

# Community Wildfire Protection Plan for Mary's River Estates Philomath, Oregon

July 2007



Prepared by



**Forest Restoration Partnership**



Mary's River Estates Community Wildfire Protection Plan

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## Chapter 1 - Introduction

This plan has two main goals. First, to provide silvicultural prescriptions that can reduce the risk of property loss, due to wildland fire, in the Mary's River Estates subdivision. Second, to promote a better understanding of how to take preventative measures that may help prevent the loss of structures during a wildland fire. This plan also discusses the potential for both crown fires and surface fires in the subdivision of Mary's River Estates, and makes recommendations to help reduce the risk of property loss in the case of such fires.

Fire plays an important role in our forested ecosystems. Historically oak woodland and savanna forest types had a very short time interval between the occurrences of fires. With the current and past fire suppression efforts we have dramatically increased this interval. By suppressing fires quickly we have changed these ecosystems, allowing coniferous trees, such as Douglas-fir, to establish and overtop the oak trees that once dominated the landscape. In some cases these forests have been altered to the point where oak is no longer the primary tree species and the understory is now dominated by woody shrubs, rather than the grass and forbs once present.

Besides the change in the actual forest we have also seen an increase in the amount of people that are residing close to the forest, in the wildland urban interface (WUI). Due to the increase of humans in these areas there is a significant increase in the risk of property and structure loss due to a wildland fire.

A crown fire needs both conditions that initiate the fire and those that will sustain it through a forest stand. Factors that influence the initiation of a crown fire consist of crown base height and the heat of ignition. Factors that influence whether or not a crown fire can sustain in a stand consist of canopy bulk density, canopy cover, and forest cover type. There are also two main types of crown fires: passive and active crown fires. A passive crown fire is one that torches individual trees and does not make a "run" through the forest, by passing from one tree to another. An active crown fire is one that "runs" through the forest, spreading from one tree to another, and often results in a stand replacing fire, completely removing the overstory. Active crown fires have historically been the type of fires that occur in western Oregon and Washington forested landscapes. These forested landscapes consist of an overstory dominated by coniferous trees, such as Douglas-fir, and an understory dominated by woody shrubs and small hardwood trees, such as bigleaf maple and red alder.

A surface fire is a fire that runs through the understory of a forest, but can be just as dangerous, to residents, as a crown fire in the wildland urban interface. Surface fires are a result of fine fuels and woody shrubs burning and can bring a fire right up to a house. These fires can quickly carry to a house if defensible parameters are not met by a homeowner. In the right conditions, a surface fire can also result in a crown fire. Ladder fuels, fuels that reach from the ground up into the canopy, can quickly cause a surface fire to carry up into the canopy and ignite a crown fire. Surface fires have historically occurred in forested landscapes of the foothills to the Oregon Coast Range, such as oak woodland and oak savannas.

## ***Organization of the Plan***

This plan is organized into six chapters.

### **Chapter 1 – Introduction**

This chapter states the goals of this plan and describes how fire plays a role in a forested ecosystem.

### **Chapter 2 – Objectives**

This chapter provides the objectives of the plan.

### **Chapter 3 – Background**

This chapter describes the historical and current state of the forests and the historical use of fire in the area of Mary's River Estates. It also describes the climate, population, and development in the area of the project. Lastly, this chapter defines what a Community Wildfire Protection Plan is and why a community should develop one. It also describes who was involved in developing this plan.

### **Chapter 4 – Methods**

This chapter describes the methods used to analyze the forest areas around Mary's River Estates and determine the potential for a fire to occur. It also illustrates how individual structures were assessed to determine how emergency responders would protect each structure.

### **Chapter 5 – Recommendations and High Priority Sites**

This chapter gives specific recommendations on how to reduce the amount of hazardous fuels in the project area. It also provides ways for a homeowner to help protect their own property in the case of a fire. Finally, it discusses different evacuation routes for residents in the case of a fire, and provides a way to inform residents of these routes.

### **Chapter 6 – Conclusion**

This chapter reiterates that initial treatments are not going to be enough, constant monitoring and re-evaluation will be necessary to maintain a fire-safe community.

## Chapter 2 - Objectives

The objectives of this plan are to:

- Increase public understanding of living in a fire vulnerable environment.
- Provide landowners, within Mary's River Estates, with information of potential fire behavior in their community.
- Identify areas that may produce extreme fire behavior under various weather conditions.
- Develop silvicultural treatments that may reduce the risk of extreme fire behavior and that develop a fire resilient landscape.
- Identify high priority areas and develop silvicultural prescriptions for immediate treatment.
- Provide landowners with resources that explain preventive measures that they can take to help reduce the risk of structure loss.

## **Chapter 3 - Background**

### ***Description of Project Area***

Mary's River Estates is located in Benton County, Oregon and is in close proximity to the Cities of Corvallis and Philomath. It is located approximately one mile west of Philomath, on US Route 20, and is approximately 645 acres. The subdivision is situated on south and east-facing slopes, which tend to be much drier than other slopes, in the eastern foothills of the Oregon Coast Range. Figure 1, on the next page, shows the location of Mary's River Estates in relation to Philomath and Corvallis.

### ***Climate***

The climate for this area consists of cool, wet winters and warm, dry summers. Average temperatures range from 41° F in the winter to 65° F in the summer. Extreme temperatures during the summer can result in high temperatures above 90° F for an average of 5-15 days a year. Winter low temperatures can drop below zero, but only do on an average of once every twenty-five years. Mean annual precipitation for the subdivision ranges from 50-70 inches (Natural Resources Conservation Service, 2007).

Winds in the Willamette Valley can also be very erratic and play an important role in the case of a fire. East winds can dry fuels out much quicker and, during a fire, can cause the fire to spread very rapidly throughout the area.

### ***Population***

Currently Mary's River Estates has 100 houses with an average of 3 people per household. There are retirees as well as families living in the subdivision. Philomath is one of the fastest growing cities in Benton County and subdivisions similar to Mary's River Estates, and neighboring Wren Hill Estates, will continue to grow in the future. An increase in the number of people living in these subdivisions increases the importance of educating landowners about living in a fire vulnerable environment.

### ***Development***

Over the next ten years the cities of Corvallis and Philomath are expected to continue to grow. With this growth more people will have the desire to live near the cities in the wildland-urban interface (WUI), the area that is developed on the edge of the surrounding forests. Mary's River Estates is a perfect example of a subdivision located in a WUI. With the increase of people living in and around a WUI, public responsibilities of living in a fire vulnerable ecosystem will need to be understood by everyone.



## Location of Mary's River Estates in Relation to Philomath and Corvallis, Oregon

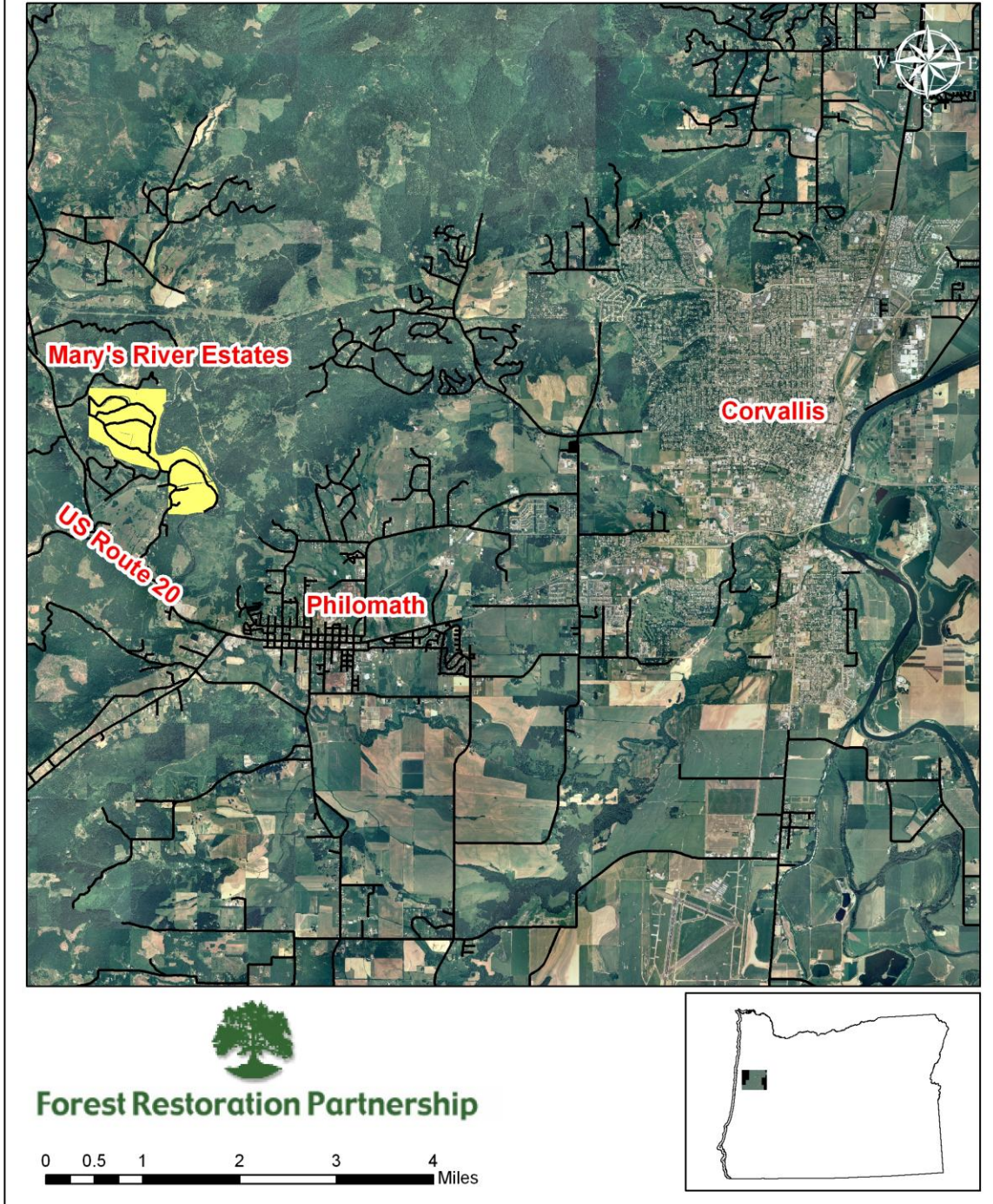


Figure 1: Location of Mary's River Estates

## ***Historic Forest Types and Presence of Wildland Fire***

Forests in the area of Mary's River Estates are quite productive due to the mild temperatures, amount of precipitation, and deep, rich, fertile soils. Historically this landscape was dominated by oak woodland and savanna with an understory consisting of grasses and forbs. These landscapes tended to burn on a regular basis with low intensity surface fires. This area was also heavily influenced by the Kalapuya Indians. The Kalapuya's frequently burned this area to make the landscape more favorable to elk and deer, which they hunted for food. With the inhabitant of Euro-Americans, the native tribes moved on and with them so did there constant fires. With the loss of these fires, conifer trees have established and have overtopped the oak trees. The understory has changed from grasses and forbs to an understory with more woody shrubs and dead and down wood. These types of forests are similar to those of the Oregon Coast Range and have historic fire return intervals of 150-300 years. These fires also tend to be that of large stand replacing fires, rather than the low intensity, frequent fires of the oak woodland forest type.

