

FOREST STEWARDSHIP PLAN

FOR THE

SHADY OAKS TREE FARM
CLACKAMAS COUNTY, OREGON



JANUARY 2012

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FOR THE
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CLACKAMAS COUNTY, OREGON

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I. PROPERTY DESCRIPTION

Legal Description: The Shady Oaks Tree Farm consists of six different tax lots in Clackamas County. Total acreage is 88.07. The first five lots listed below are located in the west half of the northwest quarter of Section 99, Township 99 South, Range 99 East, W. M.. The last lot is located in northeast quarter of the southeast quarter and in the southeast quarter of the northeast quarter of Section 98, Township 99 South, Range 99 East, W. M.. Acreages are from the County Assessor’s records.

<u>Map Number</u>	<u>Account Number</u>	<u>Acres</u>
99999 00500	99999991	19.02
99999 00600	99999992	9.51
99999 00700	99999993	19.04
99999 00800	99999994	19.06
99999 00900	99999995	9.53
99999 00700	99999996	<u>11.91</u>

1	Total	88.07
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Nearest City or Town: Estacada, Oregon

GPS Coordinates: 99° 99’ 99’’N 999° 99’ 99’’W at the gate on Shady Oaks Road

Acreage:

Total Ownership	88.07	
Total Forested	87.57	(A meadow covering 0.5 acres is excluded.)
Total Covered by this Plan	87.57	

Number of Unique Stands of Trees: 8

Does the Owner Reside on the Property? As of the date of this plan, the owner was not residing on the property. However, the owner plans to build a home there in the future.

Basic Topography:

Complex (many steep ravines and aspects)	5%
Simple (few ravines and changes of aspect)	95%
Flat (<5% grade) – 35%	
Gentle Slope (6 to 20% grade) – 10%	
Steep (>21% grade) – 55%	

Road Conditions: Good – at least 50% accessible

Improved Road Length (bulldozed with graveled surface) – 1,000 feet

Unimproved Road Length (bulldozed, but with original soil/bedrock) – 1,700 feet

Old, Unimproved Road Length (no longer drivable or drivable only with four-wheel drive vehicle) – 6,500 feet

Watershed: The streams on the property drain into Shady Oaks Creek, which is a large fish-bearing stream. Shady Oaks Creek is a tributary of the Clackamas River.

II. PROPERTY HISTORY

The property has been owned and managed by the same family for many years. It was purchased by John and Jane Doe. It then passed to their daughter, Janice Doe, and to her husband, Joe Doe. Joe and Janice Doe recently gifted it to their son, John Doe, Jr.

Most of the property has been in timber production for many years, but parts once were used for agriculture. Two of the timber types, designated Types 2 and 7 in this plan, were planted in about 1974 and 1993, respectively. These areas apparently were fields before the plantings.

In addition to agriculture and timber production, the property has been used by the family and others for recreation. John Doe, Jr. remembers enjoying the property as a child. A horse trail passes through the north side. A sign along the route indicates that it is known as the Shady Oaks trail. The neighbors also use some of the old logging roads for horseback riding. Some of this usage is unauthorized.

The property is located in an area where timber production historically has been the dominant use. It lies in a Timber District as designated by Clackamas County's comprehensive land use plan. The lands to the north, east, and south also are in the Timber District. To the west, land uses include agriculture and rural residences.

III. FOREST MANAGEMENT GOALS

Primary Goal: To live in as natural an environment as possible

More specific goals that will help achieve the primary goal are as follows:

To improve forest health

To reduce fire hazard

To enhance wildlife habitat

To maintain a diverse forest with trees of different ages and sizes

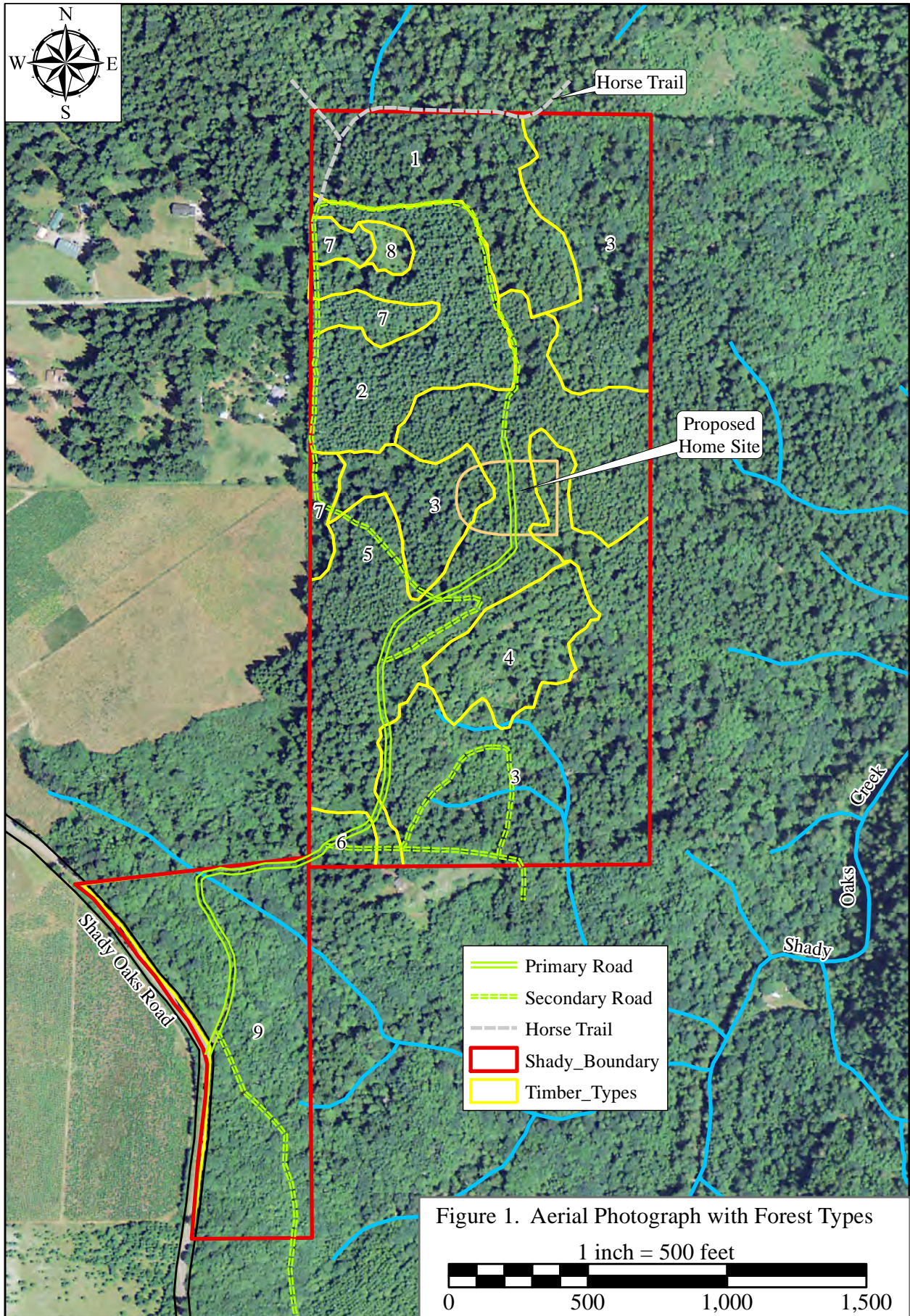
Secondary Goal: To receive a small periodic income from light, selective timber harvests, provided that these activities do not hinder achievement of the goals listed above.

