

**Wildland Fire
Protection and Preparedness Plan
for
Wiley Park, The Nickerson Property,
and Cottontail Acres
Eastham, Massachusetts**

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**WILDLAND FIRE PROTECTION AND PREPAREDNESS PLAN FOR WILEY PARK,
THE NICKERSON PROPERTY, AND COTTONTAIL ACRES**

EXECUTIVE SUMMARY

The purpose of this plan is to identify actions intended to reduce wildfire hazard at Wiley Park, the Nickerson Property, and Cottontail Acres. The plan is a cooperative venture between the Town of Eastham and Cape Cod Cooperative Extension. It is one of many similar plans being prepared in a county-wide effort to mitigate wildfire impacts on town-owned lands in Barnstable County.

The Town of Eastham nominated Wiley Park, the Nickerson Property, and Cottontail Acres as high priority for wildfire assessment and preparedness planning. At a total of 93 acres, Wiley Park, the Nickerson Property, and Cottontail Acres is an area that contributes significantly to the Wildland Urban Interface within Eastham landscape. Flammable conditions of existing vegetation and the potential for wildfires at each site justify the need and urgency of an integrated and coordinated planning approach.

Wiley Park, the Nickerson Property, and Cottontail Acres are managed by the Eastham Natural Resources Department. The three sites have multiple natural resource values, including significant ecological features, and recreational resources. Public infrastructures found on the area include a gatehouse, bathhouse, and play ground all located at Wiley Park. The properties are bordered by large freshwater ponds and private residences.

Wiley Park, the Nickerson Property, and Cottontail Acres are predominantly forested, and the existing forest vegetation is susceptible to fire. Areas with black huckleberry, scrub oak, old field red cedar, pitch pine, greenbrier, and 2005 storm damaged trees are especially vulnerable to high intensity fire due to the natural volatility or dense arrangement of these fuels. The prevailing threat is from surface fires carried through the shrub or grass layers, but dangerous crown fires are possible where pitch pine and ladder fuels are dense.

Prevention, early detection, and suppression of wildfires remain priorities for the Eastham Fire Department. Access points and roads should be well maintained and marked to allow for adequate fire control within the three properties and surrounding areas. Resource managers are advised to reduce fuel loads in fire prone areas of Wiley Park, the Nickerson Property, and Cottontail Acres. Wider zones of reduced fuels and increased access along certain dirt roads and boundaries may be achieved through a combination of mechanical treatment and prescribed fire. Removing from site or pile burning on site storm debris will greatly reduce downed dead fuel loads. Mowing or burning understory brush and selectively thinning pitch pine trees in designated areas will reduce fuel loads and thus the hazard of wildfires. These fuel reduced zones or shaded fuel breaks allow suppression forces a higher probability of safely and successfully attacking a wildland fire. The risk of wildland and residential interface fires may also be lessened through cooperative education and fire prevention strategies on private lands.

This plan presents the following recommendations:

GOALS:

- A. Increase firefighter and public safety associated with wildland fire at Wiley Park, the Nickerson Property, Cottontail Acres and surrounding private properties
- B. Reduce wildfire hazard within Wiley Park, the Nickerson Property, and Cottontail Acres through an integrated and proactive land management program.
- C. Reduce the threat from wildfire to property and life on lands adjacent to Wiley Park, the Nickerson Property, and Cottontail Acres through education and awareness programs.

OBJECTIVES:

1. Establish an Eastham Town Lands Fire Management Team that will focus on guiding implementation schedules, management actions, and future planning that relate to fire management at Wiley Park, the Nickerson Property, and Cottontail Acres.
2. Establishing an understanding of the importance of management actions to be taken by the town at Wiley Park, the Nickerson Property, and Cottontail Acres.
3. 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 communities that surround Wiley Park, the Nickerson Property, and Cottontail Acres.
4. Reduce accumulated 2005 storm damage consisting of downed dead fuel concentrations at Wiley Park and the Nickerson Property in all affected stands.
5. 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 Wiley Park, the Nickerson Property, and Cottontail Acres.
6. Establish fuel reduction zones 100 to 200-feet in width on the property lines immediately adjacent to residential structures at Wiley Park, the Nickerson Property, and Cottontail Acres at strategic locations based on prevailing winds that occur during wild fires.
7. Establish fuel reduction zones of 50 to 100-feet in width on both sides of the road along the unnamed dirt road that bisects Cottontail Acres.
8. Maintain the Cultural Grassland at Cottontail Acres.
9. Restore all or portions of the Eastern Red Cedar Woodland to Cultural Grasslands and remove invasive species at Cottontail Acres.
10. Break up the horizontal and vertical continuity of fuels and reduce fine fuel loads throughout Wiley Park, the Nickerson Property, and Cottontail Acres.

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SITE INFORMATION

Site: Wiley Park
Town, County, State: Eastham, Barnstable Co., MA
U.S.G.S. Quadrangles: Orleans MA
Latitude: 41⁰49'51" N **Longitude:** 69⁰59'52" W
Ownership: Town of Eastham
Managed by: Eastham Natural Resources Department

Total Acres: 44
Elevation: 6 – 25 Feet

Site: Nickerson Property
Town, County, State: Eastham, Barnstable Co., MA
U.S.G.S. Quadrangles: Orleans MA
Latitude: 41⁰49'42" N **Longitude:** 69⁰69'50" W
Ownership: Town of Eastham
Managed by: Eastham Natural Resources Department

Total Acres: 31
Elevation: 9 – 22 Feet

Site: Cottontail Acres
Town, County, State: Eastham, Barnstable Co., MA
U.S.G.S. Quadrangles: Orleans MA
Latitude: 41⁰49'37" N **Longitude:** 69⁰69'20" W
Ownership: Town of Eastham
Managed by: Eastham Natural Resources Department

Total Acres: 18
Elevation: 4 – 26 Feet

General Description: This planning report encompasses the cumulative 93-acres of Wiley Park, the Nickerson Property, and Cottontail Acres. The Town of Eastham's Department of Natural Resources manages these areas for recreation and open space.

Wiley Park, the Nickerson Property, and Cottontail Acres are primarily forested and support a network of trails and non-paved roads. Wiley Park is bounded on the east by the pond shore of Great Pond, on the south by Widow Harding Pond and Herring Brook, on the west by Herring Brook Road, and to the north by a developed private properties consisting of approximately 35 houses and associated structures (Figure 1). Several improvements are within the boundaries of Wiley Park; a fee collectors booth, play ground, and bath house all on the east side of the property near the pond shore of Great Pond.

The Nickerson Property is bounded by Clark's Point Road on the east, Samoset Road and several private properties with houses on the south, Herring Creek Road on the west side, and Widow Harding Pond and Herring Creek on the north (Figure 1).

Cottontail Acres is bounded by Jemima Pond and Nickerson Road on the east side, Herring Pond on the south side, Herring Pond Way on the west side, and Samoset Road on the north side (Figure 1).

Terrain is variable throughout the site. Soils are classified within the Barnstable County Survey as being Carver Soil (90 acres) type with varying slope classes and Hooksan Sand (3 acres) which occurs on a small area of the northwest corner of Wiley Park. These deep and excessively drained

sandy soils formed in glacial outwash deposits are nearly level throughout to moderately sloping around pond shores.

Mixed oak species and pitch pine dominate forest vegetation within Wiley Park and the Nickerson Property. Various expressions of the vegetation reflect local site conditions such as slope, slope position, aspect, land use history, and past disturbance events. Understory vegetation varies between grass and shrubby vegetation, including black huckleberry and lowbush blueberries. Cottontail Acres is comprised of a small area of remnant grassland with the majority of the property being comprised of old field red cedar.

Wiley Park, the Nickerson Property, and Cottontail Acres have passive recreational uses that include dog walking, general walking, nature observation, and swimming. The access to a freshwater beach, playground, open woodlands, and the network of trails contribute to making this open space area a pleasant place to hike, observe wildlife, and study the natural environments of Cape Cod.

EMERGENCY ASSISTANCE INFORMATION

Fire:	Eastham Fire Department Chief: Glenn Olson 2520 State Highway Eastham, MA 02642-2544	(508) 255-2324
Law Enforcement:	Eastham Police Department Chief: Richard Hedlund 2550 State Highway Eastham, MA 02642-2544	(508) 255-0551
Medical:	Eastham Fire Department Cape Cod Hospital	(508) 255-2324 (508) 771-1800
Site Managers:	Eastham Natural Resources Department: Natural Resources Officer: Henry Lind 555 Old Orchard Road Eastham, MA 02642-2544	(508) 240-5972

All emergency numbers can be reached through 911; the above numbers are direct lines.

JUSTIFICATION FOR MANAGEMENT

This Wildland Fire Protection and Preparedness Plan is funded through the Cape Cod Cooperative Extension in cooperation with the Town of Eastham, as part of a county-wide initiative to address wildfire hazards on town-owned or town administered open space tracts. The town of Eastham nominated the Wiley Park, the Nickerson Property, and Cottontail Acres as its highest priority for wildfire assessment and preparedness planning. These properties are heavily utilized conservation and recreation properties and primarily consist of mixed oak and pitch pine forest or emergent Red Cedar woodlands. These forest types are highly flammable especially in certain areas of the properties that contain heavy fuel accumulations. Residential development has

increased within this Wildland urban interface area over the past two decades, warranting assessment of wildfire risks and hazardous fuels.

Wiley Park, the Nickerson Property, and Cottontail Acres protect a socially valuable forested ecosystem interspersed with pond shores and a small stream. This forested land provides important habitat for many wildlife species and enables residents and visitors to enjoy and learn about the natural world around them. The area serves many passive recreational functions and protects significant natural resources, as well as the scenic and natural character of forestland within Eastham.

There are approximately 40 homes immediately abutting Wiley Park, the Nickerson Property, and Cottontail Acres. These properties situated adjacent to Wildland fuels greatly increase the potential for dangerous and costly wildfires to start in or near developed areas and then spread on to the Wiley Park, the Nickerson Property, and Cottontail Acres or for wildfires to start in these town owned properties and impact neighboring residential areas. National studies have shown that increased human activity within wildland settings generally increases the potential for wildfire ignitions. Managing Wiley Park, the Nickerson Property, and Cottontail Acres for their conservation and recreation values, reducing wildfire hazards, and protecting public safety are priorities for the Town of Eastham.

Prevention, detection, and suppression of wildfires should remain a very high priority for local fire control organizations, but resource managers must, at the same time, actively work to reduce heavy and highly flammable fuel loads in fire-prone areas through prescribed burning and mechanical cutting methods. Suppression alone will not eliminate the risk of wildfires. Although fires may occur less frequently, fires will eventually occur. Dependent on weather and fuel conditions, these fires can be expected to burn with intensities that may escape initial fire control and threaten human resources, both within Wiley Park, the Nickerson Property, and Cottontail Acres and on adjacent public and private property.

Existing fuelbreaks at Wiley Park, the Nickerson Property, and Cottontail Acres consist of pond shores, trails within the properties, areas of reduced fuel loading or consisting of vegetation that is not highly flammable, and existing public roads along the peripheries of the properties. As a result of prevailing winds, most fires will spread from the south and west to the north and east. Several residential areas are at risk. Improved access for fire control is needed, in addition to treatment of fuel concentration on town property and public education of residents in the neighboring communities. Wider zones of reduced fuel loadings and increased access along certain boundaries and interior dirt roads could be achieved through a combination of mechanical treatment and prescribed fire with minimal soil disturbance. Fuel treatments are proposed to reduce the threat of wildfires. Prescribed burning – setting fires under identified conditions – can reduce fine fuels that spread wildfires.

Several public agencies and conservation organizations on Cape Cod (including the National Park Service, Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement, Massachusetts Department of Conservation and Recreation, The Nature Conservancy, and Massachusetts Audubon Society) use a combination of prescribed fire and mechanical treatments to reduce hazardous fuel loads and maintain the ecological integrity of coastal plain forested ecosystems. Prescribed burns are carefully planned and executed to minimize escapes and smoke impacts, which are often a hazard associated with unplanned fires. Fire ecologists recommend burning designated fire-prone areas at regular periodic intervals. A program of periodic low to moderate intensity prescribed burns is designed to reduce accumulations of fine fuels and produce a long-term reduction in larger fuels.

It should be noted that although fire is a natural component of this forested ecosystem, the use of natural fire (e.g. non-management ignited fire) will not be allowed. Due to the close proximity of residential areas and transportation routes, all unplanned ignitions that occur within the Wiley Park, the Nickerson Property, and Cottontail Acres will be aggressively suppressed using methods and means consistent with protecting lives and property.

FIRE HISTORY AND PAST LAND USES

Paleo-ecological records show that fire has been part of the Cape Cod landscape for thousands of years (Winkler 1985, Patterson and Sassman 1988, Stevens 1996, and Patterson 1999). In modern times, fire continues to influence the vegetation of Cape Cod to the extent that fire adapted natural communities predominate over most of the area. Cores taken from Duck Pond on Cape Cod National Seashore, dating back 12,000 years and 4,800 years respectively, found abundant charcoal throughout the stratigraphic column suggesting that fire has played an important role in maintaining pine and oak forests on the Cape throughout the Holocene (Winkler 1982 and 1985, Bachman 1984, Clark 2002, Patterson and Crary 2004). A sediment core taken by Patterson (1999) from Mary Dunn Pond in Barnstable supports the evidence that fire was an important influence within the pre and post European settlement landscape of Cape Cod.