## ***What is a Community Wildfire Protection Plan***

A community wildfire protection plan brings together information that assesses the risk of a fire based on current forested conditions, displays the potential structure loss if a fire were to occur, and develops silvicultural treatments that could help to prevent and protect the community from a wildland fire. Although there is no current law requiring a wildfire protection plan, it allows a community to coordinate efforts that will allow everyone to get involved in the protection of their homes. These efforts consist of fuel reduction treatments, developing a defensible space around structures, and continued maintenance of the surrounding forested areas.

The Oregon Forestland-Urban Interface Fire Protection Act of 1997 (also referred to as Senate Bill 360), recognizes land that is located within an urban, or suburban, area that is vulnerable to a fire. This Act engages property owners to assist in achieving the goal of reducing a fire vulnerable area back towards a more fire resilient area. Although Benton County has not yet identified these areas, this plan has been developed in anticipation of the identification of such fire vulnerable areas in Benton County. This plan also allows the community to have a written plan for applying, and being approved, for National Fire Plan grants. These grants can be obtained to "reducing hazardous fuels that may threaten communities and natural landscapes within the wildland-urban interface on non-federal land (Pacific Northwest National Fire Plan)."

## ***The Planning Process***

This plan was developed by the cooperation of the Philomath Fire Department, Oregon Department of Forestry, Benton County, Mary's River Watershed Council, and Forest Restoration Partnership (a non-profit organization that promotes the conservation and restoration of declining forest habitats on private lands in the Western United States.)

The Philomath Fire Department performed a structure analysis of houses throughout the subdivision, the Oregon Department of Forestry distributed a Living with Fire™ brochure to

residents within the subdivision, and Forest Restoration Partnership performed the fuels analysis, developed fuel reduction treatments, and prepared the written plan.

During the months of January and February 2004 city planners in Corvallis and Philomath, the Philomath and Corvallis Fire Departments, Forest Restoration Partnership, and the Oregon Department of Forestry met three times to discuss which subdivisions should be selected to receive the grant money. Mary's River Estates was selected from the Philomath Fire District and Vineyard Mountain from the Corvallis Fire District.

On January 19, 2004, during the Mary's River Estates Property Owners' Association meeting, members of the Association voted to support the grant proposal for fuel reduction to mitigate the possibility of a catastrophic wildland fire.

An Interagency National Fire Plan Community Assistance Grant, through the Bureau of Land Management, was awarded in September 2005. The grant was award to development comprehensive fire plans that will help reduce the risk of a fire in Mary's River Estates, located in the Philomath Fire Protection District, and Vineyard Mountain, located in Corvallis Fire Protection District.

On May 11, 2006 a letter was mailed to all property owners within Mary's River Estates describing the grant and asking for permission to enter their land for fuels analysis. The letter also included a questionnaire that allowed the landowner to specify whether or not they would allow for Forest Restoration Partnership to enter their property. The letter and questionnaire can be seen in the Appendix as Attachment 1 and 2. A map, showing the landowners that granted permission for Forest Restoration Partnership to enter their property, can be seen on the next page.

A final meeting occurred on September 29, 2007 to review the first draft of the plan. In attendance were representatives from Philomath Fire and Rescue, Forest Restoration Partnership and the Oregon Department of Forestry. The plan was discussed in detail and a timeline was established to finish the plan. Other items discussed at the meeting were organizing a community meeting once the plan was finalized and putting out a mailing to residents explaining the plan and the results of the structure and fuels analyses.

## Landowners that Granted Permission for Forest Restoration Partnership to Enter their Land

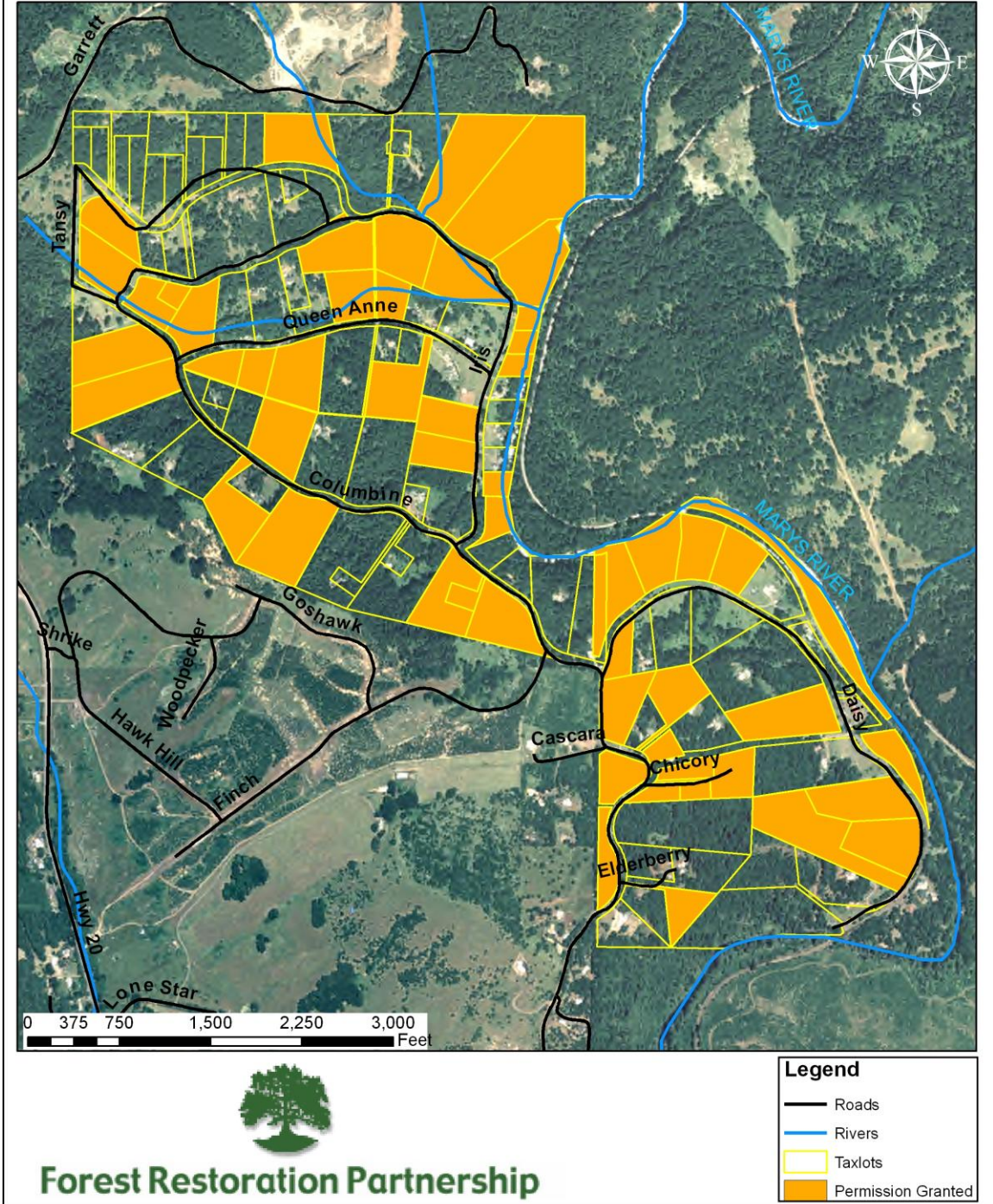


Figure 2: Landowners that Granted Permission to Enter their Property

## Chapter 4 - Methods

### *Wildfire Risk Assessment*

#### **Stand Typing**

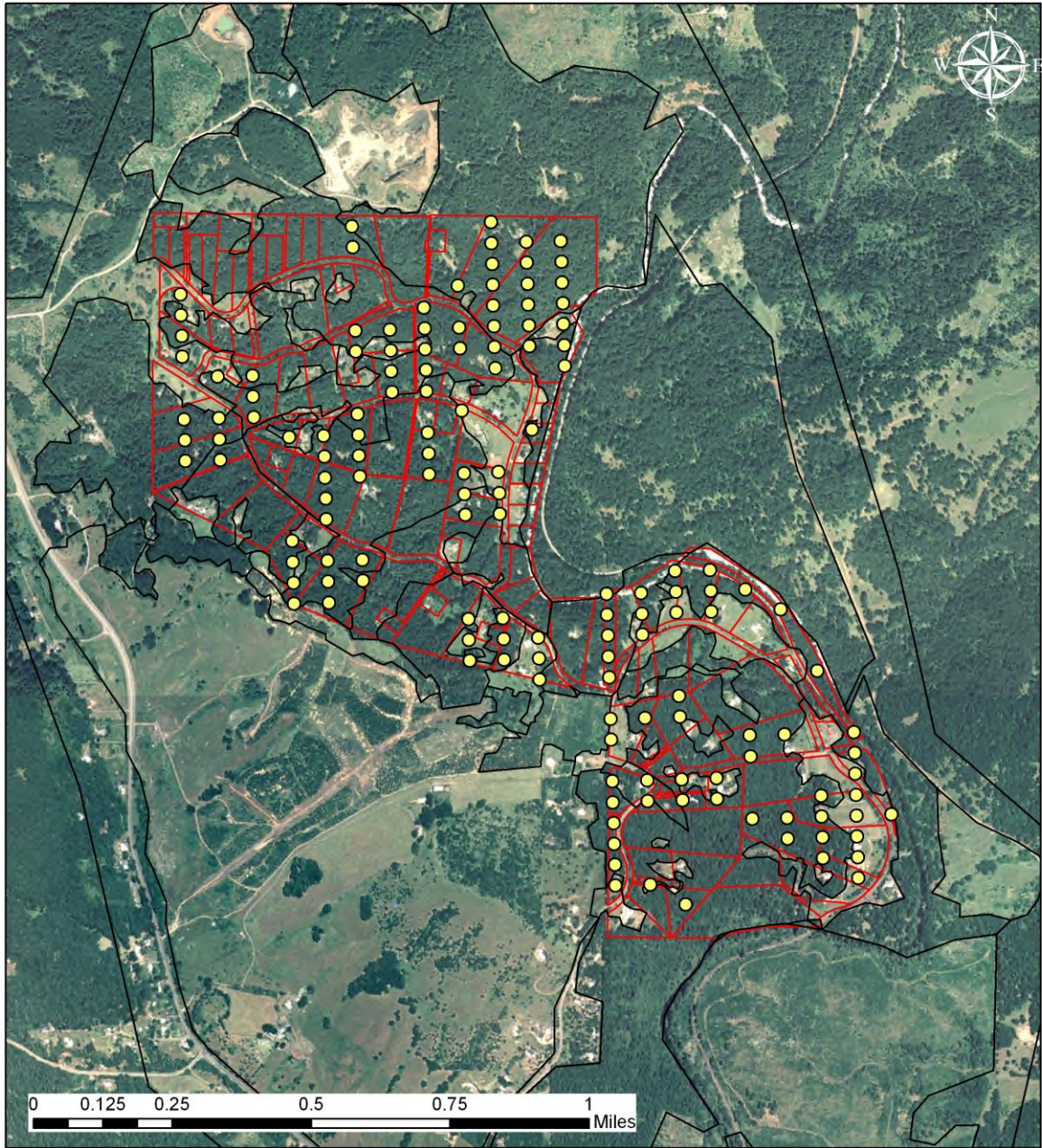
Using the subdivision boundaries and aerial photographs, each subdivision was divided into stands based on the forest cover types. Forest cover types are defined by primary vegetative cover, secondary vegetative cover, density, estimated age, and size class. Stands were then digitized as polygons using the GIS software ArcGIS 9.2™. See Attachment 3 for a more detailed description of stand types used.

