Killara Burn
Forest Management Plan

Parcel number 371114003000
Waldron Island, WA

Prepared by

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I. Purpose of Management Plan

This forest management plan was created to serve as the principal guiding document for the management of 23.46 acres of forest land owned by Killara Burn (parcel number 371114003000). It is the landowner's intention to maintain this property in the Designated Forest Land (DFL) program. This plan follows the current DFL standards required by the San Juan County Assessor's office together with the guidelines set by the Washington Department of Revenue. This plan has been developed to meet those requirements as well as to help the landowner become a more informed steward of the forest resources present on this property.

II. Goals and Primary Objectives

The overarching goals of the owner are:

> *To grow and harvest quality timber while protecting and improving the health and biological integrity of the forest.*
>
> *To promote a structurally diverse forest landscape through well-timed and thoughtfully executed forest management activities.*

The following is a list of primary objectives that support the above goals for this property:

1. Grow and harvest high quality timber.
2. Utilize timber products to help offset the cost of forest management activities.
3. Use appropriate, low-impact logging techniques when harvesting, and plan for a method of regeneration in order to ensure future productivity.
4. Promote and enhance late-successional (older) forest characteristics.
5. Protect forest resources by controlling the occurrence and spread of undesirable, non-native species.
6. Promote stand structures that reduce hazardous fuels and minimize the risk of uncontrollable forest fire.
7. Support the local economy by marketing forest products locally when possible.
8. Enhance and sustain scenic and ecological values and maintain habitat suitable for a variety of wildlife species.
9. Seek professional guidance to develop tools for improving health, quality, and productivity of the forest.

III. Legal Description and Location

The subject parcel is located on the northwest corner of Waldron Island, within Washington State's San Juan Islands (Figure 1). The size of the parcel is 23.46 acres and currently in Designated Forest Land. Due to a cabin on the north end of the property, one acre will be excluded from the DFL program. This will account for the Assessor's standard home site deduction.

Table 1. Legal description and location of parcel.

Parcel Number	Size (Acres)	Current Land Use	Short Legal Description	Title Owner
371114003000	23.46	DFL	PR LT 6 EX ESTLY 775 SE-NE EX ESTLY 775; W/ SFTPO 005	J. K. Burn

Vehicular access to the property is from a county maintained gravel road that runs east west. At approximately midpoint along the parcel's southern boundary is a north south running driveway which accesses the cabin at the north end, as well as a skid road and several small turn outs (Figure 2). A number of footpaths provide access to the northern quarter of the property and to its northwestern corner.

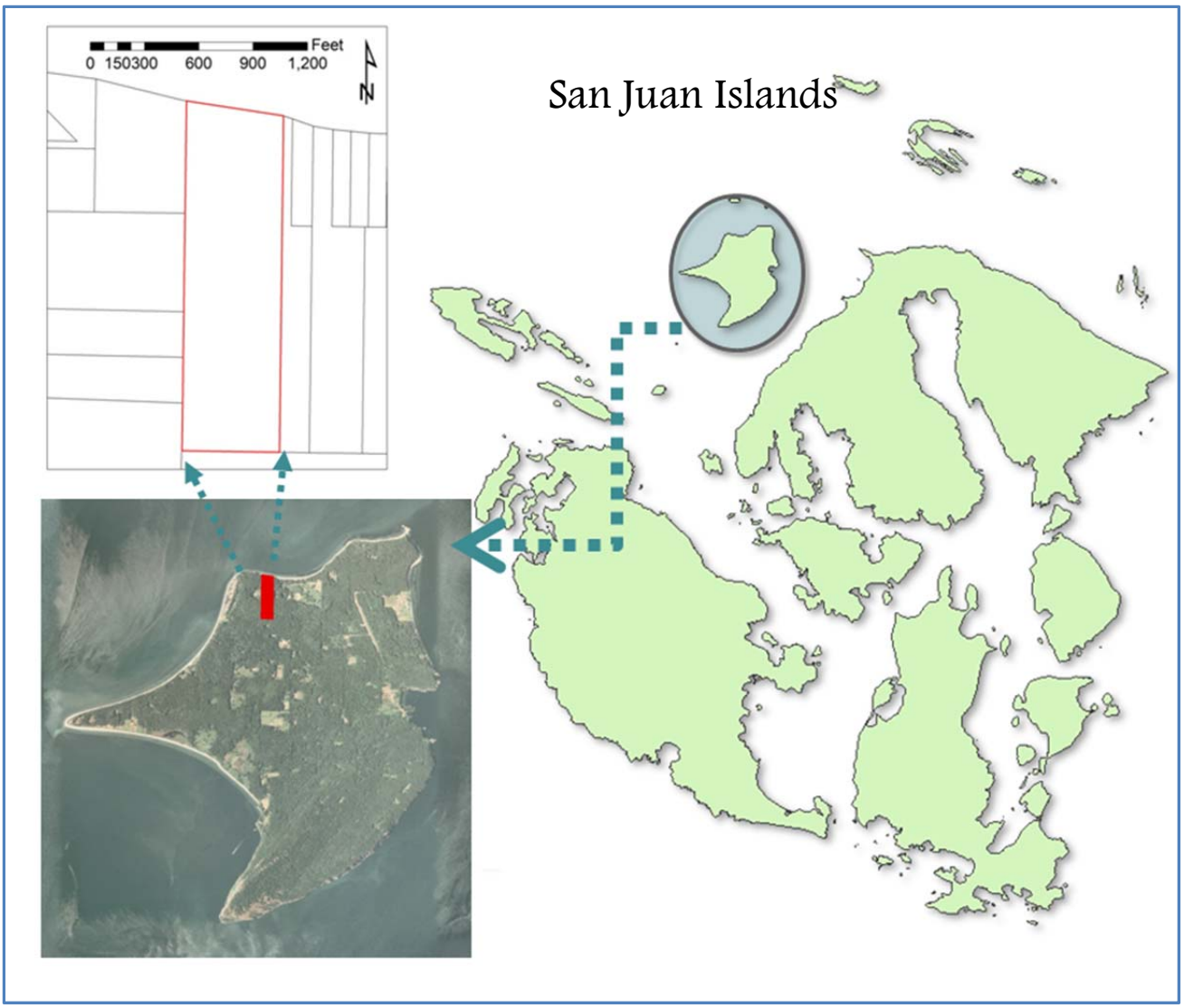

Figure 1. Location of parcel within the San Juan Islands, WA. Waldron Island is highlighted within the archipelago (upper right) and presented as an aerial photo (bottom left). In the upper left corner of figure (inset showing parcel boundaries), is the 23 acre parcel owned by Killara Burn.

