



FIREWISE USA[®]
RESIDENTS REDUCING WILDFIRE RISKS

Orcas Highlands Community Wildfire Risk Assessment and Action Plan



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rain shadow
Tree care, forestry, & consulting in the San Juan Islands

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ASSESSMENT OVERVIEW

The following Firewise USA® Community Wildfire Risk Assessment and Action Plan was prepared by Rain Shadow Consulting’s foresters Carson Sprenger and Lindsay Watkins (“Rain Shadow”) in collaboration with the Orcas Highlands Homeowners Association (HOA). Rain Shadow met with David Tunroy, the HOA Secretary and member of the Roads Committee, Brian Ehrmantraut, the HOA Vice President and member of Orcas Island Fire Department, and Bob Burke, a member of the Roads Committee and the supervisor of the community’s burn pile on May 29, 2021 for an initial site visit that included a tour of the community and brief visits to the Highlands’ forested common areas. Rain Shadow returned for more in-depth field visit focusing on the Highlands’ forested common areas and road corridors on June 16, 2021.

The Firewise USA® program is designed to help homeowners and communities in the wildland-urban interface – areas where homes are built near or among lands prone to wildland fire – reduce the risk of losing homes to catastrophic wildfire. Studies show that as many as 80% of the homes lost to wildland fire could have been saved if brush were cleared and defensible space was created around structures. The Firewise USA® program helps communities maintain the feel of living in a natural landscape while promoting effective management strategies for wildfire protection. Orcas Highlands has been a Firewise USA® Community since 2003, and this document serves as a major update to the original Community Risk Assessment prepared then by Firewise Communities/USA.

This Firewise USA® Community Wildfire Risk Assessment and Action Plan is based on the community as a whole and does not focus on specific privately owned properties and homes. It should serve as a resource for the HOA as well as individual residents and the recommended actions are intended to be implemented collaboratively. The Risk Assessment should be updated, at minimum, every five years, and the Action Plan should be updated, at minimum, every three years.

SITE DESCRIPTION

The Orcas Highlands (“The Highlands”) comprises an area just under 200 acres on Orcas Island, Washington, the largest of the San Juan Islands in Northwest Washington. The San Juan Islands, which make up San Juan County, are located in the Salish Sea between Vancouver Island and the Olympic Peninsula to the West and mainland Washington to the east. The Highlands are about four miles south of Eastsound, the largest village on Orcas Island, and the boundary is defined by the properties included in the Orcas Highlands Homeowners Association (HOA).

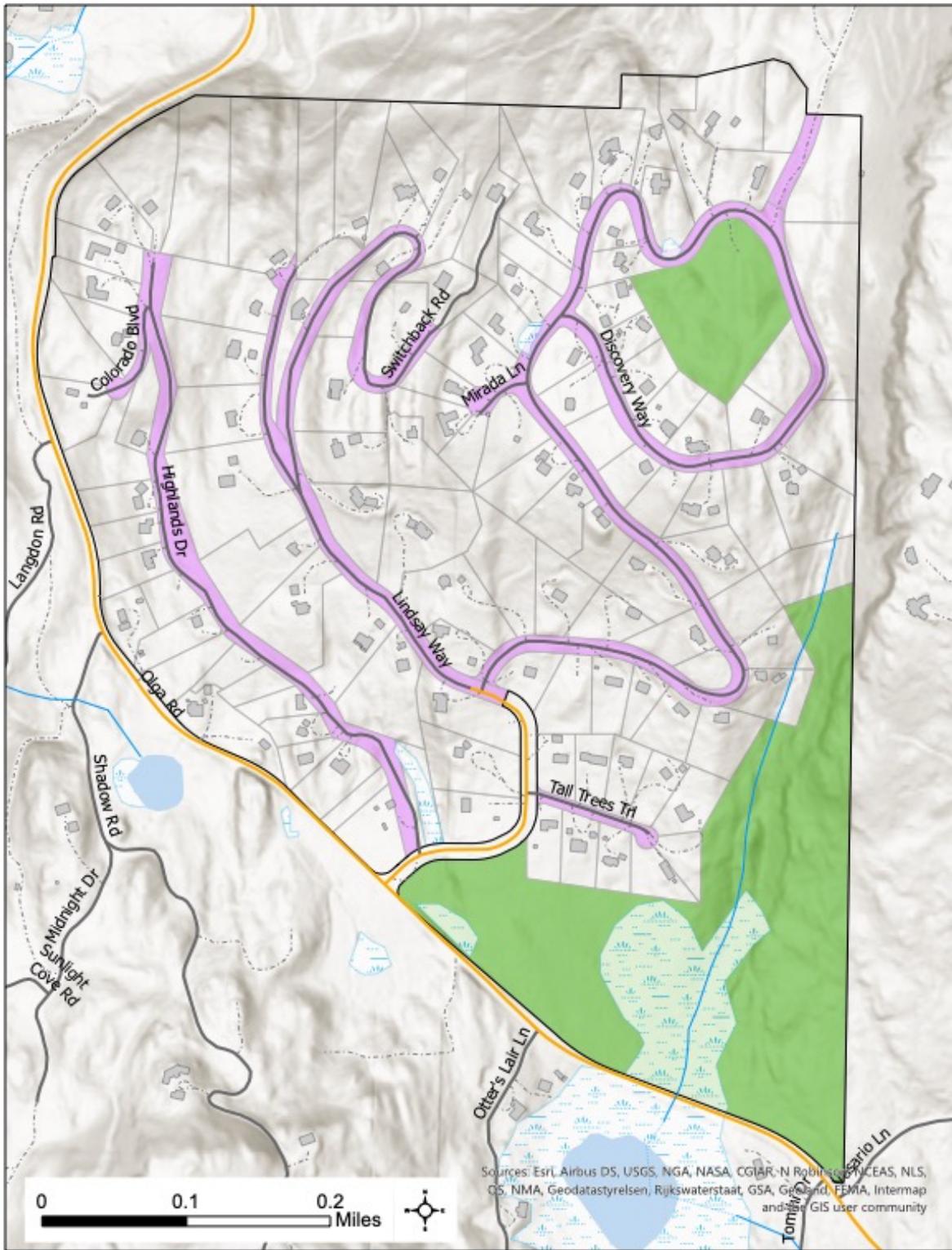


Figure 1 - A map of Orcas Highlands showing the properties included in the HOA, building footprints, forested common areas (green), public (orange) and private (gray) roads and driveways (dashed gray), HOA road easements (purple), and streams, ponds, and wetlands.

