Indirect Attack - A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuelbreaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions.

In-stand Wind - Wind speed within a stand at about eye level.

Island - An unburned area within a fire perimeter.

I-Zone - An area that, in relation to wildland/urban fire, has a set of conditions that provides the opportunity for fire to burn from wildland vegetation to the home/structure ignition zone.

Keetch-Byram Drought Index (KBDI) - An estimate (0-800) of the amount of precipitation (in 100ths of inches) needed to bring the top 8 inches of soil back to saturation. A value of 0 is complete saturation of the soil, a value of 800 means 8.00 inches of precipitation would be needed for saturation. In the 1988 version of NFDRS, outputs of KBDI are used to adjust live and dead fuel loadings.

Ladder Fuels - Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning.

LANDFIRE - Also known as the Landscape Fire and Resource Management Planning Tools Project, is a five-year, multi-partner project producing consistent and comprehensive maps and data describing vegetation, wildland fuel, and fire regimes across the United States.

Land Use Plan - A set of decisions that establish management direction for land within an administrative area; an assimilation of land-use-plan-level decisions developed through the planning process regardless of the scale at which the decisions were developed.

Large Fire - For statistical purposes, a fire burning more than a specified area of land e.g., 300 acres.

Life-Safety - Refers to the joint consideration of both the life and physical well-being of individuals.

Light (Fine) Fuels - Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of 1 hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Live Fuel Moisture Content - Ratio of the amount of water to the amount of dry plant material in living plants.

Live Fuels - Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

Live Herbaceous Moisture Content - Ratio of the amount of water to the amount of dry plant material in herbaceous plants, i.e., grasses and forbs.

Live Woody Moisture Content - Ratio of the amount of water to the amount of dry plant material in shrubs.

Local Winds - Winds which are generated over a comparatively small area by local terrain and weather. They differ from those which would be appropriate to the general pressure pattern.

Logging Debris - Unwanted tree parts (crowns, logs, uprooted stumps) remaining after harvest.

Lopping - After felling, cutting branches, tops, and unwanted boles into lengths such that resultant logging debris will lie close to the ground.

Lopping and Scattering - Lopping logging debris and spreading it more or less evenly over the ground.

National Fire Danger Rating System (NFDRS) - A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

Mass Fire - A fire resulting from many simultaneous ignitions that generates a high level of energy output.

Mathematical Model - A model that is a quantitative and mathematical representation or simulation which attempts to descibe the characteristics or relationship of physical events.

Mean Fire Return Interval - Arithmetic average of all fire intervals in a given area over a given time.

Methodology - A set of standardized procedures and practices that have been peer-reviewed and have received general acceptance by the profession.

Mid-Flame Windspeed - The speed of the wind measured at the midpoint of the flames, considered to be most representative of the speed of the wind that is affecting fire behavior.

Mineral Soil - Soil layers below the predominantly organic horizons; soil with little combustible material.

Mitigation - Those activities implemented prior to, during, or after an incident which are designed to reduce or eliminate risks to persons or property that lessen the actual or potential effects or consequences of an incident. Mitigation measures can include efforts to educate

governments, businesses, and the general public on measures they can take to reduce loss and injury and are often informed by lessons learned from prior incidents.

Mitigation Actions - On-the-ground actions that will serve to increase the defensibility of the Maximum Management Area (MMA); check, direct, or delay the spread of fire; and minimize threats to life, property, and resources. Mitigation actions may include mechanical and physical non-fire tasks, specific fire applications, and limited suppression actions. These actions will be used to construct firelines, reduce excessive fuel concentrations, reduce vertical fuel continuity, create fuel breaks or barriers around critical or sensitive sites or resources, create "black lines" through controlled burnouts, and to limit fire spread and behavior.

Model - A simplified or generalized representation of reality; a description, analogy, picture, or hypothesis to help visualize something that cannot be directly observed.

Moisture of Extinction - The fuel moisture content, weighed over all the fuel classes, at which the fire will not spread. Also called extinction moisture content (EMC).

Mop Up - Extinguishing or removing burning material near control lines, felling snags, and trenching logs to prevent rolling after an area has burned, to make a fire safe, or to reduce residual smoke.

Mosaic - The intermingling of plant communities and their successional stages in such a manner as to give the impression of an interwoven design.

National Wildlife Refuge System - All lands, waters and interests therein administered by the Fish and Wildlife Service for the protection and conservation of fish and wildlife, including those that are threatened with extinction.

Native Species - A species which is a part of the original fauna or flora of the area in question.

Natural Barrier - Any area where lack of flammable material obstructs the spread of wildfires.

Natural Fuels - Fuels resulting from natural processes and not directly generated or altered by land management practices.

Nonflammable - Material unlikely to burn when exposed to flame under most conditions.

Objective - A description of a desired condition; quantified and measured, and where possible, with established time frames for achievement or specific, achievable, measurable, time-limited results to be achieved through land management practices, either through a description of a desired condition or the degree of desired change in an attribute.

One-hour Timelag Fuel Moisture (1-h TL FM) - Moisture content of one-hour timelag fuels.

One-hour Timelag Fuels - Fuels consisting of dead herbaceous plants and roundwood less than about one-fourth inch (6.4 mm) in diameter. Also included is the uppermost layer of needles or leaves on the forest floor.

One-hundred Hour Timelag Fuel Moisture (100-h TL FM) - The moisture content of the l00-hour timelag fuels.

One-hundred Hour Timelag Fuels - Dead fuels consisting of roundwood in the size range of 1 to 3 inches (2.5 to 7.6 cm) in diameter and very roughly the layer of litter extending from approximately three-fourths of an inch (1.9 cm) to 4 inches (10 cm) below the surface.

Open Burning - Burning of any fuel outdoors without the use of mechanical combustion enhancements.

Organic Matter - That fraction of the soil that includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population.

Parameter - A variable which can be measured quantitatively; sometimes, an arbitrary constant; associated with populations. One of the unknown values that determine a model.

Particle Size - The size of a piece of fuel, often expressed in terms of size classes.

Parts of a Fire - Different areas of the fire usually determined by the predominant direction of fire spread and delineated from the fastest moving area (head) to the slowest moving area (base or tail). The most rapidly moving portion is designated the head of the fire, the adjoining portions of the perimeter at right angles to the head are known as the flanks, and the slowest moving portion is known as the rear or the base of the fire.

Passive Crown Fire - A fire in the crowns of trees in which trees or groups of trees torch, ignited by the passing front of the fire. The torching trees reinforce the spread rate, but these fires are not basically different from surface fires.

Pattern - The distribution of an aerially delivered retardant drop on the target area in terms of its length, width, and momentum (velocity x mass) as it approaches the ground. The latter determines the relative coverage level of the fire retardant on fuel within the pattern.

Piling and Burning - Piling slash resulting from logging or fuel management activities and subsequently burning the individual piles.

Preattack Planning - Within designated blocks of land, planning the locations of firelines, fire camps, water sources, and helispots; planning transportation systems, probable rates of travel, and constraints of travel on various types of attack units; and determining what types of attack units likely would be needed to construct particular firelines, their probable rate of fireline construction, and topographic constraints on fireline construction.

Precipitation - Any or all forms of water particles, liquid or solid, that fall from the atmosphere and reach the ground.

Precipitation Amount - The total amount of precipitation that occurred within the preceding 24-hour period.

Precipitation Duration - Time, in hours and fraction of hours that a precipitation event lasts. More precisely, for fire danger rating purposes, the length of time that fuels are subjected to liquid water.

Prescribed Burning - Application of prescribed fire.

Prescribed Fire - Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition.

Prescribed Fire Burn Plan - A plan required for each fire application ignited by management. Plans are documents prepared by qualified personnel, approved by the agency administrator, and include criteria for the conditions under which the fire will be conducted (a prescription). Plan content varies among the agencies.

Prescription - Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions.

Prevention - Activities directed at reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards (fuels management).

Probability - A number representing the chance that a given event will occur. The range is from 0% for an impossible event, to 100% for an inevitable event.

Probability of Ignition - The chance that a firebrand will cause an ignition when it lands on receptive fuels.

Protection - The actions taken to limit the adverse environmental, social, political, and economical effects of fire.

Protection Area - That area for which a particular fire protection organization has the primary responsibility for attacking an uncontrolled fire and for directing the suppression action. Such responsibility may develop through law, contract, or personal interest of the firefighting agent (e.g., a lumber operator). Several agencies or entities may have some basic responsibilities (e.g., private owner) without being known as the fire organization having direct protection responsibility.

Protection Boundary - The exterior perimeter of an area within which a specified fire agency has assumed a degree of responsibility for wildland fire control. It may include land in addition to that for which the agency has jurisdiction or contractual responsibility.

Punky Material - Partly decayed material, such as old wood, in which fire can smolder unles it is carefully mopped up and extinguished. A good receptor for firebrands when dry.

Radiation - Transfer of heat in straight lines through a gas or vacuum other than by heating of the intervening space.

Rate of Spread - The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

Rate of Spread Factor - A factor usually on a scale of 1 to 100 which represents a relative rate of forward spread for a specific fuel condition and fixed weather conditions (or fuel model). Factors can be used as multipliers, arguments for entering tables, or provide a ratio of values between two fuels.

Reburn - Repeat burning of an area over which a fire has previously passed, but left fuel that later ignites when burning conditions are more favorable.

Relative Humidity (RH) - The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

Residual Smoke - Smoke produced by smoldering material. The flux of smoke originating well after the active flaming combustion period with little or no vertical buoyancy and, therefore, most susceptible to subsidence inversions and down-valley flows.

Resources - Personnel, equipment, services and supplies available, or potentially available, for assignment to incidents. Personnel and equipment are described by kind and type, e.g., ground, water, air, etc., and may be used in tactical, support or overhead capacities at an incident.

Restoration - The continuation of rehabilitation beyond the initial three years or the repair or replacement of major facilities damaged by the fire.

Risk - The chance of fire starting as determined by the presence and activity of causative agents.

Risk Index - A number related to the probability of a firebrand igniting a fire.

Risk Management (RM) - A continuous, five-step process that provides a systematic method for identifying and managing the risks associated with any operation.

Risk Source - Identifiable human activity that historically has been a major cause of wildfires on a protection unit; one of the eight general causes listed on the standard fire report.

Run (Of a Fire) - Rapid advance of the head of a fire, characterized by a marked transition in fireline intensity and rate of spread with respect to that noted before and after the advance.

Running Fire - Behavior of a fire spreading rapidly with a well-defined head.

Rural - Any area wherein residences and other developments are scattered and intermingled with forest, range, or farm land and native vegetation or cultivated crops.

Scorch Height - Average heights of foliage browning or bole blackening caused by a fire.

Shaded Fuelbreak - Fuelbreaks built in timbered areas where the trees on the break are thinned and pruned to reduce the fire potential yet retain enough crown canopy to make a less favorable microclimate for surface fires.

Short-Range Spotting - Firebrands, flaming sparks, or embers are carried by surface winds, starting new fires beyond the zone of direct ignition by the main fire. The range of such spotting is usually less than 1/4 mile.

Shrub - A woody perennial plant differing from a perennial herb by its persistent and woody stem; and from a tree by its low stature and habit of branching from the base.

Shrub Type - The two-category (evergreen, deciduous) classification of shrubs vegetation in the 1988 version of NFDRS.

Significant Fire Potential - The likelihood a wildland fire event will require mobilization of additional resources from outside the area in which the fire situation originates.

Significant Weather Trigger - A weather phenomenon resulting in an environment that has a significant impact on fire spread, intensity, or occurrence. Example: strong wind, unstable air mass, etc.

Simulation - An activity that imitates something real, but it's not real itself and it can be altered by users for the specific purpose of providing an experiential learning environment. (Examples: Sand Table Exercise or CBT/WBT Forest Service Wildland Fire Simulation Scenario Editor)

Size Class of Fire - As to size of wildfire: Class A - one-fourth acre or less; Class B - more than one-fourth acre, but less than 10 acres; Class C - 10 acres or more, but less than 100 acres; Class D - 100 acres or more, but less than 300 acres; Class E - 300 acres or more, but less than 1,000 acres; Class F - 1,000 acres or more, but less than 5,000 acres; Class G - 5,000 acres or more.

Skid Steer - A self-propelled land vehicle propelled by an internal combustion engine with hydraulically-powered mechanical arms capable of utilizing various connecting attachments such as mower decks or tree cutting heads.

Slash - Debris resulting from such natural events as wind, fire, or snow breakage; or such human activities as road construction, logging, pruning, thinning, or brush cutting. It includes logs, chunks, bark, branches, stumps, and broken understory trees or brush.

Slash Disposal - Treatment of slash to reduce fire hazard or for other purposes. (Preferred to Brush Disposal).

Slope Percent - The ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent. One hundred feet of rise to 100 feet of horizontal distance equals 100 percent.

Smoke - Small particles of carbon, tarry and water vapor resulting from the incomplete combustion of carbonaceous materials such as wood, coal or oil.

Smoke Management - The policies and practices implemented by air and natural resource managers directed at minimizing the amount of smoke entering populated areas or impacting sensitive sites, avoiding significant deterioration of air quality and violations of National Ambient Air Quality Standards, and mitigating human-caused visibility impacts in Class I areas.

Snag - A standing dead tree or part of a dead tree from which at least the leaves and smaller branches have fallen. Often called a stub, if less than 20 feet tall.

Specific Heat - The heat required to raise a unit mass of a substance one degreee kelvin. It is the heat capacity of a system per unit mass; i.e., the ratio of the heat absorbed (or released) to the corresponding temperature rise (or fall).

Spot Burning - A modified form of broadcast slash burning in which the greater accumulations of slash are fired and the fire is confined to these spots. Sometimes called "Jackpot Burning" or "Jackpotting."

Spot Fire - Fire ignited outside the perimeter of the main fire by a firebrand.

Spotting - Behavior of a fire producing sparks or embers that are carried by the wind and which start new fires beyond the zone of direct ignition by the main fire.

Staging Area - Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three (3) minute available basis. Staging Areas are managed by the Operations Section.

Stand Replacing Fire - Fire which kills all or most of the living overstory trees in a forest and initiates forest succession or regrowth. Also explicitly describes the nature of fire in grasslands and some shrublands.

Strategy - The general plan or direction selected to accomplish incident objectives.

Structural Fire Protection - The protection of homes or other structures from wildland fire.

Structure - A constructed object, usually a free-standing building above ground.

Structure (Vegetative) - The arrangement of vegetation in terms of density, basal area, cover, and vertical arrangement.

Structure Fire - Fire originating in and burning any part or all of any building, shelter, or other structure.

Succession - The process of vegetational development whereby an area becomes successively occupied by different plant communities of higher ecological order.

Suppression - All the work of extinguishing or confining a fire beginning with its discovery.

Surface Fire - Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation.

Surface Fuel - Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.

Surface Wind - Wind measured at a surface observing station, customarily at some distance (usually 20 feet) above the average vegetative surface to minimize the distorting effects of local obstacles and terrain.

Tactics - Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

Task - A unit of work activity that is a logical and necessary action in the performance of a behavior; how the behavior is demonstrated or performed in a particular context.

Ten-hour Timelag Fuel Moisture (10-h TL FM) - The moisture content of the l0-hour timelag roundwood fuels.

Ten-hour Timelag Fuels - Dead fuels consisting of roundwood 1/4 to l-inch (0.6 to 2.5 cm) in diameter and, very roughly, the layer of litter extending from immediately below the surface to 3/4 inch (1.9 cm) below the surface.

Threat Fire - Any uncontrolled fire near to or heading toward an area under organized fire protection.

Tinder - Burnable organic material (duff, peat, rotten wood, etc.) with a high surface to volume ratio.

Torching - The burning of the foliage of a single tree or a small group of trees, from the bottom up.

Total Fuel - All plant material both living and dead that can burn in a worst case situation.

Unacceptable Risk - Level of risk as determined by the risk management process which cannot be mitigated to an acceptable safe level.

Uncontrolled Fire - Any fire which threatens to destroy life, property, or natural resources, and (a) is not burning within the confines of firebreaks, or (b) is burning with such intensity that it could not be readily extinguished with ordinary tools commonly available.

Underburn - A fire that consume surface fuels but not the overstory canopy.

Understory Burning - Prescribed burning under a forest canopy.

Variable - Any changing characteristic; in statistics, a measurable characteristic of an experimental unit.

Variable Wind Direction - Wind direction which varies by 60 degrees or more during the period of time the wind direction is being determined.

Vectors - Directions of fire spread as related to rate of spread calculations (in degrees from upslope).

Vegetative Regeneration - Development of new aboveground plants from surviving plant parts, such as by sprouting from a root crown or rhizomes. Even if plants form their own root system, they are still genetically the same as the parent plant.

Vegetative Reproduction - Establishment of a new plant from a seed that is a genetically distinct individual.

Vertical Fuel Arrangement - Fuels above ground and their vertical continuity, which influences fire reaching various levels or vegetation strata.

Vigor - A subjective assessment of the health of individual plants in similar site and growing conditions; or a more specific measure based upon a specific facet of growth, such as seed stalk or tiller production per plant or per unit area.

Volatile - Readily changeable into vapor at low temperatures.

Volatiles - Readily vaporized organic materials which, when mixed with oxygen, are easily ignited.

Water Tender - Any ground vehicle capable of transporting specified quantities of water.

Wet-bulb Temperature - The lowest temperature to which air can be cooled by evaporating water into it at a constant pressure when the heat required for evaporation is supplied by the

cooling of the air. It is measured by the wet bulb thermometer, which usually employs wetted wicking on the bulb as a cooling (through evaporation) device.

Wildfire - An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.

Wildfire Suppression - An appropriate management response to wildfire, escaped wildland fire use or prescribed fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire.

Wildland - An area in which development is essentially non-existent, except for roads, railroads, powerlines, and similar transportation facilities. Structures, if any, are widely scattered.

Wildland Fire - Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire.

Wildland Urban Interface (WUI) - The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wind - The horizontal movement of air relative to the surface of the earth.

Wind Direction - Compass direction from which wind is blowing.

Wind Speed - Wind, in miles per hour, measured at 20 feet above open, level ground or as adjusted to meet this standard to compensate for height of ground cover, uneven ground, and nearby obstructions.

Wind Vectors - Wind directions used to calculate fire behavior.

Wind-driven Wildland Fire - A wildland fire that is controlled by a strong consistent wind.

Woody Fuel Moisture - In NFDRS, a calculated value representing the approximate moisture content of the live woody vegetation in the rating area expressed as a percentage of the oven dry weight of the sample.

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APPENDIX A: EXAMPLE SITE IMPLEMENTATION PLANS AND REPORT

The "Example Site Plan – Short Format", "Example Site Plan – Forest Stewardship Plan Format", and "Example Treatment Report" have been completed for three properties to provide a suggested format and example content for site plans and treatment reports. The three documents are in DRAFT and have not been finalized by the property managers. Information presented is only intended to serve as an example and should not be referenced as finalized approved documents. Templates for the "Example Site Plan – Short Format" and "Example Treatment Report" are included on the project DVD and may also be obtained from the Cape Cod Cooperative Extension at P.O. Box 367, Barnstable, MA 02630. The "Example Site Plan – Forest Stewardship Plan Format" is based on the Massachusetts Department of Conservation and Recreation's Forest Stewardship Plan at can be downloaded at http://www.mass.gov/dcr/stewardship/forestry/service .

Example Site Plan – Short Format

BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN

SITE IMPLEMENTATION PLAN

(SHORT FORMAT)

Property Name:	Robbin's Pond Conservation Commission Lands		
Property Owner(s):	Town of Harwich		
Mailing Address:	732 Main Street, Harwich , MA 02645		
Contact Person:	Amy Usowski	**Position Title:**	Conservation Agent
Contact Email:	ausowski@town.harwich.ma.us	**Contact Phone:**	(508) 430-7538
Managing Agency:	Town of Harwich Conservation Department		
Mailing Address:	732 Main Street, Harwich , MA 02645		
Contact Person:	Amy Usowski	**Position Title:**	Conservation Agent
Contact Email:	ausowski@town.harwich.ma.us	**Contact Phone:**	(508) 430-7538
Plan Preparer:	Joel R. Carlson	**Position Title:**	Consultant
Preparer's Agency:	Northeast Forest and Fire Management, LLC		
Mailing Address:	29 Moody Drive, Sandwich, MA 02563-1820		
Contact Email:	joelcarlson@ne-ffm.com	**Contact Phone:**	(508) 274-2234

Town Property is Located: Harwich

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Lot/Parcel Acres	Acres Covered in Plan
See Attachment	-	-	-	-	-
				Total Acres:	345.0

Date that Draft Plan was Completed (mm/dd/yy):	08/31/12
Date the Plan was Approved (mm/dd/yy):	

Existing Management Plans Pertaining to Planning Area
Plan 1. Barnstable County Wildfire Preparedness Plan

General Management Goals for Planning Area
Goal 1. Protect water quality and improve wildlife habitat while maintaining open space for passive recreational purposes (based on personal communications with Conservation Agent).

Wildland Fire Hazard Reduction Goals
Goal 1. Increase firefighter and public safety by decreasing wildland fire risk in and around the planning area. **Goal 2.** Reduce wildfire hazard within the planning area using an integrated and proactive land management approach. **Goal 3.** Reduce the threat of wildfire to property and life on lands adjacent to the planning area using education and awareness programs.

Planning Area Overview
General Description of Planning Area: The northern portion of the planning falls within the Town of Harwich Fire Management Focus Area 5, the middle portion does not fall within a the Fire Management Focus Area, and the southern portion of the property falls within the Town of Harwich Fire Management Focus Area 4 as designated by the 2012 Barnstable County Wildfire Preparedness Plan. One improvement is located in the northwest section of the planning area, a Water District Pump House. The structure is concrete and has no direct threat from fire burning in the surrounding fuels. Several small wetlands identified by the Massachusetts Department of Environmental Protection fall within the planning area. Any management within these wetland areas or a 100 foot buffer zone around the wetlands should be coordinated with the town Conservation Commission. No Massachusetts Natural Heritage and Endangered Species Program designated "Potential Vernal Pools" or "Certified Vernal Pools" fall within the planning area. All but the southeastern portion and residential area east of the planning area fall within Massachusetts Natural Heritage and Endangered Species Program designated Priority Habitat. Management within the priority habitat areas should be reviewed by Massachusetts Natural Heritage and Endangered Species Program and follow the appropriate "Forestry Conservation Management Practices for Rare Species" in the area, such as for the Eastern Box Turtle (found at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/forestry/forestry_cmp.htm).

General Description of Surrounding Landscape:

NORTH

Along the northern border of the planning area is the town line between the Town of Brewster and the Town of Harwich. The 2012 Barnstable County Wildfire Preparedness Plan has identified the area immediately across the town line and in the Town of Brewster as being a High Wildfire Hazard area and is within the Town of Brewster Fire Management Focus Area 3.

EAST

East of the planning area is a mixture of Low Wildfire Hazard and High Wildfire Hazard. The High Wildfire Hazard areas fall within portions the Town of Harwich Fire Management Focus Area 4 and 5.

SOUTH

South of the planning area is Route 6, beyond which is an area designated in the 2012 Barnstable County Wildfire Preparedness Plan as being Low Wildfire Hazard. This area transitions into an area designated as High Wildfire Hazard and falling within a portion of the Town of Harwich Fire Management Focus Area 5.

WEST

West of the planning area and beyond Robbin's Pond is a small area that is undeveloped, beyond which are several areas of residential development. The undeveloped area and closest portions of the residential areas are identified as being Moderate Wildfire Hazard in the 2012 Barnstable County Wildfire Preparedness Plan. The furthest out residential areas fall within an area designated as High Wildfire Hazard and fall within a portion of the Town of Harwich Fire Management Focus Area 5.

Approximate Percentage of Planning Area in Wildand Fire Hazard Category			
Low	**Moderate**	**High**	**Extreme**
0%	30%	70%	0%

Approximate Number of Improvements Within Planning Area (Include Areas Not Under Ownership but Targeted for Education and Awareness)			
Residential	**Commercial**	**Industrial**	**Other**
350	2	0	10

Treatment Area Designation, Description, and Recommended Management Action(s) (In Order of Priority)	
Designation: 1. Fuel Treatment and Structural Ignitability Reduction	**Acres:** N/A
Current Conditions: N/A	
Management Objective: Establish a Fire Management Team that will focus on management actions, implementation schedules, and future planning that relate to fire management at the property.	
Management Actions Narrative: The establishment of a Fire Management Team will facilitate the strategic implementation over time of recommendations outlined within the plan. Representatives from the Fire, Natural Resources, Conservation, Recreation, Water, and Highway and Maintenance Departments are recommended for the team. Additionally the Conservation Commissions should be consulted when conducting work in wetland buffers. Dependent on need and interest, representation from the surrounding neighborhoods should be sought.	
Designation: 2. Fuel Treatment and Structural Ignitability Reduction	**Acres:** N/A
Current Conditions: N/A	
Management Objective: Establish an understanding of the importance of management actions to be taken in the planning area.	
Management Actions Narrative: Establishing a public understanding of the importance of fire management in the planning area, so as to ensure public acceptance of proposed treatments targeted at reducing fire hazard and maintaining ecological integrity. Through public meetings, brochures, and/or other methods, the fire management recommendations and justifications for those recommendations should be disseminated to key residence in the area of the property.	
Designation: 3. Structural Ignitability Reduction	**Structures:** 367
Current Conditions: N/A	
Management Objective: Educate property owners on the issues associated with defensible space, the hazards of wildfire, and the measures they can take to prevent damage to life and property in the neighborhoods that surround the planning area.	
Management Actions Narrative: The education of private property owners adjacent to the planning area on issues related to defensible space will enable the property owners to effectively mitigate conditions on their properties that will greatly reduce the likelihood of property loss during catastrophic wildfires. Additionally, firefighter safety and effectiveness will be greatly enhanced in neighborhoods and on individual properties that have been educated in, and that have taken action on mitigation strategies. FIREWISE and the Massachusetts Department of Conservation and Recreation's (DCR) Forest Fire Control produce educational materials and have well established education programs and resources. DCR Forest Fire Control often provides guidance and assistance in administering these programs. Towns, counties, and states in some areas of the country have assisted private property owners in property hazard assessments, treatment planning, and the application of treatments through technical assistance and/or by subsidizing work through small community grants. Dependent on funding sources such incentives may be beneficial for the area.	

Designation: 4. Other – Access Control	**Locations:** 8
Current Conditions: Other than access to the cranberry bog at the water district pump house, trails and road access is not controlled on the property. The unrestricted access and restricted access areas in less traveled areas allows for the dumping of debris and unauthorized setting of recreational fires. The debris can be a source of difficult to extinguish fires and in some cases emit dangerous fumes that could harm firefighters. The recreational fires while generally in fire pits can present a source for embers starting fires in nearby woodlands or hold embers over until a wind event fans the embers at starts a fire in adjacent fiuels.	
Management Objective: Limit unauthorized vehicle access to interior portions of the property.	
Management Actions Narrative: By gating or blocking roads and trails against unauthorized vehicle access to selected interior portions of the property the potential for ignition sources that could initiate a wildfire will be greatly reduced. Additionally signage that indicates no unauthorized motor vehicle access should be considered. For all gates the Fire Department as well as other town departments should be provided the combination or a copy of the key. Id areas are blocked with obstacles such as boulders care should be taken so as not to limit access of firefighting resources.	

Designation: 5. Fuel Treatment	**Linear Feet:** 3,504
Current Conditions: The primary roads that have been identified as being critical to access and egress during a wildfire are in good condition however they should carefully monitored for deteriorating condition and encroachment from vegetation or fallen debris that could hinder the passage of emergency vehicles or the egress of the public during a wildfire.	
Management Objective: Maintain road bed and remove overhanging branches and other impeding vegetation that may hinder fire apparatus or contribute to fire behavior on town owned and maintained roads and trails in and adjacent to the planning area.	
Management Actions Narrative: Maintenance of the road bed and removal of vegetation to a height and width that will facilitate emergency vehicle access and movement on roads leading to, around, and in the planning area will improve response time, facilitate egress of the public, and increase firefighter safety. Vegetation should be cleared to a width and a height that will enable emergency equipment to pass freely. All debris created by the clearing of roads should be removed from the area. The Fire Department should be consulted concerning exact specifications for roads. Annual inspections of the roads should be conducted so that vegetation maintenance needs can be identified and road conditions can be assessed and addressed.	

Designation: 6. Fuel Treatment	**Acres:** 2.9
Current Conditions: The current vegetation in the surface fuel layer consists of lowbush blueberry and huckleberry averaging approximately 1 to 2 feet in height. Flame lengths under wildfire condition in these fuels can be as long as 5 to 15 feet in length and under certain conditions even greater lengths.	
Management Objective: Establish fuel reduction zones 30 feet in width on both sides of roads and trails.	
Management Actions Narrative: The reduction or breaking up the surface fuel bed along roads and trails will increase firefighter safety and effectiveness, and reduce fire behavior. This can be accomplished with mechanical treatments. Mechanical treatment of 30 feet wide along both sides of road edges may be accomplished with a walk behind brush mower or a heavier hydraulic ride on brush cutter. If using heavier equipment, care should be taken so as not to damage overstory trees or create excessive soil compaction. The primary goal of mowing operations should be to reduce shrub height and break up the continuous shrub cover. Shrubs reduction does not need to be to the base of trees, but rather in manner that removes horizontal continuity of the shrubs between the tree trunks. Regardless of the treatment used, the necessity for follow-up treatments needs to be reassessed every 3 to 6 years.	

Designation: 7. Fuel Treatment	**Acres:** 1.7
Current Conditions: The current vegetation in the surface fuel layer consists of lowbush blueberry and huckleberry averaging approximately 1 to 2 feet in height. Flame lengths under wildfire condition in these fuels can be as long as 5 to 15 feet in length and under certain conditions even greater lengths.	
Management Objective: On the property lines immediately adjacent to residential structures establish surface fuel reduction zones 50-feet in width at strategic locations based on prevailing winds that occur during wildfires.	
Management Actions Narrative: The reduction or breaking up of the surface fuel bed along strategic property boundaries will increase firefighter safety and effectiveness, and reduce fire behavior that could potentially impact adjacent private properties. This can be accomplished with mechanical treatments. Mechanical treatment of 50- foot wide fuel reduction zones may be accomplished with a walk behind brush mower or a heavier hydraulic ride on brush cutter. If using the heavier equipment care should be taken so as not to damage over story trees or create excessive soil compaction. The primary goal of mowing operations within the zones should be to reduce shrub height and break up the continuous shrub cover. Shrubs reduction does not need to be to the base of trees but rather in manner that removes horizontal continuity of the shrubs between the tree trunks. Regardless of the treatment used, the necessity for follow-up treatments needs to be reassessed every 3 to 6 years.	

Designation: 8. Fuel Treatment	**Acres:** 11.3
Current Conditions: The current vegetation in the surface fuel layer consists of lowbush blueberry and huckleberry averaging approximately 1 to 2 feet in height. Flame lengths under wildfire condition in these fuels can be as long as 5 to 15 feet in length and under certain conditions even greater lengths. The crown fuel layer consists of mature pitch pine and oak. The areas designated for the fuel treatment generally have a dominance of pine and may have canopy fuel loads, canopy bulk densities, and crown base heights adequate for torching, passive crown fire, and potentially active crown fire. While the extreme flame lengths generated from crown fire present unique problems to fire suppression resources the greatest concern is the increased amount of embers generated at height capable of causing significant downwind spotting and potential lodging in structures and serving as a structural ignition source.	
Management Objective: Within a 100-foot buffer zone reduce the potential of crown fires by thinning and reducing ladder fuels within dense pitch pine stands with surface fuel reduction.	
Management Actions Narrative: Within the 100-foot buffer reduce the potential of crown fire by increasing the canopy base height by 20% and reducing canopy bulk density by 30%. This can be accomplished by conducting a "Thinning from Below" (removing one out of every three conifers, preferentially selecting for trees in the 4 to 8 inch size classes). It is strongly recommended that a forester or fire manager be consulted to inventory any proposed stand, establish the actual number of trees needing to be removed so as to reduce the likelihood of a crown fire under the design criteria for modeling used in 2012 Barnstable County Wildfire Preparedness Plan, and create a marking/cutting guide for implementation. The reduction or breaking up of the surface fuel bed will increase firefighter safety and effectiveness, and reduce fire behavior that could potentially transition surface fires into crown fire. This can be accomplished with mechanical treatments. Mechanical treatment of 50- foot wide fuel reduction zones may be accomplished with a walk behind brush mower or a heavier hydraulic ride on brush cutter. If using the heavier equipment care should be taken so as not to damage over story trees or create excessive soil compaction. The primary goal of mowing operations within the zones should be to reduce shrub height and break up the continuous shrub cover. Shrubs reduction does not need to be to the base of trees but rather in manner that removes horizontal continuity of the shrubs between the tree trunks. Regardless of the treatment used, the necessity for follow-up treatments needs to be reassessed every 3 to 6 years.	

