Clark County

Forest Stewardship Plan

Green
Mountain

Forest Stewardship Plan

Forest name:	**Green Mountain**
# of acres plan covers:	**360**
Forest certification #:	**SA-FM/COC-1394CC**
Plan prepared by:	**Kirk Hanson & Jim Vandling**
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County and state:	**Clark County, WA**

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Plan revised	**Monitoring data incorporated**

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Introduction

This document addresses nine forest management units totaling 360 acres that comprise Clark County's Green Mountain Forest. The forest is located in southeastern Clark County, 12 miles east of Vancouver and seven miles north of the Columbia River, and is approximately one mile southwest of Camp Bonneville. This property is one in a series of forested tracts owned by Clark County and managed by the County's Department of Environmental Services.

The Green Mountain tract was acquired by Clark County through a *trust lands transfer* agreement with the Washington Department of Natural Resources. The County has designated Green Mountain as a Forest Tier II area through the County's Comprehensive Land Use Plan. This is defined as an area that is potentially capable of sustaining long term production of commercially significant forest products.

Forest cover across this property is dominated by even-aged Douglas fir stands that vary in age from 60 – 80 years old. These stands naturally regenerated following successive fires across the site. There is more age and species diversity throughout this forest than the stands at Camp Bonneville. Additionally, stocking densities are significantly lower, which may be due to past commercial thinning activities by either the WA DNR or a previous owner. Unlike Camp Bonneville, no prior forest inventory data was transferred to the County during the acquisition process.

Continued selective commercial thinning is recommended for the majority of the forest at Green Mountain in order to meet both long-term forest structure and habitat development and sustained revenue objectives. Periodic, low-intensity thinning can optimize tree growth, simulate the successional pattern of the historic Douglas fir forest type, optimize forest health, and minimize fire hazard. Other forest management goals include creating a multiple-canopy forest structure, increasing wildlife habitat and optimizing growth and yield of high quality timber products for domestic mills.

15 years ago, the State of Washington executed a comprehensive modification of its Forest Practices Act. This followed the listing of several salmonoid species under the Endangered Species Act. At issue is the practice of even-aged silvicultural treatments (e.g. clear cutting), held as an industry standard for decades, and the impacts of intensive forest management practices near sensitive aquatic and wildlife habitat sites. Regulatory changes have primarily involved an increase in forest buffer widths, which preclude silvicultural activity in critical areas such as riparian management zones, wetland buffers and habitats for rare, threatened and endangered species.

The region's long history of large-scale, even-aged clearcuts has created significant fragmentation of wildlife habitat, an epidemic of young, low quality Douglas fir, and an oversimplification of the broad range of ecosystem services that historic, naturally diverse forests once provided. The industrial argument in favor of even-aged management has focused on the economic efficiencies of intensive plantation

management. Smaller, non-industrial private forest (NIPF) landowners throughout the region follow a more diverse spectrum of silvicultural methods that include even-aged management as well as a more natural, uneven-aged and mixed species approach to forestry.

There is a growing understanding of the ecosystem service benefits of structurally intact native forests. Natural forest ecosystems are highly resilient to and recover quickly from natural disturbance regimes, have superior storm water retention capacities, optimize the sequestration and long-term storage of carbon, provide a broad spectrum of habitat niches, produce multiple forest commodities, and supply recreational and hunting opportunities to local communities. However, the economics of uneven-aged management practices have not been studied in great depth or at length on the west side of the Cascade Mountains. A study of this nature would require a demonstration or experimental forest with a timber base large enough to accommodate a wide range of silvicultural strategies. Clark County is proposing to implement a plan of uneven-aged structure based management utilizing both Camp Bonneville and Green Mountain as experimental forests for these purposes.

Goal of forest management plan

The goal of Clark County's Green Mountain forest management plan is to research and demonstrate how former even-aged Douglas-fir forests can be managed to produce a sustained yield of commercial forest products and increased ecosystem services through the implementation of uneven-aged forest management practices. The Green Mountain forest management plan, which combines habitat conservation and enhancement, improved ecosystem functions and the production of a diversity of forest products, will provide other forest owners and managers with tested and validated silvicultural options.