Description of Properties within the Firewise Site

The Highlands includes 124 privately-owned parcels ranging in size from 0.43 acres to 3.59 acres. There are 103 dwelling units (primarily single-family residences) and 24 other buildings. Twenty-one lots remain undeveloped. The Highlands also includes 37.97 acres of forested common areas on two parcels. One area is 32.76 acres in size and makes up a substantial part of the southern end of the community including half of the western boundary. Another, 5.2 acres in size, is in the northeastern part of the community, inside the Discovery Way loop. The HOA is also responsible for 19.3 acres of land along the community's 2.75 miles of private roads.

Local Wildland Fire Characteristics

Local Fire History

Fire, whether naturally occurring or intentional, was previously an important part of the landscape in western Washington, and the San Juan Islands and our local plant communities were shaped by and adapted to fire at the species, community, and ecosystem level.

Before Euro-American settlement, Native American residents of the islands used fire to manage the land for native plant foods such as camas bulbs. From 1700 to 1879, fires burned on the islands on average every 7.4 years, and after Euro-American settlement, the fire interval averaged 103.8 years.¹

After Euro-American settlement, logging for wood to feed the island's lime kilns and fire exclusion resulted in major changes to the structure and composition of Orcas's forests. Land that once supported open-grown Douglas-fir mixed with prairie now consists of dense, closed-canopy forest. One study on nearby Mount Constitution found that open-grown Douglas-fir density was about 17 trees per acre in the 19th century, while the current density in closed-canopy, mature Douglas-fir forest is about 426 trees per acre.² Analysis of fire scars suggests that the main reason for this increase in density is the exclusion of fire from the landscape after the late 1800s.

Wildland Fire Behavior

The concept of "wildland fire behavior" describes how fires burn, from the initial ignition of fuel to the way fire spreads across the landscape. Three primary, interconnected factors influence

¹ C.B. Sprenger and P.W. Dunwiddie. 2011. Fire history of a Douglas-fir-Oregon white oak woodland, Waldron Island, Washington. *Northwest Science*, 85(2):108-119. <https://doi.org/10.3955/046.085.0203>

² D.L. Peterson and R.D. Hammer. From open to closed canopy: a century of change in a Douglas-fir forest, Orcas Island, Washington. *Northwest Science*, 75(3):262-269

wildland fire behavior, so a discussion of each of them and their role in potential fire behavior in the Highlands is relevant.

Weather

Weather plays a major role in determining fire behavior. Wind, moisture, temperature, relative humidity, and recent precipitation can all affect whether a fire is able to ignite and how it spreads. Recent weather conditions (precipitation, wind, temperature) primarily impact the moisture content of larger dead fuels and live fine fuels, while the relative humidity, temperature, and sun exposure at the time of the fire affect the moisture content of fine fuels. For any size fuel, lower moisture levels will result in fire that will be more intense and spread faster. Once a fire has started, wind can significantly increase the rate of spread and fire intensity, and precipitation (or lack thereof) can help or hinder control efforts.

While the Pacific Northwest is often known for its rainy climate, the San Juan Islands are somewhat of an exception due to the “rain shadow” effect of the mountains on Vancouver Island and the Olympic Peninsula. As storms move east from over the Pacific Ocean, the warm, wet air rises when it hits the mountains, resulting in heavy precipitation on the western slopes and leaving less moisture as the air passes over the islands to the east. In general, Orcas Island is known for cool, wet, winters and warm, dry, sunny summers. The islands can get more than 200 days of sun a year, and Orcas receives an average of about 28 inches of rain annually, most of which falls in the winter months. In the summer, average temperatures range from 60-75 degrees. Fortunately, when it comes to fire behavior, the windiest months in the islands are also the wettest months, with winter storms frequently bringing sustained winds of 40-50 mph. Winds are generally much milder in the summer, averaging under 5 mph. Between the beginning of April and the beginning of October, winds are most often from the west. Strong eastern winds in the summer, carrying very dry and warm air—known as a foehn type winds—do occasionally occur. These wind events are strongly associated with major fire events west of the cascades (a similar easterly wind, known as the *Sant Ana Winds*, are known for contributing to some of California’s largest fires).

The climate in the San Juan Islands already results in favorable fire conditions during the summer months, and looking toward the future, climate change is expected to lead to warmer and drier summers along with other increases in sea level, water temperature, and ocean acidification. Temperatures in the Puget Sound region have increased by 1.3 degrees Fahrenheit from 1895 to 2014, and the average year is predicted to be 4.2 to 5.5 degrees warmer in the 2050s than in the late 20th century with more intense heat waves. Spring precipitation increased by more than 27% between 1895 and 2014, but the overall annual precipitation didn’t change. Based on these current trends, the region is expected to have more

frequent and intense heavy rainfall in the winter and spring with hotter and drier summers. These changes will undoubtedly result in increased wildfire risk across the region.³

Topography

Topography – the slope, aspect, elevation, and specific features – of a given landscape can also affect whether a fire ignites and how quickly it spreads.

Generally, north-facing sites tend to be cooler, wetter, and more vegetatively productive than south-facing sites, resulting in heavier fuel loads with higher moisture content and fuels that dry more slowly. Fire will be less likely to ignite and will spread more slowly in these areas. On the other hand, south and west-facing slopes get more direct sunlight and are warmer sites with less moisture and more fine fuels, allowing a fire to ignite easily and spread quickly. With the aid prevailing west winds, these sites are more likely to burn during a longer portion of the year. Steep slopes also increase the rate of a fire's spread, as uphill fuels are pre-heated by fire downhill. For any given fuel bed, the steeper the slope, the faster and higher the fire will spread uphill and the more intense it will be.

