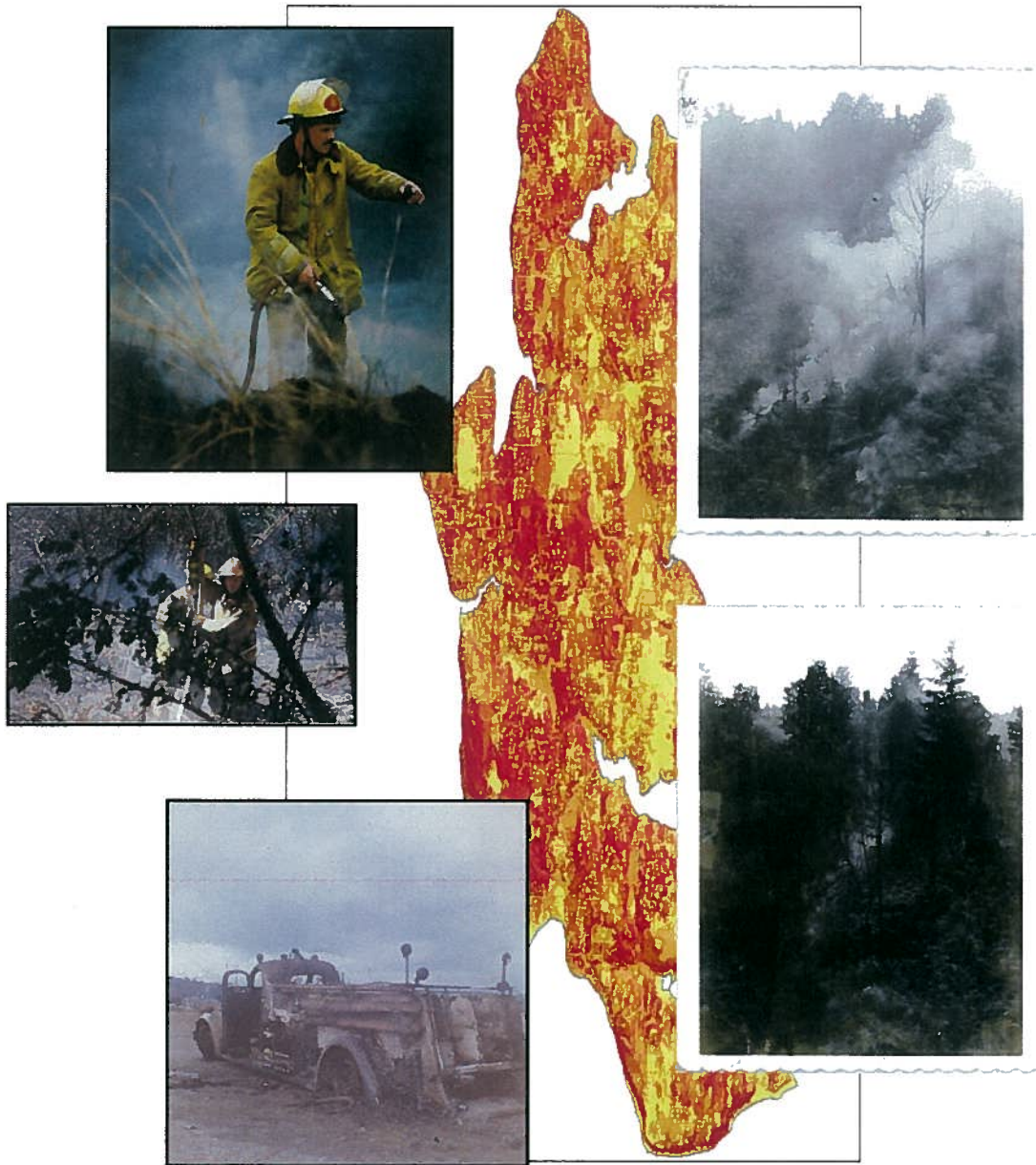




# Bainbridge Island Community Wildfire Protection Plan



Prepared by Bainbridge Island Fire Department and Peninsula College  
June 2010

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# I. Introduction

## Overview

Wildfires are a growing hazard in many regions of the United States, posing a threat to life, property, and natural and cultural resources. This is especially true where development mixes with wildlands, the area that firefighters call the **Wildland-Urban Interface (WUI)**. In addition, the secondary effects of wildfires on lives, livelihoods, and infrastructure—including erosion, landslides, introduction of invasive species, and changes in water quality—can sometimes be more disastrous than the fire itself.

Wildfires are a natural and often beneficial ecological disturbance process, influencing species composition and vegetative structure across the landscape. Decades of timber harvest and fire suppression policies have altered this process in many areas, often creating a more dense forest environment that can burn more intensely than in the past. While the Puget Sound Region may be known for its high levels of rainfall, fire is a common ecological influence in the area. Summer droughts occur here, which can elevate the risk of ignition in drier areas. Though Bainbridge Island has not experienced a large wildfire in recent years, the risk is still present—each year, about 10-30 small wildfires occur across the Island. The potential for a major wildfire disaster is very high due to the combination of having a seasonally dry climate and high vegetative fuel loads—all it would take is an ignition under the right weather conditions.

The risk wildfire poses to human life is increased by the growing number of homes located within Bainbridge Island WUI. A recent study by Headwaters Economics found that Kitsap County has the seventh highest existing risk of catastrophic losses in the event of a major wildfire in all of Washington. The same study ranks Washington third in the western states for potential future risk as the result of increasing human development in wildfire-prone areas.

Currently, many residents are developing homes in interface areas. New residents often assume that wildfire isn't a problem on the western slopes of the Pacific Northwest, though research has determined that forests in our rainshadow areas are more similar to those in central Oregon and northern California than those on the Pacific coast. Many residents of Bainbridge Island may be unaware of the concept of defensible space or unaware that the concept is directly applicable to their lands, adding to the potential for severe WUI incidents in the near future. Should we face a major wildfire it is possible that the Island could become a major disaster zone, with heavy property losses and potential loss of human life. However, with careful planning and collaboration among public agencies and communities, it is possible to minimize the losses that can result from wildfire.

In December of 2009, the Bainbridge Island Fire Department (BIFD) authorized funding for Peninsula College's Center of Excellence to research and develop a Community Wildfire Protection Plan (CWPP) in conjunction with the Bainbridge Island Fire Department, state wildland fire agencies, and other community organizations. A Community Wildfire Protection Plan identifies communities at risk, prioritizes hazardous fuel treatments, and recommends ways to reduce structural ignitability. The purpose of the Bainbridge Island CWPP is to provide a consolidated reference document and framework

that enables local, state, and federal agencies to identify hazard areas and establish effective mitigation strategies that will reduce wildfire risk to life, property, and resources.

This CWPP can be used as a foundation for developing risk assessments and prioritized mitigation projects at the home and neighborhood scale. This plan identifies and assesses wildfire hazards across the island, identifies Wildland-Urban Interface areas, and presents recommended mitigation measures to protect those areas from the effects of wildfire.

This CWPP will also increase Bainbridge Island Fire Department's competitiveness and eligibility for federal grant funding programs, such as those that come under the auspices of the Healthy Forests Restoration Act, the National Fire Plan, the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation Program, the Secure Rural Schools and Community Self Determination Act (Public Law 106-393), and others.

## **Policy Context**

The following policy documents either legislatively mandate the process of completing a CWPP, or have provided guidance and technical expertise that were used during this CWPP planning process:

### ***Healthy Forests Restoration Act***

The intent of Healthy Forests Restoration Act (HFRA) is to prevent or reduce the threat of catastrophic wildfires, maintain or increase environmental standards, increase the commercial value of hazardous forest biomass, and to encourage public input during the planning process. The HFRA also specifies the three minimum requirements that must be included in a Community Wildfire Protection Plan:

- **Collaboration:** A CWPP must be collaboratively developed by local and state government representatives, in consultation with any relevant federal agencies and other interested parties.
- **Prioritized Fuel Reduction:** A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure.
- **Treatment of Structural Ignitability:** A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.

### ***National Fire Plan***

The National Fire Plan (NFP) provides technical, financial, and resource guidance support for wildfire management and mitigation activities occurring throughout the United States. The NFP addresses five key issues and identifies five main priorities with regard to wildfire events at the local, state, and national levels, including firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.

The main priorities of the National Fire Plan are:

- Assuring that necessary firefighting resources and personnel are available to respond to wildfires that threaten lives and property.

- Conducting emergency stabilization and rehabilitation activities on landscapes and communities affected by wildfire.
- Reducing hazardous fuels (dry brush and trees that have accumulated and increase the likelihood of unusually large fires) in the county's forests and rangelands.
- Providing assistance to communities that have been or may be threatened by wildfire.
- Committing to the Wildfire Leadership Council, an interagency team created to set and maintain high standards for wildfire management on public lands.

### ***Federal Emergency Management Agency Multi-Hazard Mitigation Plan***

A Multi-Hazard Mitigation Plan (MHMP) is required by FEMA for state, local, and Indian tribal governments to meet the requirements of the Mitigation Planning regulations required under the Disaster Mitigation Act of 2000 (Public Law 106-390) which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288). This policy provides the legal basis for state, local, and Indian tribal governments to undertake a risk-based approach to identify, assess and reduce the risks posed by natural hazards through mitigation planning. The legislation requires that local governments complete a MHMP in order to remain eligible for both hazard mitigation grant funding and disaster assistance funding.

The 2004 Kitsap County Multi-Hazard Mitigation Plan (KCMMP) rated the probability level of future occurrence of wildland fire hazard events as medium due to “no historical precedent for wildfires threatening the County.” The first wildfire mitigation strategy identified in the plan is: “Identify Urban Wild Land Fire interface problem areas including the development of an urban fire risk map. This project would be dependent upon a Regional GIS program for mapping components.” A wildfire hazard assessment of Kitsap County was conducted under a 2001 Forest Service grant, though Bainbridge Island was excluded from this assessment due to lack of LiDAR (Light Detection And Ranging) data used in the County’s assessments methodology. This CWPP addresses the first KCMMP wildfire mitigation strategy by identifying and rating hazards across Bainbridge Island and delineating its WUI.

### ***The Community Wildfire Protection Plan Handbook***

The Community Wildfire Prevention Plan Handbook (CWPPH) is a guidance document that makes step-by-step recommendations for developing a community wildfire prevention plan. The document highlights overall wildfire prevention planning goals in the HFRA and other related policy documents and suggests planning methods and public outreach activities that can be used to achieve them. Although following the steps recommended in CWPPH is not required, the handbook offers valuable insight and how-to information to local governments, individual community members, fire districts, and other interested stakeholders in order to establish an effective, continuous, and wide-ranging CWPP. This handbook was utilized in the development of this plan.

### ***National Fire Protection Association and the International Code Council***

The National Fire Protection Association (NFPA) was established in 1896 and is an internationally recognized organization devoted to improving fire safety, education, and fire prevention standards at the global scale. NFPA conducts research and develops technical standards and fire prevention



methodologies that aid in protecting human life and community infrastructure from wildfire events. Two NFPA standards are applicable to CWPP planning efforts, and have been used in the development of this plan: *Standards for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas* (NFPA 1141, 2008 Edition), and *Standards for Reducing Structure Ignition Hazards from Wildfire* (NFPA 1144, 2002 and 2008 Editions). Similar to NFPA, the International Code Council has developed the *International Wildland-Urban Interface Code* (2006 and 2009 Editions), which have also been used in the development of this CWPP.

## **Determining or Designating a Community or Area as “At-Risk”**

As outlined in Title 1 of the Healthy Forest Restoration Act, communities may identify themselves as being “at-risk” based on either an analysis following the *National Association of State Foresters Field Guidance on Identifying and Prioritizing Communities-at-Risk* (June 27, 2003), if it lies within the WUI as defined in the federal register (*FR Vol. 66, No. 3, Pages 751-754, January 4, 2001*), or by stating this during development of their Community Wildfire Protection Plans. This CWPP defines all of Bainbridge Island as lying within the WUI and “at-risk.”

The Firewise Communities/USA<sup>1</sup> recommends a planning scale of approximately that of a neighborhood or homeowners association. The size of a Firewise Communities/USA site is not governed by an arbitrary, fixed rule but rather by the limit of its effectiveness. Firewise has found that communities beyond the traditional neighborhood size generally have difficulty meeting the effectiveness and individual engagement criteria required for a long-term commitment to wildfire mitigation. It should not be assumed that a community will receive treatments just because it is identified as being in the WUI and “at-risk.” Nor should it be assumed that wildfire hazard mitigation activities are unnecessary for areas outside of the WUI. Such an “at-risk” designation identifies these areas as the locations where wildfire hazard mitigation activities will have the greatest success at protecting the largest number of homes and property.

## **Criteria for Prioritizing Mitigation Activities**

The wildfire hazard maps located in Chapter IV can be used with the regionally adapted version of the National Fire Protection Association assessment forms to help determine the hazard severity level of each home or neighborhood (Appendices D-F). The Prioritization Forms (Appendix G) can be used with the mitigation strategies in Chapter VI to develop and prioritize mitigation plans.

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<sup>1</sup> [www.firewise.org](http://www.firewise.org)

## **II. Planning Process**

### **Community Involvement**

One of the major goals of any CWPP is to involve, to the greatest extent possible, any and all interested stakeholders prior to and during the CWPP planning process. As stated in the CWPPH, "A key element in community fire planning should be the meaningful discussion it promotes among community members regarding their priorities for local fire protection and forest management." A public meeting and associated education campaigns were conducted to provide fire prevention education materials and to obtain feedback from community members to determine community priorities for wildfire protection.

*Draft Posted on BIFD.ORG website for public review and comment from July 6, 2010 – August 4, 2010*

*Public Hearing and Presentation at Board of Fire Commissioners Meeting on August 4, 2010*

*Presentation and Receive Comments from City's Community Forestry Commission on August 17, 2010*

*Other presentations and receipt of comments will be ongoing*

### **Plan Adoption**

This CWPP must be approved by the Bainbridge Island Fire Department, City of Bainbridge Island, and the Washington DNR. These entities, along with regional wildfire experts and interested community members, provided comments, guidance, and feedback during the development of this plan.

### **Planning Area**

This document addresses all of Bainbridge Island and serves as a foundation and framework from which the Bainbridge Island Fire Department can help develop assessment and treatment plans at the home and neighborhood scales.

## III. Bainbridge Island Description

### Location and Background

Bainbridge Island is located at 47°39' N 122°32' W in northwestern Washington State (Figure 1). The City-Island is centrally located in the Puget Lowlands, east of the Kitsap Peninsula and west of the City of Seattle. The island is approximately 3.5 miles wide by 10.5 miles long and has an area of 28 mi<sup>2</sup> (17,778 acres). Elevations on the island range from sea level to just over 400 feet. The Island has an irregular coastline of approximately 45 miles, and an extensive network of rivers, streams, and creeks that drain into 12 distinct watersheds.

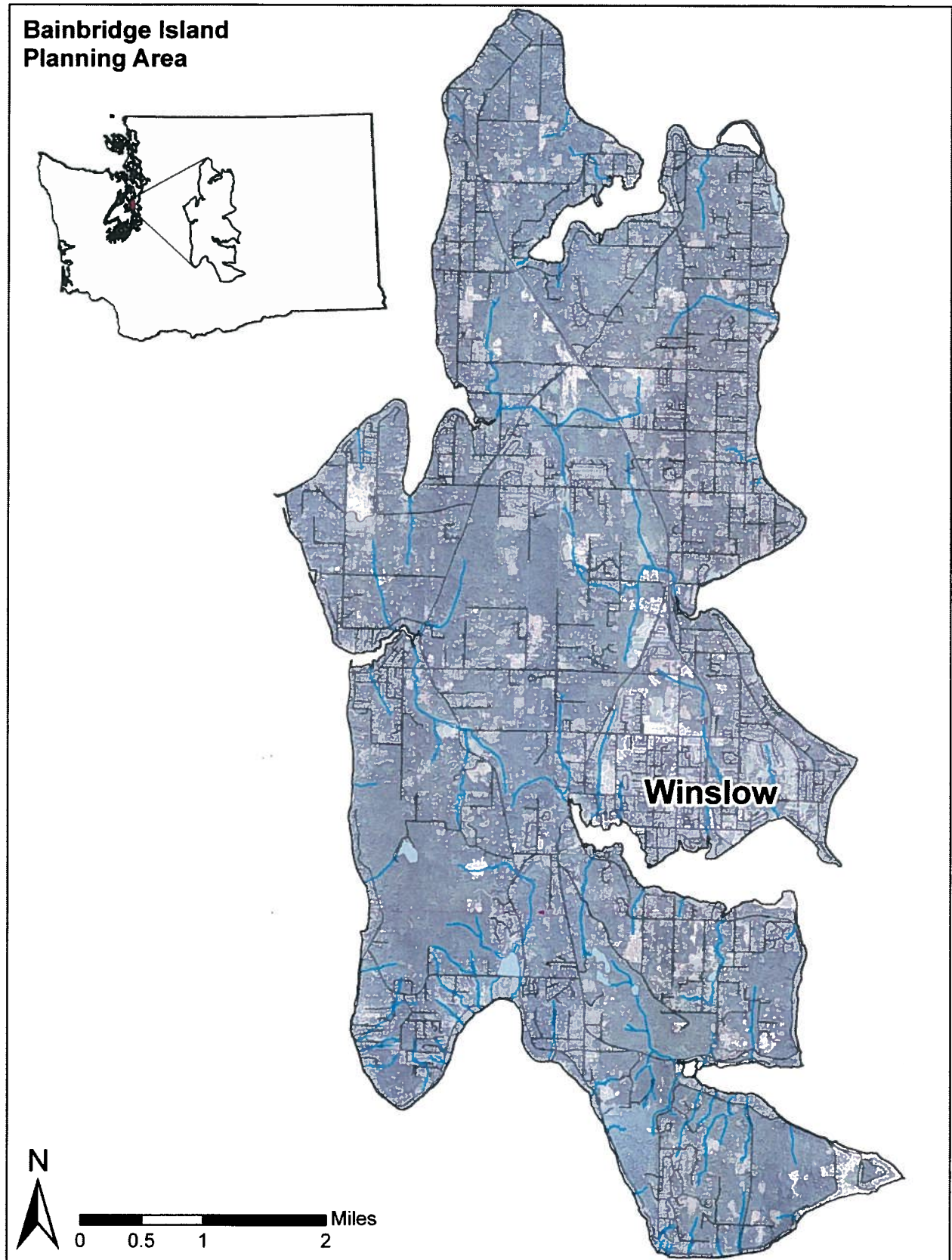
The earliest known inhabitants of the island were coastal-dwelling members of the Suquamish Tribe. European exploration and settlement began in 1792, when George Vancouver led the British ships *Discovery* and *Chatham* into Puget Sound. In 1841, the U.S. Exploring Expedition led by Charles Wilkes spent two months mapping Puget Sound, and Bainbridge Island is among the features this expedition named.

Today, Bainbridge Island is predominantly composed of residential neighborhoods. In a 2008 survey of community values, residents responded that they are committed to preserving the Island's sense of community and its green spaces, including agricultural land, forests, parks, and trails. To help preserve forested green spaces, the City of Bainbridge Island published a Community Forest Management Plan in 2006 and is currently in the draft stage of developing a Consolidated Tree Ordinance.

### Communities

The town of Winslow, located in Eagle Harbor, was incorporated in 1947. Other established neighborhoods on the island are Rolling Bay, Lynwood Center, and Island Center. In 1991, the whole island was annexed as the City of Bainbridge Island.

Figure 1: Bainbridge Island wildfire hazard assessment planning area.

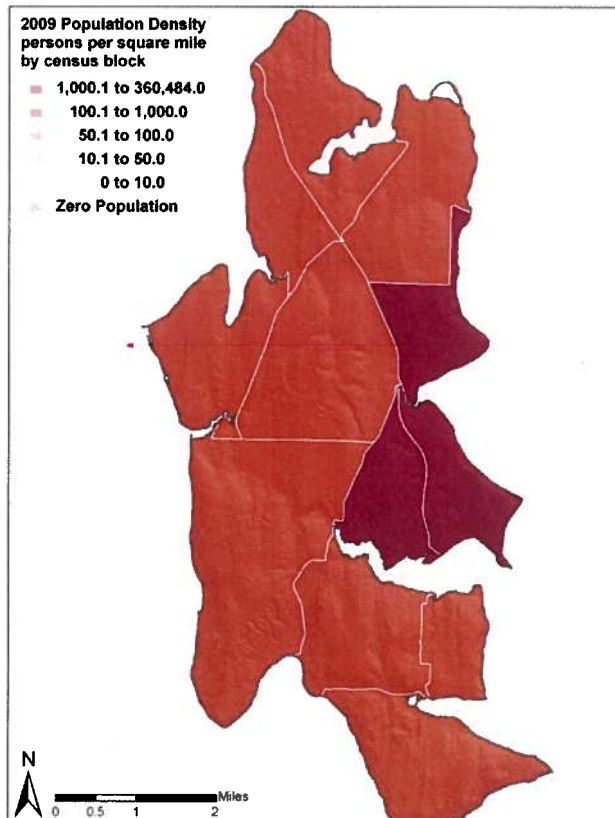


## Demographics

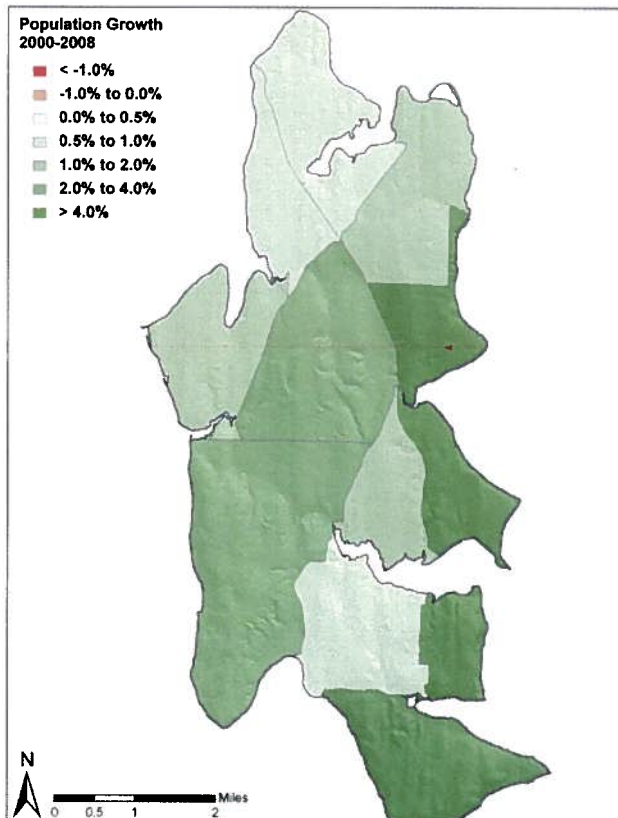
The 2009 U.S. Census population estimate for Bainbridge Island was 23,290 with a density of about 726 persons per mi<sup>2</sup> (Figure 2). This represents a 1.3% average annual growth rate from the 2000 estimate of 20,308 (Figure 3). The Island had a 2.2% average annual growth rate between 1990 (pop. 15,846) and 2000. In 2008 there were an estimated 8,800 households on Bainbridge Island and the average household size was 2.6 people. 7,100 (81%) are owner-occupied and 1,700 (19%) are renter-occupied. The median monthly housing costs for mortgaged owners was \$2,582, non-mortgaged owners \$704, and renters \$1,179. The 2008 estimated median income of households on Bainbridge Island was \$98,608 and 3 percent of people were in poverty.

The 2008 ethnicity estimate for Bainbridge Island was distributed as 92.9% white, 2.4% Asian, 0.6% American Indian or Alaska Native, 0.3% Black or African, and 0.1% Native Hawaiian and Other Pacific Islander. In 2008, 99 percent of people 25 years and over had at least graduated from high school and 66 percent had a bachelor's degree or higher. The leading industries on Bainbridge Island for the employed population 16 years and older include professional, scientific, and management; administrative and waste management services; educational services; health care; and social assistance.