By the early 1800's, almost all forested areas were divided into firewood lots and extensive fuelwood cutting and sheep grazing occurred on the landscape. Fires during this time were extensive, often thousands of acres. Descriptions of the Cape Cod landscape during this time, report widely spaced pitch pines and coppice oak sprouts.

With the expansion of railroad activities on Cape Cod in the late 1800's, forest fires increased. Drifting embers from steam locomotives started most fires (Thompson 1928). During the early 1900's on Cape Cod, fires were abundant and Thompson (1928) reported an average of 8,500 acres of woodland burned annually. Tourism was becoming an important trade on Cape Cod by the early 1900's and public opinion began to favor the suppression of all fires, although some people still continued the practice of burning blueberry patches to increase berry yields.

The first fire tower on Cape Cod was erected in 1913 in the town of Barnstable to watch for fires and communicate fire locations to local fire fighters. The Massachusetts Department of Conservation started patrolling the Cape in the 1920's along with local patrol trucks, which were equipped with water, hose, and tools. In the late 1930's, Cape Cod led the way in developing the first brush breakers to fight forest fires (Crosby 2003). After this period, forest fires tended to burn for shorter periods of time and consumed fewer acres.

Very large wildfires may still occur on Cape Cod every 30 to 50 years, instead of intervals of 10 to 20 years (Patterson and Ruffner 2002). Long intervals between fires may heighten the danger to the public, as fuels build up and people are prone to forget about the risk of wildfire and become complacent about controlling flammable accumulations of fuels around dwellings and other structures.

THE FIRE ENVIRONMENT

Fires, like many natural events, are cyclic. The fire cycle is governed by conditions such as climate, storm events, insect outbreaks, topography, soils, existing vegetation, and human activities. The climate of Cape Cod is humid and continental characterized by a moderate to large annual temperature range and well-developed winter and summer seasons. Precipitation is

ample in all months and favors development of forests (Strahler 1966). The vegetation exhibits a maritime influence due to its proximity to the Atlantic Ocean. Prevailing winds are out of the southwest from April through October and out of the northwest from November through March. Winds from the northeast are associated with storm events, bringing high winds, driving rain, and cold damp air. Precipitation maximums occur during the winter months and a minimum usually occurs in late May through July (Fletcher 1993).

Most wildfires are likely to occur in late spring and early summer, associated with southwesterly winds. The potential for fire is highest during periods of low precipitation and humidity, when fine fuels can ignite easily. Relative humidity levels are usually lowest in March through May. Wildfires occurring during periods of low humidity can create sparks and embers carried aloft in the rising hot air above the fire and cause spot fires downwind of the main fire. Strong northwesterly winds associated with changing frontal systems in early spring or fall flame many large and hard to suppress wildfires. In high winds, embers may be carried hundreds of feet from the main fire and cross barriers such as roads and water bodies.

The sandy soils found throughout Wiley Park, the Nickerson Property, and Cottontail Acres tend to dry quickly and create conditions ripe for severe fires during dry periods in the spring, summer and fall. Drought conditions in the summer can reduce live fuel moisture. Such conditions in the summer can also reduce moisture in soil and duff layers, so that the potential for severe fires increases (Patterson and Ruffner 2002).

The Keetch-Byram Drought Index (KBDI) is currently used in fire planning to evaluate the effects of extended drying on the duff layer. The index increases for each day without rain and the amount of increase depends on the daily high temperature. The scale ranges from 0 (no moisture deficit) to 800. A prolonged drought creates a high KBDI, making more fuel available for combustion and increased smoldering and difficulty in fire suppression. This mathematical system helps relate current and recent weather conditions to potential or expected fire behavior (Keetch and Byram 1988, Melton 1989). The National Park Service tracks the KBDI at Cape Cod National Seashore.

Major tropical storms occur every 30 to 40 years on Cape Cod and the Islands (Foster and Boose 1995, Foster and Motzkin 1999). Salt exposure and intense wind events may damage vegetation. Pines are especially susceptible to windthrow, uprooting, crown and branch damage. Increased available fuels and the potential for more severe wildfires result from hurricanes and tropical storms. Cape Cod has a long history of severe winter storms, blizzards, and nor'easters. Most winter storms bring the Cape storm surges and high winds. The December 2005 storm brought very high winds and heavy snow to many areas of the Cape. Many trees, which were heavily weighted with snow were uprooted or damaged. Pitch pine and locust trees were most susceptible. The west and central portions of both Wiley Park and the Nickerson Property were heavily impacted by this storm event and have considerable debris from the storm. Additionally secondary mortality from the event is adding to the debris being generated by the over story pitch pine on site.

Periodic defoliation of trees (especially oaks) by forest insects such as the gypsy moth or the newly arrived winter moth increases the exposure of sunlight to understory fuels. Downed tree branches, fine fuels in the understory, and leaf litter tend to dry out more quickly. Prolonged hot and dry conditions during episodic insect outbreaks increase fire danger and the potential for fire starts.

Topographic relief is variable within Wiley Park, the Nickerson Property, and Cottontail Acres. Throughout much of the three sites, terrain consists of flat to gently rolling sandy plains between ponds. Terrain becomes more variable and slope increases along the periphery of wetlands and pondshores (5-30%).

Topography is an important factor considered in fire management planning. Generally, fire will move up slope more rapidly and with greater intensity than it will move down slope. Fire moving up slope will preheat fuels, thereby increasing fire intensity and rates of spread. Fire intensity and rates of spread moving down slope behave much like backing fires on flat terrain. Topography can effect wind and cause local changes in fire direction, intensity, and rates of spread. Wind moving upslope may be diverted around a hill, resulting in a change in direction. On moving from flat ground to sloping ground, wind may eddy and become turbulent, resulting in updrafts and downdrafts and increased fire behavior.

Fuels are made up of various components of the vegetation, both live and dead. The effect that fuels have on the ignition, spread, intensity, and duration of fire varies according to plant species, size, amount, compactness, condition (live or dead fuels), moisture content, mineral content, horizontal continuity, and vertical arrangement of those fuels. For instance, fuel load, size class distribution, and arrangement of fuels control ignition and whether a fuel will sustain a fire. Horizontal continuity influences whether a fire will spread or not and how steady that rate of spread may be. Fuel loading and vertical arrangement influence flame length and the ability of the fire to “torch out” in the overstory. With the proper horizontal continuity in the overstory (such as within dense pitch pine), the fire may develop into a crown fire.

Wildland fires are typically spread by fine fuels such as leaves, needles, and twigs on the surface and in tree canopies. These are known as one-hour time lag fuels (material < ¼ inch in diameter) that can quickly absorb moisture from the air or lose that moisture if humidity decreases. They are capable of drying out or losing two-thirds of their moisture content in about one hour. For example, on a sunny spring day, these fine fuels can rapidly dry and increase in flammability from early morning to mid day as humidity decreases. Ten-hour time lag fuels (twigs and small branches between 1/4 inch to 1 inch in diameter) are ready to burn within 10 hours of drying time. They also help spread wildland fires because they ignite and burn quickly. 100-hour time lag fuels (branches and slash between 1 to 3 inches in diameter) equilibrate over the course of many days and are slower to ignite. 1000-hour time lag fuels (> 3 inches in diameter) are basically trees and slash that need 1000 hours of dry time before they would combust. Long periods without rain can significantly affect the ability of 100-hour and 1000-hour fuels to burn. They may contribute to the intensity of a wildland fire creating local pockets or jackpots that may flare up and cause problems with mop-up but these larger fuels contribute little to the rate of spread.

Several plant communities within Wiley Park, the Nickerson Property, and Cottontail Acres are prone to wildfires; having formed on extremely acid and excessively drained soils. This dry and acidic environment slows the decay of organic matter and leads to thick accumulations of litter and duff. Many of the constituent plants of the communities, such as black huckleberry, scrub oak and pitch pine produce volatile substances in their leaves and stems; these live fuels contribute to the spread and intensity of fire. The dense black huckleberry or scrub oak understory tends to form a horizontally continuous layer of fine fuel through which fire spreads. The retention of dead branches on stems and the trapping of fallen twigs and branches within the shrubs provide well-aerated fuels. The dense shrub layer along with ladder fuels such as greenbrier and bittersweet, contribute to the vertical arrangement of fuels, thereby increasing the possibility of scorching of canopy foliage or crowning of fires within the canopy.

Pitch pine and other conifers tend to carry fire through the tree canopy more readily than oaks. From a distance, pine stands look fresh and green. Closer inspection generally reveals that the greenness is enveloping a core of dry needles, twigs, and branches. Pine needles contain a combination of flammable organic compounds produced in the green needles during photosynthesis. If black huckleberry, scrub oak, and pitch pine vegetation are left to accumulate increased fuel loads; the increased loading of volatile fuels may significantly contribute to increased fire behavior and high intensity wildfires that threaten not only the ecosystem's functionality, but also private property in the surrounding areas.

PLANT COMMUNITIES AND CORRESPONDING FUEL MODELS

Brief descriptions of the plant communities of the Wiley Park, the Nickerson Property, and Cottontail Acres follow. Nine plant communities are described. These descriptions are based on fieldwork completed during the summer of 2006 (Johnson 2006). These generalized groupings of plant communities were completed to evaluate current vegetative conditions, wildland fuel conditions, and wildfire risk. Brief fuel discussions and fire behavior predictions accompany the plant community descriptions. Table 1 provides an outline of plant communities or vegetation types, along with corresponding fuel models, topographic position, and approximate size. Figure 2 is a base map of Wiley Park, the Nickerson Property, and Cottontail Acres depicting vegetation from available orthophotography.

Fuels are discussed in terms of standardized fuel models developed by the U.S. Forest Service (Anderson 1982, Rothermal 1983, Scott and Burgan 2005) to help estimate fire behavior. Corresponding fuel models that "best fit" plant communities within Wiley Park, the Nickerson Property, and Cottontail Acres are discussed after each plant community description. Fuel models are important tools for land managers to assess wildfire risk and to determine prescribed fire parameters. Fuel models are used in mathematical modeling of fire behavior and fire danger rating. They are presented in fuel groups: grassland, shrubland, timber, and slash. The BehavePlus Fire Modeling System is a software application designed to predict wildland fire behavior for fire management purposes. The program is designed for use by fire managers who are familiar with fuels, weather, topography, and wildfire situations. For more information, the BehavePlus fire behavior prediction system may be downloaded from the Internet (Appendix A.). Table 1 provides general characteristics of fire behavior for vegetation and corresponding fuel models within Wiley Park, the Nickerson Property, and Cottontail Acres. More specific fuel discussions and fire behavior predictions should be drafted and included in prescribed burn plans in the event that that prescribed fire implementation is planned.

Pitch Pine-Oak Forest/Woodland (Oak Dominant)

1.4 acres/1 Percent

This woodland type has an overstory with oak being dominant and some pines. The understory has a significant component of black huckleberry, with occasional concentrations of scrub oak, and other shrubs. Wiley Park and the Nickerson Property both have variations on this vegetation type. Cottontail Acres additional has an area of this vegetation type however it is less volatile do to the increased proportion of woody shrubs that do not have volatile oils in them.

Pitch Pine-Oak Forest/Woodland (Oak Dominant) is represented by Fuel Model 5 – Shrubs for growing seasons and Fuel Model 6 – Dormant Brush for dormant seasons. During the growing season the increased amount of volatiles increase flame lengths while the increased live fuel moistures decrease rate of spread. During dormant season fires the rate of spread is usually

greater with a relatively lower flame length. Crown fires or torching is unlikely in this vegetation type.

Some areas in Wiley Park and the Nickerson property that fall within this vegetation type have significant storm damage from 2005. The fuel model that best represents these conditions is Fuel Model SB2 – Moderate Load Activity Fuel or Low Load Blowdown.

Pitch Pine-Oak Forest/Woodland (Pine Dominant)

64.7 acres/67 Percent

This woodland type has an overstory with pitch pine being dominant and some oaks. Some of the pines may have a considerable amount of lower branches. The understory has a significant component of black huckleberry, with occasional concentrations of scrub oak, and other shrubs. Wiley Park and the Nickerson Property both have variations on this vegetation type.

Pitch Pine-Oak Forest/Woodland (Pine Dominant) is represented by Fuel Model 5 – Shrubs for growing seasons and Fuel Model 6 – Dormant Brush for dormant seasons. During the growing season the increased amount of volatiles increase flame lengths while the increased live fuel moistures decrease rate of spread. During dormant season fires the rate of spread is usually greater with a relatively lower flame length. If ladder fuels are present under certain weather conditions involving drought, high winds, high temperatures, and/or low humidities surface fires may move into the overstory and create extensive torching and in some cases crown fires.