#### **Inventory Procedures**




Using the forest stands and subdivision boundaries, an inventory plot grid was established using GIS. Each plot consisted of a variable-radius plot for trees greater than 5.5” diameter at breast height (DBH), and a 1/100<sup>th</sup> acre fixed-radius plot for trees less than 5.5” DBH. For each tree on a plot, species, DBH, crown height (base of the tree to the first live branch), and crown class (dominant, co-dominant, intermediate, or suppressed) were recorded. On the variable-radius plots, heights were recorded for one tree per species per plot. On the fixed-radius plots, heights were recorded for every tree. A fuel model call was also made at each plot. See Attachment 4 for a complete explanation of the inventory procedures.

Before any inventory data was collected, landowners were contacted to ask for their cooperation with the project. Data was only collected where landowners granted permission for technicians to access the property. A total of 143 inventory plots were established for data collection. Figure 2, on the next page, shows a map of the inventory plot locations.

# Inventory Plot Locations



**Forest Restoration Partnership**

Legend	
	Inventory Plots
	Stands
	Taxlots

**Figure 3: Map of Inventory Plot Locations**

## **Fuel Model Calls**

Fuel model calls were determined as defined by Scott and Burgan's *Standard Fire Behavior Models: A Comprehensive Set for use With Rothermel's Surface Fire Spread Model (2005)*. The following subset of Scott and Burgan's fuel models were determined to be appropriate for the inventory areas:

GR4: Moderate Load, Dry Climate Grass (Dynamic)  
SH5: High Load, Dry Climate Shrub  
TU1: Low Load, Dry Climate Timber-Grass-Shrub (Dynamic)  
TU5: Very High Load, Dry Climate Timber-Shrub  
TL1: Low Load Compact Conifer Litter  
TL3: Moderate Load Conifer litter  
TL5: High Load Conifer Litter  
TL9: Very High Load Broadleaf Litter

## **Fire Behavior Modeling and GIS Analysis**

Once the inventory data was collected it was analyzed with other GIS layers and a fire behavior modeling software package, *FlamMap*<sup>TM</sup>, to predict where there is a potential for surface fires and crown fires. *FlamMap*<sup>TM</sup> utilizes raster data from the GIS layers and a 10 meter Digital Elevation Model (DEM) to model the fire behavior for each 10-by-10 meter cell, independent from all adjacent cells.

Slope, aspect, and elevation were derived from the DEM and used to define the project area. Fuel model, canopy cover, crown base height, and canopy bulk density were derived from the inventory data. An additional data compiling program, designed by Donald W. Carlton at Fire Program Solutions, was utilized to take the inventory data and generate raster datasets that could be used in *FlamMap*<sup>TM</sup>. Mr. Carlton personally performed this analysis using the program *CM3 Batch*<sup>TM</sup>. Mr. Carlton's company, Fire Program Solutions, LLC, provides "state-of-the-art methods, processes and analytical support to examine fire management program issues (Fire Program Solutions)."

Three different fuel moisture scenarios were used to model the fire behavior. Each of these fuel moisture scenarios contained values for 1, 10, and 100 hour fuel moisture, herbaceous fuel moisture, and woody fuel moisture. The three fuel moisture scenarios consisted of moderate weather conditions (16-89<sup>th</sup> percentile), high weather conditions (90<sup>th</sup> percentile), and extreme weather conditions (97<sup>th</sup> percentile). Wind speeds, acquired from the Village Creek Fire and Weather Station (station number 352547), were determined for winds twenty feet above the forest canopy in each scenario. The Village Creek station was used due to its close proximity to Mary's River Estates and its longer span of historical weather data (1985-2006). It is located approximately 40 miles southwest of the estates and is maintained by the Bureau of Land Management (BLM). See Attachment 5 for detailed values of each fuel moisture scenario.

To determine the high priority sites, the crown fire output, from *FlamMap*<sup>TM</sup>, was converted to a GIS layer and overlaid on the stand type map and the taxlot information. The high priority sites were then found based on stand types and specific areas that were more susceptible to crown fires. These sites were then considered as primary target areas to reduce

fuel loads and are discussed in greater detail in the “Recommendations and High Priority Sites” section of this plan.

It is important to note that *FlamMap*<sup>TM</sup> does not predict the potential for ignition in the analysis area. Instead, the program assumes that an ignition has taken place in every cell analyzed, and then makes fire behavior predictions based on slope, aspect, fuel model, canopy cover, crown base height, canopy bulk density, and fuel moisture values. In addition, *FlamMap*<sup>TM</sup> should be used only as a general fire behavior modeling tool, and the results provided by this tool should not be interpreted as an exact prediction of potential fire behavior under a broad range of conditions. The prescriptions we have developed using the information provided by this program were not modeled to determine changes in fire behavior as a result. They were instead based on existing fuel conditions, and widely accepted practices which can be used to change these conditions.

### ***Structure Vulnerability***

During the month of August 2006, the Oregon Department of Forestry conducted a door-to-door distribution of “Living with Fire, A Guide for the Homeowner,” a pamphlet with information pertaining to what a homeowner can do to help protect their property from a fire. During this same time period, Philomath Fire and Rescue completed a structure assessment of Mary’s River Estates. The Philomath Fire and Rescue Triage Checklist was used to determine which structures would be defended before others, in the case of a fire. The following questions were assessed for each structure within the subdivision:

- Is the driveway longer than 200 feet?
- Is the roof made of combustible-asphalt shingles or wood?
- Is the siding made of combustible-wood or shingles?
- Are there trees overhanging the roof?
- Are trees and brush thinned within 30 feet of the structure?
- Are vehicles parked outside, within 30 feet of the structure?
- Are there slopes more than 20%, anywhere within 30 feet of the structure?
- Are there slopes more than 40%, anywhere within 30 feet of the structure?
- Is there a deck unenclosed to the ground, or is the structure built on stilts?
- Is there an overhead power line within 30 feet of the structure?

The driveway is also assessed to determine:

- If it is less than 12 feet wide?
- If branches overhang the driveway (14 foot clearance)?
- If it is too steep to back in (greater than 15% grade)?
- Do down and dead fuels line the driveway?



If the answers to any of the above questions are “yes”, the structure fails that question. If the answers to any of the above questions are “no”, the structure passes that question. After the assessment, the structure is determined to be in one of the following final rating categories:

1. Low Hazard
2. Moderate Hazard
3. High Hazard
4. Extreme Hazard

Table 1 shows the number of “yes” responses to determine a structures final rating:

**Table 1: Definition of Structure Hazard Ratings**

Area of Interest	Number of "yes" responses	Result
Structure	8-10	Extreme hazard
Structure	6-7	High hazard
Structure	3-5	Moderate hazard
Structure	0-2	Low Hazard

The amount of “yes” answers corresponds to the amount of efforts needed, by firefighters, to protect and save a particular structure. With limited resources, the fire department and assisting agencies may have to make decisions about which houses they will defend. Since an “Extreme hazard” home will require more effort, they may choose to protect a home with a more favorable rating. This allows them to save the most homes in the community. The ideal situation would be to have all structures with a final rating of “Low hazard”.

## Chapter 5 - Recommendations and High Priority Sites

Recommendations for action are broken into five main categories: access roads and evacuation routes, water sources, structure risk, mitigation of hazardous fuels, and the identification of high priority sites. These recommendations have been prioritized, highest to lowest, by the Philomath Fire Department, and are as follows:

1. Evacuation Routes
2. Structure Risk/Defensible Space
3. Mitigation of fine fuels
4. High Priority Sites
5. Water Sources

### *Access Roads and Evacuation Routes*

The goals of this section are:

- Establish evacuation routes in the case of an emergency.
- Identify a way to make all evacuation routes familiar to residents.

Currently there are two different ways to access Mary's River Estates. The first route is via Mary's River Estates Road, which junctions with US Route 20. The second route is a network of roads through Wren Hill Estates, located a few miles further west off of US Route 20. Both of these routes can be used as an evacuation route for residents, but they need to be made known to residents, since the route through Wren Hill Estates is relatively new. Residents also need to be aware of which route they should take, if being evacuated, so as not to interfere with fire engines trying to access Mary's River Estates. The route through Wren Hill Estates, from Mary's River Estates, accessed US Route 20 via Finch Lane, Hawk Hill Road, and Shrike Way. The primary evacuation route, as to not to interfere with incoming firefighting apparatus, is for residents to exit via the Wren Hill Estates route. The route via Mary's River Estates Road should only be used if a fire has compromised the Wren Hill Estates exit route.