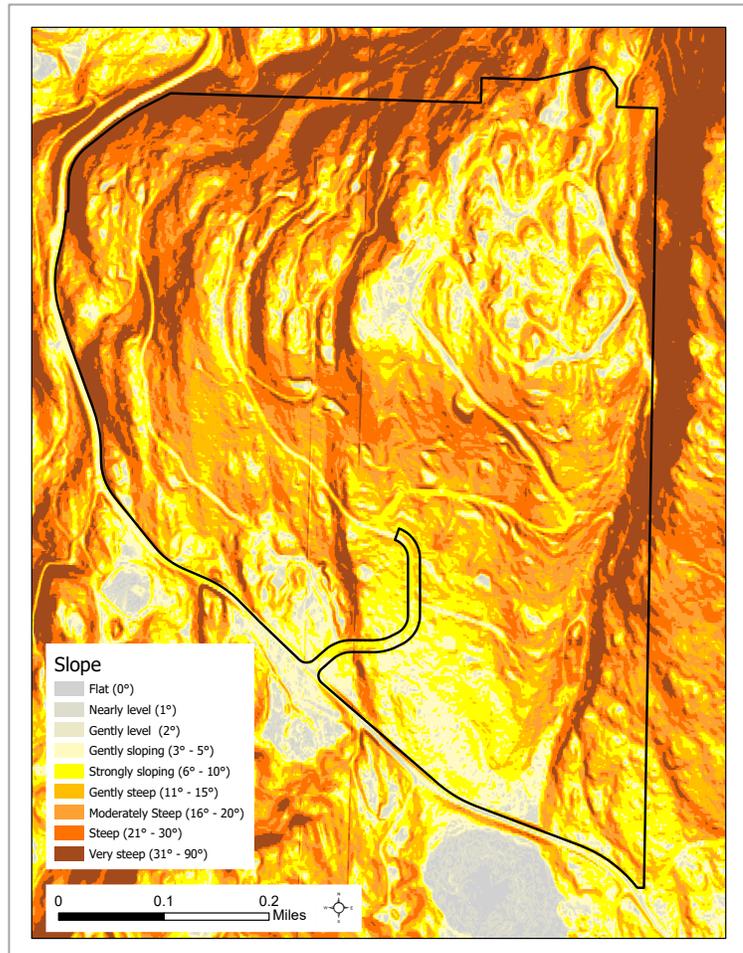


Figure 2 - A slope map of the Highlands shows that much of the area sits on steep to very steep terrain

³ Mauger, G.S., J.H. Casola, H.A. Morgan, R.L. Strauch, B. Jones, B. Curry, T.M. Busch Isaksen, L. Whitely Binder, M.B. Krosby, and A.K. Snover. 2015. State of Knowledge: Climate Change in Puget Sound. Report prepared for the Puget Sound Partnership and the National Oceanic and Atmospheric Administration. Climate Impacts Group, University of Washington, Seattle. <https://cig.uw.edu/resources/special-reports/ps-sok/>

The Highlands sits on the west-facing lower slopes of Mt. Constitution overlooking East Sound. The aspect varies from northwest to southwest, and the elevation ranges from about 215' to about 1015' above sea level, with much of the community situated on steep terrain.

Fuels

Fuels include any flammable material that may be found in a fire landscape, from living and dead plants such as trees, shrubs, and grasses, to building materials such as siding and shingles. The size, shape, moisture content, horizontal and vertical arrangement, and amount (fuel load) of fuel within a landscape all play a role in how a fire can start and spread. In general, fine fuels (less than ¼ inch in diameter) such as grasses, needles, leaf litter, and small twigs, ignite easily, burn quickly, and can spread fire rapidly. Larger fuels burn more slowly but at a higher intensity, making the fire more difficult to put out.

Many of the residential lots in the Highlands were largely cleared of trees when the community was established about 50 years ago, but now, the forest has reestablished itself in and around the area. Douglas-fir is the dominant tree species and is accompanied by a mix of other native conifers, including shore pine (lodgepole pine), grand fir, western hemlock, and western redcedar. The community also includes some stands of red alder, along with scattered bigleaf maple and pacific madrone. The understory is dominated by salal, Oregon grape, ocean spray, Nootka rose, salmonberry, sword fern, and nettles.

Fuels present the largest challenge and risk for the Highlands Community. While the forested areas in and around the Highlands previously did not have the height, density, continuity, and fuel loads for a rapidly-spreading crown fire, this has changed in recent years as forests have matured. A true independent crown fire would likely not be supported by the current fuel loads but a fast moving, torching, and high intensity type fire is definitely possible. In this scenario, individual trees would completely burn in rapid fashion, with flame lengths from 20-50 feet beyond the height of the vegetation.

Taken all together, The Highland's weather, topography, and fuels put the community at *relatively high risk* from wildland fire, and it is not a matter of if, but when a fire will threaten the community. The most likely fire scenario would be a fire that starts in a dense conifer stand and spreads uphill during a dry/drought period with low relative humidity and strong winds. Other likely sources of ignition include structure fires, vehicle fires, escaped cooking fires, or other accidental ignitions. These could initiate from anywhere within the community. Since weather and topography cannot be changed, appropriate reduction and management of fuels will be the biggest factor in reducing risk.

Existing Fire Safety Infrastructure and Challenges

The 2012 San Juan County Community Wildfire Protection Plan mentions the Highlands as one community on Orcas Island with a particularly high risk from wildfire due to a combination of fuel type, access issues, and the lack of defensible space.

As a Firewise USA® site for more than 15 years, the Highlands community has taken some steps to reduce wildfire risk and make responding to a fire easier. Some thinning has been carried out in the southern forested common area, and the community regularly holds a spring cleanup focused on clearing brush for fire mitigation. Community events and informational meetings focused on safety and emergency response are common, and the HOA website includes an Emergency Preparedness page with links to the original Firewise USA® Community Assessment from 2003, additional recommendations from the Orcas Island Fire Department from 2012, and other wildfire preparedness tips. Individual residents have worked to keep roofs and gutters clean, clear debris and vegetation from immediately around their homes, and to maintain landscaping and hardscaping that reduces fire risk.

In the event of a fire, the closest fire station to the Highlands is San Juan County Fire District #2 (Orcas Island Fire and Rescue) Station 23 in Rosario, just about a mile from the Highlands entrance. Station 23 has two trucks, including a 2600-gallon tanker that can refill in four minutes. Additional apparatus is stationed at OIFR's other six stations around Orcas Island, and OIFR has mutual aid agreements with the other San Juan County Fire Districts and Washington DNR for wildland fires, but resources may not be available quickly. The Highlands has several water tanks within the community managed by Washington Water Service that supply residences, but in the event of a fire, water would most likely be provided by OIFR through a tanker relay system to keep water available and flowing.