Designation: 9. Fuel Treatment	**Acres:** Variable

Current Conditions:
The current vegetation in the surface fuel layer consists of lowbush blueberry and huckleberry averaging approximately 1 to 2 feet in height. Flame lengths under wildfire condition in these fuels can be as long as 5 to 15 feet in length and under certain conditions even greater lengths.

Management Objective:
Break up the horizontal and vertical continuity of fuels and reduce fine fuel loads throughout the property.

Management Actions Narrative:
The reduction or breaking up of the surface fuel bed in small patches of at least 1/2 acre in size in uplands across the planning area will increase firefighter safety and effectiveness, reduce fire behavior that could potentially impact adjacent private properties and improve the sites ecological integrity. This can be accomplished with mechanical treatments (Option A), prescribed fire (Option B), or a combination of the two treatments. Note that no specific areas have been designated; specific areas are best designated during the preparation of a prescribed burn plan.

Option A:
Mechanical treatment may be accomplished with a walk behind brush mower or a heavier hydraulic ride on brush cutter. If using the heavier equipment care should be taken so as not to damage over story trees or create excessive soil compaction. The primary goal of mowing operations should be to reduce shrub height and break up the continuous shrub cover. Shrubs reduction does not need to be to the base of trees but rather in manner that removes horizontal continuity of the shrubs between the tree trunks.

Option B:
Prescribed burning will reduce fuel loads and fuel continuity. A benefit of using prescribed fire by itself or in combination with other treatments is that it greatly reduces fine fuel loads unlike mechanical treatments by themselves. Additionally, if applied under appropriate conditions many ecological benefits can be derived from the use of prescribed fire. All prescribed fire should be coordinated and approved by the Fire Department. A prescribed burn plan should be created by a qualified individual for any planned prescribed burn. A qualified and experienced burn boss should be consulted in the planning of any prescribed burn and should be used to conduct any prescribed burns. Care should be taken with regards to potential escapes resulting from prescribed burns and impacts on surrounding communities from the smoke associated with a prescribed burn.

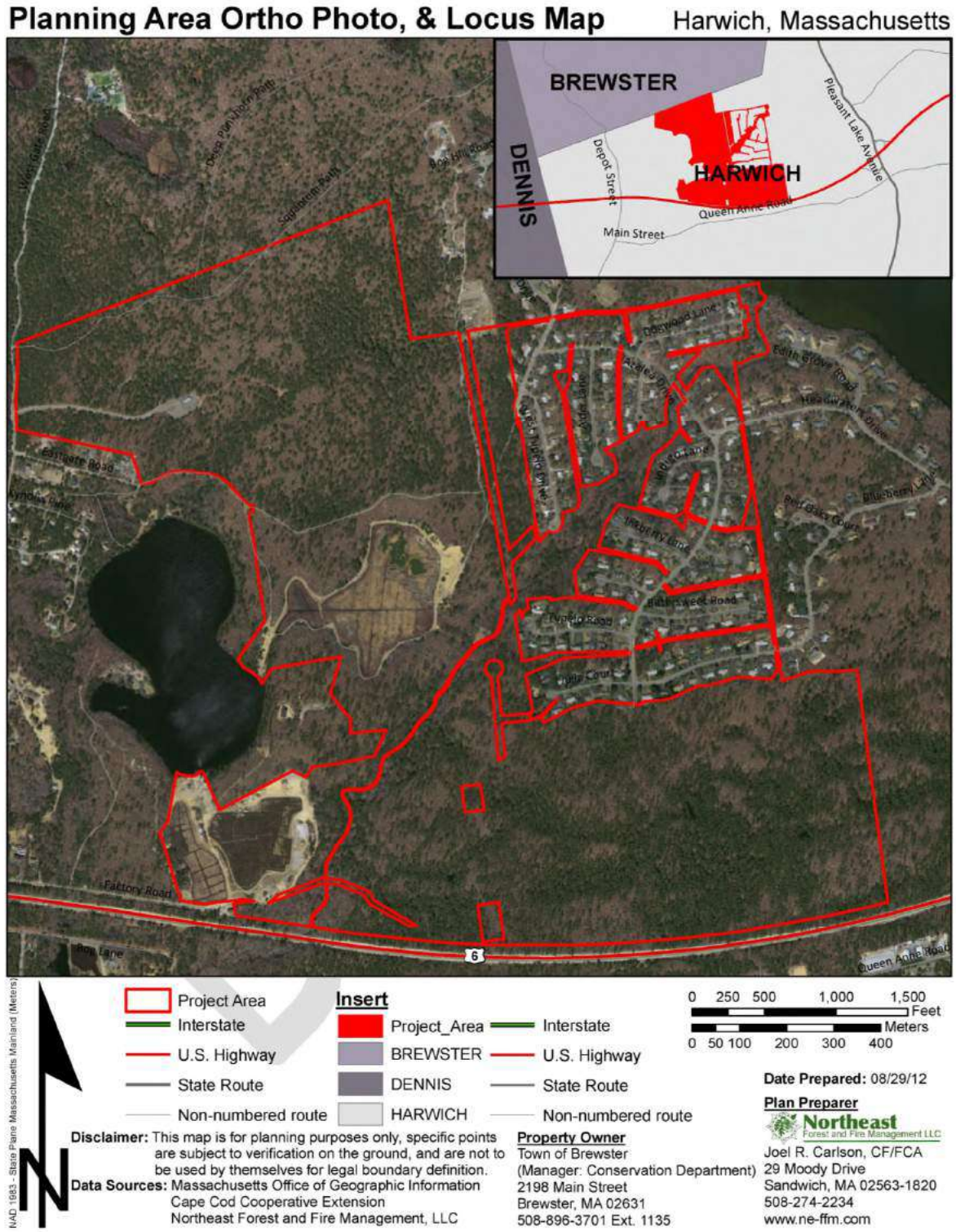
The need for follow-up treatments needs to be reassessed every 3 to 6 years and in all likelihood will be best addressed by conducting treatments annually in a rolling process from one end to the other over the years.

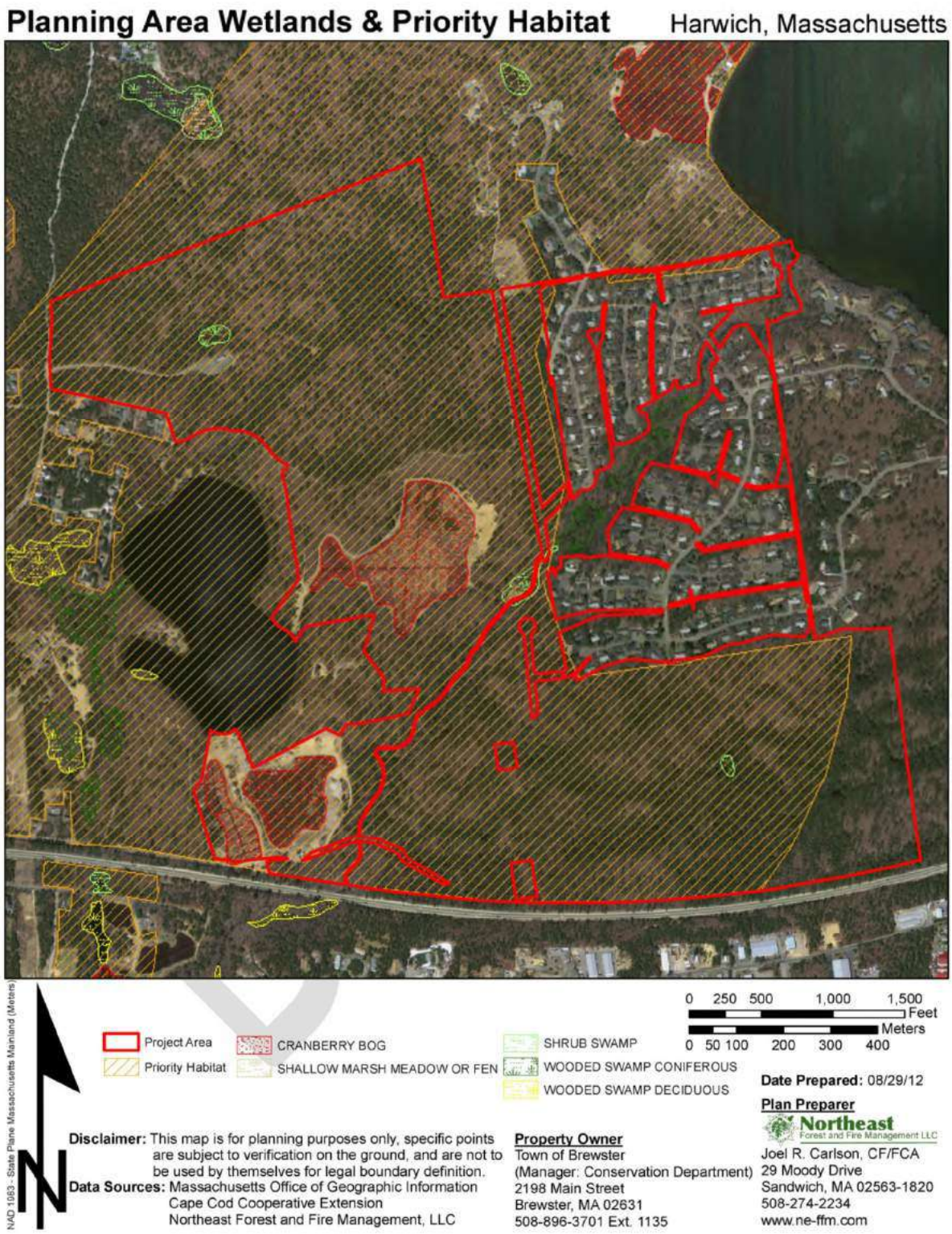
List of Attachments

Attachment 1. Map and Parcel Information
Attachment 2. Planning Area Ortho Photo, & Locus Map
Attachment 3. Planning Area Wetlands & Priority Habitat
Attachment 4. Planning Area Treatments Designations
Attachment 5. Planning Area Education & Awareness

Map and Parcel Information

Assessor's Map No	Lot/Parcel No.	Deed Book	Deed Page	Lot/Parcel Acres	Acres Covered in Plan	Assessor's Map No	Lot/Parcel No.	Deed Book	Deed Page	Lot/Parcel Acres	Acres Covered in Plan
66	L2	-	-	0.3	0.3	67	T9	-	-	2.0	2.0
67	L1-13	-	-	0.4	0.4	68	E4	-	-	4.4	4.4
67	N2	-	-	16.8	16.8	68	D59	-	-	0.3	0.3
67	L1-11	-	-	0.3	0.3	68	E12	-	-	5.8	5.8
67	L1-1	-	-	0.8	0.8	68	E10	-	-	5.5	5.5
67	L1-10	-	-	0.4	0.4	68	E11	-	-	5.7	5.7
67	L1-12	-	-	0.4	0.4	68	E12	-	-	4.6	4.6
67	L1-14	-	-	0.4	0.4	68	E13	-	-	10.0	10.0
67	L1-2	-	-	1.2	1.2	68	E2	-	-	5.4	5.4
67	LA-3	-	-	0.3	0.3	68	E3	-	-	11.9	11.9
67	L1-4	-	-	0.3	0.3	68	E5	-	-	4.4	4.4
67	L1-5	-	-	0.3	0.3	68	E6	-	-	3.4	3.4
67	L1-6	-	-	0.3	0.3	68	E8	-	-	3.7	3.7
67	L1-7	-	-	0.4	0.4	68	E9	-	-	3.8	3.8
67	L1-8	-	-	0.4	0.4	68	F2	-	-	1.9	1.9
67	LA-9	-	-	0.4	0.4	68	F3	-	-	1.1	1.1
67	S1	-	-	2.3	2.3	68	F4	-	-	0.8	0.8
67	S2	-	-	1.7	1.7	68	F5	-	-	0.8	0.8
67	S3	-	-	8.4	8.4	68	F6	-	-	3.8	3.8
67	S4	-	-	12.4	12.4	68	F7	-	-	3.8	3.8
67	T1	-	-	10.7	10.7	68	F8	-	-	6.6	6.6
67	T10	-	-	1.1	1.1	68	F9	-	-	7.2	7.2
67	T1-1	-	-	3.1	3.1	79	C1-11	-	-	52.0	52.0
67	T1-2	-	-	1.1	1.1	79	C1-A	-	-	7.4	7.4
67	T2	-	-	0.5	0.5	79	C1-B	-	-	5.9	5.9
67	T4	-	-	0.5	0.5	89	A5	-	-	73.4	73.4
67	T5	-	-	0.8	0.8	89	Z1	-	-	20.1	20.1
67	T6	-	-	0.8	0.8	90	A1	-	-	22.2	22.2
67	T8	-	-	0.1	0.1						


Planning Area Ortho Photo, & Locus Map
Harwich, Massachusetts
BREWSTER
DENNIS
HARWICH
Depot Street
Main Street
Queen Anne Road
Pleasant Lake Avenue
Factory Road
6
Project Area
Interstate
U.S. Highway
State Route
Non-numbered route
Insert
Project_Area
BREWSTER
DENNIS
HARWICH
Interstate
U.S. Highway
State Route
Non-numbered route
0 250 500 1,000 1,500 Feet
0 50 100 200 300 400 Meters
NAD 1983 - State Plane Massachusetts Mainland (Meters)
Disclaimer: This map is for planning purposes only, specific points are subject to verification on the ground, and are not to be used by themselves for legal boundary definition.
Data Sources: Massachusetts Office of Geographic Information
Cape Cod Cooperative Extension
Northeast Forest and Fire Management, LLC
Property Owner
Town of Brewster
(Manager: Conservation Department)
2198 Main Street
Brewster, MA 02631
508-896-3701 Ext. 1135
Date Prepared: 08/29/12
Plan Preparer
Northeast Forest and Fire Management LLC
Joel R. Carlson, CF/FCA
29 Moody Drive
Sandwich, MA 02563-1820
508-274-2234
www.ne-ffm.com


Planning Area Wetlands & Priority Habitat
Harwich, Massachusetts
0 250 500 1,000 1,500
Feet
Meters
0 50 100 200 300 400
Project Area
Priority Habitat
CRANBERRY BOG
SHALLOW MARSH MEADOW OR FEN
SHRUB SWAMP
WOODED SWAMP CONIFEROUS
WOODED SWAMP DECIDUOUS
NAD 1983 - State Plane Massachusetts Mainland (Meters)
Disclaimer: This map is for planning purposes only, specific points are subject to verification on the ground, and are not to be used by themselves for legal boundary definition.
Data Sources: Massachusetts Office of Geographic Information
Cape Cod Cooperative Extension
Northeast Forest and Fire Management, LLC
Property Owner
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508-896-3701 Ext. 1135
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Plan Preparer
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Forest and Fire Management LLC
Joel R. Carlson, CF/FCA
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Planning Area Treatments Designations — Harwich, Massachusetts

Project Area
6. Fuel Treatment (30' Rd. Mastication Buffer)
7. Fuel Treatment (50' Mastication Buffer)
8. Fuel Treatment (100' Thinning & Mast. Buffer)

Existing Gate
No Longer Required Gate
Proposed Gate
Proposed Gate or Blocked
Sructure Pump House

Abandoned Dirt Road
Dirt Road
Improved Dirt Road
Paved Road
Trail

0 250 500 1,000 1,500 Feet
0 50 100 200 300 400 Meters

NAD 1983 - State Plane Massachusetts Mainland (Meters)

Disclaimer: This map is for planning purposes only, specific points are subject to verification on the ground, and are not to be used by themselves for legal boundary definition.

Data Sources: Massachusetts Office of Geographic Information
Cape Cod Cooperative Extension
Northeast Forest and Fire Management, LLC

Property Owner
Town of Brewster
(Manager: Conservation Department)
2198 Main Street
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508-896-3701 Ext. 1135

Date Prepared: 08/29/12

Plan Preparer
Northeast Forest and Fire Management LLC
Joel R. Carlson, CF/FCA
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Sandwich, MA 02563-1820
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www.ne-ffm.com

Planning Area Education & Awareness

Harwich, Massachusetts

Project Area | Designation: 3. Structural Ignitability Reduction

Interstate | State Route

U.S. Highway | Non-numbered route

0 250 500 1,000 1,500 2,000 Feet

0 50100 200 300 400 500 Meters

NAD 1983 - State Plane Massachusetts Mainland (Meters)

Disclaimer: This map is for planning purposes only, specific points are subject to verification on the ground, and are not to be used by themselves for legal boundary definition.

Data Sources: Massachusetts Office of Geographic Information
Cape Cod Cooperative Extension
Northeast Forest and Fire Management, LLC

Property Owner
Town of Brewster
(Manager: Conservation Department)
2198 Main Street
Brewster, MA 02631
508-896-3701 Ext. 1135

Date Prepared: 08/29/12

Plan Preparer
Northeast Forest and Fire Management LLC
Joel R. Carlson, CF/FCA
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508-274-2234
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Example Site Plan – Forest Stewardship Plan Format

dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

CHECK-OFFS					*Administrative Box*			
CH61	CH61A	CH61B	STWSHP	C-S	Case No.		Orig. Case No.	
cert. ☐	cert. ☐	cert. ☐	new ☒	EEA ☐	Owner ID		Add. Case No.	
recert. ☐	recert. ☐	recert. ☐	renew ☐	Other ☐	Date Rec'd		Ecoregion	
amend ☐	amend ☐	amend ☐	Green Cert ☐		Plan Period		Topo Name	
			Conservation Rest. ☒		Rare Spp. Hab.		River Basin	
Plan Change:	to		CR Holder: Dennis Water Dist.					

OWNER, PROPERTY, and PREPARER INFORMATION

Property Owner(s) Town of Brewster (Manager: Conservation Department)
Mailing Address 2198 Main Street, Brewster, MA 02631 Phone 508-896-3701 Ext. 1135
Email Address conservation@town.brewster.ma.us

Property Location: Town(s) Brewster Road(s) West of Slough Road

Plan Preparer Joel R. Carlson Mass. Forester License # 326
Mailing Address 29 Moody Drive, Sandwich, MA 02563-1820 Phone (508) 274-2234

RECORDS

Assessor's Map No.	Lot/Parcel No.	Deed Book	Deed Page	Total Acres	Ch61/61A/61B Excluded Acres	Ch61/61A/61B **Certified** Acres	Stewshp Excluded Acres	Stewshp Acres
009	0014	-	-	11.9	-	-	0.0	11.9
009	0015	-	-	15.5	-	-	0.0	15.5
009	0016	-	-	9.0	-	-	0.0	9.0
010	0022	-	-	0.3	-	-	0.0	0.3
010	0023	-	-	14.9	-	-	0.0	14.9
010	0024	-	-	3.0	-	-	0.0	3.0
010	0025	-	-	16.7	-	-	0.0	16.7
010	0026	-	-	1.9	-	-	0.0	1.9
010	0037	-	-	6.2	-	-	0.0	6.2
			TOTAL	79.4	-	-	0.0	79.4

Excluded Area Description(s) (if additional space needed, continue on separate paper): None

HISTORY

Year acquired 1972 Year management began N/A

Are boundaries marked: Yes ☐ blazed / painted / flagged / signs posted (circle all that apply)? No ☒ Partially ☐

What treatments have been prescribed, but not carried out (last 10 years if plan is a recert.)?
stand no. N/A treatment - reason -
(if additional space needed, continue on separate page)

Previous Management Practices (last 10 years)

Stand #	Cutting Plan #	Treatment	Yield	Acres	Date
N/A	-	-	-	-	-

Remarks (if additional space needed, continue on separate page): None

BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

(Form revised May 2009)

Landowner Goals

Please **check** the column that best reflects the importance of the following goals:

Goal	Importance to Me			
	High	Medium	Low	Don't Know
Enhance the Quality/Quantity of Timber Products*				
Generate Immediate Income				
Generate Long Term Income				
Produce Firewood				
Defer or Defray Taxes				
Promote Biological Diversity	√			
Enhance Habitat for Birds	√			
Enhance Habitat for Small Animals	√			
Enhance Habitat for Large Animals	√			
Improve Access for Walking/Skiing/Recreation		√		
Maintain or Enhance Privacy				
Improve Hunting or Fishing			√	
Preserve or Improve Scenic Beauty	√			
Protect Water Quality	√			
Protect Unique/Special/ Cultural Areas		√		
Attain Green Certification				
Other: Fire Hazard Reduction	√			

*This goal must be checked "HIGH" if you are interested in classifying your land under Chapter 61/61A.

In your own words, describe your goals for the property:
Protect water quality and improve wildlife habitat while maintaining open space for passive recreational purposes.

Stewardship Purpose

By enrolling in the Forest Stewardship Program and following a Stewardship Plan, I understand that I will be joining with many other landowners across the state in a program that promotes ecologically responsible resource management through the following actions and values:

1. Managing sustainably for long-term forest health, productivity, diversity, and quality.
2. Conserving or enhancing water quality, wetlands, soil productivity, carbon sequestration, biodiversity, cultural, historical and aesthetic resources.
3. Following a strategy guided by well-founded silvicultural principles to improve timber quality and quantity when wood products are a goal.
4. Setting high standards for foresters, loggers and other operators as practices are implemented; and minimizing negative impacts.
5. Learning how woodlands benefit and affect surrounding communities, and cooperation with neighboring owners to accomplish mutual goals when practical.

Signature: _____ **Date:** _____

Town of Brewster

Property Overview, Regional Significant, and Management Summary

The 79.4 acre property is located in Barnstable County, in the towns of Brewster. The property is abutted by open space to the west and south. To the east and north are residential areas.

The parcel was purchased in 1972 by the Town of Brewster and a Conservation Easement was established in 2007. The conservation easement applies to Map 9 – Lot 16, Map 10 – Lot 22, Map 10 – Lot 23, Map 10 – Lot 24, Map 10 – Lot 25, Map 10 – Lot 26, and Map 10 – Lot 37. Permitted uses and activates that pertain to forest management on the property include the maintenance and use of roads and trails for passive recreational purposes, passive public recreational use, development of limited facilities related to passive recreational use, the planting and cutting of trees and shrubs and removal of invasive species when following an approved management plan and best management practices, installation of water monitoring wells, and wildlife enhancement projects after consultation with the conservation easement Grantee. Exact wording for permitted activities in addition to activities not permitted can be found in the 11 June, 2007 "Easement and Zone II Conservation Restriction for Drinking Water Supply Protection" filed at the Barnstable Land Registry District as Document Number 1.066.694 noted on Land Court Certificate Number 129282.

No structures exist on the property or are planned for the property. Based on the age and structure of the forest, ground vegetation, soil and geology, and land use practice historically used in this area, and anecdotal information; the site was never cleared and has not had any logging activity. The cranberry bog was in active management until approximately 10 years ago. Several structures associated farm activities were torn down in the last 10 to 20 years. Farming activities were likely limited to grazing with no row crop activity. Upon gradual abandonment 80 to 100 years ago fields transitioned into the forest that is on site today.

The area sits over surficial geology comprised of sand and gravel deposits were deposited during the last glaciations approximately 10,000 years ago. Soils in the area are comprised primarily of the Carver and Freetown soil series. The topography is relatively flat with low slopes of 0 to 8 percent typical of the area, and occasional areas of up to 15% slope.

Portions of the property have been designated by the Massachusetts Department of Environmental Protection as protected wetlands, primarily in the area of the former cranberry bog. The Massachusetts Natural Heritage and Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries and Wildlife has designated a small section in the northern portion of the property as Priority for Rare Species Habitat. Additionally the Massachusetts Division of Fisheries and Wildlife has identified all of the property as being within the BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas. Areas crucial to protecting the biodiversity and land identified as critical to protecting the state's long term viability of rare species, common species, and natural communities.

The trees on the property are predominantly pitch pine (*Pinus rigida*) and oak consisting of black oak (*Quercus velutina*) and white oak (*Quercus alba*). Understory vegetation is primarily comprised of blueberry (Vaccinium angustifolium) and scattered black huckleberry (*Gaylussacia baccata*).

Forest health is good throughout the property. No evidence of recent wildfire, significant wind events, or insect infestations has been observed. Limited invasive plant species occur on the property. The property is

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FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
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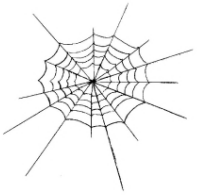
located within the Town of Brewster's Fire Management Suggested Focus Area 3, as identified by the 2012 "Barnstable County Wildfire Preparedness Plan", and is classified as being an area of High Wildand Fire Hazard. Suggested management actions for Focus Area 3 are fuel treatments and/or structural ignitability Reduction strategies.

The primary property goals are to Protect Water Quality, Promote Biological Diversity, Enhance Habitat for Birds, Enhance Habitat for Small Animals, Enhance Habitat for Large Animals, Preserve or Improve Scenic Beauty, and Fire Hazard Reduction. The property has been divided into seven stands (five forested and two non-forested) so as to better facilitate the implementations of these goals. In general, the majority of this site requires moderate to no forest management within the next ten years to meet these goals.

(Form revised May 2009)

Stewardship Issues

Massachusetts is a small state, but it contains a tremendous variety of ecosystems, plant and animal species, management challenges, and opportunities. This section of your plan will provide background information about the Massachusetts forest landscape as well as issues that might affect your land. **The Stand Descriptions and Management Practices sections of your plan will give more detailed property specific information** on these subjects tailored to your management goals.



Biodiversity: Biological diversity is, in part, a measure of the variety of plants and animals, the communities they form, and the ecological processes (such as water and nutrient cycling) that sustain them. With the recognition that each species has value, individually and as part of its natural community, maintaining biodiversity has become an important resource management goal.

While the biggest threat to biodiversity in Massachusetts is the loss of habitat to development, another threat is the introduction and spread of invasive non-native plants. Non-native invasives like European Buckthorn, Asiatic Bittersweet, and Japanese Honeysuckle spread quickly, crowding out or smothering native species and upsetting and dramatically altering ecosystem structure and function. Once established, invasives are difficult to control and even harder to eradicate. Therefore, vigilance and early intervention are paramount.

Another factor influencing biodiversity in Massachusetts concerns the amount and distribution of forest growth stages. Wildlife biologists have recommended that, for optimal wildlife habitat on a landscape scale, 5-15% of the forest should be in the seedling stage (less than 1" in diameter). Yet we currently have no more than 2-3% early successional stage seedling forest across the state. There is also a shortage of forest with large diameter trees (greater than 20"). See more about how you can manage your land with biodiversity in mind in the "Wildlife" section below. (Also refer to *Managing Forests to Enhance Wildlife Diversity in Massachusetts* and *A Guide to Invasive Plants in Massachusetts* in the binder pockets.)

Rare Species: Rare species include those that are **threatened** (abundant in parts of its range but declining in total numbers, those of **special concern** (any species that has suffered a decline that could threaten the species if left unchecked), and **endangered** (at immediate risk of extinction and probably cannot survive without direct human intervention). Some species are threatened or endangered globally, while others are common globally but rare in Massachusetts.

Of the 2,040 plant and animal species (not including insects) in Massachusetts, 424 are considered rare. About 100 of these rare species are known to occur in woodlands. Most of these are found in wooded wetlands, especially vernal pools. These temporary shallow pools dry up by late summer, but provide crucial breeding habitat for rare salamanders and a host of other unusual forest dwelling invertebrates. Although many species in Massachusetts are adapted to and thrive in recently disturbed forests, rare species are often very sensitive to any changes in their habitat

Indispensable to rare species protection is a set of maps maintained by the Division of Fisheries and Wildlife's Natural Heritage & Endangered Species Program (NHESP) that show current and historic locations of rare species and their habitats. The maps of your property will be compared to these rare species maps and the result indicated on the upper right corner of the front page of the plan. Prior to and regulated timber harvest, if an occurrence does show on the map, the NHESP will recommend protective measures. Possible measures include restricting logging operations to frozen periods of the year, or keeping logging equipment out of sensitive areas. You might also use information from NHESP to consider implementing management activities to improve the habitat for these special species.

Riparian and Wetlands Areas: Riparian and wetland areas are transition areas between open water features (lakes, ponds, streams, and rivers) and the drier terrestrial ecosystems. More specifically, a **wetland** is an area that has hydric (wet) soils and a unique community of plants that are adapted to live in these wet soils. Wetlands may be adjacent to streams or ponds, or a wetland may be found isolated in an otherwise drier landscape. A **riparian area** is the transition zone between an open water feature and the uplands (see Figure 1). A riparian zone may contain wetlands, but also includes areas with somewhat better drained soils. It is easiest to think of riparian areas as the places where land and water meet.

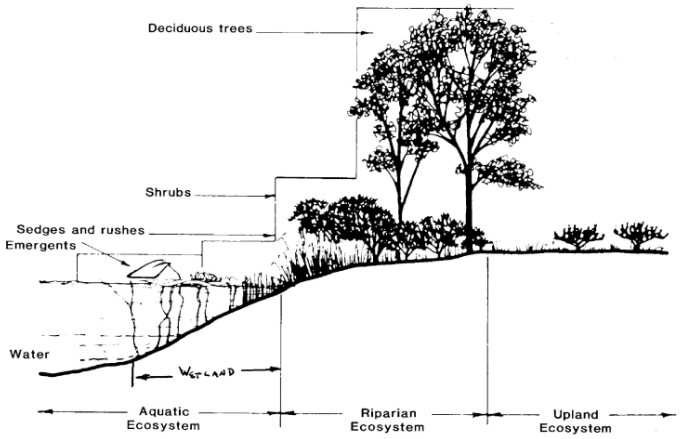


Figure 1: Example of a riparian zone.

The presence of water in riparian and wetland areas make these special places very important. Some of the functions and values that these areas provide are described below:

Filtration: Riparian zones capture and filter out sediment, chemicals and debris before they reach streams, rivers, lakes and drinking water supplies. This helps to keeps our drinking water cleaner, and saves communities money by making the need for costly filtration much less likely.

Flood control: By storing water after rainstorms, these areas reduce downstream flooding. Like a sponge, wetland and riparian areas absorb storm water, and then release it slowly over time instead of in one flush.

Critical wildlife habitat: Many birds and mammals need riparian and wetland areas for all or part of their life cycles. These areas provide food and water, cover, and travel corridors. They are often the most important habitat feature in Massachusetts' forests.

Recreational opportunities: Our lakes, rivers, streams, and ponds are often focal points for recreation. We enjoy them when we boat, fish, swim, or just sit and enjoy the view.

In order to protect wetlands and riparian areas and to prevent soil erosion during timber harvesting activities, Massachusetts promotes the use of "Best Management Practices" or BMPs. Maintaining or reestablishing the protective vegetative layer and protecting critical areas are the two rules that underlie these common sense measures. DCR's Massachusetts Forestry Best Practices Manual (included with this plan) details both the legally required and voluntary

specifications for log landings, skid trails, water bars, buffer strips, filter strips, harvest timing, and much more.

The two Massachusetts laws that regulate timber harvesting in and around wetlands and riparian areas are the Massachusetts Wetlands Protection Act (CH 131), and the Forest Cutting Practices Act (CH132). Among other things, CH132 requires the filing of a cutting plan and on-site inspection of a harvest operation by a DCR Service Forester to ensure that required BMPs are being followed when a commercial harvest exceeds 25,000 board feet or 50 cords (or combination thereof).

Soil and Water Quality: Forests provide a very effective natural buffer that holds soil in place and protects the purity of our water. The trees, understory vegetation, and the organic material on the forest floor reduce the impact of falling rain, and help to insure that soil will not be carried into our streams and waterways.

To maintain a supply of clean water, forests must be kept as healthy as possible. Forests with a diverse mixture of vigorous trees of different ages and species can better cope with periodic and unpredictable stress such as insect attacks or windstorms.