Some areas in Wiley Park and the Nickerson property that fall within this vegetation type have significant storm damage from 2005. These areas are more prone to torching and crowning of overstory trees due to the high fuel loads. The fuel model that best represents these conditions is Fuel Model SB2 – Moderate Load Activity Fuel or Low Load Blowdown.

Pitch Pine-Oak Forest/Woodland (Pine Dominant) with Grassy Understory

10.5 acres/11 Percent

This woodland type has an overstory with pitch pine being dominant and some oaks. Some of the pines may have a considerable amount of lower branches. The understory has little to no shrub cover and is almost continuous grass. This vegetation type usually is a result of agricultural practice followed by abandonment. A significant portion of Wiley Park is in this type with a smaller area occurring on the Nickerson Property.

Pitch pine-oak forest/woodland (pine dominant) with grassy understory is represented by Fuel Model 2 – Timber with grass understory. Due to the wind reduction associated with the overstory, fires in these fine fuels tend to move slower than fires in open areas under the same conditions. If ladder fuels are present under certain weather conditions involving drought, high winds, high temperatures, and/or low humidities surface fires may move into the overstory and create extensive torching and in some cases crown fires.

Some areas in Wiley Park and the Nickerson property that fall within this vegetation type have significant storm damage from 2005. These areas are more prone to torching and crowning of overstory trees do to the high fuel loads. The fuel model that best represents these conditions is Fuel Model SB2 – Moderate Load Activity Fuel or Low Load Blowdown.

Eastern Red Cedar Woodland

11.3 acres/12 Percent

The Eastern red cedar woodland has an overstory with 85 % crown closure and is comprised of 65% Eastern red cedar and 35% tree oaks. The average height of the stand is 25 feet. The

understory consists of bayberry, high bush blueberry, and to a lesser extent black cherry saplings and some arrow-wood viburnum. The ground cover is primarily fine conifer litter with occasional patches of grass. This is an old field system and likely originated from past grazing followed by abandonment. This is the primary vegetation type at Cottontail Acres and only occurs at that site.

The Eastern Red Cedar Woodland is represented by Fuel Model TL1 – Low Load Compact Conifer Litter. This fuel model produces low rates of spread and flame lengths. However, under certain weather conditions involving drought, high winds, high temperatures, and/or low humidities surface fires may move into the overstory and create extensive torching and crown fires.

Disturbed Area with Invasives

1.7 acres/2 Percent

The disturbed forest/shrubland with invasive has approximately 80% cover of black locust in the overstory. With the trees ranging in height between 30 and 40 feet. The understory and shrub layer have approximately 30% cover of black cherry, 20% cover of Norway maple, and 10% cover of multiflora rose. Additionally there is Asiatic bittersweet, Virginia creeper, and poison ivy vines throughout the area. Ground cover is leaf litter and 10 to 15% cover poison ivy. This vegetation type only occurs in one area at Cottontail Acres.

The disturbed area is represented by Fuel Model TL2 - Low Load Broadleaf Litter. This fuel model produces low rates of spread and flame lengths. However, under extreme weather conditions involving drought, high winds, high temperatures, and/or low humidity surface fires may move into the shrub layer and burn more intensely.

Cultural Grassland

3.5 acres/3 Percent

These areas are primarily dominated by little blue stem, Pennsylvania sedge, and non-native species. Areas are being encroached upon by tree seedlings and shrubs. This vegetation cover type only occurs at Cottontail Acres in two small areas.

Cultural Grasslands are best represented by Fuel Model 1 – Short Grass. During periods of greenup the grass may not burn do to high live fuel moistures. When there is sufficient thatch and the fine fuels are cured, usually during the early spring, fires are easily initiated in these fuels and spread quickly.

Coastal Atlantic White Cedar Swamp

0.5 acres/1 Percent

The overstory of these swamps are dominated by Atlantic white cedar and often may have other overstory trees mixed in to a lesser extent. The shrub layer contains high bush blueberry, sweet pepperbush, and inkberry. The herbaceous layer will contain various species of ferns and mosses. This vegetation cover type only occurs at Wiley Park in one small area.

Atlantic white cedar swamps is represented by Fuel Model TL1 – Low Load Compact Conifer Litter. The fuel bed is comprised of small compacted needles that generate limited fire behavior. However, under extreme weather conditions involving drought, high winds, high temperatures, and/or low humidities surface fires may move into the overstory as a crown fire. In addition, severe and difficult to extinguish ground fires may occur in peat deposits during drought periods.

Shrub Swamps

1.4 acres/1 Percent

Shrub dominated wetlands occur along the margins Great Pond, Widow Harding Pond, Jemima Pond, and Herring Pond. Highbush blueberry, winterberry, swamp azalea, and leatherleaf may form a continuous shrub layer with sweet pepperbush and sheep laurel occurring to a lesser extent. Young red maple, tupelo, and pitch pine trees are scattered throughout the wetlands. Low herbaceous vegetation is sparse. Virginia chain fern, marsh fern, wool-grass, reed canary grass, and large bog cranberry often occur over sphagnum moss.

The shrub swamp is represented by Fuel Model 5 - Brush during the growing season and 6 Dormant Brush during the dormant season. The leaf litter is generally compact above sphagnum or muck and fire tends to move very slowly on the surface. During high water periods, which may last for several months of the year, fire will not carry through these wetlands and they may serve as firebreaks. However, under extreme weather conditions involving drought, high winds, high temperatures, and/or low humidities surface fires may move into the shrub layer and flare up in heavy fuel concentrations. In addition, severe and difficult to extinguish ground fires may occur in peat deposits during drought periods.

Coastal Plain Pondshore

Not Mapped

An herbaceous community of exposed pondshores influenced by changing water levels. The emergent exposed pondshore supports Canada reed grass, flat-topped goldenrod, pondshore rush, golden pert, beaksedges, lance-leaf violet, and dwarf St. John's-wort. Bayonet rush, spike rushes, and pipewort are found in the semi-permanently flooded zone. Deeper water areas support yellow water lily, white water lily, and spike-rush. Numerous rare and uncommon species are found within coastal plain pond shore communities. Litter is sparse with large areas of exposed sand, cobble, or muck substrates. This community type is of significance and requires further field verification of its existence and extent for ecological reasons. Fire does not carry through this community and it serves as a firebreak. For fire behavior modeling purposes model NB9 – Bare Ground is used to represent areas that can not carry fire.

Table 1. Summary of Vegetation Types and Fire Behavior Models

Fuel Model/Vegetation Type	Fire Behavior Characteristics	Area
Fuel Model 1 – Short Grass - Cultural Grassland	Fine herbaceous fuels less than 1 ½ feet in height that are cured or nearly cured carry fire. FL – Moderate ROS - High	3%
Fuel Model 2 – Timber with Grass Understory - Pitch Pine-Oak Forest/Woodland with Grassy Understory	Fine herbaceous fuels that can be cured or still green. An overstory exists. FL – Moderate ROS - Moderate	0%
Fuel Model 5 - Brush - Pitch Pine-Oak Forest/Woodland (GS) - Shrub Swamp (GS)	Fire carried mainly on surface by the litter cast from shrubs. Foliage contains little volatile material. Stands may reach 6 feet high but have poor burning properties because of live (nonvolatile) vegetation and shading. High winds and extreme drought needed to carry fire into shrub mid-story. FL – Low to Moderate ROS - Low	45%

Fuel Model 6 – Dormant Brush - Pitch Pine-Oak Forest/Woodland (DS) - Shrub Swamp (DS)	Fire carried mainly through the continuous and volatile shrubs, such as huckleberry and scrub oak. Pines are susceptible to torching and crowning, especially in areas w/ significant ladder fuels. Crowning could lead to fire of catastrophic scale and intensity. FL – Moderate to High ROS - Moderate	
Fuel Model SB2 – Moderate Load Activity Fuel or Low Load Blowdown - Pitch Pine-Oak Forest/Woodland	Fuels are comprised of light amounts of storm debris. FL – High ROS - Low	35%
Fuel Model TL1 – Low Load Compact Conifer Litter - Eastern Red Cedar Woodland - Coastal Atlantic White Cedar Swamp	Fuels are comprised of compact fine needle litter. FL – Low ROS – Low NOTE: Under dry conditions with high winds flame lengths and rates of spread may be extreme and involve the crowns of the conifers (specifically the Eastern Red Cedar stands) resulting in a crown fire.	13%
Fuel Model TL2 – Low Load Broadleaf Litter - Disturbed Area with Invasives	Fuels are comprised of low loads of fine hardwood litter. FL – Low ROS - Low	2%
Fuel Model NB8 – Urban/Suburban Development Fuel Model NB8 – Open Water Fuel Model NB9 - Bare Ground	Fire is not carried in this model it serves as a place holder. FL – None ROS - None	2%

Note on Fuel Model Abbreviation: GS = Growing Season, DS = Dormant Season, FL = Flame Lengths, ROS = Rate of Spread.

SURROUNDING LANDSCAPE AND INHOLDINGS

The wildland/urban interface is defined as the area where combustible homes and other facilities meet combustible vegetation. This interface includes a wide variety of situations, ranging from individual houses and isolated structures to subdivisions and rural communities surrounded by wildlands. More than 40 homes are located in close proximity to Wiley Park, the Nickerson Property, and Cottontail Acres, Figure 2. In many cases, concentrations of Wildland fuels border private and town-owned land, separated only by narrow open spaces around homes. Very few homes have adequate buffers of non-burnable material around them.

Landscaping within residential areas is mixed deciduous and coniferous. Common ground covers are short grass, mixed vegetation, and softwood mulch. Most structures do not have 30 feet of defensible space on all sides. There are heavy ladder fuels often within 30 feet of dwellings. Natural forest vegetation is often within close proximity to dwellings. Pitch pine and other flammable vegetation may be within 30 feet of many structures. Firewood and fuel storage is commonly found within 20 feet of structures.

Residential areas adjacent to Wiley Park, the Nickerson Property, and Cottontail Acres are vulnerable to wildland fire. Given the prevailing wind direction and the location of residential areas a heavy focus should be given to addressing defensible space around properties located to the north and northeast of Wiley Park, to the northeast of the Nickerson Property, and north of Cottontail Acres running along the south side of Samoset Road. Numerous homes in this area

would be at risk from a wildfire event and vulnerable to ignition from firebrands, radiation, or convection from a wildfire.

The Town-owned gate house, bathhouse, and play ground located at Wiley Park is surrounded by a parking lot to the west and north, limited fuels to east between the bathhouse and beach, and low but continuous surface fuels to the west. It is unlikely that these structures will be directly impacted by a flaming front however they are at risk from embers and radiant/convective heat from an approaching fire.

In addition to the direct threat of wildfire, smoke associated with a wildland fire could impact sensitive resources in the surrounding area. Hundreds of homes are located on all sides of the three properties, with the majority of the dwellings being within a 0.5 mile radius. Beyond health impacts, smoke can impair visibility. At high relative humidities, small concentrations of smoke can create fog. Also, at high humidities and fuel moisture levels, vegetation burns poorly, creating more smoke than when the same vegetation would burn in low humidities and low fuel moisture levels. Major roads within a mile radius of Wiley Park, the Nickerson Property, and Cottontail Acres would likely be impacted by a large wildfire event. Included in these roads are the heavily traveled Route 6 located roughly 1 mile east and running in a general north/south orientation, Kingsbury Beach Road located less than ¼ mile north of Wiley Park and running east/west, Herring Brook Road that is immediately adjacent to Wiley Park and the Nickerson Property and runs north/south, and Samoset Road that is adjacent to and running east/west between the Nickerson Property and Cottontail Acres.

The smoke generated from uncontrolled wildland fires can threaten public safety and diminish air quality. Prescribed fire can mitigate smoke management concerns by assuring that atmospheric conditions on the day of a burn provide good lift and dispersal of smoke and that burns are scheduled when winds will transport smoke away from sensitive areas. Smoke will also be controlled by ensuring that fine fuels are sufficiently dry to burn well and that moisture in larger woody material and duff is high (Low KBDI). Reducing fuel loads by mechanical removal will also produce less smoke.

HISTORIC, SCENIC, AND RECREATION RESOURCES

A trail system running through each of the three properties and connecting the properties are well maintained and heavily used. The trails allow visitors to enjoy and learn about the natural world around them. The area serves many passive recreation functions and protects significant natural resources, as well as the scenic and natural character of forest and wetlands within Wiley Park, the Nickerson Property, and Cottontail Acres.

Recreational uses occurring on the property include swimming, dog walking, walking, and nature study. Mountain biking is not permitted but is not currently enforced. Dirt bikes, three and four wheeled all terrain vehicles, and snowmobiles are not allowed on trails and within forested areas. Camping and campfires are also not allowed.

Wiley Park has an area south of the parking lot and north of Herring Brook called the 1651 Arboretum. Numerous seedlings have been planted in this area. Some of the seedlings are failing due to site conditions. The area has had a large amount of work invested in it and is highly prized by the local community.