**Figure 2: Bainbridge Island population density estimate in 2009, by census block (U.S. Census data).**



**Figure 3: Bainbridge Island average annual estimated population growth 2000-2008 (U.S. Census data).**

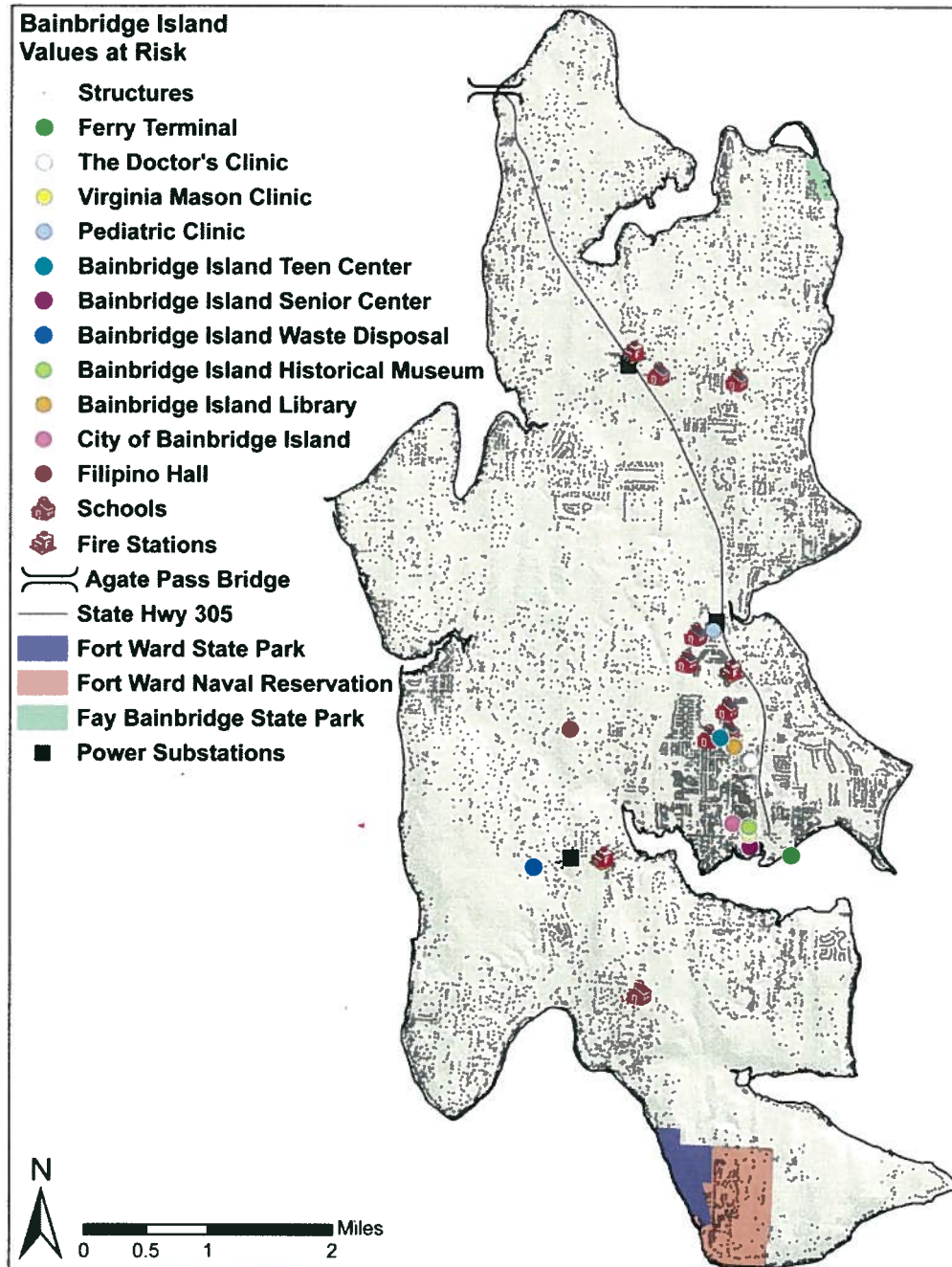




## Values at Risk

Identifying the values in need of protection is often the first step in hazard planning. Wildfire hazard mitigation efforts typically focus on protecting structures. In addition, every community has sites of social, environmental, historic, or infrastructure importance that should also receive priority during protection planning. These can include protected areas, historic sites, schools, hospitals, evacuation routes, utilities, etc. Some values at risk are shown in Figure 4. Historic sites and community centers are listed in Appendix H. Hospitals, Police and Fire Stations, and utilities are listed in Appendix I.

**Figure 4: Bainbridge Island values at risk.**



## Environment

### *Weather*

The climate on Bainbridge Island is generally characterized by mild, wet winters (40-50° F average daytime temperatures) and warm, dry summers (70-80° F average daytime temperatures). Average annual rainfall varies between 40 to 45 inches, which is influenced by the effect of the Olympic Mountains on prevailing wind patterns (Figures 5-7). Most of this rain falls in the autumn and winter; like much of western Washington, the summer months experience an average of less than 2" rain per month (Figure 8).

**Figure 5: Bainbridge Island average annual precipitation (OSU-PRISM data).**

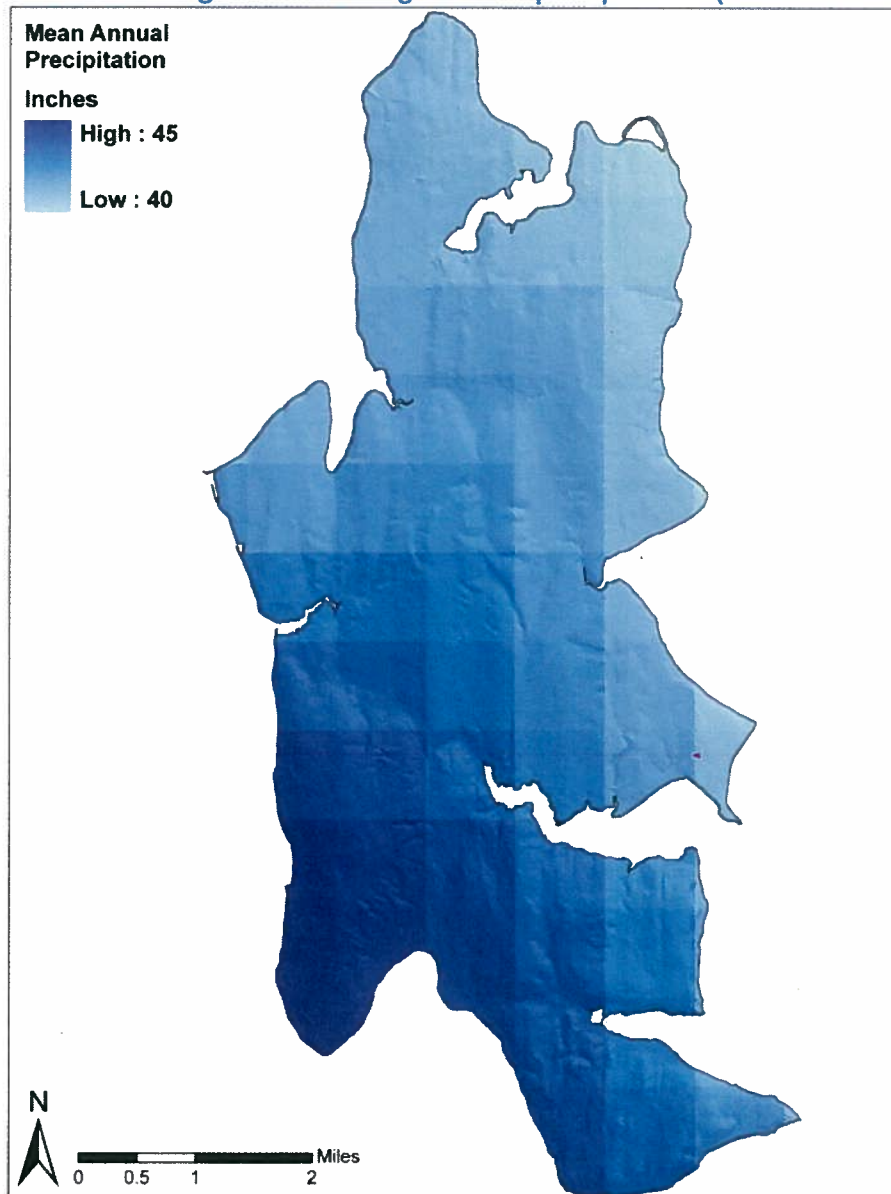


Figure 6: Prevailing winds for the Olympic Mountains drive precipitation patterns in Puget Sound (WRCC map).

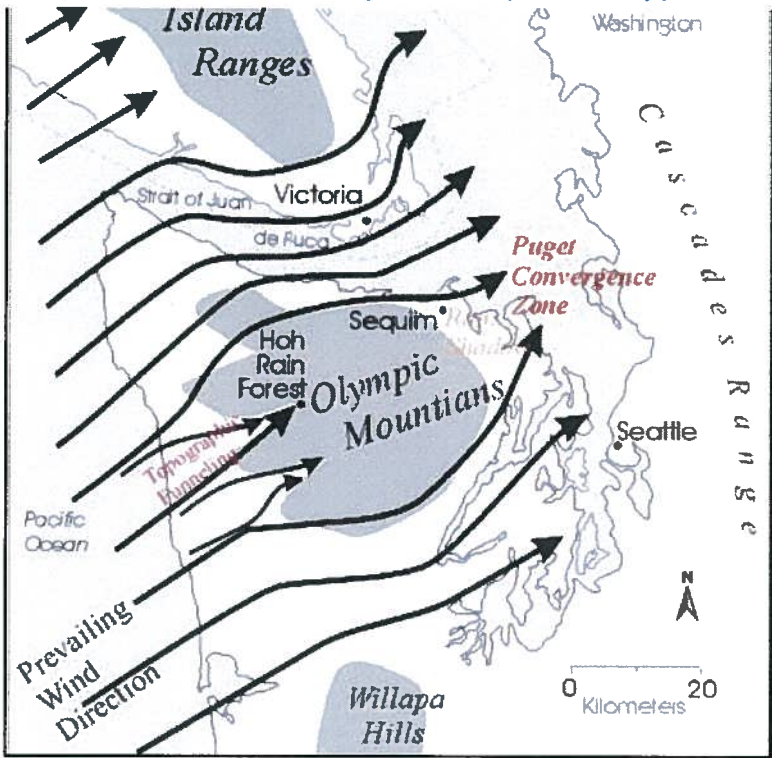


Figure 7: Windrose displaying predominant wind direction at Seattle-Tacoma Airport, ~15 miles southeast of Bainbridge Island (WRCC graph).

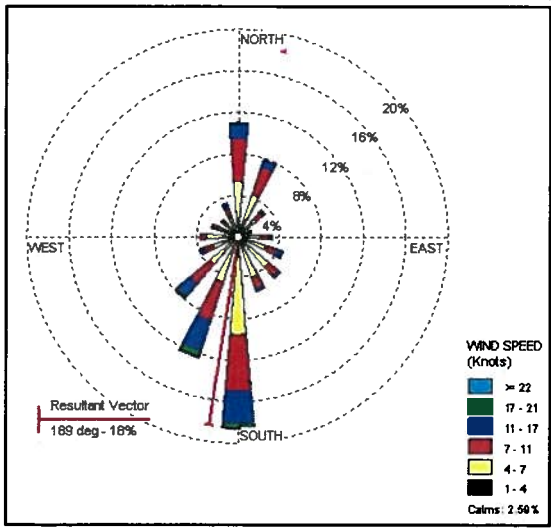
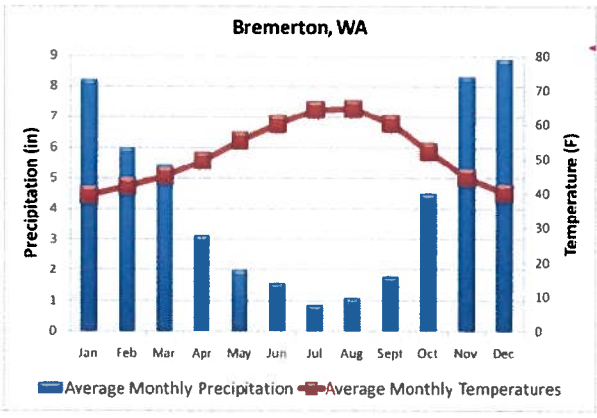


Figure 8: Climograph for Bremerton, WA ~5 mi. SW of Bainbridge Island (WRCC data).





## Geology and Soils

Bainbridge Island was initially shaped as the 3,000 foot-thick Vashon Glacier carved out Puget Sound at the end of the last Ice Age, 13,000 to 15,000 years ago (Figure 9). The island lies within a broad region in the fore-arc of the Cascade volcanic arc that extends from south of Olympia, WA to north of Campbell River, BC. To the east are the Cascades; west are the Olympic Mountains.

Soils on the island (Figure 10) are typical of Puget Sound in that dense, compacted, glacial till is present at a rather shallow depth with an underlying hardpan. This glacial till is made up of clay, silt, sand, and gravel, and overlay bedrock in varying thickness across the Island. There is sedimentary bedrock exposed on the southern part of the island, where soils in some areas are moderately well to poorly drained.

Figure 9: Bainbridge Island geology (DNR data).

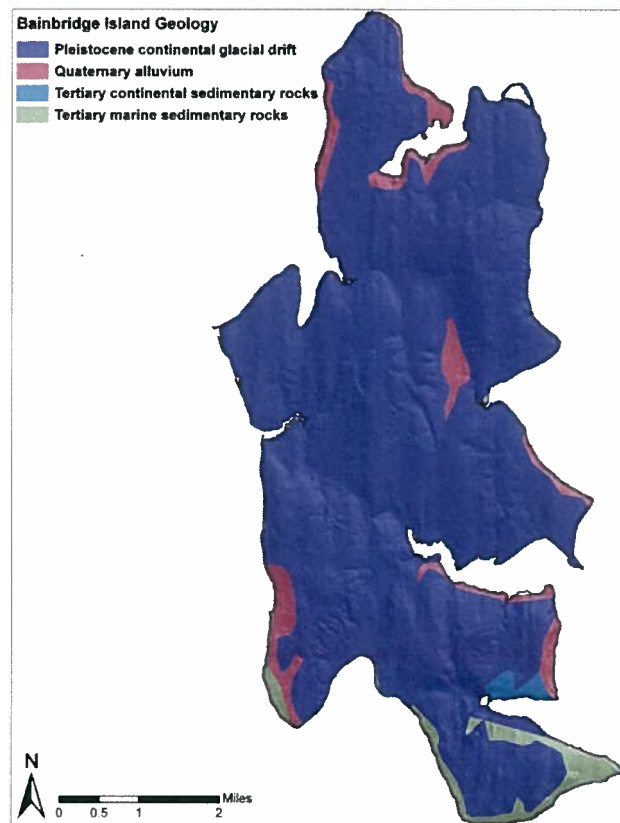
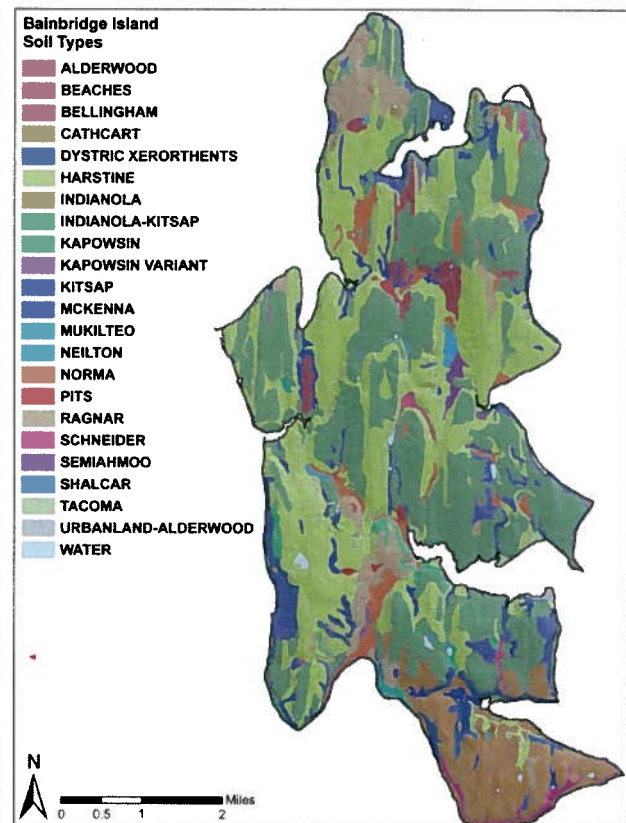


Figure 10: Bainbridge Island soil types (DNR data).

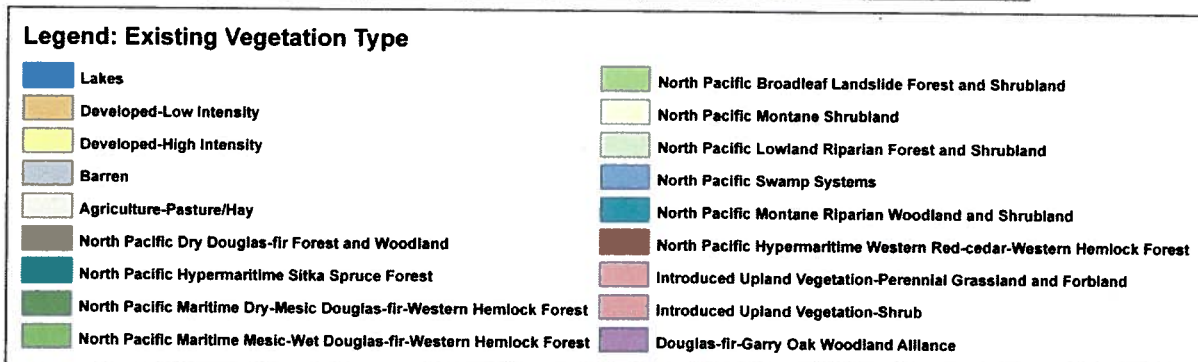


## Vegetation

Characteristic of the temperate climate of the Puget Sound region, vegetation tends to grow lush and dense. Outside of human development, second- and third-growth forest covers most of the island. Common tree species are: Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), bigleaf maple (*Acer macrophylla*), and alder (*Alnus rubra*).

Undergrowth is dominated by dense salmonberry (*Rubus spectabilis*), huckleberry (*Vaccinium parvifolium*), sword fern (*Polystichum andersonii*), salal (*Gaultheria shallon*), Oregon grape (*Mahonia aquifolium*) and English ivy (*Hedera helix*). Open areas, unless grazed or mowed, are often filled with two exotic species of blackberry (*Rubus discolor* and *R. laciniatus*) or scrub alder. Vegetation cover types are shown in Figure 11.

**Figure 11: Bainbridge Island vegetation types (USGS data).**



## ***Wildlife and Habitats***

A diversity of wildlife can be found on Bainbridge Island. The abundance of shoreline, tidelands, tidal inlets, and coastal forests are a major component of the Island's habitat. Oysters, clams, geoducks, and crabs are found on the tidelands while many species of shorebirds and waterfowl live along the shoreline or use the area as a stop-over point during migration. The forests and understory provide habitat for deer, coyotes, a variety of small mammals, and dozens of bird species. Pastures and open meadows support openland wildlife, such as pheasant, quail, and rabbits, while riparian and wetland areas provide cover for many species of fish, birds, mammals, and amphibians. Salmon presence has been verified in Springridge, Hidden Cove, Manzanita and Murden Cove. Species on Bainbridge Island that are classified as threatened, endangered, sensitive, or in need of monitoring as identified by the Washington Department of Fisheries and Wildlife (DFW) include the Bald Eagle, the Great Blue Heron, and the Pileated Woodpecker. Although no longer listed State and Federal threatened classification, Bald Eagles are still protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. They are found along the shores of saltwater and freshwater lakes and streams, and nest in predominantly coniferous forests. The Great Blue Heron is listed as state priority habitat status for breeding areas. They are typically found at low elevations near all types of fresh and saltwater wetlands, streams, and shorelines, and they usually nest in colonies in the tallest conifers or deciduous trees available. The Pileated Woodpecker is a state candidate for threatened status that usually nests within cavities in snags or live trees. Considered "uncommon" by local birders, they are generally found in mature forests. They may persist in younger forest stands if large diameter trees are retained along with significant numbers of snags and fallen trees. Other priority habitat species sighted by citizens, but not officially documented by the DFW include osprey, river otter, and harlequin ducks.

## ***Land Use***

Residential land uses occupy the largest percentage (73%) of developed land and 38% of all land on the Island (about 7,000 total units). Single-family homes account for 84% of residential units, while 16% are multi-family units in condominiums and apartment buildings of various sizes. The most densely developed areas are in Winslow and along the shoreline of the Island (Figure 12, following page). The Winslow area is developed at about 2.5 units per acre. Agriculture is still an important presence on the Island and there are a number of small-scale farms ranging from strawberry and raspberry farms to a goat dairy, tree farms, and organic vegetable farms. A few large tracts of second-growth timber remain on the Island. In 2006, there were approximately 620 acres classified as timberlands by the Kitsap County Tax Assessor.

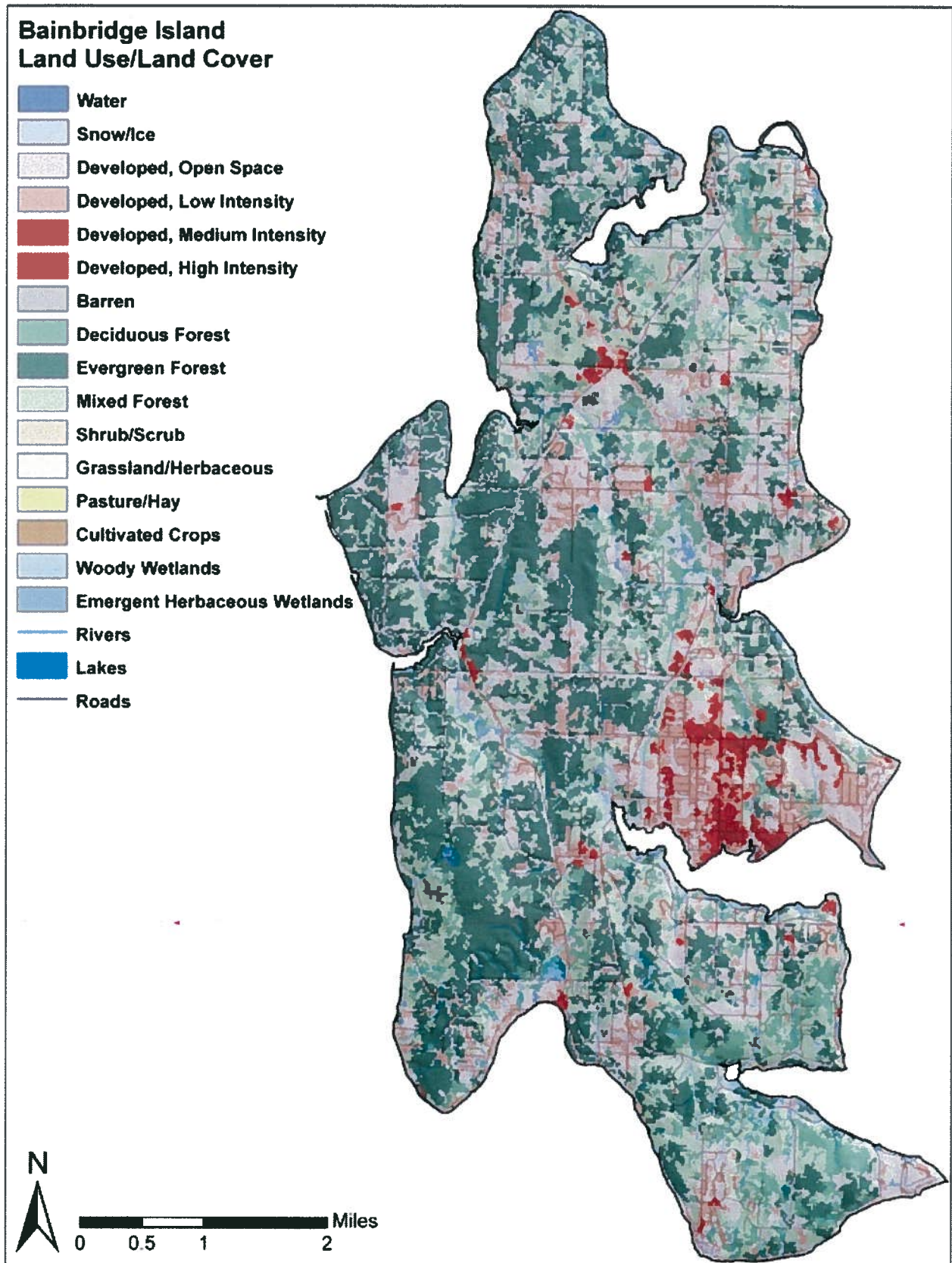
## **Transportation**

State Route 305 is the State's primary connection between Seattle and the Kitsap Peninsula and provides an important north-south connection for Island travel. The State system is supported by the City roadway system that connects residential areas to each other, the highway, and retail and

employment areas. The City's roadway system consists of approximately 119 miles of paved roads, and another 20 miles of unpaved roads.



Figure 12: Bainbridge Island Land Use/Land Cover (USDA NRCS data).



The Seattle/Bainbridge Island ferry provides about 90 crossings per week between Bainbridge Island and the Coleman Dock. The 35-minute crossing covers 8.6 miles and connects Bainbridge Island and the SR 305 corridor with downtown Seattle and the Interstate 5 and 90 corridors. Two jumbo Mark II Class auto/passenger ferries, the M/V Tacoma and M/V Wenatchee, serve the route connecting the I-90/I-5 corridors to SR 305. Each vessel has a travel speed of 28 knots, and maximum capacity for 2,500 passengers, 218 vehicles, and 60 commercial vehicles.