Timber harvesting must be conducted with the utmost care to ensure that erosion is minimized and that sediment does not enter streams or wetlands. Sediment causes turbidity which degrades water quality and can harm fish and other aquatic life. As long as Best Management Practices (BMPs) are implemented correctly, it is possible to undertake active forest management without harming water quality.

Forest Health: Like individual organisms, forests vary in their overall health. The health of a forest is affected by many factors including weather, soil, insects, diseases, air quality, and human activity. Forest owners do not usually focus on the health of a single tree, but are concerned about catastrophic events such as insect or disease outbreaks that affect so many individual trees that the whole forest community is impacted.

Like our own health, it is easier to prevent forest health problems then to cure them. This preventative approach usually involves two steps. First, it is desirable to maintain or encourage a wide diversity of tree species and age classes within the forest. This diversity makes a forest less susceptible to a single devastating health threat. Second, by thinning out weaker and less desirable trees, well-spaced healthy individual trees are assured enough water and light to thrive. These two steps will result in a forest of vigorously growing trees that is more resistant to environmental stress.

Fire: Most forests in Massachusetts are relatively resistant to catastrophic fire. Historically, Native Americans commonly burned certain forests to improve hunting grounds. In modern times, fires most often result from careless human actions.
The risk of an unintentional and damaging fire in your woods could increase as a result of logging activity if the slash (tree tops, branches, and debris) is not treated correctly. Adherence to the Massachusetts slash law minimizes this risk. Under the law, slash is to be removed from buffer areas near roads, boundaries, and critical areas and lopped close to the ground to speed decay. Well-maintained woods roads are always desirable to provide access should a fire occur.

Depending on the type of fire and the goals of the landowner, fire can also be considered as a management tool to favor certain species of plants and animals. Today the use of prescribed burning is largely restricted to the coast and islands, where it is used to maintain unique natural communities such as sandplain grasslands and pitch pine/scrub oak barrens. However, state land managers are also attempting to bring fire back to many of the fire-adapted communities found elsewhere around the state.

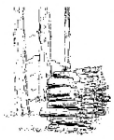
Wildlife Management: Enhancing the wildlife potential of a forested property is a common and important goal for many woodland owners. Sometimes actions can be taken to benefit a particular species of interest (e.g., put up Wood Duck nest boxes). In most cases, recommended management practices can benefit many species, and fall into one of three broad strategies. These are **managing for diversity, protecting existing habitat, and enhancing existing habitat**.

Managing for Diversity – Many species of wildlife need a variety of plant communities to meet their lifecycle requirements. In general, a property that contains a diversity of habitats will support a more varied wildlife population. A thick area of brush and young trees might provide food and cover for grouse and cedar waxwing; a mature stand of oaks provides acorns for foraging deer and turkey; while an open field provides the right food and cover for cottontail rabbits and red fox. It is often possible to create these different habitats on your property through active management. The appropriate mix of habitat types will primarily depend on the composition of the surrounding landscape and your objectives. It may be a good idea to create a brushy area where early successional habitats are rare, but the same practice may be inappropriate in the area's last block of mature forest.

Protecting Existing Habitat – This strategy is commonly associated with managing for rare species or those species that require unique habitat features. These habitat features include vernal pools, springs and seeps, forested wetlands, rock outcrops, snags, den trees, and large blocks of unbroken forest. Some of these features are rare, and they provide the right mix of food, water, and shelter for a particular species or specialized community of wildlife. It is important to recognize their value and protect their function. This usually means not altering the feature and buffering the resource area from potential impacts.

Enhancing Existing Habitat – This strategy falls somewhere between the previous two. One way the wildlife value of a forest can be enhanced is by modifying its structure (number of canopy layers, average tree size, density). Thinning out undesirable trees from around large crowned mast (nut and fruit) trees will allow these trees to grow faster and produce more food. The faster growth will also accelerate the development of a more mature forest structure, which is important for some species. Creating small gaps or forest openings generates groups of seedlings and saplings that provide an additional layer of cover, food, and perch sites.

Each of these three strategies can be applied on a single property. For example, a landowner might want to increase the habitat diversity by reclaiming an old abandoned field. Elsewhere on the property, a stand of young hardwoods might be thinned to reduce competition, while a "no cut" buffer is set up around a vernal pool or other habitat feature. The overview, stand description and management practice sections of this plan will help you understand your woodland within the context of the surrounding landscape and the potential to diversify, protect or enhance wildlife habitat.



Wood Products: If managed wisely, forests can produce a periodic flow of wood products on a sustained basis. Stewardship encompasses finding ways to meet your current needs while protecting the forest's ecological integrity. In this way, you can harvest timber and generate income without compromising the opportunities of future generations.

Massachusetts forests grow many highly valued species (white pine, red oak, sugar maple, white ash, and black cherry) whose lumber is sold throughout the world. Other lower valued species (hemlock, birch, beech, red maple) are marketed locally or regionally, and become products like pallets, pulpwood, firewood, and lumber. These products and their associated value-added industries contribute between 200 and 300 million dollars annually to the Massachusetts economy.

By growing and selling wood products in a responsible way you are helping to our society's demand for these goods. Harvesting from sustainably managed woodlands – rather than from unmanaged or poorly managed forest – benefits the public in a multitude of ways. The sale of timber, pulpwood, and firewood also provides periodic income that you

can reinvest in the property, increasing its value and helping you meet your long-term goals. Producing wood products helps defray the costs of owning woodland, and helps private landowners keep their forestland undeveloped.

Cultural Resources: Cultural resources are the places containing evidence of people who once lived in the area. Whether a Native American village from 1,700 years ago, or the remains of a farmstead from the 1800's, these features all tell important and interesting stories about the landscape, and should be protected from damage or loss.

Massachusetts has a long and diverse history of human habitation and use. Native American tribes first took advantage of the natural bounty of this area over 10,000 years ago. Many of these villages were located along the coasts and rivers of the state. The interior woodlands were also used for hunting, traveling, and temporary camps. Signs of these activities are difficult to find in today's forests. They were obscured by the dramatic landscape impacts brought by European settlers as they swept over the area in the 17th and 18th centuries.

By the middle 1800's, more than 70% of the forests of Massachusetts had been cleared for crops and pastureland. Houses, barns, wells, fences, mills, and roads were all constructed as woodlands were converted for agricultural production. But when the Erie Canal connected the Midwest with the eastern cities, New England farms were abandoned for the more productive land in the Ohio River valley, and the landscape began to revert to forest. Many of the abandoned buildings were disassembled and moved, but the supporting stonework and other changes to the landscape can be easily seen today.

One particularly ubiquitous legacy of this period is stone walls. Most were constructed between 1810 and 1840 as stone fences (wooden fence rails had become scarce) to enclose sheep within pastures, or to exclude them from croplands and hayfields. Clues to their purpose are found in their construction. Walls that surrounded pasture areas were comprised mostly of large stones, while walls abutting former cropland accumulated many small stones as farmers cleared rocks turned up by their plows. Other cultural features to look for include cellar holes, wells, old roads and even old trash dumps.

Recreation and Aesthetic Considerations: Recreational opportunities and aesthetic quality are the most important values for many forest landowners, and represent valid goals in and of themselves. Removing interfering vegetation can open a vista or highlight a beautiful tree, for example. When a landowner's goals include timber, thoughtful forest management can be used to accomplish silvicultural objectives while also reaching recreational and/or aesthetic objectives. For example, logging trails might be designed to provide a network of cross-country ski trails that lead through a variety of habitats and reveal points of interest.

If aesthetics is a concern and you are planning a timber harvest, obtain a copy of this excellent booklet: *A Guide to Logging Aesthetics: Practical Tips for Loggers, Foresters & Landowners*, by Geoffrey T. Jones, 1993. (Available from the Northeast Regional Agricultural Engineering Service, (607) 255-7654, for $7). Work closely with your consultant to make sure the aesthetic standards you want are included in the contract and that the logger selected to do the job executes it properly. The time you take to plan ahead of the job will reward you and your family many times over with a fuller enjoyment of your forest, now and well into the future.

Invasive Species Management: Invasive species pose immediate and long-term threats to the woodlands of MA. Defined as a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human, animal, or plant health, invasives are well-adapted to a variety of environmental conditions, out-compete more desirable native species, and often create monocultures devoid of biological diversity. The websites of the Invasive Plant Atlas of New England,

www.nbii-nin.ciesin.columbia.edu/ipane, and the New England Wildflower Society, www.newfs.org are excellent sources of information regarding the identification and management of invasive plants. Some of the common invasive plants found in MA are listed below.

- Oriental Bittersweet (*Celastrus orbiculata*)
- Glossy Buckthorn (*Frangula alnus*)
- Multiflora Rose (*Rosa multiflora*)
- Japanese Barberry (*Berbis thunbergii*)
- Japanese Knotweed (*Fallopia japonica*)
- Autumn Olive (*Eleaeagnus umbellata*)

Early detection and the initiation of control methods soon after detection are critical to suppressing the spread of invasive species. Selective application of the proper herbicide is often the most effective control method. See the next section for information on the use of chemicals in forest management activities.

Pesticide Use

Pesticides such as herbicides, insecticides, fungicides, and rodenticides are used to control "pests". A pest is any mammal, bird, invertebrate, plant, fungi, bacteria or virus deemed injurious to humans and/or other mammals, birds, plants, etc. The most common forest management use of a pesticide by woodland owners is the application of herbicide to combat invasive species. MA DCR suggests using a management system(s) that promotes the development and adoption of environmentally friendly no-chemical methods of pest management that strives to avoid the use of chemical pesticides. If chemicals are used, proper equipment and training should be utilized to minimize health and environmental risks. In Massachusetts, the application of pesticides is regulated by the MA Pesticide Control Board. For more information, contact MA Department of Agricultural Resources (MDAR), Pesticide Bureau at (617) 626-1776

On MA Private Lands Group Certification member properties, no chemicals listed in CHEMICAL PESTICIDES IN CERTIFIED FORESTS: INTERPRETATION OF THE FSC PRINCIPLES AND CRITERIA, Forest Stewardship Council, Revised and Approved, July 2002, may be used.

This is your Stewardship Plan. It is based on the goals that you have identified. The final success of your Stewardship Plan will be determined first, by how well you are able to identify and define your goals, and second, by the support you find and the resources you commit to implement each step.

It can be helpful and enjoyable to visit other properties to sample the range of management activities and see the accomplishments of others. This may help you visualize the outcome of alternative management decisions and can either stimulate new ideas or confirm your own personal philosophies. Don't hesitate to express your thoughts, concerns, and ideas. Keep asking questions! Please be involved and enjoy the fact that you are the steward of a very special place.

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FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

STAND DESCRIPTION

OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	1A 1B 1C	Pitch Pine/Oak	6.7 2.8 5.5 15 – Total	7 – Black Oak 6 – White Oak 6 – Red Maple 10 – Pitch Pine 5 – Snags 7 – All Species	35 – Black Oak 11 – White Oak 1 – Red Maple 72 – Pitch Pine 7 – Snags 126 – All Species	135 – Black Oak 55 – White Oak 5 – Red Maple 125 – Pitch Pine 50 – Snags 370 – All Species	- 39 - Eastern White Pine

NHESP Natural Community Type:
Pitch Pine – Oak Forest/Woodland

Canopy, Regeneration, & Ground Cover:
The mixed pine/oak canopy averages 39 ft. in height with a maximum height of 60 ft. Tree regeneration consists of scattered black oak (*Quercus velutina*) and white oak (*Quercus alba*) seedlings and advanced regeneration of less than 4 DBH. The shrub layer consists of primarily of blueberry (*Vaccinium angustifolium*) and scattered black huckleberry (*Gaylussacia baccata*), wintergreen (*Gaultheria procumbens*) with occasional small patches of catbrier (*Smilax spp.*) and highbush blueberry (*Vaccinium corymbosum*). The herb layer contains bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), and occasional pink lady's slipper (*Cypripedium acaule*).

Wildlife & Rare Plants & Animals:
These stands have the potential of supporting many of the common insect and wildlife species that occur throughout southeastern Massachusetts. The acorn production from oaks trees, berry production from blueberries and huckleberry, close proximity of water, and continuous undeveloped land adjacent to these stands increases their value to wildlife species. The stands have potential wildlife habitat value for reptiles and amphibians such as northern redbelly snakes (*Storeria occipitomaculata*), northern black racers (*Coluber constrictor constrictor*) and Spotted Salamanders (*Ambystoma maculatum*); birds such as sharp-shinned hawks (*Accipiter striatus*), cooper's hawks (Accipiter cooperii), broad-winged hawks (*Buteo platypterus*), wild turkeys (*Meleagris gallopavo*), mourning doves (*Zenaida macroura*), Red-eyed Vireo (*Vireo olivaceus*), Black-and-white Warbler (*Mniotilta varia*), Great Crested Flycatcher (Miarchus crinitus), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Red-bellied Woodpecker (*Melanerpes carolinus*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatches (*Sitta carolinensis*), hermit thrushes (*Catharus guttatus*), wood thrushes (*Hylocichla mustelina*), ovenbirds (*Seiurus aurocapillus*), and scarlet tanagers (*Piranga olivacea*); and mammals such as Virginia opossums (*Didelphis virginiana*), gray squirrels (*Sciurus carolinensis*),white-footed mice (*Hylocichla mustelina*), and white-tailed deer (*Odocoileus virginianus*). No rare plants or animals were observed. The Natural Heritage & Endangered Species Program identifies no state listed plants and four state listed animals; spiny oakworm (*Anisota stigma*) a state species of special concern, imperial moth (*Eacles imperialis*) a state threatened species, orange sallow moth (*Rhodoecia aurantiago*) a state threatened species, and eastern box turtle (*Terrapene carolina*) a state species of special concern as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stands consists of sand and gravel deposits. Soil within the stands consists of several small areas Carver coarse sand with 3% to 8% slope (252B) and Carver coarse sand with 8% to 15% slope (252C); with the majority of the stands being over Carver coarse sand with 15% to 35% slope (252D). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production.

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FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Cultural & Recreational Features:
Several small trails that originate from the cranberry bog (Stand-7) are located in these stands. No other manmade or cultural resources were observed.

Past Land Use & Stand Age:
No evidence of past tree cutting was observed. Stand condition and soil conditions make past land use for the site to have been grazed by farm animals 80 or more years ago. The stand age is approximately 80 to 100 years old based on stand appearance and common land use and abandonment for the area.

Disturbance, Forest Health, and Invasive Species:
General forest health is good. Several areas along trails have limited erosion as a result of all-terrain vehicle use. No evidence of wildland fire, insect infestations, forest diseases, or invasive species were observed.

Wildfire Fuel Conditions:
Surface fuels consist of Fire Behavior Prediction System Fuel Model Shrub-6 (SH6 – 146 - Low Load, Humid Climate Shrub). Crown fuels have a canopy fuel loading of 2.72 t/ac, canopy bulk density of 0.0058 lbs/ft^2, canopy base height of 19 ft, and a canopy ceiling of 60 ft, with an average stand height of 38 ft. Under the crown fire modeling "Design Conditions" outlined in 2012 "Barnstable County Wildfire Preparedness Plan"; areas of these stands have a potential of passive to active crown fire occurring in a wildfire.

Timber & Natural Resource Values:
Current and future timber value is limited due to the species composition of the forest and site conditions common to the area. Timber products would be limited to firewood and biomass. The greatest value to the stand is associated with maintenance of the aquifer, biological diversity, recreational use, and open space.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" are present in these stands. A NHESP "Potential Vernal Pool" is located in the northeast corner of Stand-1C and is surrounded by a small (less than 1/10 acre) Department of Environmental Protection Identified "Wooded Deciduous Swamp", additionally poertion of all three stands fall within any 100 foot buffer around wetlands in adjacent stands. A small portion of the northern side of Stand-1A falls within NHESP "Priority Habitat". All of the three stands fall within NHESP BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas. Certain activities within these stands are restricted under the 11 June, 2007 "Easement and Zone II Conservation Restriction for Drinking Water Supply Protection" filed at the Barnstable Land Registry District as Document Number 1.066.694 noted on Land Court Certificate Number 129282.

Desired Future Condition:
Maintain the current natural community type within its natural range of variability.

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OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	2A 2B 2C	Pitch Pine/Oak	6.6 10.3 11.5 28.4 – Total	5 – Black Oak 5 – White Oak 8 – Pitch Pine 5 – Snags 6 – All Species	39 – Black Oak 6 – White Oak 44 – Pitch Pine 5 – Snags 94 – All Species	257 – Black Oak 40 – White Oak 116 – Pitch Pine 40 – Snags 453 – All Species	- 39 - Eastern White Pine

NHESP Natural Community Type:
Mixed Oak Forest

Canopy, Regeneration, & Ground Cover:
The mixed oak/pine canopy averages 36 ft. in height with a maximum height of 50 ft. Tree regeneration consists of scattered black oak (*Quercus velutina*) and white oak (*Quercus alba*) seedlings and advanced regeneration of less than 4 DBH. The shrub layer consists of primarily of blueberry (*Vaccinium angustifolium*) and scattered black huckleberry (*Gaylussacia baccata*), wintergreen (*Gaultheria procumbens*) with occasional small patches of catbrier (*Smilax spp.*) and highbush blueberry (*Vaccinium corymbosum*). The herb layer contains bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), and occasional pink lady's slipper (*Cypripedium acaule*).

Wildlife & Rare Plants & Animals:
These stands have the potential of supporting many of the common insect and wildlife species that occur throughout southeastern Massachusetts. The acorn production from oaks trees, berry production from blueberries and huckleberry, close proximity of water, and continuous undeveloped land adjacent to these stands increases their value to wildlife species. The stands have potential wildlife habitat value for reptiles and amphibians such as northern redbelly snakes (*Storeria occipitomaculata*), northern black racers (*Coluber constrictor constrictor*) and Spotted Salamanders (*Ambystoma maculatum*); birds such as sharp-shinned hawks (*Accipiter striatus*), cooper's hawks (Accipiter cooperii), broad-winged hawks (*Buteo platypterus*), wild turkeys (*Meleagris gallopavo*), mourning doves (*Zenaida macroura*), Red-eyed Vireo (*Vireo olivaceus*), Black-and-white Warbler (*Mniotilta varia*), Great Crested Flycatcher (Miarchus crinitus), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Red-bellied Woodpecker (*Melanerpes carolinus*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatches (*Sitta carolinensis*), hermit thrushes (*Catharus guttatus*), wood thrushes (*Hylocichla mustelina*), ovenbirds (*Seiurus aurocapillus*), and scarlet tanagers (*Piranga olivacea*); and mammals such as Virginia opossums (*Didelphis virginiana*), gray squirrels (*Sciurus carolinensis*),white-footed mice (*Hylocichla mustelina*), and white-tailed deer (*Odocoileus virginianus*). No rare plants or animals were observed. The Natural Heritage & Endangered Species Program identifies no state listed plants or animals as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stands consists of sand and gravel deposits. Soil within the stands consists of several areas Carver coarse sand with 0% to 3% slope (252A) and Carver coarse sand with 8% to 15% slope (252C). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production.

Cultural & Recreational Features:
Several small trails that originate from the cranberry bog (Stand-7) are located in these stands. No other manmade or cultural resources were observed.

Past Land Use & Stand Age:
No evidence of past tree cutting was observed. Stand condition and soil conditions make past land use for the site to have

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been grazed by farm animals 80 or more years ago. The stand age is approximately 80 to 100 years old based on stand appearance and common land use and abandonment for the area.

Disturbance, Forest Health, and Invasive Species:
General forest health is good. Several areas along trails have limited erosion as a result of all-terrain vehicle use. Along the property bounty on the east side of Stand-2B abutters have been dumping yard waste, a potential source for invasive species. Along the northwestern edge of Stand-2C is evidence of topsoil disturbance from excavation, the areas is less than 20 square feet in size. No evidence of wildland fire, insect infestations, forest diseases, or invasive species were observed.

Wildfire Fuel Conditions:
Surface fuels consist of Fire Behavior Prediction System Fuel Model Shrub-6 (SH6 – 146 - Low Load, Humid Climate Shrub). Crown fuels have a canopy fuel loading of 1.72 t/ac, canopy bulk density of 0.0044 lbs/ft^2, canopy base height of 18 ft, and a canopy ceiling of 50 ft, with an average stand height of 35 ft. Under the crown fire modeling "Design Conditions" outlined in 2012 "Barnstable County Wildfire Preparedness Plan"; areas of these stands have a low potential of passive to active crown fire occurring in a wildfire.

Timber & Natural Resource Values:
Current and future timber value is limited due to the species composition of the forest and site conditions common to the area. Timber products would be limited to firewood and biomass. The greatest value to the stand is associated with maintenance of the aquifer, biological diversity, recreational use, and open space.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" or "Potential Vernal Pools" are present in these stands and no Department of Environmental Protection Identified wetlands or 100 foot wetland buffers are present in these stands. None of the three stands fall within NHESP designated "Priority Habitat". All of the three stands fall within NHESP BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas. Certain activities within all of Stand-2A, the northern portion of Stand-2B, and a small portion of the northern line of Stand-2C are restricted under the 11 June, 2007 "Easement and Zone II Conservation Restriction for Drinking Water Supply Protection" filed at the Barnstable Land Registry District as Document Number 1.066.694 noted on Land Court Certificate Number 129282.

Desired Future Condition:
Maintain the current natural community type within its natural range of variability.

OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	3A 3B	Pitch Pine/Oak	10.8 3.5 14.3 – Total	5 – Black Oak 4 – White Oak 7 – Pitch Pine 4 – Snags 6 – All Species	21 – Black Oak 3 – White Oak 71 – Pitch Pine 1 – Snags 96 – All Species	140 – Black Oak 35 – White Oak 240 – Pitch Pine 15 – Snags 430 – All Species	- 39 - Eastern White Pine

NHESP Natural Community Type:
Pitch Pine – Oak Forest/Woodland

Canopy, Regeneration, & Ground Cover:

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The mixed pine/oak canopy averages 37 ft. in height with a maximum height of 49 ft. Tree regeneration consists of scattered black oak (*Quercus velutina*) and white oak (*Quercus alba*) seedlings and advanced regeneration of less than 4 DBH. The shrub layer consists of primarily of blueberry (*Vaccinium angustifolium*) and scattered black huckleberry (*Gaylussacia baccata*), wintergreen (*Gaultheria procumbens*) with occasional small patches of catbrier (*Smilax spp.*) and highbush blueberry (*Vaccinium corymbosum*). The herb layer contains bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), and occasional pink lady's slipper (*Cypripedium acaule*).

Wildlife & Rare Plants & Animals:
These stands have the potential of supporting many of the common insect and wildlife species that occur throughout southeastern Massachusetts. The acorn production from oaks trees, berry production from blueberries and huckleberry, close proximity of water, and continuous undeveloped land adjacent to these stands increases their value to wildlife species. The stands have potential wildlife habitat value for reptiles and amphibians such as northern redbelly snakes (*Storeria occipitomaculata*), northern black racers (*Coluber constrictor constrictor*) and Spotted Salamanders (*Ambystoma maculatum*); birds such as sharp-shinned hawks (*Accipiter striatus*), cooper's hawks (Accipiter cooperii), broad-winged hawks (*Buteo platypterus*), wild turkeys (*Meleagris gallopavo*), mourning doves (*Zenaida macroura*), Red-eyed Vireo (*Vireo olivaceus*), Black-and-white Warbler (*Mniotilta varia*), Great Crested Flycatcher (Miarchus crinitus), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Red-bellied Woodpecker (*Melanerpes carolinus*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatches (*Sitta carolinensis*), hermit thrushes (*Catharus guttatus*), wood thrushes (*Hylocichla mustelina*), ovenbirds (*Seiurus aurocapillus*), and scarlet tanagers (*Piranga olivacea*); and mammals such as Virginia opossums (*Didelphis virginiana*), gray squirrels (*Sciurus carolinensis*),white-footed mice (*Hylocichla mustelina*), and white-tailed deer (*Odocoileus virginianus*). The Natural Heritage & Endangered Species Program identifies no state listed plants and four state listed animals; spiny oakworm (*Anisota stigma*) a state species of special concern, imperial moth (*Eacles imperialis*) a state threatened species, orange sallow moth (*Rhodoecia aurantiago*) a state threatened species, and eastern box turtle (*Terrapene carolina*) a state species of special concern as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stands consists of sand and gravel deposits. Soil within the stands consists of several areas Carver coarse sand with 0% to 3% slope (252A) and Carver coarse sand with 8% to 15% slope (252C). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production.

Cultural & Recreational Features:
Several small trails that originate from the cranberry bog (Stand-7) are located in these stands. No other manmade or cultural resources were observed.

Past Land Use & Stand Age:
No evidence of past tree cutting was observed. Stand condition and soil conditions make past land use for the site to have been grazed by farm animals 80 or more years ago. The stand age is approximately 80 to 100 years old based on stand appearance and common land use and abandonment for the area.

Disturbance, Forest Health, and Invasive Species:
General forest health is good. Several areas along trails have limited erosion as a result of all-terrain vehicle use. No evidence of wildland fire, insect infestations, forest diseases, or invasive species were observed.

Wildfire Fuel Conditions:
Surface fuels consist of Fire Behavior Prediction System Fuel Model Shrub-6 (SH6 – 146 - Low Load, Humid Climate Shrub). Crown fuels have a canopy fuel loading of 2.82 t/ac, canopy bulk density of 0.0077 lbs/ft^2, canopy base height

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of 21 ft, and a canopy ceiling of 49 ft, with an average stand height of 37 ft. Under the crown fire modeling "Design Conditions" outlined in 2012 "Barnstable County Wildfire Preparedness Plan"; areas of these stands have a potential of passive to active crown fire occurring in a wildfire.

Timber & Natural Resource Values:
Current and future timber value is limited due to the species composition of the forest and site conditions common to the area. Timber products would be limited to firewood and biomass. The greatest value to the stand is associated with maintenance of the aquifer, biological diversity, recreational use, and open space.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" or "Potential Vernal Pools" are present in these stands and no Department of Environmental Protection Identified wetlands or 100 foot wetland buffers are present in these stands. None of the three stands fall within NHESP designated "Priority Habitat". All of the two stands fall within NHESP BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas. Certain activities within the northern portion of Stand-3 are restricted under the 11 June, 2007 "Easement and Zone II Conservation Restriction for Drinking Water Supply Protection" filed at the Barnstable Land Registry District as Document Number 1.066.694 noted on Land Court Certificate Number 129282.

Desired Future Condition:
Maintain the current natural community type within its natural range of variability.

OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	4	Pitch Pine/Oak	4.6	6 – Black Oak 4 – White Oak 8 – Pitch Pine 4 – Snags 6 – All Species	19 – Black Oak 9 – White Oak 87 – Pitch Pine 1 – Snags 96 – All Species	100 – Black Oak 80 – White Oak 230 – Pitch Pine 10 – Snags 430 – All Species	- 39 - Eastern White Pine

NHESP Natural Community Type:
Pitch Pine – Oak Forest/Woodland

Canopy, Regeneration, & Ground Cover:
The mixed pine/oak canopy averages 39 ft. in height with a maximum height of 51 ft. Tree regeneration consists of scattered black oak (*Quercus velutina*) and white oak (*Quercus alba*) seedlings and advanced regeneration of less than 4 DBH. The shrub layer consists of primarily of blueberry (*Vaccinium angustifolium*) and scattered black huckleberry (*Gaylussacia baccata*), wintergreen (*Gaultheria procumbens*) with occasional small patches of catbrier (*Smilax spp.*) and highbush blueberry (*Vaccinium corymbosum*). The herb layer contains bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), and occasional pink lady's slipper (*Cypripedium acaule*).

Wildlife & Rare Plants & Animals:
The stand has the potential of supporting many of the common insect and wildlife species that occur throughout southeastern Massachusetts. The acorn production from oaks trees, berry production from blueberries and huckleberry, close proximity of water, and continuous undeveloped land adjacent to the stand increases its value to wildlife species. The stand haas potential wildlife habitat value for reptiles and amphibians such as northern redbelly snakes (*Storeria occipitomaculata*), northern black racers (*Coluber constrictor constrictor*) and Spotted Salamanders (*Ambystoma maculatum*); birds such as sharp-shinned hawks (*Accipiter striatus*), cooper's hawks (Accipiter cooperii), broad-winged

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hawks (*Buteo platypterus*), wild turkeys (*Meleagris gallopavo*), mourning doves (*Zenaida macroura*), Red-eyed Vireo (*Vireo olivaceus*), Black-and-white Warbler (*Mniotilta varia*), Great Crested Flycatcher (Miarchus crinitus), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*), Red-bellied Woodpecker (*Melanerpes carolinus*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatches (*Sitta carolinensis*), hermit thrushes (*Catharus guttatus*), wood thrushes (*Hylocichla mustelina*), ovenbirds (*Seiurus aurocapillus*), and scarlet tanagers (*Piranga olivacea*); and mammals such as Virginia opossums (*Didelphis virginiana*), gray squirrels (*Sciurus carolinensis*),white-footed mice (*Hylocichla mustelina*), and white-tailed deer (*Odocoileus virginianus*). The Natural Heritage & Endangered Species Program identifies no state listed plants and four state listed animals; spiny oakworm (*Anisota stigma*) a state species of special concern, imperial moth (*Eacles imperialis*) a state threatened species, orange sallow moth (*Rhodoecia aurantiago*) a state threatened species, and eastern box turtle (*Terrapene carolina*) a state species of special concern as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stand consists of sand and gravel deposits. Soil within the stand consists of several areas Carver coarse sand with 3% to 8% slope (252B) and Carver coarse sand with 8% to 15% slope (252C); with a small area of the stand being over Carver coarse sand with 15% to 35% slope (252D). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production.

Cultural & Recreational Features:
Several small trails that originate from the cranberry bog (Stand-7) and the field (Stand-6) are located in the stand. No other manmade or cultural resources were observed.

Past Land Use & Stand Age:
No evidence of past tree cutting was observed. Stand condition and soil conditions make past land use for the site to have been grazed by farm animals 80 or more years ago. The stand age is approximately 80 to 100 years old based on stand appearance and common land use and abandonment for the area.

Disturbance, Forest Health, and Invasive Species:
General forest health is good. Several areas along trails have limited erosion as a result of all-terrain vehicle use. No evidence of wildland fire, insect infestations, forest diseases, or invasive species were observed.

Wildfire Fuel Conditions:
Surface fuels consist of Fire Behavior Prediction System Fuel Model Shrub-6 (SH6 – 146 - Low Load, Humid Climate Shrub). Crown fuels have a canopy fuel loading of 3.33 t/ac, canopy bulk density of 0.0085 lbs/ft^2, canopy base height of 23 ft, and a canopy ceiling of 51 ft, with an average stand height of 36 ft. Under the crown fire modeling "Design Conditions" outlined in 2012 "Barnstable County Wildfire Preparedness Plan"; areas of the stand have a potential of passive to active crown fire occurring in a wildfire.

Timber & Natural Resource Values:
Current and future timber value is limited due to the species composition of the forest and site conditions common to the area. Timber products would be limited to firewood and biomass. The greatest value to the stand is associated with maintenance of the aquifer, biological diversity, recreational use, and open space.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" or "Potential Vernal Pools" are present in the stand and no Department of Environmental Protection Identified wetlands or 100 foot wetland buffers are present in the stand. None of the stand falls within NHESP designated "Priority Habitat". The entire stand falls within NHESP BioMap2 Core Habitat, Critical

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Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas.

Desired Future Condition:
Maintain the current natural community type within its natural range of variability.

OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	5	Disturbed Pitch Pine	2.8	4 – Pitch Pine	18 – Pitch Pine	180 – Pitch Pine	- 39 - Eastern White Pine

NHESP Natural Community Type:
None

Canopy, Regeneration, & Ground Cover:
The pine canopy averages 27 ft. in height with a maximum height of 30 ft. In the northern edge of the stand is a failing Scotch pine (*Pinus sylvestris*) remnant plantation that is approximately 0.2 aces in size; trees are approximately 8 inches DBH, off the approximately 70 trees in this area 25% are dead with another 25% dying. No tree regeneration is present in this stand. The shrub layer consists of primarily of scattered blueberry (*Vaccinium angustifolium*).