NATURAL RESOURCES & SPECIES OF CONCERN RESPONSE TO FIRE

The mixed oak and pitch pine forests of Wiley Park, the Nickerson Property, and Cottontail Acres are adapted to survive low to moderate intensity fire. Black and white oak trees are capable of surviving low intensity fire due to thick bark. When oaks are top-killed by moderate intensity fire, trees may sprout readily from stumps (Abrams 2005, Abrams 1992, Lorimer 1993, and Rawinski 2000). Severe and high intensity fire, generally associated with wildfire, may consume the duff, injure root systems, and kill trees. Severe wildfires may also scorch acorns in the duff layer, preventing their germination. Periodic low to moderate intensity prescribed fire is likely to open up the understory temporarily, allowing enhanced growth of black oak and white oak sprouts and increasing the importance of oak within these mixed oak and pine forests. Throughout much of the northeast, there is a concern that oak is not regenerating and that lack of periodic low intensity fire is a contributing factor.

Grassy areas that contain warm season grasses such as little bluestem are promoted by late spring fires. Mowing and other mechanical treatments may reduce the height of woody vegetation and have the general appearance of promoting grasses but tend to build up thatch that inhibits warm season grass development while still allowing low woody vegetation to be sustained and in many cases expand in area and density.

Pitch pine with its thick corky bark and many dormant buds is also adapted to survive fire. Even after foliage and leaves are killed, epicormic shoots may be released along the bole and provide new foliage. Older trees tend to survive moderate to high intensity fires. Fires during the growing season are more likely to kill pines, especially if feeder roots are damaged. Pines are more susceptible to turpentine beetle attack following fire. Severe wildfires are likely to promote germination of pitch pine because the duff layer is consumed and mineral soil exposed. Therefore, severe fires tend to increase the importance of pitch pine in the community and the likelihood of serious crown fire in future unplanned ignitions (Patterson and Ruffner 2002).

High severity and intensity fires may cause actual tree mortality and local extirpation of populations. Although many oaks exhibit the ability to be top-killed and sprout vigorously after fire, fires that are too intense or severe will kill trees completely. Arson fires during drought years may create high severity and intensity fires. Fuel loadings within the forest – residential ecotone are exceptionally high due to extensive build-up of shrubs and thick vines which create laddered fuels and unusually intense fire behavior. Fuel treatments on town property and public education of the threat of wildfire and the measures that can be taken to improve defensible space around structure on private property will greatly reduce the risk of wildfire impacting structures.

The Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife reports the following rare species occurrences (Table 2) for the town of Eastham (Swain 2005):

Table 2. Massachusetts Natural Heritage and Endangered Species Program Rare Species Occurrences for the Town of Eastham

Common Name	Scientific Name	State Status
<u>Vascular Plants</u>		
Dwarf Bulrush	<i>Lipocarpa micratha</i>	E
Prickly Pear	<i>Opuntia humifusa</i>	E
Maryland Meadow Beauty	<i>Rhexia mariana</i>	E
Broom Crowberry	<i>Corema conradii</i>	SC
Bushy Rockrose	<i>Helianthemum dumosum</i>	SC

Common's Panic Grass	<i>Dicanthelium commonsianum</i> v. <i>addisoni</i>	SC
Plymouth Gentian	<i>Sabatia kennedyana</i>	SC
Pondshore Knotweed	<i>Polygonum puritanorum</i>	SC
Butterfly-weed	<i>Asclepias tuberosa</i>	WL
Black-fruited Spike-rush	<i>Eleocharis melanocarpa</i>	WL

Invertebrates

Melsheimer's Sack Bearer	<i>Cicinnus melsheimeri</i>	T
Chain Fern Borer Moth	<i>Papaipema stenocelis</i>	T
Scarlet Bluet	<i>Enallagma pictum</i>	T
Water-willow Stem Borer	<i>Papaipema sulphurata</i>	T
Spatterdock Darner	<i>Aeschna mutata</i>	SC
Coastal Heathland Cutworm	<i>Abagrotis nefascia</i>	SC
Comet Darner	<i>Anax longipes</i>	SC
Gerhard's Underwing Moth	<i>Catocala Herodias gerhardi</i>	SC
New England Bluet	<i>Enallagma laterale</i>	SC
Eastern Pond Mussel	<i>Ligumia nasuta</i>	SC
Dune Noctuid Moth	<i>Oncocnemis riparia</i>	SC
Pink Sallow	<i>Psectraglaea carnosus</i>	SC

Vertebrates

Upland Sandpiper	<i>Bartramia longicauda</i>	E
Roseate Tern	<i>Sterna dougallii</i>	E
Piping Plover	<i>Charadrius melodus</i>	T
Diamondback Terrapin	<i>Malaclemys terrapin</i>	T
Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	T
Spotted Turtle	<i>Clemmys guttata</i>	SC
Least Tern	<i>Sterna antillarum</i>	SC
Common Tern	<i>Sterna dougallii</i>	SC
Artic Tern	<i>Sterna paradisaea</i>	SC
Eastern Box Turtle	<i>Terrapene carolina carolina</i>	SC

State Listing Abbreviations: E – Endangered, T – Threatened, SC – Special Concern, & WL – Watch Listed

Wiley Park, the Nickerson Property, and Cottontail do not contain any certified vernal pools however all fall within the Massachusetts Natural Heritage and Endangered Species Program (NHESP) Potential and Critical Habitat of Rare Species state wide mapped areas (NHESP 2006). The Priority Habitats of Rare Species mapped areas represent the geographic extent of habitat of state-listed rare species in Massachusetts based on observations documented within the last 25 years in the database of the NHESP. The Estimated Habitats of Rare Wildlife mapped areas are a subset of the Priority Habitats of Rare Species. They are based on occurrences of rare wetland wildlife observed within the last 25 years and documented in the NHESP database. Priority Habitats and Estimated Habitats of Rare Wildlife are the filing trigger for proponents, municipalities, and other stakeholders for determining whether or not a proposed project must be reviewed by the NHESP for compliance with the Massachusetts Endangered Species Act (MESA) (NHESP 2006).

Box Turtles are common in fire adapted ecosystems. Populations are most vulnerable to severe wildfire events during the growing season. Populations are likely to respond favorably to low intensity prescribed fire when applied during appropriate times of year ensuring adequate soil moisture and on a rotation schedule that ensures adequate portions of the habitat remain undisturbed and available for box turtles.

Management activities proposed within designated habitat for the above listed rare species require review by the Eastham Conservation Commission and the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife.

The detrimental effects on wildlife from large, fast-moving wildfire or severe wildfire, which burns into the litter and duff, are greater than the minimized effects of a carefully planned and executed low-intensity prescribed burn carried out on a small portion of the property at the appropriate time of the year.

Lacking detailed baseline information on wildlife within the area, one can only speculate as to possible changes in wildlife use resultant from prescribed fire or mechanical treatments to reduce fuel loads within designated areas of Wiley Park, the Nickerson Property, and Cottontail Acres. Plant species composition will likely remain the same or increase slightly within these properties. Structural changes within the plant community are expected. Such changes will reflect changes in soft mast and hard mast production and mid-story cover for wildlife. Selective thinning of pine will increase canopy gaps providing increased light to oak trees. This will allow for more vigorous growth of oaks, resulting in increased hard mast (acorn production). Reduction in height and cover of invasive vines and understory shrubs such as black huckleberry will provide increased light for forest herbs and low growing shrubs. The first year following prescribed fire or mowing within the understory shrub layer, soft mast (berries) production will decrease. By the third year, soft mast production will increase.

Most healthy, mature birds and mammals can escape the active flame front in a prescribed burn. Prescribed burn rates of spread do not generally exceed 15-20 feet per minute and flame lengths are low. Most animals are able to flee from the fire or find safety in a burrow. Very young gray fox and other small mammals that have shallow dens may be more susceptible to fire during the reproductive season. Amphibians and reptiles are also more vulnerable depending on the time of year and the specific species. Eastern Box Turtles have been observed burrowing under the leaf litter in oak forests in advance of a flaming front during a prescribed fire at the Massachusetts Military Reservation and then re-emerging unharmed after the passage of flames.

Vertebrates and invertebrates that cannot escape the direct path of fires or mowing equipment may be injured or in some instances killed. This includes relatively immobile organisms such as eggs or fledglings. Timing prescribed burning or mechanical operations for late growing season and dormant season and using lightweight equipment, which minimizes soil compaction, will greatly reduce direct impacts to wildlife from treatments. Also, prioritizing treatment zones and establishing a rotation of treatment blocks will accommodate many wildlife species. Setting a goal that no more than one third of a given habitat type on a property (depending on conservation targets, as well as logistical and financial constraints) is under mechanical or prescribed fire treatment within a given year is necessary to balance competing resource objectives.

LOCAL PREPAREDNESS AND FIREFIGHTING CAPABILITIES

Wiley Park, the Nickerson Property, and Cottontail Acres are within the jurisdiction of the Eastham Fire Department. The headquarters fire station is currently staffed and serves the entire Town of Eastham and is located on Route 6, 1.3 miles east of Herring Brook Road. The Eastham Fire Department has a rapid response time and a variety of resources available for fire suppression.

The Eastham Fire Department maintains one fire department and 10 pieces of apparatus (one of which is specific to Wildland fire) (Crosby 2003). The department has a total of 19 personnel; 18

career and 1 call (Crosby 2003). In 2005 the department responded to 509 fire related calls and 1,535 Emergency Medical Service calls (Crosby 2003). The department has wildland fire initial and extended attack responsibilities for the entire 14 square miles that Eastham encompasses (Crosby 2003).

The Eastham Fire Department utilizes the Barnstable County Control Mutual Aid System for Cape Cod, which provides assistance from other area fire departments on Cape Cod in suppressing large forest fires and structural fires. The Mutual Aid Center is located in the Barnstable Sheriff's Department Communication Center in Barnstable Village.

The Massachusetts Department of Conservation and Recreation's (DCR) District 1 has wildland fire detection, education, fighting responsibilities for Cape Cod and the Islands. DCR District 1 operates Fire Towers in Brewster, Sandwich, Dennis, and Wellfleet. Any given day during fire season depending on fire danger, staffing, and the District's budget one or more of these towers may be operated. Fire towers can be instrumental in quickly spotting, locating, and reporting wildfires within their jurisdiction to respective fire departments. Other detection methods include resident inholding phone calls, adjacent neighbor phone calls and cell phone reports from park users. During periods of high fire danger, DCR's District 1 conducts ground patrols and works closely with the Town of Eastham. Staffing levels for DCR District one varies by season. As of 2006, year round District staff was one District Warden and two District Patrolmen (one stationed full time on Martha's Vineyard). Starting mid spring slightly after fire season begins additional staff are added through seasonal hire. These staff operate the Fire Towers and assist full time staff in fire and non-fire related activities. The seasonal staff are usually laid off mid fall slightly before the fire season ends. Wildland suppression equipment for District 1 consists of 2 brushbreakers, and 2 patrol trucks in addition to other miscellaneous equipment.

Cape Cod National Seashore has a Fire Management Program that has local, neighboring property, and national wildland fire suppression responsibilities. In addition to suppression responsibilities a high level of expertise resides in the program in the areas of education, prevention and mitigation, and prescribed fire. The National Seashore maintains a year round fire staff consisting of a Fire Management Officer, an Engine Foreman, and a Fire Management Program Assistant. The National Seashore's three Wildland fire engines are staffed by seasonal crew and the year round staff.

The Cape Cod National Seashore tracks the Keetch Byram Drought Index (KBDI) and the National Fire Danger Rating (NFDRS) based on weather collected at a fire weather sites located in Truro and Wellfleet. The KBDI relates current and recent weather conditions to potential or expected fire severity. NFDRS is a system that integrates the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an area's protection needs (NWCG FDWT 2002). DCR's Bureau of Forest Fire control using a fire weather station in Plymouth and local fire weather forecasts determines a locally derived Fire Danger Class similar to NFDRS and uses this information for determining staffing levels for any given day. The National Fire Weather Service's Taunton office during fire season issues world wide web based fire weather forecasts and Red Flag Warnings/Watches. The office additional will issue site specific Spot Weather forecasts for Wildland fire suppression activities.

A potential predestinated staging area for firefighters and equipment depending on conditions would likely be located at the parking lot at Wiley Park or on Hearing Brook Road for Wiley Park. Potential staging areas for the Nickerson Property are the parking lot at Wiley Park, on Hearing Brook Road, or on Samoset Road. Potential staging areas for Cottontail Acres are on Samoset Road or Nickerson Road. It is very likely due to the close proximity of the Eastham Fire

Department to the three properties that in coming mutual aid resources would be stages at the Fire Department itself.