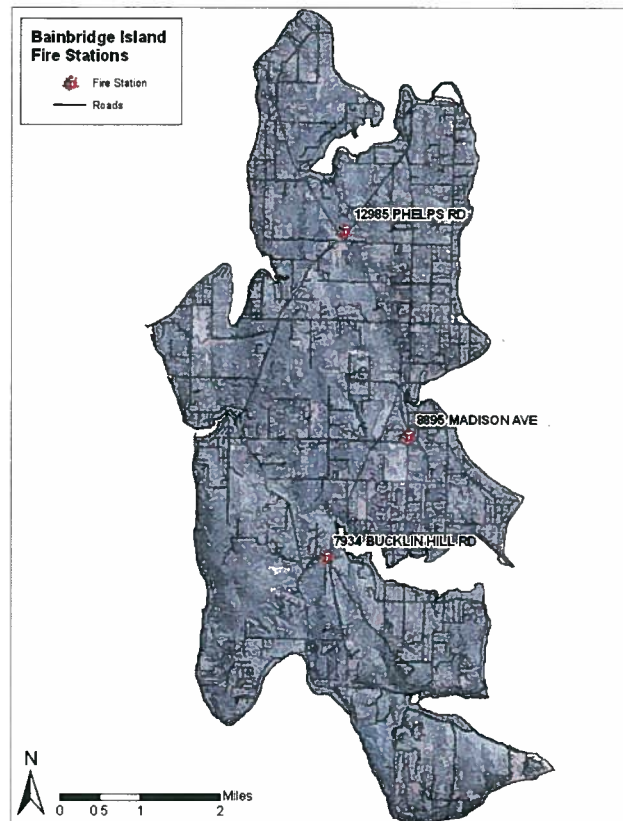
The State Route 305 corridor, the Agate Pass Bridge, and the Ferry Terminal are critical infrastructure that should receive a high priority in wildfire hazard mitigation planning.

## Fire Protection

The entire island lies within the Bainbridge Island Fire District and is served by the Bainbridge Island Fire Department's three stations (Figure 13). During the past 60 years, the Bainbridge Island Fire Department has grown from 16 volunteer firefighters and one make-shift fire truck to three fire stations, 21 response vehicles, and over 80 members. In 1994, the Department officially became the Bainbridge Island Fire Department. The Bainbridge Island Fire Department vehicles currently include four engines, a ladder truck, a rescue truck, a special operations vehicle, a brush truck, and a fire boat. For areas with limited water supply, the department has 4 water tenders equipped with pumps: two 3000-gallon tenders, and two 2500-gallon tenders, which can be used to provide a steady supply of water for firefighting activities. Of the 2,652 calls the Department responded to in 2009, 73% (1,995) were Emergency Medical Service (EMS) calls.

The primary focus of the Fire Operations division is to provide fire suppression and EMS to Bainbridge Island. Their mission has also expanded over the years to include marine firefighting, technical rescues, hazardous materials operations, and terrorism response, as well as education, prevention, and preparedness. Station 23, located at 12985 NE Phelps Road, serves as the Island's secondary Emergency Operations Center (EOC) in the event of a large scale emergency.

Figure 13: Fire stations on Bainbridge Island.



## IV. Wildfire Risk and Hazard Assessment

Wildfire risk is commonly defined as the likelihood of a wildfire occurring and is usually based on past fire history. While it would be impossible to predict exactly when and where wildfires will occur in the future, homeowners and fire planners should be aware of fire prone areas when prioritizing areas for mitigation activities. Wildfire hazards are commonly defined as those factors (fuels, topography, weather, fire protection, etc.) which can affect the destruction caused by a wildfire once it has ignited.

Wildfires are ignited both by natural causes, such as lightning, and by various human activities. Human-caused fires account for about 40% of all wildfires in the Northwest. Common human causes are:

- Campfires
- Debris Burning and Uncontained Burn Barrels
- Fireworks
- Arson
- Children
- Smoking
- Off-Highway Vehicles
- Home Equipment

### Fire History

#### *Fire History on Bainbridge Island*

Often overlooked in the rain-soaked Puget Sound Region, wildfire is an age-old element of these forests and prairies, and fires of varying severity have occurred both historically and in recent times. Although fire history in the area is difficult to trace back more than 350 years, wide-spread stands of Douglas-fir (a fire-dependant forest type), tree-stand age classes, fire-scarred trees, and charcoal layers suggest that major fires burned in Kitsap County 450, 480, 540, and 670 years ago. Medium-sized, less intense fires occur on a several decade scale, and small fires of a few acres or less occur every year on Bainbridge Island (Figures 14-16, Table 1 and 2).

Figure 14: Number of natural vegetation fires on Bainbridge Island, 1989-2009 (BIFD data).

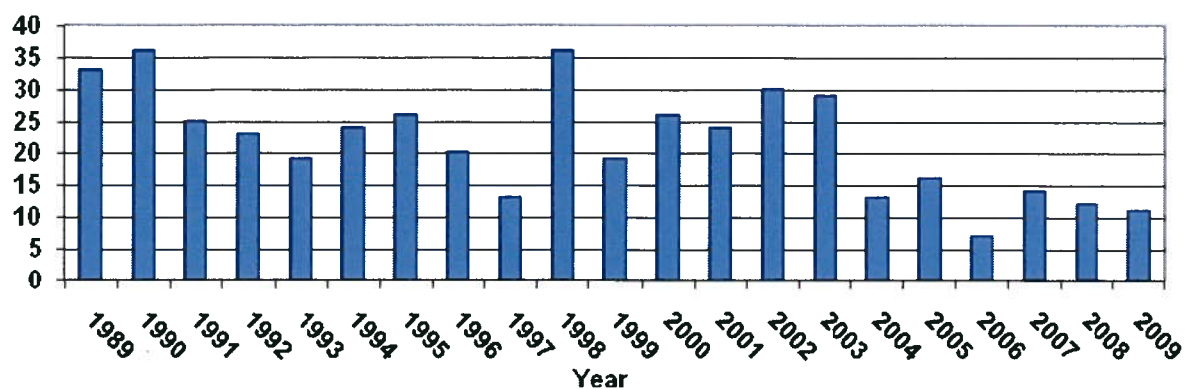


Figure 15: Bainbridge Island vegetation fires, 1989-2009 (BIFD data).

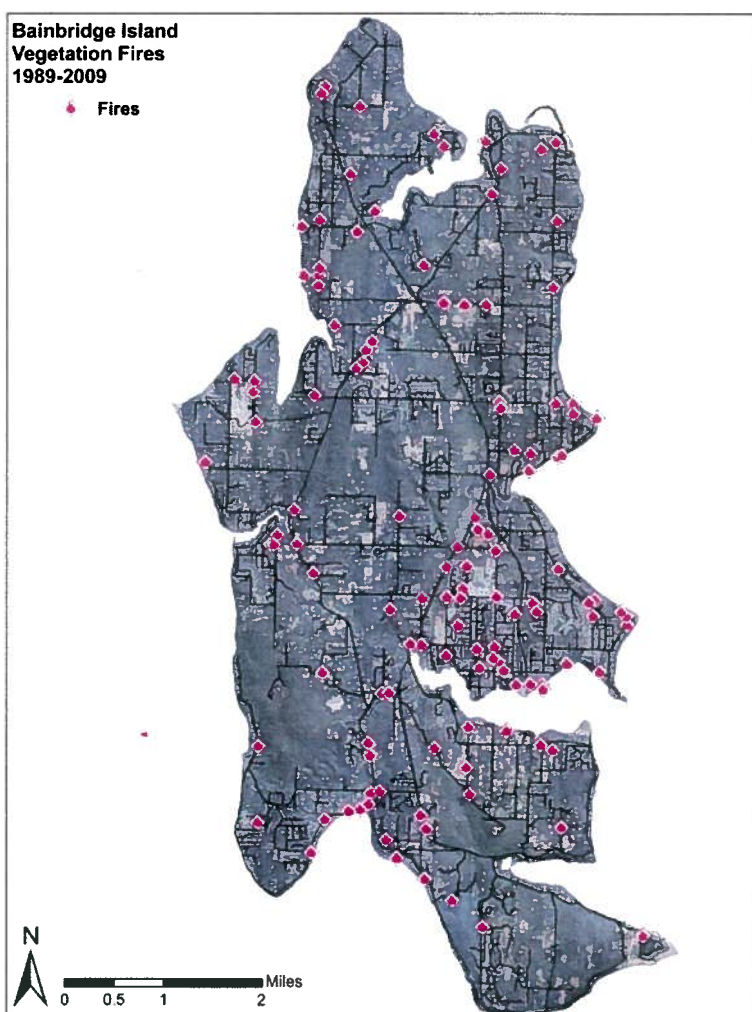


Table 1: Recent fire history (1989-2009) on Bainbridge Island (BIFD data).

Year	# of incidents	Year	# of incidents	Year	# of incidents
1989	33	1994	24	2000	26
1990	36	1995	26	2001	24
1991	25	1996	20	2002	30
1992	23	1997	13	2003	29
1993	19	1998	36	2004	13
1994	24	1999	19	2005	16
1995	26	2000	26	2006	7
1996	20	2001	24	2007	14
1997	13	2002	30	2008	12
1998	36	2003	29	2009	11
1999	19	2004	13		
2000	26	2005	16		
2001	24	2006	7		
2002	30	2007	14		
2003	29	2008	12		
2004	13	2009	11		
2005	16				
2006	7				
2007	14				
2008	12				
2009	11				



2009	11	2002	30	1995	26
2008	12	2001	23	1994	24
2007	14	2000	26	1993	19
2006	7	1999	19	1992	23
2005	16	1998	36	1991	25
2004	13	1997	13	1990	36
2003	28	1996	20	1989	33

Figure 16: Number of natural vegetation fires on Bainbridge Island, 1951-1968 (BIFD data).

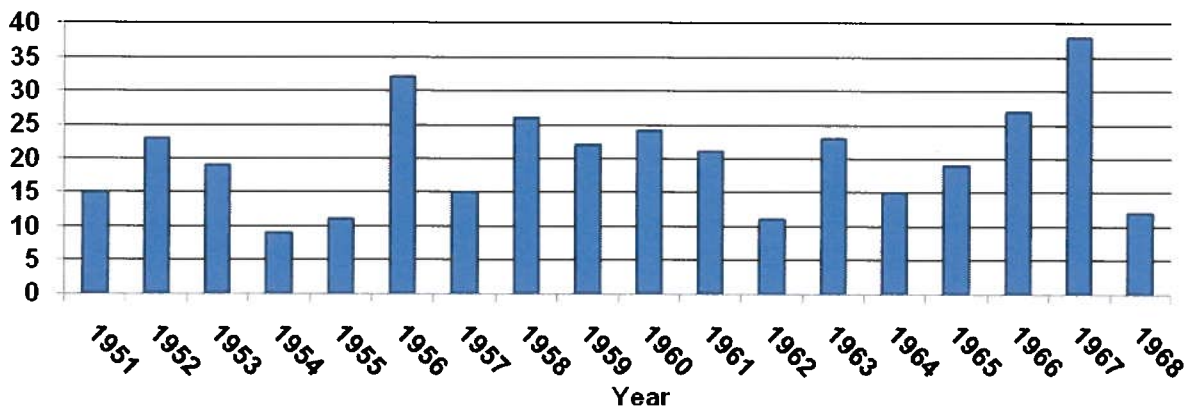


Table 2: Past Fire History (1951-1968) on Bainbridge Island (BIFD data).

Year	# of incidents	Year	# of incidents	Year	# of incidents
1968	12	1962	11	1956	32
1967	38	1961	21	1955	11
1966	27	1960	24	1954	9
1965	19	1959	22	1953	19
1964	15	1958	26	1952	23
1963	23	1957	15	1951	15

### Statewide Trends and Patterns

The National Interagency Fire Center (NIFC), the nation’s support center for wildland firefighting, keeps records of wildfire occurrence across the nation. Wildfires and acres burned in Washington State from 2002-2009 are listed in Table 3. NIFC records of human vs. lightning caused fires in the Northwest (OR and WA) from 2002 through 2009 are listed in Table 4.

**Table 3: Recent wildfire occurrence information for Washington State (NIFC data).**

Year	Fires	Total Acres Burned
2009	1,976	77,250
2008	1,303	147,264
2007	1,268	214,925
2006	1,579	410,060
2005	998	185,748
2004	1,674	92,617
2003	1,373	200,517
2002	1,285	92,742

**Table 4: Lightning- and human-caused wildfires in OR and WA (NIFC data).**

Year	Lightning Caused Fires	Lightning Caused Burn Acres	Human Caused fires	Human Caused Burn Acres	Total Fires	Total Acres
2009	1,843	148,328	1,624	29,592	3,467	177,920
2008	1,624	183,253	1,365	99,706	2,989	282,959
2007	1,486	618,879	2,346	244,335	3,832	863,214
2006	2,170	843,984	2,666	112,098	4,836	956,082
2005	901	122,131	1,924	219,012	2,825	341,143
2004	2,042	64,460	1,901	58,178	3,943	122,638
2003	1,605	234,331	2,370	126,381	3,975	360,712
2002	1,797	988,527	2,148	105,544	3,945	1,104,071

## Historic Fire Regime

A natural fire regime is a general classification of the frequency and role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning. These groups are intended to characterize the presumed historical fire regimes within landscapes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context. The five regimes are described as follows:

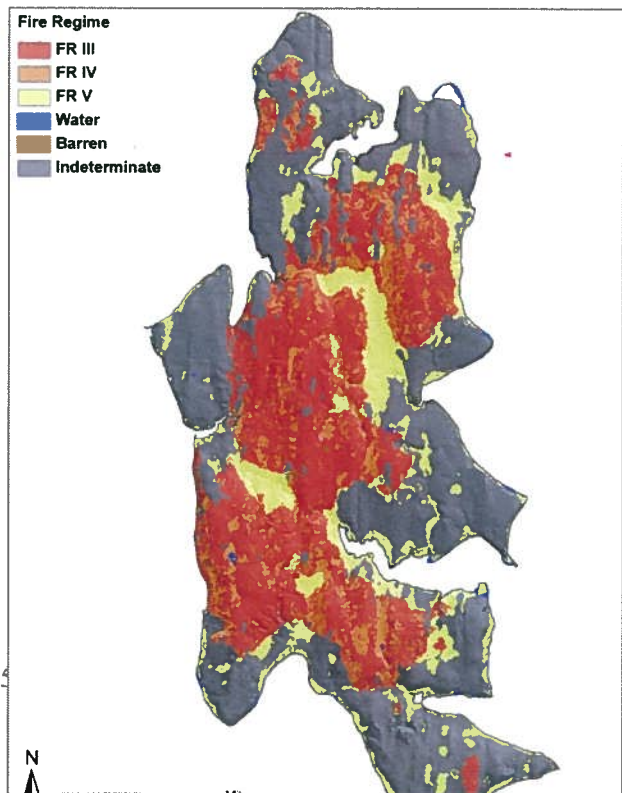
**Fire Regime I:** 0-35 year frequency with low to mixed severity (surface fires most common).

**Fire Regime II:** 0-35 year frequency with high severity (stand replacement fires).

**Fire Regime III:** 35-100+ year frequency with mixed severity.

**Fire Regime IV:** 35-100+ year frequency with high severity (stand replacement fires).

**Fire Regime V:** 200+ year frequency with high severity (stand replacement fires).



This historic fire regime data is a 30-meter resolution data set developed by the LANDFIRE Project, a federal program devoted to providing spatial data to wildland managers ([www.landfire.gov](http://www.landfire.gov)). The data represents an integration of the spatial fire frequency and severity regime characteristics simulated using a vegetation and disturbance dynamics model. This information is an approximate representation of the general conditions present in an area and should be used for reference only.

The majority of forested land on Bainbridge Island is classified as a moderate to high fire severity regime (Figure 16). “High” severity fire regimes are characterized by infrequent severe crown fires, surface fires that cause high tree mortality, or stand replacement fires that typically result in total stand mortality and moderate-to-high loss of the duff-litter layer. Unlike moderate severity fire regimes, the landscape following high severity regimes are usually dominated by a lack of remnant survivor trees. The complete loss of the overstory results in the eventual development of an even-aged forest stand. These stand-replacing fires in western Washington are generally associated with drought years and east wind weather events (which lower humidity). Fires are often of short duration, but of high intensity and severity.

### Fire Regime Condition Class

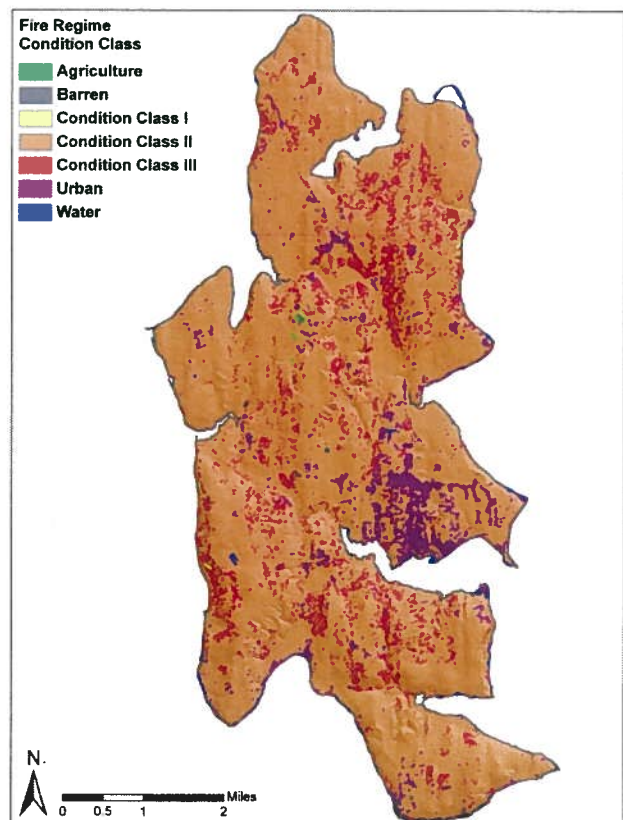
A fire regime condition class (FRCC) is a classification of the degree of departure from the natural regime. The condition class scale was developed to generally describe how the current severity, intensity, and frequency of fires have affected key vegetative components of the ecosystem, as compared to historic or reference conditions. The majority of Bainbridge Island is within the Fire Regime Condition Class 2 (Figure 17). The three condition classes are described as follows:

**Condition Class 1:** Fire frequencies are within or near the historical range, and have departed from historical frequencies by no more than one return interval; vegetation attributes are intact and functioning within the historic range. The risk of losing key ecosystem components is low.

**Condition Class 2:** Fire frequencies and vegetation attributes have been moderately altered from the historical range and fire frequencies have departed from historical frequencies by more than one return interval. The risk of losing key ecosystem components is moderate.

**Condition Class 3:** Fire frequencies and vegetation attributes have been significantly altered from the historical range and fire frequencies have departed from historical frequencies by multiple return

Figure 18: Fire Regime Condition Class on Bainbridge Island (LANDFIRE data).

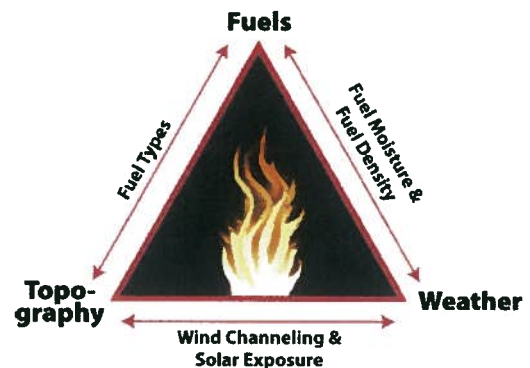


intervals. The risk of losing key ecosystem components is high.

## Wildfire Conditions

Wildfire behavior is driven by the interaction of a few factors: weather, vegetation type (commonly called “fuels”), and topography. The wildfire triangle (Figure 18) is a simple graphic used in wildland firefighter training courses to illustrate how the environment affects fire behavior. Each point of the triangle represents one of the three main factors that drive wildfire behavior. The sides represent the interplay between the factors that are seen on the ground as they affect wildfire behavior. The potential for wildfires to become severe depends on these factors. For example, drier and warmer weather combined with dense fuel loads and steeper slopes will cause more hazardous fire behavior than light fuels on flat ground.

Figure 19: The wildfire behavior triangle (graphic by Ron Kaufman, WWU).



Large fires in western Washington typically occur on steep south-facing slopes, and often result from a combination of circumstances including a source of ignition in areas of dry, heavy fuels, an extended period of drought, and dry east winds. Wildfires here usually occur during the dry summer months of July, August, and early September, but they can occur anytime between April and October given the right conditions. Fire hazard increases in the late summer and early fall when hot, dry east winds occur more frequently and the area has experienced the low point of the annual precipitation cycle.

## Types of Wildfires

**Ground fires** burn in natural litter, duff, roots, and sometimes high organic soils. Once started, they are very difficult to detect and control. They also have a tendency to rekindle.

**Surface fires** burn in grasses and low shrubs (up to 4’ tall) or in the lower branches of trees. They may move rapidly and ease of control depends upon the fuel involved.

**Crown fires** burn in the tops of trees. Once started, they are very difficult to control since wind plays an important role in crown fires.

**Spotting fires** can be produced by crown fires as well as wind and topography conditions. Large burning embers are thrown ahead of the main fire, and can travel as much as 1.5 miles ahead of the flame front. Once spotting begins, the fire is extremely difficult to control.

## Hazard Assessment

For this CWPP, a Geographic Information System (GIS) analysis was used to model and analyze wildfire hazards and risks. Three spatially-explicit data sets of factors critical to wildfire behavior (fuels, slope, and aspect) were combined with proximity to hydrants and past vegetation fires to develop wildfire hazard and risk maps of Bainbridge Island (Figures 20-25). Each factor was assigned a numeric weight based on its potential contribution to fire behavior (Table 5), following point-rating conventions based on NFPA 1144 (2008, Annex A). The points for each of the factors were then added together to create a hazard rating map. This mapping layer was combined with a risk layer based on previous fire history. The final map was then scaled into quartiles to provide a relative ranking of low to high hazard (Figure 25). An overview of the assessment factors and their relative ratings are listed in Table 5; more details are found in the following pages. A technical overview of the GIS analysis process is covered in Appendix J.

**Table 5: Hazard assessment criteria and ratings.**

Category	Item	Points	Point Category	Hazard Rating	Percent of Overall Rating
Spatial Hazard	Fuels	0	Non Burnable	None	50%
		5	Light	Low	
		10	Medium	Moderate	
		20	Heavy	High	
		25	Slash (None Present)	Very High	
	Slope	1	<10%	Minimal	25%
		4	10-20%	Low	
		7	21-30%	Moderate	
		10	31-40%	High	
		15	>40%	Very High	
	Aspect	0	N	Low	8.3%
		2	E	Moderate	
		3	W	High	
		5	S	Very High	
Protection Hazard	Hydrants	0	Hydrant within 1000'	Low	8.3%
		5	Hydrant $\geq$ 1000' away	High	
Ignition Risk	Past Vegetation Fires*	1	0 fires / square mile**	Low	8.3%
		2	>0-5.4 fires / square mile	Moderate	
		4	>5.4-14 fires / square mile	High	
		5	>14 fires / square mile	Very High	
	Maximum Possible:	60			100%

\* Category values were derived from the entire data set of 21 years (1989-2009), and are not annual values.