Wildlife & Rare Plants & Animals:
The stand has the potential of supporting some of the common insect and wildlife species that occur throughout southeastern Massachusetts. Due to the lack of mast producing trees and berry producing shrubs the stands bennifit to wildlife is limited. The stand has potential wildlife habitat value for birds such as Black-and-white Warbler (*Mniotilta varia*), tufted titmouse (*Baeolophus bicolor*), and ovenbirds (*Seiurus aurocapillus*); and mammals such as gray squirrels (*Sciurus carolinensis*) and white-footed mice (*Hylocichla mustelina*). The Natural Heritage & Endangered Species Program identifies no state listed plants or animals as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stand consists of sand and gravel deposits. Soil within the stand consists of several areas Carver coarse sand with 0% to 3% slope (252A) and Carver coarse sand with 3% to 8% slope (252B); with the majority of the stand being over Carver coarse sand with 8% to 15% slope (252C). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production.

Cultural & Recreational Features:
Several small trails that originate from the cranberry bog (Stand-7) and the field (Stand-6) are located in the stand and a cellar hole is located in the northern portion of the stand. No other manmade or cultural resources were observed.

Past Land Use & Stand Age:
The area was heavily disturbed with abandonment and establishment of the current pitch pine stand approximately 30 to 40 years ago.

Disturbance, Forest Health, and Invasive Species:
General forest health is poor due to overcrowding of trees. The Scotch pine (*Pinus sylvestris*) area is very poor with the majority of the trees dyeing or likely to die within the next 5 to 10 years. No evidence of wildland fire, insect

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infestations, forest diseases, or invasive species were observed.

Wildfire Fuel Conditions:
Surface fuels consist of Fire Behavior Prediction System Fuel Model Timber Litter-3 (TL3 – 183 – Moderate Load Conifer Litter). Crown fuels have a canopy fuel loading of 1.02 t/ac, canopy bulk density of 0.0041 lbs/ft^2, canopy base height of 20 ft, and a canopy ceiling of 30 ft, with an average stand height of 27 ft. Under the crown fire modeling "Design Conditions" outlined in 2012 "Barnstable County Wildfire Preparedness Plan"; areas of the stand have a minimal potential of passive to active crown fire occurring in a wildfire.

Timber & Natural Resource Values:
Current and future timber value is limited due to the species composition of the forest and site conditions common to the area.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" or "Potential Vernal Pools" are present in the stand and no Department of Environmental Protection Identified wetlands or 100 foot wetland buffers are present in the stand. None of the stand falls within NHESP designated "Priority Habitat". The entire stand falls within NHESP BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas.

Desired Future Condition:
Allow to transition and mature pine forest.

OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	6	Abandoned Field	2.1	N/A	N/A	N/A	N/A

NHESP Natural Community Type:
None

Canopy, Regeneration, & Ground Cover:
The field consists of a mixture of warm season and cool season grasses intermixed forbs and woody species.

Wildlife & Rare Plants & Animals:
Open fields and early successional habitat is in decline and management of such habitat plays an important role in the preservation of grassland birds. The area has potential wildlife habitat value for reptiles and amphibians such as northern redbelly snakes (*Storeria occipitomaculata*) and northern black racers (*Coluber constrictor constrictor*); birds such as Eastern Meadowlarks (*Sturnella magna*), Broad-winged Hawk (*Buteo platypterus*), Red-tailed Hawk (*Buteo jamaicensis*), and northern bobwhite (*Colinus virginianus*); and mammals such as meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), and short-tailed shrew (*Blarina brevicauda*). The Natural Heritage & Endangered Species Program identifies no state listed plants or animals as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stand consists of sand and gravel deposits. Soil within the stand consists of Carver coarse sand with 3% to 8% slope (252B); with a small area of the stand being over Carver coarse sand with 15% to 35% slope (252D). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production.

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Cultural & Recreational Features:
A cellar hole is located in the western portion of the stand. No other manmade or cultural resources were observed.

Past Land Use & Stand Age:
The area at one time greater than 10 to 30 years ago was associated with farming operations. Following abandonment and within the last 5 to 10 years trees have been removed and the field maintained with mowing and supplemental palntings.

Disturbance, Forest Health, and Invasive Species:
Several invasive species were observed in the central portion of the field; honey locust (*Gleditsia triacanthos*), black locust, and black locust (*Robinia pseudoacacia*), several non-native herbaceous species. At the edges of the field oriental Bittersweet (*Celastrus orbiculatus*) and honeysuckle (*Lonicera spp.*) was observed. The potential of expansion from the observed invasive species in this area is high in the absence of management. No evidence of wildland fire or insect infestations were observed.

Wildfire Fuel Conditions:
Surface fuels consist of Fire Behavior Prediction System Fuel Model Grass Shrub-2 (GS2 – 122 – Moderate Load, Dry Climate Grass-Shrub). No crown fuels occur in this stand, however several scatted trees could in wildfire.

Timber & Natural Resource Values:
No timber occurs in this area. The greatest value to the stand is associated with maintenance of the aquifer, biological diversity, recreational use, and open space.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" or "Potential Vernal Pools" are present in the stand and no Department of Environmental Protection Identified wetlands or 100 foot wetland buffers are present in the stand. None of the stand falls within NHESP designated "Priority Habitat". The entire stand falls within NHESP BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas.

Desired Future Condition:
Reduce the presence of invasive species and maintain the current open field.

OBJ	STD NO	FOREST TYPE	ACRES	MSD (Inches)	BA(ft^2/Acre)	VOL (Trees/Acre)	SITE INDEX
STEW	7	Open	12.2	N/A	N/A	N/A	N/A

NHESP Natural Community Type:
None

Canopy, Regeneration, & Ground Cover:
Along the edges of the stand and in clumps in the middle of sandy area sapling size to mature pitch pine (*Pinus rigida*) occurs. The cranberry bog contains 5 to 15 year old pitch pine (*Pinus rigida*) regeneration ranging in height from 5 to 20 feet. The bog areas are dominated by formerly cultivated cranberries.

Wildlife & Rare Plants & Animals:
Water in and around the cranberry bog is a valuable resource for wildlife in and around the bog. The open sand ares adjacent to the bog provide nesting areas for turtles. Open fields and early successional habitat is in decline and management of such habitat plays an important role in the preservation of grassland birds. The area has potential wildlife

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habitat value for reptiles and amphibians such as northern redbelly snakes (*Storeria occipitomaculata*), northern black racers (*Coluber constrictor constrictor*), snapping turtle (*Chelydra serpentina*), and (*Chrysemys picta*); birds such as Eastern Meadowlarks (*Sturnella magna*), Broad-winged Hawk (*Buteo platypterus*), and Red-tailed Hawk (*Buteo jamaicensis*); and mammals such as meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), and short-tailed shrew (*Blarina brevicauda*). The Natural Heritage & Endangered Species Program identifies no state listed plants or animals as being associated with this natural community type.

Geology, Topography, and Soils:
Surficial geology of the stand consists of sand and gravel deposits. Soil within the stand consists of several areas Carver coarse sand with 8% to 15% slope (252C) and Carver coarse sand with 15% to 35% slope (252D); with the majority of the stand being over Freetown coarse sand with 0% to 1 % slopes (55A). Carver soils have a very rapid permeability with available water capacity being very low. Depth to the seasonal high water table is more than 6 feet. The droughtiness of Carver soil is poorly suited to forest production. Freetown soils have a very rapid permeability in the mineral soil layer and moderately rapid permeability in the underlying organic layer and the available water capacity is high.

Cultural & Recreational Features:
Several small trails that lead into adjacent stands originate from this area. A small public parking area exists on the eastern side of the cranberry bog, with access off of Slough Road. No other manmade or cultural resources were observed that were not associated with prior bog management activities.

Past Land Use & Stand Age:
The area was in active cranberry bog management until 5 to 10 years ago when it management activities were abandoned.

Disturbance, Forest Health, and Invasive Species:
No evidence of wildland fire was observed however multiple sites were observed where unauthorized recreational fire pits were. No evidence of insect infestations, forest diseases, or invasive species were observed.

Wildfire Fuel Conditions:
Under most conditions the area would not carry surface fire and would be classified as a non-burnable Fire Behavior Prediction System Fuel Model such as Articulate (NB3 – 93), Open Water (NB8 – 98), or Bare Ground (NB9 – 99).

Timber & Natural Resource Values:
No timber occurs in this area. The greatest value to the stand is associated with maintenance of the aquifer, biological diversity, recreational use, and open space.

Regulated, Restricted Use, and Sensitive Area:
No NHESP "Certified Vernal Pools" or "Potential Vernal Pools" are present in the area. The entire area is within a Department of Environmental Protection Identified wetlands and/or 100 foot wetland buffers zone. None of the stand falls within NHESP designated "Priority Habitat". All of the three stands fall within NHESP BioMap2 Core Habitat, Critical Natural Landscape, Species of Conservation Concern, and Core Natural Landscape Block designated areas. Certain activities within the stand are restricted under the 11 June, 2007 "Easement and Zone II Conservation Restriction for Drinking Water Supply Protection" filed at the Barnstable Land Registry District as Document Number 1.066.694 noted on Land Court Certificate Number 129282.

Desired Future Condition:
Allow to transition and revert back to a forest wetland system.

dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

MANAGEMENT PRACTICES

to be done within next 10 years

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	ALL	N/A	Establish Boundary Markings & Maintain Boundary Markings	79.4	N/A	N/A	2013 & Every 3 Years

Goal: General Property Management – Identify property boundaries and prevent un-authorized activities and encroachment.

Action: Initial Treatment (Boundary Establishment & Marking) – Boundaries for the property should be established and marked for the entire property with the exception of the portion of the boundary abutting Slough Road where no marking is required. All property corners and any property lines not directly on Slough Road will need to be established and marked using blaze, paint, flagging, or signs every 100 to 200 feet. The total liner feet of boundary requiring marking is approximately 8,797.

Action: Maintenance Treatment (Boundary Marking) – Boundary markings should be checked every 3 years and refreshed or replaced as needed.

NRCS Practice Code: 472 (Access Control - Forest Boundary Line)

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	ALL	N/A	Education & Awareness	N/A	N/A	N/A	Ongoing

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property and reduce the threat of wildfire to property and life on lands adjacent to the property using education and awareness programs.

Action: Ongoing (Reduce Structural Ignitability) – Educate property owners in communities adjacent to the property on the issues associated with defensible space, the hazards of wildfire, and the measures they can take to prevent damage to life and property. The total number of residences range from 200 to 250.

NRCS Practice Code: None

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	7	N/A	Road Improvement	N/A	N/A	N/A	2013

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property.

Action: One Time Installation (Road Grading) – The dirt road entrance from Slough Road into the property through Stand-7 (cranberry bog) should be improved to better facilitate access and egress for the public and emergency vehicles and reduce the potential of erosion. The total liner feet of road requiring improvement is approximately 75.

NRCS Practice Code: 472 (Access Road – Forest Erosion Control)

dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	7	N/A	Dry Hydrant	N/A	N/A	N/A	2013

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property.

Action: One Time Installation (Dry Hydrant) – Install a dry hydrant in the eastern portion of Stand-7 (cranberry bog) to enable refilling of firefighting equipment in the event of a wild fire.

NRCS Practice Code: None

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	1C & 7	N/A	Access Restriction & Gates	N/A	N/A	N/A	2013

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property.

Action: One Time Installation (Gate) – Install a gate in the northeastern portion of Stand-1C at the beginning of the dirt road/trail entering the property from Slough Road.

Action: One Time Installation (Gate & Vehicle Obstacles) – Install a gate and obstacles to prevent vehicle passage (boulders or similar) in the eastern portion of Stand-7 (cranberry bog) to restrict access into the property beyond the public parking area.

NRCS Practice Code: None

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	2B	N/A	Road Clearance Improvement	N/A	N/A	N/A	2013& Every 4 Years

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property and reduce wildfire hazard within the property using an integrated and proactive land management.

Action: Initial Treatment (Limbing and Brush Cutting) – The dirt road entrance from Slough Road into the property to the gate at Stand-6 (old field) should have low hanging limbs and brush encroaching into the road bed removed so that wildland fire equipment can more easily access and egress the property. The total liner feet of road requiring improvement is approximately 295.

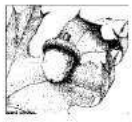
Action: Maintenance Treatment (Limbing and Brush Cutting) – The dirt road entrance from Slough Road into the property to the gate at Stand-6 (old field) will need to be maintained by additional limb removal and brush cutting every 4 to 5 years.

NRCS Practice Code: None

dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program



OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	2C & 3A	N/A	Turn Around Point & Reduced Fuel Safety Area	0.7	N/A	N/A	2013& Every 4 Years

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property and reduce wildfire hazard within the property using an integrated and proactive land management.

Action: Initial Treatment (Surface Fuel Mastication) – Cut and remove all pitch pines within the triangle formed by the dirt road/trail in the southwest corner of Stand-3A, all stumps should be flush cut to the ground to reduce the chance of damaging emergency vehicle tires.

Action: Initial Treatment (Thinning From Below) – Around the triangle formed by the dirt road/trail in the southwest corner of Stand-3A, reduce the potential of crown fire by increasing the canopy base height and reducing canopy bulk density by removing one out of every three (approximately 150 trees) pitch pines (*Pinus rigida*) trees, preferentially selecting for trees in the 4 to 8 inch size classes.

Action: Maintenance Treatment (Surface Fuel Mastication) – Around the triangle formed by the dirt road/trail in the southwest corner of Stand-3A, reduce the potential of crown fire and potential impact on wildland suppression resources by decreasing potential surface fire flame lengths by mowing the shrub layer with a brush cutter.

Action: Maintenance Treatment (Surface Fuel Mastication) – Around the triangle formed by the dirt road/trail in the southwest corner of Stand-3A, the brush cut area will need to be maintained by additional brush cutting every 3 to 4 years.

NRCS Practice Code: 394 (Firebreak – Construct Firebreak) for initial treatment and,
666 (Forest Stand Improvement – Light-Moderate Stand Thinning) for initial treatment, and
314 (Brush Management – Medium Mechanical) for maintenance treatments

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	1C, 2A, & 2B	N/A	Crown Fire Reduction Buffer	3.2	N/A	N/A	2013& Every 4 Years

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property and reduce wildfire hazard within the property using an integrated and proactive land management.

Action: Initial Treatment (Thinning From Below) – Within the buffer along the eastern side of the property reduce the potential of crown fire by increasing the canopy base height by 20% and reducing canopy bulk density by 30% by removing one out of every three (approximately 372 trees) pitch pines (*Pinus rigida*) trees, preferentially selecting for trees in the 4 to 8 inch size classes.

Action: Initial Treatment (Surface Fuel Mastication) – Within the buffer along the eastern side of the property reduce the potential of crown fire and potential impact on adjacent lands by decreasing potential surface fire flame lengths by mowing the shrub layer with a brush cutter.

Action: Maintenance Treatment (Surface Fuel Mastication) – Within the buffer along the eastern side of the property, maintain the reduced surface fuels by brush cutting every 3 to 4 years.

NRCS Practice Code: 394 (Firebreak – Construct Firebreak) for initial treatment and,

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FOREST MANAGEMENT PLAN

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666 (Forest Stand Improvement – Light-Moderate Stand Thinning) for initial treatment, and
314 (Brush Management – Medium Mechanical) for maintenance treatments

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	1C, 2A, 2B, 2C, 5, & 6	N/A	Reduced Fuel Road Buffer	3.8	N/A	N/A	2013& Every 4 Years

Goal: Wildland Fire Hazard Reduction – Increase firefighter and public safety by decreasing wildland fire risk in and around the property and reduce wildfire hazard within the property using an integrated and proactive land management.

Action: Initial Treatment (Limbing and Brush Cutting) – Along the dirt road/trail running south from Slough Road through Stands-1C, 2B, and 3A and the dirt road/trail running east/west from the gate in Stand-6 (old field) to the western side of the property, improve access and egress by removing low hanging limbs, brush encroaching into the road bed and removing trees that would block emergency vehicle passage.

Action: Initial Treatment (Thinning From Below) – Along the dirt road/trail running south from Slough Road through Stands-1C, 2B, and 3A and running east/west from the gate in Stand-6 (old field) to the western side of the property reduce potential fire behavior with the brush cutting of the shrubs to a width of 30 feet of both sides of the road.

Action: Maintenance Treatment (Surface Fuel Mastication) – The brush cut road buffer will need to be maintained with brush cutting every 3 to 4 years.

NRCS Practice Code: 394 (Firebreak – Construct Firebreak) for initial treatment and
314 (Brush Management – Medium Mechanical) for maintenance treatments

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	5	Disturbed Pitch Pine	Stand Conversion to Field	4.5	N/A	N/A	N/A

Goal: Ecological & Wildlife Habitat – Allow to transition and mature pine forest.

Action: None – Other than "General Property Management" and "Wildland Fire Hazard Reduction" action already recommended for portions of this stand no silvicultural prescription is recommended for during the next ten years. Ensure that management actions in neighboring stands do not impact this stand.

NRCS Practice Code: None

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	6	Old Field	Old Field Maintenance & Invasive Species Control	4.6	N/A	N/A	2013& Annually

Goal: Ecological & Wildlife Habitat – Reduce the presence of invasive species and maintain the current open field.

Action: Initial Treatment (Herbicide Application & Brush Cutting) – Through a combination of mechanical cutting and herbicide application, treat non-desirable herbaceous and woody invasive species along the edges and in the interior of the

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FOREST MANAGEMENT PLAN

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field.

Action: Maintenance Treatment (Mowing & Brush Cutting) – Mow and brush cut the field annually.

NRCS Practice Code: 314 (Brush Management – Mechanical-Chemical) for initial treatment and,
314 (Brush Management – Light Mechanical) for maintenance treatments

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B, & 4	Pitch Pine/Oak	None	50.2 (remaining)	N/A	N/A	N/A

Goal: Ecological & Wildlife Habitat – Maintain the current natural community types within their natural range of variability.

Action: None – Other than "General Property Management" and "Wildland Fire Hazard Reduction" action already recommended for portions of these stands no silvicultural prescription is recommended for during the next ten years. Ensure that management actions in neighboring stands do not impact this stand.

NRCS Practice Code: None

OBJ	STD NO	TYPE	SILVICULTURAL PRESCRIPTION	AC	TO BE REMOVED		TIMING
					BA/AC	TOT VOL	
STEW	7	Open	None	12.2	N/A	N/A	N/A

Goal: Ecological & Wildlife Habitat – Allow to transition and revert back to a forest wetland system.

Action: None – Other than "General Property Management" and "Wildland Fire Hazard Reduction" action already recommended for portions of this stand no silvicultural prescription is recommended for during the next ten years. Ensure that management actions in neighboring stands do not impact this stand.

NRCS Practice Code: None

dcr

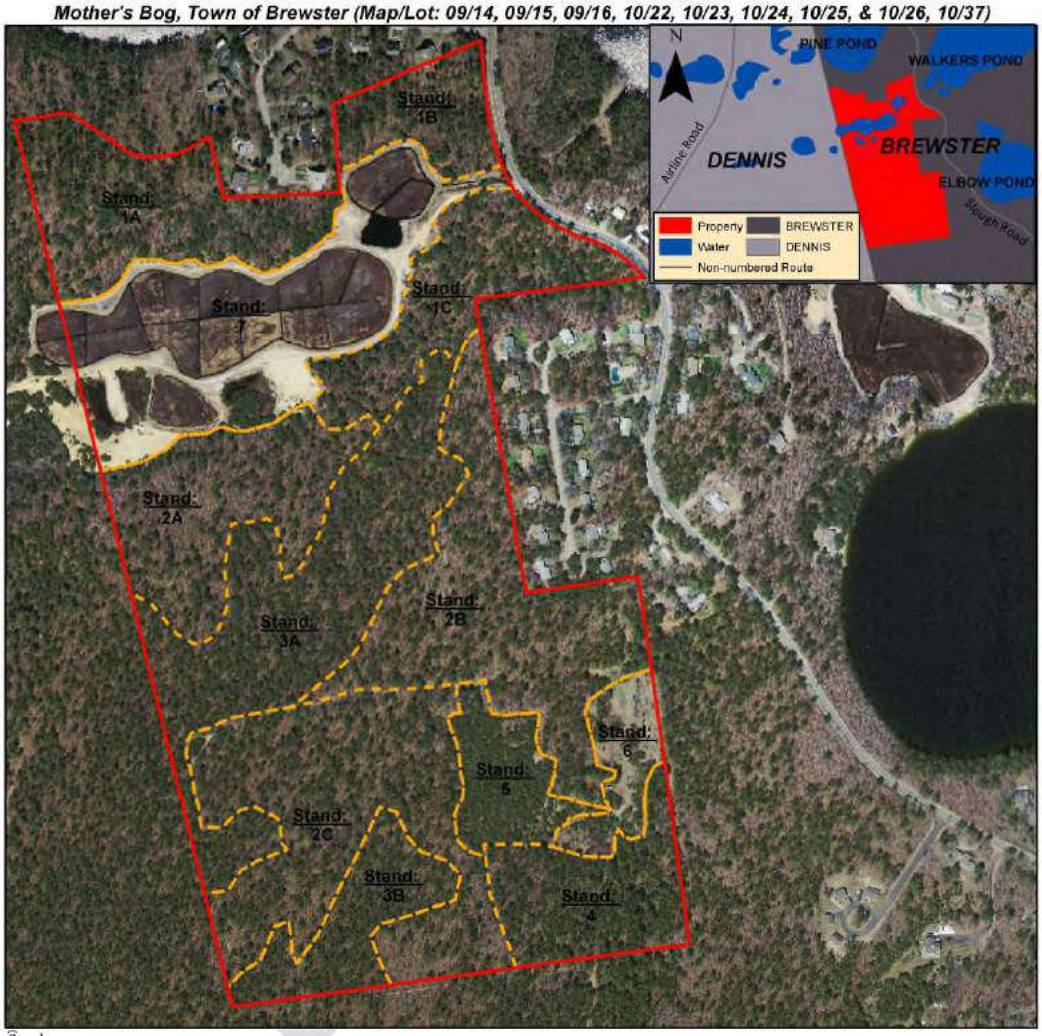
FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Property Ortho Photo & Locus Map

Brewster, Massachusetts

Mother's Bog, Town of Brewster (Map/Lot: 09/14, 09/15, 09/16, 10/22, 10/23, 10/24, 10/25, & 10/26, 10/37)



NAD 1983 - State Plane Massachusetts Mainland (Meters)

Property Boundary Stand Line

0 100 200 400 600 Feet
0 20 40 60 120 160 200 Meters

Date Prepared: 08/29/12

Plan Preparer
Northeast Forest and Fire Management LLC
Joel R. Carlson, CF/FCA
29 Moody Drive
Sandwich, MA 02563-1820
508-274-2234
www.ne-ffm.com

Disclaimer: This map is for planning purposes only, specific points are subject to verification on the ground, and are not to be used by themselves for legal boundary definition.
Data Sources: Massachusetts Office of Geographic Information
Cape Cod Cooperative Extension
Northeast Forest and Fire Management, LLC

Property Owner
Town of Brewster
(Manager: Conservation Department)
2198 Main Street
Brewster, MA 02631
508-896-3701 Ext. 1135

Town of Brewster Mother's Bog Property Brewster
Page **27** of **33**

(Form revised April 2010)

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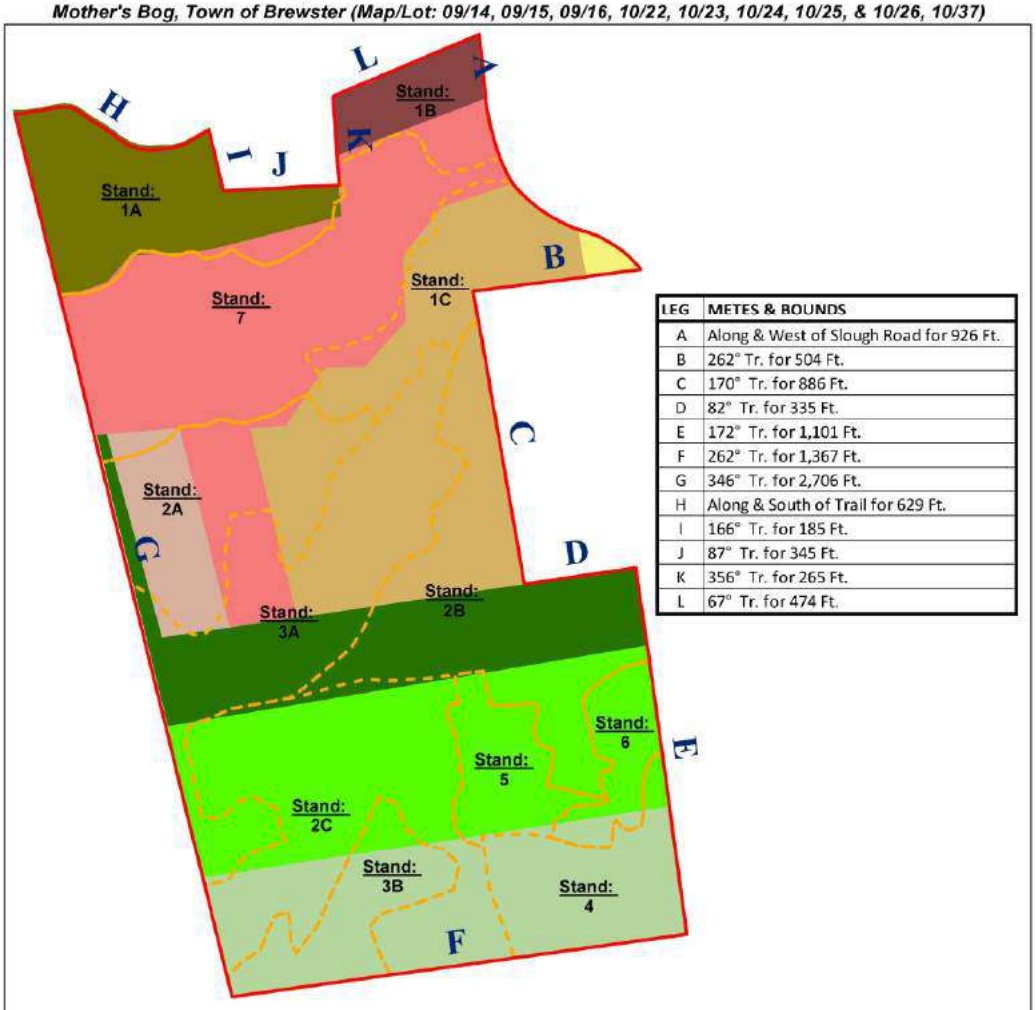
FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Property Boundary, Metes/Bounds & Parcels Brewster, Massachusetts

Mother's Bog, Town of Brewster (Map/Lot: 09/14, 09/15, 09/16, 10/22, 10/23, 10/24, 10/25, & 10/26, 10/37)



LEG	METES & BOUNDS
A	Along & West of Slough Road for 926 Ft.
B	262° Tr. for 504 Ft.
C	170° Tr. for 886 Ft.
D	82° Tr. for 335 Ft.
E	172° Tr. for 1,101 Ft.
F	262° Tr. for 1,367 Ft.
G	346° Tr. for 2,706 Ft.
H	Along & South of Trail for 629 Ft.
I	166° Tr. for 185 Ft.
J	87° Tr. for 345 Ft.
K	356° Tr. for 265 Ft.
L	67° Tr. for 474 Ft.

NAD 1983 - State Plane Massachusetts Mainland (Meters)

Property Boundary
Stand Line
Map/Lot: 10/22
Map/Lot: 10/25
Map/Lot: 9/14
Map/Lot: 10/23
Map/Lot: 10/26
Map/Lot: 9/15
Map/Lot: 10/24
Map/Lot: 10/37
Map/Lot: 9/16

0 100 200 400 600 Feet
0 20 40 80 120 160 200 Meters

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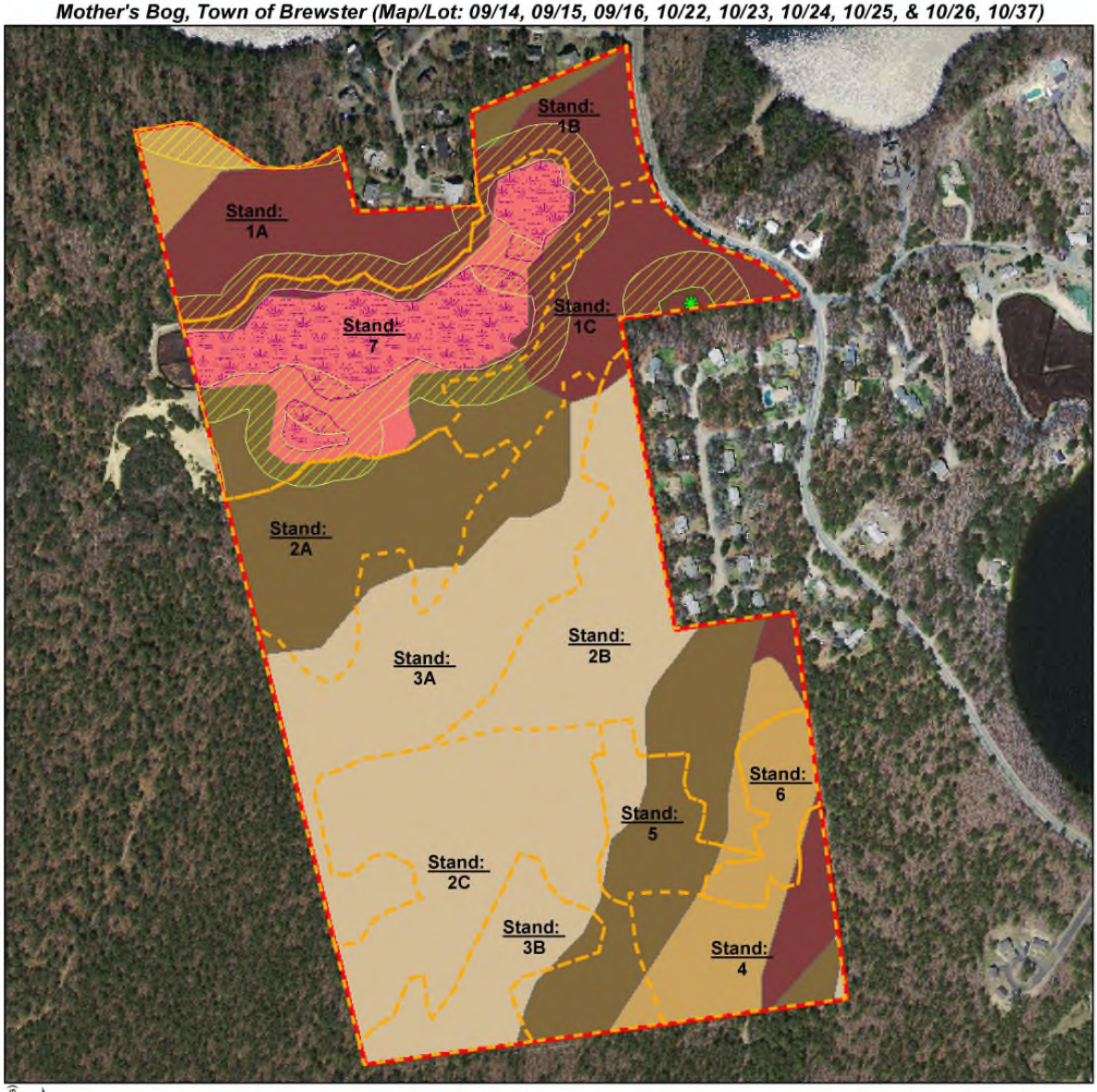
Town of Brewster | Mother's Bog Property | Brewster
Page **28** of **33**

Property Soils, Wetlands, & Priority Habitat Brewster, Massachusetts

Mother's Bog, Town of Brewster (Map/Lot: 09/14, 09/15, 09/16, 10/22, 10/23, 10/24, 10/25, & 10/26, 10/37)



Property Boundary
Stand Line
Potential Vernal Pool
100 Ft. Wetland Buffer
Priority Habitat
Cranberry Bog
Decidous Wooded Swamp

Soils
Carver coarse sand, 0% to 3% slopes (252A)
Carver coarse sand, 3% to 8% slopes (252B)
Carver coarse sand, 8% to 15% slopes (252C)
Carver coarse sand, 15% to 35% slopes (252D)
Freetown coarse sand, 0% to 1 % slopes (55A)

0 100 200 400 600 Feet
0 20 40 80 120 160 200 Meters

NAD 1983 - State Plane Massachusetts Mainland (Meters)

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FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Property Boundary, Trails, & Roads