Clark County has found that the silvicultural standards defined within the Forest Stewardship Council's (FSC) U.S. Forest Management Standards provide significant guidance to forest owners seeking to emulate natural forest dynamics through their forest management practices. Therefore, the County will seek to follow, at a minimum, FSC's guidelines for forest management. In 2011 – 2013, Clark County developed a comprehensive forest management plan for 1,833 acres of the 3,840-acre Camp Bonneville tract that allowed this forest to quality for FSC certification. In 2015 the remaining forested acreage at the Camp will be incorporated into the management plan and therefore covered by FSC certification. In 2012, Camp Bonneville's forest was also certified under the American Tree Farm System (ATFS). Upon completion of this management plan, Clark County will also seek certification for the Green Mountain forest under both the FSC and ATFS.

A critical component of any sustainable forestry model is long-term economic viability. The Board of County Commissioners has required that the management of Green Mountain, like Camp Bonneville, be financially self-sustaining while maintaining the natural environment at the site. Therefore, the primary financial goal of the forest management plan is to develop sufficient revenue to cover all forest management costs.

It is anticipated that by conducting overdue thinning and moving towards actively managing the Green Mountain forest, the forest can provide positive revenue back to the County. Therefore, timber revenue generated from Green Mountain could also be used to provide essential County services to the public.

Forest Management Objectives

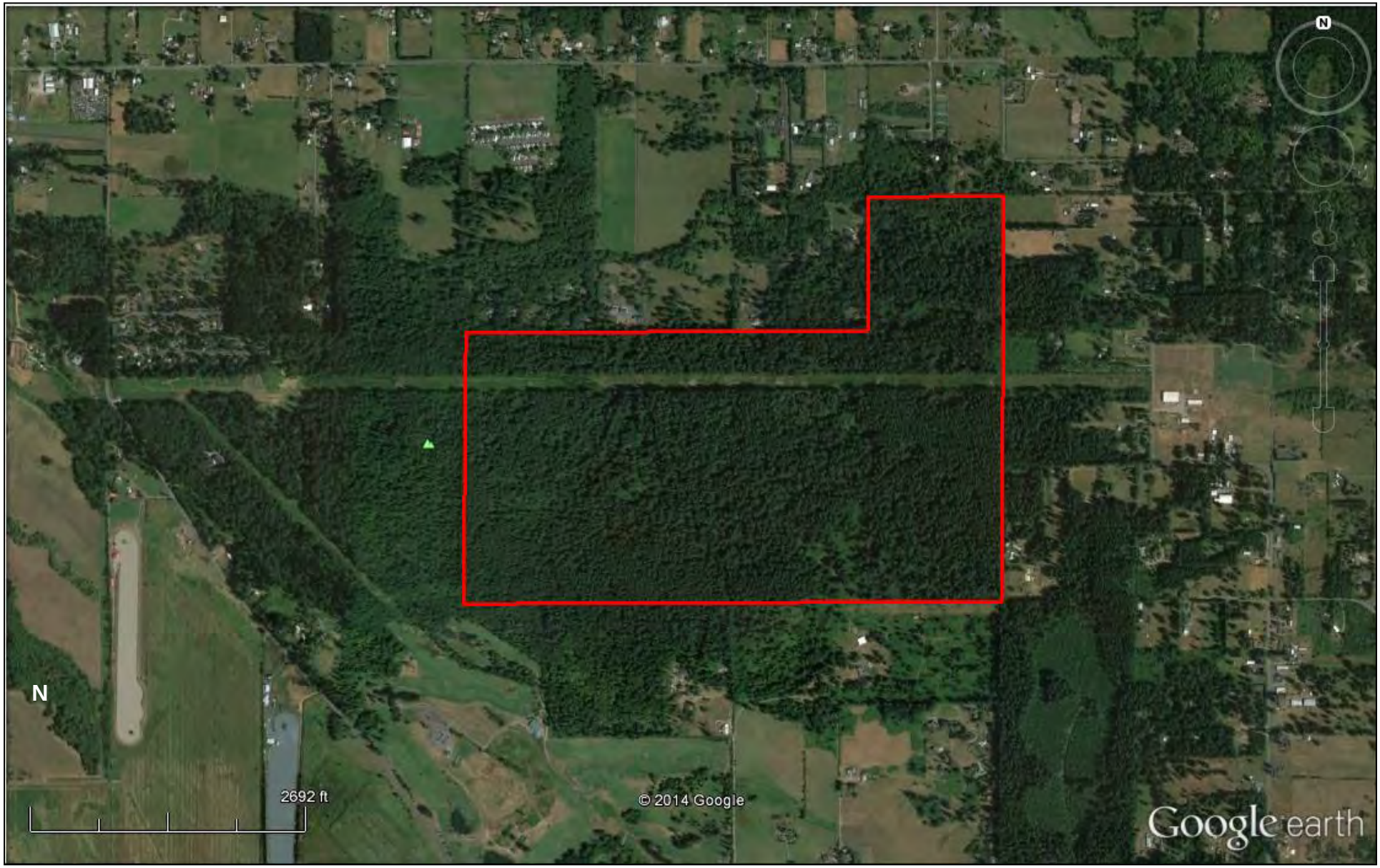
Short term (1-10 years)