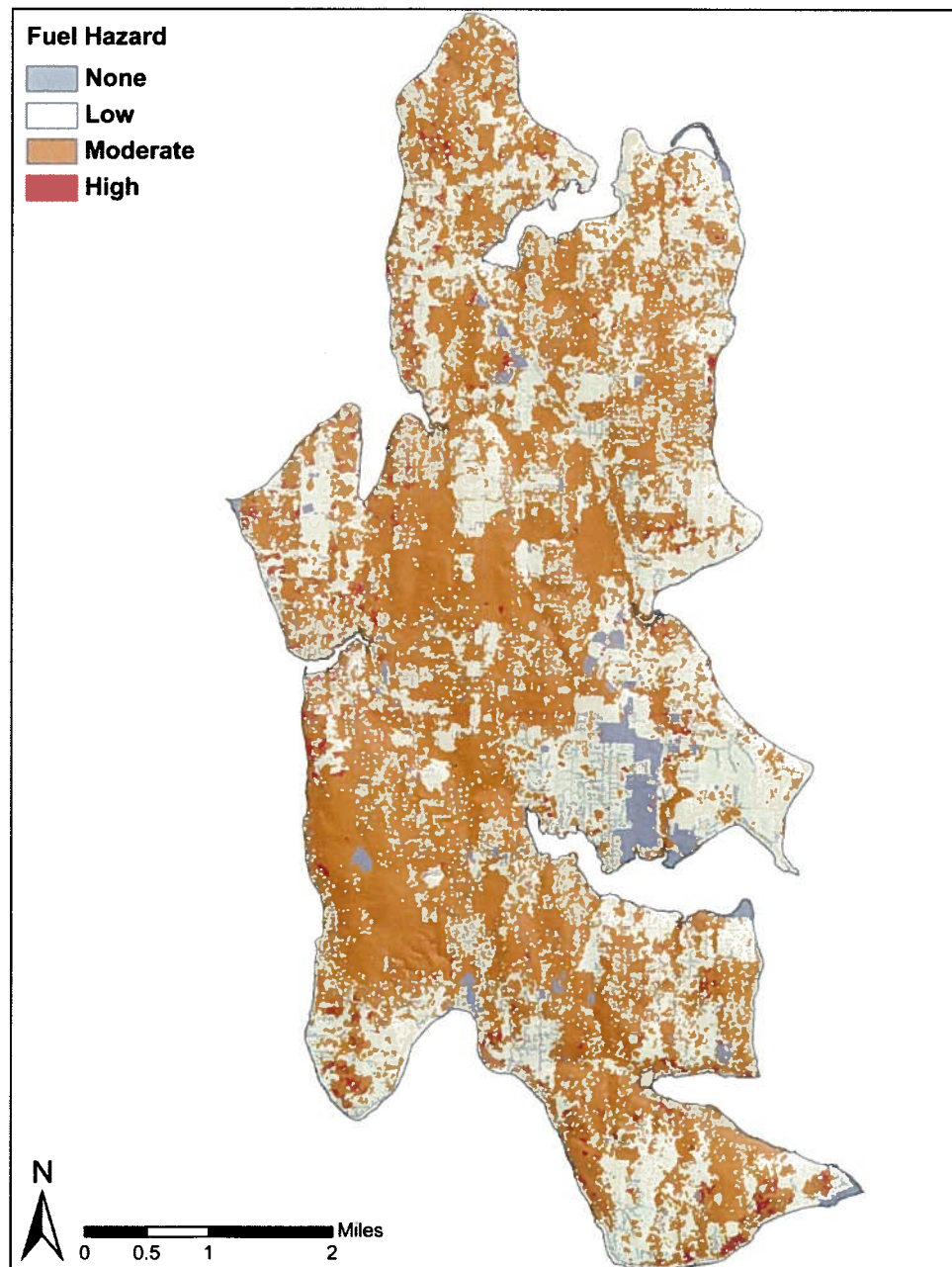
\*\* The four groups represent quartiles of the results; for example, the Low (1 point) category is the lowest quartile of the data (0-25<sup>th</sup> percentile).



## Vegetative Fuels

The presence of living or dead vegetative fuels can be the greatest contributor to wildfire hazard. Combustion of vegetation can create flame lengths exceeding 100', radiate heat capable of igniting structures 100' away, and cast off firebrands that can travel well over a mile. Vegetation cover for Bainbridge Island was displayed in Figure 11 (page 17); this fuel hazard assessment (Figure 20) uses the 40 Scott & Burgan fire behavior fuel model (FBFM) descriptions to classify vegetation hazards into categories of non-burnable (e.g., roads, extensive areas of concrete, etc.), light (grasses, forests with light litter; fuel loading <1.10 tons/acre), medium (most forests; fuel loads ~1.1 to 2.5 tons/acre), heavy (dense forests; fuel loads >5 tons/acre), and slash (none present in this database). The fuels are ranked according to NFPA 1144 criteria. A technical description of the fuels hazard development method is located in Appendix J.

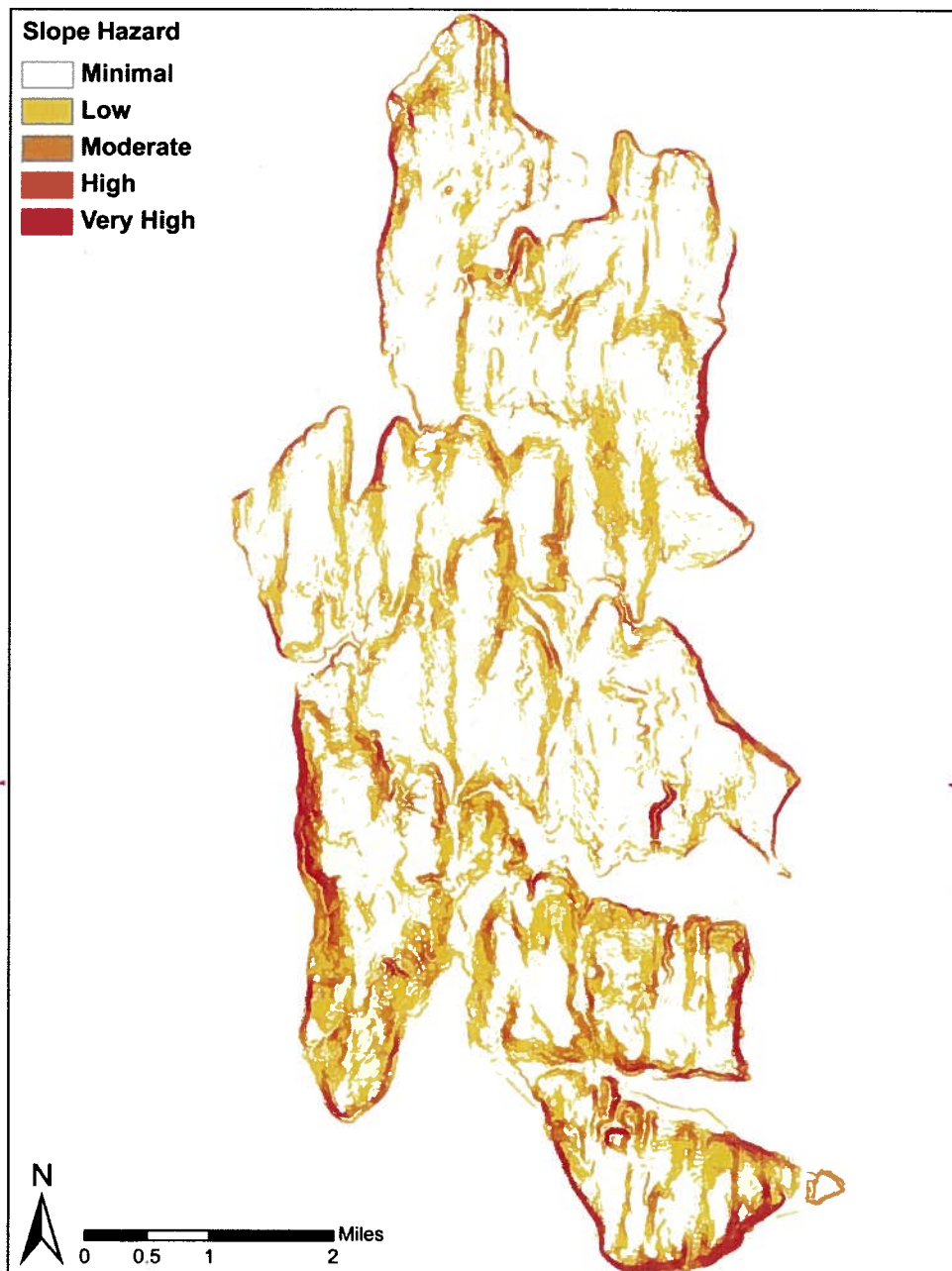
Figure 20: Hazard levels for the *Vegetative Fuels* factor.



## Slope

Steep slopes increase a fire's rate of spread uphill and can create topographic influences on wind. Topography is mostly low, rolling hills with several ridges oriented north to south. The percent slope is derived from 10 m digital elevation model (DEM) supplied by the Washington Department of National Resources (DNR). The slope hazard rating is a large contributor to the overall hazard rating because of its influence on fire spread and the increased difficulty of fighting wildfire as slope steepens (Figure 21).

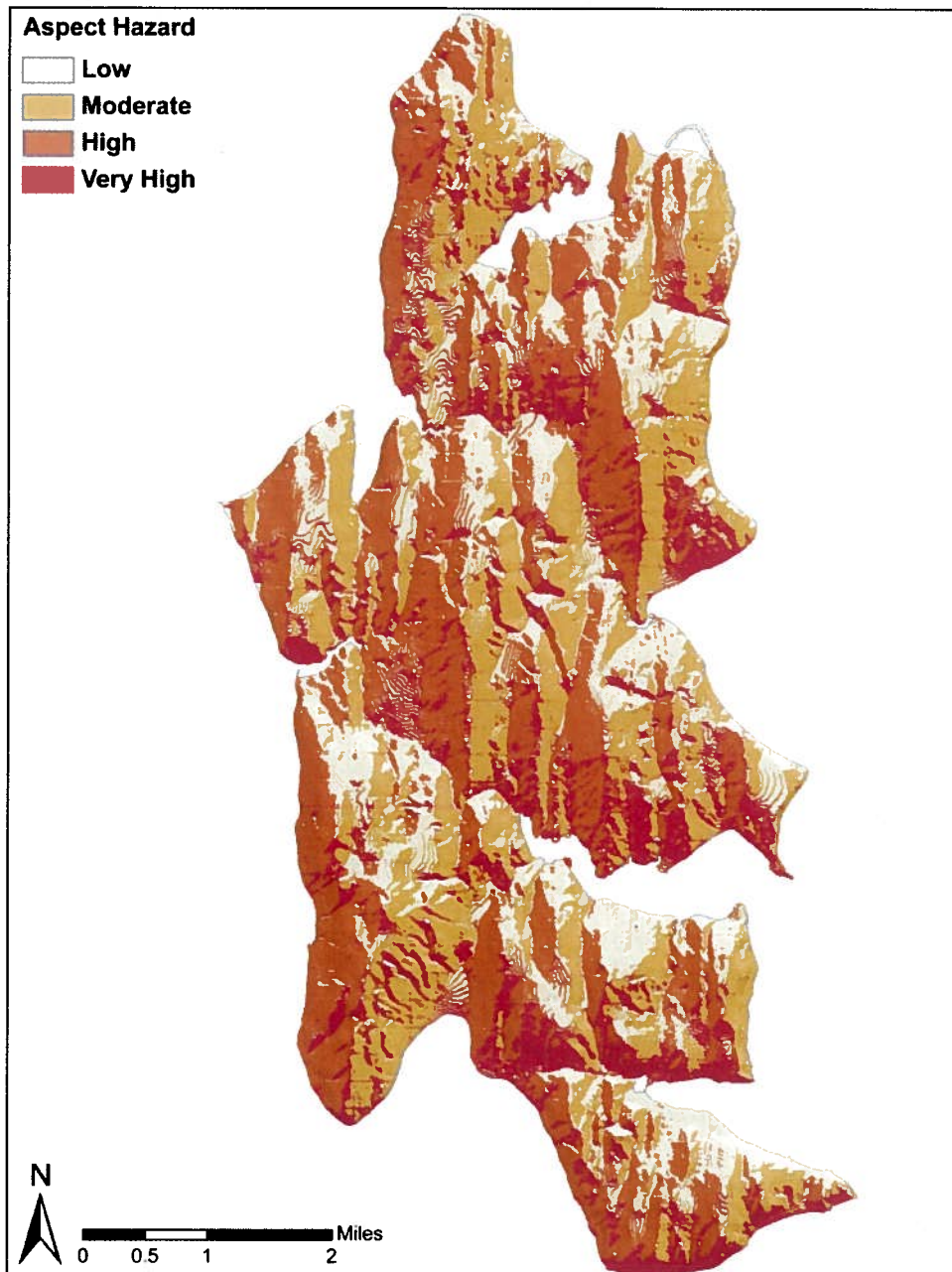
Figure 21: Hazard levels for the *Slope* factor.



## Aspect

Bainbridge Island has many cloudy days, but solar insolation still has a large effect on fuels, especially during fire season. South-facing slopes receive much more solar radiation than slopes with a north aspect, due to the island's mid latitude location near the 48<sup>th</sup> parallel. South slopes thus typically have drier fuels and soils, which affects fuel types and densities that can be grown on the slopes, as well as potential fuel moisture levels. While important, aspect hazard is not a major driver of fire behavior and thus accounts for a smaller amount of the hazard ratings (Figure 22).

Figure 22: Hazard levels for the *Aspect* factor.





### ***Proximity to Fire Hydrants***

Homes in Kitsap County are generally evaluated for fire hydrant proximity by a 1000' distance measured along accessible roadways. To display areas where fire hoses could be used for fighting vegetation fires along with protecting homes, this hazard map is derived using a 1000' radius circular buffer around all fire hydrants (Figure 23).

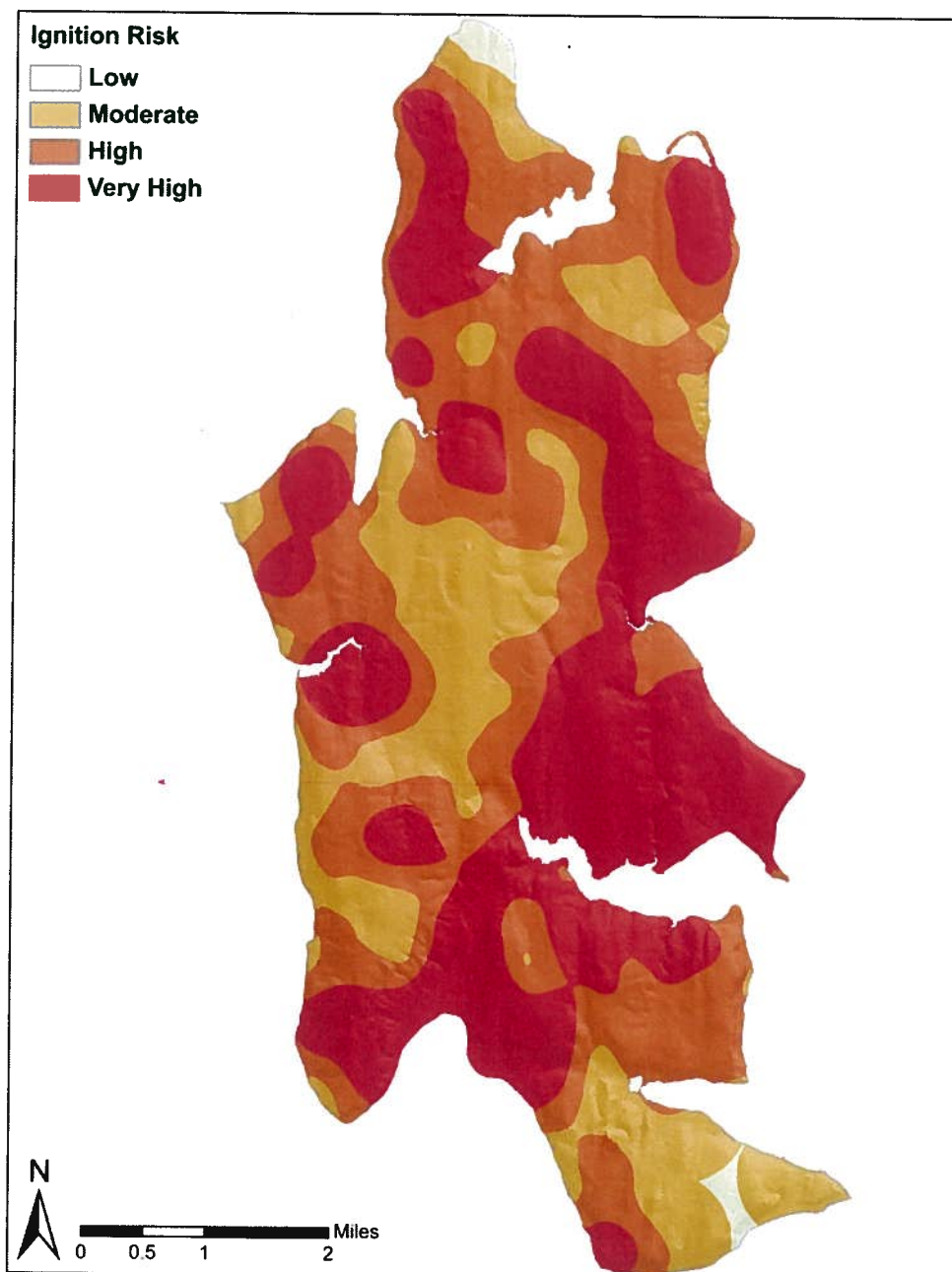
**Figure 23: Hazard levels for the *Hydrant Proximity* factor.**



### ***Past Vegetation Fires***

Fire ignition risk hazard was derived using 1989-2009 vegetation fire data provided by the Bainbridge Island Fire Department as a proxy for future ignition risk. Fire density was calculated as fires per 21 years per square mile (i.e., the entire 21 years of data was analyzed) using a search radius of 2979' (the radius of a circle encompassing an area of approximately one square mile) (Figure 24). The results, which ranged from 0 to ~28, were divided into quartiles to align with the points scale.

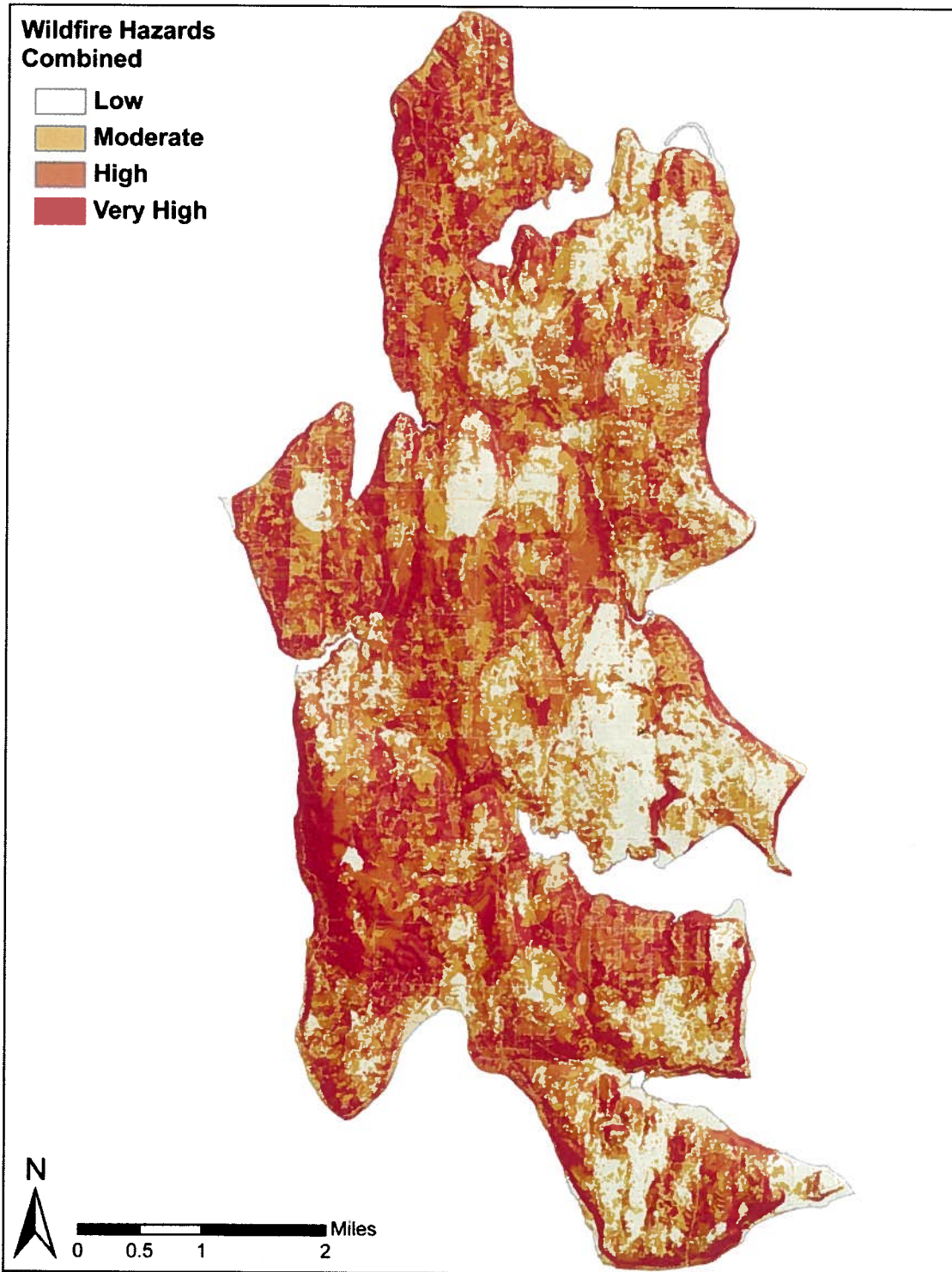
**Figure 24: Hazard levels for the *Fire Ignition Risk* factor.**



### Overall Wildfire Hazard

To create the final hazard rating map, all of the assessment maps were summed using the point scale in Table 5 and classified from low to very high by quartile (Figure 25).

Figure 25: Overall *Wildfire Hazard* levels for Bainbridge Island.



## V. WUI and Priority Mitigation Areas

### Wildland-Urban Interface

The term Wildland-Urban Interface (WUI) is defined simply as an area where humans and human development meet or intermix with wildland (vegetative) fuels. In an effort to further refine this definition, HFRA has identified two levels of the WUI designation: Interface and Intermix communities. The federal definition of an interface community is an area in or adjacent to (within 1.5 miles) wildland vegetation where development densities are at least three residential, business, or public building structures per acre. For less developed areas, the intermix community has development densities of at least one residential structure per 40 acres. By definition, the majority of Bainbridge Island does not meet the interface density definition, but rather of an intermix density. However, in practice fire managers across the western U.S. use the 1 structure/40 acres definition to delineate WUI areas. Further, there are no wildland areas of Bainbridge Island further than 1.5 miles from human development. Thus, all of Bainbridge Island is considered Wildland-Urban Interface.

### Priority Mitigation Areas

A 1990 Washington Department of Natural Resources (DNR) wildfire hazard assessment delineated all of Bainbridge Island as a high risk area. This was refined somewhat by DNR in 2000, but without a description of methods used. In 2005, a U.S.-wide WUI was developed using GIS by the U.S. Forest Service to support the HFRA and national policy makers<sup>2</sup>, and it also designated all of Bainbridge Island as “at-risk.” All of these efforts incorporated GIS analysis, but were limited by a lack of transparency in their development or were evaluated at a spatial scale that rendered community/neighborhood-level assessment impossible.

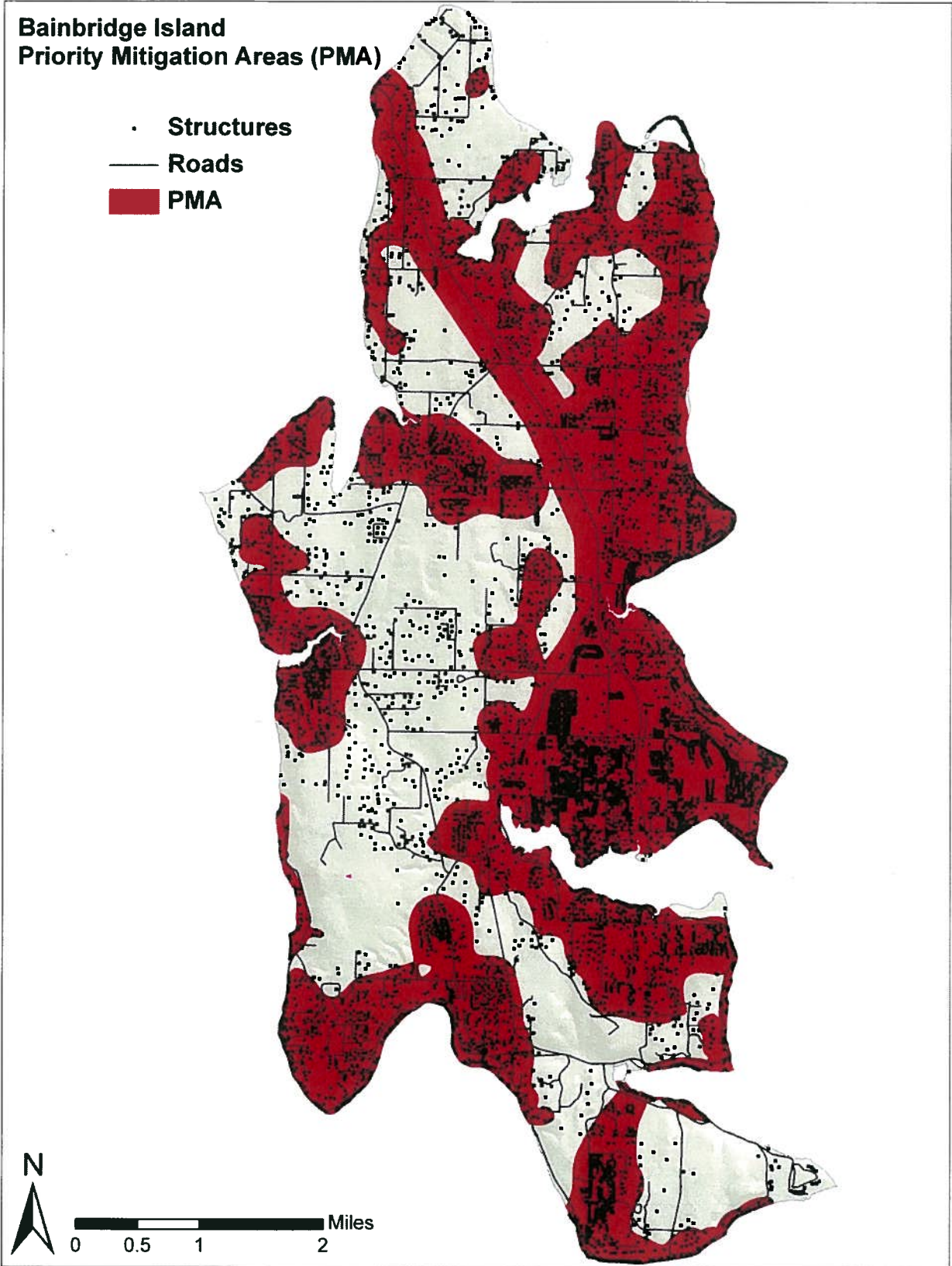
Because all of Bainbridge Island lies in the WUI, a more sophisticated GIS analysis was done for this CWPP to determine where initial mitigation efforts would have the greatest potential to protecting the greatest number of structures, an area termed the Primary Mitigation Area (PMA). To do this, the overall wildfire hazard map (Figure 25, previous page) was used to select structure addresses/footprints lying in areas with moderate to very high hazard (i.e, low overall hazard areas were removed from consideration). Structure density was calculated from the clipped address map for a 1,489’ radius moving window (the diameter of a 40 acre circle), and the results were reclassified to meet the local WUI definition of  $\geq 1$  house/40 acres. A 1,000’ buffer was added to State Route 305 and included in the PMA, as it is the main ingress/egress route for the island. The PMA map developed for this CWPP is shown in Figure 26 (see Appendix J for technical details).