Fire evacuation route signs, similar to tsunami evacuation route signs on the Oregon Coast, should be placed throughout the subdivision. These signs will allow residents to exit the subdivision, in the case of an emergency, in a very timely and efficient manner. This will also help to keep residents from interfering with incoming emergency vehicles as they exit the subdivision. Figure 3, on the next page, shows a map of the evacuation routes.

# Evacuation Routes

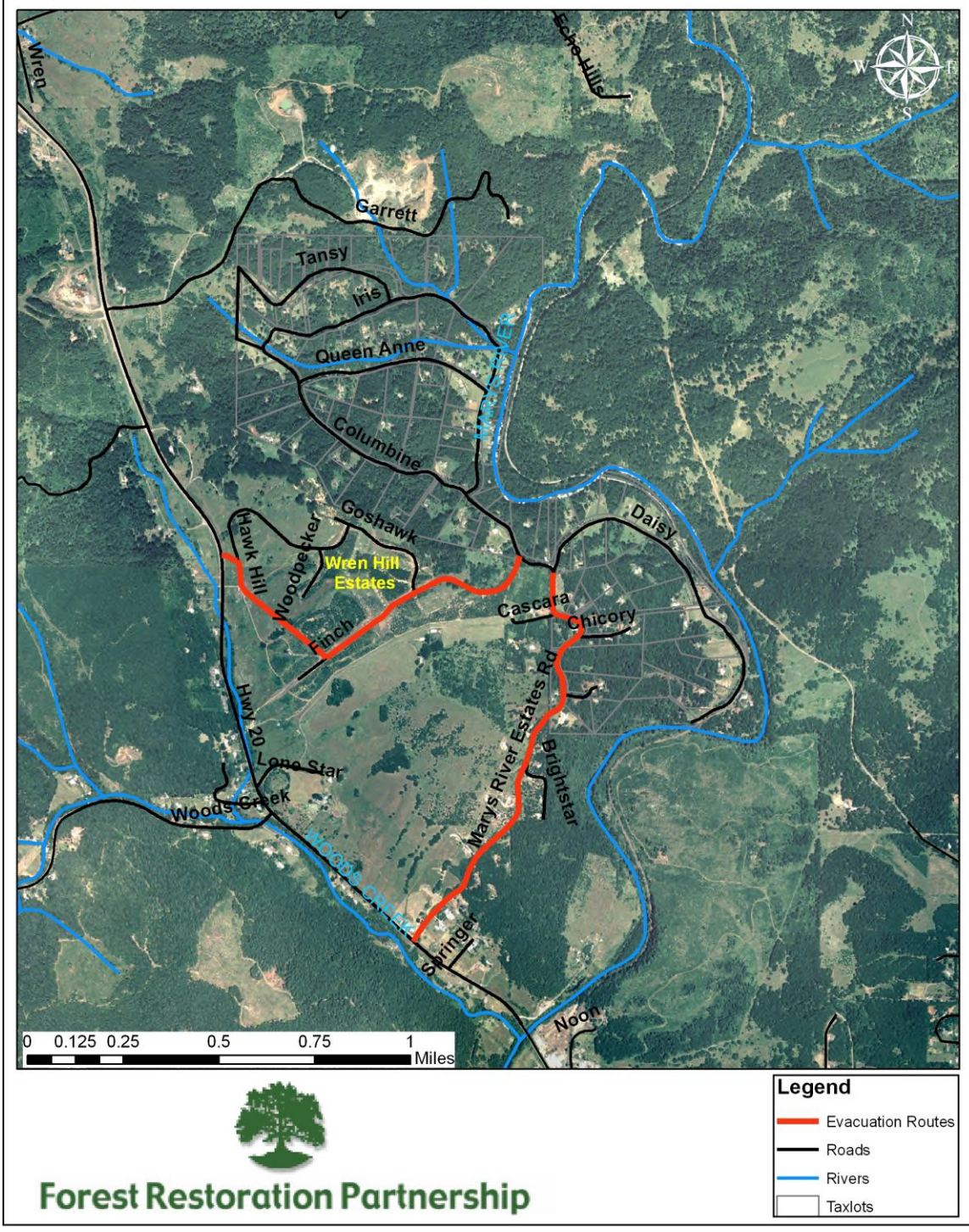


Figure 4: Map of Evacuation Routes

## *Water Sources*

The goals of this section are:

- Identify where current water sources are located.

Currently there are two main water sources to fight fire within Mary's River Estates. The first is a water pump on Daisy Drive, located inside of Mary's River Estates. The second source consists of two hydrants, fed from the same reservoir, in neighboring Wren Hill Estates. The map on the next page shows the location of these sources.

The Philomath Fire Department has concluded that these water sources are currently sufficient for firefighting operations, since they are on separate ends of Mary's River Estates.

# Water Source Locations

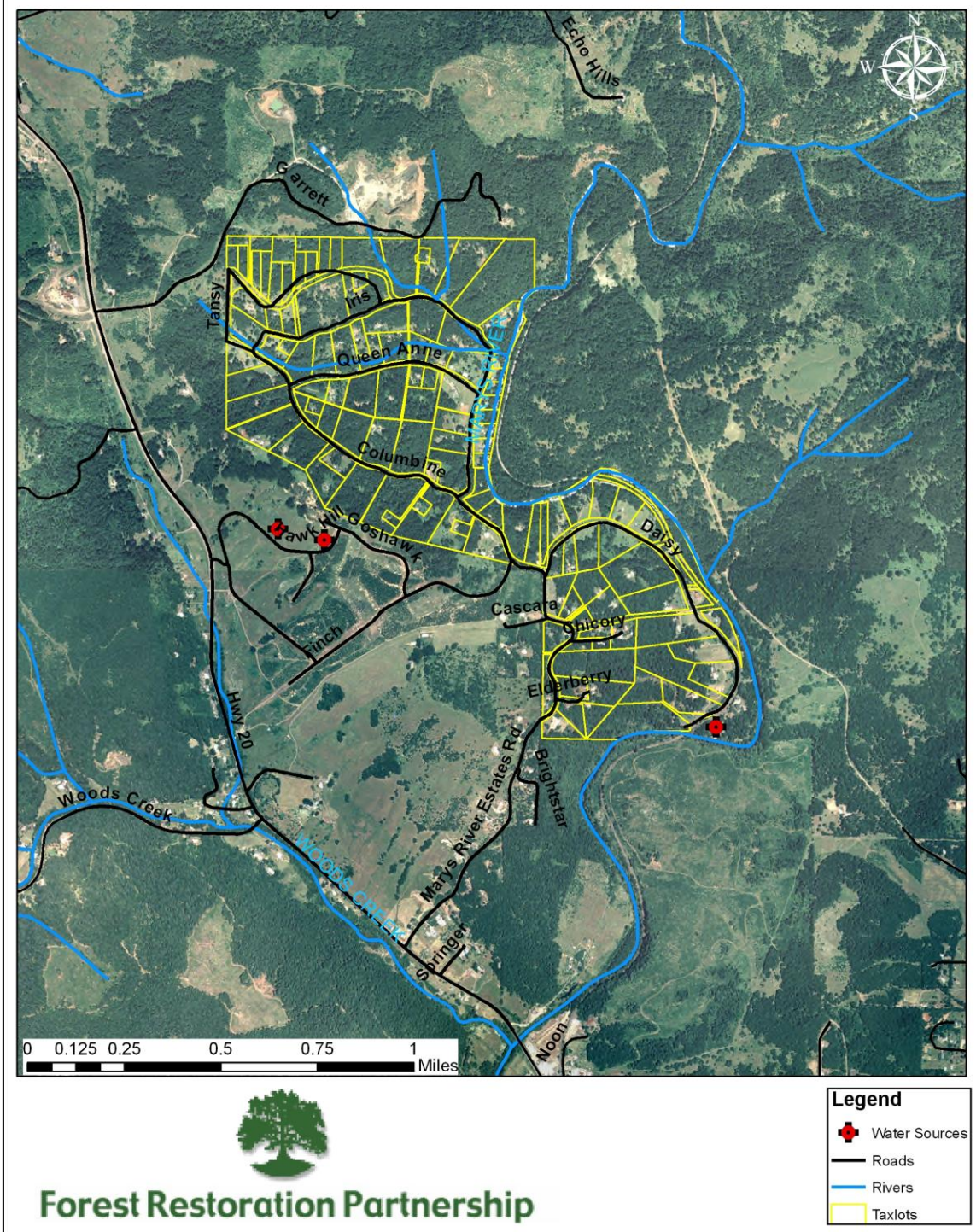


Figure 5: Water Source Locations

## Structure Risk

The goals of this section are:

- Educate the public on ways to decrease the risk of property loss in the case of a fire.
- Provide additional resources on living in a fire vulnerable landscape.

Based on the results, of August 2006, from the Oregon Department of Forestry fire prevention work and Philomath Fire and Rescue Structural Triage Checklist, Table 2, there are many houses that do not have the recommended defensible space and over half of the structures were determined to be either rated as an extreme hazard or a high hazard.

**Table 2: Percentage of Houses with each Structure Hazard Rating**

<u>Outcome for Defense of Structure</u>	<u>Percent of Houses</u>
Low Hazard	1.3%
Moderate Hazard	24.4%
High Hazard	32.0%
Extreme Hazard	42.3%

It is recommended that all structures in this subdivision be in compliance with Living with Fire™ practices. Living with Fire™ is a multi-agency organization that educates the public about living in a fire prone environment. The following list of recommendations is from the Living with Fire™ website, <http://www.livingwithfire.info/>. Additional information and resources pertaining to Living with Fire™ practices can also be found at their website, as well as the Firewise™ Communities website, <http://www.firewise.org/>.

- Excess vegetation on road shoulders is removed.
- Cedar shake roofs are replaced with a non-combustible, Class A alternative.
- Fuels, or other woody material, are chipped or removed immediately after cutting.
- Firewood is piled away from the house, not against it.
- A three-foot fire-free area, with no vegetation, is created on all sides of the house.
- Dead leaves and branches are removed from trees, shrubs, and plants within the home ignition zone (the area within 200 feet of your home).
- Remove leaves and conifer needles from the home ignition zone.
- Prune trees so the lowest branches are 6 to 10 feet from the ground in the home ignition zone.
- Cut back brush and shrubs at least 30 feet from your home.
- Lawn should be kept green to help serve as a fire break.
- Trees are thinned at the edge of the home ignition zone.
- Trees are carefully spaced within the home ignition zone, to help slow the spread of a fire.
- Provide a driveway that is at least 12 feet wide with a clearance of at least 14 feet to provide better access for emergency vehicles.