ACCESS AND INTERIOR DIRT ROADS

Roads and trails in and around Wiley Park, the Nickerson Property, and Cottontail Acres are important for access to the site in the event of a fire and may be used as a fire break to help stop a fire. They also serve as egress for the public to exit an area that may be in jeopardy of burning. Roads that are too narrow for fire apparatus or that dead end and create a problem for equipment to turn around in, can not only be dangerous for fire personnel due to the potential entrapment situation but often can impact the public in the same similar way by restricting their egress. Trails that vehicles may not be able to travel down are still of tremendous use to fire fighters and the public if they are well marked and properly maintained. While the trails may not provide vehicle access they provide well defined rapid routes of egress from the area. They also may make the difference when coupled with fire hose and hand tools between stopping a fire or not.

Wiley Park has several roads that enter into the residential area to the north of the property, one main road that runs along the western border of the property, a road that enters into the property from the west side and ends in a parking lot near Great Pond, and several foot trails within the property. The road on the west side is Herring Brook Road. Herring Brook Road is a paved, two lane, public road, that is approximately 24 feet wide, has a well brushed/maintained road edge, has little to no tree over hangs, and runs north/south. At the northwest corner of the property is the intersection of Herring Brook Road and Ridge Road. Ridge Road borders the north side of the property and runs east/west. This road is a private way with approximately 11 houses on it and is approximately 12 to 14 feet wide and gravel surfaced. None of the houses abut Wiley Park. Ridge Road intersects with a north/south road, Phair Road. Phair Road has 4 houses that are on its west side and abut Wiley Park. Phair Road tees into Luther's Lane which initially runs east/west and then north/south. The portion of Luther's Lane that runs west from Phair Road ends in a cul-de-sac that has 3 houses, all abut Wiley Park. The portion of Luther's Lane that runs east for approximately 90 yards and then turns north has 4 houses that are on the south side and abut Wiley Park. Beehive Road is a narrow gravel road that runs south from Kingsbury Beach Road and dead ends at the extreme northeastern tip of Wiley Park. The Wiley Park access road that runs east into the property from Herring Creek Road to the property parking lot is a two lane paved road. The parking lot at the end of the access road if not filled with vehicles is more than adequate to serve as a turn around for fire apparatus. Trails within Wiley Park are well maintained. The trails are all even surfaced and clear of debris. The Ladyslipper Trail is north of the access road and runs southeast from Ridge Road to the property parking lot. The Loop Walking Trail runs south from the northwestern portion of the Ladyslipper Trail just north of the access road. The trail extends to the southwestern corner of the property while running parallel to Herring Brook Road. A spur runs out to Herring Brook Road from the trails southwestern corner. From this point the trail runs east and parallels the Herring Brook until the trail splits just short of Great Pond and heads south to the Nickerson Property and north paralleling the shore line of the pond until it connects into the parking lot near the bathhouse.

The Nickerson Property has three roads that abut it and one trail with a spur connecting to Wiley Park. The west side of the Nickerson Property is abutted by Herring Brook Road which is described in the preceding narrative on roads around Wiley Park. At the south west corner of the Nickerson Property Mallard Lane, a private way, runs east from Herring Brook Road and ends in a cul-de-sac. Mallard Lane is approximately 22 feet wide, is paved, and is 200 yards long. A total of 8 homes are on Mallard Lane with five directly abutting the west side of the southern edge of the Nickerson Property. Running north from Samoset Road, Clark's Point Road abuts the eastern portion of the Nickerson Property. The road is initially paved and then turns into a gravel

surface. The road has a considerable amount of overhang of branches and is approximately 22 feet wide. Clark's Point Road dead ends at a house near Great Pond. A total of 6 homes are accessed from this road. The primary trail in the Nickerson Property runs east from Herring Creek Road to Clark's Point Road. The trail initial is open but approximately 1/3 of the way to the east becomes rough. Approximately at the half way point (380 yards) of this trail a spur runs north and connects into the trail systems of Wiley Park.

Cottontail Acres has two roads that abut the property, one road that bisects the property, and an extensive trail network. Herring Pond Way abuts the western boundary of Cottontail Acres, and runs north into Samoset Road. The road is dirt that is approximately 8 to 10 feet wide, and is banked on both sides by 10 to 16 inches. The road dead ends at its southern end and provides access to 3 houses. Samoset Road runs approximately east/west. The road is a two lane paved road that is approximately 24 feet wide. Samoset has several structures and private properties to its south between it and Cottontail Acres on the western and eastern portion of the northern boundary of the property. In the middle is approximately a sixty yard long section of the road that directly abuts Cottontail Acres. From this section of Samoset Road an unnamed road initially heads southeast and then east bisecting the property. This road is a sand and gravel road approximately 8 to 10 feet wide. The road has overhanging branches and continues beyond the east end of Cottontail Acres ending in a dead end. The road provides access to two structures on the eastern side of the property. The trail systems of Cottontail Acres consist of numerous loop trails on the north and south sides of the unnamed dirt road that bisects the property.

GOALS, OBJECTIVES, AND RECOMMENDED ACTIONS

GOALS:

- A. Increase firefighter and public safety associated with wildland fire at Wiley Park, the Nickerson Property, Cottontail Acres and surrounding private properties
- B. Reduce wildfire hazard within Wiley Park, the Nickerson Property, and Cottontail Acres through an integrated and proactive land management program.
- C. Reduce the threat from wildfire to property and life on lands adjacent to Wiley Park, the Nickerson Property, and Cottontail Acres through education and awareness programs.

OBJECTIVES:

1. Establish an Eastham Town Lands Fire Management Team that will focus on guiding implementation schedules, management actions, and future planning that relate to fire management at Wiley Park, the Nickerson Property, and Cottontail Acres.

The establishment of an Eastham Town Lands Fire Management Team will facilitate the strategic implementation over time of recommendations outlined within the Wildland Fire Protection and Preparedness Plan for Wiley Park, the Nickerson Property, and Cottontail Acres (Figure 1). Representatives from Eastham's Natural Resources Department, Fire Department, Recreation & Beach Department, and Public Works Department should comprise the team. Additionally dependent on need and interest, representation from the surrounding communities should be sought. For the purposes of the plan or actions identified by the Fire Management Team the Eastham Conservation Commission shall review and approve any fire management activities proposed within wetlands and priority Natural Heritage and Endangered

Species Habitats and consult with the Massachusetts Natural Heritage and Endangered Species Program as necessary.

2. Establishing an understanding of the importance of management actions to be taken by the town at Wiley Park, the Nickerson Property, and Cottontail Acres.

Establishing a public understanding of the importance of fire management at Wiley Park, the Nickerson Property, and Cottontail Acres (Figure 1) will ensure public acceptance of proposed treatments (Figures 4A, B, C, & D) targeted at reducing fire hazard and maintaining ecological integrity. Through public meetings, brochures, and/or other methods the recommendations and justifications for those recommendations put forth by the Wildland Fire Protection and Preparedness Plan for Wiley Park, the Nickerson Property, and Cottontail Acres should be disseminated to key communities within the town of Eastham and the individuals and groups that use the properties.

3. 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 communities that surround Wiley Park, the Nickerson Property, and Cottontail Acres.

The education of private property owners adjacent to Wiley Park, the Nickerson Property, and Cottontail Acres (Figure 4A) on issues related to defensible space will enable the property owners to effectively mitigate conditions on their properties that greatly reduce the likelihood of property loss during catastrophic wildfires. Additionally firefighter safety and effectiveness will be greatly enhanced in communities and on individual properties that have been educated in, and 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.

4. Reduce accumulated 2005 storm damage consisting of downed dead fuel concentrations at Wiley Park and the Nickerson Property in all affected stands.

Removal of 2005 storm debris and damaged trees at Wiley Park and the Nickerson Property (Figure 4B) will remove fuel concentrations that would potentially contribute significantly to fire behavior during a wildfire and if not removed could greatly complicate suppression actions. Removal of debris can be accomplished using several methods; collection and chipping (Option A) or pile and burn (Option B), or a combination of the two methods. In addition to removing debris trees that are standing and dead or damaged to such an extent that they will die or pose a significant safety hazard due to falling limbs, should be cut and removed with the storm debris.

Option A:

Collection and chipping can be accomplished throughout the year. Debris should be cut into pieces that can be moved by hand to the trail systems and then chipped or loaded on vehicles to be chipped at another location. By hand dragging the debris rather than using heavy equipment the likelihood of damaging trees in the treatment area, and for pine potentially attracting pine bark beetle is greatly reduced. Chips should be removed from site so as to reduce the likelihood of beetle infestation in remaining trees.

Option B:

Pile and burn would be more cost effective than chipping and better reduce the threat of attracting pine bark beetles, if done properly. The piling of debris should be accomplished in the same manner as the collection and chip option, and may be done during any time of the year. However the burning of the piles is restricted to the Massachusetts "Open Burn" season that runs from 15 January to 15 March of each year. Burning of piles should be done only after consultation with the Eastham Fire Department. Care should be given so that escape fires do not occur and that the smoke does not impact sensitive areas. Information on safe and effective pile burning can be attained from the Fire Department, Cape Cod National Seashores Fire Management Program, DCR Forest Fire Control, the Northeast Barrens web page, and/or Northeast Forest and Fire Management, LLC. For contact information and web sites see Appendixes A and B.

The total area needing treatment is approximately 21 acres at Wiley Park and 11 acres at the Nickerson Property.

Within the area containing 2005 storm damaged south of the parking lot at Wiley Park, care should be taken so that the "1651 Arboretum" tree plantings are not impacted by the treatment activities.

5. 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 Wiley Park, the Nickerson Property, and Cottontail Acres.

Removal of vegetation to a height and width that will facilitate emergency vehicle access and movement on roads leading to, around, and in (Figure 4C); Wiley Park, the Nickerson Property, and Cottontail Acres 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 Eastham Fire Department should be consulted concerning exact specifications for roads.

The following roads are recommended for assessment of treatment need and extent: Kingsbury Beach Road 0.9 Miles, Samoset Road 1.3 Miles, Herring Brook Road 0.8 Miles, Nickerson Road 0.3 Miles, Clark's Point Road 0.3 Miles, Herring Pond Way 0.2 Miles, Mallard Lane 0.1 Miles, Ridge Road 0.2 Miles, Phair Road 0.1 Miles, Luther Lane 0.3 Miles, Beehive Road 0.1 Miles, Cottontail Acres Unnamed Road 0.3 Miles, The Nickerson Property

Unnamed, Access Road (Western Half of Property) 0.2 Miles, and Wiley Park Parking Lot Access 0.2 Miles.

The Nickerson Property Unnamed Access Road (Western Half of Property) should be maintained for Wildland fire apparatus, not all types of emergency vehicles like the other roads. This road will only provide access to attack wildfires on the interior of the property. A gate with a lock should be erected to restrict unlawful access and potential accidental or arson fire. Access should be available to town officials and departments only such as the Fire Department.

Annual inspections of the roads should be conducted so that vegetation maintenance needs can be identified and road conditions can be assessed and addressed.

6. Establish fuel reduction zones 100 to 200-feet in width on the property lines immediately adjacent to residential structures at Wiley Park, the Nickerson Property, and Cottontail Acres at strategic locations based on prevailing winds that occur during wild fires.

The reduction or breaking up the surface fuel bed along strategic property boundaries (Figure 4D) will increase firefighter safety and effectiveness, and reduce fire behavior that could potentially impact adjacent private properties. This can be accomplished with mechanical treatments (Option A), prescribed fire (Option B), or a combination of the two treatments.

Option A:

Mechanical treatment of 100 to 200 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.

Option B:

Prescribed burning within the fuel reduction zones 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 Eastham 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 with 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 approximate acres to be treated assuming a 200 foot wide buffer is 14 acres for Wiley Park, 12 acres for the Nickerson Property, and 12 acres for Cottontail Acres; for a total of 38 acres.

Regardless of the treatment used the necessity for follow-up treatments need to be reassessed every 3 to 6 years.

NOTE: Areas at Cottontail Acres may not require treatments under this objective if treatments in objectives 8 and 9 are addressed.

7. Establish fuel reduction zones of 50 to 100-feet in width on both sides of the road along the unnamed dirt road that bisects Cottontail Acres.

The reduction or breaking up the surface fuel bed along the road that bisects Cottontail Acres (Figure 4C) will increase firefighter safety and effectiveness, and reduce fire behavior that could potentially impact adjacent private properties. This can be accomplished with mechanical treatments (Option A), prescribed fire (Option B), or a combination of the two treatments.

Option A:

Mechanical treatment of 50 to 100 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.

Option B:

Prescribed burning within the fuel reduction zones 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 Eastham 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 with 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 approximate acres to be treated assuming a 100 foot wide buffer on each side of the road is 4 acres.

Regardless of the treatment used the necessity for follow-up treatments need to be reassessed every 3 to 6 years.

NOTE: This treatment objective may be dropped if treatment objective 9 is addressed.

8. Maintain the Cultural Grassland at Cottontail Acres.

The maintenance of the cultural grassland areas (Figure 4B) will reduce potential fire intensity in the area and have ecological benefits for grassland dependent species, in addition to maintaining an open area for recreational use. This can be accomplished with mechanical treatments (Option A), prescribed fire (Option B), or a combination of the two treatments with the treatment(s) being focused on promoting warm season grasses and forbs and maintaining or reducing shrub cover.