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<sup>2</sup> <http://silvis.forest.wisc.edu/Library/WUIDefinitions2.asp>



Figure 26: Bainbridge Island Priority Mitigation Areas.



## VI. Wildfire Modeling

### “Watch-Out” Weather Conditions

Weather strongly affects wildfire behavior. Any combination of two of the following “watch-out” weather parameters can create more intense and potentially destructive fire behavior:

- 20’ wind speeds >7 mph
- Sustained winds from the east (more common in late August to early October)
- Relative humidity <40%
- Temperature >72° F
- 1,000-hour fuel moisture <20% (1,000 hour fuels are dead branches, etc., between 3 and 8 inches in diameter)
- 14 days without rain.

Components of extreme fire behavior include more intense heat and preheating of surrounding fuels, stronger flame runs, potential tree crowning, increased likelihood of significant spot fires, and fire-induced weather (e.g., strong winds, lightning cells). Extreme fire behavior is significantly more difficult to combat and suppress, and would drastically increase the threat to the existence of homes and communities throughout the wildland-urban interface.

### Modeling Fire Behavior on Bainbridge Island

Modeling fire behavior can give fire managers an idea of what behavior might be expected by using specific weather inputs mapped across the spatial hazard map (i.e., Figure 25, page 32, for Bainbridge Island). Another advantage of modeling is that managers can manipulate variable inputs—including changes in fuel load, fuel moisture, and weather—to see how the static variables and varying conditions could affect fire behavior. Models like this are useful during wildfire suppression and can also be used for planning and mitigation activities so managers will know what areas can have increased danger should a wildfire occur. A number of modeling programs have been developed by the U.S. Forest Service for planning purposes, including *BehavePlus*, *Farsite*, and *Flammap*.<sup>3</sup>

*BehavePlus* can produce outputs showing expected fire behavior (Figure 27; Table 6). Fire behavior that entails flame lengths greater than four feet *cannot be attacked directly by wildland firefighters with hand tools on the ground*. This significantly increases both the difficulty of suppression by engine crews as well as the potential for extreme fire behavior. *Flammap* and *Farsite* can produce a variety of landscape-level fire behavior GIS layers, including flame length and rate of spread. While *Farsite*

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<sup>3</sup> [http://www.fire.org/index.php?option=com\\_frontpage&Itemid=1](http://www.fire.org/index.php?option=com_frontpage&Itemid=1)

calculates the same outputs based on a simulated point of fire origin, *Flammap* calculates outputs independently for each cell. Because of this, *Flammap* outputs were used to create hazard maps for Bainbridge Island showing the areas that are expected to have an increased danger to wildland firefighters due to dangerous flame lengths (see Table 6) and rate of spread given “watch-out” or worse weather conditions. For the examples in Figures 28-31, *Flammap* was given input variables using the default fuel moisture levels (representing very dry fine dead fuels, as might occur in the region after a few weeks in August without rain), 100% foliar moisture (representing mature vegetation where new growth has essentially stopped, e.g., as in a period of drought), and wind speed inputs of 8, 15, and 20 mph (for flame lengths) and 20 mph (for rate of spread).

Figure 27: Example BehavePlus run showing potential fire behavior in low density grass with scattered trees after a couple weeks of no rain, with wind speeds of 8 mph. The blue 1 in the center of the graph (circled in red) indicates fire characteristics associated with the described conditions. In this run, flame lengths are greater than 8 feet, making such a wildfire impossible to attack directly and increasing the likelihood of extreme fire behavior.

Grassy fuels in summer, scattered small trees  
Fire Characteristics Chart

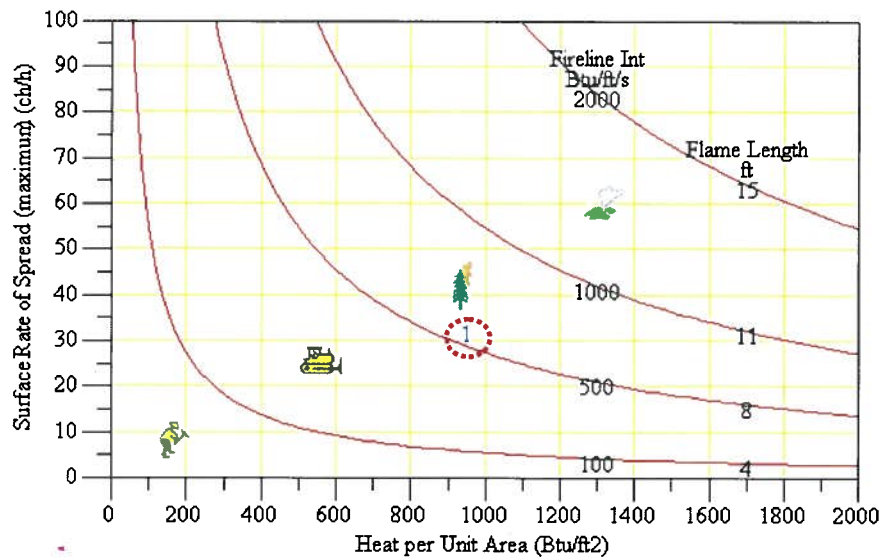


Table 6: Fire Suppression Interpretations (NWCG Fireline Handbook Appendix B, Table 14).

Flame Length (ft.)	Fireline Intensity (Btu/ft/sec)	Interpretations
< 4	< 100	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 – 8	100 – 500	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 – 11	500 – 1,000	Fires may present serious control problems such as: torching out, crowning, and spotting. Control efforts at the fire head will probably






		be ineffective.
> 11	> 1,000	Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.

**Figure 28: Predicted wildfire flame lengths on Bainbridge Island when wind speeds are 8 mph.**



**Flame Lengths with  
8 mph Wind Speeds**

**Feet**

-  Non-Burnable
-  0 - 4
-  4 - 8
-  8 - 11
-  > 11

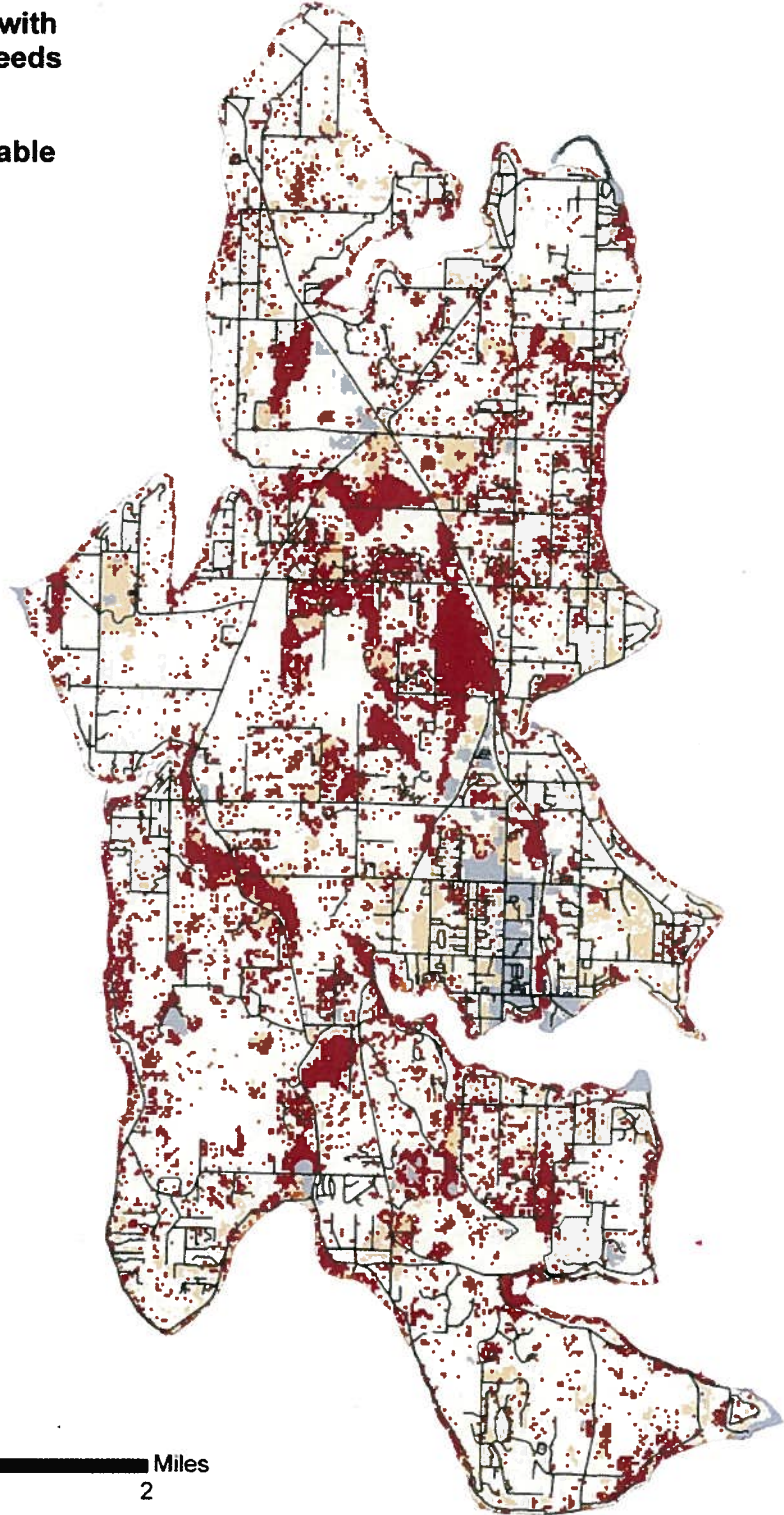
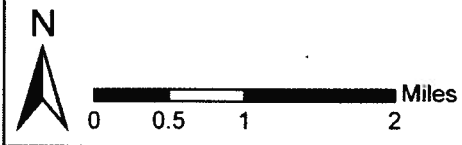


Figure 29: Predicted wildfire flame lengths on Bainbridge Island when wind speeds are 15 mph.

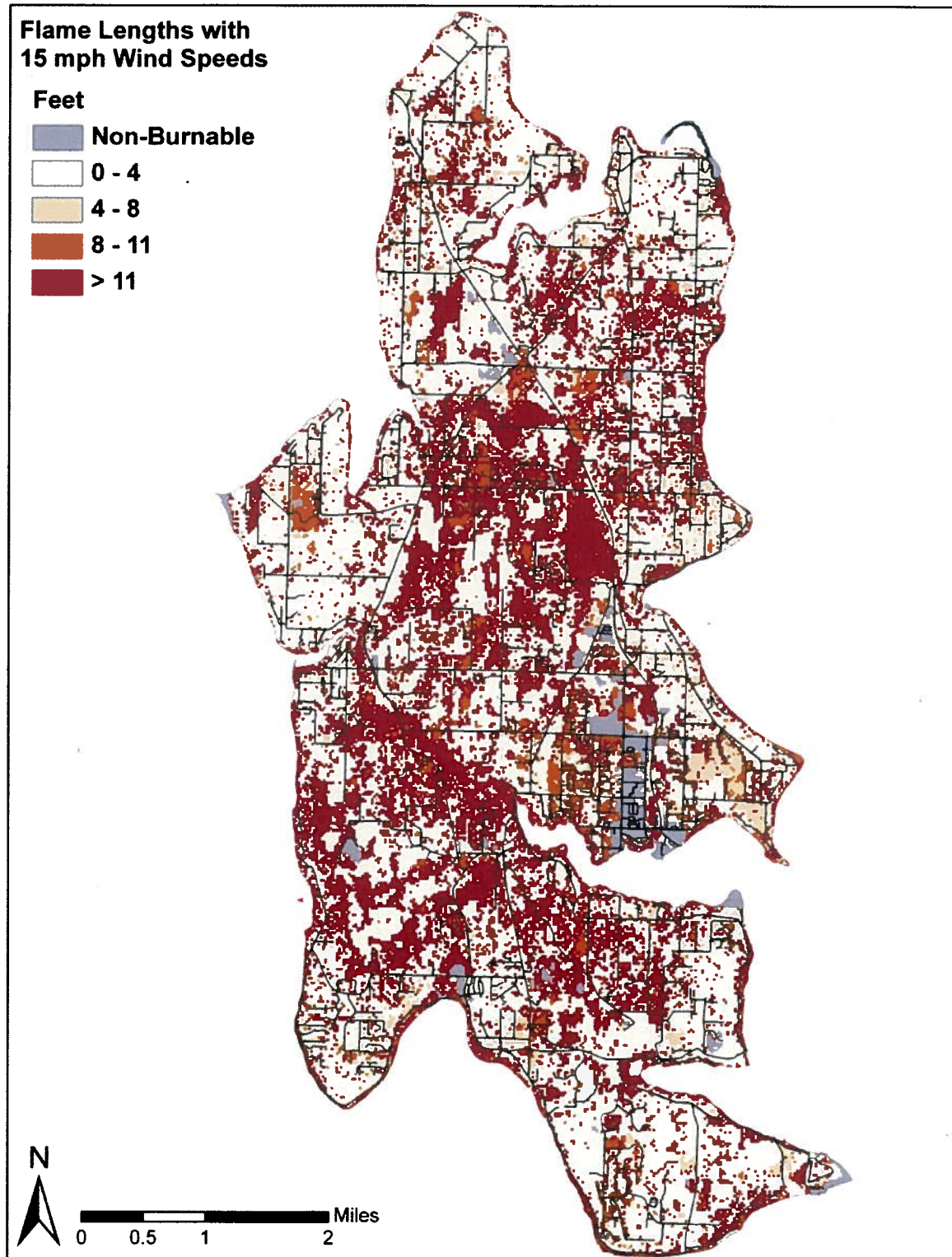
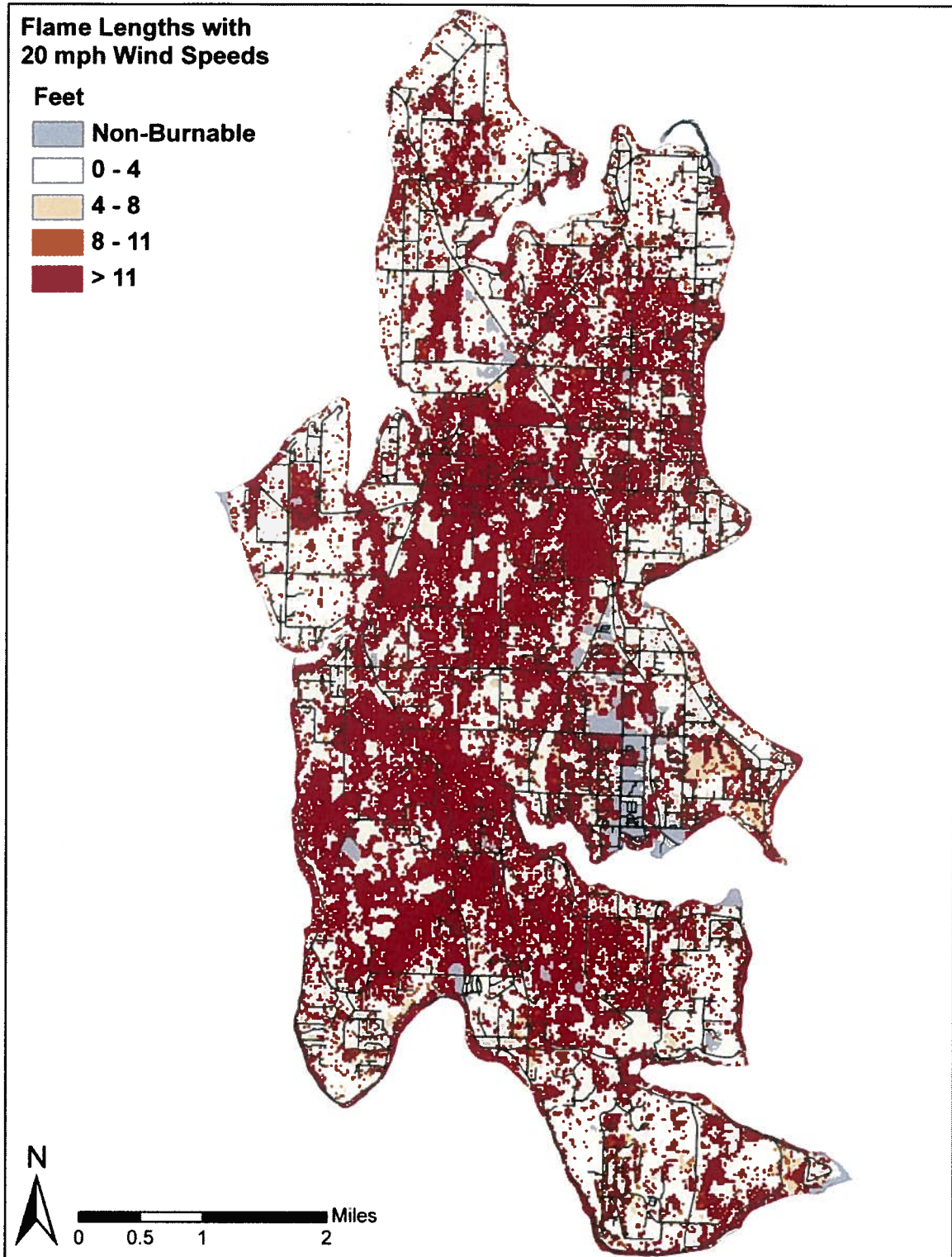
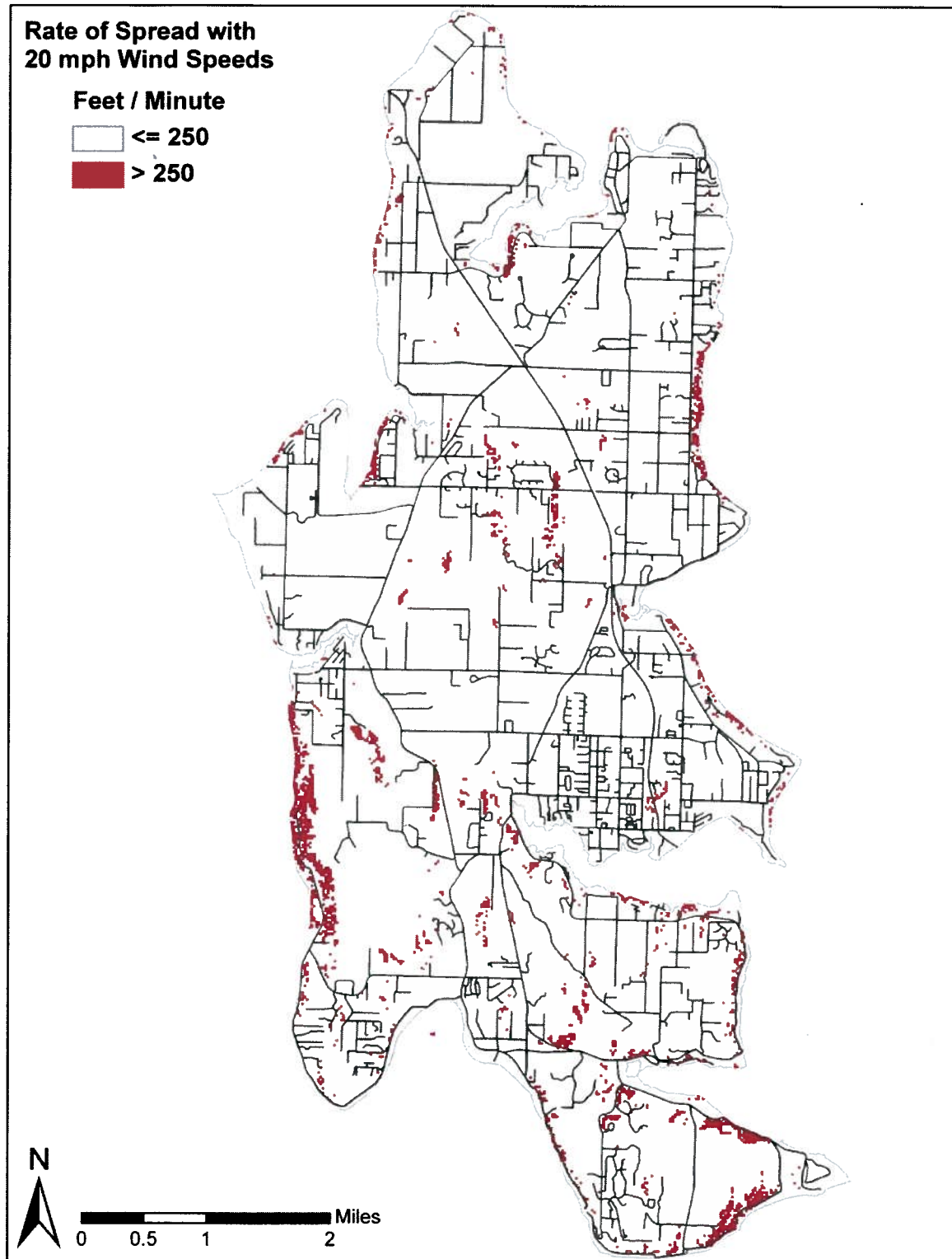




Figure 30: Predicted wildfire flame lengths on Bainbridge Island when wind speeds are 20 mph.



**Figure 31: Predicted wildfire rate of spread on Bainbridge Island when wind speeds are 20 mph. 250 feet/minute is a normal walking speed; rates of spread higher than that can be difficult to attack directly.**



## VII. Mitigation Strategies

The mitigation strategies in this CWPP have been written from a broad perspective. As homes and neighborhoods within the WUI at-risk areas are assessed, mitigation plans should be developed using



the strategies deemed most effective for those sites. The four primary mitigation strategies include: **Hazardous Fuel Reduction, Reduction of Structural Ignitability, Improvements in Emergency Response, and Education/Outreach.** Hazard mitigation activities and fuels reduction projects can entail considerable expense and therefore must be carefully weighed and chosen to ensure costs are commensurate with the benefits that would be derived. However, it is important to remember that fire prevention efforts typically cost far less than fire suppression or fire damage.

## **Hazardous Fuel Reduction**

While weather and topography are factors beyond human control, wildfire behavior can be influenced by modifying fuel load and continuity across the landscape. Reducing hazardous fuels around homes, along transportation corridors, and at a landscape scale can significantly minimize losses to life, property, and natural and cultural resources in the event of a major wildfire. Forests that are managed for resistance to fire damage will also be more resistant to damage by insects, disease organisms, and extreme weather conditions, further protecting fish, wildlife, watersheds, and other public resources. All treatments on federal land need to meet NEPA requirements and all treatments on state land need to meet SEPA requirements. All other lands must meet local ordinances, as relevant. Any fuel treatments, including tree removal, could need to meet the requirements of the proposed Bainbridge Island Consolidated Tree Ordinance.