## ***Mitigation of Hazardous Fuels***

The goal of this section is to:

- Develop silvicultural treatments that can be used to reduce hazardous fuels throughout the subdivision.
- Identify each fire type; active crown fire, passive crown fire, and surface fire, and show where each is on the ground.

In order to reduce the risk of property loss in an area of high population, treatments should be designed to reduce the spread of a surface fire within 100 feet of a structure and reduce the threat of a crown fire over the entire landscape. To do this vegetation can be treated in one of two ways, or a combination of the two. The first would be to reduce the amount of cover in the understory, mainly through dead fuels (dead shrubs or standing or down dead trees) and ladder fuels. This will help to prevent a surface fire from becoming a crown fire. The second way would be to reduce the amount of cover in the overstory. This can reduce the crown fire behavior; however it can also increase the surface fire behavior through increasing winds that dry out understory fuels more rapidly. The following silvicultural treatments are recommended with the idea to keep a fire out of the canopy and to prevent extreme fire behavior. These treatments are also written to begin the restoration of oak woodland and oak savanna forest types. However, these treatments alone will not be sufficient to accomplish these goals; additional maintenance of the stand will need to occur, as described in the “Continued Maintenance of Fine Fuels and Understory Vegetation” section.

### **Treatment #1: Reduce Understory Fine Fuels**

Reducing the understory fine fuel load can be accomplished by brush mowing and masticating the understory. This can be accomplished by hand; however, due to the extensive labor of doing this by hand it can also be accomplished by using a machine with a masticating head. The purpose of this kind of treatment is to reduce and redistribute the amount of fine fuels on a given site. It should include areas with a high amount of fine fuels, such as woody shrubs in very close proximity to structures and/or roads. This treatment can also be used to reduce the amount of activity fuels (slash) after a thinning. Broadleaf shrub cover will not modify fire behavior during a crown fire in extreme weather conditions; however, they still should be removed in some forest cover types. For example, in an oak woodland/savanna, grass and forbs are desired over a shrub dominated understory. Grass and forbs will result in a faster moving fire, with a much lower intensity and severity than an understory dominated by shrubs. Broadleaf shrubs can also reduce fire behavior. Broadleaf shrubs can modify the microclimate on a site by increasing the humidity in the understory through transpiration and by increasing the amount of shade on site.

### **Treatment #2: Thin from Below**

Thinning from below is an effective treatment for stands that contain a high amount of coniferous trees in the smaller diameter classes. These trees tend to have crowns that are closer to the ground and act as ladder fuels. This is especially true of grand fir, a shade tolerant species that can have a crown base just off the forest floor. This treatment will result in a higher average crown base height and a reduction in crown bulk density for a given stand. It can also reduce the amount of tree mortality in a stand by removing the trees that are in the intermediate and

suppressed crown class stages. If these trees were to stay in a stand and die, they would become ladder fuel in the form of a standing dead tree or by increasing the amount of dead wood on the forest floor.

### **Treatment #3: Pruning and Tree Removal**

In some stands it can be more effective to assess crown fire potential on a tree-by-tree basis. In stands that have individually grown trees, with live crowns extending to the ground, pruning can be used to raise the height of the crown and reduce the risk of a fire getting into the crown. This treatment can be used in stands that have very few or no trees in the smaller diameter classes, but still have a high potential for a crown fire to exist.

### **Identification of each Fire Type**

The maps on the next three pages show the three different fire types across the subdivision, at the three different weather scenarios; moderate, high, and extreme. The results are from the *FlamMap*<sup>TM</sup> analysis. The different weather condition scenarios are described in the “Fire Behavior Modeling and GIS Analysis” section of this plan.

Areas that are within the surface fire and passive crown fire ratings should be individually assessed to remove understory fuels and ladder fuels. Areas that are modeled as an active crown fire are discussed in greater detail in the “High Priority Sites” section of this plan.