Brewster, Massachusetts

Mother's Bog, Town of Brewster (Map/Lot: 09/14, 09/15, 09/16, 10/22, 10/23, 10/24, 10/25, & 10/26, 10/37)

NAD 1983 - State Plane Massachusetts Mainland (Meters)

Property Boundary
Stand Line
Cellar Hole
Gate
Dirt Road
Narrow Trail
Trail/Dirt Road

0 100 200 400 600 Feet
0 20 40 80 120 160 200 Meters

Date Prepared: 08/29/12

Plan Preparer
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508-896-3701 Ext. 1135

Town of Brewster | Mother's Bog Property | Brewster
Page **30** of **33**

(Form revised April 2010)

dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Property Boundary, Stands, & Treatments

Brewster, Massachusetts

Mother's Bog, Town of Brewster (Map/Lot: 09/14, 09/15, 09/16, 10/22, 10/23, 10/24, 10/25, & 10/26, 10/37)

Property Boundary | Stand Line | Trail/Dirt Road | Gate

Dry Hydrant | Road Improvement | Crown Fire Reduction Buffer
Gate | Turn Around Point | Reduced Fuel Road Buffer
Restrict Access | Road Clearance | Reduced Fuel Safety Area
Invasive Species Control & Old Field Maintenance

0 100 200 400 600 Feet
0 20 40 80 120 160 200 Meters

NAD 1983 State Plane Massachusetts Mainland (Meters)

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Town of Brewster | Mother's Bog Property | Brewster
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(Form revised April 2010)

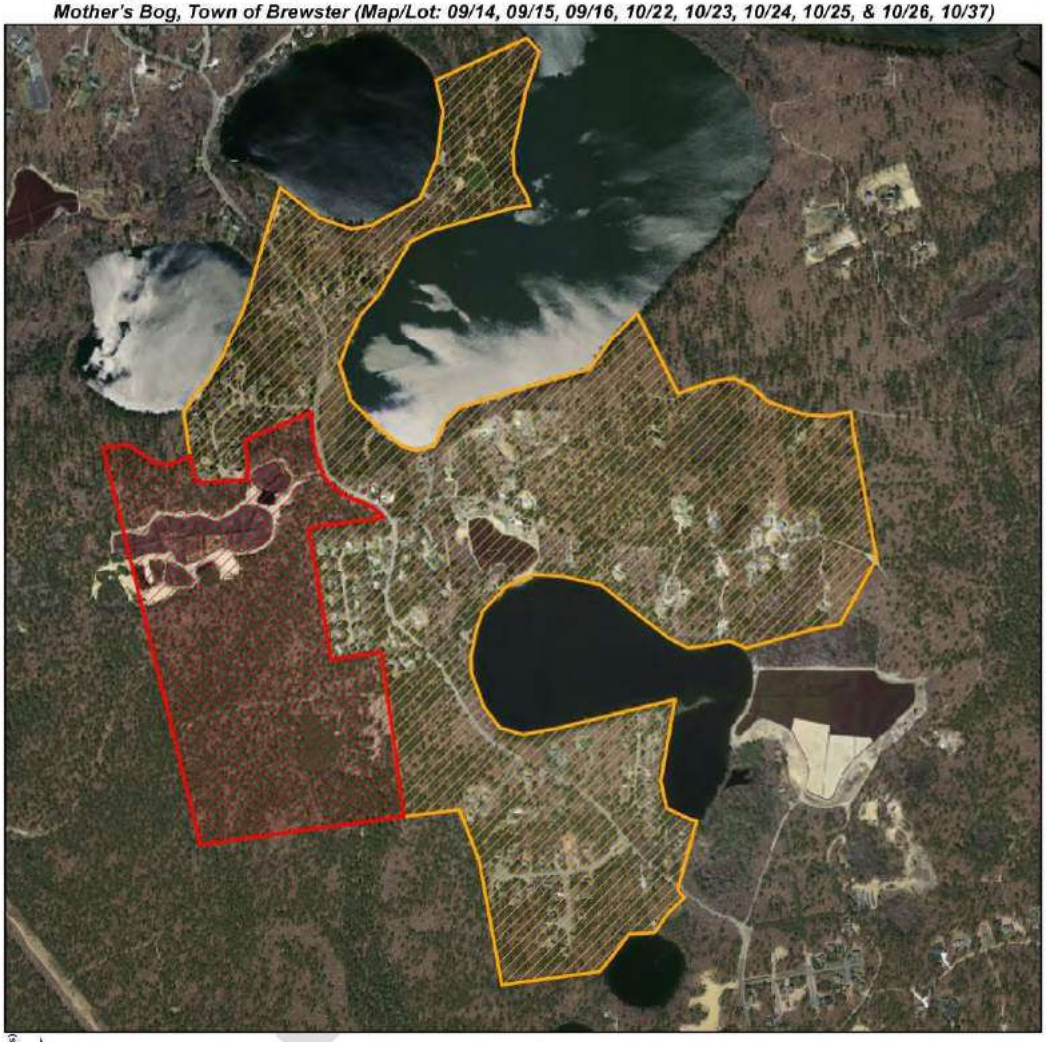
dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Property Boundary & Education/Awareness Brewster, Massachusetts

Mother's Bog, Town of Brewster (Map/Lot: 09/14, 09/15, 09/16, 10/22, 10/23, 10/24, 10/25, & 10/26, 10/37)



NAD 1983 - State Plane Massachusetts Mainland (Meters)

Property Boundary Education & Awareness Areas

0 0.02505 0.1 0.15 0.2 0.25 Miles
0 0.050.1 0.2 0.3 0.4 Kilometers

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Town of Brewster Mother's Bog Property Brewster
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(Form revised April 2010)

dcr

FOREST MANAGEMENT PLAN

Submitted to: Massachusetts Department of Conservation and Recreation
For enrollment in CH61/61A/61B and/or Forest Stewardship Program

Signature Page

Please check each box that applies.

☐ **CH. 61/61A Management Plan.** I attest that I am familiar with and will be bound by all applicable Federal, State, and Local environmental laws and /or rules and regulations of the Department of Conservation and Recreation. I further understand that in the event that
I convey all or any portion of this land during the period of classification, I am under obligation to notify the grantee(s) of all obligations of this plan which become his/hers to perform and will notify the Department of Conservation and Recreation of said change of ownership.

☒ **Forest Stewardship Plan.** When undertaking management activities, I pledge to abide by the management provisions of this Stewardship Management Plan during the ten year period following approval. I understand that in the event that I convey all or a portion
of the land described in this plan during the period of the plan, I will notify the Department of Conservation and Recreation of this change in ownership.

☐ **Green Certification.** I pledge to abide by the FSC Northeast Regional Standards and MA private lands group certification for a period of five years. To be eligible for Green Certification you must also check the box below.

☒ **Tax considerations.** I attest that I am the registered owner of this property and have paid any and all applicable taxes, including outstanding balances, on this property.

Signed under the pains of perjury:

Owner: _____ **Date:** _____
Town of Brewster

I attest that I have prepared this plan in good faith to reflect the landowner's interest.

Plan Preparer: _____ **Date:** _____
Joel R. Carlson

I attest that the plan satisfactorily meets the requirements of CH61/61A and/or the Forest Stewardship Program.

Approved, Service Forester: _____ **Date:** _____

Approved, Regional Supervisor: _____ **Date:** _____

In the event of a change of ownership of all or part of the property, the new owner must file an amended Ch. 61/61A **plan within 90 days from the transfer of title to insure continuation of** Ch. 61/61A **classification.**

Example Treatment Report

Barnstable County Wildfire Preparedness & Mitigation Grant

FY 2012 – FINAL REPORT

Name of Property:	Yarmouth Town Lands		
Property Owner/Manager:	Town of Yarmouth, Department of Natural Resources		
Town Completed In:	Yarmouth	**Date Work Completed:**	2012
Implementation Plan Project is Based On:	Wildland Fire Protection and Preparedness Plan for Yarmouth Town Lands		
Date of Plan:	June, 2008	**Plan Preparer:**	Northeast Forest and Fire Management, LLC

List Goals of Plan That Work Supports

A. Increase firefighter and public safety by decreasing wildland fire risk in and around the Yarmouth Town Lands identified in the Wildland Fire Protection and Preparedness Plan.

B. Reduce wildfire hazard within the Wildland Fire Protection and Preparedness Planning area for the Yarmouth Town Lands using an integrated and proactive land management program.

C. Reduce the threat of wildfire to property and life on lands adjacent to the Wildland Fire Protection and Preparedness Planning area for the Yarmouth Town Lands using education and awareness programs.

List Objectives of Plan That Work Supports

- Establish fuel reduction zones 100 to 200-feet in width at strategic locations based on prevailing winds that occur during wildfires, on property lines immediately adjacent to residential structures at the Yarmouth Town Lands Wildland Fire Protection and Preparedness Planning Area.

Information on 2012 Barnstable County Wildfire Preparedness Plan (CWPP)

Fire Management Focus Area: Yarmouth-6

Wildfire Hazard Rating Percent (approximate):

Low	Moderate	High	Extreme
0	0	100	0

Resources Benefited/Treated

Acres Treated: 8.4 **Structures Benefited:** 135

Project Summary: Surface fuels on town lands along the property boundaries adjacent to a residential community were masticated. A fuel reduction buffer zone of approximately 100 feet in width was created. The work was conducted by a private contractor using a compact tracked loader with a brush cutter attachment. Surface fuel horizontal continuity was broken up and average fuel depths reduced from approximately 2 feet to less than 0.25 feet on average. The fuel depth reduction is expected to reduce flame lengths in the buffer zone by as much as 25% to 50% and rate of spread by as much as 50%.

Describe Modifications to Project Implementation: None

Project Highlights: During the implementation of the project multiple property owners approached the contractor and expressed their support of the fuel buffer project and stated their relief knowing that proactive management was taking place that would provide protection from wildfire in the area.

Suggestions for Program Improvement: None

Attachments (NOTE: At a minimum, please attach 3 - 5 pictures for use in final report booklet)

Attachment 1. Project Photographs
Attachment 2. Project Area Map

BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

Name and Contact Information for Questions:	William D. Bonnetti, Field Supervisor Yarmouth Division of Natural Resources 597 Forest Road Extension West Yarmouth, MA 02673 Office Phone: (508) 760-4800 Email: BBonnetti@yarmouth.ma.us

Report Preparer's Signature: _____ **Date:** ___/___/___

William D. Bonnetti
(Print Name)

Field Supervisor
(Print Position Title)

Please submit an electronic copy including photos to bclark@barnstablecounty.org AND mail a signed hardcopy to Bill Clark, Cape Cod Cooperative Extension, P.O. Box 367, Barnstable, MA 02630.

Attachment 1. Project Photographs

Pre-treatment

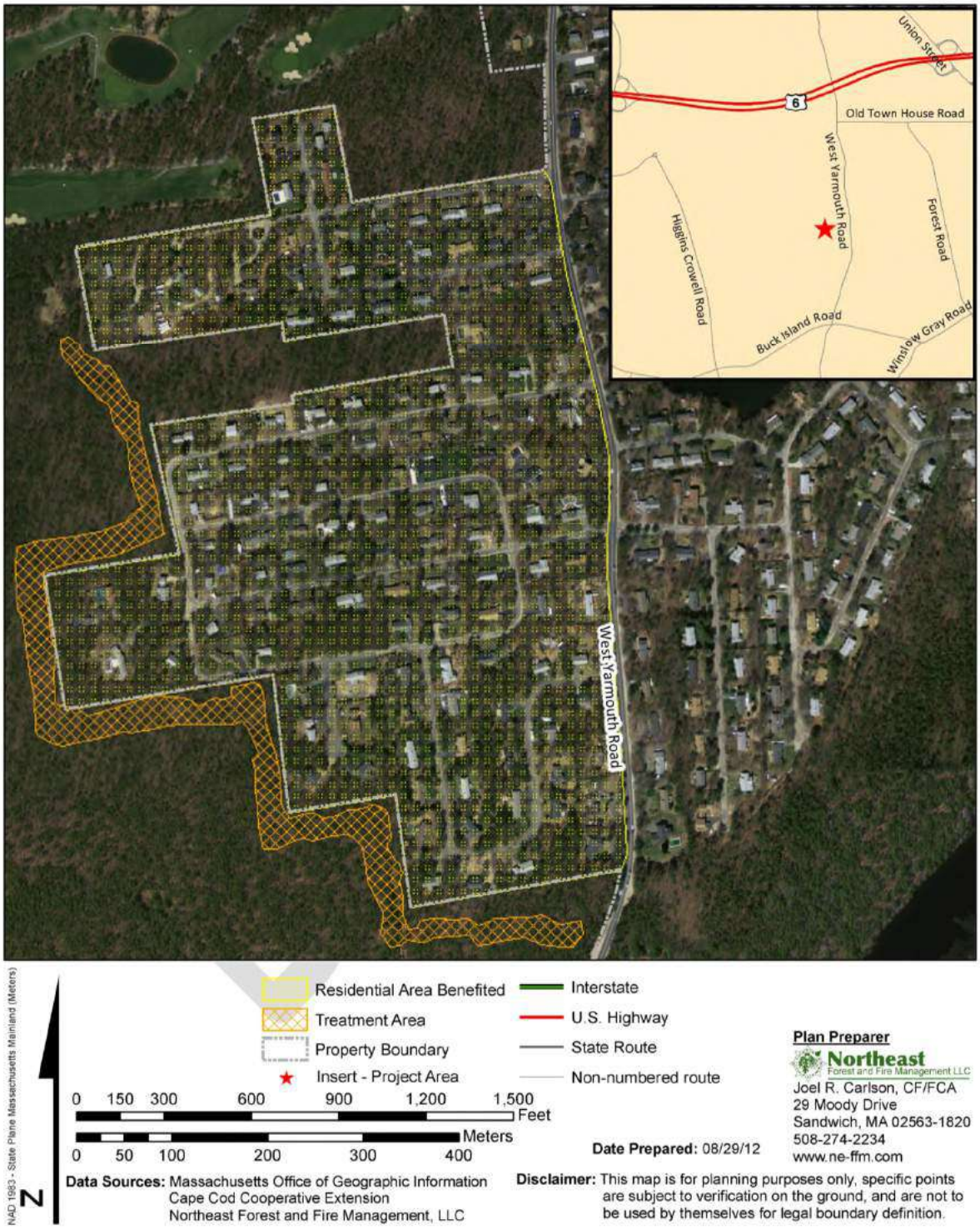
Compact Tracked Loader & Brush Cutter

Post-treatment

Post-treatment

Attachment 2. Project Area Map

2012 - Town of Yarmouth Wildland Fuel Treatment Area Map



APPENDIX B: TOWN WILDFIRE RISK MAPS AND DATA OVERVIEWS

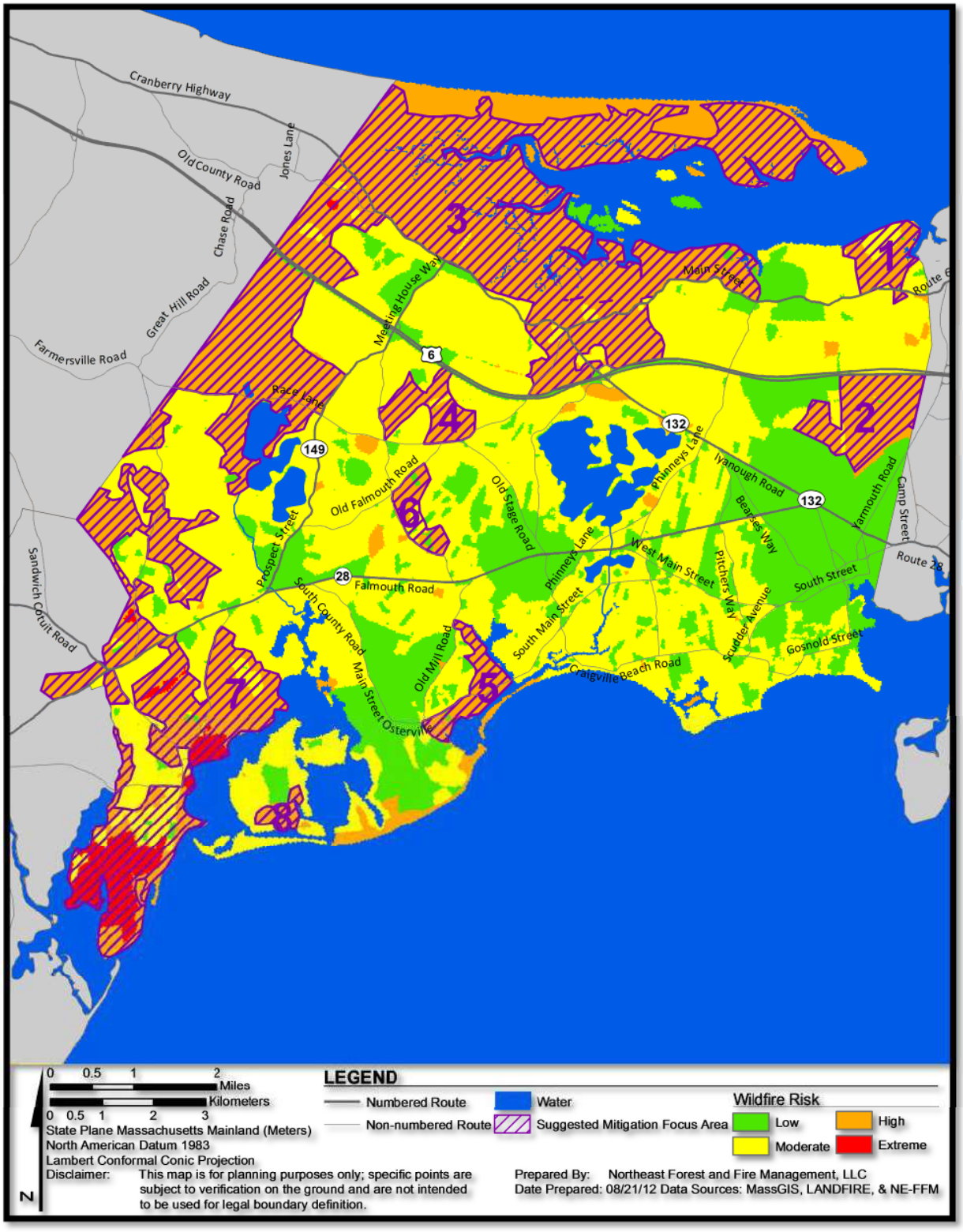
Data has been summarized for each town in Barnstable County and presented in a graphical and table format. The graphical and table information is intended to be used as a tool by land managers, land owners, and agencies in identifying areas that may require a site plan to guide implementation on the ground. Additionally the information is presented so that town information can be easily accesses when preparing reports and grants.

The graphical format is a map that shows the four calculated risk levels and major roads for reference. Additionally suggested Focus Area have been identified and numbered. The Focus Areas were derived by using the hazard ratings and ortho photos. Areas that contained High and Extreme ratings, totaling greater than 50 acres were delineated using the screen digitizing function on GIS.

The tabular information summarizes general statistics for the town, results from the fire department survey, and information from the county wide hazard rating map. Existing fire management plans for lands within the town and wildland fire management programs are presented to provide information on current management and possible sources of information and resources for fire management work. The Town Focus Areas presented in the map are summarized and possible broad scale strategies from the management recommendations section of the plan are listed.

Town of Barnstable

TOWN OF BARNSTABLE WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF BARNSTABLE SUMMARY STATISTICS

Town:	Barnstable	Population Density (people/$mi.^2$):	753.2
Land Area ($mi.^2$):	60.0	Home Density (housing units/$mi.^2$):	439.1
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		20.7	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
38.1%	10.9%	36.1%	14.9%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
17.1%	48.7%	32.5%	1.7%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	21	0 – 5 (ch./hr.):	21	No Data:	22	0 – 0.5 (mi.):	11	0 – 5 (people/$mi.^2$):	67
4 – 8 (ft.):	24	5 – 15 (ch./hr.):	4	Surface Fire:	42	0.5 – 1.0 (mi.):	19	5 – 60 (people/$mi.^2$):	3
8 – 12 (ft.):	32	15 – 40 (ch./hr.):	44	Passive Crown Fire:	32	1.0 – 1.5 (mi.):	32	60 – 525 (people/$mi.^2$):	17
> 12 (ft.):	23	> 40 (ch./hr.):	31	Active Crown Fire:	4	> 1.5 (mi.):	39	> 525 (people/$mi.^2$):	13

Fire Department Statistics (Barnstable, W. Barnstable, COMM, and Cotuit)

Fire Stations: 6 Fulltime Firefighters: 87 Call Firefighters: 53

Water Tender

Type 1:	1	(Brush Breaker)
Type 2:	2	
Type 3:	1	

Structure Engines

Type 1:	8
Type 2:	0

Wildland Engines

	Standard	Brush Breaker
Type 3:	3	
Type 4:	0	
Type 5:	0	
Type 6:	1	
Type 7:	0	

NOTE: Data provided by Town Survey and Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

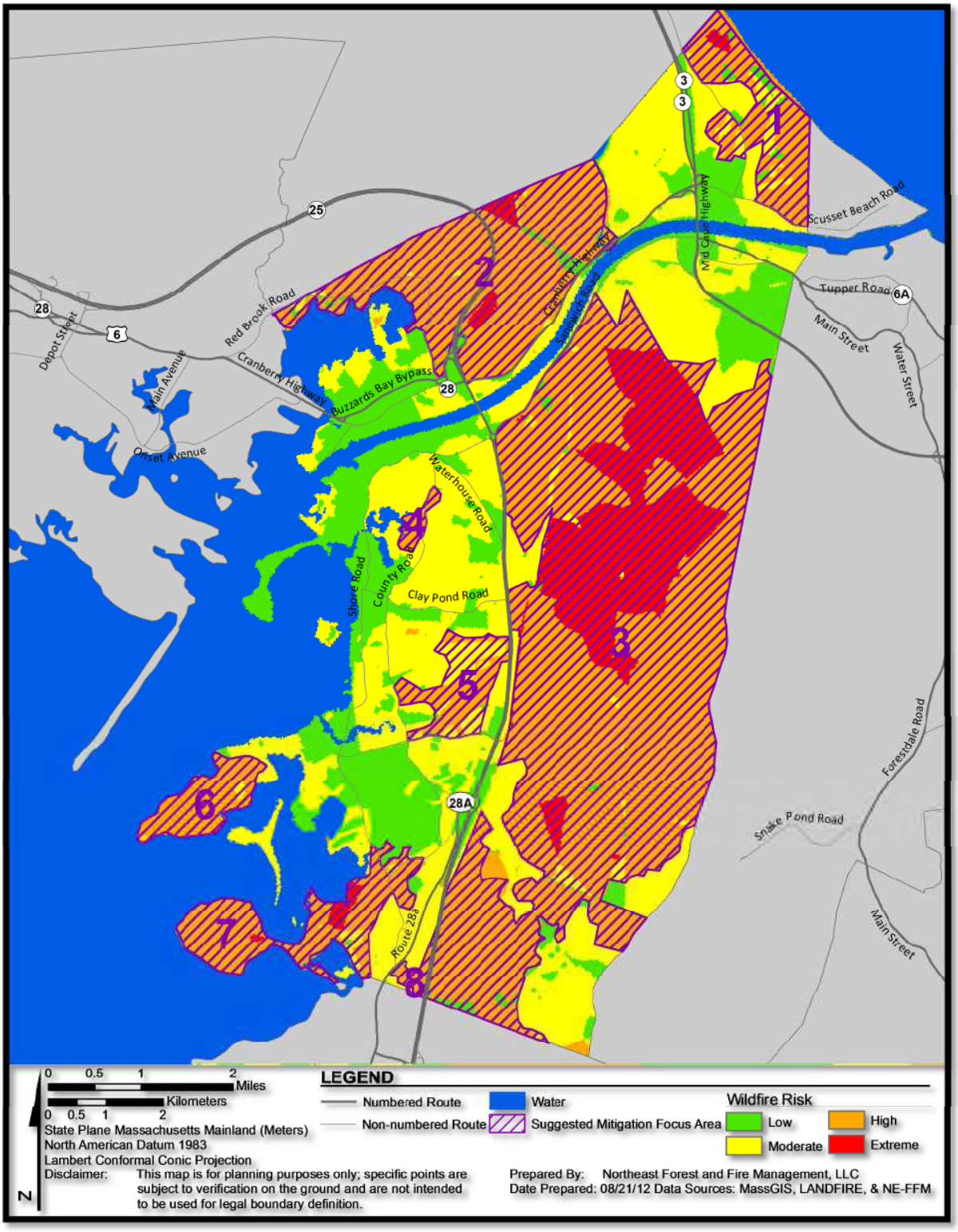
- Old Jail Lane Conservation Area and Adjacent Town Land - Wildfire Preparedness Plan (CWPP)
- Town of Barnstable Prescribed Burn Program
- West Barnstable Conservation Area and Adjacent Open Space Lands - Wildfire Preparedness Plan (CWPP)

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	330	No	Fuel Treatments and/or Structural Ignitability Reduction
2	645	No	Fuel Treatments and/or Structural Ignitability Reduction
3	7,666	Yes	Fuel Treatments and/or Structural Ignitability Reduction
4	332	No	Fuel Treatments and/or Structural Ignitability Reduction
5	276	No	Fuel Treatments and/or Structural Ignitability Reduction
6	208	No	Fuel Treatments and/or Structural Ignitability Reduction
7	3,289	Yes	Fuel Treatments and/or Structural Ignitability Reduction
8	93	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Bourne

TOWN OF BOURNE WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF BOURNE SUMMARY STATISTICS

Town:	Bourne	Population Density (people/$mi.^2$):	482.9
Land Area ($mi.^2$):	40.9	Home Density (housing units/$mi.^2$):	264.2
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		20.9%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
45.2%	8.5%	23.3%	23.0%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
13.9%	31.6%	45.0%	9.5%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	23	0 – 5 (ch./hr.):	30	No Data:	21	0 – 0.5 (mi.):	17	0 – 5 (people/$mi.^2$):	60
4 – 8 (ft.):	21	5 – 15 (ch./hr.):	5	Surface Fire:	30	0.5 – 1.0 (mi.):	30	5 – 60 (people/$mi.^2$):	5
8 – 12 (ft.):	26	15 – 40 (ch./hr.):	24	Passive Crown Fire:	47	1.0 – 1.5 (mi.):	43	60 – 525 (people/$mi.^2$):	24
> 12 (ft.):	30	> 40 (ch./hr.):	40	Active Crown Fire:	2	> 1.5 (mi.):	11	> 525 (people/$mi.^2$):	11

Fire Department Statistics

Fire Stations: 4 Fulltime Firefighters: 37 Call Firefighters: 12

Water Tender

Type 1:	0
Type 2:	0
Type 3:	0

Structure Engines

Type 1:	2
Type 2:	0

Wildland Engines

	Standard	Brush Breaker
Type 3:	1	
Type 4:	0	
Type 5:	1	
Type 6:	0	
Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

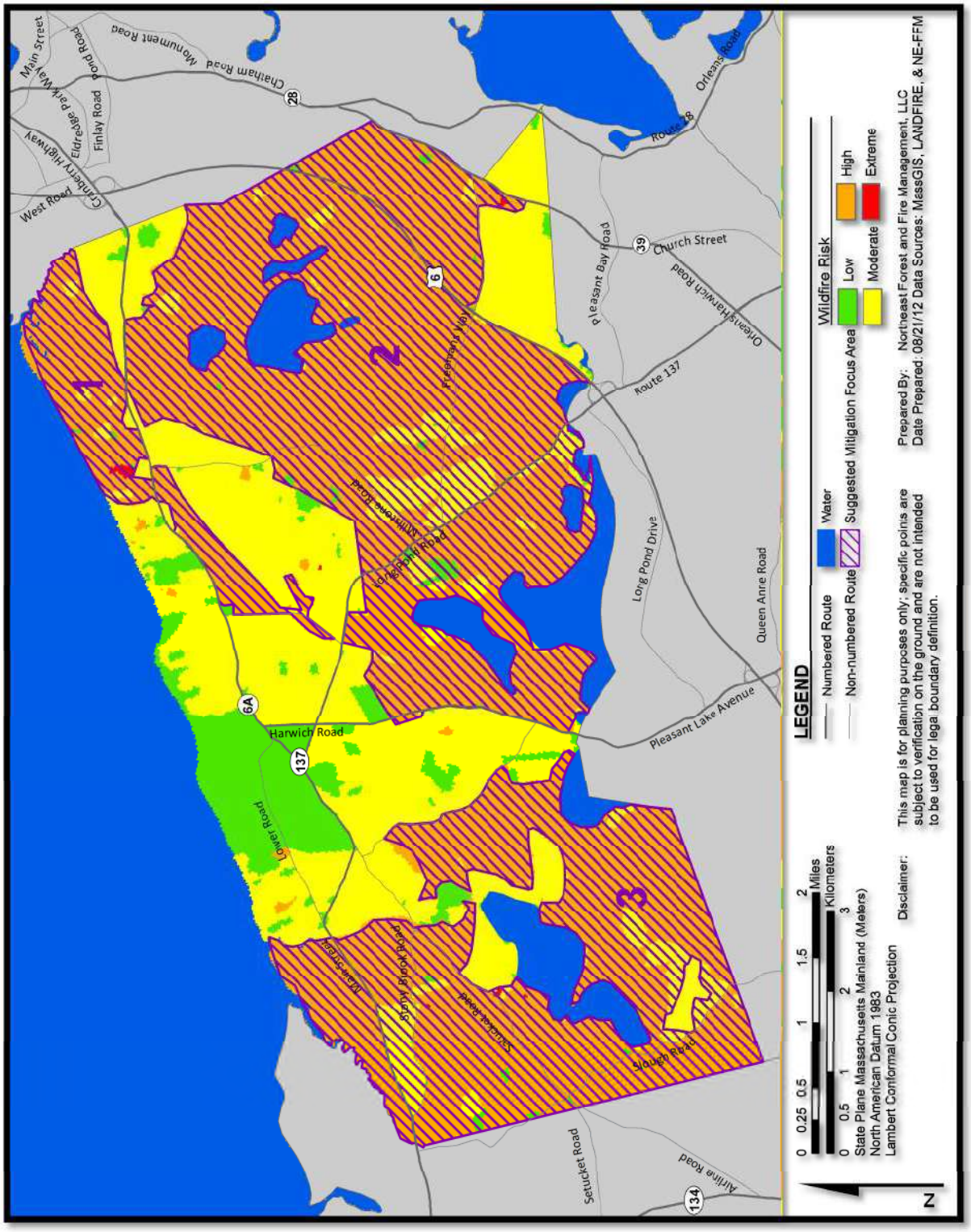
- Bourne Town Forest, Four Ponds Conservation Area, and Bourne Water District Lands - Wildfire Preparedness Plan (CWPP)
- Camp Edwards Fire Management Plan

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	873	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	2,372	Yes	Fuel Treatments and/or Structural Ignitability Reduction
3	9,677	Yes	Fuel Treatments
4	75	No	Fuel Treatments and/or Structural Ignitability Reduction
5	485	No	Fuel Treatments and/or Structural Ignitability Reduction
6	411	No	Fuel Treatments and/or Structural Ignitability Reduction
7	898	Yes	Fuel Treatments and/or Structural Ignitability Reduction
8	69	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Brewster

TOWN OF BREWSTER WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF BREWSTER SUMMARY STATISTICS

Town:	Brewster	Population Density (people/$mi.^2$):	426.9
Land Area ($mi.^2$):	23.0	Home Density (housing units/$mi.^2$):	345.6
Town Hosing Units Vacant for Seasonal/Recreational Use (%):	36.3%		

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
44.3%	19.9%	24.1%	11.7%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
5.6%	37.8%	56.4%	0.2%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	24	0 – 5 (ch./hr.):	33	No Data:	31	0 – 0.5 (mi.):	11	0 – 5 (people/$mi.^2$):	69
4 – 8 (ft.):	27	5 – 15 (ch./hr.):	5	Surface Fire:	25	0.5 – 1.0 (mi.):	22	5 – 60 (people/$mi.^2$):	6
8 – 12 (ft.):	26	15 – 40 (ch./hr.):	32	Passive Crown Fire:	42	1.0 – 1.5 (mi.):	33	60 – 525 (people/$mi.^2$):	9
> 12 (ft.):	23	> 40 (ch./hr.):	31	Active Crown Fire:	2	> 1.5 (mi.):	33	> 525 (people/$mi.^2$):	17