1. Thin dense stands to enhance forest health and timber productivity
2. Improve wildlife habitat through snag creation, distribution of downed woody debris and forage planting
3. Develop and implement control and eradication measures for noxious non-native plant species
4. Begin a systematic monitoring program to inventory and assess forest resources and wildlife habitat
5. Develop an annual or semi-annual commercial thinning plan that provides sufficient income to pay for all forest management expenses and provide positive revenue to the County
6. Implement research and development programs to demonstrate structure-based forest management principles
7. Host educational forestry tours and events for the public, county stakeholders and county staff and officials.

Long term (10+ years)

1. Restore historic species composition and habitat complexity throughout forest
2. Begin restoring areas of forest to late seral conditions
3. Produce periodic income through commercial thinning
4. Use forest resources as a model for structure-based forest management
5. Recruit or retain legacy trees, old and large trees, snags and downed woody debris in order to sustain populations of native plants, fungi, and animals, both within individual forest stand and across the entire forest
6. Monitor forest ecosystem dynamics, record and analyze trends and periodically update forest management plan to reflect new strategies for managing the forest

Map 1. Aerial Photo



Property Description

Legal description
Township 2 North, Range 3 East, Section 16

Property description
The Green Mountain Forest is a 360-acre forested property located in southwest Clark County. The property extends from the eastern flank of Green Mountain (elevation 804') The property is located along the margins of a portion of prairie habitat that extends into the foothills of the Cascade Mountains. Although the site is included in the westside western hemlock vegetation zone, the area has burned periodically since 1900, and consequently the current forest is predominantly comprised of even aged stands of Douglas fir. Typical understory species include sword fern (*Polystichum munitum*), red huckleberry (*Vaccinium parvifolium*), vine maple (*Acer circinatum*), Oregon grape (*Mahonia nervosa*), hazelnut (*Corylus sp*.), snowberry (Symphoricarpos albus), and elderberry (*Sambucus canadensis*).

Regional landscape
Green Mountain is located in Southwest Clark County just east of the City of Vancouver. Clark County lies in a long structural basin (Willamette-Puget Trough) between the Pacific Coast ranges to the west and the parallel Cascade Range to the east. The Columbia River, the major trunk stream of the Pacific Northwest, flows through the Cascade Range, borders Clark County as it crosses the trough, then passes through the Pacific Coast ranges into the Pacific Ocean to the west.

About 58 percent of Clark County is in woodland. About 93 percent of the woodland is privately owned, 6 percent is State owned, and about one percent is owned by the Federal Government. Economic development in Clark County is diversified. Farming is important, but it is secondary in value of total products to industrial products, which include lumber, pulp, paper, aluminum, and chemicals. About 42 percent of the county is cleared and in farmland; the rest is forested or logged-off land.

Forest Fire History
In 1902 the massive Yacolt Fire destroyed virtually the entire original forests and homesteads throughout this region. The chart below lists the most significant forest fires within the immediate vicinity of Green Mountain.