One specific and significant challenge that could pose a risk during a wildland fire is the lack of multiple egress routes. All of the Highlands' roads funnel downhill to Lindsay Way, providing only one way out to Olga Road. An evacuation could be difficult to nearly impossible during a larger fire, particularly if a road were to be blocked by a downed tree. Egress could be made more difficult by responding emergency vehicles, as the private roads are narrow and have limited space for larger apparatus to pass or turn around and maintaining a water supply will require tankers to come and go. Streets and individual properties are well-marked with signs and reflective address numbers for emergency response, but some driveways may be too steep or tight or lack overhead clearance for some firetrucks.

SITE OBSERVATIONS & CURRENT CONDITIONS

Individual Properties

This assessment focused primarily on the Highlands Common Areas and road easements; however, in walking and driving around the community, general conditions on individual properties were noted.

Homes are constructed from a variety of construction materials, some of which present an elevated risk in a fire. While most homes have non-combustible roofing materials and gutters, many also have wood siding with attached wooden porches, decks, railings, and/or fences. As trees have grown and the forest canopy has closed throughout much of the community, many homes have nearby or overhanging tree limbs, and needle litter and debris were noted on several roofs.

Most properties are well-maintained with minimal debris buildup immediately around the home and thoughtful landscaping; however, some of the more wooded properties have a higher density of trees and shrubs close to structures and a build-up of ladder fuels.

Common Areas

South Common Area (32.76 acres)

The largest common area consists of a roughly triangular area at the southern end of the Highlands, stretching between Olga Road to the southwest, the Vusario neighborhood to the east, 10 private parcels to the north, and the public section of Lindsay Way coming into the community to the northeast. An old skid road provides access to the southeastern corner of the parcel and leads to a well.

This area is almost entirely forested. Douglas-fir is the dominant species, with a mix of grand fir, western redcedar, western hemlock, red alder, and bigleaf maple throughout. The understory is a mix of salal, Oregon grape, ocean spray, salmonberry, sword fern, nettles, grasses, and other native shrubs and forbs, and varies in density from thick to sparse and mossy.

A seasonal stream runs northeast to southwest through the parcel and through a wetland area that is smaller and drier than it would appear from county maps and may dry completely in the summer months. The terrain east of the stream bed is steeper with more challenging access, and the forest is more structurally complex with a heavier fuel load. Given the topography, this may present less of a risk to the Highlands community, but the area is directly downhill of the Vusario neighborhood and Moran State Park.

About one-third of the south forested common area has recently been thinned and treated to reduce fuel loads. The Highlands invested about \$10,000 in 2019 and hired Harvey Logging to remove unhealthy and suppressed trees in the area east of Lindsay Way along Olga Road. This work was generally focused within 100 feet of the roads. Much of the resulting slash was chipped and distributed on the forest floor, with some used to create habitat piles.



Figure 3 - Part of the common area that was recently thinned, with slash chipped and distributed on the forest floor



Figure 4 - A habitat pile created from slash in part of the common area that was recently thinned. Habitat piles concentrate slash rather than leaving it across a wider area, and the resulting pile is useful for a variety of wildlife species.

Where the forest has not been recently thinned in the common area, density is high and will result in competition-driven mortality and an increased risk of windthrow or failure from snow loading. In turn, this will result in heavier fuel accumulation. Several areas already have significant blowdown and fuel accumulation, and one area in particular seems to have been affected by possible *Armillaria* root rot leading to mortality and snags and down woody debris. The areas of most concern are south of the parcels along Tall Trees Trail.



Figure 5 - An area of high tree density with significant fuel accumulation in the common area



Figure 6 - An area of high tree density with recent blowdown, which will lead to fuel accumulation. Armillaria root rot may be contributing to tree mortality in this area.

The southern common area includes the Highlands community burn pile area, west of the private parcels on Tall Trees Trail and accessible from Lindsay Way. This area has been used for

burning brush after yearly spring clean-ups. Rain Shadow's tree crew was hired in Spring of 2021 to remove several hazardous alder trees and clean up the site to make the area safer for burning.



Figure 7 - The Highlands community burn pile. Several hazardous alders were recently removed around the burn area, and the HOA rented an excavator to clean up and increase safety in the area.

North Common Area (5.2 acres)

This smaller common area is in the northeastern part of the community on the inside of Discovery Way. It is bordered by Discovery Way and its associated road easement to the north and northeast, and by privately owned parcels to the southeast, south, west, and at the northwest corner. Douglas-fir and shore pine are the dominant overstory species. The understory is relatively sparse and consists mostly of sword fern and moss. Tree regeneration is low due to the closed canopy, which prevents light from reaching the forest floor. A large water tank sits the northern part of the parcel, and a short driveway leads to the tank from the northeastern part of the Discovery Way loop. The trees here are tall and skinny with moderately to severely reduced live-crown ratios, indicating that the stand is suffering from overcrowding. Competition-induced mortality is likely to result in standing dead trees, down woody debris, and a continued accumulation of fuel. The trees within one tree length (80-100') of the Discovery Way loop road are of particular concern as any dead or windthrown trees here could fall across the road and prevent egress.

Remnant skid roads run parallel to the parcel's southeastern boundary and north-south through the eastern half of the parcel, connecting with the driveway to the water storage tank.



Figure 8 - A dense stand of Douglas-fir and shore pine in the northern common area



Figure 9 - The water storage tank in the northern common area

Road Easements

The Highlands HOA is responsible for 19.3 acres of land along the community's 2.75 miles of private roads; however, roads are not always located directly in the middle of the road easement area, so the extent to which the HOA can manage vegetation along the sides of the roads varies. Roadside vegetation varies in type and density, but in many cases includes grasses along with tall and dense ocean spray that could easily act as a ladder fuel to carry fire from the ground into the tree canopy. Road edges also accumulate needle litter and cones that could provide an ignition source or help a ground fire spread, and roadside trees have limbs that extend across the road and could carry crown fire to one another. Historically, the HOA has contracted with Tim Segault for mowing each summer.



Figure 10 - Needle litter, grasses, and dense ocean spray along the side of a road



Figure 11 - The steep slope on the right side of this road will allow fire to spread rapidly uphill through the ocean spray. Overhanging branches on the left side of the road could help to carry flames across the road.