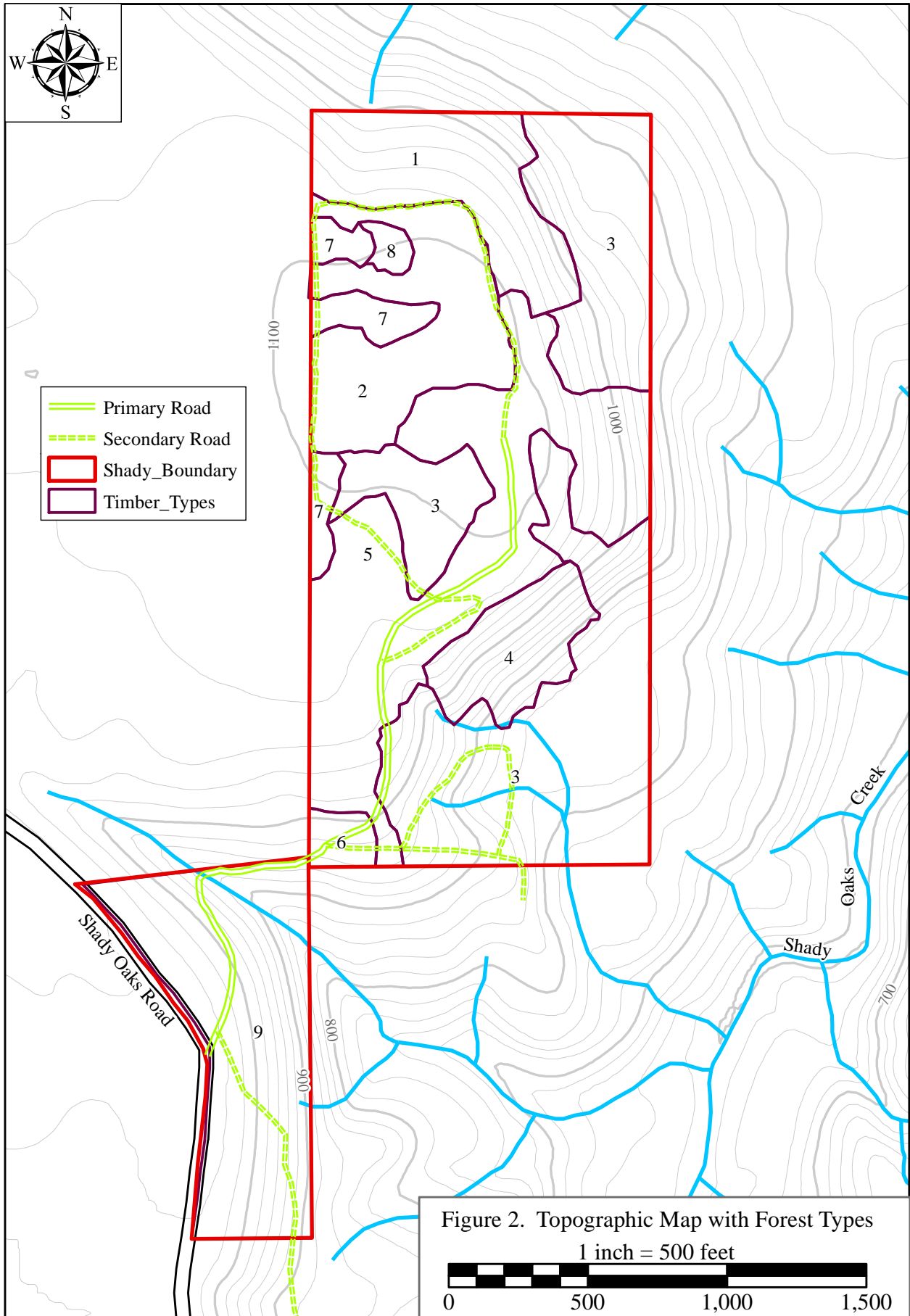
IV. PROPERTY MAPS

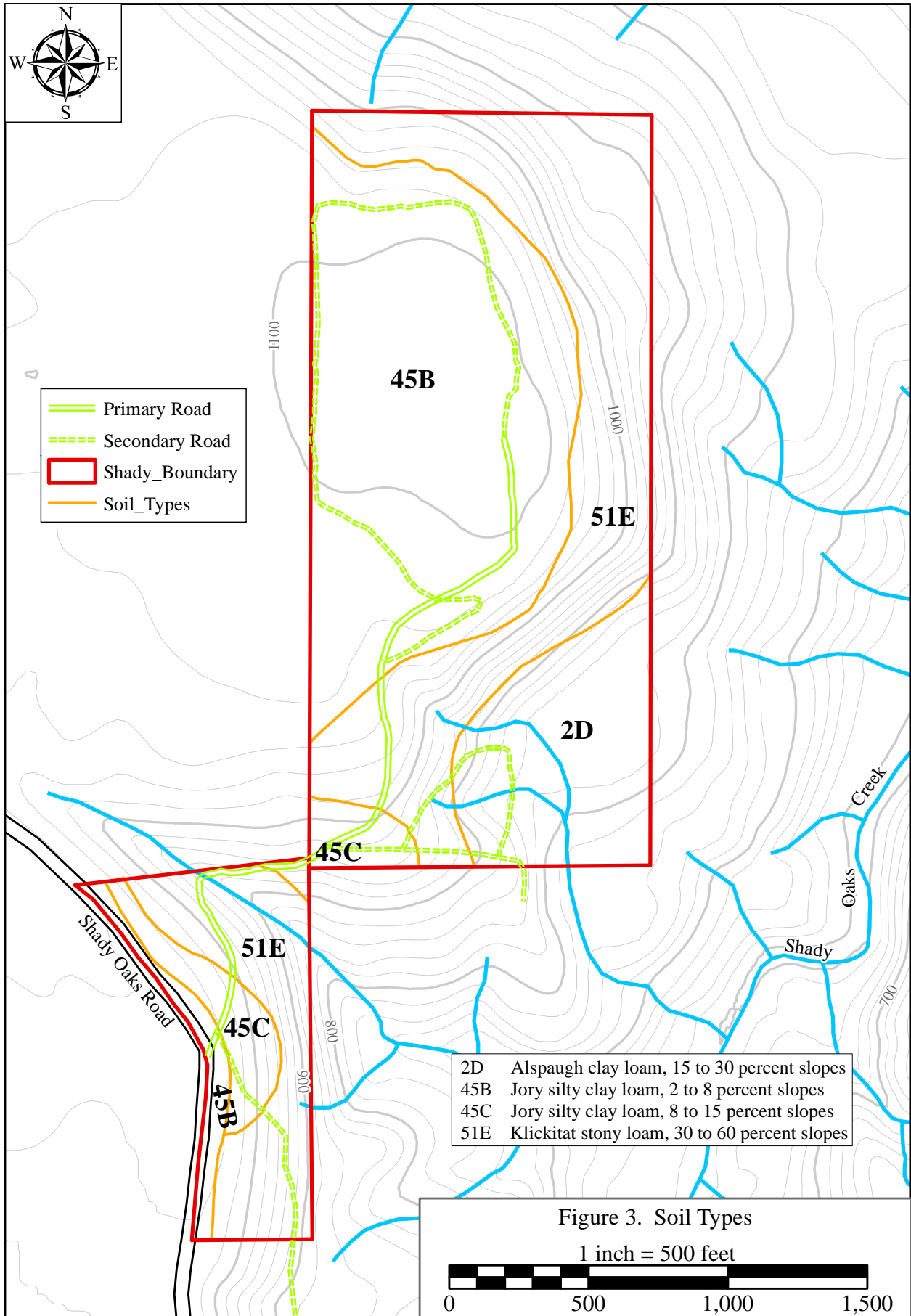
Four maps follow. Figure 1 is a forest type map superimposed on a 2009 aerial photograph. Figure 2 is a topographic map with the forest types superimposed on it. Forest types are described in detail in Section VI of this plan.

Figure 3 is a soils map. The map was obtained from the U. S. Department of Agriculture Natural Resources Conservation Service. Soil types are described in more detail in Section V.

Figure 4 shows the location of root disease pockets that were found during a timber cruise completed in December 2011. The property may contain others. Management options for minimizing spread of this disease are discussed in Section V.







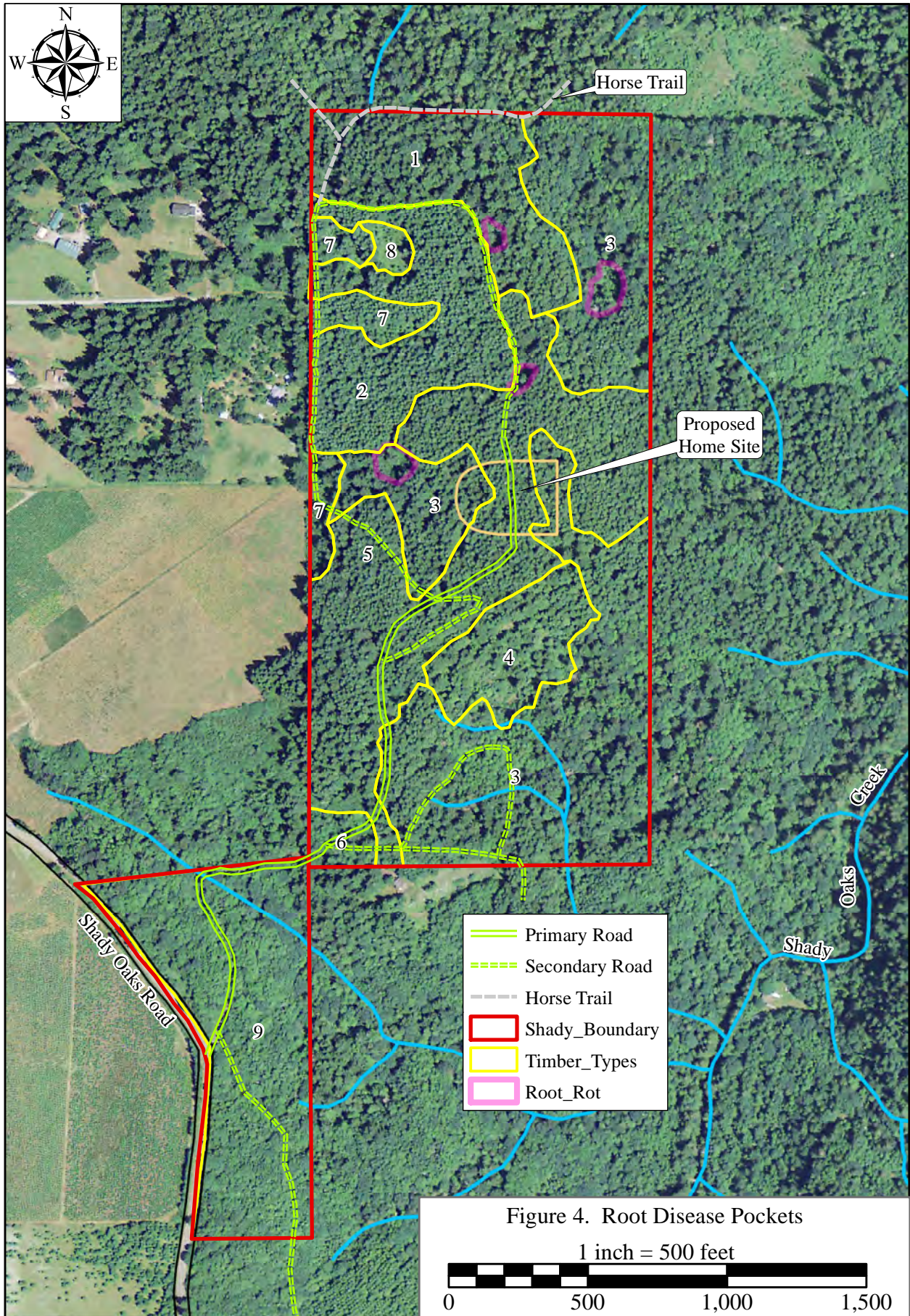
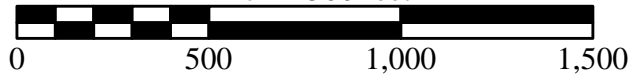


Figure 4. Root Disease Pockets

1 inch = 500 feet



V. FOREST NATURAL RESOURCES ENHANCEMENT AND PROTECTION

Protection of Special Sites and Social Considerations

Special Sites – The property has no known archaeologically, culturally, or historically valuable sites. A search of the Oregon Historic Sites database returned no results. In addition, the property contains no known biologically, ecologically, or geologically valuable sites.

The property contains no High Conservation Value Forests. These forests are defined as those of outstanding and critical importance due to their environmental, social, biodiversity, or landscape values. However, the forest stand designated as Type 1 contains some very large trees. Some of the diameters exceed 40 inches. Average age is about 78 years. The Does wish to preserve these large trees.

Adjacent Stand or Ownership Concerns – Activities on neighboring properties have had relatively little impact on the Shady Oaks Tree Farm. A clearcut harvest recently was completed on a property to the north. However, the harvest area cannot be seen from the Doe’s proposed home site or from the flat area where the Does plan to spend most of their time. The neighbors to the west produce Christmas trees, and rural residences are located close to the western property line. These uses have been of little concern. They are not visible from the proposed home site.

All timber harvests in this plan will either be small salvage cuts or selective harvests, so that a buffer of trees will be maintained between the home site and the neighbors. Consequently, forest management activities on the Shady Oaks Tree Farm are not likely to impact the neighboring properties significantly.

One concern regarding the neighbors is their use of the property for horseback riding. The western boundary of the northern part of the property is fenced and clearly visible, and many of the riders come from this direction. The Shady Oaks horse trail crosses through the north side of the property. The northern boundary is not clearly marked. Although some of the horseback riding is unauthorized, it does not appear to cause significant damage or other problems. The best solution may be personal interactions with the neighbors.

Recreation – The Does enjoy the natural forested environment, including the trees and wildlife. They do not plan to engage in any high impact recreational activities. Consequently, the forest management goals listed in Section III satisfy their recreational requirements. All timber management will be designed to protect the forest and to maintain the forest cover.

Access – Access to the Shady Oaks Tree Farm is from Shady Oaks Road. The main access road lies entirely within the property. It is gated at the county road and is closed to the public. The road is graveled for about the first 1,000 feet. It continues for another 1,700 feet before becoming too narrow and rough for all but four-wheel drive vehicles. Other roads and trails provide additional interior access. None of these other roads and trails is drivable.

The northern, southern, and western boundaries of the northern part of the property are marked. A fence runs along the western boundary. The location of this boundary also is evident by changes in land use. Iron fence posts are located along the northern and southern boundaries, although these posts are not easy to see. More visible marking of the boundaries could reduce the likelihood of trespass, but doing so is not a high priority. Road access currently is controlled by the gate on Shady Oaks Road, and most of the nearby residences are located to the west, where the boundary is already well marked.

Air, Water, and Soil Protection

Soil Protection – According to the Natural Resources Conservation Service maps, the property contains four soil types. All are suitable for timber production and harvesting, although they have some limitations. The soil types are described below. Average Douglas-fir site index is listed for each. Site index is a measure of productivity. It is defined as the projected height of dominant and large co-dominant trees at a breast height age (4.5 feet above ground level) of 50 years. For Douglas-fir, site index is divided into five classes, with Class 1 being best for growth. Site Indexes 122 and 126 are Class 2. Site Index 112 is Class 3.