Year	Name of Fire
1902	Yacolt Burn (238,000 acres across three counties)
1938	1st Livingston Mtn.Fire
1951	2nd Livingston Mtn.Fire
1970	N.Fk Lacamas Cr.Fire

Climate & Geology

Climate

Clark County, approximately 70 miles inland from the Pacific Ocean and west of the Cascade Mountains, has the predominantly temperate marine climate typical of the West Coast. It has a dry season and pleasant temperature in summer, a mild but rather rainy winter, and a narrow range in temperature. Some of the factors that influence the climate are terrain and distance and direction from the ocean. The coastal mountains protect this area from the more intense winter storms that move inland from the ocean, and the Cascade Range shields it from the higher summer and lower winter temperatures of eastern Washington. Cold air in winter and the occasionally hot air in summer flowing west through the Columbia River Gorge has a decided influence on the climate.

Clark County has a mild marine climate that is typical of the northwestern part of Oregon and the western part of Washington. It has mild, wet winters and moderately warm, dry summers. The climate reflects the influence of the Cascade Mountains to the east and the parallel Coast Range to the west. Nearly 75 percent of the annual precipitation normally occurs from October 1 to March 31. The remaining 6 months, from April 1 to September 30, receive only 25 percent of the total precipitation. The average annual precipitation differs greatly from place to place. This difference is directly related to the effects of the two bordering mountain ranges. The average annual precipitation on much of the Coast Range and the Cascade Mountains exceeds 100 inches. Precipitation at lower altitudes and toward the center of the basin between the two mountain ranges is much less. The annual precipitation at Vancouver is about 37 inches; the precipitation reaches 114 inches in the Cascade Mountains in the northeastern corner of the county. During the growing season, however, the range in precipitation is small. For example, precipitation for July and August combined averages 1.40 inches at Vancouver, the driest station, in comparison with 2.77 inches at Cougar, the wettest station. The average annual snowfall at Vancouver is 8.4 inches, and it is estimated to exceed 200 inches at an elevation of 3,000 feet in the eastern and northeastern parts of the county.

Late in spring and in summer large high-pressure centers over the north Pacific Ocean bring a prevailing flow of cool and comparatively dry air from a northwesterly direction. As the air moves inland, it becomes warmer and drier. As a result a dry season begins late in spring and reaches a peak in midsummer. In July and August, it is not unusual for 2 or 3 weeks to pass without measurable rainfall.

In fall and winter, low-pressure centers in the Gulf of Alaska intensify and high-pressure centers become smaller and move south. Circulation of air around these pressure centers in the north Pacific bring a prevailing flow of warm, moist air into this part of the State from a southwesterly direction. As a result, winter temperatures are mild and the rainy season begins in fall, reaches a peak in midwinter, and decreases in spring.

In the warmest summer months, afternoon temperatures range from the middle seventies to the lower eighties, and nighttime temperatures are in the fifties. Maximum temperatures exceed 90° F. on 5 to 15 days each summer and reach 100° or slightly higher in one summer out of three. Temperatures in the foothills and higher elevations of the county are slightly lower than those recorded in the valleys. The hottest weather generally occurs when hot, dry, easterly winds reach the area. In this kind of weather, humidity is low and the risk of forest fires is high. Following 1 or 2 days of unusually warm weather, cooler air from the ocean moves inland and afternoon temperatures return to the seventies and eighties.

In the coldest months, afternoon temperatures range from the upper thirties to the middle forties, and nighttime readings from 25° to 35°. In most winters, a minimum temperature of below freezing occurs on 40 to 75 nights and a maximum temperature of freezing or below occurs on a few days. The coldest weather generally occurs when a high pressure area develops over the Pacific Northwest and cold air from east of the Cascades reaches this area. The sky is frequently clear under these conditions; minimum temperatures range from 5° to 15° and maximum temperatures remain below freezing. In an average year, the relative humidity ranges from about 50 percent in midafternoon to 85 percent at sunrise in the warmest and driest months and from 75 percent in midafternoon to 85 percent or higher early in the morning in winter.