RECOMMENDATIONS

Fuel reduction throughout the Highlands – on privately-owned parcels, in forested common areas, and along the roads – should be the foremost priority when it comes to lowering the community’s risk from wildfire. Many of the following recommendations can be implemented by the HOA with the support of the community’s residents, but to truly minimize fire risk for all, individual property owners will also need to take action. Individual residents and the community as a whole will need to balance the need for fire protection measures against the desire to maintain certain flammable components of homes and the surrounding landscape. These considerations apply to the choice of building materials, the construction of attached decks and porches, landscaping and hardscaping elements, types of trees/shrubs/plants, and the desire to live in a beautiful place that feels “natural.”

Individual Properties

Given the higher risk of fire in the community and the difficulty of access for fire suppression apparatus, the creation of defensible space around individual homes may mean the difference between a home being lost in a fire or being spared. In a case where residents are at home and unable to evacuate, this could also mean the difference between a fire that is simply destructive and one that is deadly.

Property owners should assess the vulnerability of the home itself and the surrounding home ignition zones to embers that could carry fire to the structure. Home ignition zones are broken into three categories: the immediate zone (within 0-5 feet of the home and any attachments), the intermediate zone (5-30 feet from the home), and the extended zone (30-100 feet from the home). In some cases, the extended zone is likely to extend onto neighboring property or into common areas or road easements, in which case, property owners are highly encouraged to work collaboratively with their neighbors and the HOA to manage fuels together.

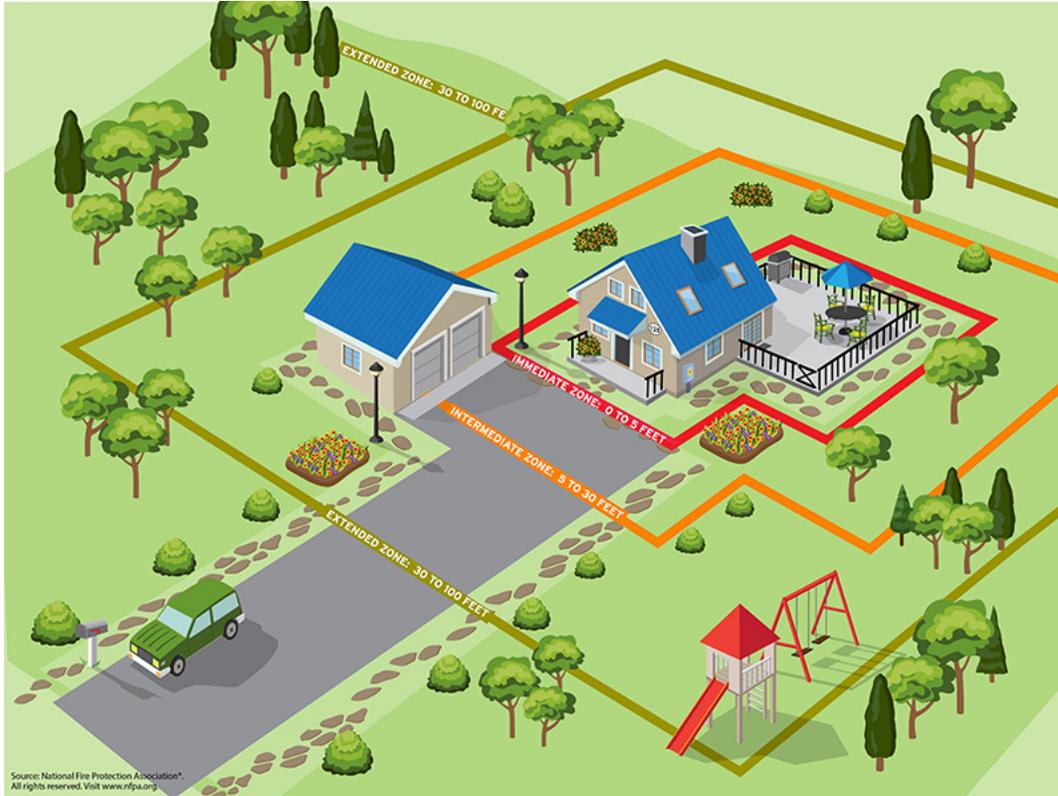


Figure 12 - Property owners should consider the vulnerability to fire of the home itself as well as 3 surrounding zones. From the National Fire Protection Association/Firewise USA®

When assessing the home itself, property owners should consider the following factors:

- Roofing materials: class A fire-rated roofing products such as composite shingles, metal, concrete, and clay tiles offer the best protection. Roofs should be inspected regularly and kept clear of debris. Any loose or missing shingles or tiles should be repaired or replaced to prevent any embers that might land on the roof from entry.
- Gutters: gutters should be metal or non-combustible and kept free of debris
- Soffit vents: roof and attic vents should be non-combustible and have mesh or screening to prevent embers from entering
- Siding: brick, stucco, masonry, plaster, and fiber-cement are non-combustible siding materials; however, wood siding is extremely common in the northwest and within the Highlands. Some wood siding is treated to be fire-resistant. Vinyl siding is not recommended in areas prone to fire. Regardless of the type of siding, homeowners should check for cracks and crevices that could accumulate debris and provide an entry point for embers. Areas around the home should be kept free from debris, with special attention to keeping dead/dry vegetation away from wood siding.

- Skirting: skirting may be used around the bottom of structures as protection from exposure. Ideally, it should be a non-combustible material and should be kept free of debris.
- Attachments: many homes in the Highlands have attached decks, porches, stairs, fences, and other structures. Where these attachments are constructed from wood or other combustible materials, metal flashing should be installed between the house and the attachment to stop the progress of a fire. Flammable and combustible items should not be stored under decks or close to the house. If wildfire is in the area, any furniture should be removed from decks and put inside or well away from the house.
- Windows: dual-pane, tempered glass windows are safer from cracking from radiant heat in a fire.

Immediate Zone (0-5 feet from the house)

Within the immediate ignition zone (0-5 feet from the house and the furthest attached points), property owners should focus on **creating a combustible-free area**. All dead vegetation and debris and any potentially flammable live vegetation (grasses, shrubs such as ocean spray, and certain plants with high concentrations of natural resins, oils, and waxes) should be removed. Landscaping plantings should include fire-resistant plants and should be well irrigated to keep them from drying out and becoming part of the fuel load. Hardscaping, such as concrete, stone, or gravel pathways and patios can help to keep the area free of debris and vegetation, and wood mulch should be replaced with non-combustible alternatives such as crushed stone or gravel. Branches that overhang the home or any attachments should be trimmed, and branches can also be pruned from 6 to 10 feet off the ground to prevent a potential ground fire from climbing into the canopy. Hardwood trees (bigleaf maple, red alder, Pacific madrone) and fruit trees are less flammable and preferable to conifers in close proximity to structures.