Alsbaugh clay loam, 15 to 30 percent slopes (Symbol 2D) – This soil is deep and well drained. Depth to bedrock is over 80 inches. It is moderately well suited to timber harvesting. The major limitations are steepness of slope and relatively low soil strength. Erosion hazard is moderate due to the steep slopes. Average Douglas-fir site index is 126.

Jory Silty Clay Loam, 2 to 8 percent slopes (Symbol 45B) – This soil is deep and well drained. Depth to bedrock is over 80 inches. It is moderately well suited to timber harvesting. The primary limitation is its relatively low strength. Erosion hazard is slight. Average Douglas-fir site index is 122.

Jory Silty Clay Loam, 8 to 15 percent slopes (Symbol 45C) – This soil is essentially the same as the Jory Silty Clay Loam, 2 to 8 percent slopes, except for the steeper slopes. It also is deep and well drained. It also is moderately well suited to timber harvesting, with the major limitation being its relatively low strength. Erosion hazard is slight. Average Douglas-fir site index is 122.

Klickitat Stony Loam, 30 to 60 percent slopes (Symbol 51E) – The Klickitat soil is not as deep as the others. Depth to bedrock is 40 to 60 inches. However, it is well drained. The soil is poorly suited for logging equipment, and erosion hazard is severe. These limitations are attributable to the steep slopes.

The soils data indicate that Douglas-fir site index ranges from 112 to 126. However, tree data taken in the merchantable timber types indicates that site index averages 133, which is high Class 2. The Natural Resources Conservation Service data are averages for each soil over a large geographic range. The data taken on the property should better reflect site quality.

The Does do not intend to harvest timber on the steeper slopes. Consequently, potential damage from use of harvesting equipment in these areas will be avoided. Timber harvest on the more gentle slopes should take place during dry conditions in order to avoid compaction.

Roads – The first 1,000 feet of road into the property are graveled and in good condition. The section of road from the end of the gravel to the proposed home site will be widened and graveled so that fire trucks can access the home site. The currently graveled portion of the road crosses a small stream channel. The culvert there currently is in good condition, and it will continue to be maintained.

Most of the other roads on the property are not drivable or are passable only with four-wheel drive vehicle. However, they should be periodically mowed and cleared of brush in order to provide better access in case of a fire. They also serve as fire breaks.

Streams – The property contains the headwaters of two small tributaries to Shady Oaks Creek. Slopes are steep around one of these streams, and the Does do not intend to log on steep slopes. Any logging equipment should be kept at least 50 feet from the streams. The property contains no wetlands or ponds.

Effects of Natural Disasters – The property has not been affected by floods, wildfire, or other natural disasters. Damage from past windstorms has been relatively light. If a natural disaster does occur, the primary goal of any plan will be to restore the health of the forest and to maintain as much of the forest cover as possible.

Fish and Wildlife Biodiversity

Fish and Wildlife – One of the landowner’s goals is to enhance wildlife habitat. The property is frequented by deer and other forest animals. In general, the diversity and number of wildlife species increases as timber stand structure becomes more diverse. A forest of different ages and tree sizes with scattered small openings in the canopy will support a more diverse wildlife population than an even-aged forest with trees of the same size and a closed canopy. The former is likely to have more understory vegetation that can be used for feeding. It also will attract more types of birds, because different species use different forest layers.

Some areas in Types 2 and 5 are densely stocked and could be thinned. Thinning strategies for these types that can enhance wildlife habitat are discussed in Section VI.

Because the property contains only the headwaters of a few small tributaries to Shady Oaks Creek, it likely contains no fish. However, the stream protection measures discussed above will avoid damage to fish farther downstream.

State and Federal Threatened or Endangered Plants and Animals – According to the Oregon Department of Forestry, no threatened, endangered, or other sensitive wildlife species inhabit the property or nearby properties. The Oregon Biodiversity Information Center maintains information on rare plant species. None is known to be present on the Shady Oaks Tree Farm.

Management of Forest Resources

Protection from Pests – In general, trees on the property are healthy and growing well. The major pest problem is root disease. The property contains several pockets affected by laminated and possibly other root diseases. Several Douglas-firs in these areas have died or are dying. Figure 4 shows the pockets found during a timber cruise completed in December 2011.

Laminated root disease is widespread throughout the Pacific Northwest. It spreads by root contact between host trees. It rots the roots so that infected trees either die standing or blow over. Down trees killed by laminated root disease are characterized by decayed roots broken close to the root collar. After a tree dies or is cut, the disease can remain in the stump and roots for many years. Newly planted trees are infected when their roots come in contact with the old roots.

Rate of spread varies between pockets and is unpredictable. Of the species on the property, Douglas-fir is the most susceptible. Western hemlock is intermediate in susceptibility, and western redcedar is somewhat resistant. All hardwoods are immune.

The disease generally kills small patches of timber rather than destroying entire stands over large areas. For this reason, it may be viewed as beneficial. It diversifies stand structure by creating small openings and by increasing the number of snags and the volume of large woody debris on the ground. These effects enhance wildlife habitat. Snags are used by woodpeckers and by other birds and wildlife. Large woody debris is used by salamanders and other animals. The stand openings may regenerate naturally with less susceptible tree species.

The primary strategy for stopping spread of the disease in established timber stands is to remove all trees in the disease center, as well as those within 50 feet of visibly infected trees. The opening can be replanted with less susceptible species. Alternatively, stumps and associated roots can be removed with an excavator, thus removing the disease from the soil. The site then can be replanted with Douglas-fir or other susceptible species.

Given the goal of enhancing wildlife habitat, the preferred alternative is no action at this time. However, pockets should be marked and monitored. If they begin to spread at an unacceptable rate, the landowner can consider other options.

The property contains few invasive species. However, Himalaya berry, which is an invasive, is growing in the more open areas that have fewer or younger trees. Overall, it is a minor problem. Its cover should naturally decrease as the overstory trees grow larger.

Reforestation – Most of the timber stands are well stocked. Much of the poorly stocked acreage is on steep slopes, which will not be managed. Consequently, the plan does not call for any reforestation activity in the near future. If future activities create stand openings, trees will be planted. In order to ensure regeneration success, the sites must be prepared before planting. They can be cleared with a tractor or by hand. Herbicide applications also may be helpful. After site preparation and planting, brush competition will need to be monitored and controlled, if necessary. Seedlings also may need protection from animals. Western redcedar is particularly susceptible to deer browse.

The most likely species for reforestation are those that are native to the area. Douglas-fir, western hemlock, and western redcedar are the three conifer species currently growing on the property. In order to enhance diversity, a mixture of these species can be planted. Native hardwoods, such as red alder and bigleaf maple, also may be considered.

Home Fire Safety – If a home site is approved by the county, the Does plan to clear a two-acre area and build a home near the center. The area around the home should be kept clear of flammable vegetation and other debris.

A Pacific Northwest Extension publication (PNW 618, October 2010), entitled “Reducing Fire Risk on your Forest Property,” provides additional information on protecting the forest and a forest home site. It is available from the Oregon State University Extension Service. Among other topics, it discusses the benefits of thinning and pruning in reducing fire hazard.

The Oregon Department of Forestry is responsible for fire protection on most forestlands in Oregon. The Shady Oaks Tree Farm is within the North Cascades District, which is headquartered in Molalla. Their telephone number is 503-829-2216. In addition, the property is located within Clackamas County Fire District #1. The closest District fire station is on Beaver Creek Road near Clarkes, about six miles away. Their telephone number is 503-632-7111. However, “911” should be dialed in case of an emergency.

Management Plan Implementation Constraints – Implementation of this plan is subject to few constraints. Timber harvesting is a permitted activity in Clackamas County’s Timber District. However, as for all private lands in Oregon, harvest activities must comply with the Forest Practices Rules. A copy of these rules is available from the Oregon Department of Forestry. Their purpose is to protect soils, water, wildlife, and other forest resources. They ensure that sound practices are used when harvesting timber, building roads, reforesting, or engaging in other forest practices.

The Rules require that the Department of Forestry be notified before any timber is harvested, except for personal firewood use. Activities such as road construction or reconstruction, herbicide application, pre-commercial thinning, and site preparation for planting also require notification.

When contracting for timber harvesting services, the landowner should hire an “Oregon Professional Logger.” Oregon Professional Loggers have completed an educational program sponsored by Associated Oregon Loggers that covers the requirements of Oregon’s Forest Practices Rules and that teaches the most environmentally sound logging methods.

Logging generally should be confined to the dry season, so that soil compaction is minimized. Little or no rock will be needed on most of logging roads if harvesting is limited to dry conditions.

VI. STAND LEVEL INFORMATION

The Shady Oaks Tree Farm contains eight timber types, described on the following pages. In addition to the eight timber types, the property contains a small meadow (Type 8), which covers about 0.5 acres. The main access road covers about 1.27 acres. The Does do not plan to use the meadow for growing trees. They may build a horse coral or use it for storage or other non-forest purposes. Therefore, this meadow is not covered in this plan.

Current conditions and management options are listed for each of the eight timber types. The options range from intensive to no management, and the consequences of each option are discussed. Those most consistent with the landowner's goals then are identified. Many of the terms used in this section of the plan are defined in the Glossary in Section X. The species codes in the tables also are defined in the Glossary.

A stand table is provided for each of the eight timber types. These tables list average number of trees, basal area, and board and cubic foot volumes by species and diameter class. They can be helpful in designing thinning treatments.

Current board foot volume growth was calculated for all types using Forest Projection and Planning System (FPS) software. FPS was developed by Dr. James Arney. It is supported by the Forest Biometrics Research Institute and can be purchased from them. It is widely used throughout the Pacific Northwest. The projected growth rates are included in the type descriptions.

Type 1 – 7.8 Acres

Type 1 - Current Conditions

This type is well stocked with mature Douglas-fir. Stand is even-aged, with an average of 78 years. It appears to have regenerated naturally, so that spacing is somewhat uneven. Many of the trees contain high quality export logs. In general, the trees are healthy. However, a few contain butt rot or have been infected with root disease. Except for the far southeastern corner, the type can be shovel logged.

According to the timber cruise, the type contains an average of 46 MBF (thousand board feet) per acre, of which 99 percent is in Douglas-fir. Average diameter is 23 inches, and the stand contains an average of 93 trees per acre.

According to the FPS growth model, this type is growing in board foot volume by about 0.39 MBF per acre per year, a rate of only 0.8 percent. The slow growth is attributable primarily to its relatively old age. The relatively high stocking, in which trees have little room to grow, also explains the low rate.

Type 1 - Management Options

1. Clearcut Log – Type contains a high volume of merchantable timber. The return from logging all of the trees would be substantial. After logging, the site would be reforested. However, this option is contrary to the landowner’s goals for the property.
2. Thinning from Below – In this option, the small trees are removed in order to create an evenly spaced stand of larger trees. As an example, if all trees that are 20 inches or smaller in diameter are removed, about 88 percent of the original volume and 59 percent of the original number of trees would remain. If all trees that are 25 inches or smaller in diameter are removed, about 65 percent of the original volume and 35 percent of the original number of trees would remain. In general, trees that have live branches over less than 40 percent of their height should be considered for thinning. Growth on these trees has begun to slow, and many eventually will die. The landowner could receive a substantial return from the logging, especially with the heavier thinning, and the resultant stand would be an open and park-like. Growth of the leave-trees will accelerate due to the increased spacing. In addition, the treatment would improve habitat for deer and other wildlife. However, the stand would not necessarily look natural because of the relatively even spacing.