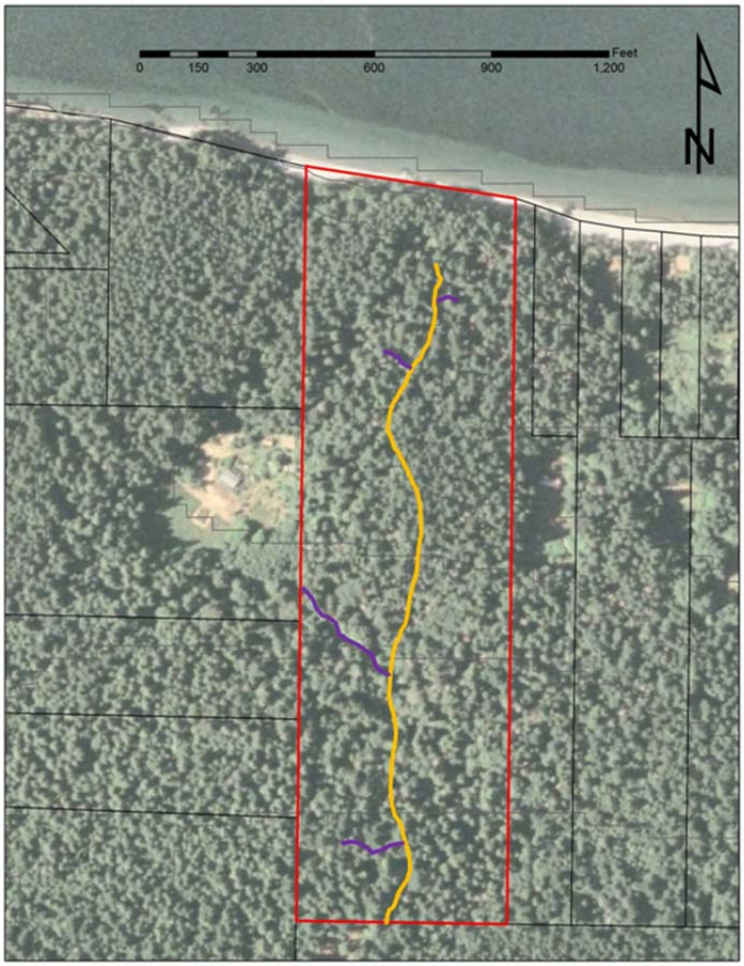

Figure 2. Map showing location of driveway (yellow line) and skid roads and turn outs (purple lines).

IV. Background and Land Use History

Waldron Island totals about 2,900 acres (4.5 square miles). It is one of several "outer" or "non-ferry" islands among the San Juan Islands, with the nearest ferry-served island, Orcas, to the southeast. Waldron has no land line telephone service and no grid power. Passengers, mail, and small freight loads are handled by a number of island-based boat operators. Barge services are used for large loads such as vehicles, building supplies, bulk propane, and, occasionally, log export.

Over the last century logs have been exported from Waldron by booming and barging. Waldron currently has three small, part-time sawmill operations which produce dimension lumber for local use.

Surprisingly, the volume of lumber produced from these sawmills does not meet the local demand and, therefore, lumber is regularly imported. Almost all of the heated buildings on the island use cord wood for fuel, and there is a small but steady market for firewood, which remains a locally produced product.

Aside from a handful of early cleared farms, much of Waldron Island was logged around 1900. The majority of the harvested timber was processed locally and sold as cord wood to feed the San Juan Island lime kilns. It was during this time that most of the easily accessible and merchantable timber was removed from Waldron.

The subject parcel was likely logged for cord wood around 1900. Remnant stumps from this logging (and possibly some homestead logging activity) can be seen scattered across the property. It appears that the land was logged quite heavily at this time as only a dozen or so old-growth Douglas-fir (*Pseudotsuga menziesii*) trees remain. These residuals were likely left due to their inferior grade as they all exhibit pronounced sweeps or other defects such as butt rot and open fire scars. More common across the parcel are scattered old-growth western red cedar (*Thuja plicata*) that were likely passed over due to size or defects. Some of the old stumps on the property are cedar and appear to be of a decent size.

This parcel was once owned by the now late Elvita Johnson and was purchased from her by Killara's father circa 1970. Subsequent logging on the Killara Burn parcel since the 1970 purchase has been sporadic and somewhat limited. Since 1981 small-scale selective removal of lumber grade trees has occurred every few years. Some of the lumber was sold or traded but much of it went into the cabin which now resides on the property. Also, cord wood has been cut and sold from the property in conjunction with driveway improvements and maintenance.

The landowner has limited experience in traditional forest management, but has sought the advice and counsel of a professional forester to assist in the preparation of an updated forest management plan as well as on-going stewardship of the property.

V. Soil Description and Management Implications

According to the NRCS soil survey of San Juan County, this property contains only one soil type: Indianola loamy sand (Figure 3). Its full description is "Indianola loamy sand, warm, 3-15% slope." This soil type is found on only 1.1% of property in San Juan County. It is derived from glacial outwash, which makes it significantly coarse in texture and, therefore, low in both water-holding capacity and fertility. Trees can root deeply in its sandy texture, though the anchorage may only be moderately good. This soil is better suited for the growing of trees than for farmland.