Intermediate Zone (5-30 feet)

In the intermediate ignition zone (5-30 feet from the home), property owners should focus on **landscaping choices and fuel breaks that help decrease fire behavior**. Driveways, walkways, patios, and decks can all act as fuel-breaks if they are constructed of non-combustible material. Lawns and grasses should be maintained at a height of 4 inches or less, and vegetation should be spread out, with trees and shrubs limited to small clusters. Trees should be spaced with a minimum of 18' between crowns, and ladder fuels should be removed under trees to prevent a ground fire from reaching the canopy. Branches should be pruned from 8 to 12 feet off the ground, but not more than 1/3 of the height for smaller trees. Plants, trees, and lawns should be watered regularly to prevent them from being coming dry.

Extended Zone (30-100 feet)

In the extended ignition zone, homeowners should focus on **managing vegetation to decrease fire behavior and prevent fire from spreading**. The goal in the extended zone is not to prevent fire altogether, but to keep flames small and on the ground and interrupt the fire's path to prevent it from reaching structures. In this zone, homeowners will likely need to work together and in collaboration with the HOA, as the extended zone is likely to extend onto other privately owned property or into common areas and road easements where fuel reduction is crucial.

In the extended zone, property owners should focus on removing dead trees and plant material and minimizing the accumulation of ground litter and debris. Any storage sheds or outbuildings that fall into this zone should be clear of vegetation. Trees or clumps of trees within 30-60 feet of homes should have at least 12 feet between tree tops, and trees or clumps of trees within 60 to 100 feet of homes should have at least 6 feet between tree tops. Brush and small conifers growing between mature trees or clumps of mature trees should be kept to a minimum.

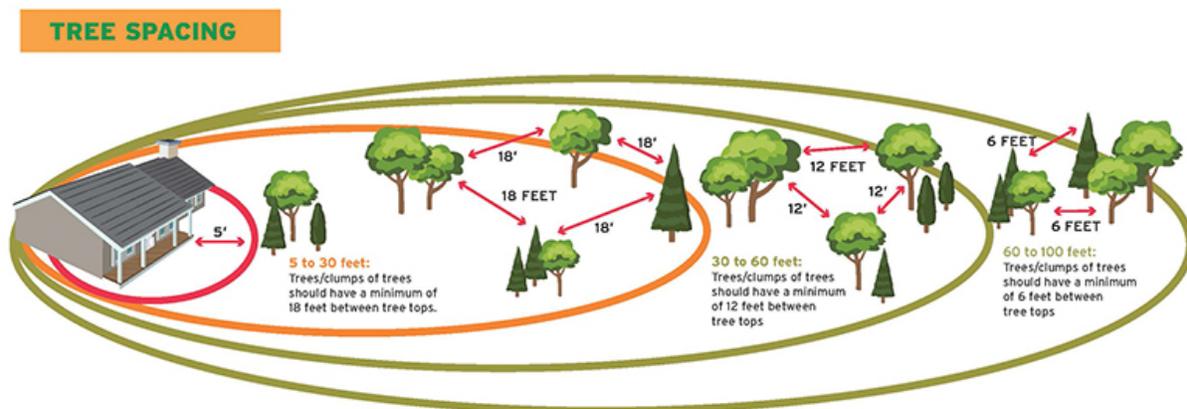


Figure 13 - Recommended tree spacing in the intermediate ignition zone (5 to 30 feet) and the extended ignition zone (30 to 100 feet). From the National Fire Protection Association/Firewise USA®

Some properties may include wooded areas outside the extended zone, and some lots are undeveloped entirely. In these cases, areas beyond 100 feet from a home or structure may still present an elevated fire risk where fuel loads are heavy, so fuel reduction treatment should be considered. Owners may consider thinning with appropriate slash treatment (see recommendations for common areas below) and pruning lower branches to minimize the chances of a crown fire.

Emergency Planning and Emergency Vehicle Access

Beyond minimizing combustible materials on/around homes and reducing fuel loads, another key area of focus for individual property owners is emergency preparedness. All households should have and practice an emergency action plan that includes each family member and pets.

Homeowners should be sure insurance policies are up-to-date and accurate, and keeping a home inventory is helpful in the event of a claim.

Driveways should be well-marked for emergency vehicles and should be at least 12 feet wide with 15 feet of vertical clearance to allow for emergency vehicle access. *All residents should schedule a drive through with the Orcas Fire Department to ensure that firetrucks and emergency vehicles can safely enter and exit your property. The ability to engage suppression on a structure fire depends on safe access via a pumper truck and other equipment. This should be redone every 5 years.*

On a community-wide basis, residents should consider working together to establish designated “safe zones” throughout the Highlands that could be used by multiple households in the event of a fire.

Common Areas

South Common Area

Approximately 20 acres of the south common area would benefit from additional thinning, particularly in the areas downhill of the residences along Tall Trees Trail. About 7.5 acres were previously thinned, with a similar-size area needing the most immediate attention. Thinning will decrease competition-driven mortality and fuel accumulation and increase the vigor of the trees that remain.

In the area near the burn pile with more standing dead trees, possibly due to Armillaria root rot, dead and dying trees should be removed. This is a wetter area and would likely support planted trees such as western redcedar that are root-rot resistant. Any plantings should be protected from browsing using deer fencing or cages, and this area should be monitored annually for additional signs or root rot and to track the success of planted trees.

Areas along Olga Rd and Lindsay Way have generally already been thinned, but 50-foot shaded fuel breaks should be maintained along both of these roads due to their critical locations downhill of most of the Highlands residences.

North Common Area

The north common area should be thinned to reduce tree density with the greatest focus within one tree length (80-100') of the road. Thinning will reduce competition-induced mortality, especially of the shore pines. Several dead trees are already leaning and could fall into the road, so these should be removed as well. Slash should be chipped, stacked in habitat piles (away from the road), or converted to biochar (see Thinning, Harvesting, and Managing Woody Biomass below).

The remnant skid roads and the driveway to the water storage tank provide equipment access and act as additional fuel breaks. These should be maintained and fuel reduction should be a priority around the water tank and hydrant to ensure access in an emergency.