Option A:

Mowing in the spring will have some benefit for the promotion of warm season grasses however after repeated treatments will build a thatch layer that will favor woody shrubs. Mowing in June and again in the same year in August as a single treatment will greatly reduce shrub cover and density in areas that are being dominated by shrubs.

Option B:

Prescribed burning within the grassland areas during the spring will reduce fine fuel loads, fuel continuity, and promote warm season grasses. All prescribed fire should be coordinated and approved by the Eastham 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 with 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 approximate acres to be treated are 3.5.

When conducting any treatments care should be taken to not impact any nesting grassland birds. Massachusetts NHESP should be consulted for additional information and recommendations see Appendixes A and B.

Regardless of the treatment used the necessity for follow-up treatments need to be reassessed every 3 to 6 years. An initial target treatment interval of 4 years will benefit the grasslands.

9. Restore all or portions of the Eastern Red Cedar Woodland to Cultural Grasslands and remove invasive species at Cottontail Acres.

The removal of invasive species and conversion the Eastern red cedar woodlands (Figure 4B) will reduce potential fire intensity in the area and have ecological benefits for grassland dependent species, in addition to maintaining an open area for recreational use.

The conversion/restoration of the Eastern red cedar woodland is best accomplished through the use of heavy mechanical equipment. Any chips or debris created by the treatment should be removed from the site. Stumps should be flush cut to the ground. Several cedars should be left un-cut on site to improve habitat diversity. Following the cedar tree removal a brush cutting may be required. After the completion of the clearing, the area should be

treated as part of the near by cultural grasslands and the treatments outlined in objective 8 should be adopted for the area.

The treatment of the invasive species can be accomplished by cutting, chipping, and mowing. Repeated frequent growing season mowing will be required to reduce the dominance of invasive species and herbicide may be required for complete eradication of the invasive species. An experienced herbicide applicator should be consulted and used for any application of herbicide.

The approximate acres to be treated are 11 acres for the Eastern red cedar woodlands and 1.7 acres for the invasive species area.

After the initial treatments have been conducted the areas should be assessed every 2 years to determine the need for follow up treatments on areas that have re-sprouts of invasive species. Additionally after the initial conversion treatments are conducted the treatment options and intervals of objective 8 should be adopted for the area.

10. Break up the horizontal and vertical continuity of fuels and reduce fine fuel loads throughout Wiley Park, the Nickerson Property, and Cottontail Acres.

The reduction or breaking up the surface fuel bed in small patches of at least 1/10th acre in size across the properties (Figure 1) will increase firefighter safety and effectiveness, and reduce fire behavior that could potentially impact adjacent private properties. This can be accomplished with mechanical treatments (Option A), prescribed fire (Option B), or a combination of the two treatments.

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 Eastham 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 with 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 approximate acres to be treated assuming a 100 foot wide buffer on each side of the road is 4 acres.

Regardless of the treatment used the necessity 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.

NOTE: This treatment objective does not replace other treatment objectives but greatly enhances the effectiveness of those treatments.

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APPENDIX A - FIRE MANGEMENT WEB RESOURCES

Aid to determining fuel models - http://www.fs.fed.us/rm/pubs_int/int_gtr122.pdf

BehavePlus - <http://www.fire.org>

Cape Cod Cooperative Extension - <http://www.capecodextension.org/home.php>

Cape Cod Emergency Preparedness Handbook: A Guide to Natural Disasters - <http://www.capecodcommission.org/projectimpact/handbook.htm>

Department of Conservation and Recreation, Forest Fire Control - <http://www.mass.gov/dcr/stewardship/firecont/index.htm>

Establishing Fire Prevention Education Cooperative Programs and Partnerships - <http://www.nwcg.gov/pms/pubs/cooppart.pdf>

Fire Education Exhibits and Displays - <http://www.nwcg.gov/pms/pubs/exdispla.pdf>

FireWise - <http://www.firewise.org/index.php>

Firewise - Be Firewise Around Your Home - <https://www.cmsassociates.com/Firewise/12434.pdf>

Firewise Construction/Landscape Checklist - <https://www.cmsassociates.com/Firewise/9053.pdf>

Firewise Developing a Cooperative Approach to Wildfire Protection - <https://www.cmsassociates.com/Firewise/9872.pdf>

Firewise Insiders Guide - Facilitator's / Operators - <https://www.cmsassociates.com/Firewise/9080.pdf>

Firewise Participant Workbook - <https://www.cmsassociates.com/Firewise/9042.pdf>

Glossary of Wildland Fire Terminology - <http://www.nwcg.gov/pms/pubs/pubs.htm>

Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide - http://www.nifc.gov/fire_policy/rx/rxfireguide.pdf

Managing Fuels in Northeastern Barrens - http://www.umass.edu/nrc/nebarrensfuels/ne_barrens/index.html

National Weather Service, Fire Weather - <http://www.erh.noaa.gov/box/firewx.shtml>

Natural Heritage and Endangered Species Program - <http://www.mass.gov/dfwele/dfw/nhosp/nhosp.htm>

Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model - http://www.fire.org/downloads/behaveplus/3.0.0/rmrs_gtr153.pdf

Wildfire Prevention and the Media - <http://www.nwcg.gov/pms/docs/wpsandmedia.pdf>

Wildfire Prevention Event Management Guide - http://www.nifc.gov/preved/event_guide.html

Wildfire Prevention Marketing Guide - http://www.nifc.gov/preved/mark_guide.html

Wildfire Prevention Sign & Poster Guide - <http://www.nwcg.gov/pms/pubs/nfes2753/nfes2753.pdf>

Wildfire Prevention Strategies - <http://www.nwcg.gov/pms/docs/wfprevnttrat.pdf>

APPENDIX B - CONTACTS FOR FIRE & ECOLOGICAL ISSUES

Name: Glenn Olson, Fire Chief
Affiliation: Eastham Fire Department
Address:
2520 State Highway
Eastham, MA 02642-2544
Telephone: (508) 255-2324
Area of Expertise: Fire Suppression, Emergency Medical Services, Fire Education
Detection, and Public Safety.

Name/Affiliation: David W. Crary Jr., Fire Management Officer
Affiliation: National Park Service - Cape Cod National Seashore
Address:
National Park Service
99 Marconi Site Road
South Wellfleet, MA 02667
Telephone: (508) 349-3785 x 247
Area of Expertise: Wildland Fire Management, Fire Ecology, Wildland Fire Training,
Mechanical Treatments of Fuels, and Prescribed Fire.

Name/Affiliation: Joel Carlson, Certified Forester – Consultant
Affiliation: Northeast Forest and Fire Management, LLC
Address:
29 Moody Drive
Sandwich, MA 02563
Telephone: (508) 274-2234
Area of Expertise: Wildland Fire Management, Fire Ecology, Mechanical Treatments,
Wildland Fire Planning, Wildland Fire Training and Education, and Prescribed Fire.

Name/Affiliation: Caren Caljouw, Conservation Biologist - Consultant
Address:
921 New Braintree Road
Oakham, MA 01068-9669
Telephone: (508) 274-2234
Area of Expertise: Wildland Fire Management Planning, Fire Ecology, Monitoring, General
Ecology, Wildland Fire Training and Education, and Prescribed Fire.

Name/Affiliation: William A. Patterson III, Fire Ecologist/Professor
Affiliation: University of Massachusetts
Address:
Department of Forestry and Wildlife Management
Amherst, MA 01003
Telephone: (413) 545-1970
Area of Expertise: Forest Ecology, Fire Ecology, Wildland Fire Research, Fire
Management Planning, Mechanical Treatments of Fuels, and Prescribed Fire.

Name/Affiliation: Tim Simmons, Restoration Ecologist

Affiliation: Massachusetts Natural Heritage & Endangered Species Program

Address:

Massachusetts Division of Fisheries and Wildlife

Route 135

Westborough, MA 01581

Telephone: (508) 792-7270 x 126

Area of Expertise: Fire Ecology, General Ecology, Monitoring, Mechanical Treatments of Fuels, Fire Management Planning, and Prescribed Fire.

Name/Affiliation: Josh Nigro, District 1 Fire Warden

Affiliation: Massachusetts Department of Conservation and Recreation

Address:

District 1 – Bureau of Forest Fire Control & Forestry

PO Box 621

Sandwich, MA 02563

Telephone: (508) 888-1149

Area of Expertise: Wildland Fire Suppression, Wildland Fire Detection, Wildland Fire Prevention, and Wildland Fire Awareness.

Name/Affiliation: Ronald Aseltine, District 1 Fire Patrolmen – FIREWISE Coordinator

Affiliation: Massachusetts Department of Conservation and Recreation

Address:

District 3 – Bureau of Forest Fire Control & Forestry

PO Box 171

Assonet, MA 02702

Telephone: (508) 644-9839

Area of Expertise: Fire Wise Programs and Education, Wildland Fire Suppression, Wildland Fire Detection, Wildland Fire Prevention, and Wildland Fire Awareness.

APPENDIX C - GLOSSARY OF TERMS

(For additional terms see the National Wildfire Coordinating Group's Glossary of Wildland Fire Terminology web link in Appendix A.)

Basal Area – a measure, similar to cover, being the proportion of ground surface occupied by a species.

BehavePlus Fire Modeling System - a software application to predict wildland fire behavior for fire management purposes.

Canopy Closure – the distance between the tree tops if one were to look straight up. If the canopy closure is very dense, then the spacing is very tight with very little sunlight able to pass through.

Chain – a unit of measure in land survey and forestry, equal to 66 feet (20 meters). Commonly used to report fire perimeters, fireline distances, and rates of spread.

Cover – the vertical projection of above ground parts onto the ground. Ecologists recognize many types of cover: crown cover, vegetative cover, ground cover, forest cover etc.

Crown Fire – a fire that advances from top to top of trees or shrubs more or less independently of the surface fire. Sometimes crown fires are classed as either running or dependent, to distinguish the degree of independence from the surface fire.

Defensible Space – a designated area around a home or building that is intentionally maintained so as to be free of any features that would tend to increase the risk of damage from wildfire.

Density – the number of individuals per unit area.

Density Board – a post or board used to measure cover and height of vegetation by obstruction to vision.

Drought Index – a number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper slope soils. The Keetch-Byram Drought Index (KBDI) is used in fire planning to evaluate the effects of extended drying on the duff layer.

Duff – the partly decomposed organic material sandwiched between the litter of freshly fallen twigs, needles, and leaves and the mineral topsoil.

Fine Fuels – small diameter fuels such as grass, leaves, draped pine needles, and twigs, which when dry, ignite readily and are rapidly consumed.

Fire Behavior – the manner in which fire reacts to the variables of fuel, weather, and topography.

Fire Danger – resultant of both constant and variable fire danger factors, which affect the ignition, spread, and difficulty of control of fires and damage they cause.

Fire Frequency – the number of fires per unit time in a designated area.

Fire Intensity – generally refers to flame length and rates of spread in surface fires. High intensity fires have long flame lengths and high rates of spread but may not burn down into the litter and duff layers.

Fire Severity – generally refers to fire burning into the litter and duff layers, associated with certain surface fires or ground fires. Severe fires occur when temperatures are high and humidity and precipitation are low for long periods of time, duff and litter dry out and fire can reside for long periods of time, resulting in reduction or loss of organic material down to mineral layers.

Fireline Intensity – the heat released per unit of time for each unit length of the leading fire edge. The primary unit is Btu per linear foot of fire front per second.

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

FIREWISE – a multi-organizational initiative sponsored by the National Wildfire Coordinating Group's Wildland/Urban Interface Working Team. An initiative designed to work with concerned citizens, local fire departments, public land managers, and other fire safety professionals to lessen the risk of interface fires through education, prevention, and supportive mutual aid.

Flame Length – the average length of flames when the fire has reached its full, forward rate of spread, measured along the slant of the flame from the midpoint of its base to its tip.

Fuel – combustible plant material, both living and dead that is capable of burning in a wildland situation.

Fuel Arrangement – the spatial distribution and orientation of fuel particles within the fuel bed.

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

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

Fuel Continuity – the degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed, a critical influence on a fire's ability to sustain combustion and spread. This applies both to aerial fuels and surface fuels.

Fuel Model – a characterization of the fuel properties within a typical field situation. Sets of standardized fuel models are available from the USDA Forest Service for fire behavior and fire spread modeling. (www.fs.fed.us/pnw/fera/firehouse)

Fuel Moisture Content – the quantity of moisture in a fuel expressed as a percentage of the weight when thoroughly dried at 212⁰ F.

Fuel Reduction Zone – any area, strategically located for fighting anticipated fires, where the vegetation has been periodically modified or treated so that fires burning into it can be more easily controlled. Widened zones of reduced fuels decrease wildfire intensity and allow for more effective fire 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.

Ground Fire – a fire that consumes the organic material beneath the surface litter, such as a duff fire or a peat fire.

Ground Fuels – all combustible materials below the surface litter layer, including duff, tree and shrub roots, punky wood, dead lower moss and lichen layers, and sawdust, that normally support glowing combustion without flame.

Head Fire – a fire spreading or set to spread with the wind.