3. Thinning from Above – In this option, trees are removed from the middle and upper portion of the range of crown and diameter classes. The goal is to open up the canopy and favor development of promising trees of the same classes. Most of the trees that are cut come from the codominant class, but any intermediate or dominant trees interfering with the development of potential crop trees also are removed. The immediate financial return would be greater than for Thinning from Below, but because some of the faster growing trees are removed and many of the slower ones remain, growth rate after thinning is less. The method can result in improved wildlife habitat. Spacing still would be relatively even, but due to the greater range of tree sizes, the stand would look more natural than if thinned from below.
4. Variable Density Thinning – In this option, different parts of the stand are thinned to different spacings. Some areas remain well stocked, whereas others are thinned so that they are more open. As for Thinning from Below, growth of the leave-trees will accelerate due to the increased spacing, but the increase likely will not be as great. On the other hand, the more variable stand will support a wider variety of wildlife. It also would have a somewhat more natural appearance. Depending upon the intensity of the treatment, it also could provide a substantial financial return.
5. Group or Individual Tree Selection – In this option, small patches of trees or individuals are selected for logging. Damaged or diseased trees can be removed. This option can be tied with treatments designed to minimize the spread of root disease. In selecting individual trees, care is needed to ensure that the stand is not high graded. That is, the largest, most valuable trees should not be selected for logging. The resultant stand would look natural, with variable spacing and scattered openings. This stand structure would be beneficial for a variety of wildlife. The openings would be reforested with either Douglas-fir or a mixture of species. Depending upon the intensity of the treatment, this option could provide a substantial financial return.
6. No Management – The type generally is healthy, although growth is relatively slow. No management would retain the natural look and the large trees. Of course, it would provide no financial return.

Option 6 is most consistent with the landowner's goals. The landowner is open to occasional selective harvests, as in Option 5, and some of these harvests could occur in this type.

Type 1 – Stand Table

Stand Table Summary

TC TSTNDSUM

Project SHADY

T99S R99E S99 T0001

T99S R99E S99 T0001

Twp Rge Sec Tract Type Acres Plots Sample Trees
 99S 99E 99 SHADY OAKS 0001 7.80 8 41

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 Date: 3/1/2012
 Time: 3:26:30PM

Spc	S T	DBH	Sample Trees	FF 16'	Av Ht Tot	Trees/ Acre	BA/ Acre	Logs Acre	Average Log		Net Tons/ Acre	Net Cu.Ft. Acre	Net Bd.Ft. Acre	Totals		
									Net Cu.Ft.	Net Bd.Ft.				Tons	Cunits	MBF
DF		12	2	80	95	16.557	13.00	33.11	13.2	40.0	8.33	438	1,325	65	34	10
DF		14	1	79	94	6.297	6.73	12.59	19.5	60.0	4.67	246	756	36	19	6
DF		15	1	76	94	5.774	7.09	11.55	21.0	60.0	4.61	243	693	36	19	5
DF		18	1	78	102	3.809	6.73	7.62	33.0	95.0	4.78	251	724	37	20	6
DF		19	1	81	150	3.173	6.25	9.52	32.3	113.3	5.85	308	1,079	46	24	8
DF		20	1	83	150	2.795	6.10	8.39	37.0	143.3	5.90	310	1,202	46	24	9
DF		21	1	79	127	2.799	6.73	8.40	37.7	126.7	6.01	316	1,064	47	25	8
DF		22	1	77	111	2.684	7.09	5.37	53.0	160.0	5.41	285	859	42	22	7
DF		23	2	79	132	4.559	13.15	13.68	44.9	163.9	11.67	614	2,242	91	48	17
DF		24	3	79	136	6.332	19.89	16.96	54.5	203.0	17.57	925	3,443	137	72	27
DF		25	2	82	144	3.666	12.50	11.00	52.5	216.7	11.53	577	2,383	90	45	19
DF		26	5	79	124	9.008	33.21	21.26	67.5	245.4	27.24	1,434	5,218	212	112	41
DF		27	3	80	148	4.880	19.40	14.64	66.3	276.3	18.45	971	4,044	144	76	32
DF		28	2	84	151	2.752	11.77	8.26	74.2	336.9	11.64	613	2,782	91	48	22
DF		29	4	79	129	5.769	26.46	17.31	65.9	257.9	21.66	1,140	4,463	169	89	35
DF		30	1	82	133	1.242	6.10	3.73	79.3	346.7	5.62	296	1,292	44	23	10
DF		32	4	79	140	4.743	26.49	14.23	90.3	378.7	24.42	1,285	5,388	191	100	42
DF		33	2	81	140	2.130	12.65	6.39	96.6	416.0	11.73	617	2,658	91	48	21
DF		44	2	81	154	1.198	12.65	3.59	179.1	858.3	12.23	644	3,085	95	50	24
DF		45	1	79	123	.594	6.56	1.78	167.3	680.0	5.67	298	1,212	44	23	9
DF	Totals		40	80	121	90.763	260.56	229.36	51.5	200.2	224.96	11,811	45,911	1,755	921	358
BM		21	1	83	80	2.535	6.10	5.07	31.0	90.0	3.93	157	456	31	12	4
BM	Totals		1	83	80	2.535	6.10	5.07	31.0	90.0	3.93	157	456	31	12	4
Totals			41	80	120	93.298	266.66	234.43	51.1	197.8	228.89	11968	46,367	1,785	934	362

Type 2 – 10.1 Acres

Type 2 - Current Conditions

Type 2 is a well stocked 37-year-old Douglas-fir plantation. Stand is even aged, and spacing is mostly even. Trees are growing well and have no serious problems, except for sweep in some of them. Topography is flat.

According to the timber cruise, the type contains an average of 22 MBF per acre, all in Douglas-fir. Average diameter is 13 inches, and the stand contains an average of 230 trees per acre. Due to the tight spacing, many of the trees are suppressed. Growth on these trees has slowed significantly, and their crowns have receded. Many will die in the next few years. Due to the closed canopy, little light reaches the forest floor, and the stand contains little understory vegetation. Consequently, wildlife habitat is poor.

According to the FPS growth model, the type is growing in board foot volume by about 1.18 MBF per acre per year, a rate of 5.3 percent. The rate is relatively high, because young stands grow faster on a percentage basis than older ones. Nevertheless, the high stocking reduces the rate from what it potentially could be.

Type 2 - Management Options

1. Clearcut Log – The type contains enough volume for a clearcut harvest that will provide a substantial financial return. However, the trees still are growing at a relatively fast rate and could grow at a faster rate if thinned. After logging, the type would be reforested. This option is contrary to the landowner's goals for the property.
2. Thinning from Below – In this option, the smaller trees would be removed in order to create an evenly spaced stand of larger trees. As an example, if all trees that are 12 inches or smaller in diameter are removed, about 67 percent of the original volume, but only 41 percent of the original number of trees, would remain. In general, trees that have live branches over less than 40 percent of their height should be considered for thinning. These trees are growing well below their potential and eventually will die. Because the trees to be removed would be small, the landowner could receive a substantial financial return only in a good log market. Thinning would result in an increased rate of growth on the leave-trees and improve habitat for deer and other wildlife. The stand would be evenly spaced before and after treatment.

3. Thinning from Above – In this option, trees are removed from the middle and upper portion of the range of crown and diameter classes. The goal is to open up the canopy and favor development of promising trees of the same classes. Most of the trees that are cut come from the codominant class, but any intermediate or dominant trees interfering with the development of potential crop trees also are removed. The immediate financial return would be greater than for Thinning from Below, but because some of the faster growing trees are removed and many of the slower ones remain, growth after thinning would be less. The method can result in improved wildlife habitat. Spacing still would be relatively even, but due to the greater range of tree sizes, the stand would look more natural than if thinned from below.
4. Variable Density Thinning – In this option, different parts of the stand are thinned to different spacings. Some areas remain well stocked, whereas others are thinned so that they are more open. As for Thinning from Below, growth of the leave-trees will accelerate due to the increased spacing, but the increase likely will not be as great. On the other hand, the more variable stand will support a wider variety of wildlife. It also would have a somewhat more natural appearance. Depending upon the intensity of the treatment, it also could provide some financial return. However, because the trees are small, this return would be limited.
5. Group or Individual Tree Selection – In this option, small patches of trees or individuals are selected for logging. Damaged or diseased trees can be removed. In selecting individual trees, care is needed to ensure that the stand is not high graded. That is, the largest, most valuable trees should not be selected for logging. The resultant stand would look natural, with variable spacing and scattered openings. This stand structure would be beneficial to a variety of wildlife. The openings would be reforested with either Douglas-fir or a mixture of species. Depending upon the intensity of the treatment, this option could provide some financial return, especially in a good log market.
6. No Management – The type generally is healthy and growing well. No management will retain the even, close spacing. Growth rate will be less than if the stand is thinned, and wildlife habitat will remain poor. Of course, no management will provide no financial return.

Options 2, 3, 4, and 5 all are compatible with the landowner's goals. They all improve wildlife habitat and capture volume that would be lost to natural mortality. However, because the stand is healthy, treatments can be delayed until the log market improves. Treatments can be applied to small areas over time, rather than all at once.

Type 2 - Stand Table
Stand Table Summary

TC TSTNDSUM																	
Project SHADY																	
T99S R99E S99 T0002										T99S R99E S99 T0002							
Twp Rge Sec Tract Type Acres Plots Sample Trees										Page: 1							
99S 99E 99 SHADY OAKS 0002 10.10 10 55										Date: 3/1/2012							
										Time: 3:26:30PM							
Spc	S T	Sample		Av		Trees/ Acre	BA/ Acre	Logs Acre	Average Log		Net Tons/ Acre	Net Cu.Ft. Acre	Net Bd.Ft. Acre	Totals			
		DBH	Trees	FF 16'	Ht Tot				Net Cu.Ft.	Net Bd.Ft.				Tons	Cunits	MBF	
DF		7	1	85	77	14.054	3.76	28.11	4.5	20.0	2.40	126	562	24	13	6	
DF		8	5	88	74	50.309	17.56	100.62	5.5	23.0	10.49	552	2,310	106	56	23	
DF		9	2	88	77	15.877	7.01	23.82	9.0	30.0	4.07	214	714	41	22	7	
DF		10	2	87	67	13.338	7.27	19.63	10.1	36.8	3.76	198	722	38	20	7	
DF		11	4	87	84	22.158	14.62	44.32	10.7	38.7	9.05	476	1,716	91	48	17	
DF		12	4	86	79	18.837	14.79	32.54	12.9	40.0	8.00	421	1,302	81	43	13	
DF		13	1	87	82	3.892	3.59	7.78	15.5	55.0	2.29	121	428	23	12	4	
DF		14	7	76	69	30.535	32.64	45.64	14.6	41.0	12.64	665	1,871	128	67	19	
DF		15	4	89	98	11.375	13.96	22.75	23.6	88.9	10.22	538	2,022	103	54	20	
DF		16	5	86	88	13.347	18.64	26.69	24.4	81.7	12.38	652	2,182	125	66	22	
DF		17	3	86	87	6.991	11.02	13.98	25.7	88.5	6.82	359	1,237	69	36	12	
DF		18	5	87	87	10.205	18.03	20.41	30.2	101.1	11.73	617	2,064	118	62	21	
DF		19	4	89	87	6.979	13.74	13.96	32.3	114.8	8.56	450	1,602	86	45	16	
DF		20	4	86	90	6.755	14.74	13.51	38.4	126.8	9.85	518	1,713	99	52	17	
DF		21	2	89	90	2.916	7.01	5.83	44.0	147.5	4.88	257	860	49	26	9	
DF		23	2	88	91	2.465	7.11	4.93	49.5	183.3	4.63	244	904	47	25	9	
DF		Totals		55	86	79	230.032	205.50	424.51	15.1	52.3	121.78	6,409	22,208	1,230	647	224
Totals			55	86	79	230.032	205.50	424.51	15.1	52.3	121.78	6409	22,208	1,230	647	224	

Type 3 – 29.5 Acres

Type 3 – Current Conditions

This type is stocked mostly with Douglas-fir, but it has a substantial hardwood component. Much of the hardwood volume is found in the draws. Ages are mixed. The primary age class averages about 44 years, but some trees are 80 years or older. Stocking is sporadic, in part because the type has been partially logged in the past. The trees are growing well, although the stand contains some pockets of root disease. Many of the Douglas-firs are open-grown and consequently contain numerous large limbs. Most of the acreage can be shovel logged.