Road Easements

Shaded Fuel Breaks

The principal management recommendation for the road easement zones is to implement a system of shaded fuel breaks. The purpose of a shaded fuel break is to create a fuel and vegetation arrangement that, in the event of a wildfire, reduces fire intensity and rate-of-spread such that it can more easily be controlled or extinguished. It also provides safer access for fire suppression work as well as emergency escape routes, which is critical in the Highlands where roads are narrow and there is only one way out of the community. The design of the fuel breaks for the Highlands incorporates the use of existing roads (and, in some cases, driveways) as these features have fuel-free surfaces and provide important access for the installation and maintenance of the fuel breaks.

Design

All shaded fuel breaks are designed to be installed on both sides of roads and the width of the treatment zone should be measured as a *horizontal distance* from the edge of the road. Shaded fuel breaks should ideally maintain a 30 to 70% canopy cover of mature trees. In areas where canopy cover is less than 30%, implementation will need to be flexible and allow for younger trees to establish and increase in size and height before the recommended treatments can be applied. Flexibility will also need to be employed in areas where treatment zones overlap with landscaped features and private plantings.

Shaded Fuel Break Prescription

Low slope (< 35% slope) shaded fuel breaks have a treatment zone of **25 feet** and high slope (>35% slope) shaded fuel breaks have a treatment zone of **35 feet**. Note that the HOA road easements are not uniform in size or shape and flexibility will need to be used when delineating the actual treatment zones. It is strongly advised that the full fuel break widths be applied regardless of the easement location. Within these treatment zones:

- Open dense tree canopies to achieve a 60-70% canopy cover by thinning out low-vigor and less drought tolerant trees (suppressed). Target trees 9" DBH and smaller and preference the removal of hemlock, cedar, pine, and grand fir over Douglas-fir and alder.

- Reduce ladder fuels by removing small conifers (< 6" DBH), limbing lower branches on retained trees (limb to 12 vertical feet from base), and removing branches overhanging the road to a height of 18 vertical feet.
- Reduce brush type fuels by mowing or cutting (e.g., ocean spray, conifer seedlings, rose, salal, *Rubus* (blackberry) species)
- Reduce woody surface fuels by cutting and removing all fine and moderate fuel classes (<5" in diameter) that have accumulated to a height of 3" or more, leaving in place large woody debris.
- Woody debris created from thinning and pruning should be chipped or removed from the site and burned at the community burn pile location. Converting the biomass to Bio-char via conservation burn piles or portable kilns is a better practice and should be encouraged as this will greatly reduce carbon emissions.
- Larger diameter logs (>10" in diameter) should be left on site in full contact with the ground to decay.

Because of the high risk of catastrophic fire during extreme weather events and the relative inaccessibility for ground-based fire suppression equipment, the installation of a system of shaded fuel breaks is a high priority for the long-term protection of the Highlands. As such, efforts should be made to implement these treatments as soon as possible. Maintenance, likely needed on a 4 to 6-year interval, will be important, yet will be at significantly lower cost than initial installation (see cost estimates below).

Thinning, Harvesting, and Managing Woody Biomass

Forest ecosystems have a natural carrying capacity with limited light, space, and nutrients for trees and other vegetation. In dense, crowded stands, trees compete for resources as they grow, ultimately resulting in some mortality. Many of Orcas's current forests have grown back on land that was previously cleared and have now reached the "competitive exclusion" phase of forest development, where suppressed and unhealthy trees are dying off. While this process will naturally thin the forest over a long period of time, it will also result in heavy fuel loads and stands that are more susceptible to widespread damage from windthrow or disease infestation. By managing forests with harvesting and thinning, we can speed the process of a forest reaching "old growth conditions" and essentially grow bigger, healthier trees faster. In the process, we can greatly enhance the overall health of a forest, reduce fire risk, increase resistance to insects, disease, and drought, and provide higher-quality wildlife habitat.

However, when it comes to fire risk, thinning and harvesting activities can result in abundant and sometimes excessive amounts of slash, the debris left over after forest treatments. Reducing the density of trees alone will not reduce fire risk if slash and biomass accumulation leads to dangerous fuel loads.

The following are recommended methods for treating slash and accumulated woody debris:

- Chipping may be one of the fastest ways to treat slash in areas with easy access and has the advantage that it can be done year-round, regardless of weather. A large chipper can handle full-length limbs and tops of trees efficiently. Chipping is most appropriate in areas close to roads or the edge of openings. The over-application of chips to the forest floor (i.e., smothering) should be avoided in areas other than short distances from roads and openings or mulching projects around individual trees and paths.
- Lop-and-scatter is a method of dispersing smaller sized slash throughout the forest to achieve rapid decomposition and keep nutrients on the site. Slash should be cut so that when it is scattered it lies as close to the ground as possible (within 8 to 12 inches of the ground). When properly done, this method can be an attractive and effective means of treating slash. If the cut slash is not adequately dispersed, or if too much material is applied to a particular area at once, this method can increase the fuel hazard.
- Burning slash is an inexpensive and effective method of reducing fuel loads, and through the creation of biochar, provides an opportunity to stabilize carbon in the soil and increase soil health. To create biochar, slash can be burned in a portable flame-cap kiln or stacked in conservation burn piles during management operations. When creating conservation burn piles, slash of similar diameters (within a few inches) should be stacked in cone-shaped piles with the largest material at the center. More, smaller piles (4-6' in diameter and 4-6' tall) are better than fewer, larger piles. Piles should be allowed to dry and can be covered with tarps until an appropriate time to burn, as dry material decreases emissions of volatile gasses into the atmosphere. Piles should not be burned until the ground is saturated and weather conditions are cool and wet. When burning, light the pile from the top and allow it to burn until it reaches the bottom of the pile, pushing any unburned material into the pile with a rake. Once the pile has burned to the bottom into a bed of hot coals with a slight coat of ash, it should be extinguished with water.



Figure 14 - Conservation burn piles before being burned for biochar

San Juan County requires burn permits for all fires larger than 2 feet by 2 feet.