In terms of timber production, Indianola loamy sand is considered a *site class III* for Douglas-fir (based on a scale of 1 to 5; 1 being the most productive sites and 5 the least.). The *site index* for Indianola soils is 140. This means that a typical Douglas-fir tree growing on this soil will be approximately 140 feet tall at 100 years of age.

Due to the coarse texture of the soil, and low degree of slopes on this property, the risk of erosion and compaction due to logging activity is relatively low. The steepest portion of the property occurs within 100' feet of the shoreline, where mechanized logging will not occur. The remainder of the property exhibits little to no slope. If signs of erosion *were* to occur in areas where harvesting has taken place, the following action should be taken:

1. Apply 4-6" of straw to area to decrease surface runoff
2. Plant native species such as western red cedar and salal (*Gaultheria shallon*) to stabilize soil.
3. Decommission roads or trials crossing to affected area.

The coarse texture of Indianola soil (very little clay content) means that there is little concern of compaction during light, intermittent harvesting operations. It should be noted that there is a wet area near the northwestern border of Stand 1 that is at a higher risk for compaction. If and when harvesting is planned for this area, activities should be carried out in the dry season. Care should be taken when conducting any logging operations to avoid wet, saturated soils.

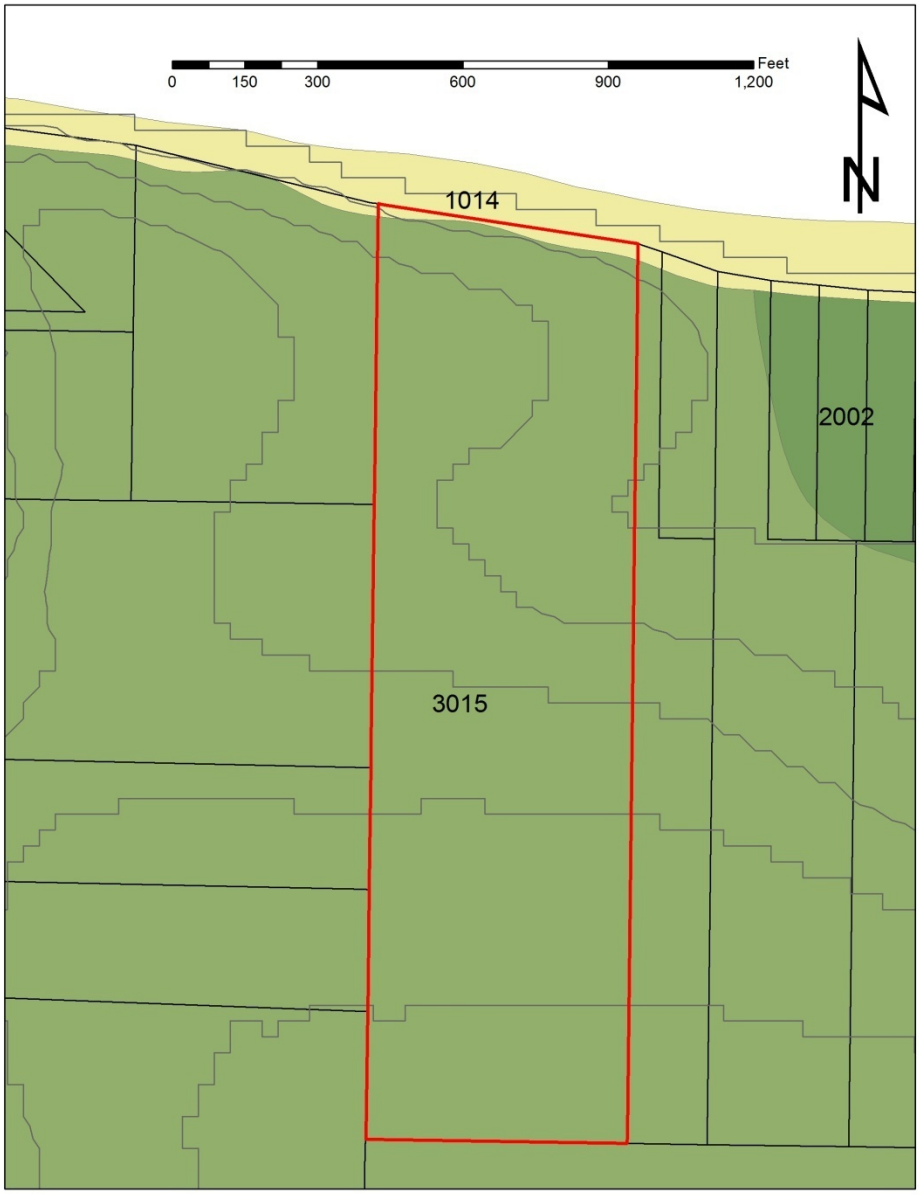

Figure 3. Soils map showing the only type present on the subject property type 3015 (Indianola loamy sand).

VI. Stand Descriptions (See **Stand Map**, Figure 4)

Overview

The stands on this property are typical of dry, low-elevation sites in the San Juan Islands. Stumps present throughout the stands indicate that, around the time of early Euro-American settlement (circa 1880), the property was dominated by large Douglas-firs. Western red cedars were historically present as well but in smaller numbers. The shoreline was a place where a greater mixture of species would have been found. Lodgepole pine (*Pinus contorta*) and madrone (*Arbutus menziesii*) would have been common, along with stunted and windswept Douglas-fir. Hardwoods in these pre-settlement, mature forests likely played only a minor role because gaps in the forests large enough to allow for their regeneration rarely formed. However, moisture-loving hardwoods such as alder (*Alnus rubra*), maple (*Acer macrophyllum*), willow (*Salix* sp.), crab apple (*Malus fusca*), and sometimes aspen (*Populus tremuloides*) and cottonwood (*Populus trichocarpa*) would have been common along the edges of seeps, swamps, and bogs.