The common methods for fuel reduction treatments include:

- Fire
- Mechanical
- Hand labor
- Chemical/Herbicide
- Grazing
- A combination of the above

Types of fuel reduction projects can include:

- Stand thinning
- Pruning/thinning from below
- Reduction of disease stands
- Prescribed fires
- Fuel breaks
- Firewise plantings

To aid in prioritizing areas to receive funding and attention for fuel reduction efforts, the projects should be ranked as high, medium, or low based on the criteria listed below (Appendix G).

- Wildfire Hazard and Risk at the project location
- Number of acres treated
- Number of residences with improved protection
- Cost/Benefit analysis results
- Community/Environmental Assets protected

- Time needed to implement

## **Reduction of Structural Ignitability**

The risk wildfire poses to forest lands and homes is inseparable; wildland fires can burn homes, and structural fires can spread to the forest. Because most developments in the WUI across the western U.S. reside down-slope of public and private wildlands, these developments can pose a significant threat to these resources. Therefore, any actions taken by WUI communities to reduce their ignitability will also be of benefit to forest resource managers.

### ***Building Codes***

As a basic measure, codes, covenants, conditions, and restrictions regarding construction and defensible space should be strictly enforced. It is further recommended that the City of Bainbridge Island adopt the National Fire Protection Association 1144 or International Wildland-Urban Interface Code to ensure that new development is less vulnerable to wildfire. Some examples of how Bainbridge Island Code would be enhanced by this adoption are:

- Structures would require Class 1, 2, or 3 ignition-resistant construction based on fire hazard severity surrounding the structure (1-extreme hazard, 2-high hazard, 3-moderate hazard).
- Automated sprinkler systems would be required for structures in Class 1 areas.
- Address signs and supports would be required to be made of noncombustible materials.
- Defensible space of 100', 50', and 30' would be required for structures in Class 1, 2, or 3 areas respectively.

### ***Firewise Construction and Landscaping***

As many as 2,000 homes in the United States are destroyed by wildfires each year. Because of the intensity of a wildfire situation, no fire department can ever guarantee the safety of a home or its residents in this event. While local agencies can provide information on how to reduce wildfire risk, individual property owners have a responsibility to take proactive steps to reduce their vulnerability to wildfire. Wildland-urban ignition research indicates that a home's characteristics and the area immediately surrounding a home within 100 to 200 feet (the "home ignition zone") principally determine a home's ignition potential during a severe wildfire. Creating a "defensible space" around the home, including reducing fuel loads such as dead tree limbs and other dead vegetation and using nonflammable building materials, are the two most important steps homeowners can take to protect their homes. Firewise construction and landscaping methods, some of which are provided in the following pages, will help reduce the risk of a home igniting and increase the chances of it being protected by firefighters.

Generally, in designing a Firewise home and landscape, it's important to consider the following:

- Fire history for the local area.
- Site location and overall terrain.

- Prevailing winds and seasonal weather.
- Property contours and boundaries.
- Native vegetation type and fuel capacity.
- Irrigation capacity and needs.

### ***Firewise Construction***

The Firewise construction methods detailed below—which sometimes suggest and provide more enhanced protection than codes—are important steps to take in new construction, remodeling, and general home maintenance that will increase the chance of a home outlasting a wildfire:

**Location** – All structures should be set back 30 feet or more from downhill slopes and construction on steep slopes should be avoided.

**Access** – Driveways and private roads should be at least 12 feet wide with a vertical clearance of 15 feet and a slope of less than 5 percent to allow for emergency access. Any driveway or private road over 200 feet long should provide a 45-foot radius turnaround within 50 feet of the home. Bridges should be strong enough to support heavy emergency vehicles, including bulldozers hauled on trucks. Homes should have more than 30 feet of defensible space on all sides, clear of any major obstacles to emergency personnel and equipment.

**Roof** – As the most vulnerable part of the home to wildfire, roofs should be made of Class A materials, such as asphalt, tile, or metal roofing, which are most resistant to fire. In addition, a fire-resistant sub-roof can add extra protection.

**Decks** – After roofs, wooden decks are the most likely means by which a wildfire can destroy a home. Decks should be made from materials less flammable than wood, such as composites, or wood should be treated to resist sustaining flames. In addition, open areas under decks should be enclosed or screened with metal mesh (less than ¼ inch gaps) to prevent firebrands from settling under the deck and igniting the structure from below.

**Exterior walls** – Fire resistant materials such as cement, plaster, stucco, or concrete masonry such as stone, brick, or block are best. Vinyl siding melts at fairly low temperatures and should be avoided. Fiber-cement siding is fire-resistant and can be used as long as there are no flammable materials (firewood, etc.) placed next to the walls.

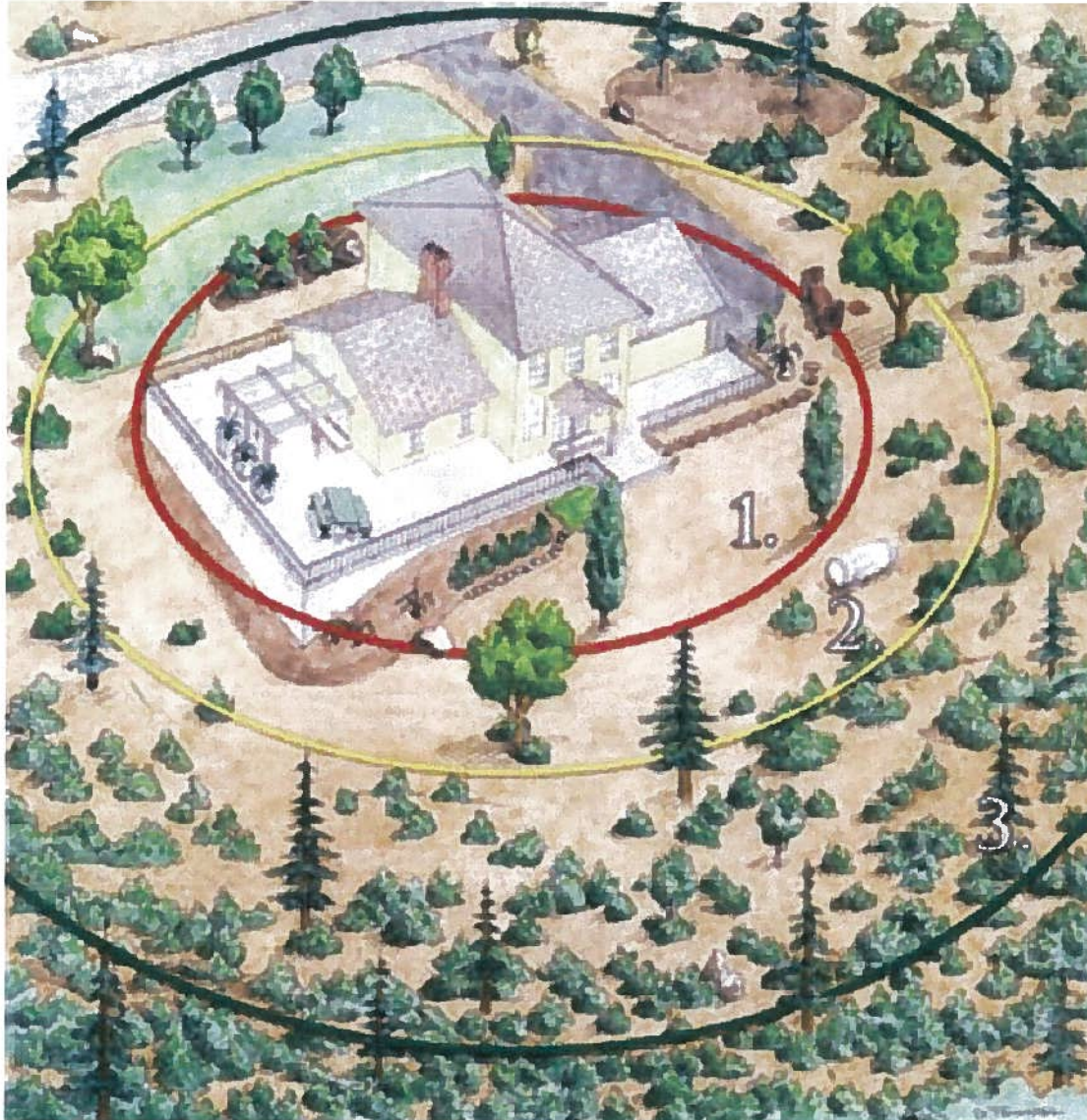
**Windows** – All windows and glass doors should be double-paned or tempered glass to reduce their likelihood of breaking when heated. Plastic skylights should be avoided due to their potential to melt. Windows and skylights should be equipped with nonflammable screens or shutters.

**Other openings** – Vents in the attic, subfloor, or foundation should be screened with ¼ inch or smaller metal mesh to prevent firebrands from entering. Chimneys should have spark arrestors installed to prevent fire from entering the home as well as to prevent sparks from the chimney from landing outside and starting a fire.

### ***The Firewise Landscaping Zones Concept***

In creating a Firewise landscape, the zone concept is used to achieve the primary goals of reducing fuels and structural ignitability (Figure 32).

Figure 32: Firewise landscaping zones; recommended mitigation measures for each zone are referenced below (image from Napa, CA Firewise).



**Zone 1:** A minimum 30 foot perimeter of fuel free area.

- Area should be clear of obstacles to emergency equipment.
- All dead vegetative matter should be removed.
- The area should be well-irrigated with a minimum amount of vegetation, limited to thinly spaced, fire-resistant plant varieties.
- Any trees in this zone should be limbed up 6' to 10' above the ground and 10' above the roof.
- Roof and rain gutters should be kept clear of leaves, needles, and debris.
- Fuels such as firewood, lumber scraps, or other combustibles (lawnmowers, gas cans, etc.) should not be stored in this zone.

**Zone 2:** 30 to 60 foot perimeter of minimum fuel.

- Use fire-resistant vegetation in this area.
- Ensure that vegetation is low-growing or limbed up.
- Thin trees to a wider spacing.
- Use an irrigation system in this area.
- Remove dead vegetation monthly or seasonally, as conditions warrant.

**Zone 3:** 60 to 100 foot perimeter of reduced vegetation.

- Trees should be well spaced among low growing plants in this area.
- Avoid dense vegetation.
- Dead vegetation removed as necessary.

**Zone 4:** Beyond 100 feet from the structure.

- Natural area selectively pruned and thinned to remove highly flammable vegetation.

**Maintenance** is of utmost importance in *all* four zones; in particular, homeowners should continuously remove or reduce dead vegetation and ladder fuels (vegetation that could provide a “ladder” that allows fire to move from the ground to tree canopies).

### ***Fire-Resistant Plants***

Making use of appropriately placed fire-resistant plants can add another aspect of protection against wildfire; these plants take longer to ignite, and when well spaced, may help stop a wildfire from ever reaching the home. Plants that are fire resistant have some common qualities. They have leaves that are pliable and moist, they do not accumulate dead or dry twigs or leaves, and they have watery and mild sap. Oregon State University’s booklet “Fire-Resistant Plants for Home Landscapes”<sup>4</sup> contains lists and photos of fire-resistant plants by type and provides enough information about each to allow for selection of the proper plants for any Pacific Northwest locale. Landscaping design should focus on developing islands of asymmetrical shapes that are spaced well enough to prevent fire from maintaining a consistent flame front.

Some common fire-resistant plants suitable for Pacific Northwest climates include Iceplant, Wild Strawberry, Columbine, Hostas, Salvia, Tall Oregon Grape, Mock Orange, Pacific Rhododendron, Vine and Big-Leaf Maples, and Flowering Dogwood.

### ***Firewise Communities/USA program***

The fire season of 1985 motivated wildfire agencies and organizations to focus on local solutions to wildfire risks in WUI areas by forming what is now the Firewise Communities/USA program. The program is a cooperative, non-regulatory program administered by the National Fire Protection

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<sup>4</sup> <http://extension.oregonstate.edu/catalog/html/pnw/pnw590/pnw590.pdf>



Association and sponsored by the U.S. Forest Service, the U.S. Department of the Interior, and state forestry organizations, including the Washington DNR (which provides free assistance to communities wishing to obtain Firewise Communities status). The Firewise Communities approach emphasizes community responsibility for planning in the design of a safe community as well as effective emergency response and individual responsibility for safer home construction and design, landscaping, and maintenance. Working with local fire department personnel, communities across Bainbridge Island—which are defined at the neighborhood/homeowner association scale—could earn Firewise Communities/USA status by meeting the following criteria:

- Enlist a wildland-urban interface specialist to complete a community assessment and create a plan that identifies agreed-upon achievable solutions to be implemented by the community.
- Sponsor a local board or committee that maintains the Firewise Community/USA program and tracks its progress or status.
- Observe a Firewise Communities/USA Day each year that is dedicated to a local Firewise project.
- Invest a minimum of \$2.00 per capita annually in local Firewise projects. (In-kind work by municipal employees and/or citizen volunteers using municipal and other equipment can be included toward the \$2/capita goal, as can state/federal grants dedicated to Firewise purposes.)
- Submit an annual report to Firewise Communities/USA that documents continuing compliance with the program. Status is renewable annually.

## Emergency Response Improvements

Bainbridge Island Fire Department should continuously evaluate their capacity to provide safe, cost-effective wildland fire management with appropriate planning, staffing, training, equipment, and management oversight. Needed improvements to emergency response infrastructure identified in this planning document can also gain increased eligibility for grant funding. The insurance industry uses the Public Protection Classification (PPC) program from the Washington Surveying and Rating Bureau (WSRB) to evaluate a community's fire-protection services. PPC evaluation criteria are:

- **Fire alarm and communications systems**, including telephone systems, telephone lines, staffing, and dispatching systems.
- **The fire department**, including equipment, staffing, training, and geographic distribution of fire companies.
- **The water supply system**, including condition and maintenance of hydrants, and a careful evaluation of the amount of available water compared with the amount needed to suppress fires.
- **Fire Safety Control**, including fire inspections and public safety education.

Access to property during a wildfire can also be a significant factor limiting emergency response. Substitute Senate Bill 5315, which is intended to begin dealing with this issue, was signed into law in May 2007. The Bill says that the Washington Association of Sheriffs and Police Chiefs will convene a work group to develop a model policy for sheriffs regarding residents, landowners, and others in lawful possession and control of land during a wildfire. The policy will include guidance on allowing access, when safe and appropriate, to residents, landowners, and others during a wildfire to conduct fire prevention or suppression activities and protect or retrieve any property located in their residences.

Until the policy is formally completed, county sheriffs may establish and maintain a registry of persons authorized to access their land during a wildfire.

Items that could improve emergency response identified during the initial draft of this CWPP are:

- Brush truck (currently needing replacement).
- Additional wildland fire Personal Protective Equipment (PPE) for firefighters.
- Training for firefighters.

## **Education/Outreach**

Educational projects can include efforts to inform the public of wildfire hazards and risks as well as promote Firewise or similar methods of reducing fuel hazards and structural ignitability through public presentations, publications, PSAs, TV, and/or radio. WUI communities are encouraged to contribute to their wildfire safety by joining the Firewise Communities/USA program.

### ***Possible Projects***

- Provide Firewise training and workshops.
- Publicized Firewise construction and landscaping projects.
- Public presentations on wildfire hazard.
- Defensible space and forest zone treatment workshops.
- Home wildfire risk assessment workshops.
- Forest health and stewardship education.
- Provide information packets on fire-safe construction materials, landscaping, access, water supply, and fuel breaks (many of which are available for only shipping costs from Firewise<sup>5</sup>).

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<sup>5</sup> <http://catalog.cmsassociates.com/firewise/>

## **VIII. Plan Recommendations**

1. Adopt the NFPA 1144 or International Wildland-Urban Interface Code for Bainbridge Island.
2. Undertake Public Protection Class rating update of fire protection services using WSRB ratings.
3. Promote the development of Firewise Communities at the neighborhood scale beginning with Primary Mitigation Areas, in association with DNR.
4. Undertake evaluations at the home and neighborhood scale of Bainbridge Island, beginning with the Primary Mitigation Areas, using standardized assessment protocols (Appendices D-F).
5. Develop mitigation plans at the home and/or neighborhood scale using the mitigation strategies described in Chapter VII.
6. Recommend consideration in the Bainbridge Island Consolidated Tree Ordinance of the need for fire hazard tree removal within the 30' defensible space zone around structures during its final draft and updates.
7. Update the Bainbridge Island roads and driveway GIS layers to improve length accuracy and include width, turnarounds, and gradient for expanded access hazard assessment.
8. Distribute Firewise and/or other wildfire hazard information to Bainbridge Island residents through local media and community events.
9. Evaluate funding sources for equipment identified in Chapter VII's Emergency Response Improvements section.

## IX. Monitoring and Evaluation

### Methods

This CWPP is intended to be a working document that can be used as a tool for approaching wildfire prevention and fuel-reduction efforts across Bainbridge Island. This plan should be updated and expanded annually or as needed as more localized communities are assessed within the at-risk areas and mitigation projects are developed and prioritized. Results from prevention activities may not be immediate, requiring documentation over time for thorough evaluation. Progress in partnerships, hazardous fuels reduction projects, and Firewise Communities/USA successes should be tracked in this document.

Accomplishments should be documented both quantitatively and qualitatively. The *10-Year Comprehensive Strategy Implementation Plan* drafted by the Western Governors Association provides possible measures for quantitative documentation (Table 7); however, the single most important quantitative reporting element is the number of implemented projects that result in a significant and measurable reduction of risk to the communities and landscapes within the project area.

**Table 7: Performance measures identified in the Western Governors Association 10-Year Comprehensive Strategy Implementation Plan.**

State Foresters or their equivalent will be responsible for tracking performance measures (A) and (B) for determining when communities have met the associated requirements. Federal agencies will be responsible for tracking performance measure (C).

**A)** Number and percent of communities-at-risk covered by a Community Wildfire Protection Plan (CWPP) that are reducing their risk from wildfire. A community is at reduced risk if it has satisfied at least one of the following requirements:

- Recognized as a FIREWISE community or equivalent, or
- Enacted a mitigation/fire prevention ordinance, or
- High priority hazardous fuels identified in a CWPP or equivalent are reduced or appropriate fuel levels on such lands are maintained in accordance with a plan.

**B)** Percentage of at-risk communities who report increased local suppression capacity as evidenced by:  
The increasing number of trained and/or certified firefighters and crews, or  
Upgraded or new fire suppression equipment obtained, or  
Formation of a new fire department or expansion of an existing department involved in wildfire fighting.

**C)** Number of green tons and/or volume of woody biomass from hazardous fuel reduction and restoration treatments on federal land that are made available for utilization through permits, contracts, grants, agreements, or equivalent.

In the long term, it is also important to document situations where a wildfire burned through an implemented project area, and determine how the treatment affected fire behavior. Successfully implemented projects can be documented qualitatively as “success stories.” These success stories can then be placed on National Association of State Foresters (NASF), Firewise, and the National Fire Plan websites as examples of how CWPPs and related efforts are reducing risks to communities, and can also demonstrate community success in future BIFD grant application efforts.

Several publications on protocols and guidelines for multiparty monitoring of community-based forest restoration projects are available online from the U.S. Forest Service.<sup>6</sup>

## **Adaptive Management**

Adaptive management is a process of learning from management and mitigation actions. As applied to this CWPP, it involves implementing a transparent and replicable approach to current projects, monitoring and analyzing the effects of that approach, and then incorporating these findings into the next round of projects. At the end of each project or monitoring period, the following questions should be asked:

- Were the mitigation measures implemented as planned?
- What went right and what went wrong?
- Are there opportunities for improvement?
- Were objectives met?
- Were the mitigation measures effective at protecting the resources?
- If the mitigation measures successfully protected the resources, were they overprotective and did they place unnecessary constraints on the ability to accomplish project objectives?

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<sup>6</sup> <http://www.fs.fed.U.S./r3/spf/cfrp/monitoring> and <http://www.fs.fed.U.S./forestmanagement/index.shtml>



## X. Potential Funding Sources

This CWPP can be utilized to apply for National Fire Plan, Pre Disaster Mitigation, and other State and federal grant programs as relevant. Funding under the National Fire Plan is available through the Interagency National Fire Plan Community Assistance, Volunteer Fire Department Assistance, and State Fire Assistance Wildland Urban Interface Hazard Mitigation Grants programs.

There are two programs delivered through the **U.S. Forest Service** to assist in meeting the needs of rural areas: the Rural Fire Prevention and Control (RFPC) and Rural Community Fire Protection (RCFP). These programs provide cost-share grants to rural fire districts.

The **NRCS's** Environmental Quality Incentives Program (EQIP) allows farmers and forest landowners to receive financial and technical support with structural and management conservation practices on agricultural and forest land. Some of the practices EQIP can assist include thinning, slash treatment, and fuel break projects.

The **Firewise Communities/USA** program can also assist communities in finding grants from an assortment of funding sources.

**FEMA** offers grants to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. There are three types of grants available:

### *Assistance to Firefighters Grant (AFG)*

The primary goal of the Assistance to Firefighters Grants (AFG) is to meet the firefighting and emergency response needs of fire departments and nonaffiliated emergency medical services organizations.

### *Staffing for Adequate Fire and Emergency Response (SAFER)*

The SAFER Grant was created to provide funding directly to fire departments and volunteer firefighter interest organizations in order to help them increase the number of trained, "front-line" firefighters available in their communities.

### *Fire Prevention and Safety (FP&S)*

The FP&S grants support projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations, firefighter safety, and mitigate high incidences of death and injury.

The **Washington DNR** offers programs that can make several types of training, equipment, and other assistance more affordable to local fire districts.

### *Wildland Fire Training*

Through this program, fire districts may be eligible for:

- Wildland firefighting courses taught in your community at no cost, after meeting requirements and with a minimum registration of 15 trainees.
- Instruction by qualified instructors.

Fire protection districts and departments that are not eligible may still register students but must pay a modest tuition.

Opportunities for this training may be available to fire protection districts and departments in Washington State that:

- Have volunteer members.
- Serve communities with a population of 10,000 or fewer residents.
- Border on or include a Department of Interior agency (Bureau of Land Management, National Park Service, Bureau of Indian Affairs, U.S. Fish & Wildlife Service) within its protection area OR currently have a Wildland Fire Response Agreement with a Department of Interior agency.

#### *Wildland Fire Assistance Grants*

These grants are administered by DNR through funding from the U.S. Department of Agriculture. This grant program provides a 50% match for purchases of personal protective equipment and general equipment. The Wildland Fire Assistance Grant Program is administered in two phases annually:

- Phase I – Personal protective equipment (PPE) can be acquired from the first Monday of March until the last Friday in April.
- Phase II – General Equipment Grant Program is open from the first Monday in September and to the last Friday in October.

Opportunities for these grants may be available to fire protection districts and departments in Washington State that:

- Respond to wildland fire on private, state, or federal lands.
- Serve communities with a population of 10,000 or fewer residents.
- Serve a community of more than 10,000 residents AND a service area that includes a rural community of fewer than 10,000 residents.

#### *Rural Fire Assistance Grants*

Administered by DNR with funding from the U.S. Department of Interior, this program helps rural fire districts and departments meet basic needs for equipment, training, and fire prevention through a 10% match.

Opportunities for this training may be available to fire protection districts and departments in Washington State that:

- Protect rural, wildland-urban interface communities (where homes are built in forested or sparsely populated areas).
- Play a substantial cooperative role in protecting federal lands.
- Have fire protection agreements with the Department of the Interior or the State of Washington.
- Serve communities with a population of 10,000 or fewer residents.

#### *Firefighter Property Program*

This program helps fire protection districts and fire departments get fire engines and fire tenders suitable for low-cost conversion to wildland use. Fire districts receive the title to the property. Districts may have to pay the expense of transporting the vehicle from an out-of-state location (about two-thirds

of the vehicles located through this program come from other states). This program replaces the Federal Excess Property Program (FEPP) in Washington State.

Opportunities to obtain equipment through this program may be available to fire protection districts and fire departments in Washington that:

- Agree put the vehicle in service within a year of taking possession.
- Are willing to assist DNR in protecting Washington wildlands from wildfire.