- Habitat piles and constructed logs are deliberately made from slash and provide ecosystem services for a variety of wildlife that can mimic those provided by large coarse woody debris that may be absent from younger forests. Habitat piles should be about 10-12 feet across at the base and about 6 feet tall. Four to six crisscrossed layers of large poles (at least 4" diameter) make up the base of the pile and provide structural support and tunnels for small wildlife to escape predators. At least 18 inches of finer material should be added on top and can provide ground-nesting birds with forage, cover, and nesting sites. Constructed logs are made from numerous cut trees and large branches stacked together lengthwise and can provide some of the ecosystem functions of larger rotting logs. Constructed logs can retain moisture and accumulate leaf litter and debris, making a favorable environment for fungi and insects that attract other wildlife. Constructed logs should be 12 to 20 feet long and about 2 feet wide. Cribbing can be used to define the dimensions of the constructed log and hold the smaller diameter poles together. Two to three habitat piles or constructed logs can be constructed per acre, about 100 feet apart. Construction should be avoided where piles/logs may present a fire hazard. In warm, dry, sunny areas, piles and logs are best constructed in the shade, and in cooler, wetter areas, they are best constructed on the edge of a clearing or in an area with partial sun. Piles within 100 feet of surface water benefit amphibians and other aquatic species.

TIMELINE AND COST ESTIMATES

General

Firewise USA® requires that the Community Wildfire Risk Assessment be updated at minimum every 5 years. Given the size of the Highlands common areas and the dynamics of local forest ecosystems, this should include updates to the treatment plan for the forested common areas and road easements and may require some additional consulting. The community's Action Plan is required to be updated at minimum every 3 years; this task can be managed by the HOA board with input from community members at no external cost.

Firewise USA® also requires each site to annually invest the equivalent of one volunteer hour per dwelling unit in wildfire risk reduction actions. For example, the Highlands has 103 homes, so 103 hours of work or the monetary equivalent, based on the independent sector value of volunteer time (currently \$25.53), need to be completed for that year. Firewise USA® provides a [list of time and expense examples](#), but it is likely that the Highlands will have no trouble

meeting this requirement given the anticipated investments in forest management and the existing annual community

Common Areas

In general, continued thinning and fuel reduction in the south common area should be prioritized over the next 1 to 3 years, with hazard tree reduction and thinning in the north common area occurring at the same time or in the following year or two. Estimated per acre treatment costs are \$1,800-\$2,500 for the south common area. The north common area will require additional hazard tree work and treatment costs will likely range from \$2,500-\$3,500/acre.

Shaded Fuel Breaks

Shaded fuel breaks should be installed as soon as possible due to their high degree of importance in wildfire protection. Initial installation costs are 5 to 10 times the maintenance costs and should be considered an important long-term investment in the overall fire safety of the Highlands. The cost estimates below are based on costs per mile of treatment for a single side of road for a given width, 25 feet vs. 35 feet. There are approximately 2.75 miles of roads throughout the HOA. The range in costs for roadside fuel breaks is necessarily wide and indicative of the variable nature of tree density, fuel arrangement, slope, and other site characteristics. These costs are based on actual fuel reduction contracts on Orcas, San Juan, and Waldron Island over the last 10 years. The HOA board should use these ranges for budgeting purposes but should also pursue an open bidding process for any planned work.

Shaded Fuel Break Installation Cost Estimate			
Cost per mile/single side 25' width		Cost per mile/single side 35' width	
<i>Low Range</i>	<i>High Range</i>	<i>Low Range</i>	<i>High Range</i>
\$4,500	\$16,000	\$5,000	\$19,500

Table 1 - Shaded fuel break installation cost estimates

In addition to the shaded fuel breaks, annual mowing will keep grass and other light fuels in control. Costs for mowing will likely be around \$2,000/year.

Management Activity Summary	Timing/Frequency	Cost
General		
Community Wildfire Risk Assessment update, to include updates to treatment plan for common areas and road easements	Every 5 years	\$1000
Action Plan Update	Every 3 years	\$0
Community-wide wildfire risk reduction activities	Annually	\$0
Common Areas		
South common area thinning and fuel treatment – 20 acres	Over next 3 years	\$2,500/acre
North common area thinning and fuel treatment – 5.2 acres	Over next 2 years	\$3,500/acre
Road Easements		
Shaded fuel break installation	ASAP	\$55,000
Shaded fuel break maintenance	Every 4-6 years	\$11,000
Mowing	Annually	\$2,000/year

Table 2 – Summary of recommended management activities along with their timing/frequency and estimated cost

Six-Year Cost Projection and Recommended Timeline		
Year	Management Actions	Cost
1	Shaded fuel break installation, roadside annual mowing, thinning approx. 7 acres of south common area	\$74,000
2	Thinning approx. 7 acres of south common area, roadside annual mowing	\$19,000
3	Thinning approx. 7 acres of south common area, roadside annual mowing	\$19,000
4	Thinning north common area, roadside annual mowing	\$20,200
5	Roadside annual mowing	\$2,000
6	Shaded fuel break maintenance, update to Community Wildfire Risk Assessment & treatment plan for common areas & road easements, roadside annual mowing	\$14,000
Six-year total budget		\$148,200
Average yearly cost for the six-year project timeline		\$24,700

Table 3 - Projected costs over 6 years

Cost Reduction and Cost-Sharing Opportunities

At present, the Washington Department of Natural Resources (DNR) offers cost-reduction and cost-sharing programs for wildfire risk reduction in eastern Washington; however, as wildfire risk continues to increase across western Washington, DNR is exploring additional possibilities for assisting small forest landowners and communities in reducing wildfire risk. The [San Juan Islands Conservation District](#) currently working on a potential cost-sharing program with DNR that may have funding available in the next year, though this is not a guarantee. In the meantime, the Conservation District is an excellent resource for technical assistance and additional ideas for grants and cost-sharing programs.

LINKS TO ADDITIONAL INFORMATION

[Firewise USA®](#)

[Preparing Homes for Wildfire \(From Firewise USA®\)](#)

[How to Prepare for a Wildfire \(From Ready.gov\)](#)

[2003 Orcas Highlands Firewise Assessment](#)

[2012 OIFR Recommendations for the Highlands](#)

[San Juan County Emergency Management Wildland Fire](#)

[San Juan County Wildfire Protection Plan \(2012\)](#) – An updated Wildfire Protection Plan for San Juan County is expected to be released in 2021

[Washington State Fire Adapted Communities Learning Network](#)

[Fire-resistant Plants for Home Landscapes in the Pacific Northwest](#)

[Wildland Fire Behavior \(From the National Park Service\)](#)