Fire Department Statistics

Fire Stations: 2 Fulltime Firefighters: 12 Call Firefighters: 32

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0			
Type 2:	0	Type 3:	2	
Type 3:	0	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	3	Type 6:	0	
Type 2:	0	Type 7:	0	

NOTE: Data summarized from Town Survey

Current Fire and Fuel Management Programs and Plans

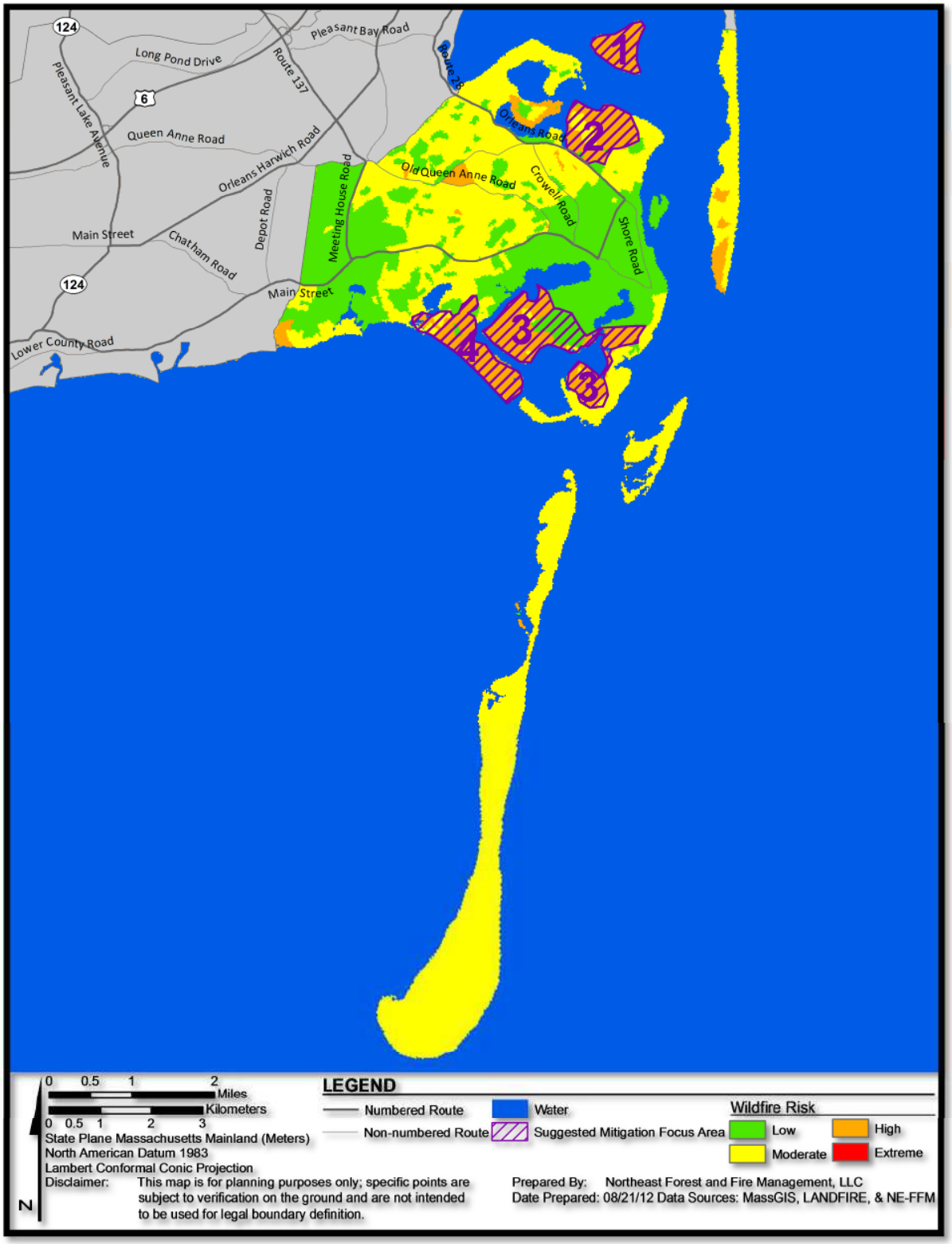
- Punkhorn Parklands - Wildfire Preparedness Plan (CWPP)

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	795	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	5,633	No	Fuel Treatments and/or Structural Ignitability Reduction
3	3,450	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Chatham

TOWN OF CHATHAM WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF CHATHAM SUMMARY STATISTICS

Town:	Chatham	Population Density (people/$mi.^2$):	378.1
Land Area ($mi.^2$):	16.2	Home Density (housing units/$mi.^2$):	453.3
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		54.8%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
31.1%	20.2%	23.8%	24.9%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
26.5%	59.9%	13.6%	0.0%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	19	0 – 5 (ch./hr.):	17	No Data:	27	0 – 0.5 (mi.):	8	0 – 5 (people/$mi.^2$):	58
4 – 8 (ft.):	34	5 – 15 (ch./hr.):	4	Surface Fire:	45	0.5 – 1.0 (mi.):	12	5 – 60 (people/$mi.^2$):	6
8 – 12 (ft.):	17	15 – 40 (ch./hr.):	42	Passive Crown Fire:	29	1.0 – 1.5 (mi.):	27	60 – 525 (people/$mi.^2$):	17
> 12 (ft.):	29	> 40 (ch./hr.):	37	Active Crown Fire:	0	> 1.5 (mi.):	54	> 525 (people/$mi.^2$):	19

Fire Department Statistics

Fire Stations: 2 Fulltime Firefighters: 25 Call Firefighters: 5

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0	Type 3:	0	
Type 2:	0	Type 4:	0	
Type 3:	0	Type 5:	0	
Structure Engines		Type 6:	0	
Type 1:	3	Type 7:	1	
Type 2:	0			

NOTE: Data summarized from Town Survey

Current Fire and Fuel Management Programs and Plans

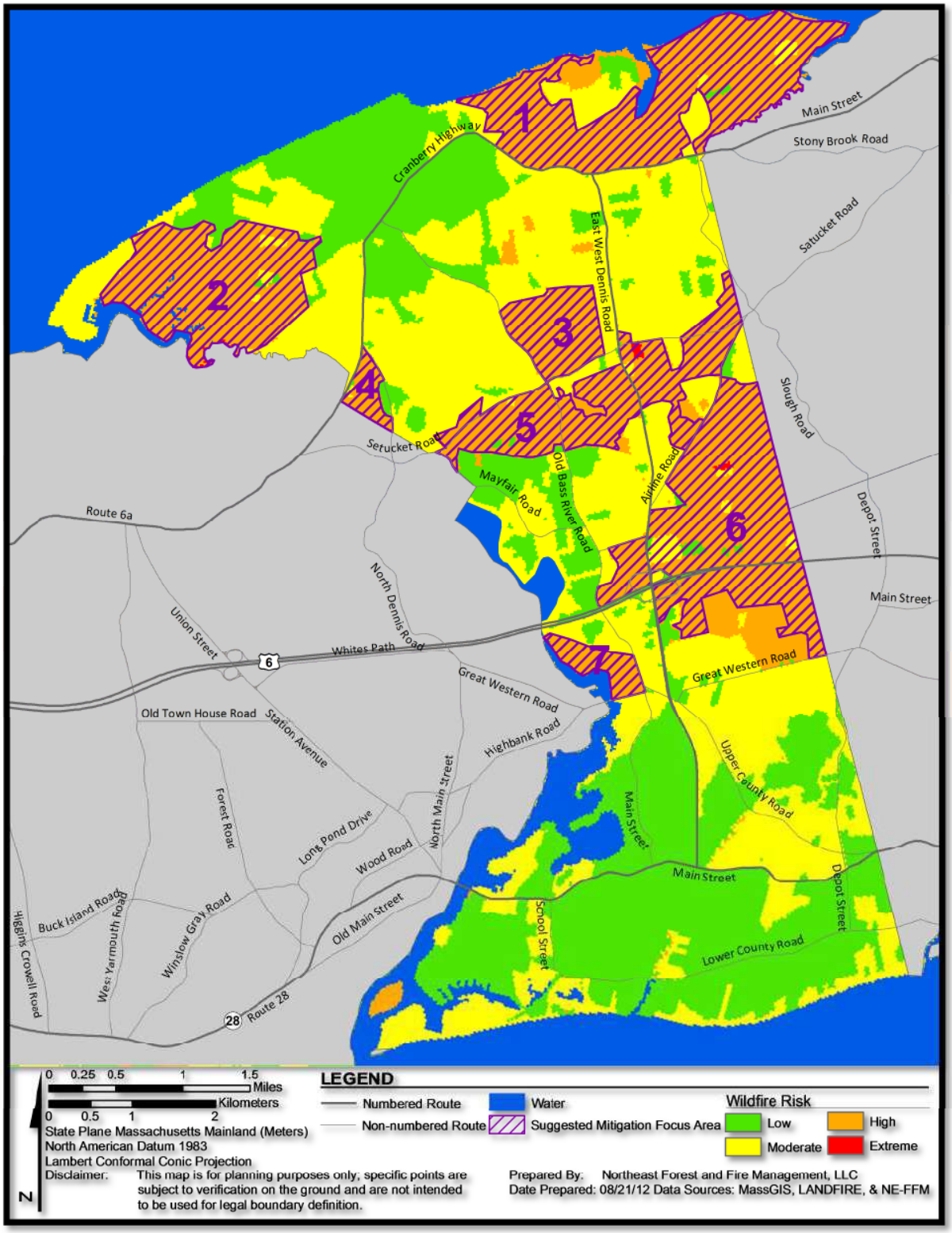
- Chatham Town Forest and Harwich Water Department Lands - Wildfire Preparedness Plan (CWPP)
- The Goose Pond Tract - Wildfire Preparedness Plan (CWPP)
- Cape Cod National Seashore Fire Management Plan
- Cape Cod National Seashore Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	153	No	Fuel Treatments
2	305	No	Fuel Treatments and/or Structural Ignitability Reduction
3	620	No	Fuel Treatments and/or Structural Ignitability Reduction
4	346	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Dennis

TOWN OF DENNIS WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF DENNIS SUMMARY STATISTIC

Town:	Dennis	Population Density (people/$mi.^2$):	689.7
Land Area ($mi.^2$):	20.6	Home Density (housing units/$mi.^2$):	756.6
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		50.3%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
47%	7.5%	24.9%	27%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
23.3%	47.0%	29.4%	0.3%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	20	0 – 5 (ch./hr.):	20	No Data:	24	0 – 0.5 (mi.):	15	0 – 5 (people/$mi.^2$):	69
4 – 8 (ft.):	27	5 – 15 (ch./hr.):	5	Surface Fire:	45	0.5 – 1.0 (mi.):	25	5 – 60 (people/$mi.^2$):	3
8 – 12 (ft.):	27	15 – 40 (ch./hr.):	44	Passive Crown Fire:	29	1.0 – 1.5 (mi.):	45	60 – 525 (people/$mi.^2$):	16
> 12 (ft.):	26	> 40 (ch./hr.):	31	Active Crown Fire:	2	> 1.5 (mi.):	15	> 525 (people/$mi.^2$):	12

Fire Department Statistics

Fire Stations: 2 Fulltime Firefighters: 35 Call Firefighters: 10

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0			
Type 2:	0	Type 3:	0	
Type 3:	0	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	2	Type 6:	1	
Type 2:	0	Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

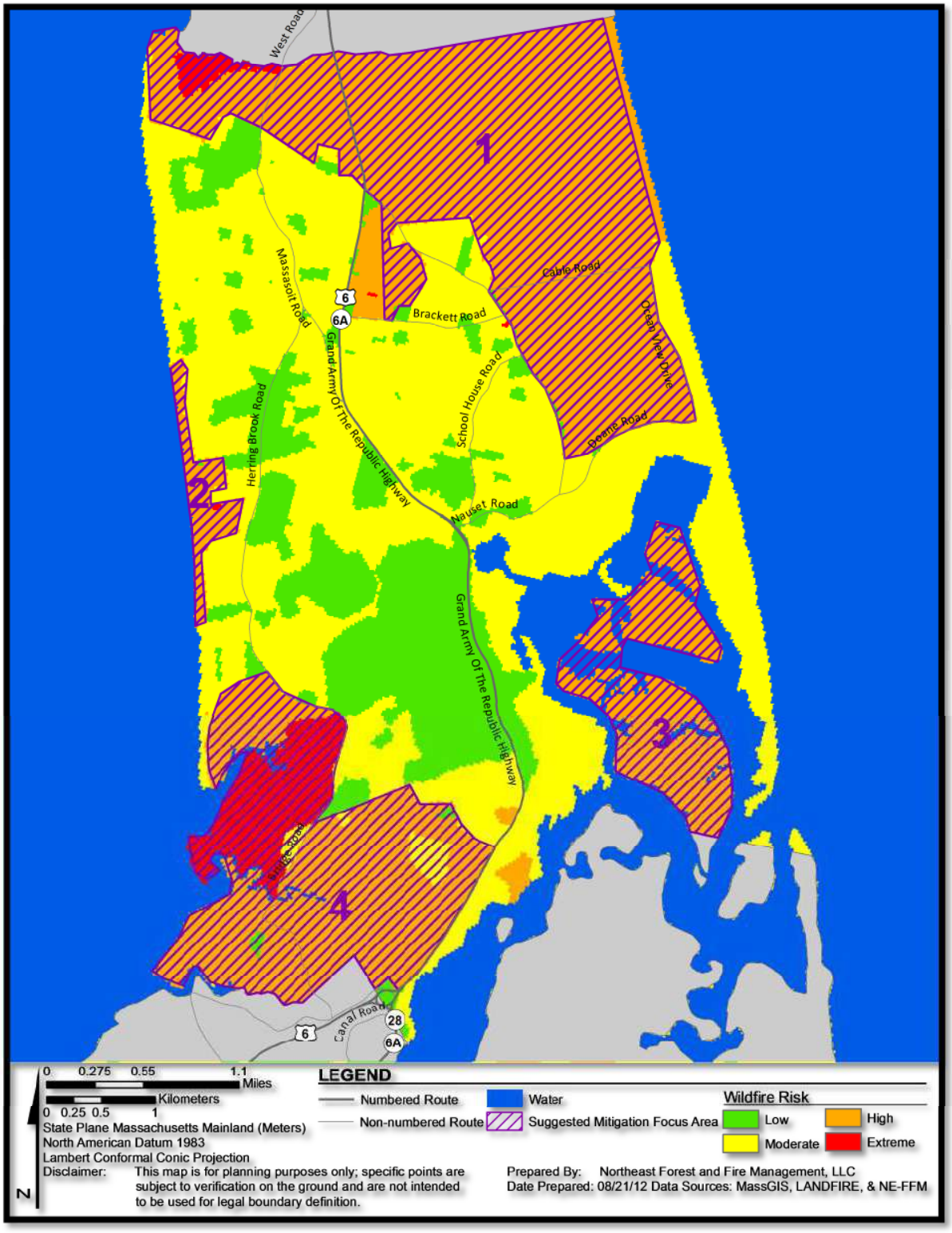
- Princess Beach Conservation Area and Adjacent Scargo Hill - Wildfire Preparedness Plan (CWPP)
- Green Belt Well Field - Wildfire Preparedness Plan (CWPP)
- Plashes Conservation Area and Surrounding Open Space Tracts - Wildfire Preparedness Plan (CWPP)
- Ralph and Florence Shoop Memorial Conservation Lands - Wildfire Preparedness Plan (CWPP)

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	990	No	Fuel Treatments and/or Structural Ignitability Reduction
2	723	No	Fuel Treatments and/or Structural Ignitability Reduction
3	238	No	Fuel Treatments and/or Structural Ignitability Reduction
4	68	No	Fuel Treatments and/or Structural Ignitability Reduction
5	641	No	Fuel Treatments and/or Structural Ignitability Reduction
6	1,029	Yes	Fuel Treatments and/or Structural Ignitability Reduction
7	98	Yes	Fuel Treatments and/or Structural Ignitability Reduction
8	990	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Eastham

TOWN OF EASTHAM WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF EASTHAM SUMMARY STATISTICS

Town:	Eastham	Population Density (people/$mi.^2$):	354.0
Land Area ($mi.^2$):	14.0	Home Density (housing units/$mi.^2$):	425.7
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		55.6%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
34.1%	20.3%	17.4%	27.7%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
10.1%	45.3%	40.9%	3.7%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	24	0 – 5 (ch./hr.):	21	No Data:	23	0 – 0.5 (mi.):	4	0 – 5 (people/$mi.^2$):	60
4 – 8 (ft.):	22	5 – 15 (ch./hr.):	5	Surface Fire:	42	0.5 – 1.0 (mi.):	25	5 – 60 (people/$mi.^2$):	5
8 – 12 (ft.):	21	15 – 40 (ch./hr.):	39	Passive Crown Fire:	35	1.0 – 1.5 (mi.):	46	60 – 525 (people/$mi.^2$):	18
> 12 (ft.):	33	> 40 (ch./hr.):	35	Active Crown Fire:	0	> 1.5 (mi.):	25	> 525 (people/$mi.^2$):	17

Fire Department Statistics

Fire Stations: 1 Fulltime Firefighters: 18 Call Firefighters: 1

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0			
Type 2:	0	Type 3:	1	
Type 3:	1	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	2	Type 6:	0	
Type 2:	0	Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

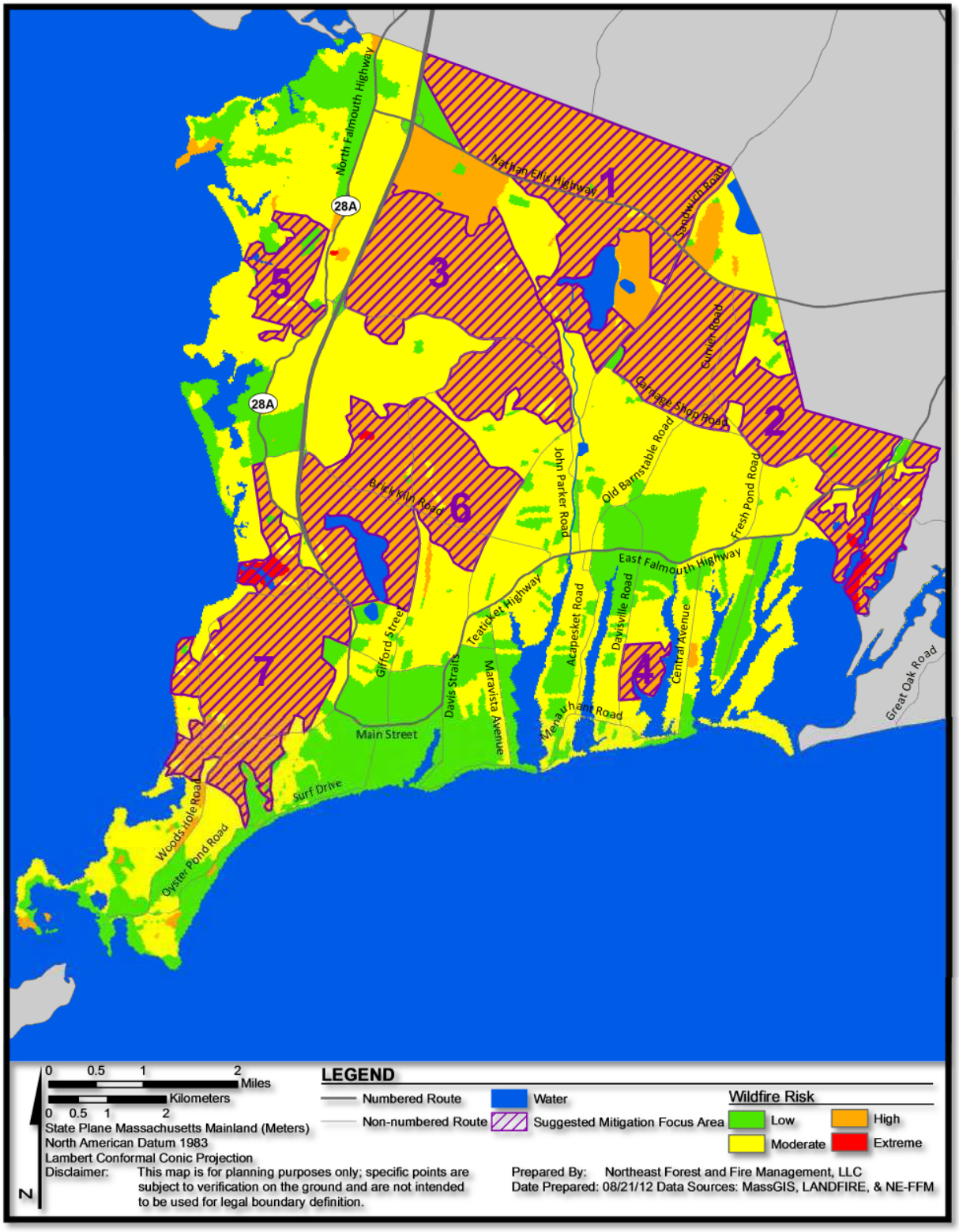
- Wiley Park, The Nickerson Property, and Cottontail Acres - Wildfire Preparedness Plan (CWPP)
- Cape Cod National Seashore Fire Management Plan
- Cape Cod National Seashore Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	2,148	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	108	Yes	Fuel Treatments and/or Structural Ignitability Reduction
3	535	No	Fuel Treatments
4	1,279	Yes	Fuel Treatments and/or Structural Ignitability Reduction

Town of Falmouth

TOWN OF FALMOUTH WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF FALMOUTH SUMMARY STATISTICS

Town:	Falmouth	Population Density (people/$mi.^2$):	713.4
Land Area ($mi.^2$):	44.2	Home Density (housing units/$mi.^2$):	497.0
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		30.6%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
46.5%	13.4%	15.6%	24.5%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
13.2%	44.2%	42.2%	0.5%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	18	0 – 5 (ch./hr.):	24	No Data:	25	0 – 0.5 (mi.):	12	0 – 5 (people/$mi.^2$):	61
4 – 8 (ft.):	23	5 – 15 (ch./hr.):	7	Surface Fire:	38	0.5 – 1.0 (mi.):	29	5 – 60 (people/$mi.^2$):	5
8 – 12 (ft.):	32	15 – 40 (ch./hr.):	30	Passive Crown Fire:	36	1.0 – 1.5 (mi.):	41	60 – 525 (people/$mi.^2$):	21
> 12 (ft.):	27	> 40 (ch./hr.):	40	Active Crown Fire:	1	> 1.5 (mi.):	19	> 525 (people/$mi.^2$):	13

Fire Department Statistics

Fire Stations: 5 Fulltime Firefighters: 72 Call Firefighters: 3

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0	Type 3:	1	
Type 2:	0	Type 4:	0	
Type 3:	0	Type 5:	1	
Structure Engines		Type 6:	1	
Type 1:	6	Type 7:	0	
Type 2:	0			

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

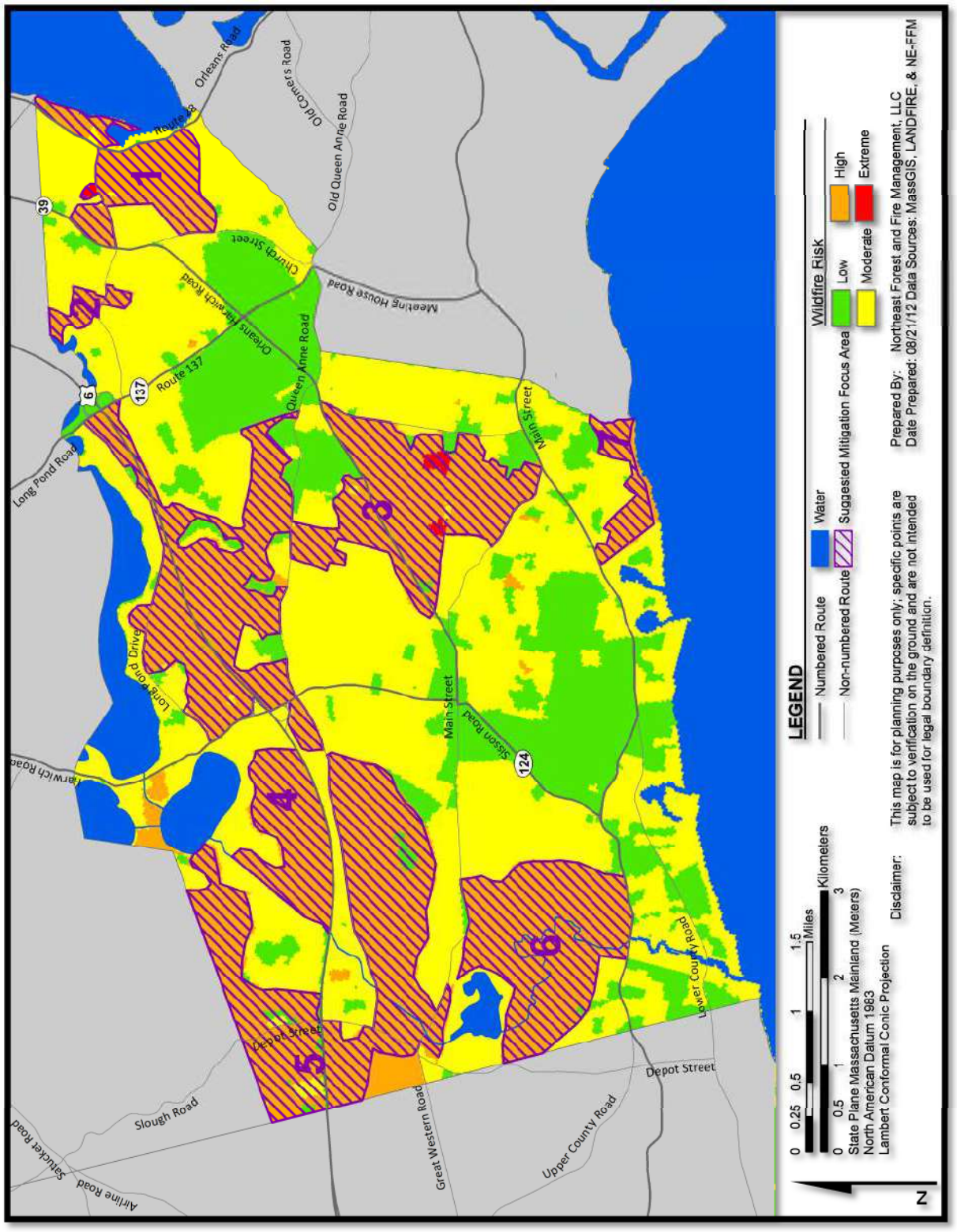
- DRAFT - Beebe Woods and Peterson Farm Conservation Areas - Wildfire Preparedness Plan
- Wildland Fuel Hazard Assessment for Mashpee National Wildlife Refuge (CWPP)
- Camp Edwards Fire Management Plan
- US Fish and Wildlife Prescribed Burn Program
- Massachusetts Army National Guard Prescribed Burn Program
- Massachusetts Department of Conservation and Recreations, Waquoit Bay Prescribed Burn Program
- Massachusetts Department of Fish and Game, Frances A. Crane Wildlife Management Area Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	2,381	No	Fuel Treatments and/or Structural Ignitability Reduction
2	2,391	Yes	Fuel Treatments and/or Structural Ignitability Reduction
3	2,066	No	Fuel Treatments and/or Structural Ignitability Reduction
4	151	No	Fuel Treatments and/or Structural Ignitability Reduction
5	454	No	Fuel Treatments and/or Structural Ignitability Reduction
6	1,937	Yes	Fuel Treatments and/or Structural Ignitability Reduction
7	2,008	Yes	Fuel Treatments and/or Structural Ignitability Reduction

Town of Harwich

TOWN OF HARWICH WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF HARWICH SUMMARY STATISTICS

Town:	Harwich	Population Density (people/$mi.^2$):	583.0
Land Area ($mi.^2$):	21.0	Home Density (housing units/$mi.^2$):	775.5
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		39.0%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
46.5%	16.7%	26.8%	10.0%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
13.1%	54.0%	32.5%	0.3%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	19	0 – 5 (ch./hr.):	12	No Data:	20	0 – 0.5 (mi.):	21	0 – 5 (people/$mi.^2$):	69
4 – 8 (ft.):	26	5 – 15 (ch./hr.):	17	Surface Fire:	34	0.5 – 1.0 (mi.):	14	5 – 60 (people/$mi.^2$):	4
8 – 12 (ft.):	27	15 – 40 (ch./hr.):	36	Passive Crown Fire:	44	1.0 – 1.5 (mi.):	21	60 – 525 (people/$mi.^2$):	16
> 12 (ft.):	28	> 40 (ch./hr.):	35	Active Crown Fire:	1	> 1.5 (mi.):	43	> 525 (people/$mi.^2$):	12

Fire Department Statistics

Fire Stations: 2 Fulltime Firefighters: 39 Call Firefighters: 0

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0	Type 3:	0	
Type 2:	0	Type 4:	0	
Type 3:	0	Type 5:	0	
Structure Engines		Type 6:	1	
Type 1:	4	Type 7:	0	
Type 2:	0			

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

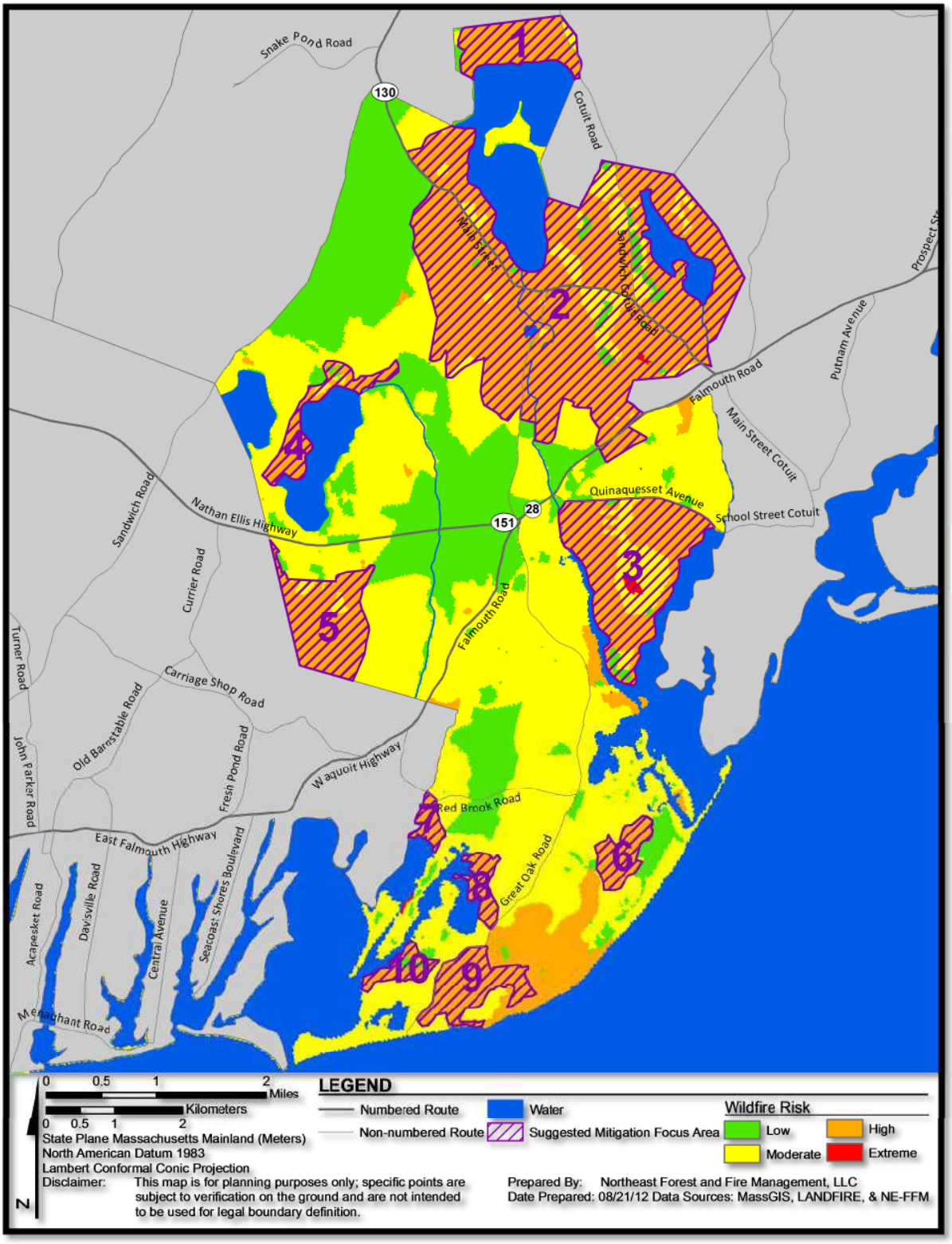
- Chatham Town Forest and Harwich Water Department Lands - Wildfire Preparedness Plan (CWPP)
- Thompson's Field Conservation Area and Adjacent Water District Lands - Wildfire Preparedness Plan (CWPP)
- Bell's Neck - Wildfire Preparedness Plan (CWPP)