## **Appendix A: Acronyms**

**BIFD** Bainbridge Island Fire Department  
**BLM** Bureau of Land Management  
**CWPP** Community Wildfire Protection Plan  
**DNR** Department of Natural Resources  
**DOI** Department of the Interior  
**FBFM** Fire Behavior Fuel Model  
**FEMA** Federal Emergency Management Agency  
**FSRS** Fire Suppression Rating Schedule  
**USFWS** United States Fish and Wildlife Service  
**HFI** Healthy Forests Initiative  
**HFRA** Healthy Forests Restoration Act  
**IAFC** International Association of Fire Chiefs  
**ICC** International Code Council  
**ISO** Insurance Services Office  
**ITC** Inter-Tribal Timber Council  
**NASF** National Association of State Foresters  
**NEPA** National Environmental Policy Act  
**NFPA** National Fire Protection Association  
**NGOs** Non-Governmental Organizations  
**NIFC** National Interagency Fire Center  
**NLC** National League of Cities  
**NRCS** Natural Resources Conservation Service  
**NWCG** National Wildfire Coordinating Group  
**OFM** Office of Financial Management  
**PCC** Public Protection Classification  
**PMA** Primary Mitigation Area  
**USDA** United States Department of Agriculture  
**USFS** United States Forest Service  
**WDFW** Washington Department of Fish and Wildlife  
**WGA** Western Governors Association  
**WSRB** Washington Surveying and Rating Bureau  
**WUI** Wildland-Urban Interface

## Appendix B: Glossary and Wildland Fire Terms

**Aerial Fuels:** All live and dead vegetation in the forest canopy or above the surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

**Air Tanker:** A fixed-wing aircraft equipped to drop fire retardants or suppressants.

**Agency:** Any federal, state, county or city organization participating with jurisdictional responsibilities.

**Aspect:** Direction toward which a slope faces.

**Blow-up:** A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a fire storm.

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

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

**Buffer Zones:** An area of reduced vegetation that separates wildland fuels from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such as agriculture, recreation areas, parks, or golf courses.

**Burning Ban:** A declared ban on open air burning within a specified area, usually due to sustained high fire danger.

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

**Burning Index:** An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

**Burning Period:** That part of each 24-hour period when fires spread most rapidly, typically from 10:00 a.m. to sundown.

**Chipping:** Reducing wood related material by mechanical means into small pieces to be used as mulch or fuel. Chipping and mulching are often used interchangeably.

**Chain:** A unit of linear measurement equal to 66 feet.

**Closure:** Legal restriction, but not necessarily elimination of specified activities such as smoking, camping or entry that might cause fires in a given area.

**Command Staff:** The command staff consists of the information officer, safety officer, and liaison officer. They report directly to the incident commander and may have assistants.

**Complex:** Two or more individual incidents located in the same general area which are assigned to a single incident commander or unified command.

**Condition Class:** The classification system used by the USFS to determine the extent of departure from the natural fire regime.



**Condition Class I:** A forest system within its natural fire range and at low risk for catastrophic fire.

**Condition Class II:** A forest that has moderately departed from its historic fire occurrence and is at moderate risk of experiencing losses to a wildfire.

**Condition Class III:** A forest that has departed from its historic fire regime and the risk of losing key habitat is high.

**Controlled Burn:** synonymous with Prescribed Fire.

**Cooperating Agency:** An agency supplying assistance other than direct suppression, rescue, support, or service functions to the incident control effort; e.g., Red Cross, law enforcement agency, Telephone Company, etc.

**Creeping Fire:** Fire burning with a low flame and spreading slowly.

**Crown Fire (Crowning):** The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

**Curing:** Drying and browning of herbaceous vegetation or logging slash.

**Dead Fuels:** Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

**Debris Burning:** A fire spreading from any fire originally set for the purpose of clearing land or for rubbish, garbage, range, stubble, or meadow burning.

**Defensible Space:** An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildfire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

**Detection:** The act or system of discovering and locating fires.

**Dozer:** Any tracked vehicle with a front-mounted blade used for exposing mineral soil.

**Dozer Line:** Fire line constructed by the front blade of a dozer.

**Drop Zone:** Target area for air tankers, helitankers, and cargo dropping.

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

**Dry Lightning Storm:** Thunderstorm in which negligible precipitation reaches the ground. Also called a dry storm.

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

**Energy Release Component (ERC):** The computed total heat released per unit area (British Thermal Units per square foot) within the fire front at the head of a moving fire.

**Engine:** Any ground vehicle providing specified levels of pumping, water, and hose capacity.

**Engine Crew:** Firefighters assigned to an engine.

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

**Environmental Assessment (EA):** EAs were authorized by the National Environmental Policy Act (NEPA). They are concise, analytical documents prepared with public participation that determine if an Environmental Impact Statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

**Environmental Impact Statement (EIS):** EISs were authorized by the National Environmental Policy Act (NEPA). Prepared with public participation, they assist decision makers by providing information, analysis, and an array of action alternatives, allowing managers to see the probable effects of decisions on the environment. Generally, EISs are written for large-scale actions or geographical areas.

**Escape Route:** A preplanned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, natural rocky area that is large enough to take refuge without being burned, or other areas which allows access to safety zones. When escaped routes deviate from a defined physical path, they should be clearly marked (flagged).

**Escaped Fire:** A fire which has exceeded or is expected to exceed initial attack capabilities or prescription.

**Extended Attack Incident:** A wildfire that has not been contained or controlled by initial attack forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

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

**Fingers of a Fire:** The long narrow extensions of a fire projecting from the main body.

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

**Fire Behavior Forecast:** Prediction of probable fire behavior usually prepared by a Fire Behavior Officer, in support of fire suppression or prescribed burning operations.

**Fire Break:** A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

**Fire Cache:** A supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

**Fire Crew:** An organized group of firefighters under the leadership of a crew leader or other designated official.

**Fire Intensity:** A general term relating to the heat energy released by a fire.

**Fireline:** A linear fire barrier that is scraped or dug to mineral soil.

**Fire Load:** The number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

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

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

**Fire Perimeter:** The entire outer edge or boundary of a fire

**Fire Regime:** A natural fire regime is a classification of the role that fire would play across a landscape in the absence of human intervention.

**Fire Season:** 1) Period(s) of the year during which wildfires are likely to occur, spread, and affect resource values sufficiently to warrant organized fire management activities. 2) A legally enacted time during which burning activities are regulated by state or local authority.

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

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

**Fire Weather:** Weather conditions that influence fire ignition, behavior, and suppression.

**Fire Weather Watch:** A term used by fire weather forecasters to notify using agencies, usually 24 to 72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

**Fire Whirl:** Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to more than 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

**Firefighting Resources:** All people and major items of equipment that can or potentially could be assigned to fires.

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

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

**Flaming Front:** The zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front. Also called the fire front.

**Flanks of a Fire:** The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

**Flare-up:** Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

**Future Desired Conditions:** The future desired conditions on federal land is a return to Condition Class 1. (see Condition Class 1)

**Flashy Fuels:** Fuels such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash, that ignite readily and are consumed rapidly when dry. Also called fine fuels.

**Forbs:** Plants with a soft, rather than permanent woody stem, that is not a grass or grass-like plant.

**Fuel:** Any combustible material. This includes vegetation, such as grass, leaves, ground litter, shrubs, and trees, which feed a fire.

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

**Fuel Loading:** The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.

**Fuel Model:** Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model has been specified

**Fuel Moisture (Fuel Moisture Content):** The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried.

**Fuel Reduction (Fuel Treatment):** Manipulation, including combustion or removal of fuels, to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

**Fuel Type:** An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

**Geographic Area:** A political boundary designated by the wildfire protection agencies where these agencies work together in the coordination and effective utilization.

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

**Haines Index:** An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

**Hand Line:** A fireline built with hand tools.

**Hazard Reduction:** Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

**Head of a Fire:** The side of the fire having the fastest rate of spread.

**Heavy Fuels:** Fuels of large diameter, such as snags, logs, and large limb wood, that ignite and are consumed more slowly than flash fuels.

**Helibase:** The main location within the general incident area for parking, fueling, maintaining, and loading helicopters. The helibase is usually located at or near the incident base.

**Helispot:** A temporary landing spot for helicopters.

**Hotspot:** A particularly active part of a fire.

**Hot spotting:** Reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat, generally the first step in prompt control, with emphasis on first priorities.

**Incident:** A human-caused or natural occurrence, such as wildfire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural or cultural resources.

**Incident Action Plan (IAP):** A plan that contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including but not limited to: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map.

**Incident Command Post (ICP):** Location at which primary command functions are executed. The ICP may be co-located with the incident base or other incident facilities.

**Incident Command System (ICS):** The combination of facilities, equipment, personnel, procedure and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

**Incident Commander:** Individual responsible for the management of all incident operations at the incident site.

**Initial Attack:** The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

**Job Hazard Analysis:** This analysis of a project is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions, and the required safety equipment to ensure public and employee safety.

**Keech Byram Drought Index (KBDI):** Commonly-used drought index adapted for fire management applications, with a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).



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

**LANDFIRE:** a federal interagency group devoted to providing spatial data to wildland managers ([www.landfire.gov](http://www.landfire.gov)).

**Land/Resource Management Plan (L/RMP):** a document prepared with public participation and approved by an agency administrator that provides general guidance and direction for land and resource management activities for an administrative area. The L/RMP identifies the need for fire's role in a particular area and for a specific benefit. The objectives in the L/RMP provide the basis for the development of fire management objectives and the fire management program in the designated area.

**Light (Fine) Fuels:** Fast-drying fuels, such as grasses and conifer needles, generally with comparatively high surface area-to-volume ratios, which are less than ¼-inch in diameter and have a moisture time lag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

**Litter:** Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer, composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

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

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

**Mobilization:** The process and procedures used by all organizations, federal, state and local for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

**Mop-up:** To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

**Multi-Agency Coordination (MAC):** A generalized term which describes the functions and activities of representatives of involved agencies and/or jurisdictions who come together to make decisions regarding the prioritizing of incidents, and the sharing and use of critical resources. The MAC organization is not a part of the on-scene ICS and is not involved in developing incident strategy or tactics.

**Mutual Aid Agreement:** Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

**National Environmental Policy Act (NEPA):** NEPA is the basic national law for protection of the environment, passed by Congress in 1969. It sets policy and procedures for environmental protection, and authorizes Environmental Impact Statements and Environmental Assessments to be used as analytical tools to help federal managers make decisions.

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

**National Wildfire Coordinating Group (NWCG):** A group formed under the direction of the Secretaries of Agriculture and the Interior and comprised of representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service and Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildfire activities and provide a forum to discuss, recommend action, or resolve issues and problems of substantive nature. NWCG is the certifying body for all courses in the National Fire Curriculum.

**Normal Fire Season:** 1) A season when weather, fire danger, and number and distribution of fires are about average. 2) Period of the year that normally comprises the fire season.

**Operational Period:** The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not more than 24 hours.

**Overhead:** People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

**Peak Fire Season:** That period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

**Planned Ignition:** The intentional initiation of a wildfire by hand-held, mechanical, or aerial device where the distance and timing between ignition lines or points and the sequence of igniting them is determined by environmental conditions (weather, fuel, topography), firing technique, and other factors which influence fire behavior and fire effects (see prescribed fire).

**Preparedness:** Condition or degree of being ready to cope with a potential fire situation.

**Prescribed Fire:** A wildfire originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed fire plan for which NEPA requirements (where applicable) have been met prior to ignition (see planned ignition).

**Prescribed Fire Plan (Burn Plan):** This document provides the prescribed fire burn boss information needed to implement an individual prescribed fire project.

**Prescription:** Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

**Prevention:** Activities directed at reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards.

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

**Radiant Burn:** A burn received from a radiant heat source.

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

**Reburn:** The burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; an area that has reburned.

**Red Flag Warning:** Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

**Rehabilitation:** The activities necessary to repair damage or disturbance caused by wildfires or the fire suppression activity.

**Relative Humidity (RH):** The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure. RH is a strong driver of moisture content in fine fuels.

**Remote Automatic Weather Station (RAWS):** An apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which the data is re-transmitted to an earth-receiving station for use in the National Fire Danger Rating System.

**Resources:** 1) Personnel, equipment, services, and supplies available, or potentially available, for assignment to incidents. 2) The natural resources of an area, such as timber, forage, watershed values, recreation values, and wildlife habitat.

**Resource Management Plan (RMP):** A document prepared by field office staff with public participation and approved by field office managers that provides general guidance and direction for land management activities at a field office. The RMP identifies the need for fire in a particular area and for a specific benefit.

**Response to Wildfire:** The mobilization of the necessary services and responders to a fire based on ecological, social, and legal consequences, the circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected.

**Retardant:** A substance or chemical agent which reduces the flammability of combustibles.

**Run (of a fire):** The rapid advance of the head of a fire with a marked change in fire line intensity and rate of spread from that noted before and after the advance.

**Safety Zone:** An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of a blowup in the vicinity.

**Severity Funding:** Funds provided to increase wildfire suppression response capability necessitated by abnormal weather patterns, extended drought, or other events causing abnormal increase in the fire potential and/or danger.

**Single Resource:** An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

**Size-up:** To evaluate a fire to determine a course of action for fire suppression.

**Slash:** Debris left after logging, pruning, thinning or brush cutting; includes logs, chips, bark, branches, stumps, and broken understory trees or brush.

**Slop-over:** A fire edge that crosses a control line or natural barrier intended to contain the fire.

**Smoke Management:** Application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

**Snag:** A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

**Spark Arrester:** A device installed in a chimney, flue, or exhaust pipe to stop the emission of sparks and burning fragments.

**Spot Fire:** A fire ignited outside the perimeter of the main fire by flying sparks or embers.

**Spot Weather Forecast:** A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

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

**Staging Area:** Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three-minute available basis. Staging areas are managed by the operations section.

**Strategy:** The science and art of command as applied to the overall planning and conduct of an incident.

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

**Suppressant:** An agent, such as water or foam, used to extinguish the flaming and glowing phases of combustion when directly applied to burning fuels.

**Suppression:** All the work of extinguishing or containing a fire, beginning with its discovery.

**Surface Fuels:** Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

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

**Torching:** The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

**Uncontrolled Fire:** Any fire which threatens to destroy life, property, or natural resources.

**Unplanned Ignition:** The initiation of a wildfire by lightning, volcanoes, or unauthorized and accidental human-caused fires.

**Under burn:** A fire that consumes surface fuels but not trees or shrubs.

**Volunteer Fire Department (VFD):** A fire department of which some or all members are unpaid.

**Wildfire:** Unplanned ignition of a fire in a wildland setting (such as a fire caused by lightning, volcanoes, unauthorized and accidental human-caused fires, and escaped prescribed fires).

**Water Tender:** A ground vehicle capable of transporting specified quantities of water.

**Wildland fire:** Any nonstructural fire, other than prescribed fire, that occurs in wildland setting.

**Wildfire Implementation Plan (WFIP):** A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildfire being managed for resource benefits.

**Wildfire Use:** The management of naturally ignited wildfires to accomplish specific pre-stated resource management objectives in predefined geographic areas outlined in Fire Management Plans.

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



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**Appendix D: Neighborhood Wildfire Hazard Assessment  
Form**

# Nighborhood Wildfire Hazard Assessment Form

This assessment form is based on 2006 International Wildland-Urban Interface Code Appendix C and 2002 NFPA 1144 Annex A

<b>Community Name</b>	<b>Community Location</b>
<b>Primary Access Road Name</b>	<b>Evaluator(s)</b>
<b>Evaluation Date</b>	

<b>A: Neighborhood Design</b>	<b>Score</b>	<b>Rating</b>	<b>Notes</b>	
<b>Access</b>				
Two or more primary roads	0			
One road through	3			
One road in and out (entrance & exit are the same)	5			
<b>Gate</b>				
Not gated	0			
Locked gate	5			
<b>Bridges</b>				
No bridges or bridges with no weight and width restrictions	0			
Low weight or narrow bridge restricting emergency vehicle access	5			
<b>Road Width</b>				
20' or more	1			
Less than 20'	3			
<b>Road Grade</b>				
5% or less	1			
Greater than 5%	3			
<b>Road Type</b>				
All weather, paved	0			
All weather, gravel	3			
Limited access or unmaintained	5			
<b>Secondary Road Terminus</b>				
Loop roads or cul-de-sacs, outside turning radius of 45' or more	1			
Cul-de-sac, outside turning radius of less than 45'	2			
Dead-end road, less than 200' long	3			
Dead-end road, more than 200' long	5			
<b>Street Signs</b>				
Present, with ≥4" reflective letters	1			
Missing, or present with <4" letters or non-reflective letters	3			
		<b>Sum:</b>		



<b>B: Vegetation / Fuels</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Fuel Type</b>				
Light (e.g., grasses <6", deciduous leaf litter)		1		
Medium (e.g., grasses >6", conifer litter, light brush, small trees)		5		
Heavy (e.g., dense brush, timber)		10		
Very heavy (e.g., logging slash, high volume of dead and down)		15		
<b>Ladder Fuels</b>				
Most tree branches pruned up >6' above ground or understory fuels		0		
Most tree branches close to ground or understory fuels		5		
<b>Defensible Space</b>				
70% or more of neighborhood		1		
30 - 70% of neighborhood		10		
Less than 30% of neighborhood		20		
			<b>Sum:</b>	

<b>C: Topography and Weather</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Weather</b>				
History of high fire occurrence		0 - 5		
Exposed to unusually severe fire weather and strong, dry winds		0 - 5		
Local weather conditions and prevailing winds		0 - 5		
<b>Slope</b>				
8% or less		1		
8 - 19%		4		
20 - 29%		7		
More than 30%		10		
<b>Topographic features*</b>				
Topography that adversely affects fire behavior		0 - 5		
<i>* Consider attributes like ridges, saddles, steep slopes, steep narrow draws, small canyons, etc.</i>				
			<b>Sum:</b>	

<b>D: Building and Property Construction</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Roofing</b>				
More than 75% of homes have metal, tile, class A asphalt or fiberglass shingles		0		
50 - 70% of homes have metal, tile, class A asphalt or fiberglass shingles		10		
Less than 50% of homes have metal, tile, class A asphalt or fiberglass shingles		15		
More than 50% of homes have wood roofs		20		

<b>D: Building/Property Construction (con't)</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Siding and Decks</b>				
More than 75% of homes have noncombustible siding/deck	0			
50 - 70% of homes have noncombustible siding/deck	5			
50 - 70% of homes have noncombustible siding and combustible deck	10			
Less than 50% of homes have noncombustible siding and combustible deck	15			
More than 50% of homes have combustible siding/deck	20			
<b>Foundations / Crawlspace</b>				
More than 75% of homes have enclosed foundations with vents covered by $\leq 1/4$ " metal mesh	0			
50 - 70% of homes have enclosed foundations with with vents covered by $\leq 1/4$ " metal mesh	5			
Less than 50% of homes have enclosed foundations with vents covered by $\leq 1/4$ " metal mesh	15			
More than 50% of homes have open foundations	20			
	<b>Sum:</b>			

<b>E: Fire Protection - Water Source</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
500 GPM hydrants spaced within 1,000'	0			
Hydrants spaced $> 1,000'$ apart or $< 500$ GPM hydrants	2			
Other water source available within community (tanks, pools, lakes, etc.)	5			
Water source located within 20 minute or less round trip	7			
Water source located farther than 20 minute but less than 45 minute round trip	10			
Water source farther than 45 minute round trip	15			
	<b>Sum:</b>			

<b>F: Utilities</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Electric</b>				
Underground, clearly marked	0			
Underground, not clearly marked	1			
Overhead, with adequate right of way ( $> 20'$ )	2			
Overhead, with right of way not maintained	5			

<b>F: Utilities (con't)</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Gas</b>				
Underground, clearly marked		0		
Underground, not clearly marked		1		
Aboveground, with 15' of brush clearance and >30' from structures		2		
Aboveground, with no brush clearance or <30' from structures		5		
		<b>Sum:</b>		

<b>G: Surrounding Landscape</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
Neighborhood is predominately within low fire hazard mapping area		0		
Neighborhood is predominately within moderate fire hazard mapping area		10		
Neighborhood is predominately within high fire hazard mapping area		15		
Neighborhood is predominately within extreme fire hazard mapping area		20		
		<b>Sum:</b>		

<b>Neighborhood Hazard Ratings</b>	<b>Sum</b>
<b>A: Neighborhood Design</b>	
<b>B: Vegetation / Fuels</b>	
<b>C: Topography and Weather</b>	
<b>D: Building and Property Construction</b>	
<b>E: Fire Protection - Water Source</b>	
<b>F: Utilities</b>	
<b>G: Surrounding Landscape</b>	
<b>Total:</b>	

<b>Neighborhood Hazard from Wildfire Rating Scale</b>	
<b>Low</b>	<b>&lt; 70</b>
<b>Moderate</b>	<b>71 - 110</b>
<b>High</b>	<b>111 - 135</b>
<b>Extreme</b>	<b>&gt; 135</b>

**Additional notes:**

# **Appendix E: Qualitative Property Wildfire Hazard Assessment Form**

# Qualitative Property Wildfire Hazard Assessment Form

*This assessment form is based on NFPA 1144, Standard for Reducing Structure Ignition Hazards from Wildfire, 2008*

<b>Homeowner Name</b>	<b>Home Address</b>
<b>Evaluator(s) / Evaluation Date:</b>	
<b>Assessment Item</b>	<b>Mitigation Recommendations</b>
<b>1. Overview of Surroundings</b>	
How is the structure positioned in relationship to severe fire behavior?	
Type of Construction	
<b>2. Chimney to Eaves</b>	
Inspect the roof - noncombustible? Shingles missing? Shingles flat with no gaps?	
Gutters - present? Noncombustible?	
Litter on roof, in gutters, or crevices?	
<b>3. Top of Exterior Wall to Foundation</b>	
Attic, eaves, soffit vents, and crawl space:	
Inspect windows & screens - metal screens? Multit-paned or tempered windows? Picture windows facing vegetation?	
Wall and attachments - noncombustible? Will they collect litter?	
Decks - combustible material?	
Fences:	
Flammable material next to or under structure?	
Combustible materials near or on surface where walls meet roof or deck?	
Nooks, crannies, or other spaces where firebrands could enter?	
<b>4. Foundation to 30' from Structure</b>	
Landscaped (managed) vegetation - separation distances, maintenance, plant selection?	
Propane tanks?	
Vehicle and RV use and parking, including lawn mowers, etc.	
Outbuildings / structures:	
<b>5. Between 30' – 100+'</b>	
Inspect vegetation clearance and crown separation, setbacks, etc.	