According to the timber cruise, the type contains an average of 26 MBF per acre, of which 78 percent is in Douglas-fir and 12 percent is in red alder. Other species include western redcedar, western hemlock, and bigleaf maple. Average diameter is 15 inches, but diameters of some of the older trees exceed 40 inches. The stand contains an average of 141 trees per acre. Of this total, 67 are Douglas-fir, 48 are red alder, and 19 are bigleaf maple. According to the FPS growth model, this type is growing in board foot volume by about 1.01 MBF per acre per year, a rate of 4.0 percent.

Type 3 – Management Options

1. Clearcut Log – The type contains enough volume for a clearcut harvest that will provide a substantial financial return. After logging, the type would be reforested. This option is contrary to the landowner's goals for the property.
2. Group or Individual Tree Selection – In this option, small patches of trees or individuals are selected for logging. Damaged or diseased trees can be removed. This option can be tied with treatments designed to minimize the spread of root disease. In selecting individual trees, care is needed to ensure that the stand is not high graded. That is, the largest, most valuable trees should not be selected for logging. The resultant stand would look natural, with variable spacing and scattered openings. This stand structure would be beneficial to a variety of wildlife. The openings would be reforested with either Douglas-fir or a mixture of species. Depending upon the intensity of the treatment, this option could provide some financial return, especially in a good log market.
3. No Management – The type generally is healthy and growing well. The stand already is variable in structure and consequently provides good wildlife habitat. Of course, no management will provide no financial return.

Option 3 is most compatible with the landowner's goals. The landowner is open to occasional selective harvests, as in Option 2, and some of these harvests could occur in this type, possibly in conjunction with treatments for root disease control.

TC		Stand Table Summary														
TSTNDSUM		Project SHADY														
T99S R99E S99 T0003											T99S R99E S99 T0003					
Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees			Page:						
99S	99E	99	SHADY OAKS	0003	29.50	28	132			1						
										Date:	3/1/2012					
										Time:	3:26:30PM					
S Spc	T	DBH	Sample Trees	FF 16'	Av Ht Tot	Trees/ Acres	BA/ Acres	Logs Acres	Average Log		Net Tons/ Acres	Net Cu.Ft. Acres	Net Bd.Ft. Acres	Totals		
									Net Cu.Ft.	Net Bd.Ft.				Tons	Cunits	MBF
DF		7	1	79	49	5.948	1.59	5.95	6.0	10.0	.68	36	59	20	11	2
DF		8	1	84	58	4.028	1.41	4.03	7.0	30.0	.54	28	121	16	8	4
DF		9	1	82	85	3.260	1.44	3.26	14.0	40.0	.87	46	130	26	13	4
DF		11	2	88	91	3.848	2.54	7.70	11.5	42.4	1.68	88	326	49	26	10
DF		12	3	85	83	5.134	4.03	8.60	14.5	45.8	2.38	125	394	70	37	12
DF		13	1	88	86	1.390	1.28	2.78	16.0	55.0	.85	44	153	25	13	5
DF		14	1	88	93	1.172	1.25	2.34	20.5	75.0	.91	48	176	27	14	5
DF		15	5	85	100	5.497	6.75	10.99	23.7	81.0	4.96	261	890	146	77	26
DF		16	4	88	100	3.632	5.07	7.26	26.6	93.8	3.68	194	681	108	57	20
DF		17	7	86	104	5.865	9.24	12.60	29.8	104.5	7.14	376	1,316	211	111	39
DF		18	4	88	105	2.870	5.07	6.42	32.4	108.2	3.95	208	695	116	61	20
DF		19	2	85	108	1.380	2.72	2.76	41.2	144.5	2.16	114	399	64	34	12
DF		20	5	86	113	3.035	6.62	7.27	38.1	138.4	5.27	277	1,006	155	82	30
DF		21	8	87	108	4.307	10.36	10.26	39.9	149.7	7.78	409	1,537	229	121	45
DF		22	7	90	114	3.239	8.55	7.87	48.3	199.3	7.23	380	1,568	213	112	46
DF		23	3	87	123	1.368	3.95	3.69	49.2	185.8	3.45	181	685	102	54	20
DF		24	5	88	111	1.995	6.27	4.39	59.3	242.9	4.94	260	1,066	146	77	31
DF		25	2	85	121	.788	2.69	1.99	58.2	228.2	2.20	116	454	65	34	13
DF		26	3	87	123	1.045	3.85	2.81	60.8	263.9	3.24	171	742	96	50	22
DF		28	10	89	119	2.912	12.45	7.54	75.4	333.2	10.80	569	2,513	319	168	74
DF		29	4	86	123	1.167	5.36	3.24	73.4	324.3	4.52	238	1,051	133	70	31
DF		31	1	90	124	.234	1.22	.70	85.0	360.0	1.13	60	252	33	18	7
DF		32	4	85	120	.964	5.39	2.85	86.0	383.3	4.66	245	1,094	138	72	32
DF		33	3	84	123	.702	4.17	1.65	105.3	460.6	3.29	173	758	97	51	22
DF		34	2	85	125	.433	2.73	1.10	116.1	509.9	2.43	128	561	72	38	17
DF		36	1	86	147	.185	1.31	.56	122.3	663.3	1.29	68	369	38	20	11
DF		37	1	88	137	.168	1.25	.50	131.3	690.0	1.26	66	347	37	19	10
DF		41	1	82	124	.157	1.44	.47	139.3	610.0	1.25	66	287	37	19	8
DF		43	1	76	150	.170	1.72	.51	163.7	680.0	1.59	84	347	47	25	10
DF	Totals		93	86	96	66.892	121.71	132.10	38.3	151.2	96.10	5,058	19,979	2,835	1,492	589
RA		7	2	87	79	9.588	2.56	19.18	5.8	20.0	2.54	110	384	75	33	11
RA		8	2	80	78	8.723	3.04	17.45	6.1	17.1	2.43	106	298	72	31	9
RA		9	2	73	78	8.428	3.72	16.86	6.2	20.0	2.42	105	337	71	31	10
RA		10	2	87	87	4.698	2.56	9.40	10.7	35.0	2.32	101	329	69	30	10
RA		11	1	72	75	2.900	1.91	5.80	8.5	20.0	1.13	49	116	33	15	3
RA		12	3	81	69	5.630	4.42	11.26	11.3	32.3	2.93	127	364	86	38	11
RA		14	1	92	91	1.097	1.17	3.29	15.0	56.7	1.13	49	186	33	15	5
RA		16	1	87	96	.918	1.28	1.84	31.0	110.0	1.31	57	202	39	17	6
RA		17	2	66	63	2.852	4.49	5.70	10.2	28.5	1.34	58	163	39	17	5
RA		18	1	85	82	.777	1.37	1.55	32.5	100.0	1.16	51	155	34	15	5
RA		19	1	84	96	.697	1.37	1.39	35.5	120.0	1.14	50	167	34	15	5
RA		20	1	74	60	.808	1.76									
RA		22	1	84	86	.520	1.37	1.04	49.5	165.0	1.18	51	172	35	15	5
RA		23	1	84	79	.476	1.37	.95	50.0	155.0	1.09	48	148	32	14	4
RA		30	1	72	59	.379	1.86	.38	25.0	40.0	.22	9	15	6	3	0
RA	Totals		22	80	78	48.491	34.30	96.08	10.1	31.6	22.35	972	3,036	659	287	90
RC		34	1	68	107	.331	2.08	.99	76.3	236.7	1.02	76	235	30	22	7
RC		35	1	74	96	.264	1.76	.53	120.5	395.0	.86	64	209	25	19	6
RC		36	3	73	98	.770	5.44	1.54	128.0	417.1	2.66	197	642	78	58	19
RC	Totals		5	72	100	1.364	9.29	3.06	110.0	354.8	4.54	336	1,085	134	99	32

Stand Table Summary																
TC TSTNDSUM																
Project SHADY																
T99S R99E S99 T0003											T99S R99E S99 T0003					
Twp Rge Sec Tract Type Acres Plots Sample Trees											Page: 2					
99S 99E 99 SHADY OAKS 0003 29.50 28 132											Date: 3/1/2012					
											Time: 3:26:30PM					
Spc	S T	Sample		Av		Trees/ Acre	BA/ Acre	Logs Acre	Average Log		Net Tons/ Acre	Net Cu.Ft. Acre	Net Bd.Ft. Acre	Totals		
		DBH	Trees	16'	Tot				Net	Net				Tons	Cunits	MBF
BM		7	1	85	60	5.019	1.34	5.02	8.0	20.0	1.00	40	100	30	12	3
BM		9	1	82	60	3.260	1.44	6.52	6.0	20.0	.98	39	130	29	12	4
BM		10	1	84	60	2.518	1.37	2.52	16.0	40.0	1.01	40	101	30	12	3
BM		12	2	62	63	6.128	4.81	7.76	7.7	18.4	1.50	60	143	44	18	4
BM		13	1	88	70	1.390	1.28	2.78	15.5	45.0	1.08	43	125	32	13	4
BM		22	1	83	90	.546	1.44	1.09	50.5	145.0	1.38	55	158	41	16	5
BM		36	1	89	70	.177	1.25	.35	93.5	450.0	.83	33	159	24	10	5
BM		Totals	8	77	63	19.038	12.94	26.04	11.9	35.2	7.77	311	917	229	92	27
WH		11	2	90	79	3.631	2.40	5.45	13.0	46.7	1.45	71	254	43	21	7
WH		12	1	88	65	1.631	1.28	3.26	11.0	35.0	.74	36	114	22	11	3
WH		37	1	92	109	.157	1.17	.31	158.5	810.0	1.02	50	254	30	15	8
WH		Totals	4	89	75	5.419	4.85	9.02	17.3	69.0	3.21	156	623	95	46	18
Totals			132	83	84	141.205	183.09	266.30	25.7	96.3	133.97	6834	25,639	3,952	2,016	756

Type 4 – 4.6 Acres

Type 4 – Current Conditions

This type consists of poorly stocked Douglas-fir on a very steep, rocky slope. Average age is about 40, but both age and tree size are variable. Many of the trees are open-grown and contain numerous large limbs. The terrain includes exposed ledges and large boulders. Because of the broken terrain, tree spacing is uneven. A few spots in this type may be inoperable for logging. Otherwise, cable systems will be required.

According to the timber cruise, the type contains an average of 17 MBF per acre, all in Douglas-fir. Average diameter is 19 inches, and the stand contains an average of 77 trees per acre. According to the FPS growth model, this type is growing in board foot volume by about 0.74 MBF per acre per year, a rate of 4.4 percent.