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	363	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	59	No	Fuel Treatments and/or Structural Ignitability Reduction
3	1,687	Yes	Fuel Treatments and/or Structural Ignitability Reduction
4	338	No	Fuel Treatments and/or Structural Ignitability Reduction
5	1,257	No	Fuel Treatments and/or Structural Ignitability Reduction
6	735	No	Fuel Treatments and/or Structural Ignitability Reduction
7	116	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Mashpee

TOWN OF MASHPEE WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF MASHPEE SUMMARY STATISTICS

Town:	Mashpee	Population Density (people/$mi.^2$):	596.0
Land Area ($mi.^2$):	23.5	Home Density (housing units/$mi.^2$):	420.1
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		36.1%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
39.2%	15.2%	33.2%	12.4%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
19.4%	21.9%	58.6%	0.1%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	20	0 – 5 (ch./hr.):	25	No Data:	22	0 – 0.5 (mi.):	11	0 – 5 (people/$mi.^2$):	61
4 – 8 (ft.):	24	5 – 15 (ch./hr.):	7	Surface Fire:	36	0.5 – 1.0 (mi.):	15	5 – 60 (people/$mi.^2$):	2
8 – 12 (ft.):	33	15 – 40 (ch./hr.):	34	Passive Crown Fire:	39	1.0 – 1.5 (mi.):	33	60 – 525 (people/$mi.^2$):	16
> 12 (ft.):	24	> 40 (ch./hr.):	34	Active Crown Fire:	3	> 1.5 (mi.):	41	> 525 (people/$mi.^2$):	21

Fire Department Statistics

Fire Stations: 2 Fulltime Firefighters: 32 Call Firefighters: 1

Water Tender	
Type 1:	0
Type 2:	1
Type 3:	0

Structure Engines	
Type 1:	3
Type 2:	0

Wildland Engines	Standard	Brush Breaker
Type 3:	2	x
Type 4:	0	
Type 5:	0	
Type 6:	0	
Type 7:	1	x

NOTE: Data summarized from Town Survey

Current Fire and Fuel Management Programs and Plans

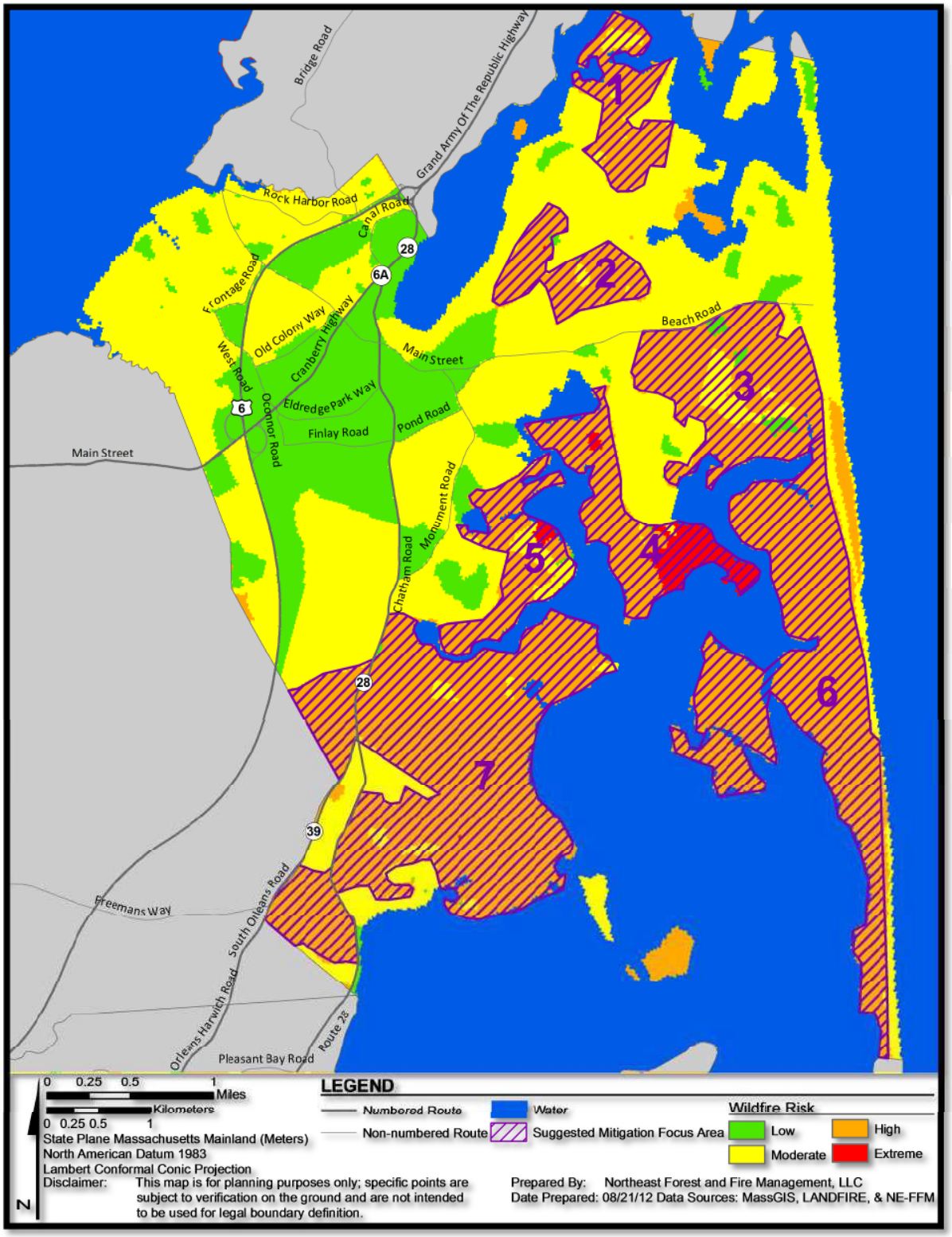
- The Town of Mashpee River Woodlands - Wildfire Preparedness Plan (CWPP)
- Wildland Fuel Hazard Assessment for Mashpee National Wildlife Refuge (CWPP)
- Camp Edwards Fire Management Plan
- Town of Mashpee Prescribed Burn Program
- US Fish and Wildlife Prescribed Burn Program
- Massachusetts Army National Guard Prescribed Burn Program
- Massachusetts Department of Fish and Game, Frances A. Crane Wildlife Management Area Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	271	No	Fuel Treatments and/or Structural Ignitability Reduction
2	77	No	Fuel Treatments and/or Structural Ignitability Reduction
3	3,142	Yes	Fuel Treatments and/or Structural Ignitability Reduction
4	806	Yes	Fuel Treatments and/or Structural Ignitability Reduction
5	172	No	Fuel Treatments and/or Structural Ignitability Reduction
6	389	No	Fuel Treatments and/or Structural Ignitability Reduction
7	119	No	Fuel Treatments and/or Structural Ignitability Reduction
8	53	No	Fuel Treatments and/or Structural Ignitability Reduction
9	82	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Orleans

TOWN OF ORLEANS WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF ORLEANS SUMMARY STATISTICS

Town:	Orleans	Population Density (people/$mi.^2$):	414.8
Land Area ($mi.^2$):	14.2	Home Density (housing units/$mi.^2$):	376.7
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		38.7%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
31.9%	19.5%	33.5%	15.1%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
12.8%	45.4%	40.2%	1.7%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	20	0 – 5 (ch./hr.):	20	No Data:	29	0 – 0.5 (mi.):	5	0 – 5 (people/$mi.^2$):	71
4 – 8 (ft.):	31	5 – 15 (ch./hr.):	4	Surface Fire:	33	0.5 – 1.0 (mi.):	5	5 – 60 (people/$mi.^2$):	2
8 – 12 (ft.):	23	15 – 40 (ch./hr.):	44	Passive Crown Fire:	37	1.0 – 1.5 (mi.):	14	60 – 525 (people/$mi.^2$):	12
> 12 (ft.):	25	> 40 (ch./hr.):	33	Active Crown Fire:	1	> 1.5 (mi.):	76	> 525 (people/$mi.^2$):	16

Fire Department Statistics

Fire Stations: 1 Fulltime Firefighters: 23 Call Firefighters: 11

Water Tender		Wildland Engines	Standard	Brush Breaker
Type 1:	0			
Type 2:	0	Type 3:	1	
Type 3:	0	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	2	Type 6:	0	
Type 2:	0	Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

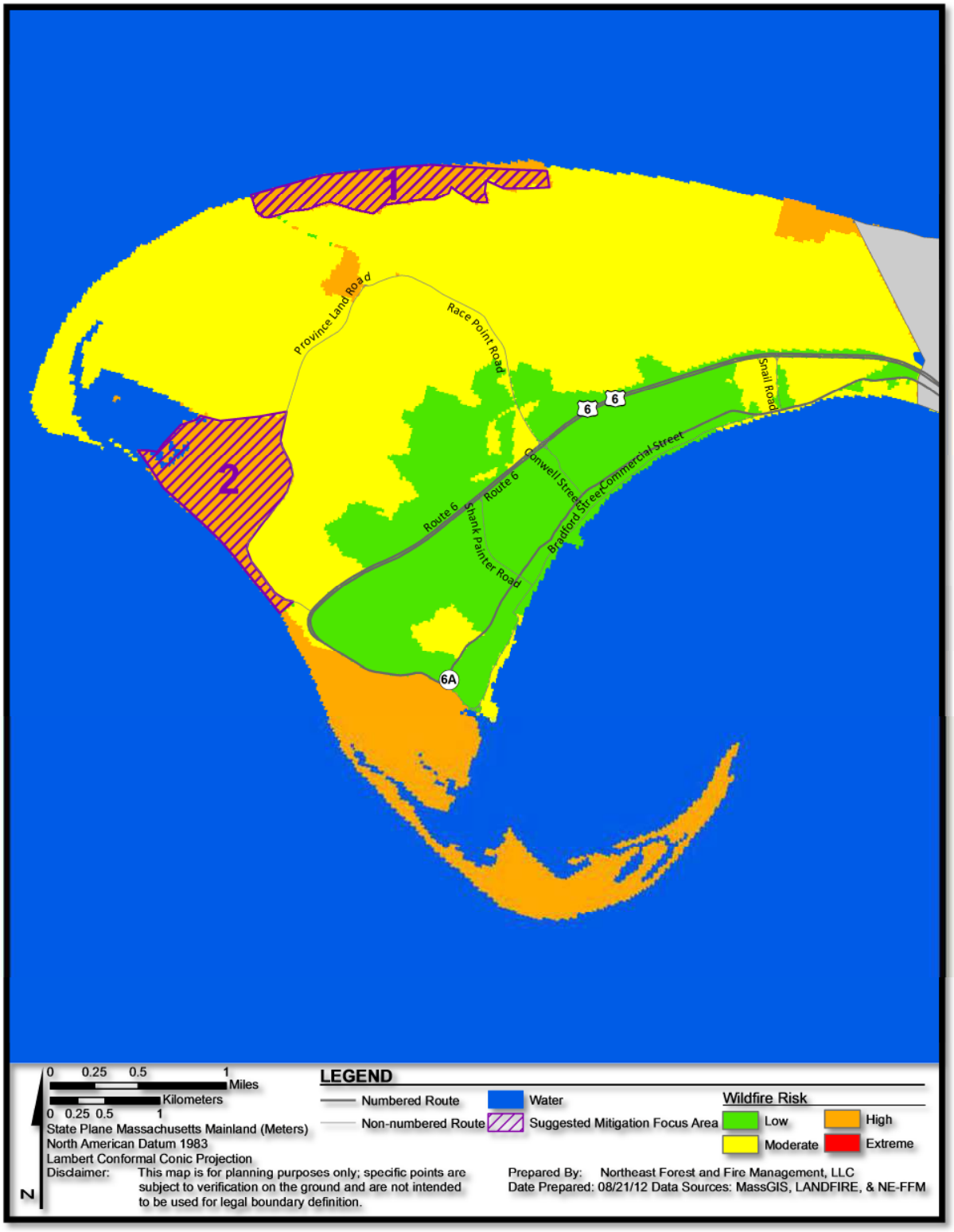
- Orleans Watershed Lands - Wildfire Preparedness Plan (CWPP)
- Paw Wah Point - Wildfire Preparedness Plan (CWPP)
- Cape Cod National Seashore Fire Management Plan
- Cape Cod National Seashore Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	220	No	Fuel Treatments and/or Structural Ignitability Reduction
2	196	No	Fuel Treatments and/or Structural Ignitability Reduction
3	514	No	Fuel Treatments and/or Structural Ignitability Reduction
4	334	No	Fuel Treatments and/or Structural Ignitability Reduction
5	244	Yes	Fuel Treatments and/or Structural Ignitability Reduction
6	955	No	Fuel Treatments
7	1434	No	Fuel Treatments and/or Structural Ignitability Reduction

Town of Provincetown

TOWN OF PROVINCETOWN WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF PROVINCETOWN SUMMARY STATISTICS

Town:	Provincetown	Population Density (people/$mi.^2$):	303.3
Land Area ($mi.^2$):	9.7	Home Density (housing units/$mi.^2$):	463.2
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		51.7%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
63.5%	4.1%	20.3%	12.1%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
22.2%	58.7%	19.1%	0.0%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	27	0 – 5 (ch./hr.):	25	No Data:	62	0 – 0.5 (mi.):	10	0 – 5 (people/$mi.^2$):	71
4 – 8 (ft.):	37	5 – 15 (ch./hr.):	8	Surface Fire:	13	0.5 – 1.0 (mi.):	10	5 – 60 (people/$mi.^2$):	3
8 – 12 (ft.):	6	15 – 40 (ch./hr.):	38	Passive Crown Fire:	20	1.0 – 1.5 (mi.):	10	60 – 525 (people/$mi.^2$):	6
> 12 (ft.):	30	> 40 (ch./hr.):	29	Active Crown Fire:	5	> 1.5 (mi.):	70	> 525 (people/$mi.^2$):	21

Fire Department Statistics

Fire Stations: 4 Fulltime Firefighters: 0 Call Firefighters: 77

Water Tender

Type 1:	0
Type 2:	0
Type 3:	0

Structure Engines

Type 1:	4
Type 2:	0

Wildland Engines

	Standard	Brush Breaker
Type 3:	0	
Type 4:	0	
Type 5:	0	
Type 6:	0	
Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

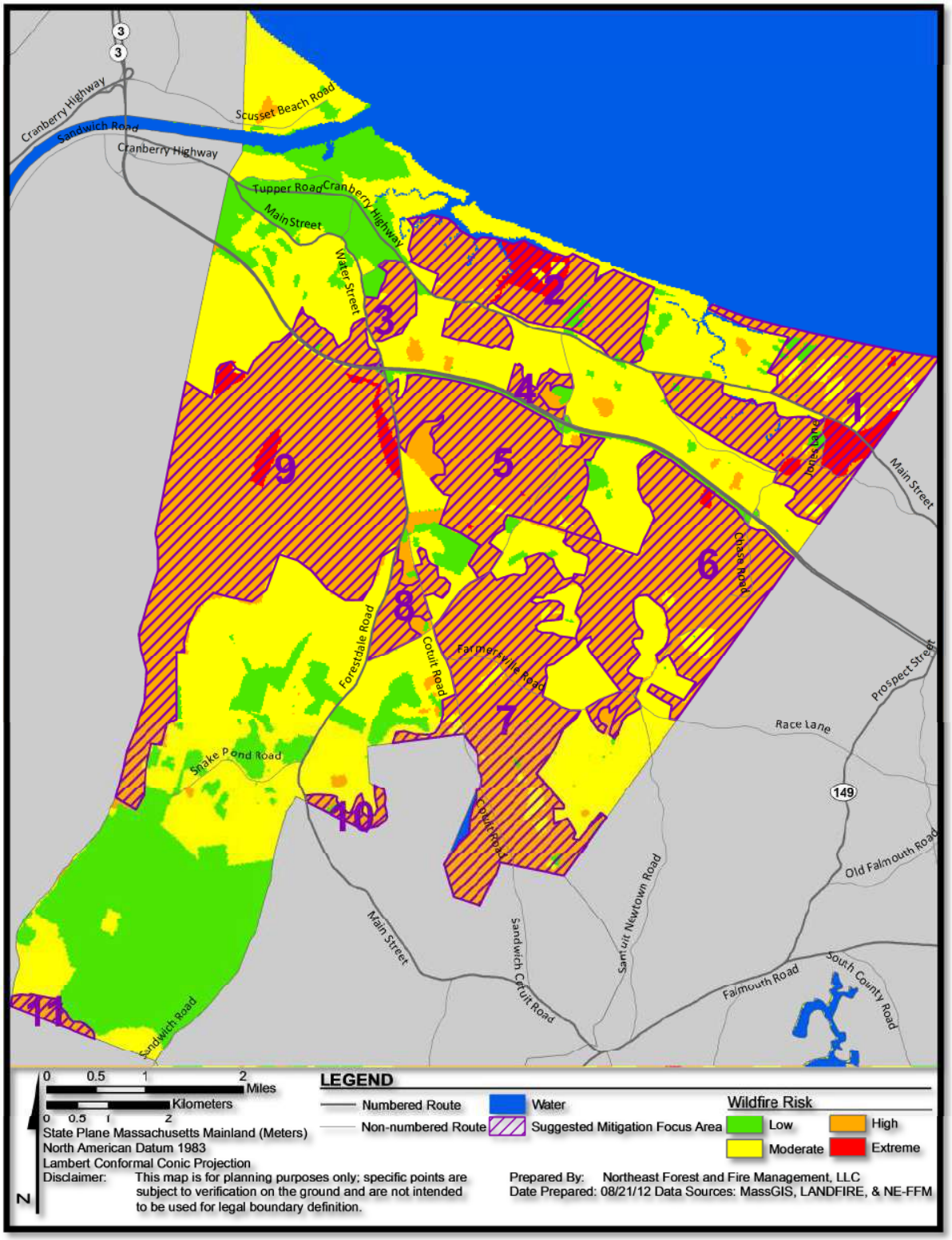
- Cape Cod National Seashore Fire Management Plan
- Cape Cod National Seashore Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	178	No	Fuel Treatments
2	288	No	Fuel Treatments

Town of Sandwich

TOWN OF SANDWICH WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF SANDWICH SUMMARY STATISTICS

Town:	Sandwich	Population Density (people/$mi.^2$):	480.8
Land Area ($mi.^2$):	43.0	Home Density (housing units/$mi.^2$):	220.3
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		16.7%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
43.7%	14.1%	29.6%	12.7%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
15.0%	37.9%	45.0%	2.1%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	23	0 – 5 (ch./hr.):	30	No Data:	25	0 – 0.5 (mi.):	22	0 – 5 (people/$mi.^2$):	69
4 – 8 (ft.):	26	5 – 15 (ch./hr.):	7	Surface Fire:	28	0.5 – 1.0 (mi.):	39	5 – 60 (people/$mi.^2$):	4
8 – 12 (ft.):	26	15 – 40 (ch./hr.):	28	Passive Crown Fire:	45	1.0 – 1.5 (mi.):	30	60 – 525 (people/$mi.^2$):	10
> 12 (ft.):	25	> 40 (ch./hr.):	34	Active Crown Fire:	2	> 1.5 (mi.):	9	> 525 (people/$mi.^2$):	17

Fire Department Statistics

Fire Stations: 3 Fulltime Firefighters: 36 Call Firefighters: 0

Water Tender

Type 1:	0
Type 2:	1
Type 3:	0

Structure Engines

Type 1:	3
Type 2:	0

Wildland Engines

	Standard	Brush Breaker
Type 3:	0	
Type 4:	0	
Type 5:	2	x
Type 6:	0	
Type 7:	0	

NOTE: Data summarized from Town Survey

Current Fire and Fuel Management Programs and Plans

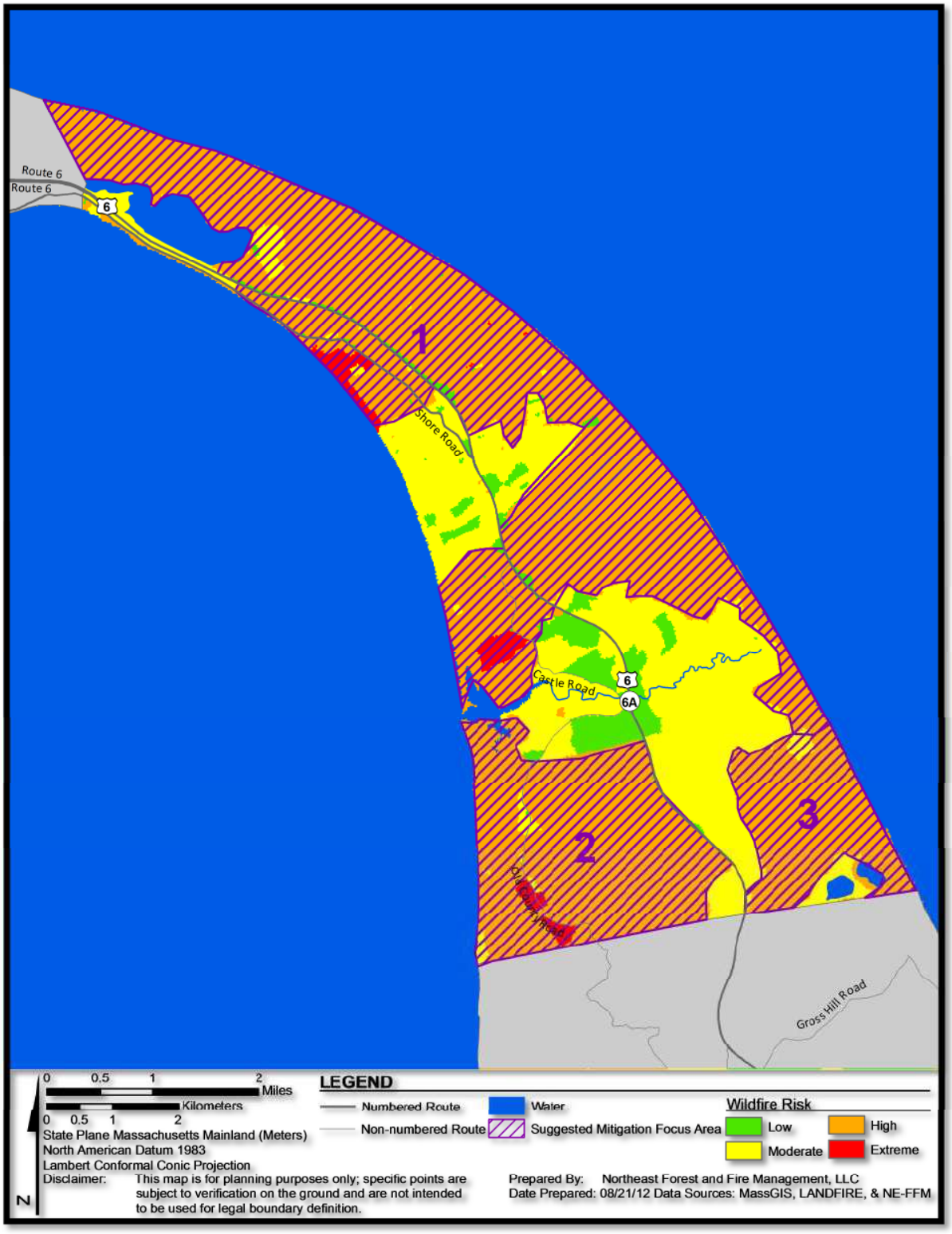
- Maple Swamp and Discovery Hill Sandwich Town Lands Complex - Wildfire Preparedness Plan (CWPP)
- Camp Edwards Fire Management Plan
- Massachusetts Army National Guard Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	1,637	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	1,295	Yes	Fuel Treatments and/or Structural Ignitability Reduction
3	348	No	Fuel Treatments and/or Structural Ignitability Reduction
4	92	No	Fuel Treatments and/or Structural Ignitability Reduction
5	1,442	Yes	Fuel Treatments and/or Structural Ignitability Reduction
6	1,943	Yes	Fuel Treatments and/or Structural Ignitability Reduction
7	2,147	No	Fuel Treatments and/or Structural Ignitability Reduction
8	265	No	Fuel Treatments and/or Structural Ignitability Reduction
9	3,886	Yes	Fuel Treatments
10	96	No	Fuel Treatments and/or Structural Ignitability Reduction
11	87	No	Fuel Treatments

Town of Truro

TOWN OF TRURO WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF TRURO SUMMARY STATISTICS

Town:	Truro	Population Density (people/$mi.^2$):	94.5
Land Area ($mi.^2$):	21.2	Home Density (housing units/$mi.^2$):	145.8
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		64.8%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
68.1%	23.7%	4.4%	3.9%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
4.2%	27.7%	66.5%	1.7%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	32	0 – 5 (ch./hr.):	33	No Data:	22	0 – 0.5 (mi.):	11	0 – 5 (people/$mi.^2$):	66
4 – 8 (ft.):	22	5 – 15 (ch./hr.):	4	Surface Fire:	28	0.5 – 1.0 (mi.):	11	5 – 60 (people/$mi.^2$):	14
8 – 12 (ft.):	19	15 – 40 (ch./hr.):	36	Passive Crown Fire:	50	1.0 – 1.5 (mi.):	17	60 – 525 (people/$mi.^2$):	7
> 12 (ft.):	26	> 40 (ch./hr.):	27	Active Crown Fire:	0	> 1.5 (mi.):	61	> 525 (people/$mi.^2$):	12

Fire Department Statistics

Fire Stations: 1 Fulltime Firefighters: 0 Call Firefighters: 21

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0			
Type 2:	0	Type 3:	0	
Type 3:	1	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	3	Type 6:	1	
Type 2:	0	Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

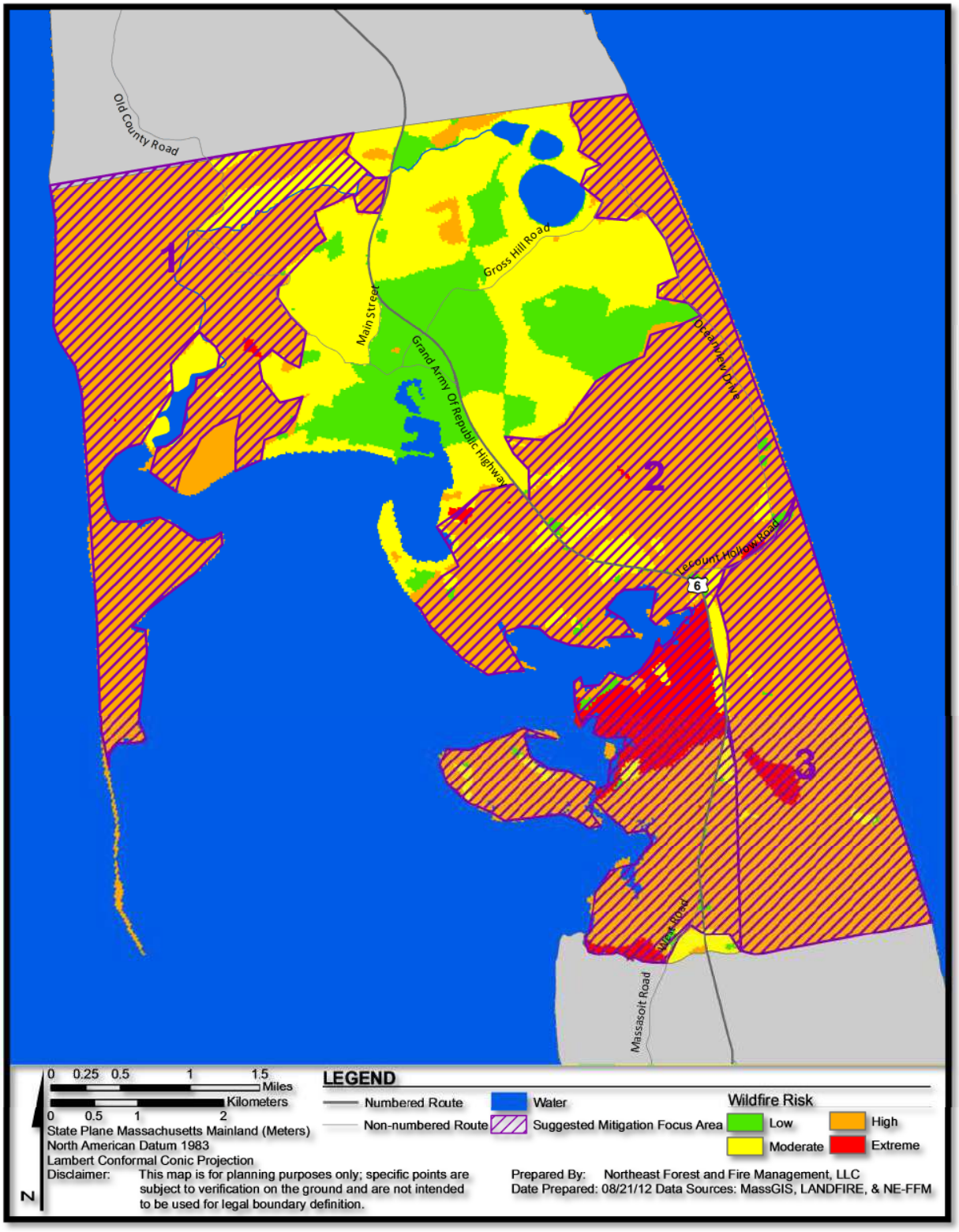
- Cape Cod National Seashore Fire Management Plan
- Cape Cod National Seashore Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	6,055	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	2,427	Yes	Fuel Treatments and/or Structural Ignitability Reduction
3	1,116	No	Fuel Treatments

Town of Wellfleet

TOWN OF WELLFLEET WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF WELLFLEET SUMMARY STATISTICS

Town:	Wellfleet	Population Density (people/$mi.^2$):	138.9
Land Area ($mi.^2$):	19.8	Home Density (housing units/$mi.^2$):	217.4
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		60.8%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
29.7%	15.5%	32.7%	22.1%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
10.1%	21.6%	64.1%	4.2%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	27	0 – 5 (ch./hr.):	30	No Data:	28	0 – 0.5 (mi.):	13	0 – 5 (people/$mi.^2$):	53
4 – 8 (ft.):	27	5 – 15 (ch./hr.):	4	Surface Fire:	20	0.5 – 1.0 (mi.):	13	5 – 60 (people/$mi.^2$):	8
8 – 12 (ft.):	20	15 – 40 (ch./hr.):	36	Passive Crown Fire:	52	1.0 – 1.5 (mi.):	38	60 – 525 (people/$mi.^2$):	14
> 12 (ft.):	27	> 40 (ch./hr.):	30	Active Crown Fire:	0	> 1.5 (mi.):	38	> 525 (people/$mi.^2$):	26

Fire Department Statistics

Fire Stations: 1 Fulltime Firefighters: 9 Call Firefighters: 15

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0			
Type 2:	1	Type 3:	0	
Type 3:	0	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	2	Type 6:	1	
Type 2:	0	Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