## **Appendix F: Quantitative Property Wildfire Hazard Assessment Checklist**

# Quantitative Property Wildfire Hazard Assessment Checklist

This assessment form is based on NFPA 1144, Standard for Reducing Structure Ignition Hazards from Wildfire, 2008

<b>Homeowner Name</b>	<b>Neighborhood Name &amp; Location</b>
<b>Address / Coordinates</b>	<b>Evaluator(s) / Evaluation Date</b>

<b>A: Chimney to Eaves</b>	<b>Score</b>	<b>Rating</b>	<b>Notes</b>	
<b>Is there a chimney?</b>				
None	0			
Present, with spark arrester	5			
Present, without spark arrester	20			
<b>What is the primary roofing material?</b>				
Metal/Asphalt/Tile	0			
Wood, Treated	30			
Wood, Untreated	50			
<b>What is the primary gutter material?</b>				
None or Metal	0			
Vinyl or Wood	5			
None, exposed wood fascia	5			
<b>What is the primary soffit material?</b>				
Metal, with metal mesh/screens	0			
Vinyl, with metal mesh/screens	10			
Wood or no vent screens	15			
Open eaves	20			
	<b>Sum:</b>			

<b>B: Top of Walls to Foundation</b>	<b>Score</b>	<b>Rating</b>	<b>Notes</b>	
<b>Is the foundation/crawlspace enclosed?</b>				
Enclosed with vents covered by $\leq 1/4$ " metal mesh	0			
Enclosed with open vents or combustible mesh	5			
Open	15			
<b>Is there a fixed fire protection system?</b>				
NFPA 13, 13R, 13D sprinkler system	0			
None	5			
<b>What is the primary construction material? (Consider amount and type of windows, deck size and exposure(s), proximity to fuels that promote firebrands, etc.)</b>				
Noncombustible / fire-resistive / ignition-resistive siding and deck	0-14			
Noncombustible / fire-resistive / ignition-resistive siding and combustible deck (score depends on qualities above)	15-49			

Combustible siding and deck	50		
	<b>Sum:</b>		
<b>C: Foundation to 30' from Structure</b>			
	<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Are there fences or other attachments to the structure?</b>			
None or non-combustible	0		
Combustible	15		
<b>What is the average slope within 30' of the structure?</b>			
Little to no slope	0		
Slope 5 - 9%	1		
Slope 10 - 20%	4		
Slope 21 - 30%	7		
Slope 31 - 40%	10		
Slope >40%	15		
<b>What is the predominant fuel type within 30' of the structure?</b>			
Sand, gravel, etc. (non combustible)	0		
Light fuels, maintained, e.g., established lawn, up to 6" tall	5		
Light fuels, not maintained, e.g., wild grasses and forbs, up to 6" tall	10		
Light fuels, non-fire-prone shrubs w/leaves (include creeping or spreading, e.g., ground ivy)	12		
Medium fuels, grasses and forbs over 6" tall (pasture, heavy weeds, etc.)	15		
Medium fuels, herbaceous understory or forest needle/leaf litter	15		
Medium fuels, light brush or small trees	20		
Medium fuels, shrubs w/needles (creeping/spreading, e.g., spreading juniper)	20		
Heavy fuels, fire-prone shrubs (manzanita, etc.)	25		
Heavy fuels, dense brush or timber	25		
Heavy fuels, logging slash	30		
<b>Is there fuel modification treatment within 100' of the structure? (e.g., removal of ladder fuels, dead branches removed, limbed up trees, tree crown separation, tree canopies &gt;10' from structure(s), etc.)</b>			
71 - 100' of vegetation treatment from the structure	0		
30 - 70' of vegetation treatment from the structure	7		
<30' of vegetation treatment from the structure	15		
<b>What is the separation from structure(s) on adjacent property(ies) that can contribute to fire spread or behavior? (Consider ignition risk of adjacent properties' structures, including garages, gazebos, sheds, and other outbuildings.)</b>			
More than 200'	0		
100-200'	1		
30-100'	3		
<30'	5		
	<b>Sum:</b>		

**What is the predominant fuel model within 30' of the structure?**

Fuel Model:

<b>D: 30' to 100+' from Structure</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>What is the average slope between 30-100' of the structure?</b>				
Little to no slope		0		
Slope 5 - 9%		1		
Slope 10 - 20%		2		
Slope 21 - 30%		3		
Slope 31 - 40%		6		
Slope >40%		10		
<b>What is the predominant fuel type between 30-100' of the structure?</b>				
Sand, gravel, etc. (non combustible)		0		
Light fuels, maintained, e.g., established lawn, up to 6" tall		1		
Light fuels, not maintained, e.g., wild grasses and forbs, up to 6" tall		1		
Light fuels, non-fire-prone shrubs w/leaves (include creeping or spreading, e.g., ground ivy)		5		
Medium fuels, grasses and forbs over 6" tall (pasture, heavy weeds, etc.)		5		
Medium fuels, herbaceous understory or forest needle/leaf litter		5		
Medium fuels, light brush or small trees		5		
Medium fuels, shrubs w/needles (creeping/spreading, e.g., spreading juniper)		10		
Heavy fuels, fire-prone shrubs (manzanita, etc.)		15		
Heavy fuels, dense brush or timber		15		
Heavy fuels, logging slash		20		
<b>Is there fuel modification treatment between 100-200' of structure?*</b>				
100 - 200' of vegetation treatment from the structure		0		
71 - 100' of vegetation treatment from the structure		5		
* E.g., removal of ladder fuels, dead branches removed, limbed up trees, tree crown separation, tree canopies >10' from structure(s), etc.				
<b>What is the separation from structure(s) on adjacent property(ies) that can contribute to fire spread or behavior? (Consider ignition risk from burning adjacent properties' structures (including garages, gazebos, sheds, and other outbuildings).</b>				
More than 200'		0		
100-200'		1		
30-100'		3		
<30'		5		
		<b>Sum:</b>		

**What is the predominant fuel model between 30-120' of the structure?**

Fuel Model:

<b>E: Overview of Surrounding Environment</b>		<b>Score</b>	<b>Rating</b>	<b>Notes</b>
<b>Topography and weather considerations</b>				
Topography that adversely affects fire behavior		0 - 5		
Areas with history of high fire occurrence		0 - 5		
Areas exposed to unusually severe fire weather and strong, dry winds		0 - 5		
Local weather conditions and prevailing winds		0 - 5		
<b>What is the predominant fuel type of the surrounding environment?</b>				
Sand, gravel, etc. (non combustible)		0		
Light fuels, maintained, e.g., established lawn, up to 6" tall		2		
Light fuels, not maintained, e.g., wild grasses and forbs, up to 6" tall		5		
Light fuels, non-fire-prone shrubs w/leaves (include creeping or spreading, e.g., ground ivy)		5		
Medium fuels, grasses and forbs over 6" tall (pasture, heavy weeds, etc.)		10		
Medium fuels, herbaceous understory or forest needle/leaf litter		10		
Medium fuels, light brush or small trees		10		
Medium fuels, shrubs w/needles (creeping/spreading, e.g., spreading juniper)		12		
Heavy fuels, fire-prone shrubs (manzanita, etc.)		15		
Heavy fuels, dense brush or timber		15		
Heavy fuels, logging slash		15		
<b>What is the building setback relative to slopes of ≥30%?</b>				
Equal to or greater than 30' to slope ≥30%		1		
Less than 30' to slope ≥30%		5		
<b>Where are gas and electricity utilities placed?</b>				
Both belowground		0		
One aboveground, one belowground		3		
Both aboveground		5		
<b>What is the separation from structure(s) on adjacent property(ies) that can contribute to fire spread or behavior? (Consider ignition risk from burning adjacent properties' structures, including garages, gazebos, sheds, and other outbuildings.)</b>				
More than 200'		0		
100-200'		1		
30-100'		3		
<30'		5		
		<b>Sum:</b>		



**What is the predominant fuel Hazard in the surrounding environment?**

**Fuel Model:**

<b>Property Hazard Ratings</b>	<b>Sum</b>
<b>A: Chimney to Eaves</b>	
<b>B: Top of Walls to Foundation</b>	
<b>C: Foundation to 30' from Structure</b>	
<b>D: 30' to 100+' from Structure</b>	
<b>E: Overview of Surrounding Environment</b>	

<b>Structure Ignition Hazard from Wildfire Rating Scale*</b>		
<b>Slight structure ignition hazard</b>		<b>0 - 14</b>
<b>Moderate structure ignition hazard</b>		<b>15 - 29</b>
<b>Significant structure ignition hazard</b>		<b>30 - 49</b>
<b>Severe structure ignition hazard</b>		<b>50+</b>

*\* Compare with **each** of the five hazard assessment areas*

## Appendix G: Prioritized Wildfire Hazard Mitigation Form

Neighborhood/Structure	
Location	
Project Lead	
Ignition Risk and Hazard Rating (Appendix D,E, F)	
Values Protected (# of homes, schools, hospitals, utilities, etc.)	
Steps taken to reduce Structural Ignitability (Appendix E)	
Hazardous fuels Reduction Projects (Type, Method, # of Acres)	
Education/Outreach Activities	
Emergency Response Capabilities and Needs	
Access/ Evacuation Plan	
Funding Source (cost/benefit)	

Timeline	
Overall Priority Rating (High, Medium, Low)	

## Appendix H: National Register of Historic Places and Community Facilities

Historic Places	Address	Listed	Area of Significance
Agate Pass Bridge	WA 305 over Agate Pass	1995	Transportation
Bainbridge Island Filipino Community Hall	7566 NE High School Rd.	1995	Events
Fort Ward Historic District	South of Winslow	1978	Architecture/Engineering
U.S. Naval Radio Communications Station	0.5 mi N of Beans Point	1996	Communications/Military
<b>Community Facilities</b>			
Virginia Mason Winslow Clinic	380 Winslow Way E		Medical
Bainbridge Island Teen Center	9332 NE High School RD		Youth Center
Bainbridge Island Senior Center	370 Brien Drive		Senior Center
Bainbridge Island Library	1270 Madison Ave N		Public Library
Bainbridge Island Historical Museum	215 Ericksen Ave NE		History
City of Bainbridge Island	280 Madison Ave N		City Government
Bainbridge Island Waste Disposal Facility	7215 NE Vincent Rd		Public Service
Ferry Terminal	Winslow Ferry landing		Transportation

## Appendix I: Emergency Contacts

Contact	Phone #
Bainbridge Island Fire Department Station 21 (Main Headquarters) 8895 Madison Avenue NE, Bainbridge Island, WA 98110	(206) 842-7686
<b>WA DNR - Report a Forest Fire</b>	<b>1-800-562-6010</b>
Washington Department of Natural Resources South Puget Sound Region 950 Farman Avenue N, Enumclaw, WA 98022	(360) 825-1631
<b>Law Enforcement</b>	<b>911</b>
Police Department 625 Winslow Way East, Bainbridge Island, WA 98110	(206) 842-5211
Washington State Patrol 4811 Werner Road, Bremerton, WA 98312	(360) 478-4646
<b>Fire and EMS</b>	<b>911</b>
Virginia Mason Clinic 380 Winslow Way E., Bainbridge Island, WA 98110	(206) 842-5632
The Doctors Clinic 945 Hildebrand Lane Northeast Bainbridge Island, WA 98110	(206) 855-7700
Bainbridge Pediatrics 9431 Coppertop Loop, Suite A Bainbridge Island, WA 98110	(206) 780-5437
Bainbridge Island Ambulance Association 12985 Phelps Rd. NE Bainbridge Island, WA 98110	(206) 842-2676
<b>Bainbridge Island Utilities</b>	
Puget Sound Energy 10885 NE 4th Street, P.O. Box 97034 Bellevue WA 98009-9734	(888) 225-5773
City of Bainbridge Island Water 280 Madison Ave North Bainbridge Island, WA 98110	(206) 780-8603 or 842-1212
South Bainbridge Water 4573 Point White Dr NE Bainbridge Island, WA 98110	(206) 842-4299
Island Utilities 625 Winslow Way E, Bainbridge Isle, WA 98110	(206) 319-2656
Meadowmeer Water P.O. Box 10483, Bainbridge Island, WA. 98110	(206) 780-2958

There are over 100 independent water companies on Bainbridge Island. For information, contact Christy or Debbie at the COBI offices.

(206) 780-8603

## Appendix J: Risk and Hazard Assessment Methodology

All GIS analysis was performed in ArcGIS 9.3.1 (ArcINFO license), using the Washington State Plane North FIPS 4601 projection and the NAD83 datum.

### Fuel Hazard Assessment

The Fuel Hazard layer (**BI\_FuelsHzd**) used in the Bainbridge Island Hazard Assessment is a refinement of the 40 Scott & Burgan fire behavior fuel model (FBFM 40) available from LANDFIRE.<sup>7</sup> The FBFM 40 classification is a revision of the original 13 Anderson Fuel Models created by the U.S. Forest Service which links vegetative type (such as a woodlot) to a set of average fuel loadings (such as “Timber (litter and understory)”) that can help predict wildfire behavior.

LANDFIRE (Landscape Fire and Resource Management Planning Tools Project) is a vegetation, fire, and fuel characteristics mapping project initiated by a request from federal land agencies to help resource managers prioritize areas for hazardous fuel reduction and ecological conservation. Sponsored by the Wildland Fire Leadership Council, it is a shared project between the DOI and Forest Service wildland fire management programs, partnered with the USFS Missoula Fire Sciences Laboratory, the USGS, and The Nature Conservancy. LANDFIRE “provides science to support the Healthy Forests Restoration Act (Community Wildfire Protection Plans), the National Fire Plan, and land and fire management planning stewardship of public and private lands.” LANDFIRE mapping procedures integrate relational databases, geo-referenced field plots, remote sensing, systems ecology, gradient modeling, predictive landscape modeling, vegetation disturbance dynamics, and peer-reviewed fire science to create a state-of-the-art scientific analysis of the U.S. landscape.

While reliable in defining mid- to large-scale vegetation type, the LANDFIRE data tends to overestimate vegetation cover, and its 30 meter resolution is not fine enough to define the Wildland-Urban Interface in smaller regions, such as an area the size of Bainbridge Island.

To refine the boundary between vegetative fuels and development, the LANDFIRE FBFM40 layer was compared against a 0.5 ft resolution orthophoto (acquired from the USGS Seamless Server,<sup>8</sup> imagery date March 2007, downloaded 1/2010). A shape file was created using heads-up digitizing on top of the orthophoto, delineating areas of forest, low vegetation, and non-burnable landscapes such as water, pavement, and barren areas. The Kitsap County road centerline and Bainbridge Island private road and driveway centerline layers were merged, given a twenty foot buffer (to account for the approximate width of the surface, which was assumed to be non-burnable), and visually corrected against the orthophoto. The Washington Department of Natural Resources (DNR) hydrology layer (downloaded

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<sup>7</sup> <http://www.landfire.gov>

<sup>8</sup> <http://seamless.usgs.gov>

1/2010<sup>9</sup>) was used to identify and confirm water bodies. Due to the uncertainty in identifying tree species or understory from aerial photos, the remaining classifications for forested areas were clipped from the FBFM 40 model. The resultant layer was reclassified based on NFPA 1144 (2008, Annex A) criteria (Table J1).

**Table J1: Bainbridge Island vegetation fuel classification and ranking**

Fuel Type (FBFM 40 classifications)	Points
Non-Burnable (NB1, NB8, NB9)	0
Light (GR1, GR2, TL4, TL7)	15
Medium (GS2, TL5, TL6, TU1, TU2, SB1)	20
Heavy (TL8, TU5)	25
Heavy load fuels ( <i>none present</i> )	30

## Layers Used

Retrieved from Kitsap County website ([www.kitsapgov.com/gis/metadata](http://www.kitsapgov.com/gis/metadata)):

- Site Address points (**situs**).
- Building Footprints (**footprints**).
- Fire Districts (**firedist**).
- Street Centerlines (**roadcl**).
- 10-meter grids of Kitsap County derived from USGS DEMs (**KitsapDEM**).

Received from City of Bainbridge Island via email:

- Private Roads (**BIRD**).
- Driveways (**Driveways**).
- Hydrants (**Hydrant\_Complete**).

Retrieved from LANDFIRE:

- 40 Scott & Burgan Fire Behavior Fuel Model (**FBFM40**).

Retrieved from USGS Seamless Server ([seamless.usgs.gov](http://seamless.usgs.gov)):

- Bainbridge Island 0.5 foot resolution orthophoto (**BainbridgeOrtho**).

Layers created for Hazard Assessment:

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<sup>9</sup> <http://fortress.wa.gov/dnr/app1/dataweb/dmmatrix.html>



- Vegetative fuels model modified from the FBFM40 layer using heads-up digitizing over the 0.5' orthophoto and processing steps (**BI\_FuelHzd**).
- A slope hazard layer (**BI\_SlopeHzd**).
- An aspect hazard layer (**BI\_AspectHzd**).
- A fire hydrant proximity hazard layer (**BI\_HydHzd**).
- A risk layer based on previous fires (**BI\_VegFireHzd**).
- An overall hazard layer (**BI\_AllHzd**).
- A boundary delineating the Wildland-Urban Interface (**WUI1**).

## Geoprocessing Steps:

### Fuels

1. To represent paved areas, three road layers were merged together and given the FBFM40 attribute NB1. The Kitsap County road centerlines (**roadcl**) layer was used as the foundation layer due to its accuracy in representing roads. Private roads from the Bainbridge Island roads layer (**BIRD**) were clipped and merged along with the Bainbridge Island driveways layer (**Driveways**). The combined road layer (**Corr\_2RoadDrvEdit2**) was visually corrected against a 0.5 ft resolution orthophoto (**BainbridgeOrtho**) for accuracy and given a 20 ft buffer (**Corr\_2RoadDrvEdit2\_Buffer**).
2. A polygon layer (**BainbridgeFuels7**) with the FBFM40 field was created where boundaries between areas of low (FBFM40: GR1, GR2, & GS2) and absent fuel hazards (FBFM40: NB1, NB2, & NB9) were visually delineated from densely vegetated areas using the 0.5 ft resolution orthophoto (**BainbridgeOrtho**).
3. The FBFM40 fuel raster was converted to a shape file and projected to the NAD 83 datum for compatibility (**fbfm40 polygon -> fbfm40polygon\_Project1**).
4. Features delineated in **BainbridgeFuels7** were clipped from **fbfm40polygon\_Project1** (**BainbridgeFuels7**) -> copy and draw outline around extent -> clip features from outline and save edits -> **BainbridgeFuels7copy**.
5. The **fbfm40polygon\_Project1** layer was clipped with **BainbridgeFuels7copy** layer creating **fbfm40polygon\_Project1\_Clip** layer.
6. The **fbfm40polygon\_Project1\_Clip** layer was copied and checked for discrepancies against the orthophoto and edited accordingly resulting in: **fbfm40polygon\_Project1\_ClipCopy**.

7. **BainbridgeFuels7** was merged with **fbfm40polygon\_Project1\_ClipCopy** creating **Fuels7\_FBFMpolyMerge**.
8. The road layer (**Corr\_2RoadDrvEdit2\_Buffer**) was clipped and merged with **Fuels7\_FBFMpolyMerge** resulting in **FIs7\_FBFMrdMg**.
9. The merged polygon layer (**FIs7\_FBFMrdMg**) was converted to a raster using “maximum combined area” with 1 ft cell resolution (**BI\_VegFIs**).
10. The fuels raster (**BI\_VegFIs**) was reclassified according to the criteria described above (Table J1), creating the fuels hazard layer (**BI\_FuelHzd**).

#### **Slope**

1. The *Import Interchange* tool was used to import Kitsap DEM raster (**KitsapDEM**).
2. The *Slope* tool was used to create a slope layer from the Kitsap DEM (**BI\_Slope**).
3. Using the *Reclassify* tool, **BI\_Slope** was reclassified by percent rise from 1-15 and given a 1 ft cell size output (**BI\_SlopeHzd**).

#### **Aspect**

1. The *Import Interchange* tool to import Kitsap DEM raster (**KitsapDEM**).
2. The *Aspect* tool was used to create an aspect layer from the Kitsap DEM (**BI\_Aspect**).
3. Using the *Reclassify* tool, **BI\_Aspect** was reclassified from 0 -5 (Table 2) and given a 1 ft cell size output (**BI\_AspectHzd**).

#### **Wildfire Ignition Risk**

Vegetation fires data from 1989 through 2009, with corresponding address locations, was provided by the Bainbridge Island Fire Department in an Excel spreadsheet.

1. Using the *Geocoding* tool based on ESRI Streetmap and Google Maps geocoding data, and the Bainbridge Island vegetation fires 1989-2009 spreadsheet, a layer was created with the vegetation fires spatially represented (**Geocoding\_Result\_89\_90\_Merge**).
2. The **Geocoding\_Result\_89\_90\_Merge** layer was projected into NAD 83 for analysis (**vf\_08\_09**).
3. The *Kernel Density* tool was used with a radius setting of 2978.921 (the radius of a spherical square mile) to create a layer of fires per square mile (**KD\_vf\_2979**).
4. The **KD\_vf2979** layer was reclassified by quartiles and given a hazard rating ranging from 1-5 with a 1 ft cell size output (**BI\_VFireHzd**).

#### **Hydrant Access Hazard**

This layer represents areas within a fire hose length (1000') of a fire hydrant.

1. Using the *Buffer* tool, a 1000' buffer was added to the **Hydrants** layer (**Hydrant\_1000buffer**).
2. Using the *Merge* tool, the **Hydrant\_1000buffer** layer was merged with an outline shape (**NoHydrants**) and given an attribute field for hydrant access (**Hyd\_Merge**).
3. Using the *Reclassify* tool, the **Hyd\_Merge** layer was reclassified as 0 or 5 for "access" or "no access" (**Hyd\_Hzd**).
4. Using the *Polygon to Raster* tool with "maximum combined area" setting and 1 ft cell size output, the **Hyd\_Hzd** layer was converted to a raster grid (**BI\_HydHzd**).

### Priority Mitigation Areas

The PMA layer was developed using the Bainbridge Island site addresses shapefile (**situs**).

1. The **situs** layer was clipped to include only those address points that lie in moderate wildfire hazard or above the **BI\_AllHzd** layer in order to eliminate **situs** points in
2. Using the *Kernel Density* tool, the **situs** layer was converted to houses per 40 acres using a 1489.461 radius (the diameter of a 40-acre circle) with a 1 ft cell size (**KD\_sitHzd**).
3. This layer was reclassified according to WUI intermix densities of  $\geq 1$  house per 40 acres (**Re\_sitHzd**).
4. **Re\_sitHzd** was converted to a polygon using the *Raster to Polygon* tool (**sitHzdply**).
5. SR 305 was clipped from the **roadcl** layer, given a 1000' buffer and merged with the WUI polygon in order to include the primary egress route in the WUI (**BI\_PMAedit**).
6. The **BI\_PMAedit** layer was further edited by hand based on input from BIFD and public meetings resulting in the final mitigation priority area (**BI\_PMA**).

### Modeling

Modeling layers were developed using *Flammap* modeling software.

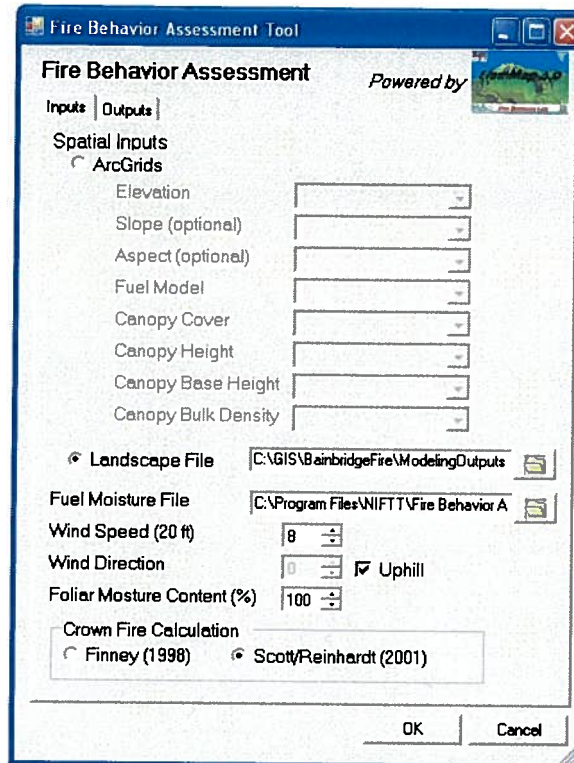
1. GIS layers for Elevation, Slope, Aspect, FBFM40, Canopy Cover, Canopy Height, Canopy Base Height, and Canopy Bulk Density were downloaded from LANDFIRE using the Landfire Data Access Tool (LFDAT)<sup>10</sup> in order to get identical extents, 30m cell size, and NAD83 projection coordinates.
2. The downloaded FBFM40 raster was clipped and merged with the revised FBFM40 raster (**BI\_VegFls**) creating (**FBFM\_Rev**).
3. Using *Flammap*, a landscape file (**Landscape.lcp**) was created using all nine layers including the revised FBFM40 layer (**FBFM\_Rev**).

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<sup>10</sup>

<http://frames.nbii.gov/portal/server.pt?open=512&objID=382&PageID=1675&cached=true&mode=2&userID=316>

4. Four outputs were created using the Landscape.lcp file, *Flammap* default fire season fuel moisture file, uphill wind direction, default 100% foliar moisture, and Scott and Reinhardt crown fire calculations.
5. Flame length outputs were created using “watch out” wind speeds of 8, 15, 20 mph (**FL8mphW**, **FL15mphW**, **FL20mphW**) and a Rate of Spread output was created using 20 mph wind speeds (**ROS20mphW**).



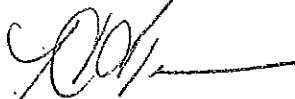
## Acknowledgements and Approvals

Plan prepared by:  
Peninsula College

With assistance from:  
Bainbridge Island Fire Department and the Washington State Department of Natural Resources.

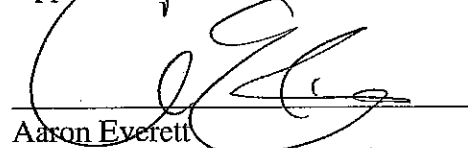
The Bainbridge Island Fire Department (BIFD) is very excited to enter into a partnership with Firewise; the purpose for this partnership is to make our community a safer place to live, work and play. We anticipate that this relationship will enhance the ability of the BIFD to provide our customers with some valuable tools, materials and advice for making their homes safer from wildfires in cooperation and partnership with Firewise and other Bainbridge Island and Kitsap County agencies.

Respectfully,

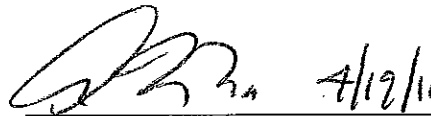


Hank Teran, Fire Chief

Approvals:



Aaron Everett  
Washington State Forester  
Washington Department of  
Natural Resources  
Box 47001  
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Olympia, WA 98504-7001



Art Tasker  
South Puget Sound Regional Manager  
Washington Department of  
Natural Resources  
950 Farman Ave N.  
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See attachment for additional approvals.

Phyllis Mann, Director



KITSAP COUNTY  
EMERGENCY MANAGEMENT  
COUNCIL - 2011

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March 21, 2011

Chief Hank Teran  
Bainbridge Island Fire Department  
8895 Madison Ave. NE  
Bainbridge Island, WA 98110

Dear Chief Teran:

On behalf of our office thank you for giving us the opportunity to review the newly developed Bainbridge Island Community Wildfire Protection Plan (CWPP). This plan is very detailed and we concur with all the mitigation strategies outlined in the plan.

I recommend the following:

1. The CWPP become an appendix to the Kitsap County Mitigation Plan, 2010.
2. The CWPP become an appendix to the Bainbridge Island Comprehensive Emergency Management Plan which is now being updated by this office.

Please keep this office apprised of any updates you make to this plan. If we can be of further assistance to you or your staff, do not hesitate to call.

Sincerely,

Phyllis A. Mann, Director

A handwritten signature in black ink that reads "Phyllis A. Mann".

CC: Jared Moravec