Type 4 – Management Options

1. Clearcut Log – The type contains enough volume for a clearcut harvest. However, reforestation would be difficult due to the steep, rocky slopes. This option is contrary to the landowner's goals for the property.
2. No Management – Few other management options exist for this type due to its steep, rocky slopes. This option is consistent with the landowner's goals.

Type 5 - 19.4 Acres

Type 5 – Current Conditions

Type 5 is well stocked with Douglas-fir. Stand is mostly even-aged, with an average of about 53 years. However, it contains scattered older trees, many of which are open-grown and rough. It appears to have been naturally regenerated, so that spacing is somewhat uneven. Trees are of good quality and growing well. Due to the dense stocking, the stand contains little understory vegetation and relatively poor wildlife habitat. Terrain is mostly gentle, and all of the acreage, except in the far east, can be shovel logged.

According to the timber cruise, the type contains an average of 37 MBF per acre, of which 99 percent is in Douglas-fir. Average diameter is 14 inches, and the stand contains an average of 216 trees per acre.

According to the FPS growth model, this type is growing in board foot volume by about 0.75 MBF per year, a rate of only 2.0 percent. The low growth rate is attributable to the high stocking, in which trees have little room to grow.

Type 4 - Stand Table

Stand Table Summary

TC TSTNDSUM																
Project SHADY																
T99S R99E S99 T0004										T99S R99E S99 T0004						
Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees						Page:	1		
99S	99E	99	SHADY OAKS	0004	4.60	6	22						Date:	3/1/2012		
													Time:	3:26:30PM		
Spc	S T	Sample		Av	Trees/ Acres	BA/ Acres	Logs Acres	Average Log		Net Tons/ Acres	Net Cu.Ft. Acres	Net Bd.Ft. Acres	Totals			
		DBH	Trees	FF 16'				Ht Tot	Net Cu.Ft.				Net Bd.Ft.	Tons	Cunits	MBF
DF		11	1	86	59	9.486	6.26	9.49	16.0	40.0	2.88	152	379	13	7	2
DF		12	1	84	66	8.355	6.56	8.35	19.0	60.0	3.02	159	501	14	7	2
DF		15	3	84	82	15.666	19.22	31.33	19.7	65.0	11.71	616	2,037	54	28	9
DF		16	1	85	85	4.590	6.41	9.18	22.5	75.0	3.92	207	688	18	10	3
DF		17	1	85	91	4.066	6.41	8.13	27.5	90.0	4.25	224	732	20	10	3
DF		18	1	82	87	3.803	6.72	7.61	30.5	95.0	4.41	232	723	20	11	3
DF		19	4	84	92	13.130	25.85	26.26	34.9	109.3	17.40	916	2,871	80	42	13
DF		20	2	84	98	5.884	12.84	11.77	41.0	129.5	9.16	482	1,524	42	22	7
DF		21	2	78	95	6.150	14.79	12.30	43.3	128.3	10.13	533	1,578	47	25	7
DF		26	1	82	84	1.823	6.72	3.65	61.0	205.0	4.23	222	747	19	10	3
DF		31	1	83	110	1.282	6.72	2.56	108.0	440.0	5.26	277	1,128	24	13	5
DF		38	1	85	113	.814	6.41	1.63	164.5	560.0	5.09	268	911	23	12	4
DF		39	1	84	109	.791	6.56	1.58	166.0	560.0	4.99	263	886	23	12	4
DF		42	1	83	111	.682	6.56	1.36	194.5	695.0	5.04	265	948	23	12	4
DF		44	1	81	109	.652	6.89	1.30	214.0	725.0	5.30	279	946	24	13	4
DF		Totals	22	84	84	77.173	144.93	136.51	37.3	121.6	96.79	5,094	16,600	445	234	76
Totals			22	84	84	77.173	144.93	136.51	37.3	121.6	96.79	5094	16,600	445	234	76

Type 5 – Management Options

1. Clearcut Log – Type contains a high volume of merchantable timber. The return from logging all of the trees would be substantial. After logging, the type would be reforested. This option is contrary to the landowner’s goals for the property.
2. Thinning from Below – In this option, the smaller trees would be removed in order to create an evenly spaced stand of larger trees. As an example, if all trees that are 12 inches or smaller in diameter are removed, about 79 percent of the original volume and 51 percent of the original number of trees would remain. If all trees that are 15 inches or smaller in diameter are removed, about 61 percent of the original volume and 32 percent of the original number of trees would remain. In general, trees that have live branches over less than 40 percent of their height should be considered for thinning. These trees are growing well below their potential and eventually will die. The landowner could receive a substantial return from the logging, especially with the heavier thinning, and the resultant stand would be an open and park-like. The largest trees would remain. Growth on the leave-trees would accelerate due to the increased spacing. In addition, the treatment would improve habitat for deer and other wildlife. However, the stand would not necessarily look natural because of the relatively even spacing.
3. Thinning from Above – In this option, trees are removed from the middle and upper portion of the range of crown and diameter classes. The goal is to open up the canopy and favor development of promising trees of the same classes. Most of the trees that are cut come from the codominant class, but any intermediate or dominant trees interfering with the development of potential crop trees also are removed. The immediate financial return would be greater than for Thinning from Below, but because some of the faster growing trees are removed and many of the slower ones remain, growth after thinning is less. The method can result in improved wildlife habitat. Spacing still would be relatively even, but due to the greater range of tree sizes, the stand would look more natural than if thinned from below.
4. Variable Density Thinning – In this option, different parts of the stand are thinned to different spacings. Some areas remain well stocked, whereas others are thinned so that they are more open. As for Thinning from Below, growth of the leave-trees will accelerate due to the increased spacing, but the increase likely will not be as great. On the other hand, the more variable stand will support a wider variety of wildlife. It also would have a somewhat more natural appearance. This option can be tied with treatments designed to minimize the spread of root disease. Depending upon the intensity of the treatment, it also could provide a substantial financial return.
5. Group or Individual Tree Selection – In this option, small patches of trees or individuals are selected for logging. Damaged or diseased trees can be removed. This option also can be tied with treatments designed to minimize the spread of root disease. The resultant stand would look natural, with variable spacing and scattered openings. This stand structure would be beneficial for a variety of wildlife. The openings would be reforested with either Douglas-fir or a mixture of species. Depending upon the intensity of the treatment, this option could provide a substantial financial return.

Type 5 Stand Table

TC TSTNDSUM															Stand Table Summary					
Project SHADY																				
T99S R99E S99 T0005											T99S R99E S99 T0005									
Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees	Page: 1												
99S	99E	99	SHADY OAKS	0005	19.40	20	132	Date: 3/1/2012												
								Time: 3:26:30PM												
Spc	S T	Sample		Av	Trees/ Acre	BA/ Acre	Logs Acre	Average Log		Net Tons/ Acre	Net Cu.Ft. Acre	Net Bd.Ft. Acre	Totals							
		DBH	Trees	FF 16'				Ht Tot	Net Cu.Ft.				Net Bd.Ft.	Tons	Cunits	MBF				
DF		7	1	85	69	7.027	1.88	14.05	4.0	15.0	1.07	56	211	21	11	4				
DF		8	3	87	88	15.415	5.38	30.83	6.3	23.3	3.81	195	719	74	38	14				
DF		9	3	83	95	13.463	5.95	26.93	8.7	23.3	4.44	234	629	86	45	12				
DF		10	9	86	97	30.581	16.68	78.79	8.3	32.0	12.45	655	2,521	241	127	49				
DF		11	9	84	98	26.756	17.66	50.30	12.6	42.8	12.00	632	2,151	233	123	42				
DF		12	6	88	98	13.508	10.61	27.02	15.3	58.3	7.87	414	1,575	153	80	31				
DF		13	5	85	107	10.400	9.59	23.28	16.0	53.6	7.06	372	1,248	137	72	24				
DF		14	7	85	109	12.350	13.20	26.46	20.7	73.5	10.40	547	1,945	202	106	38				
DF		15	11	87	111	16.319	20.03	32.64	25.7	93.6	15.95	839	3,055	309	163	59				
DF		16	10	86	110	13.364	18.66	29.30	26.4	92.2	14.72	775	2,702	286	150	52				
DF		17	8	88	112	9.053	14.27	22.66	26.7	101.9	11.48	604	2,308	223	117	45				
DF		18	17	86	114	17.982	31.78	41.14	32.8	116.1	25.65	1,350	4,776	498	262	93				
DF		19	5	86	112	4.715	9.28	10.32	37.6	131.4	7.36	388	1,356	143	75	26				
DF		20	10	87	114	8.267	18.04	18.96	40.8	148.3	14.69	773	2,813	285	150	55				
DF		21	4	86	110	3.074	7.39	6.15	49.9	178.5	5.83	307	1,098	113	60	21				
DF		22	7	87	112	4.904	12.94	12.62	43.9	170.3	10.53	554	2,150	204	108	42				
DF		23	1	83	110	.682	1.97	1.36	61.0	220.0	1.58	83	300	31	16	6				
DF		24	3	83	121	1.883	5.91	5.65	44.4	176.1	4.76	251	995	92	49	19				
DF		25	1	86	98	.538	1.84	1.08	61.5	220.0	1.26	66	237	24	13	5				
DF		27	1	84	118	.495	1.97	1.49	53.3	206.7	1.51	79	307	29	15	6				
DF		28	3	87	123	1.268	5.42	3.80	65.9	282.2	4.76	251	1,073	92	49	21				
DF		31	1	74	108	.471	2.47	1.41	58.0	236.7	1.56	82	334	30	16	6				
DF		32	2	87	97	.650	3.63	1.30	107.1	431.2	2.65	139	561	51	27	11				
DF		33	1	81	116	.356	2.12	1.07	83.7	310.0	1.70	89	331	33	17	6				
DF		34	1	86	108	.298	1.88	.60	126.0	500.0	1.43	75	298	28	15	6				
DF		36	1	88	124	.254	1.79	.51	135.5	655.0	1.31	69	332	25	13	6				
DF		44	1	85	129	.178	1.88	.53	170.0	783.3	1.72	91	418	33	18	8				
DF	Totals	131	86	103		214.252	244.21	470.24	21.2	77.5	189.55	9,971	36,445	3,677	1,934	707				
WH	14	1	89	86		1.640	1.75	3.28	20.0	75.0	1.35	66	246	26	13	5				
WH	Totals	1	89	86		1.640	1.75	3.28	20.0	75.0	1.35	66	246	26	13	5				
Totals		132	86	103		215.892	245.96	473.52	21.2	77.5	190.89	10037	36,691	3,703	1,947	712				

6. No Management – The type generally is healthy, although growth is relatively slow. No management would retain the natural look and the large trees. Of course, it would provide no financial return.

Options 2, 3, 4, 5, and 6 all are consistent with the landowner's goals. They all improve wildlife habitat and capture volume that would be lost to natural mortality. However, because the stand is healthy, treatments can be delayed until the log market improves. Treatments can be applied to small areas over time, rather than all at once.

Type 6 – 1.0 Acres

Type 6 – Current Conditions

Type 6 is very poorly stocked. Ages are mixed, ranging from 30 to 80 years. Trees primarily consist of young red alder, cherry, cascara and other hardwoods. Conifers are scattered and of varying sizes and ages, some as old as 80 years. Terrain is gentle.

According to the timber cruise, the type contains an average of 10 MBF per acre. Average diameter is 9 inches, and the stand contains an average of 437 trees per acre. Of the 437 trees, 114 are Douglas-fir, and 223 are red alder. The remaining trees include cherry, cascara, and bigleaf maple. However, no maples fell on any of the cruise sample plots. According to the FPS growth model, this type is growing in board foot volume by about 0.36 MBF per acre per year, a rate of 3.6 percent.