Though no formal survey of pre-settlement forest conditions was conducted for this property, the following observations provide some clues. Evidence of large-scale windthrow (e.g., groups of similarly aged downed logs exhibiting a common orientation) was not apparent. However, the appearance of some recent wind damaged trees (broken tops, winthrow, large down limbs) and the parcel's exposure to storms from the northeast suggests that wind and snow storms may be a significant contributor to tree damage and mortality.

From a historical perspective, although all of the major disturbance agents (i.e., wind, disease, fire, and insects) had important roles for most of the forest types found in the San Juan Islands, the historical disturbance regime was *dominated* by fire. From what is known of historical fires on Waldron, the historical fire regime for Douglas-fir forests on Waldron is best described as low severity. In essence, this means that fires tended to burn frequently (about every 5 to 20 years) and also caused relatively light damage—killing or damaging small to medium sized trees, shrubs, and herbs. Across Waldron Island evidence of past fire (in the form of fire scarred trees, snags, and stumps) is abundant. This property is no exception.

Stand type 1: (5.9 Acres)

This stand is a mostly even mixture of Douglas-fir and cedar. The trees are well formed, healthy, and of high quality. The stand is mature—with dominants in the age range of 90-120 years—and exhibits a well developed young cohort of cedar, hemlock and grand fir. The younger cohort is just approaching sawtimber size and is in the age range of 40-50 years. Small pockets of seedlings and saplings are also present but gaps sufficient for their regeneration are few.

This fully stocked stand appears to have been mostly untouched over the last 100 years. Its structure is characterized by a multi-layered canopy, a broad assortment of trees sizes, and also the type of spatial patchiness that is associated with mature, unlogged forests. It has good quantities of down wood (coarse woody debris), snags, and some small gaps as well—all important elements of late successional forests. Over time, with modest levels of harvesting, it will continue to develop increasing old-growth characteristics. It will also provide a sustainable flow of high quality timber that can be sold periodically to supply the local market.

A four-plot cruise of this stand (using variable plot radius sampling, BAF 54.44) showed that average board foot volume is around 39 mbf/acre (thousand board feet per acre; standard deviation 8.9 mbf). This is in the ballpark for an unlogged 90-120 year old stand growing on land with a site class of III. The average tree height for all species is 107', and 117' for Douglas-fir specifically. This is a little low as the site index for this soil type is 140 (height potential for a 100 year Douglas-fir). This difference is likely related to the exposure that these trees receive from the wind.

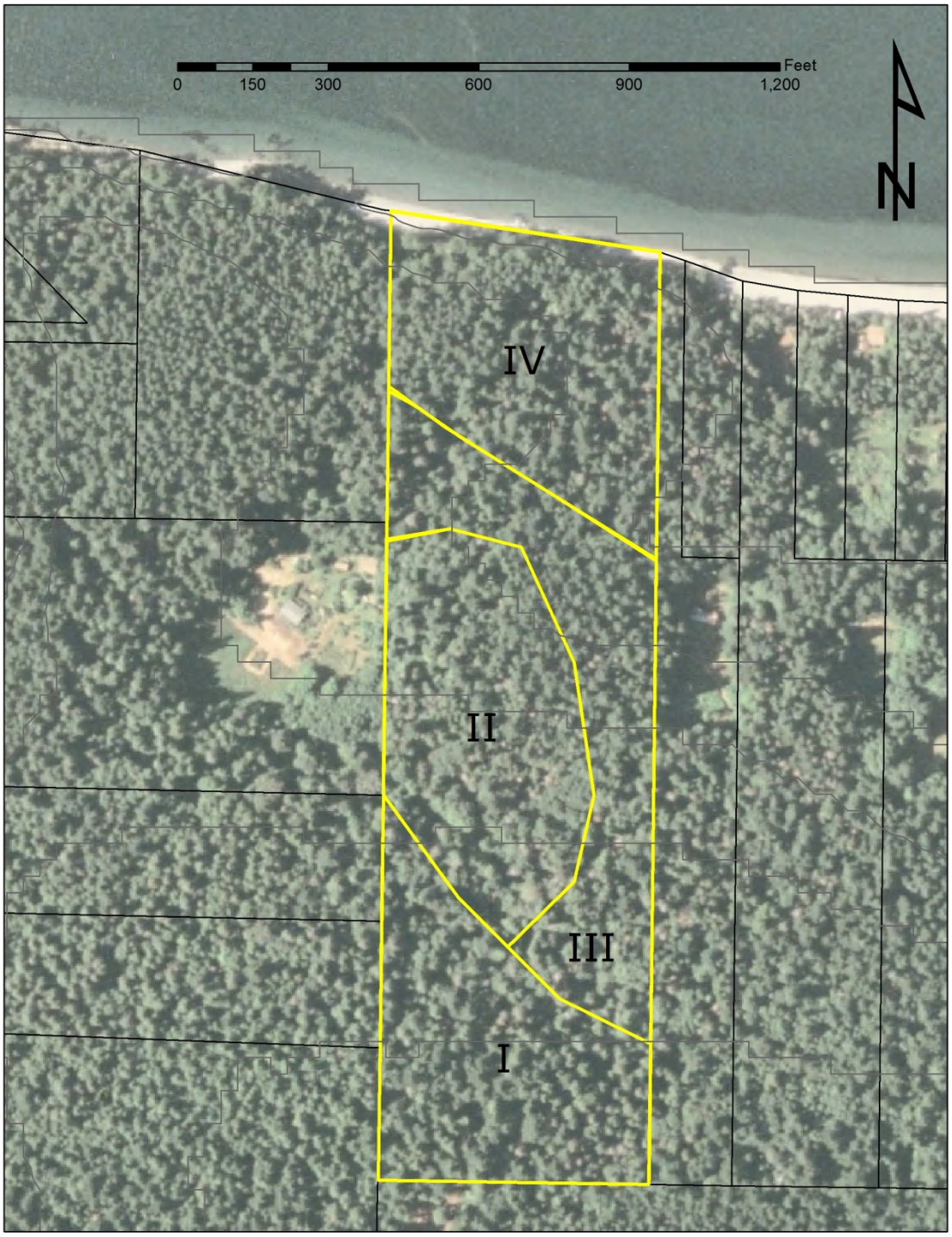

Figure 4. Stand type map showing location of the 4 stand types present on the subject property.