Hundred Hour Time Lag Fuels – dead fuels consisting of roundwood in the size range from 1 – 3 inches in diameter, estimated to reach 63% of equilibrium moisture content in one hundred hours.

Invasive Non-native Plant – a plant that exhibits rapid growth and out competes native plant species, thereby reducing species diversity. Not all non-native plants are invasive.

Ladder Fuels – any materials which allow fire to move vertically from the ground up to the tops of trees (e.g. dead fuels to lower branches to other intermediate trees and shrubs to the upper tree canopies).

Litter – loose debris such as leaves, branches, twigs, logs laying on the surface of the ground.

One-Hour Time Lag Fuels – dead fuels consisting of dead herbaceous plant materials, sticks, needles and roundwood less than 0.25 inches in diameter, expected to reach 63% of equilibrium moisture content in one hour or less.

National Fire Danger Rating System – a multiple index designed to provide fire and land management personnel with a systematic way of assessing various aspects of fire danger on a day-to-day basis.

Prescribed Burning – controlled application of fire to wildland fuels under specified environmental conditions that allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Prescription – a written statement defining the objectives to be attained as well as the conditions of temperature, humidity, wind direction and speed, fuel moisture, and soil moisture, under which a fire will be allowed to burn.

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.

Relative Humidity – the ratio, in percent, of the amount of moisture in a volume of air to the total amount which that volume can hold at the given temperature and atmospheric pressure.

Slash – the remnants of tree limbing, thinning, and ground fuel reduction. May also be resultant from strong winds. Composed of branches, tops, cull logs, uprooted stumps, and broken or uprooted trees.

Spotting – production of burning embers in the mowing fire front that are carried a short distance ahead of the fire, or in some cases are lofted by convective action or carried by fire whirls some distance ahead of the fire.

Surface Area to Volume Ratio (SAV) – the ratio between the surface area of an object, such as a fuel particle to its volume. The smaller the particle, the more quickly it can become wet, dry out, or become heated to combustion temperature during a fire.

Surface Fire – a fire that burns surface litter, other loose debris, and low vegetation.

Ten-Hour Time Lag Fuels – dead fuels consisting of wood, 0.25 – 1 inch in diameter, estimated to reach 63% of equilibrium moisture content in ten hours.

Thousand-Hour Time Lag Fuels – dead fuels consisting of roundwood 3 – 8 inches in diameter, estimated to reach 63% of equilibrium moisture content in one thousand hours.

Wildfire – any fire occurring on wildland except a fire under prescription.

Wildland – an area characterized predominantly by native vegetation, in which development is essentially non-existent, except for roads, powerlines and similar facilities.

Wildland – Residential (or Urban) Interface – the area where combustible homes and other structures meet combustible vegetation. This interface may include a wide variety of situations, ranging from individual houses and isolated structures to subdivisions and rural communities surrounded by wildlands.