Type 6 – Management Options

1. Clearcut Log – The type contains little volume and has little potential to produce a valuable stand in the near future. It could be clearcut in conjunction with harvests in nearby types. It then could be cleared and replanted in order to create a productive forest.
2. No Management – The type is an open area adjacent to well stocked forests. It adds to the diversity of the landscape and thus helps maintain a diverse habitat for wildlife. This option is most consistent with the landowner's goals for the property.

Type 6 - Stand Table

TC TSTNDSUM													Stand Table Summary				
Project SHADY																	
T99S R99E S99 T0006										T99S R99E S99 T0006							
Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees	Page:	Date:		Time:						
99S	99E	99	SHADY OAKS	0006	1.00	2	14	1	3/1/2012		3:26:30PM						
Spc	S T	Sample		Av	Trees/	BA/	Logs	Average Log		Net	Net	Totals					
		DBH	Trees	FF				Ht	Acres			Acres	Acres	Net	Net	Tons	Cunits
DF		1	1	6	50.002	.27											
DF		8	1	81	43.664	15.24	43.66	6.0	20.0	4.98	262	873	5	3	1		
DF		19	1	89	6.412	12.62	12.82	29.0	100.0	7.07	372	1,282	7	4	1		
DF		27	1	77	4.134	16.44	8.27	79.0	260.0	12.41	653	2,150	12	7	2		
DF		39	1	77	1.981	16.44	3.96	155.5	475.0	11.71	616	1,882	12	6	2		
DF		43	2	49	7.971	80.39	15.94	62.8	204.9	19.01	1,000	3,267	19	10	3		
DF	Totals		7	77	114.164	141.40	84.66	34.3	111.7	55.17	2,904	9,454	55	29	9		
RA		4	1	42	50.002	4.36											
RA		6	3	50	150.005	29.45											
RA		11	1	81	23.095	15.24	23.09	15.0	30.0	7.97	346	693	8	3	1		
RA	Totals		5	81	223.102	49.06	23.09	15.0	30.0	7.97	346	693	8	3	1		
CA		3	1	24	50.002	2.45											
CA	Totals		1	24	50.002	2.45											
CH		3	1	27	50.002	2.45											
CH	Totals		1	27	50.002	2.45											
Totals			14	78	41	437.270	195.36	107.75	30.2	94.2	63.14	3250	10,147	63	33	10	

Type 7 – 2.9 Acres

Type 7 – Current Conditions

Type 7 is a well stocked 15-year-old Douglas-fir plantation. It contains some scattered older trees that are generally open grown and rough. Spacing is mostly even in the younger trees.

According to the timber cruise, the type contains an average of 3 MBF per acre. Average diameter is 6 inches, and the stand contains an average of 312 trees per acre. Most of the trees are Douglas-fir, although some hardwoods have naturally regenerated in the plantation.

According to the FPS growth model, this type is growing in board foot volume by about 0.60 MBF per acre per year, a rate of 21.6 percent. This high growth rate is attributable to the fact that the trees are very young. Most are starting with little or no volume, so that any volume growth would increase percentage growth significantly.

Type 7 – Management Options

1. Thinning – Stocking is relatively high, and trees soon will be competing with each other. Removal of some of the hardwoods and overstory Douglas-firs could help sustain the high growth rate. The thinning could occur within the next five to 10 years. An earlier thinning would result in a greater growth response than a later one, but few merchantable logs would be available. Within 10 years, some trees may be large enough that those removed could pay for the operation.
2. No Management – The plantation is healthy and growing at a high rate. It will continue to grow at a high rate for several years, although the rate will slow as the trees begin to compete with each other.

The landowner's primary goal is maintenance of a natural forest, rather than timber production, Option 2 is more consistent with this goal. When the stand reaches merchantable size, in 15 to 20 years, the landowner can consider partial cutting.

Type 7 - Stand Table

TC TSTNDSUM														Stand Table Summary			
Project SHADY																	
T99S R99E S99 T0007											T99S R99E S99 T0007						
Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees			Page:	1						
99S	99E	99	SHADY OAKS	0007	2.90	5	18			Date:	3/1/2012						
										Time:	3:26:30PM						
Spc	T	DBH	Sample Trees	FF 16'	Av Ht Tot	Trees/ Acre	BA/ Acre	Logs Acre	Average Log		Net Tons/ Acre	Net Cu.Ft. Acre	Net Bd.Ft. Acre	Totals			
									Net Cu.Ft.	Net Bd.Ft.				Tons	Cunits	MBF	
DF		1	2		6	40.001	.22										
DF		2	1		11	20.001	.44										
DF		3	1		20	20.001	.98										
DF		4	2		40	40.001	3.49										
DF		5	1		25	20.001	2.73										
DF		6	2		28	40.001	7.85										
DF		7	1	58	38	42.996	11.49	43.00	5.0	10.0	4.08	215	430	12	6	1	
DF		17	1	85	77	3.512	5.54	7.02	23.5	70.0	3.14	165	492	9	5	1	
DF		19	1	79	77	3.255	6.41	6.51	28.5	80.0	3.53	186	521	10	5	2	
DF		29	1	81	79	1.329	6.10	2.66	72.0	225.0	3.64	191	598	11	6	2	
DF		40	1	79	101	.716	6.25	1.43	159.5	515.0	4.34	228	738	13	7	2	
DF		Totals	14	62	28	231.816	51.49	60.62	16.3	45.8	18.72	985	2,778	54	29	8	
CA		2	4		12	80.003	1.75										
CA		Totals	4		12	80.003	1.75										
Totals			18	62	24	311.819	53.24	60.62	16.3	45.8	18.72	985	2,778	54	29	8	

Type 9 – 11.2 Acres

Type 9 – Current Conditions

This young stand is dominated by sprouting red alder, bigleaf maple, cherry, cascara, hazel, and other species. Most trees average about 28 years old, but a few older trees are scattered through the type. Spacing and tree size both are variable. Douglas-fir is widely scattered. Terrain is relatively gentle near Upper Highland Road, and this area can be shovel logged. The eastern part of the type is steeper and will require cable logging systems.

According to the timber cruise, the stand contains an average of only 2 MBF per acre. Average diameter is 5 inches, and the stand contains an average of 806 trees per acre. According to the FPS growth model, the type is growing in board foot volume by about 0.14 MBF per year, a rate of 5.7 percent. This rate is relatively low for a young stand, but reflects that fact that it consists of densely stocked hardwood clumps in which trees have little room to grow.

Type 9 – Management Options

1. Clear and Replant – Much of the type is stocked with non-commercial or low value trees. It has little potential to produce a valuable stand in the near future. It could be cleared and replanted to a productive forest.
2. No Management – Growth projections indicate that the type will have enough volume in about 25 years so that clearcut logging will produce a positive financial return. This option avoids the cost of clearing and replanting with no immediate return, as in Option 1, but produces a less valuable stand in the future.

The landowner's primary goal is maintenance of a natural forest, rather than timber production, Option 2 is more consistent with this goal.

Type 9 - Stand Table

Stand Table Summary																	
TC TSTNDSUM																	
Project SHADY																	
T99S R99E S99 T0009											T99S R99E S99 T0009						
Twp	Rge	Sec	Tract	Type	Acres	Plots	Sample Trees			Page:	1						
99S	99E	99	SHADY OAKS	0009	11.20	14	119			Date:	3/1/2012						
										Time:	3:26:30PM						
S Spc	T	DBH	Sample Trees	FF 16'	Av Ht Tot	Trees/ Acre	BA/ Acre	Logs Acre	Average Log		Net Tons/ Acre	Net Cu.Ft. Acre	Net Bd.Ft. Acre	Totals			
									Net Cu.Ft.	Net Bd.Ft.				Tons	Cunits	MBF	
RA		4	1		44	7.143	.62										
RA		6	13		55	92.861	18.23										
RA		7	4	78	46	34.260	9.16	34.26	6.3	10.0	4.92	214	343	55	24	4	
RA		8	1	79	45	6.395	2.23	6.39	8.0	10.0	1.18	51	64	13	6	1	
RA		9	1	80	45	5.053	2.23	5.05	8.0	20.0	.93	40	101	10	5	1	
RA		10	1	90	73	3.234	1.76	6.47	9.0	35.0	1.34	58	226	15	7	3	
RA		13	1	87	83	2.001	1.84	4.00	18.0	55.0	1.66	72	220	19	8	2	
RA		Totals	22	79	53	150.946	36.09	56.18	7.8	17.0	10.03	436	954	112	49	11	
DF		2	2		13	14.286	.31										
DF		4	2		29	14.286	1.25										
DF		5	2		41	14.286	1.95										
DF		7	1	78	41	8.565	2.29	8.56	4.0	10.0	.65	34	86	7	4	1	
DF		8	1	80	49	6.238	2.18	6.24	6.0	30.0	.71	37	187	8	4	2	
DF		11	3	81	57	9.647	6.37	9.65	15.3	36.5	2.80	148	352	31	17	4	
DF		15	1	79	74	1.819	2.23	3.64	18.0	50.0	1.24	65	182	14	7	2	
DF		Totals	12	80	36	69.128	16.57	28.09	10.1	28.7	5.41	285	807	61	32	9	
CW		27	1	84	101	.497	1.98	.99	83.0	310.0	1.90	83	308	21	9	3	
CW		Totals	1	84	101	.497	1.98	.99	83.0	310.0	1.90	83	308	21	9	3	
WH		1	1		4	7.143											
WH		4	2		37	14.286	1.25										
WH		13	1	87	65	2.001	1.84	2.00	22.0	60.0	.90	44	120	10	5	1	
WH		14	1	82	63	1.987	2.12	1.99	24.0	60.0	.98	48	119	11	5	1	
WH		Totals	5	85	32	25.418	5.22	3.99	23.0	60.0	1.88	92	239	21	10	3	
CH		2	1		14	7.143	.16										
CH		4	3		25	21.429	1.87										
CH		5	7		50	50.002	6.82										
CH		11	1	86	48	2.927	1.93	2.93	13.0	20.0	.86	38	59	10	4	1	
CH		Totals	12	86	40	81.501	10.78	2.93	13.0	20.0	0.86	38	59	10	4	1	
BM		2	3		29	21.429	.47										
BM		3	1		30	7.143	.35										
BM		Totals	4		29	28.572	.82										
CA		2	5		20	35.716	.78										
CA		3	36		27	257.152	12.62										
CA		4	10		33	71.431	6.23										
CA		Totals	51		28	364.299	19.64										
RC		1	1		6	7.143	.04										
RC		2	1		10	7.143	.16										
RC		Totals	2		8	14.286	.19										
WI		3	10		20	71.431	3.51										
WI		Totals	10		20	71.431	3.51										
Totals			119	80	33	806.079	94.78	92.17	10.1	25.7	20.07	933	2,367	225	105	27	

VII. TAX AND BUSINESS MANAGEMENT

Record Keeping: Managing forestland is like running any other business. Good record keeping is essential. It can help to minimize tax liability. All expenses and returns should be recorded.

Property Taxes: Under Oregon law, most forestland properties can qualify for special assessments that reduce property taxes. Both the Forestland Tax and Small Tract Forestland Programs are available to small forestland owners. Most small ownerships, including the Shady Oaks Tree Farm, are enrolled in the Forestland Tax program.