Stand type 2: (5.9 Acres)

Stand 2 is a mixture of grand fir, big leaf maple, and Douglas-fir. The grand firs are much more numerous, though the average tree size is low. It is also in poor health—suffering from a combination of drought stress, bark beetle attack, and overcrowding. About 20% of the trees have already died and another 30% is in sharp decline. The maple is present mostly as larger individuals with spreading crowns and few merchantable saw logs. Some high quality specialty grade (burls) logs are present but these are few. The health of the stand improves toward its northern edge where an increasing component of Douglas-fir is present.

Abundant stumps indicate this stand was heavily logged. It likely had all of the merchantable Douglas-fir removed and was allowed to naturally regenerate to alder and grand fir. As the alder senesced and died out, it was replaced by more grand fir and scattered maples. The quality of the standing timber is low, with about 2/3 of the volume being only suitable for cord wood. This stand was sampled for volume (5 plot cruise, BAF 34) and the estimated board foot per acre is 23.3 mbf (standard deviation 2.1 mbf). According to the cruise, grand fir accounts for about 6.7 mbf/acre and the maple averages to 5.3 mbf. The density of grand fir is three times that of the maple (76 trees per acre compared with 25) and slightly more than double that of Douglas-fir (36 trees per acre—although this is skewed somewhat by two plots in the northern edge of the stand with higher abundance of this species).

This stand is in decline and the most beneficial management action may be to clean much of the unit of grand fir and maple in order to reestablish a healthy new cohort of Douglas-fir.

Stand type 3: (5.5 Acres)

This is a dense, slightly overstocked stand of Douglas-fir, grand fir, cedar, and hemlock. No species clearly dominates though Douglas-fir and grand fir together make up about 2/3 of the volume. Cedar and Douglas-fir are present in two cohorts. The younger cohort of trees is estimated to be 80-90 years, and the older cohort is approximately 250-300 years old. The scattered older Douglas-firs are adorned with charred bark, as well as an occasional healed over fire scar.

The size of the 80-90 year cohort averages about 14 inches dbh, while the average size of the larger cohort, though much more variable, is about 36 inches dbh. Estimated density is around 320 trees per acre (TPA).

This overcrowded stand is showing early signs of suppression-induced mortality. Essentially, the trees are fighting for access to light, and many are beginning to decline in vigor. Some have already succumbed to the competition and died. An indication of an overcrowded stand is when the average percent live crown (percent of a tree's height covered with live foliage) is less than 25%. Percent live crown was estimated on a number of trees in the younger cohort to be between 10-20%.

Stand type 4: (5 Acres)

The stand is mostly pure Douglas-fir and is well stocked with generally healthy and well formed sawtimber. A few large and ornamented Douglas-fir are scattered about along with some older cedars which exhibit signs of past fire, extensive woodpecker activity, and ornamented multi-topped crowns. A number of these cedars have recently died or experienced sever top dieback, likely the result of overcrowding and drought stress. The understory is composed primarily of salal and oceanspray (*Holodiscus discolor*).

The northern edge of this stand borders the property's shoreline, and is defined by its exposed, rocky edge to the north and its close proximity to the water. Portions of this shoreline zone exhibit a strong north aspect and attain steeper slopes (15-25%) compared with the rest of the property. The Douglas-fir in this zone range from slightly stunted to very twisted and wind sculpted. The latter are wonderful "character trees" and are a defining shoreline feature in San Juan County. Though not large, some of these firs are quite old and well rooted—an important factor in the stability of the soil on the shoreline.

An interesting and unusual feature can be found at the very northwest end of Stand 4 just up from the beach. Here lies a magnificent grove of crab apple which is reminiscent of an old orchard. Care should be taken to protect this possible artifact of Native American history, as some of the local archeological and ethnobotanical literature makes reference to the prized crab apple "orchards" that Coast Salish people tended in our area. Also present in this location, though a bit higher up on the bank, are a number of unusually large Douglas maples (*Acer glabrum var. douglasii*).

VII. Wildlife Habitat and Important Ecological Features

A complete wildlife inventory was not completed for this plan; however, the following observations were made. The shoreline is a very active place for a number of wildlife species including eagles, shorebirds, and otters. The undeveloped portion of shoreline belonging to this property is fostering the development of large and enduring conifers as well as overhanging and fallen trees; two structural features that are critically important for both terrestrial and marine wildlife species.

The older forest conditions present in stand type 1 and 4 include a number of high quality forage and nesting snags for cavity nesting birds. High quality snags for our region are defined as standing dead Douglas-fir or cedar trees larger than 16 inches dbh. These types of snags can remain standing for decades. Even more enduring are living trees that contain portions of large diameter dead wood (Figure 5). Old-growth Douglas-firs and cedars (typically with multiple dead tops) are good examples of this. They are rarer but also very important due to their long expected life span. The most important management decision regarding the wildlife habitat will be the retention of the snags and large, down logs, old growth Douglas-firs, and old growth cedars.

Figure 5. Good example of a wildlife tree showing ornamented and partially decayed top.

VIII. Forest Fuels and Fire Hazard Reduction

Uncontrolled forest fire is a serious threat to all forest land in San Juan County. Two of the best methods to help prevent catastrophic wildfire are 1) managing hazardous woody fuels, and 2) providing vehicular access to key areas.