# Fire Behavior with Moderate Weather Conditions

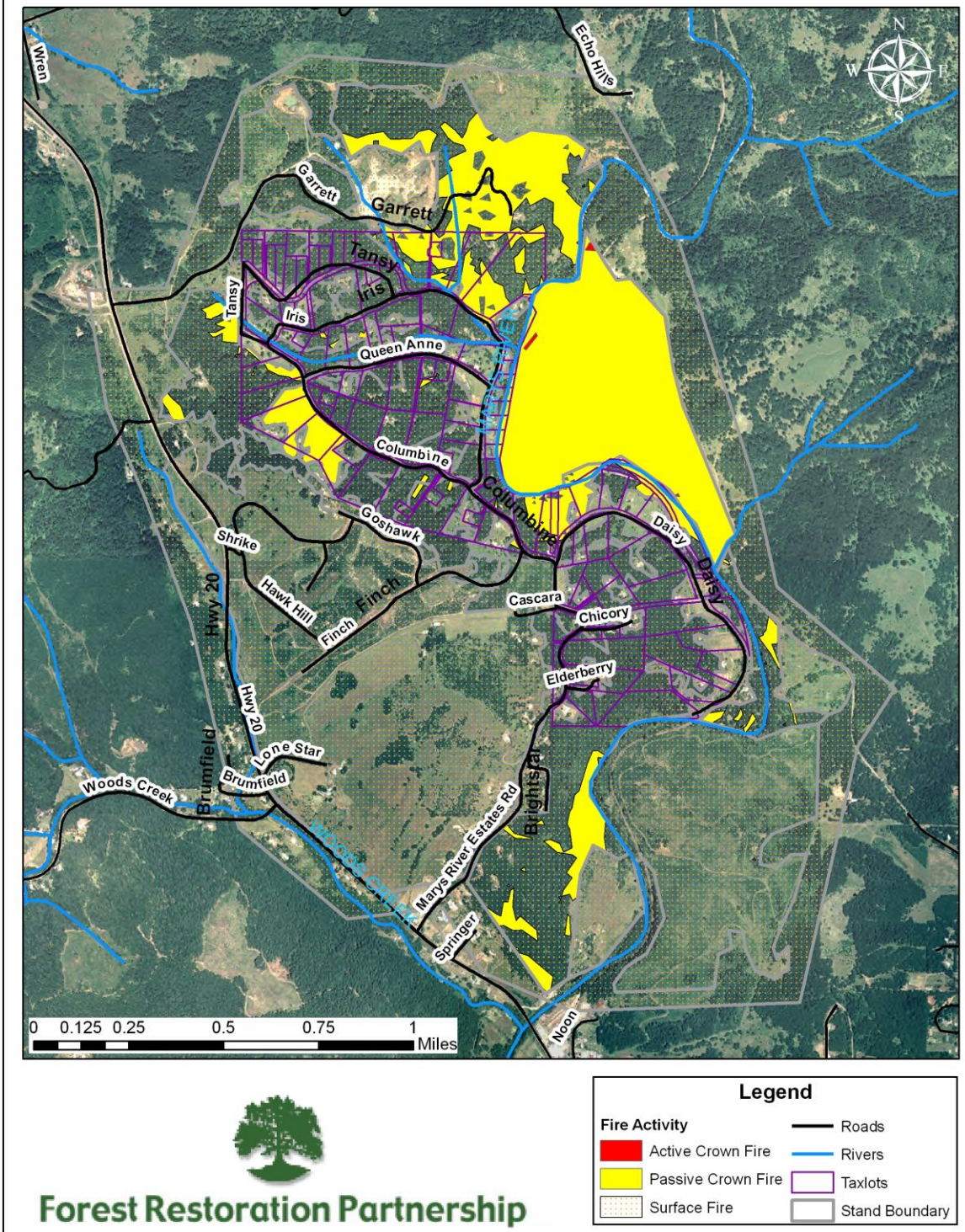


Figure 6: Fire Behavior with Moderate Weather

# Fire Behavior with High Weather Conditions

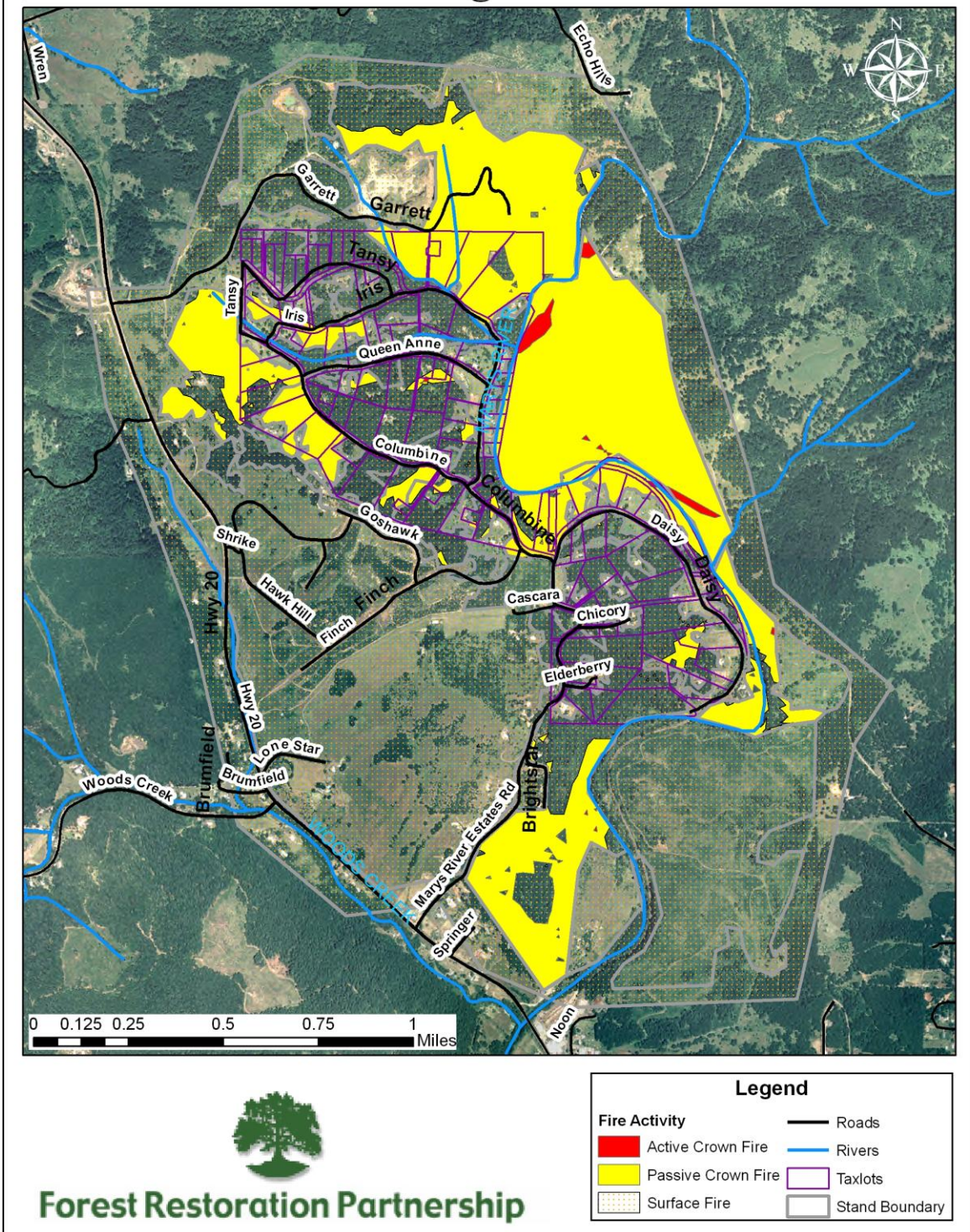


Figure 7: Fire Behavior with High Weather Conditions

# Fire Behavior with Extreme Weather Conditions

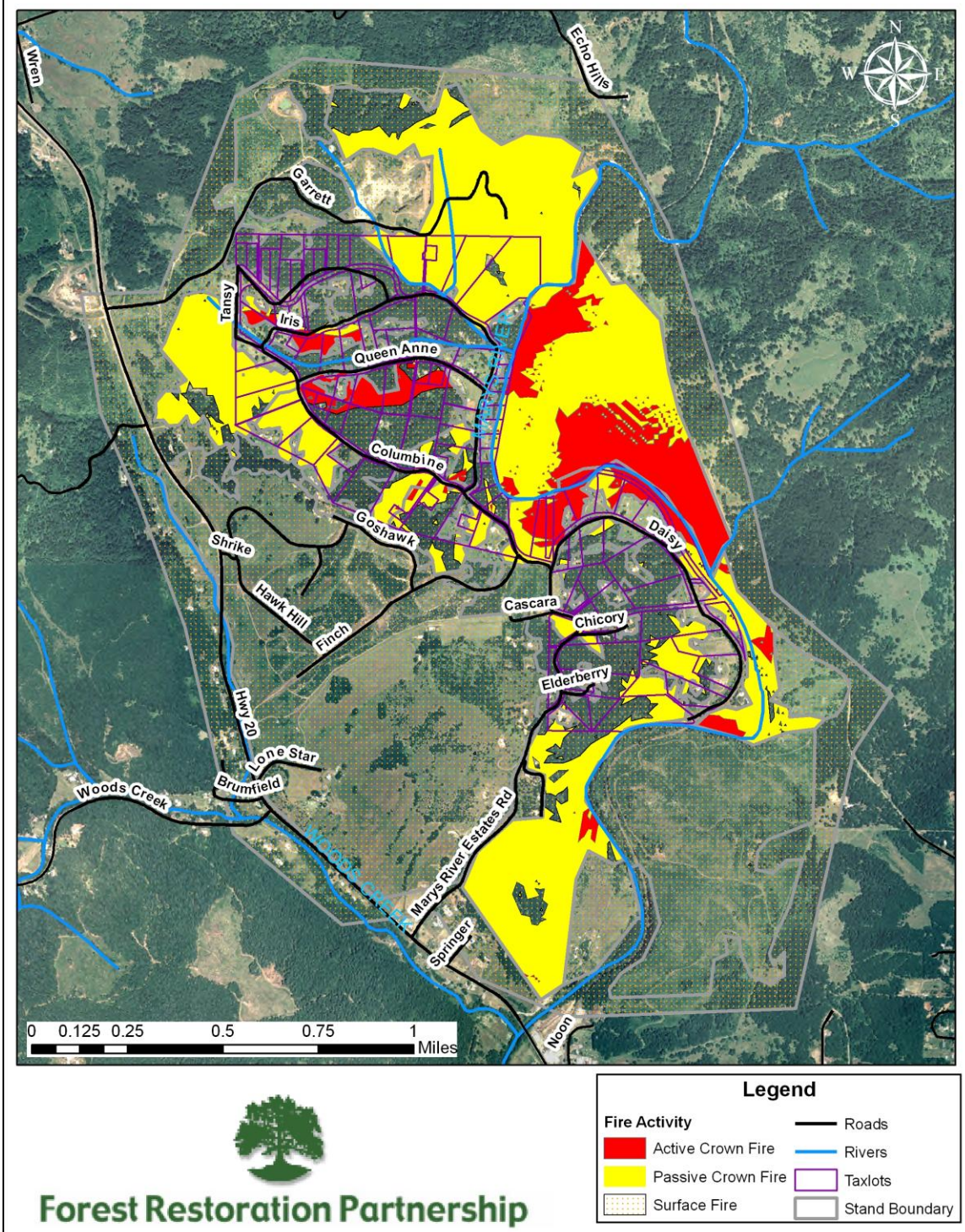


Figure 8: Fire Behavior with Extreme Weather Conditions

## *High Priority Sites*

The goals of this section are:

- Identify high priority sites that are in need of immediate treatment due to the potential for a crown fire.
- Develop a combination of the silvicultural treatments for each high priority site

The following recommendations are being made based on the potential for a crown fire to exist, as modeled by *FlamMap*<sup>TM</sup>. The treatments describe ways that can reduce the risk of a crown fire. Although the treatments are prescribed for an entire stand, it does not necessarily mean that the entire stand needs to be treated. Treatments should be focused toward slopes that are more prone to fires, south- and east-facing slopes. Figure 4, on the next page, shows a map with stand numbers.

See Attachment 6 for additional information on how to identify tree species that are discussed in the stand descriptions.

# Stand Map

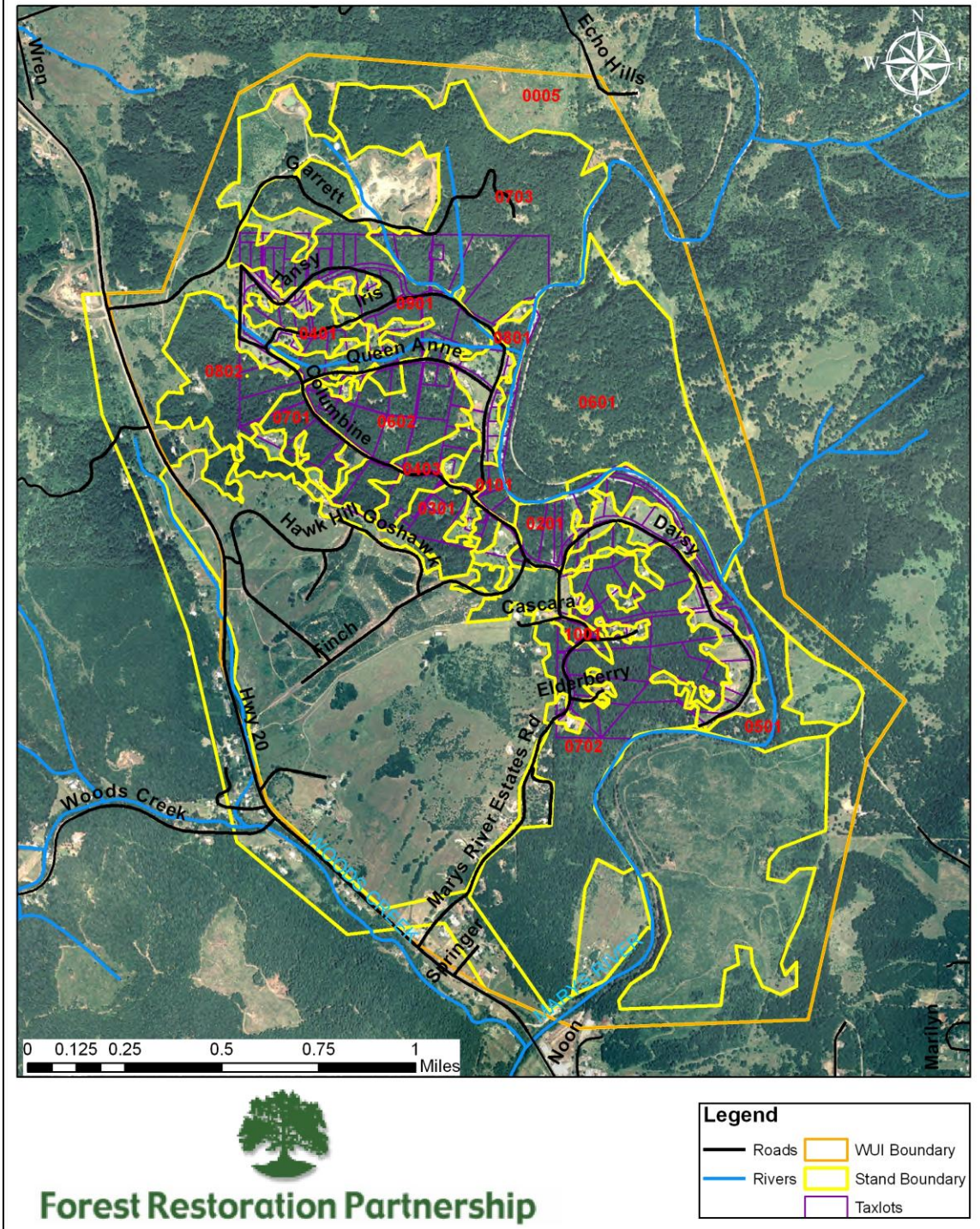


Figure 9: Stand Map

### **Stand 0301**

This stand is comprised of bigleaf maple, Douglas-fir, grand fir, and Oregon white oak. The stand density is relatively low, at 110 square feet of basal area per acre. However, 36% of the basal area is made up of Douglas-fir and grand fir under 10" DBH, which can act as ladder fuel in a surface fire. The recommended treatment would consist of a thinning from below. The thinning would remove all grand fir under 10" DBH and all Douglas-fir under 7" DBH. It would also remove 50% of all Douglas-fir between 8" and 10" DBH, or approximately 18 trees per acre. Due to the high component of grand fir the recommended treatment also consists of locating and either pruning or removing large grand fir. These trees tend to have lower crown bases and by pruning or removing these trees the stand will have a higher average crown base height. Brush mowing and masticating, or piling and burning, slash is also highly recommended due to the contribution of timber litter on the forest floor following the removal of overstory trees.