FIGURE 1. PROPERTIES AND ADJACENT LANDS

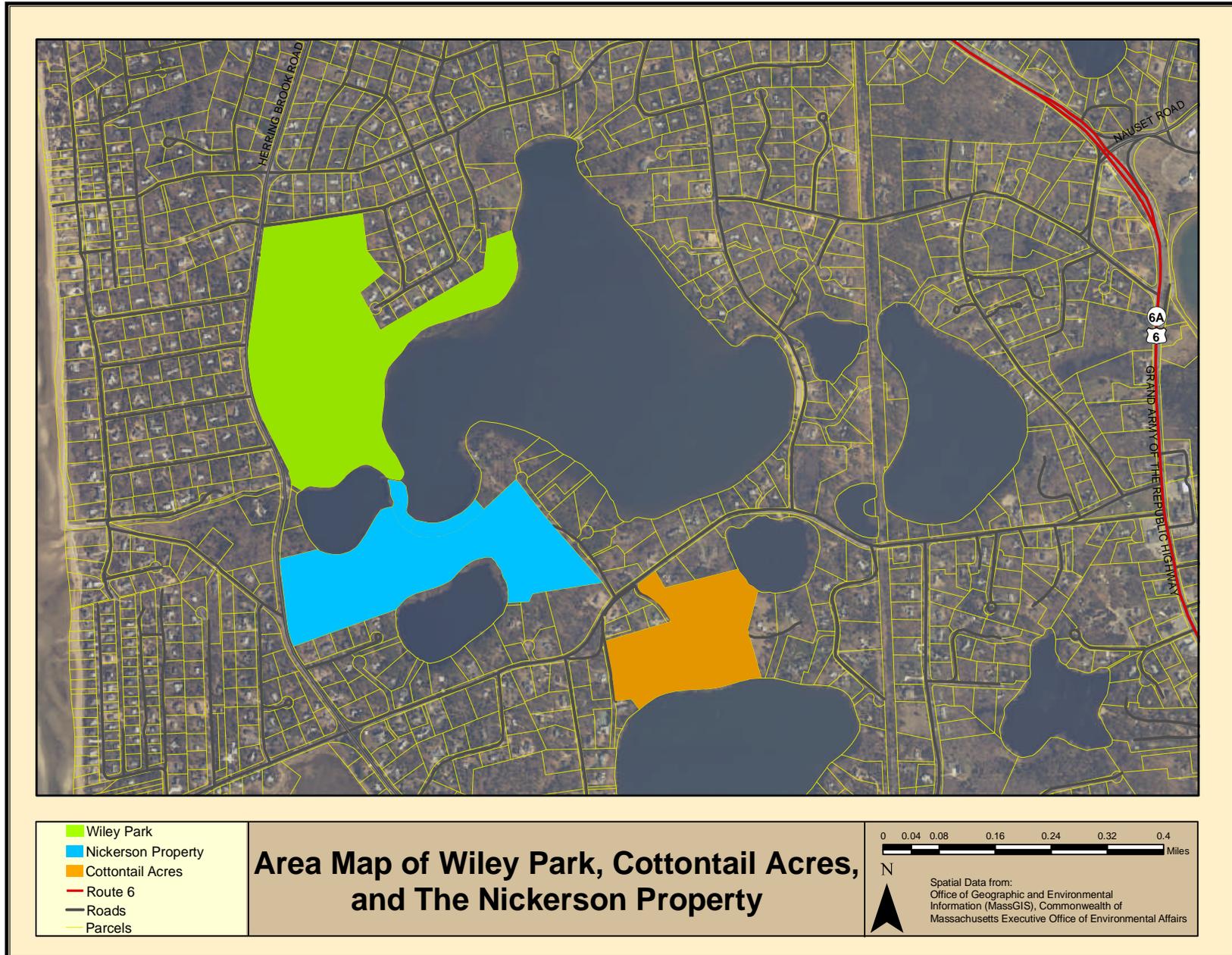


FIGURE 2. VEGETATION

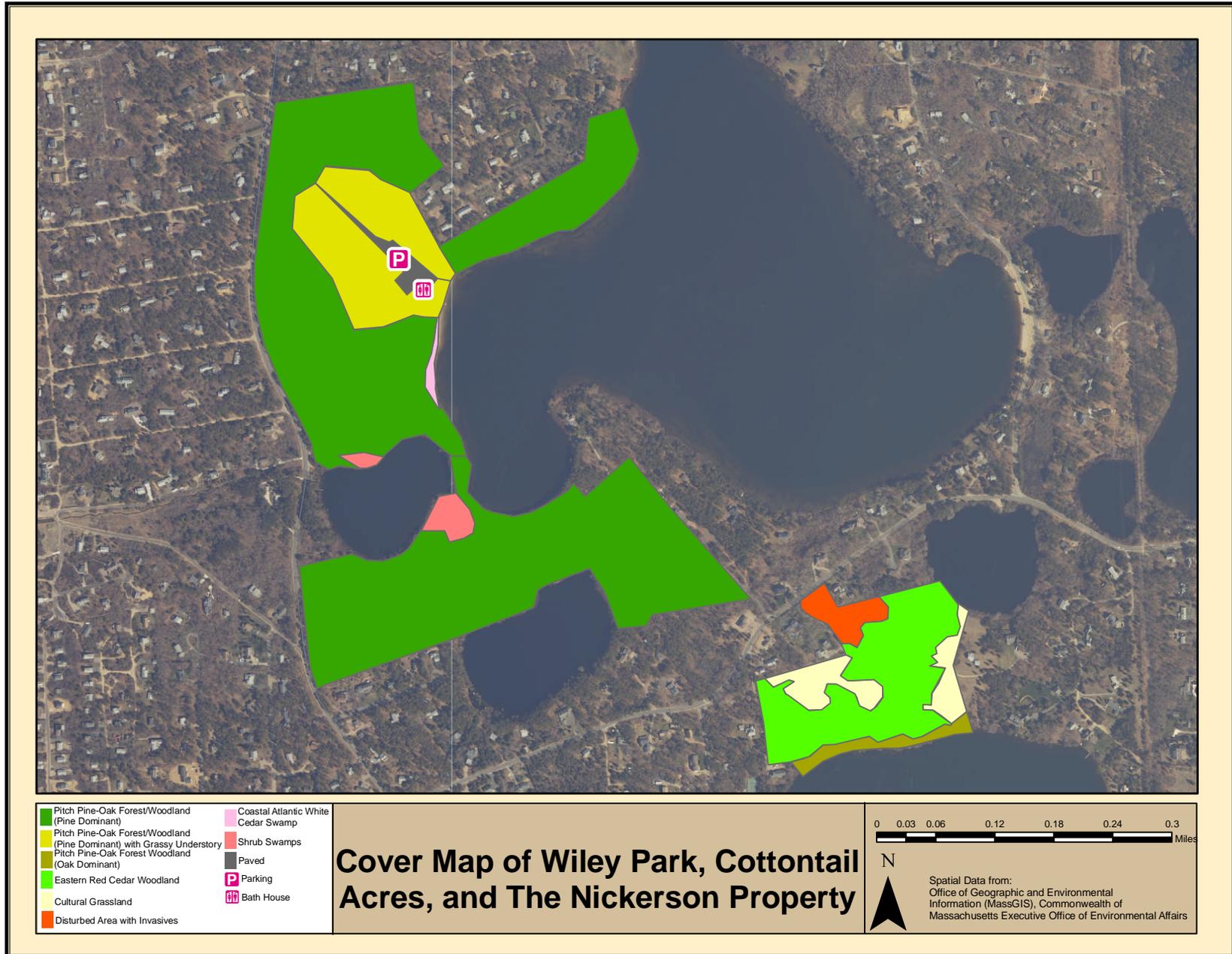


FIGURE 3. FUELS

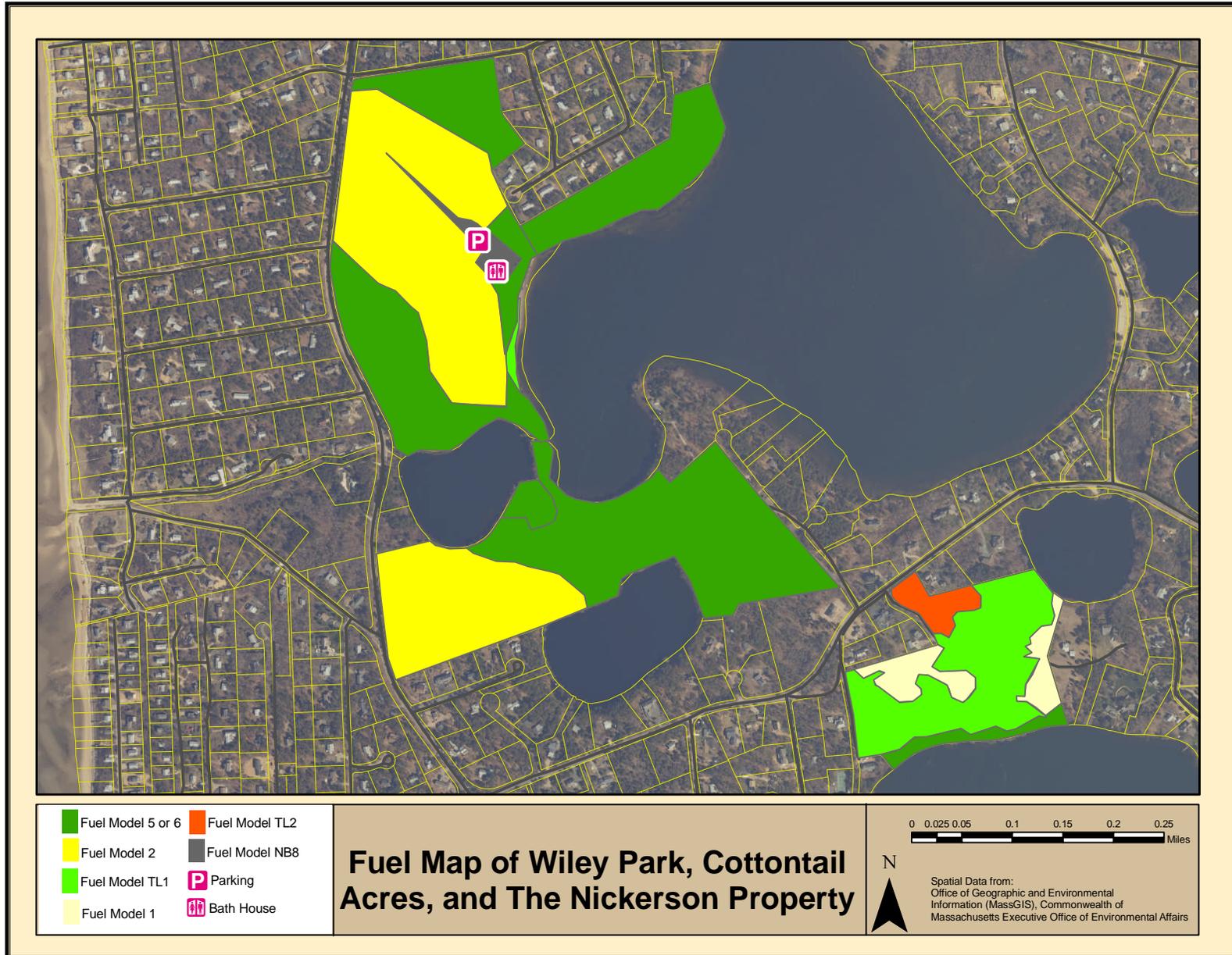


FIGURE 4A. PUBLIC EDUCATION AREAS

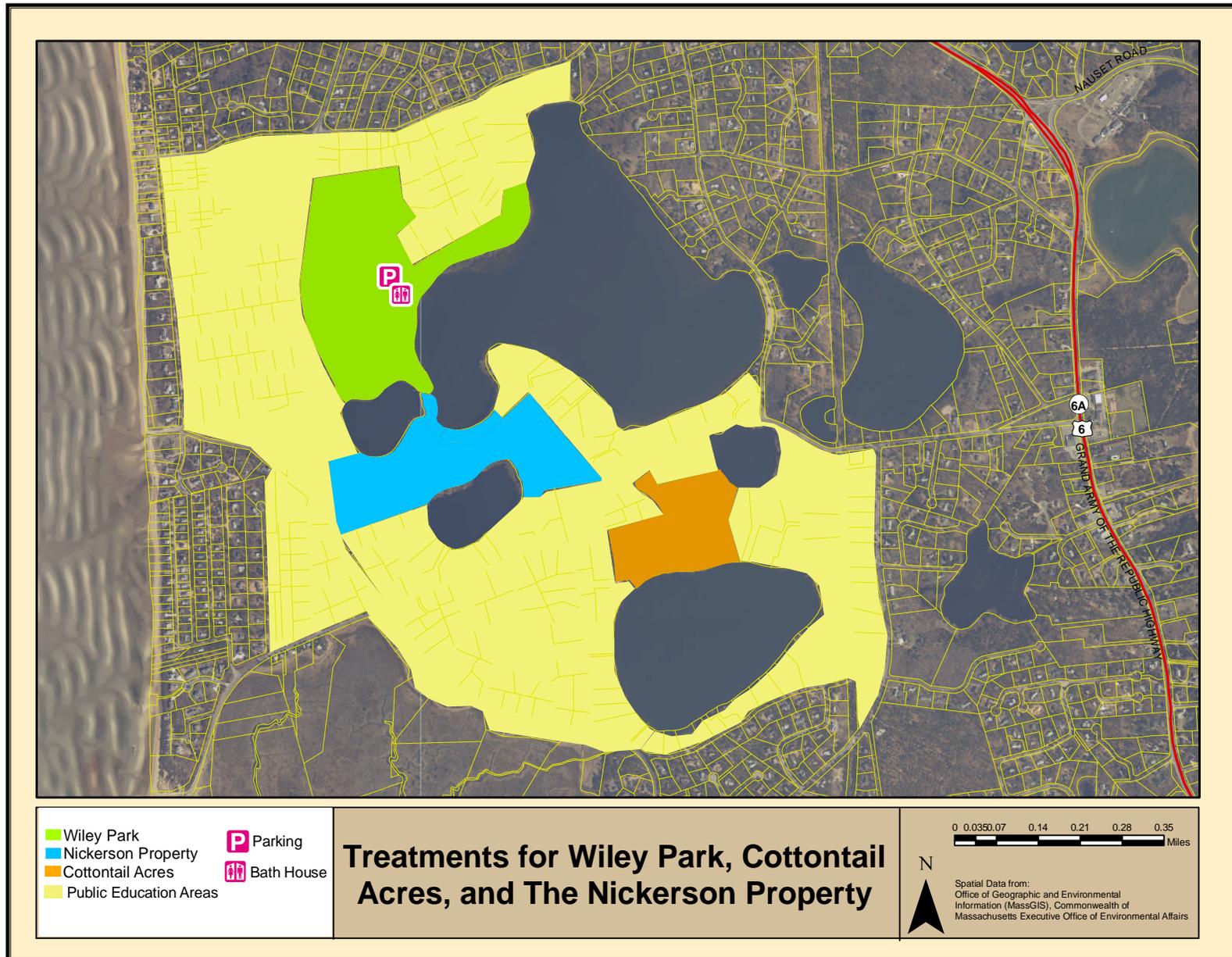


FIGURE 4B. STORM DAMAGE TREATMENT, GRASSLAND MAINTENANCE, & CEDAR STAND TREATMENT AREAS

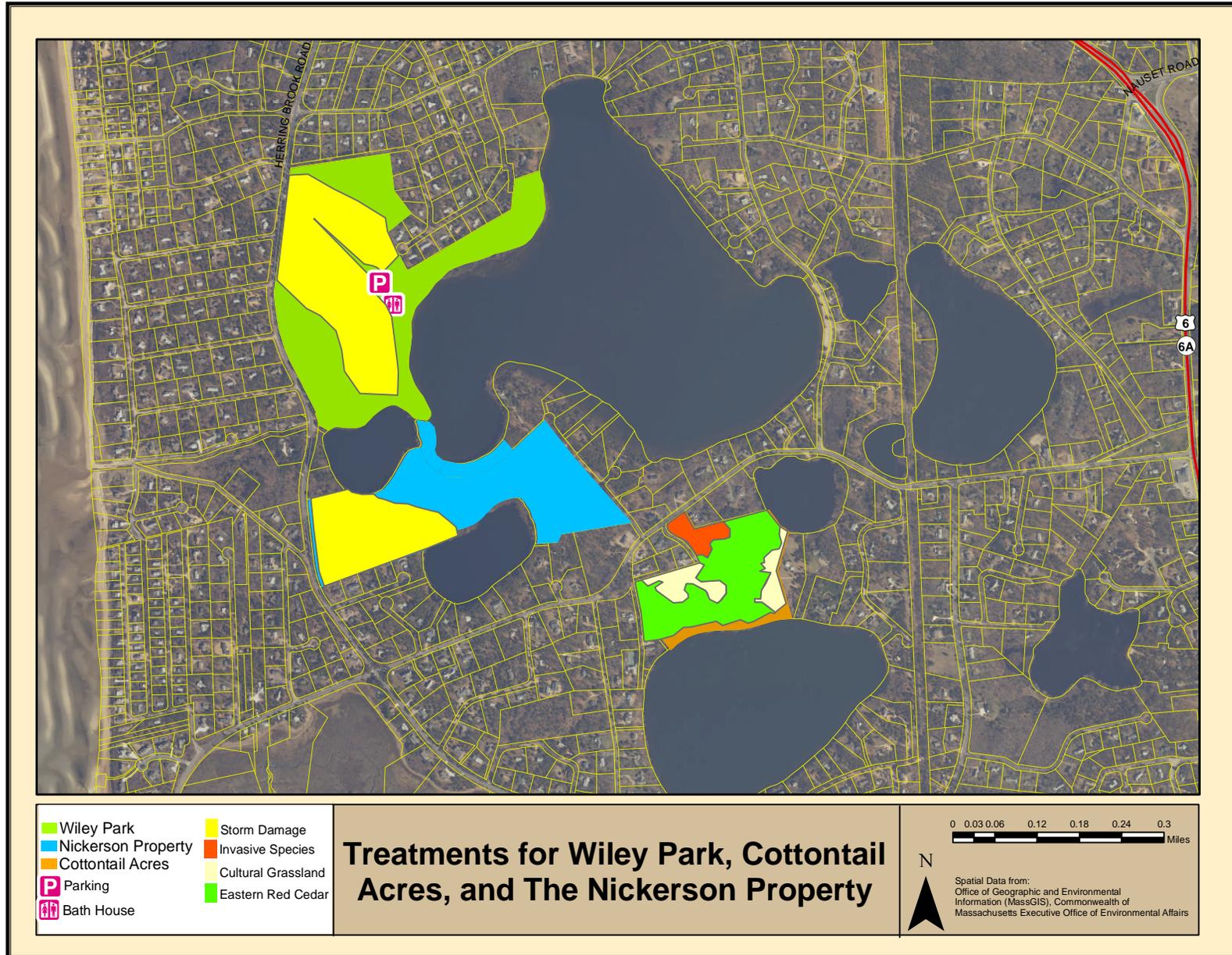


FIGURE 4C. ROAD OPENINGS AND TREATMENT AREAS

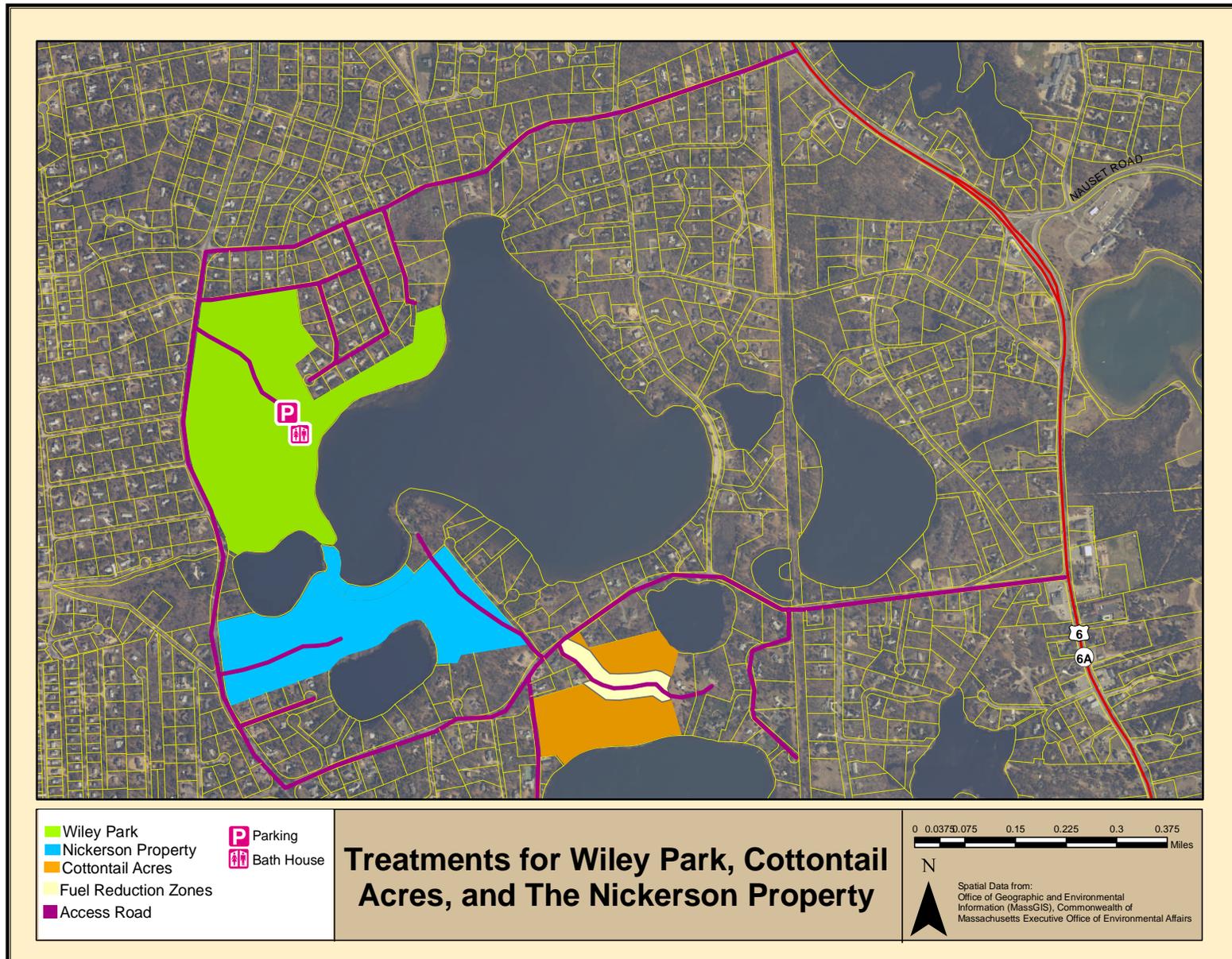


FIGURE 4D. FUEL REDUCTION AREAS