Not all woody fuels are alike. In a typical Douglas-fir forest, much of what is considered "woody fuel" (essentially all woody biomass above ground) is not hazardous and often does not warrant management actions. In general, the types of fuel to be concerned with are the following:

• Fine fuels. Fine fuels include grasses, needles, and small twigs up to ¼ inch in diameter—all of which dry out very quickly and burn hot and fast. Fine fuels are most abundant on the edge of clearings and next to buildings.

• Small diameter branches. Material larger than fine fuels but less than 3 inches in diameter (usually the bulk of logging slash and blow downs). Once dried, it can be a major source of fuel for wildfires. When accumulated to high levels, this is the type of fuel that can feed fires enough to initiate the transition from surface fire to partial crown fire—an extremely dangerous situation.

• Ladder fuels. Ladder fuels are most commonly small live trees that grow underneath and close to mature trees, creating a continuous vertical arrangement of fuel from the ground into the canopy. Ladder fuels can also include low sweeping limbs on mature cedars, dead trees, vines, and tall shrubs.

• Old-growth trees and snags. These landscape features pose a unique problem. In our dry climate, snags and old-growth trees contain numerous pockets of decayed and sometimes resin soaked wood. When fires are present (either from controlled brush fires or uncontrolled wildfire), embers can land in these regions and cause a very rapid change to the fire environment. Because of their ecological value, removal of these enduring features is not recommended. Rather, managers should be familiar with their locations and use extreme caution if and when fires are in the area.

Stands1, 2, and 4 on this parcel do not exhibit high levels of hazardous fuels. Stand 3 has moderate levels of hazardous fuels due to the abundance of down wood from recent mortality. It also has a

moderate east facing slope near the east property boundary. The greater the slope, the greater the intensity of fire behavior. This area should be treated to reduce the fuel load via hand slashing and pile-and-burn methods. Thinning and harvesting activities can create abundant fuel and it is recommended that these be treated in order to maintain safe 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. 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 (smothering) should be avoided in areas other than short distances from roads and openings or mulching projects around individual trees.

Burning small slash piles during the wet season is an inexpensive and effective method of reducing fuel loads. Piles should be constructed during management operations, avoiding large layers of debris across the forest floor. Piles should be made early in the season to allow for partial drying and covered with tarps to facilitate clean, hot burning. Piles should not be burned until the ground around them is saturated and weather conditions are cool and wet. Keep the size of the piles manageable (10-20’ in diameter) and within 200 feet of access roads.

Lop-and-scatter is a method of dispersing smaller sized slash throughout the forest in order to achieve rapid decomposition. 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 is an attractive and effective means of treating slash. However, if the cut slash is not adequately dispersed or if too much material is applied to a particular area at once, this method can create more hazardous fuel conditions.

Vehicular access for much of the property is good. However, the width of the driveway is too narrow at several key locations and both fire suppression trucks and compact logging equipment cannot safely travel on this road.

IX. Forest Health: Disease, Insects, and Invasive Species

Disease

Two small (.1 acre) root rot pockets were identified. The types of pathogenic fungi that are likely at work are laminated root rot (*Phellinus weirii)* and Armillaria (*Armillaria spp*)—two fungi which target both Douglas-fir and grand fir. Both types can aggressively transmit infection through root to root contact and are capable of a rate of expansion of about 1 foot per year. Both types also survive in a latent state in old stumps and transition to their aggressive stage once they come into contact with live roots. The rate of infection is often correlated with other forms of disturbance (e.g., insect mortality, damage from heavy equipment or livestock) as well as drought.

Both pathogens are native fungal organisms that are common in the Pacific Northwest. In the natural development and maturation of Douglas-fir forests these pathogens have a functional role. They increase in abundance with stand age and tend to be the drivers of small to medium sized canopy gaps, thereby helping to initiate natural regeneration and spur habitat diversity. At times, however, these diseases can cause significant damage to merchantable timber and lead to economic loss of timberland investment. There are two options for mitigating the damage caused by root rots. The first method involves removing all stumps and large roots of infected trees. This is an aggressive approach primarily used on industrial timberland with short rotations using clear-cutting methods. The second option involves a combination of frequent monitoring and disease pocket mapping, salvage logging where appropriate, and perhaps the planting of resistant species (e.g., western white pine, alder, and/or bigleaf maple). The current level of root rot infection is considered low and not a major problem at this time. Future monitoring of these and other new infection pockets is recommended.

Insects

Fir engraver beetles (*Scolytus ventralis*) have been active on the island and were likely responsible for a considerable amount of the grand fir mortality. The outbreak has collapsed for now but could be reinvigorated if care is not taken to thin overstocked stands with large grand fir components.

Invasive Species

English Ivy (*Hedera helix*)

English ivy is, unfortunately, a common invasive species on Waldron Island. As it grows into the canopy of trees, increased light levels allow it to fruit—producing berries that are then spread by birds to new locations. English ivy has many detrimental effects on native vegetation such as 1) blocking out light to the host tree which can result in tree mortality, 2) adding excessive weight to the tree and thereby increasing the chance of stem breakage or the tree falling over, and 3) inhibiting native understory plant growth and reproduction. English ivy is also known to create an ideal refuge and bedding site for introduced pests such as rats and starlings.

Several outbreaks of English ivy were located (Figure 6) while conducting an ecological inventory of this property (February 2011). All of these outbreaks contained both prostrate (growing along the ground) and aerial shoots. The vigor and level of infestation of each of the outbreaks was mild to moderate and none of ivy was observed growing higher than 50 feet from the ground.

Figure 6. Photo showing patch of ivy growing on the subject property. Note charred cedar stump.