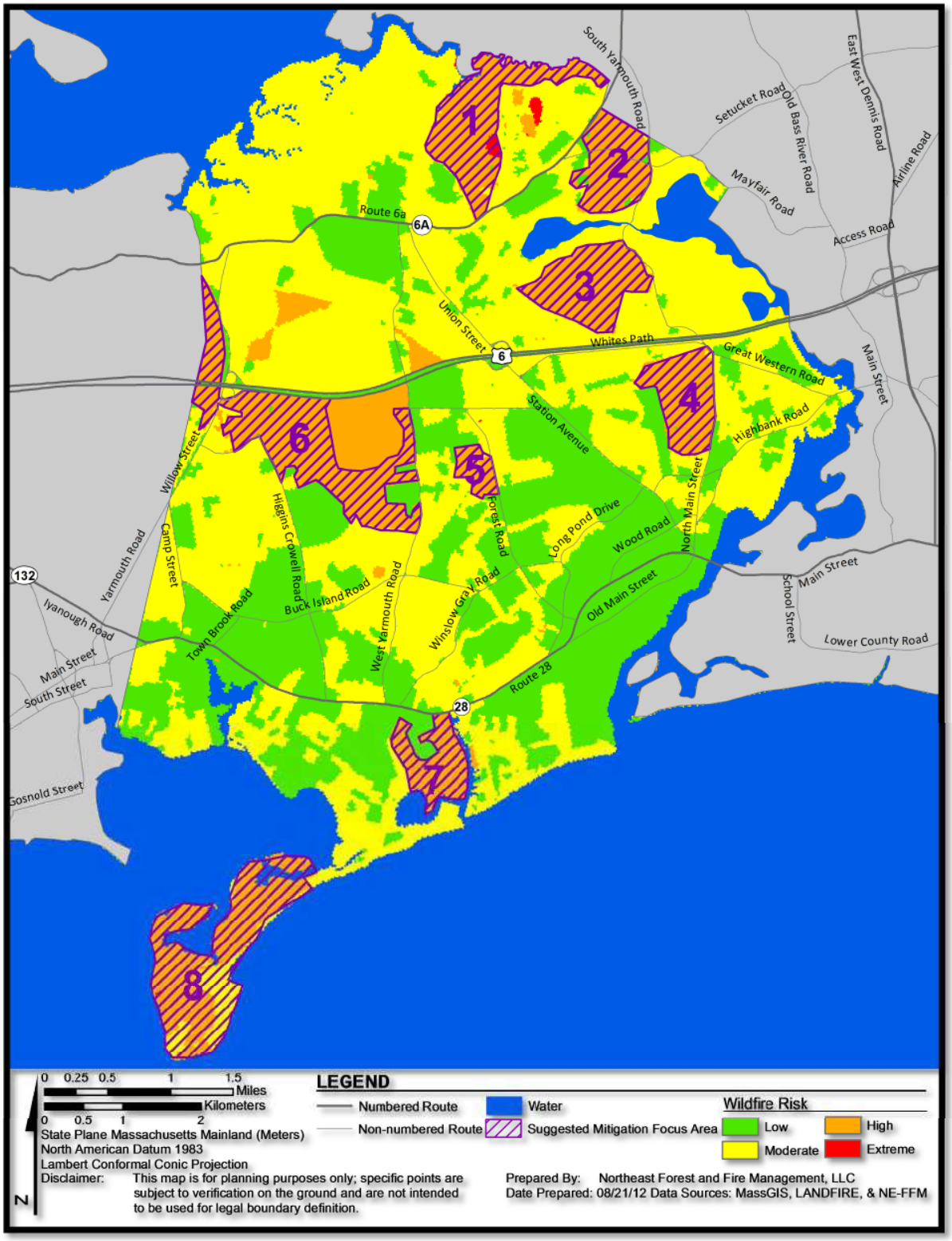
- Cape Cod National Seashore Fire Management Plan
- Cape Cod National Seashore Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	2,753	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	4,447	Yes	Fuel Treatments and/or Structural Ignitability Reduction
3	1,884	Yes	Fuel Treatments

Town of Yarmouth

TOWN OF YARMOUTH WILDFIRE RISK MAP



BARNSTABLE COUNTY WILDFIRE PREPAREDNESS PLAN
Community Wildfire Protection Plan

TOWN OF YARMOUTH SUMMARY STATISTICS

Town:	Yarmouth	Population Density (people/$mi.^2$):	979.1
Land Area ($mi.^2$):	24.3	Home Density (housing units/$mi.^2$):	718.7
Town Hosing Units Vacant for Seasonal/Recreational Use (%):		27.9%	

Percent of Town Classified by Wildland Urban Interface Types

Urban/No Vegetation	Uninhabited	Interface	Intermix
45.7%	14.0%	24.2%	14.2%

Percent of Town by Modeled Wildfire Risk

Low	Moderate	High	Extreme
15.7%	67.2%	16.8%	0.2%

Percent of Town by Modeled/Calculated Wildfire Risk Inputs

Flame Length		Rate of Spread		Fire Type		Dist. from Fire Station		Pop. Density	
0 – 4 (ft.):	22	0 – 5 (ch./hr.):	12	No Data:	19	0 – 0.5 (mi.):	14	0 – 5 (people/$mi.^2$):	63
4 – 8 (ft.):	25	5 – 15 (ch./hr.):	7	Surface Fire:	44	0.5 – 1.0 (mi.):	23	5 – 60 (people/$mi.^2$):	9
8 – 12 (ft.):	27	15 – 40 (ch./hr.):	49	Passive Crown Fire:	32	1.0 – 1.5 (mi.):	27	60 – 525 (people/$mi.^2$):	18
> 12 (ft.):	26	> 40 (ch./hr.):	33	Active Crown Fire:	5	> 1.5 (mi.):	36	> 525 (people/$mi.^2$):	10

Fire Department Statistics

Fire Stations: 3 Fulltime Firefighters: 65 Call Firefighters: 10

Water Tender		Wildland Engines		
			Standard	Brush Breaker
Type 1:	0			
Type 2:	0	Type 3:	0	
Type 3:	0	Type 4:	0	
Structure Engines		Type 5:	0	
Type 1:	6	Type 6:	1	
Type 2:	0	Type 7:	0	

NOTE: Data provided by Massachusetts Department of Conservation and Recreation

Current Fire and Fuel Management Programs and Plans

- Yarmouth Town Lands - Wildfire Preparedness Plan (CWPP)
- Town of Yarmouth Prescribed Burn Program

Suggested Mitigation Focus Area (See Town Wildfire Risk Map)

Area ID	Area Acres	High Risk Present	Likely Management Action (See Management Recommendations)
1	373	Yes	Fuel Treatments and/or Structural Ignitability Reduction
2	232	No	Fuel Treatments and/or Structural Ignitability Reduction
3	282	No	Fuel Treatments and/or Structural Ignitability Reduction
4	221	No	Fuel Treatments and/or Structural Ignitability Reduction
5	62	No	Fuel Treatments and/or Structural Ignitability Reduction
6	585	No	Fuel Treatments and/or Structural Ignitability Reduction
7	168	No	Fuel Treatments and/or Structural Ignitability Reduction
8	587	No	Fuel Treatments and/or Structural Ignitability Reduction

APPENDIX C: COUNTY-WIDE FIRE DEPARTMENT SURVEY

Fire Department Survey

This survey is intended to summarize wildland fire suppression capabilities and needs across Cape Cod by identifying training, equipment, or other needs that may increase wildfire preparedness.

Project Overview

Barnstable County's Cape Cod Cooperative Extension has conducted a Wildfire Preparedness Planning program for Barnstable County municipalities for the past six years. The program is designed to reduce wildfire hazards on municipal lands and educate the public about the risk of wildland fires. To date, wildfire preparedness plans have been developed for priority properties in twelve of the fifteen towns of Barnstable County, but many towns still lack the information required to identify and prioritize town and private lands that could benefit from the Wildfire Preparedness Planning program. The current project will address information gaps and provide Barnstable County municipalities with information to better prioritize and plan for future wildfire mitigation projects across multiple property ownerships.

Project Objectives

- Identify all wildland fire hazard possibilities throughout Barnstable County;
- Develop a county map displaying hazardous areas in Barnstable County;
- Establish a guide for ranking priority properties for developing Wildfire Preparedness Plans.
- Develop a countywide system for rating risk of wildfire;
- Provide information on various strategies appropriate for Barnstable County that will address wildland fire hazards and serve as a guide for future Wildfire Preparedness Planning;
- Assess current wildland fire suppression capacities;
- Identify areas needed to increase effectiveness of wildland fire suppression capacities.

Please return the completed survey by email, fax, or the postal service to Josh Nigro, DCR District 1 Forest Fire Control Warden by Friday 6 April, 2012.

Josh Nigro
DCR District 1 Forest Fire Control Warden
Shawme-Crowell State Forest
P.O. Box 621
Sandwich, MA 02563
Office Phone: (508) 888-1149

Mobile Phone: (508) 889-4094
Fax: (508) 833-8869
Email: Josh.Nigro@State.MA.US

One survey should be completed for each municipal fire department or jurisdiction.

Your time in answering the following questions to the best of your ability is greatly appreciated. Responses will enable us to create a plan that will better meet Barnstable County's Wildland Fire Hazard Mitigation needs.

TRAINING:

1) **How many firefighters are in your department?**

   Full-time: _____ **Call:** _____ **Volunteer:** _____

2) **How many individuals have attended the following wildland firefighting training classes (list highest level attained and avoid double counting).**

Course (lowest to highest)	Number of Individuals
2-Hour DCR Wildfire Class	_____
2-Hour Fire Shelter Class	_____
12-Hour DCR Class	_____
NWCG Self-paced S130/190 (online or CD)	_____
NWCG S130/190 Classroom	_____

3) **What other wildland fire related courses have personnel taken? Indicate the number of people trained and list any courses not in the table.**

Course	Number of Individuals
NWCG, S-212 Wildland Fire Chainsaws	_____
NWCG, S-211 Pumps and Water Use	_____
NWCG, S-215 Fire Ops. in the Wildland/Urban Interface	_____
NWCG, S-290 Intermediate Fire Behavior	_____
_____	_____
_____	_____
_____	_____
_____	_____

4) **Does your department conduct wildland fire drills or training scenarios?**

   YES _____ **NO** _____

   What is a yearly estimate of hours spent on wildland fire drills or trainings?

   _____

5) **Does your department conduct/participate in prescribed burns or pile burns?**

   YES _____ **NO** _____

   How many prescribed burns per year? _____

   What prescribed burn acres per year? _____

   How many pile burns per year? _____

6) **Would participation in prescribed burns benefit your department?**

YES _____ **NO** _____

Rate goals of participation in order of importance from most to least. (training, fuel hazard reduction, ecological management, list/rate others)

1st _____ **4th** _____

2nd _____ **5th** _____

3rd _____ **6th** _____

7) **What trainings could benefit your department, list others. Rank 1-10, with 1 being most important.**

____ **Access to more classroom-based NWCG wildland fire courses**

____ **Access to more self-paced (online/CD) NWCG wildland fire courses**

____ **Live fire or field based training exercises**

____ **County or state run fire academy wildfire trainings**

____ **Participation on prescribed fires with cooperators**

____ **Individual community college courses on fuels m or wildfire**

____ **Community college certificate in wildland fire or fuels mgmt.**

____ _____

____ _____

EQUIPMENT:

1) **How many <u>SETS</u> (leather boots, Nomex, leather gloves, hard hats, and fire shelter) of wildland fire personal protective equipment (PPE) does your department have?**

_____

2) **Does your department require fire shelters be carried by your firefighters when fighting wildfires?**

YES _____ **NO** _____

3) **How many fire shelters does the department have?**

_____

If you know, are they new generation fire shelters (post-2005)?

_____

4) **How many porta-tanks and portable pumps does the department have that are suitable for wildland fire?**

Porta-tanks: _____ **Portable Pumps:** _____

5) **How many chainsaws does your department have for use on wildland fires?**

What is the average bar length of the saws? _____

Do you have chaps for saw operators? _____

Are saw operators required to wear them? _____

6) **Using the diagram below, please fill in the table and identify what type and how many engines your department has that meets the following engine and tender typing criteria (note if it is a brush breaker, capable of off-road travel, or if the apparatus is excess property):**

Engine Types

Components	STRUCTURE ENGINES		WILDLAND ENGINES				
	1	2	3	4	5	6	7
Pump Rating							
minimum flow (gpm)	1000+	250+	150	50	50	30	10
at rated pressure (psi)	150	150	250	100	100	100	100
Tank Capacity Range (gal)	400+	400+	500+	750+	400-750	150-400	50-200
Hose (feet)							
2.1/2 inch	1200	1000	-	-	-	-	-
1.1/2 inch	400	500	500	300	300	300	-
1 inch	-	-	500	300	300	300	200
Ladders	48'	48'	-	-	-	-	-
Master Stream (GPM)	500	-	-	-	-	-	-
Personnel (minimum)	4	3	2	2	2	2	2

Components	Water Tender Types		
	1	2	3
Tank capacity (gallons)	5,000+	2,500+	1,000+
Pump capacity (gal/min)	300+	200+	200+
Off load capacity (gal/min)	300+	200+	200+
Maximum refill time (minutes)	30	20	15

Engine/Tender Type	Number	No. that are Brush Breakers	No. that are 4wd or AWD	No. that are Excess Property
Type 1 Engines:				
Type 2 Engines:				
Type 3 Engines:				
Type 4 Engines:				
Type 5 Engines:				
Type 6 Engines:				
Type 7 Engines:				
Type 1 Tender:				
Type 2 Tender:				
Type 3 Tender:				

7) **Does your department have VHF radio capability?**

If so, are these radios field, computer programmable, or both?

1) **From your experience, what is the most common cause of wild fire in your department's jurisdiction?**

2) **Approximately how many wild fires occurred in your department's jurisdiction last year and what was their average size?**

Number of Fires: _____ **Average Size (acres):** _____

3) **What is the largest wildland fire in the history of your town?**

Year: _____ **Acreage:** _____

4) **What is the average number of open burn permits issued each year (pile burns)?**

YES _____ **NO** _____

If there is a fee what is it? **YES** _____ **NO** _____

Do people have to sign for permits? **YES** _____ **NO** _____

5) **Does your department collaborate with federal, state, county, or other municipal agencies on issues related to wild or prescribed fire?**

YES _____ **NO** _____

Does your department collaborate with not for profit organizations on issues related to wild or prescribed fire?

YES _____ **NO** _____

Does your department contract with a for profit company on issues related to wild or prescribed fire?

YES _____ **NO** _____

List the organizations and describe the collaboration and/or contracting.

6) **Does the department conduct public outreach or training on wildland fire?**

YES _____ **NO** _____

Describe what types of outreach or training?

7) **Does the department conduct presentations on wildland fire prevention in town schools?**

YES _____ **NO** _____

When is the last time Smokey visited a town school?

_____

8) **Does your town have a Wildfire Protection and Preparedness Plan for municipal lands?**

YES _____ **NO** _____

Was the department involved in that planning process?

YES _____ **NO** _____

9) **Please rate the following on importance to increasing wildland fire suppression capabilities or wildfire preparedness - 1 being most important 10 being least important (list and rate any others):**

_____ **Increased knowledge on fuel treatments**

_____ **Increased wildland fire trainings**

_____ **More information on structure ignitions from wildland fire**

_____ **Increased participation on prescribed fires in Barnstable County**

_____ **Increased knowledge of fire behavior fire weather**

_____ **More wildland fire equipment**

_____ **More firefighters**

_____ **More Personal Protective Equipment (PPE)**

_____ _____

_____ _____

10) **Do you have any questions or other information related to wildland fire, this**

questionnaire, or the proposed Barnstable County Community Wildfire Protection Plan?

Name of Person Completing Survey: _____

Position/Job Title of Person Completing Survey: _____

Contact Phone Number: _____

Contact Email: _____

Fire Department, Jurisdiction, or Town Represented in Survey: _____

Thank You For Your Time

APPENDIX D: BROCHURE ON REDUCING WILDFIRE ON CAPE COD

Community Involvement

It's important to practice fire safety around your home, neighborhood, and business to reduce the risk of wildfire. A carelessly discarded cigarette, an abandoned campfire, or a wind-driven backyard fire are just some of the ways fire can turn a tranquil setting into a raging wildfire. Like all natural hazards, wildfires do not respect political or jurisdictional boundaries, highlighting the necessity for a regional approach and cooperation among private landowners, communities, private organizations, and all levels of government. Obey all restrictions about fires, never leave a fire unattended, and don't try to get close to a wildfire. Let emergency responders do their jobs. Support public land management efforts to reduce wildland fuels and work together with your neighbors and local fire department to address fire protection needs in your area. *For more information visit these helpful web sites:*

CAPE COD COOPERATIVE EXTENSION
www.capecodextension.org
CAPE COD FIRE DEPARTMENTS
www.capecodfd.com
FEDERAL EMERGENCY MANAGEMENT AGENCY
www.usfa.fema.gov
FIREWISE COMMUNITIES
www.firewise.org
FUELS MANAGEMENT NORTHEAST BARRENS
www.umass.edu/nrc/nebarrensfuels
MA DEPT. CONSERVATION & RECREATION
FOREST FIRE CONTROL
www.mass.gov/dcr/stewardship/firecont
NATIONAL FIRE PROTECTION ASSOCIATION
www.nfpa.org
USDA FOREST SERVICE
www.fs.fed.us

Cape Cod Cooperative Extension
Box 367
Barnstable, MA
02630-0367

Phone: 508 375 6701
Fax: 508 362-4518

Create a Defensible Space Around Your Home

- Maintain at least thirty feet of defensible space around your home in short grass or other nonflammable materials. This is your "first priority zone" to consider for fire protection.
- Clean up your yard. Remove any underbrush, pine needles, dead-fall or long grass. Keep your grass mowed and watered.
- Prune low hanging branches on evergreens up to 8 feet above the ground.
- Store firewood 30 feet or more from your house. If your property slopes, move your woodpile and other flammable materials uphill from the house.
- Keep propane tanks at least 30 feet from buildings and clear vegetation within 10 feet of the tank.
- Contact your utility company if trees or branches are not clear of power lines.
- Maintain driveways 12 feet or wider to accommodate emergency vehicles and keep branches along passageways pruned a minimum of 10 feet above the ground.
- Remove any yard waste from wildland interface boundaries.
- Work with local fire officials to understand what type of wildland vegetation surrounds your home, how flammable it is, and how continuous it is on your property. Determine the need for a second or third priority zone of defensible space on your property.
- Reduce fuels in this second or third priority zone of defensible space around your home. Retain oak trees and other less flammable deciduous trees within this forested zone. Selectively remove pitch pine trees and space pines so that individual trees are at least 30 feet apart. Remove any slash from logging activities. Prune lower branches on remaining pines and other evergreens. Mow or brush cut volatile shrubs and vines such as scrub oak, black huckleberry, and greenbrier on a regular basis to maintain a low-stature understory.
- Talk with neighbors and local fire officials about wildfire protection efforts in your area and schedule a neighborhood clean-up event.

Reducing Wildfire Risk on Cape Cod

The pitch pine and scrub oak vegetation of Cape Cod is considered one of the most fire prone natural landscapes within the northeastern United States. These forests and woodlands are inherently prone to burning. The flammable conditions of the vegetation, fast draining sandy soils, and increased development in proximity to this fire prone landscape place homeowners at risk from wildfires.

These same forests and woodlands are important aquifer recharge areas and help maintain water quality. They provide valuable habitat for plants and wildlife, many of which are rare in Massachusetts. The forests and woodlands are also much cherished recreational resources on Cape Cod. Many people choose to live in or adjacent to wildland settings because the areas offer natural scenic beauty, a more relaxed lifestyle, and privacy.

In many areas where forests mingle with homes and other facilities, vegetation management is needed to reduce the likelihood of catastrophic fire losses. Cape Cod Cooperative Extension has initiated the Wildfire Assessment and Preparedness Program to mitigate wildfire impacts on town-owned wild lands throughout Barnstable County. The program works cooperatively with towns, state and federal partners, private citizens and organizations to reduce wildfire hazards on public lands, increase firefighter and public safety, and inform landowners through education and awareness programs.

The Wildland Urban Interface

The Wildland Urban Interface exists wherever homes and businesses are built among trees and other combustible vegetation. Pitch pine, scrub oak, black huckleberry, and greenbrier are especially vulnerable to high intensity fire due to their natural volatility and dense arrangement. Fire hazards also exist in certain non-forested plant communities of Cape Cod, such as phragmites wetlands. Drought conditions, high winds, and the accumulation of dried vegetation may set the stage for destructive interface fires in these settings.

The prevailing threat is from wildfires carried through the shrub and grass layers, but dangerous crown fires are possible where pitch pine and ladder fuels are dense and fire exclusion or storm damage have created a build up of fuels. Interface fires often start as small accidental ignitions. Uncontrolled fire can move from the wildland into a residential community or start within a residential community and spread into adjacent wildlands. The interface area is generally considered that first wave of buildings adjacent to dense wildland vegetation but even some business areas a distance from the interface, can be at risk when wind carries showers of embers from wildfires.

Successful fire protection cannot solely rely on good fire control capability. To be successful, interface stakeholders must implement a combination of appropriate activities to raise awareness, reduce fuel hazards, and plan for potential fire occurrences.

Public land managers use prescribed burning to reduce fuel loads

Reducing Fuel Loads

Fuel management options employed by public land managers of wild lands often involve brush cutting during the summer months followed by carefully executed prescribed burns to reduce the stature and density of the volatile shrub understory and reduce the amount of litter on the forest floor. These management activities limit the spread of surface fires and reduce the risk of crown fires in pine stands. The goal is not to remove all vegetation from the forest, but to thin the area so fires will be of low intensity and more easily extinguished. Fire resistant deciduous trees are retained, and pitch pine trees are selectively thinned and spaced more widely to reduce the potential for crowning fires.

What you can do to make your home less vulnerable to wildfire

- Use fire resistant roofing materials.
- Ensure that your roof is free of combustible debris and no overhanging trees or vegetation provide fuel for airborne sparks and embers.
- Ensure chimneys meet current building code requirements and have approved spark arrestors.
- Use fire resistant building materials for exterior walls and double pane glass in windows.
- Ensure that all eaves are closed in and screen all vents including soffits.
- Keep areas under decks and porches clear of debris and sheath with flame resistant materials.
- Ensure your address is clearly signed on your property for quick identification.
- Maintain adequate emergency vehicle access, and an on-site emergency water supply (such as a pool, pond, or tank).
- Keep shovels, rakes, axes, garden hoses, sprinklers and roof ladders readily accessible to assist firefighters.

APPENDIX E: POTENTIAL SOURCES OF FUNDING

Safe and Vital Communities Program - The Allstate Foundation
Provides grants for community development, government/public administration, safety/disasters. Grants average $1,000 to $10,000.

www.allstate.com/foundation/

Wildfire Preparedness Planning - Cape Cod Cooperative Extension
The program is intended to help with public education about the risk of wildland (forest) fires and address the issue of fire safety, specifically management of available wildland fuels on public owned lands. This initiative, funded by Barnstable County, will provide the services of a consulting forester who will evaluate identified town owned parcels and develop wildland fire management plans for each identified parcel. Each fire management plan will address fuel reduction measures (mechanical, prescribed fire, or combination mechanical/fire prescriptions) that, if implemented, will reduce the risk of wildfire. The program will also include matching mini-grants to help implement the recommendations made by the consulting forester.

http://www.capecodextension.org/Natural-Resources/Wildlife-Preparedness-Planning.html

Volunteer Fire Assistance - Massachusetts Department of Conservation and Recreation
Through the USDA Forest Service's Volunteer Fire Assistance program, the Bureau is enabled to issue grants and materials to towns with less than 10,000 populations. This program provides technical, financial and other assistance to fire departments for forest fire related purposes.

www.mass.gov/dcr/stewardship/firecont/services.htm

Federal Excess Property Program - Massachusetts Department of Conservation and Recreation
Within the Commonwealth, the Bureau administers the USDA Forest Service's Excess Property Program. This program provides cities and towns with free firefighting materials. Any equipment acquired must be used for fire control purposes only.

www.mass.gov/dcr/stewardship/firecont/services.htm

Community Forest Stewardship Grants - Massachusetts Department of Conservation and Recreation
The purpose of the Community Forest Stewardship Grants grant program is to aid communities in putting forest stewardship into practice and to help connect the local citizens to their forest and the benefits these forests provide - including a local source of wood products, clean water, biodiversity, and wildlife habitat.

http://www.mass.gov/dcr/stewardship/forestry/service/steward.htm

Forest Stewardship Program - Massachusetts Department of Conservation and Recreation
The Massachusetts Forest Stewardship Program supports and encourages private forest landowners' efforts to manage, enjoy, and care for their land using a long-term approach. The program is administered by the Massachusetts Department of Conservation and Recreation Bureau of Forestry which strives to provide education and periodic cost-share opportunities to forest landowners.

http://www.mass.gov/dcr/stewardship/forestry/service/steward.htm

Landowner Incentive Program - Massachusetts Division of Fisheries and Wildlife
The LIP program is administered through the MA Division of Fisheries and Wildlife as a partnership that provides private landowners interested in developing and maintaining wildlife habitat on their property with financial and technical assistance.

http://www.mass.gov/dfwele/dfw/habitat/grants/lip/lip_home.htm

Environmental Quality Incentives Program - Natural Resource Conservation Service
The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides technical and financial assistance to agricultural producers and forest land owners who want to improve and protect the condition of soil, water, air, plants and animals.

http://www.ma.nrcs.usda.gov/programs/eqip/index.html

Wildlife Habitat Incentive Program - Natural Resource Conservation Service
The Wildlife Habitat Incentive Program (WHIP) is a voluntary program that provides technical and financial assistance to people who want to improve fish and wildlife habitat or restore natural ecosystems on their land.

http://www.ma.nrcs.usda.gov/programs/whip/index.html

Private Stewardship Grants - US Fish and Wildlife Service
Provides grants or other assistance on a competitive basis to individuals and groups engaged in private conservation efforts that benefits species listed or proposed as endangered or threatened under the Endangered Species Act, candidate species, or other at-risk species on private lands within the United states.

http://www.fws.gov/grants/conserve.html

Assistance to Firefighters Grant Program - FEMA and US Fire Administration Program
The purpose of the Assistance to Firefighters Grant Program is to award one-year grants directly to fire departments and nonaffiliated emergency medical services organizations of a State to enhance their abilities with respect to fire and fire-related hazards. This program seeks to support organizations that lack the tools and resources necessary to protect the health and safety of the public and their emergency response personnel with respect to fire and all other hazards they may face.

www.usfa.fema.gov

Community Facilities Loans and Grants - Rural Housing Service, U. S. Dept. of Agriculture
Provides grants (and loans) to cities, counties, states and other public entities to improve community facilities for essential services to rural residents. Projects can include fire and rescue services; funds have been provided to purchase fire-fighting equipment for rural areas. No match is required.

www.rurdev.usda.gov

Reimbursement for Firefighting on Federal Property - U. S. Fire Administration and FEMA
Program provides reimbursement to fire service organizations that have engaged in firefighting operations on federal land. Payments can be for direct expenses and direct losses.

www.usfa.fema.gov

Fire Management Assistance Grant Program - Readiness, Response and Recovery Directorate, FEMA
Fire Management Assistance is available to States, local and tribal governments, for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.

http://www.fema.gov

Hazard Mitigation Grant Program - Federal Insurance and Mitigation Administration, FEMA
The Hazard Mitigation Grant Program provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration.

http://www.fema.gov

APPENDIX F: DESCRIPTION OF GIS DATA LAYERS AND FILES INCLUDED ON PROJECT THE DVD

Contact the Cape Cod Cooperative Extension at P.O. Box 367, Barnstable, MA 02630 to request copies of any data.

FOLDER 1. FINAL PLAN

- **Barnstable County Wildfire Preparedness Plan - CWPP - 09-10-12**
  Two copies of the final plan; one in is in MS-Word (docx) and the second is in Adobe Acrobat Reader (pdf) format.

FOLDER 2. PROJECT SUMMARIES

- **Project Overview**
  A two page project overview in MS-Word (docx) format.
- **Project Overview**
  A PowerPoint overview in MS-PowerPoint (ppt) format.

FOLDER 3. TEMPLATES – SITE PLAN AND PROJECT REPORT

- **Template - Site Plan - Short**
  An example short format plan in MS-Word (docx) format for site specific implantation planning, that focusses on fire management project implementation, for planning that will address management issues in addition to fire management, go to the Massachusetts Department of Conservation and Recreations web page at http://www.mass.gov/dcr/stewardship/forestry/service/lawsnforms.htm for a blank template of a Forest Stewardship Management Plan.
- **Template - Project Report**
  An example report in MS-Word (docx) format for summarizing and reporting completed fire management implementation projects.

FOLDER 4. GOOGLE EARTH FILES

- **Barnstable_County_CWPPs**
  A Google Earth (kml) format file that will display all site specific Wildfire Preparedness and Prevention, Fuel Management, and Community Wildfire Protection Plans that have been completed in Barnstable County, completed as of August of 2012.
- **Template - Project Report**
  A Google Earth (kml) format file that will display all site Town Focus Areas that were identifies in the Barnstable County Wildfire Preparedness Plan.

FOLDER 5. READING

- **Multiple Documents**
  Eleven documents containing valuable information that will support and/or supplement information presented in the Barnstable County Wildfire Preparedness Plan. All documents are in Adobe Acrobat Reader

(pdf) format and consist of several journal articles, federal guides, and a Barnstable County informational brochure.

FOLDER 6. GIS LAYERS

- **Analysis Layers (Sub-Folder)**
  Data created during the data analysis and map generation processes for the project.
  Inputs Layers (Sub-Folder):
  - **cape_census_blks**: Census blocks clipped to Cape Cod also contains information on weighted analysis in attribute table- you could make a final map just by coloring the blocks according to 'zonal mean sum' in the attribute table.
  - **cape_open_space**: MassGIS open space layer clipped to Cape Cod.
  - **cape_roads**: MassGIS EOTmajroads file clipped to Cape Cod.
  - **crown_fire**, & **flame_length**, **rate_spread**: The raster layers from FlamMap before being reclassified in 1-4 so they have original values for fire behavior (not the layers used in the analysis though, the reclassified layers were used). Will need to be reprojected to match up with MassGIS layers.
  - **dist_fire_st**, & **pop_density**: Raster layers of distance to fire station and population density before being reclassified in 1-4.
  - **cf_reclass**, **dens_reclass**, **fd_reclass**, **fl_reclass**, & **ros_reclass**: The 5 reclassified (1-4) layers used in the weighted analysis to produce the final map.

  Outputs Layers (Sub-Folder):
  - **final_map**: The final map document that contains the final_risk layer correctly classified in low, moderate, high, and extreme categories. It also includes the final_rast layer (the risk assessment is still in raster version, not joined to census blocks).
  - **cape_census_blks**: Cape census blocks with results of final analysis included in attribute table in "zonal_sum" column.
  - **final_rast**: Final risk analysis in raster version before being joined to census blocks
  - **final_risk**: Final risk analysis layer by census blocks. Layer just needs to be displayed correctly using the 'classified' function in the symbology tab to be divided and colored into low, moderate, high, and extreme categories.
  - **focus_areas**: Suggested Mitigation Focus Areas identified using final hazard output layer.
  - **Barnstable_co_cwpps**: Location of all draft and finalized site specific wildland fire plans.

  Landfire Layers (Sub-Folder):
  All LandFire data used to create FlamMap layers, also includes meta data. All are titled similarly: as an example "z65_final" labeled as z65_asp_final for the aspect layer.

- **9 files**: **asp** (aspect), **cbd** (canopy bulk density), **cbh** (canopy base height), **cc** (forest canopy cover), **ch** (canopy height), **dem** (elevation), **fbfm40** (40 Scott and Burgan fuel models), **mfri** (mean fire return interval), and **slp** (slope).

MassGIS Layers (Sub-Folder):

Includes all original layers used from MassGIS (no clipping) in the MassGIS naming. Includes meta data/descriptions from MassGIS.

- **7 files**: **counties_poly**, **eotmajroads_arc**, **majpond_poly**, **majstrm_arc**, **openspace_poly**, & **towns_poly** (*see http://www.mass.gov/mgis/massgis.htm for details*).
- ***NOTE:*** *Due to file size this folder does not contain the USGS Color Ortho Imagery (2008/2009), go to http://www.mass.gov/mgis/massgis.htm to acquire this layer.*

U.S. Census Layers (Sub-Folder):

U.S. Census Bureau Block data for the state of Massachusetts for 2010

- **7 census2010blocks_poly**: U.S. Census Block data (*see http://www.mass.gov/mgis/massgis.htm for details*).

University of Wisconsin - WUI Layers (Sub-Folder):

WUI classification data for the state of Massachusetts.

- **ma_wui**: WUI classification data (*see http://silvis.forest.wisc.edu/maps/wui/state for details*).