The average annual precipitation ranges from approximately 40 inches in the vicinity of Vancouver to between 75 and 110 inches along the foothills and higher elevations in the eastern part. Available records indicate that the heaviest precipitation probably occurs in the northeastern part of the county. The annual precipitation near Cougar, in the Lewis River valley, ranges from 72 to 172 inches. Rain fall of more than half an inch per hour can be expected once in 2 years. During the rainy season, precipitation is usually moderate in intensity and continuous over a period of time, rather than a downpour for a brief period. Rainfall of heavy intensity, however, occurs occasionally as the more intense weather systems move across the area. Precipitation amounting to 2 to 4 inches in a 24-hour period is recorded in the areas of heavier rainfall almost every year.

Vegetative History

Historic trends of the vegetation of western Washington since the recession of the Pleistocene glaciers has been inferred from pollen records in lake sediments. The lowland forests across much of Western Washington during the Pleistocene were composed of mountain hemlock, spruces and pines. Grass, sedge, and sagebrush pollen was also present, indicating an open steppe community. As climate warmed between 18,000 and 12,000 years BP, pine pollen increased, and Douglas fir and Sitka spruce are present as well.

The Holocene, or modern glacial period, marked a series of changes culminating in the modern vegetation assemblage. The early Holocene period (10,000-6,000 BP) was likely warmer and drier than at present, and was characterized by Douglas fir, red alder, oak, bracken fern, grasses, and various prairie herbs. This community type is still

present today, likely sustained through the more mesic late Holocene period by a combination of edaphic factors and application of fire by Native American groups.

Cooling temperatures and increasing precipitation in the late Holocene, or last 4-6,000 years, ushered in a final set of changes to the regional forest composition. Douglas fir, western hemlock, and red alder increase dramatically in the pollen profile, and western red-cedar joined the assemblage about 5,000 years BP.

Pollen cores analysis taken north of the site reveals an initial community of pine, spruce, and mountain hemlock resulting from post-glacial conditions. Western hemlock is present, but is a minor component of the pollen record until the cooler period of the late Holocene (4,000 years BP until present). Western red cedar is the last major tree species to arrive on the scene, completing the modern assemblage.

Based on this history, it can be inferred that the Green Mountain forest has the arboreal diversity necessary to adjust to climatic change, as it has many times before. The key difference today is that there is a broader range of anthropogenic impacts than ever before which will influence the response of the biotic community to changes in moisture and temperature regimes. The vegetation across Green Mountain may experience dramatic changes over the next millennium due to climate change and forest management; however, a few species will certainly be represented. Douglas-fir and red alder would be present. Western red cedar and western hemlock, preferring cooler and moister sites, may eventually recede from the site and seek higher ground or north facing slopes.

Geology

Clark County lies in a long structural basin (Willamette-Puget Trough) between the Pacific Coast ranges to the west and the parallel Cascade Range to the east. The Columbia River, the major trunk stream of the Pacific Northwest, flows through the Cascade Range, borders Clark County as it crosses the trough, then passes through the Pacific Coast ranges into the Pacific Ocean to the west.

The western part of the county consists of a series of gently rolling alluvial terraces that form plains and benches rising steplike from the present level of the Columbia River. The elevations in these areas range from a few feet to more than 800 feet above sea level. The eastern part of the county consists of high old alluvial terraces against volcanic foothills and mountains of the western slopes of the Cascade Range. Along the eastern margin of the county, some of the higher peaks rise to an elevation of nearly 4,000 feet. Mountain ridges 2,000 to 3,000 feet in elevation are common. Much of this area is very steep, and a fall of 1,000 feet within a lateral distance of half a mile is not uncommon. The mountainous terrain is heavily dissected by streams that originate in this area and to the east. Most of the important streams that drain the county flow in a westerly direction. The more prominent streams are: the North Fork of the Lewis River; the East Fork of the Lewis River; the Washougal and Little Washougal Rivers; and Lacamas, Salmon, Big Tree, Cedar, Canyon, Mason, and Lockwood Creeks.

Soils

See Soils Map in Appendix I.

The soil types across the Green Mountain forest are comprised of two primary series: Hesson and Olympic. The Olympic soils are primarily found along the slopes of Green Mountain, whereas the Hesson soils occur primarily along the ridge and north and south-facing slopes leading off the east side of Green Mountain.

Figure 1: Typical soil near surface comprised of stony, clayey sandy silt.