If no control measures are implemented on these patches, they will continue to increase in size and number. Due to several mature patches on neighboring parcels (Burn parcels to the south and west), it will be important to work together in order to effectively eradicate the ivy (or, at least, control its spread). Though controlling ivy can be labor intensive, it is imperative that action be taken soon while the outbreaks are of a manageable size. Rapid implementation of control measures will not only save trees and other native plants, but it will save time and money. Waiting for several years to control the ivy will be even more costly.

There are three common approaches for controlling ivy: manually removing the plant (cutting vines and digging up all roots), applying herbicide, or a combination of the two. According to the Washington Department of Natural Resources, manual removal is the most effective method of control. One reason

for this is that the thick, waxy leaves of ivy make it a poor target for herbicide treatment, as the herbicide can run off and affect nearby native vegetation.

For manual removal of ivy on tree trunks, vines should be cut at ground level and then again at approximately 4-5 feet high to kill the growth in the upper portion of the tree. This is important in minimizing damage to the tree and to keep the ivy from producing berries. Manually remove the rooted vines from the trunk of the tree while trying not to damage the live tissues of the tree. (Gloves should be worn when removing ivy because the sap can cause a skin reaction with some people.) Removing ivy in the understory (rooted in the ground) should be done in the dormant season (late winter/early spring) when the moist soil makes it easier to remove roots. If resources do not allow for complete removal, begin by controlling the perimeter of the patch to inhibit the plant from spreading. Pile debris separate from compost and monitor. Ivy can easily resprout if it has contact with soil.

The Nature Conservancy acknowledges that there is no single best method for ivy removal, but a combination of manual digging and herbicide application has been found to be quite successful. As stated above, vines should be cut from the base of the trees followed by a cut stem application of herbicide on the larger vines. After an area of ivy has been hand dug, wait for the plants to resprout and then apply herbicide directly on the leaves. Herbicides that have been effective in ivy control are glysophate and triclopyr (found under a number of brand names; e.g. Roundup). An ideal time to apply herbicides is late fall or during warm winter days—when temperatures are above 55° F but most native vegetation is dormant. Any ivy removal strategy will involve ongoing monitoring and removal.

For more information on ivy removal, the following websites may be useful:

- The Nature Conservancy's invasive species website: www.tncweeds.ucdavis.edu/control.html
- DNR: www.dnr.metrokc.gov/wlr/LANDS/weeds/pdf/english-ivy-control.pdf
- Washington Arboretum: www.depts.washington.edu/wpa/stewardship_archives.htm#ivy
- Washington Native Plant Society's Ivy Out program: www.ivyout.org
- **San Juan County Noxious Weed Board: http://sanjuan.wsu.edu/noxious/index.html**

Holly (*Ilex aquifolium*)

Several holly trees were found during our inventory. What makes holly a threat is that is has the ability to establish under a full canopy (seed is dispersed by birds) and colonize a wide variety of local forest types. Therefore, if left unchecked it could become an abundant and competitive component of these stands. Competition will likely be most severe with native shade-tolerant shrubs (such as salal and Oregon grape) and young conifers (Douglas-fir, cedar, grand fir, and yew).

Any thinning activities may increase light levels and disturb soil which could facilitate the expansion of this non-native species. Holly is difficult to remove by cutting alone because it will resprout quickly. A more effective method of control is to cut the stem of the tree and apply herbicide to the stump. Whole tree removal is also an option (removing stumps via equipment). Small holly seedlings (up to 2 inches in diameter) should be pulled manually when found.

X. Management Recommendations and Suggested Timeline for Implementation (See **Management Timeline,** Table 2)

Stand 1

The general approach for this stand should involve a 50-60 year regime of frequent, light thinning followed by a shelterwood cut to initiate the regeneration of Douglas-fir and cedar. The shelterwood cut will leave seed trees (large, well-formed Douglas-fir trees), large wildlife trees and other biological legacies (snags, down logs), but will open up the site enough for the successful regeneration of desired species.

The thinning should only remove 5-10% of the volume during each cut and be scheduled approximately every ten years, starting with 2011. In general, each acre should produce about 400 board feet per year of volume growth. This means that every 10 years, the unit is capable of accruing about 23 mbf (thousand board feet) of volume. Focusing thinning harvests on the pockets of high density cedar, hemlock, and fir will help the stand to continue to grow and be productive. Selective removal should focus on the smaller diameter and defective trees thus improving the quality of the stand. Even with the focus on such trees, these thinning operations will generate revenue as much of the timber is of good quality.

Stand 2

This poor quality stand is rapidly transitioning into a shrub dominated, low volume and disease affected stand. It is a potentially productive site that is in need of a salvage cut, followed by a planting of Douglas-fir. In order to reestablish a vigorous stand of Douglas-fir, a large patch cut should be carried out this year to salvage remaining grand fir, harvest the maple, and to prepare the ground for planting. For about 4 of the 6 acres, all trees should be removed except any well formed and wind firm Douglas-fir. Sawtimber and cordwood should be removed and slash should be piled and burned. Rubber tracked yarding and slash piling will knock back competing shrubs and facilitate next winter's planting. Plant at a density of 300 TPA (12' spacing) using locally sourced (seed from San Juan County) two year old Douglas-fir seedlings. Order seedlings at time of harvest to ensure good supply, plant out seedlings by February 2012.

Note: a Forest Practices Application for a 4 acre salvage cut is currently being submitted to the Department of Natural Resources (February 2011).

Stand 3

This stand is showing signs of stagnated growth and self-thinning; a condition that will lead to an overall decline in tree vigor and health. It would benefit from a thinning from below concentrated on over-stocked portions of the stand within the next 5-10 years. This thinning would remove poor quality trees as well as some merchantable trees in order to develop more even spacing and increase the vigor of residual trees. This increased vigor can show benefits in tree growth, seed production, and the ability to withstand injuries and diseases.