### **Stand 0401 and 0403**

This stand is also comprised of bigleaf maple, Douglas-fir, grand fir, and Oregon white oak. It has a basal area of 230 square feet per acre, of which less than half is Douglas-fir and grand fir (90 square feet per acre). The majority of the basal area is comprised of Oregon white oak (110 square feet per acre). The recommended treatment for these stands is a thinning from below. The thinning would remove all grand fir and Douglas-fir less than 8" DBH. The high component of oak with the mixed in Douglas-fir suggests that the Douglas-fir were open grown and most likely have a lower crown height. Therefore, this treatment would also prune or remove these Douglas-fir trees unless they are completely secluded from anything else or are completely surrounded by oak.

### **Stand 0501**

This stand is comprised of Douglas-fir and Oregon white oak. It has a basal area of 213 square feet per acre, of which 64% is Douglas-fir. However, the average size of the Douglas-fir in this stand is relatively larger than other areas in the subdivision. The recommended treatment for this stand is also a thinning from below. The thinning would consist of removing all Douglas-fir less than 10" DBH. It would also remove select Douglas-fir around the oak, which would allow the oak to have more space to continue to grow. The remaining Douglas-fir should be pruned so the average crown height is raised. The pruning will help to stop surface fires from becoming crown fires. Brush mowing and masticating, or piling and burning slash is also highly recommended due to the contribution of timber litter on the forest floor following the removal of overstory trees.

### **Stand 0602**

This stand is comprised of bigleaf maple, Douglas-fir, grand fir, and Oregon white oak. It has a basal area of 205 square feet per acre, of which 80% is made up of Douglas-fir and grand fir. The recommended treatment for this stand is also a thinning from below. The thinning would consist of removing all grand fir less than 10" DBH and all Douglas-fir less than 7" DBH. It would also remove 60-75% of all Douglas-fir between 8" and 10" DBH, or approximately 27-33 trees per acre. Brush mowing and masticating, or piling and burning slash is also highly recommended due to the contribution of timber litter on the forest floor following the removal of overstory trees.

For additional information contact:

- Forest Restoration Partnership (541) 929-4377
- Oregon Department of Forestry (541) 929-3266
- Philomath Fire and Rescue (541) 929-3002
- Oregon Department of Agriculture Grant Resources  
<http://www.oregon.gov/ODA/grants.shtml>

### ***Continued Maintenance of Fine Fuels and Understory Vegetation***

The goals of this section are:

- Explain the importance of continued maintenance throughout the life of the forest.
- Provide ways to maintain desired forest conditions.

After the completion of these immediate treatments, actions should be taken to maintain stands in a manner that keeps fine fuels to minimal build-up. Ways to accomplish this consist of brush mowing, prescribed fire, or individual tree removals. Keeping fuels from coming back after treatment will maintain a stand from returning to its current state and will help to reduce the risk of property loss in the long run. These maintenance activities should occur in both the high priority sites and all other sites throughout the subdivision. Fine fuels and dead wood will accumulate over time and need to constantly be monitored to ensure that a surface fire does not get out of control and develop into a crown fire.

Actions should also take place to maintain a lower basal area and lower stocking levels (trees per acre) in the overstory. This should be accomplished by maintaining a forest inventory on all properties. This inventory can provide information such as basal area, volume, canopy bulk density, crown base height, and canopy cover. By maintaining a lower basal area and a lower stocking level the potential for an active crown fire to occur may decrease.

One way to accommodate these maintenance activities would be to schedule annual clean-up days. These days should be scheduled in the spring, after the winter rains have ceased and are a way to remind residents of the importance of maintaining a clear space around their homes before the fire season begins.

With these efforts, as well as those described in the “High Priority Sites” section, Mary’s River Estates will lower the risk of a catastrophic fire, which could burn down houses, from occurring within the subdivision.

## Chapter 6 – Conclusion and Action Item List

It is important to remember that the initial treatments of the high priority sites are just the beginning of protecting Mary's River Estates from a fire. Continued efforts, through long term maintenance of the forest and Living with Fire™ strategies near structures, will be necessary to help protect residents from property loss in the case of a fire.

Below is the list of recommendations with suggested implementation dates.

1. Evacuation Route Signs – Notify residents of evacuation routes during the fall of 2007 and install evacuation route signs during the fall and winter of 2007.
2. Establish a Defensible Space around Structures – Begin implementing with an inaugural “Spring Clean-Up Day” during the spring of 2008.
3. Mitigation of Fine Fuels – Begin removing fine fuels during the spring of 2008, during the “Spring Clean-Up Day”, and finish during the summer of 2008.
4. Treating the High Priority Sites – Begin implementation during the summer of 2008.



## 5. References

ESRI, ArcGIS 9.2™ software package. 2006.

FlamMap™ Version 3.0 software package. 2006.

Fire Programs Solutions, LLC. 2007. <http://www.fireps.com/>.

Firewise™ Communities. 2007. <http://www.firewise.org/>.

Living with Fire™. 2007. <http://www.livingwithfire.info/>.

Natural Resources Conservation Service. 2007. <http://www.nrcs.usda.gov/>.

Pacific Northwest National Fire Plan. November 2006. <http://www.nwfireplan.gov/>

Scott, J.H., and R.E. Burgan. 2005. *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model*. USDA For. Serv. Gen. Tech. Rep. RMRS-GTR-153. 80 p.

# Attachment 1

Letter mailed on May 11, 2006

Owner  
Address  
City, State Zip

**RE: Taxlot #**

The Philomath Fire and Rescue along with the Forest Restoration Partnership have been awarded a National Fire Plan grant that would be able to assist our community in the creation of a community fire plan. The tax lot referenced above is within the Mary's River Estates community and is eligible for a survey under this grant.

The National Fire Plan funding in the Pacific Northwest is intended to support strategic community risk assessment and mitigation plans for fuel reduction. Funding is made available from the Forest Service, National Parks Service, Fish and Wildlife Service, Bureau of Land Management, and Bureau of Indian Affairs as a part of the Wildland Urban Interface Fuels program to implement projects on non-federal lands for reducing hazardous fuels that may threaten communities and natural landscapes within the Wildland Urban Interface.

As the forestry coordinator for this project, Forest Restoration Partnership has been tasked with modeling how a fire would behave in the event that a wildfire does enter our community. In order to accurately model fire behavior, we need to gather data that will help us describe the vegetation in the forest immediately surrounding your home. Unfortunately, forests and wildfires do not know property boundaries, which is why we need the cooperation of as many landowners as possible in order to generate accurate data that can be projected across the landscape.

The survey itself will be very unobtrusive, and of little burden to you, the landowner. It will simply involve establishing a couple temporary measurement plots on each property, marked by a small (3"x3") survey flag, where one of our technicians will record tree heights, diameters, and information regarding overall forest structure.

Please take the time to complete and return the questionnaire included with this letter, indicating whether or not you will grant Forest Restoration Partnership access to your property for the purpose of this inventory.

Again, thank you for your time, and we greatly appreciate your cooperation and support in the development of this community fire plan.

Sincerely,

*Chief Dale Staib*

Chief Dale Staib  
Philomath Fire and Rescue

## Attachment 2

*Questionnaire*

Name:

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Tax lot Number:

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Property Address:

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Do you grant Forest Restoration Partnership permission to access your property for the purpose of conducting an inventory of forest vegetation?

**YES**

**NO**

If you answered “yes” above, please indicate how you would like to be notified of when your property will be visited:

Please call me.

Phone number: \_\_\_\_\_

Please e-mail me.

E-mail address: \_\_\_\_\_

Please knock on the door.

No need to notify.

Thanks,

Forest Restoration Partnership  
(541) 929-4377

## Attachment 3

### *Stand Typing Guidelines*

*Prepared by Jason Dorn, Forest Restoration Partnership*

The stand type descriptions used for this project are based on traditional stand-typing guidelines, as described in John Bell and J.R. Dillworth's manual titled *Log Scaling and Timber Cruising*, pages 311-316, with slight changes made to accommodate data entry constraints of modern software programs such as ArcView. Each code is composed of up to four components, which are used to describe timber types based on predominant species composition, size class of this species, stocking density, and secondary species.

The general format of the codes used is as follows:

#### **D3Mm**

Species, or groups of species for which the timber type has been named are indicated by a capital letter, in this case “**D**,” for Douglas-fir. The number that follows indicates the size class of the dominant species. In this case a value of “**3**” is used to indicate that it is a stand of small sawtimber. The capital letter “**M**” that follows then indicates the stand density, in this case it is a medium density stand. The final letter, or letters, in some cases, is used to indicate the presence of an additional stand component. This letter is always shown in lower case, when it is present. In this case, the letter “**m**” is used to indicate a minor component of bigleaf maple in the stand. This letter code is not used unless the secondary specie(s) compose at least 20% of the basal area of a stand.

*Symbols used to create our stand type codes:*

#### **Timber Types**

**D = Douglas-fir**

**HD = mixed hardwoods**

**O = open** (no existing cover, or inconsistent, patchy cover)

#### **Size Classes**

**2 = pole-sized timber** (5-11 inches DBH)

**3 = small sawtimber** (11-21 inches DBH, mainly younger trees)

#### **Density, or Stocking Levels**

**L = low** (10-39% of site potential)

**M = medium** (40-69% of site potential)

**H = high** (70-100% of site potential)

#### **Secondary Species**

**m = bigleaf maple**

**oo = Oregon white oak**

**d = Douglas-fir**

**c = Western red cedar**

#### **Site Name Code Translation:**

Unique names have been assigned to each stand inventoried, even where the stand type is not unique. The stand name is made up of a pair of two-digit codes, and will appear as follows:

**0301**

The first two digits represent the corresponding forest cover type for the stand. In this case the numerical code “03” indicates a **D3H** stand type. The second pair of digits are consecutive numbers used to identify different stands within a give type. In this case the numerical code “01” is used to show that this is the first stand having that particular cover type. If there were three additional stands with the same cover type, their corresponding name codes would be as follows: 0302, 0303, and 0304.