Income Taxes: Timber harvest and other revenue-generating activities generally produce federal and state income tax liability, including capital gains taxes. A tax advisor who is knowledgeable about forestland should be consulted.

Federal and State Incentive Programs: Some of the sources of financial assistance for forestland owners are listed in Section IX. The landowner should be aware that participation in these incentive programs has tax implications. Again, a tax advisor who is knowledgeable about forestland should be consulted.

Estate Taxes: Good estate planning can help to lessen tax liability when passing land to heirs. The landowner should seek advice from a tax advisor or estate planner who is knowledgeable about forestland.

Land Use Designation: The Shady Oaks Tree Farm is located in a Timber District as designated by Clackamas County. The purpose of the District is to conserve forestlands, to assure the continued growing and harvesting of timber, to conserve, protect, and enhance water, wildlife, and other forest resources, and to minimize wildfire hazard and risks. Consequently, few uses other than growing trees are allowed.

Contracts: When hiring loggers, tree planters, and others to work on the property, the landowner should enter into formal written contracts with them. The contracts specify the duties of each party, the price that will be paid for the services, and other important considerations. They also should specify that the contractors carry sufficient liability insurance to protect the landowner from any damage caused in the course of carrying out the contract. The Oregon State University Extension Service can provide more information, as well as a sample contract.

VIII. MANAGEMENT ACTIVITY SCHEDULE

The following summarizes the management activities recommended under this plan. The first five items are continuous activities with no specific starting or ending date.

1. Maintain Forest Roads. The main access road should continue to be maintained so that fire trucks can access the property, if needed. Other roads should be kept open for fire truck access, as well as for fire breaks.
2. Implement other fire safety measures, such as pruning, thinning, or access control, as needed.
3. Monitor Root Disease Pockets – If any of the pockets are expanding at a rapid rate, the control options described in this report can be implemented.
4. Maintain records of all expenses and returns.
5. Become familiar with the state Forest Practices Rules and other laws that affect forest management.
6. Thin overstocked stands, particularly Types 2 and 5. This activity can be timed to take advantage of good log markets.
7. Replant any areas where a group selection harvest method was used. The site should be cleared and planted within a year of logging. Brush competition and animal damage should be monitored until trees are above the brush and out of the reach of animals. Brush control and animal damage protection measures should be implemented as necessary.
8. Update this plan periodically as needed and prepare a new one within 10 years.

IX. SOURCES OF TECHNICAL AND FINANCIAL ASSISTANCE

Oregon Department of Forestry (ODF) – Local Stewardship Foresters provide technical advice, as well as assist in obtaining financial assistance for preparation of management plans and implementation of silvicultural practices. They also can provide information about the Forest Practices Act, stream classification and protection measures, threatened and endangered species, fire protection, and other issues related to forestry operations. Jeff Hepler is the Stewardship Forester in ODF’s Molalla office. His telephone number is 503-829-2216. The ODF website is at www.oregon.gov/ODF.

Oregon State University Extension Service – Local Extension Agents conduct a wide variety of education programs for woodland owners. Mike Bondi is the Forestry Extension Agent for Clackamas County. He can be reached in Oregon City at 503-655-8631. The Extension Service website is at www.extension.oregonstate.edu/clackamas.

Oregon Department of Fish and Wildlife (DFW) – Fish and wildlife biologists often are available to work with landowners to support fish and wildlife on their properties. They can assist in securing financial aid for enhancement of wildlife habitat, in-stream habitat enhancement, and conservation or rehabilitation of riparian areas. The Northwest Region Office is located in Clackamas. Telephone number is 971-673-6000. The DFW website is at www.dfw.state.or.us.

Tax Programs – The Clackamas County Assessor or ODF Stewardship Forester, whose number is given above, can provide more information about Oregon’s property tax programs for forestland. Information about Oregon’s tax programs also can be found at www.oregon.gov/DOR/TIMBER/index.shtml. Tax credits for federal income taxes also are available for reforestation activities. Information about federal tax programs for forestland can be found on the National Timber Tax website at www.timbertax.org.

Natural Resources Conservation Service (NRCS) – This federal agency works with landowners to develop and implement conservation plans. It administers several financial incentive programs. It also can provide detailed information on soils and other natural resources. The Clackamas County Service Center is located in Oregon City. Telephone number is 503-655-3144. Website address for NRCS in Oregon is www.or.nrcs.usda.gov.

Oregon Small Woodland Owners Association (OSWA) – The mission of this group is to preserve the rights and promote the responsibilities of small woodland owners by educating owners, policy makers, and the public about forestry issues on private lands. The state group and local chapters sponsor several educational programs each year. Their publications also contain useful educational material. Telephone number for the state office in Salem is 503-588-1813. Website is at www.oswa.org. Website for the Clackamas County Farm Forestry Association, which is affiliated with OSWA, is at www.ccffa-oswa.org.

Oregon Tree Farm System – This group supports sound forest management by ensuring that its members meet specified standards and by recognizing landowners whose properties exemplify the stewardship ethic. The program requires that the landowner have an updated management plan and that Tree Farms be inspected periodically for compliance with the standards. Its publications also contain useful educational material. The Oregon Tree Farm System can be contacted through their website at www.otfs.org. Website for the American Tree Farm System, which is the national organization of which the Oregon Tree Farm System is a part, is at www.treefarmssystem.org.

Oregon Forest Resources Institute (OFRI) – The goal of this organization is to educate the public about forestry practices in Oregon. It publishes educational materials and sponsors workshops and other educational programs. It is located in Portland and can be reached at 971-673-2944. Their website address is www.oregonforests.org.

World Forestry Center – The Center in Portland also provides educational materials to the public about forestry in Oregon and sponsors educational programs. It maintains permanent and traveling exhibits about the practice of forestry, both past and present. Telephone number is 503-228-1367. Website address is www.worldforestry.org.

Oregon Forest Industry Directory – This directory provides a list of companies that provide services to the forest products industry, including log buyers, buyers of special forest products, custom sawyers, forestry contractors, and others. Website address is www.orforestdirectory.com.

Association of Consulting Foresters (ACF) – Members collectively offer a complete range of professional forestry expertise, including forest management, forest products marketing, evaluation and acquisition of forestland and timber, economics, forest engineering, and environmental analysis. Every member meets high standards of training and professional ethics. Each possesses a degree in forestry, maintains continuing education, and has practiced for at least five years. Members must be independent of any business that could create a conflict of interest in serving clients, such as a timber procurement entity. The telephone number for the national office in Virginia is 703-548-0990. Their website, found at www.acf-foresters.org, contains a list of members. The author of this plan is a member of ACF and can provide a list also.

X. GLOSSARY

Basal Area – the cross-sectional area of a tree, in square feet, at 4.5 feet above ground level (breast height). When the basal areas of all trees in a stand are added together, the result is expressed as square feet per acre, which is a measure of a stand's density.

Biodiversity – The variety and abundance of life forms, processes, functions, and structures of plants, animals, and other living organisms.

Board Foot – A unit for measuring wood volume. It is a piece of wood one foot long, one foot wide, and one inch thick.

Canopy – The more or less continuous cover of branches and foliage formed collectively by the tops, or crowns, of adjacent trees.

Clearcut – A harvest method that removes essentially all trees in a stand.

Crop Tree – A tree identified to be grown to maturity for the final harvest cut, usually on the basis of its location with respect to other trees and to its timber quality

Cubic Foot – A unit for measuring wood volume. It is a piece of wood one foot long, one foot wide, and one foot thick.

Cunit – 100 cubic feet

Diameter at Breast Height (DBH) – Tree diameter outside bark at 4.5 feet above ground level.

Forest Stand or Type – A group of trees with distinct characteristics, such as species, age, or condition, which can be distinguished from adjacent groups.

Form Factor (FF) – A measure of tree taper. It is the ratio of outside bark diameters at 16 and 4 feet above stump level.

Group Selection – A harvest method in which trees are removed and new age classes are established in small groups. The width of groups is commonly about twice the height of the mature trees. Smaller openings provide microenvironments suitable for regeneration of shade-tolerant trees, such as western hemlock and western redcedar, and larger openings provide conditions suitable for regeneration of more shade-intolerant trees, such as Douglas-fir.

GPS (Global Positioning System) Coordinates – Coordinates obtained from a satellite-based navigational device that allows users to determine their location on the surface of the earth.

High Conservation Value Forest – A forest of outstanding and critical importance due to its environmental, social, biodiversity, or landscape values. An old growth Douglas-fir forest would be an example.

High-Grading – Cutting only the high value trees from a forest property, leaving a stand of poor quality with decreased future productivity.

Invasive Species – Non-native species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health. Himalaya berry, for example, is an invasive species. It is non-native and causes both economic and environmental harm.

MBF – 1,000 board feet

Selection Harvest – Harvesting of trees to regenerate and maintain a multi-aged structure by removing some trees in all size classes, either singly or in small groups.

Single-Tree Selection – Removal of individual trees of all size classes more or less uniformly throughout the stand to promote growth of remaining trees and to provide space for regeneration.

Site Class – An expression of forest site quality based on its potential for growing trees. Each site class is a grouping of site indexes. Douglas-fir sites are broken into five site classes, with Class 1 being the best for growth. Douglas-fir site classes cover the following site index groups:

Class 1	Site Index 136 and higher
Class 2	Site Index 116-135
Class 3	Site Index 96-115
Class 4	Site Index 76-95
Class 5	Site Index 75 and lower

Site Index – An expression of forest site quality based on its potential for growing trees. For Douglas-fir, it is defined as the projected average height of dominant and large codominant trees at a breast height (4.5 feet above ground level) age of 50 years.

Special Sites – Those areas offering unique historical, archaeological, cultural, geological, biological, or ecological value. Special Sites include historical, archeological, cultural, or ceremonial sites or features of importance to the forest owner; sites of importance to wildlife, such as rookeries, refuges, fish-spawning grounds, vernal ponds, and shelters for hibernating animals; unique ecological communities, such as relic old-growth trees, springs, glades, savannas, fens, and bogs; and geological features such as terminal moraines, cliffs, and caves.

Species Codes	BM	Bigleaf Maple	RA	Red Alder
	CA	Cascara	RC	Western Redcedar
	CH	Cherry	WH	Western Hemlock
	CW	Black Cottonwood	WI	Willow
	DF	Douglas-fir		

Stand Structure – The horizontal and vertical distribution of plants in the forest, including the height, diameter, crown layers, and stems of trees, shrubs, understory plants, snags, and down woody debris.

Stocking – An indication of the number of trees in a stand in relation to the desirable number for best growth and management.

Thinning – A cultural treatment designed to reduce stand density in order to improve growth, enhance forest health, or recover potential mortality.

Thinning from Above – A method of thinning which trees are removed from the middle and upper portion of the range of crown and diameter classes. Trees are removed in order to open up the canopy and favor development of promising trees of the same classes. Most of the trees that are cut come from the codominant class, but any intermediate or dominant trees interfering with the development of potential crop trees also are removed.

Thinning from Below – A method of thinning in which trees are removed from the lower crown and diameter classes. In the lightest thinnings, only overtopped trees are removed. In a somewhat heavier thinnings, overtopped trees, as well as trees in intermediate crown classes, are removed. In the heaviest thinnings, only dominant trees and large codominant trees are left.

Variable Density Thinning – A method of thinning in which different parts of the stand are thinned to different spacings. Some areas remain well stocked, whereas others are thinned so that they are more open. One approach to variable density thinning can be described as thinning with skips and gaps. Some areas are skipped over in the thinning, whereas others are thinned so heavily that a gap is created in the stand.