In approximately 20 years a reproduction method should be implemented across this stand. Converting this stand to a two aged system could be relatively simple and would meet the management objectives. This system involves removing all but a select few widely spaced dominant trees with highly desirable physical characteristics that will reseed the next age class. The lower story, which in this case is of merchantable size, would be reduced to a low density of carefully picked merchantable trees. This low density will increase light to the understory and help to establish a new age class. It is important to monitor regeneration and take appropriate actions to ensure seedlings germinate and acquire adequate light. Preparing the site for regeneration (mechanically or by hand), supplementing inadequate regeneration through planting, and removing competing vegetation are some possible management actions that can help ensure future productivity.

Following adequate regeneration, the widely scattered dominant trees would be removed and the lower-canopy positioned trees would be reduced to a widely scattered density resembling the former dominants in order to dedicate adequate light to the next age class. This two aged system resembles a shelterwood system, and can produce timber for years to come and provide good cover and structure to benefit wildlife.

Stand 4

A commercial thin on the southern 2/3 of this stand is recommended in 10-15 years, with a second thinning scheduled 25 to 30 years from now. After both phases of thinning have been completed for the

stand, small group selection will be the preferred method of harvesting timber. With this method, there is more flexibility with the selection of trees to remove. In general, the largest and most vigorous trees should be retained while focusing the harvesting on the less vigorous and slower growing trees. The stand will support modest removals of timber immediately after the thinning is completed (<400 bf/acre/year). However, in order to capitalize on the gains in growth resulting from the thinning, it is advised to wait 10-15 years after the second thinning before much appreciable harvest occurs.

In the long-term, if Douglas-fir is to remain a dominant tree within this stand, methods of selective removal will need to focus on the establishment of new cohorts of Douglas-fir through the creation of larger and larger canopy gaps (up to ½ acre in size or larger). This means that harvesting methods will transition from the removal of individual trees to the removal of clusters of trees (following methods of *variable density thinning*—a silvicultural treatment often implemented to promote more naturally structured stands). These gaps will be needed to provide sufficient levels of light for Douglas-fir regeneration. Given the current age and structure of the stand, it is estimated that a good time to begin regeneration harvesting is when the stand approaches 150years of age (roughly 50 years from now). At that time, managers will need to determine if natural regeneration is meeting minimum stocking levels or if planting may be required. Within gaps, seedling density should initially be high (> 400 TPA) to account for seedling and sapling mortality. If planting seedlings, make sure the seed source is of local origin (San Juan Islands).

Though most of the stand has only light to moderate levels of hazardous fuels, some level of management should be done in the immediate vicinity of the residence. A buffer of 25 to 50 feet should be established around the structure. Within this buffer, shrubs should be trimmed low, dead branches removed, and trees pruned up to 10 feet from the ground. Treat the area closest to the structure and on the downhill side of the structure most intensively.

Table 2. Management Timeline

ACTIVITY	2011 W	2011 Sp	2011 S	2011 F	2015	2020	2025	2030	2035	2040	2045	2050	2060
GENERAL													
Improve width and maintain driveway/turn outs			■		■		■		■		■		■
Cruise for and control ivy		■			■		■			■			■
Cruise for and control holly		■			■		■			■			
STAND 1													
Commercial thin			■			■		■		■		■	
Shelterwood cut			■			■			■				
STAND 2													
Salvage/regeneration cut & 1st commercial harvest				■									■
Burn slash				■									
Plant seedlings (by 2/2012)				■									
Precommercial thin							■			■			
STAND 3													
Commercial thin					■								
Operation to convert to two aged system. Remove all but select few upper-strata trees. Reduce lower-strata								■					
Monitor regeneration and take appropriate action									■				
Remove upper-strata and reduce lower-strata										■			
STAND 4													
Commercial thin							■				■		
Regeneration gap harvests													■

2012 Forest Management Plan Addendum

Harvest/Management Activities

In 2011 15 mbf of grand fir and maple were harvested from Stand 2. This was a patch cut designed to open up the stand and create new growing space for more desirable species. The material was used to offset the cost of the clean-up work.

In 2012, 800 red cedar and 1,400 Douglas-fir seedlings were planted in the even-age management zone within stand 2.

Annual Allowable Cut Calculation

Based on soil productivity data from the Natural Resource Conservation Service, Northwest Natural Resource Group has calculated the annual sustainable harvest level for the Burn property to be approximately 5 mbf/year.

Monitoring

Monitoring is an important component of the Burn forest management plan for addressing safety concerns, invasive species, and overall forest health. The Landowner conducts a formalized inspection at least once per year. Every other year a consulting forester also conducts a walk through inspection. During these visits, the forester and landowner assess overall forest health. Other forest attributes that are observed include:

1. Yield of all forest products harvested.
2. Composition and observed changes in the flora and fauna.
3. Environmental impacts of harvesting and other operations.

In addition to these regular monitoring inspections, the landowners observe qualitative forest conditions during period walk through of the forest that are added to this management plan.
The following attributes will be monitored, at a minimum, via observations:

1. Impacts to roads
2. Growth of seedlings and saplings
3. Presence of invasive species, in particular along forest access and haul roads and along margins of forest.
4. Wildlife
5. Snag and downed log recruitment

Date	Observation	Note taker
12/9/11	Harvesting in stand two is nearly complete. Wet year and road could use 30-40 yards of gravel to help firm up the soft spots and avoid rutting. New seedlings on order and should be planted in spring.	C. Sprenger
6/9/12	Seedlings look good, mortality very low. Brush will need to be controlled next 3-5 years.	C. Sprenger

XI. Signature Page

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_____ Date_____

Carson Sprenger, Forester

LANDOWNER SIGNATURE:
I intend to manage this property consistent with the rules and regulations of the Designated Forest Land Program and to implement this plan to the best of my ability. Furthermore, I am aware of the potential tax liability involved when the land ceases to be classified as timberland.

_____ Date_____

Killara Burn
37 January Road
Leverett, MA 01054