**Stand Type Numerical Codes**

**00 = O**

**01 = D2H**

**02 = D2Hm**

**03 = D3H**

**04 = D3Lm**

**05 = D3Loo**

**06 = D3M**

**07 = D3Mmoo**

**08 = D3Moo**

**09 = HD2Hd**

**10 = HD2M**

**11 = D2Lc**

**12 = HD2H**

**13 = D2L**

**14 = D2M**

**15 = D3Lmoo**

## Attachment 4

### NFP – WESTERN OREGON GRANT PROJECT Mary's River Estates and Vineyard Mountain Subdivisions Fuels Inventory Protocol

*Prepared by Jason Dorn, Forest Restoration Partnership*

#### **INTRODUCTION:**

This inventory is being conducted in order to model fire behavior in the event that a wildfire enters either one of these communities. Inventory data will be used to generate outputs from the Fire and Fuels Extension of the USDA's Forest Vegetation Simulator software, which will then be entered in FlamMap, which predicts fire behavior at the landscape scale.

#### **SAMPLE DESIGN:**

Sample points will be installed over the entire area of both subdivisions, on a 3-chain-by-5-chain grid, oriented to the cardinal directions. Sample points on the north-south lines are spaced at the 3-chain intervals, and these lines are on 5-chain intervals. This will provide us with a sampling frequency of 1 plot to every 1.5 acres.

Each sample point will consist of a variable-radius plot, and a nested fixed-radius plot. Basal area factor for the variable radius plot will be chosen on a per-plot basis, allowing the technician to keep his/her tree count as low as possible (minimum six trees per plot average). The fixed-radius plot will be a 1/100<sup>th</sup> acre plot (11.8ft), and will be used to measure saplings and pole-sized trees not recorded on the variable-radius plot. Plots established in non-forested cover types will be for the purpose of making fuel model calls only – no tree data will be collected on these plots. If a plot lands on a driveway, road, or within a structure, it will be offset in ½-chain increments, in the direction of travel, until it lands in a suitable location.

#### ***Variable-radius Plots***

- The variable-radius plot will be used to measure all trees greater than 5.5 inches DBH, even if smaller trees are counted as “in” with the selected BAF
- Tree status, species, DBH, base-to-live crown, and crown class will be entered for each live tree recorded on the variable-radius plot
- Heights will be recorded on a frequency of one per plot, with the goal being to have ample heights for all species occurring on the inventory
- Base-to-live crown will be measured for height-sampled trees, and estimated for all others
- Tree status, species (guess if indeterminable), DBH, and height will be estimated for all snags on the variable-radius plot

#### ***Fixed-radius Plots***

- The 1/100<sup>th</sup> acre (11.8ft) fixed-radius plot will be used to measure trees greater than 5 feet in height, and up to 5.49 inches DBH.
- Trees greater than 5.5 inches DBH that fall within this plot, but were not counted as “in” trees on the variable radius plot will be ignored
- Tree status, species, DBH, base-to-live crown, height, and crown class will be entered for each tree or group of trees recorded on the fixed-radius plot

- The first tree occurring on the fixed plot will be recorded as an individual tree, and will have a measured height and base-to-live crown, additional trees will be tallied in groups based on species and 1-inch DBH classes, and will have an average, estimated height recorded for the group.

### **DATA COLLECTION PROCEDURES:**

This inventory will be conducted using the “NFP\_WO” application in Data Plus Professional, which will be loaded in your handheld data recorder. You will create/use one of two files for this inventory; a file titled “MR\_EST,” or one titled “VIN\_MTN,” depending on where you are conducting the inventory. This application contains two levels of data only – the plot (parent) level, and the tree (child) level.

#### ***Plot-Level Data (Plot\_data)***

- PLOT\_NO: enter the plot number indicated on the map you are using. This entry must be unique.
- BAF: choose a basal area factor for the plot that will allow you to have at least 6 tree records. Press the F2 key (Ctrl+2 on the Ranger) for a drop-down menu of acceptable basal area factors.
- CVR\_TY: is the plot forested or non-forested? Enter a value of “1” for forested plots, and “2” for non-forested plots. (menu available by pressing F2/Ctrl+2).
- FUEL\_M: using the pictorial guide provided, select the appropriate fuel model for the area you are currently in. Look no further than 100 feet (roughly half the distance between plots), or to the next break in vegetation, when determining the appropriate fuel model to enter. Enter the three-digit numerical fuel model code (menu available by pressing F2/Ctrl+2).
- If you are in a non-forested plot (CVR\_TY entry = 2), press Ctrl+down to advance to the next plot.
- If you are in a forested plot (CVR\_TY entry = 1), press the F5 (Ctrl+5 on the Ranger) key to drop into the tree-level data.

#### ***Tree-Level Data (Tree\_data)***

- TREE\_NO: Tree numbers will automatically be entered by the application. This column is formatted as “view only,” and can not be changed by the user.
- TALLY: this column is used to indicate how many trees a given record represents, and it defaults to a value of “1.” Values greater than 1 should only be used for trees recorded on the fixed-radius plot, having similar characteristics (same species, DBH, etc.).
- STATUS: use this column to indicate whether the tree is living (1), recent mortality (2), or older mortality (3). This column defaults to a value of “1,” indicating a live tree (menu available by pressing F2/Ctrl+2).
- SPP: tree species, by USDA R6 numeric codes. Press F2/Ctrl+2 to open the drop-down menu of all available tree species codes.
- DBH: enter the diameter at breast height to the nearest inch.
- HT: when appropriate, enter the height of the tree to the nearest foot.
- HT\_TOP: if the tree being measured has a dead top, enter the height to the top of the live portion of the crown.
- BLC: enter the height from the base of the tree to the bottom of the live crown, to the nearest foot.

- CRN\_CL: enter the crown class code (menu available by pressing F2/Ctrl+2)
- At the completion of all tree-level data, press the F4 key (Ctrl+4 on the Ranger) to exit to the plot-level screen. The application will perform an error check at this time, and will indicate any potential errors in data entry.

## TABLES

**Table 1. Available Tree Species Codes**

CODE	SPECIES
17	grand fir
22	noble fir
42	Alaska yellow cedar
81	incense cedar
202	Douglas-fir
231	Pacific yew
242	Western redcedar
263	Western hemlock
264	mountain hemlock
312	bigleaf maple
351	red alder
361	Pacific madrone
431	golden chinkapin
492	Pacific dogwood
500	hawthorn
746	quaking aspen
747	black cottonwood
760	bitter cherry
815	Oregon white oak
818	California black oak
920	willow

**Table 2. Crown Class Codes**

CODE	CROWN CLASS
1	open-grown
2	dominant
3	co-dominant
4	intermediate
5	Suppressed

**Table 3. Fuel Model Codes and Definitions**

CODE	MODEL NUMBER	DEFINITION
1	GR4	Moderate Load, Dry Climate Grass
2	SH5	High Load, Dry Climate Shrub
3	TU1	Low Load, Dry Climate Timber-Grass-Shrub
4	TU5	Very High Load, Dry Climate Timber-Shrub
5	TL1	Low Load, Compact Conifer Litter
6	TL3	Moderate Load, Conifer Litter
7	TL4	Small Downed Logs



## Attachment 5

### *Fuel Moisture Scenarios and Weather Station Catalog* *Prepared by Jason Dorn, Forest Restoration Partnership*

Variable/Component Range	Mod	High	Ext
Percentile Range	16-89	90-96	97-100
Fuel Moistures			
1 Hour Fuel Moisture	7.60	5.40	4.10
10 Hour Fuel Moisture	9.10	6.80	5.40
100 Hour Fuel Moisture	15.00	12.30	10.40
Herbaceous Fuel Moisture	100.50	69.90	54.80
Woody Fuel Moisture	126.60	101.70	91.50
20' Wind Speed	3.30	4.90	7.20

3771 Weather Records Used, 3432 Days With Wind (91.01%)

WLSTINV1-Weather Station Inventory for 352547

Station: 352547 Name: VILLAGE CREEK NESDIS: 324A14E2

Type: 4 (RAWS S NFDRS) Create/Mod Date: 05-Dec-2006 Obs Time/Z: 13/PST  
Assoc Man: \_\_\_\_\_ Prev Stn: \_\_\_\_\_ Fcst Zone: 603

State: 41-OR County: 039-Lane Lat/Lon: 44 15 8, 123 28 2  
Obs Agcy: 2 (USDI BLM) Unit: EUGENE Mnemonic: EUD FS Reg: 6

Fuel Stk: \_\_\_\_\_ Wdy FM Mea: \_\_\_\_\_  
Site: 3 Elev: 1500 Asp: 3 Ann Prec: 65.00 Season:  
Ltng scale: 1.00 Hum code: 2 Temp code: 1 Pres code: 1  
Wind Spd code: 1 KBDI: 100 One/Ten Fl: N

## Attachment 6

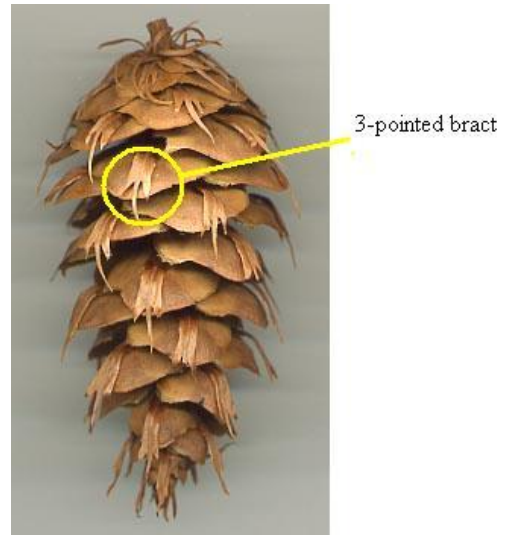
### *Tree Identification*

#### *Douglas-fir*

Douglas-fir is a conifer with flat needles that stick out in all directions around the branch. If the needle is removed from the branch it will leave a small, raised leaf scar. The cones have a very distinct 3-pointed bract, as seen in the picture below.



**Figure 11: Douglas-fir branch**



**Figure 10: Douglas-fir cone**

#### *Grand fir*

Grand fir is a conifer with flat needles that stick out on two sides of the branch. The needles also have a white stomata pattern on the underside, making the bottom of the needle appear white in color.



**Figure 12: Grand fir branch**

*Oregon white oak*

Oregon white oak is a deciduous tree, meaning it drops its leaves in the fall. The leaves are approximately 5 inches long and have 5 to 7 rounded lobes. The acorns are about 1 inch long with a shallow cup.



**Figure 13: Oregon white oak leaf and acorn**

*Bigleaf maple*

Bigleaf maple is a deciduous tree with leaves up to 12 inches in diameter. The leaves have 5 deeply cut lobes and turn yellow-brown in the fall. The seed is paired and looks similar to a set of wings, as seen in the picture below.



**Figure 14: Bigleaf maple leaf and seed**