The typical soil profile across Green Mountain, starting at the surface layer, is stony, dark reddish-brown clayey sandy silt. The subsoil layer is composed of three slightly differing layers. In sequence from the top, the thin upper portion is friable, dark reddish-brown clayey sandy silt; the next layer is firm, reddish-brown heavy clayey sandy silt; and the lower portion is very firm, dark-brown gravelly clayey sandy silt. The underlying material is weathered basalt bedrock. The depth to the basalt bedrock differs as the topography differs. Generally, as the slope increases the soil becomes shallower. The soil is well drained and slowly permeable. The available water capacity is high. Surface runoff is rapid to very rapid, and the hazard of erosion is severe to very severe if the surface is left bare.

Soil type descriptions

The following soil descriptions have been excerpted from the Clark County Soil Survey.

Hesson Series

The Hesson series consists of deep, well-drained soils that are mostly level to gently rolling. Some areas are hilly and very steep. These are moderately fine textured soils that have a fine textured subsoil. The parent material is deeply weathered, mixed old alluvium that contains varying amounts of gravel. The original vegetation is a heavy growth of Douglas-fir and a scattering of western red cedar and grand fir. The understory consists principally of vine maple, salal, Oregon grape, ferns, and red huckleberry.

All the acreage has been logged. Areas not in cultivation are in second-growth timber. The understory is similar in composition to that of the native stands. Red alder is dominant in some areas. The annual precipitation ranges from 50 inches to more than 60 inches.

Hesson clay loam, 0 to 8 percent slopes (HcB)
This is the dominant soil of the high terraces along the mountain foot slopes in the county. In most places the slope is 2 to 5 percent. The relief is undulating. Slopes are generally short to moderate in length. In a typical profile the surface layer is dark reddish brown clay loam about 8 inches thick. The subsurface layer is dark reddish-brown clay loam about 4 inches thick. Below this layer is friable, dark reddish-brown clay loam about 10 inches thick. The next layer, to a depth of about 91 inches, is reddish-brown clay. In sequence from the top, the uppermost 18 inches is friable, the next 39 inches is firm, and the lower 12 inches is very firm.

Included in mapping were some areas that are nearly level or are slightly depressional and have a slightly mottled layer at a depth of 30 to 40 inches. This indicates reduced permeability and a temporary perched water table during rainy periods. This soil is well drained and has moderately slow permeability. The available water capacity is high, and fertility is moderate.

Hesson gravelly clay loam, 8 to 20 percent slopes (HgD)
This soil is similar to Hesson clay loam, 0 to 8 percent slopes, except that the surface layer is gravelly and the subsoil contains more gravel. Surface runoff is medium, and the erosion hazard is moderate. The available water capacity is moderate.

Hesson clay loam, 20 to 30 percent slopes (HcE)
This soil is similar to Hesson clay loam, 0 to 8 percent slopes, except that the surface layer is 2 to 3 inches thinner. Included in mapping were some areas where the surface layer is gravelly clay loam. The slopes are generally moderate in length where they lead into drainageways, but they are longer on the terrace breaks. Surface runoff is medium to rapid, and the erosion hazard is moderate to severe where the surface is left bare in winter.

Olympic Series
The Olympic series consists of well-drained, gently sloping to very steep soils underlain by basalt bedrock at a depth of 40 inches or more. These are moderately fine textured soils that formed on mountainous foot slopes in weathered igneous lava flows. Most of the soils formed in place, but in small areas they formed in material moved by gravity. The original vegetation was Douglas-fir, grand fir, hemlock, western red cedar, and Oregon white oak. The understory plants were vine maple, salal, Oregon grape, ferns, and grasses. The annual precipitation is 45 to 80 inches.

Olympic stony clay loam, 30 to 60 percent slopes (OmF).-
This soil is on long side slopes in the mountains and on short slopes along drainage-ways in the foothills. It is similar to Olympic clay loam, 8 to 20 percent slopes, except that it is very steep and the surface layer is stony. In places this soil developed in material moved through gravity. Some of these areas are still unstable. Surface runoff is rapid to very rapid, and the hazard of erosion is severe to very severe if the surface is left bare. The slope and the stony surface layer limit use of this soil to timber.

Present Site Conditions

Overview of Forest

The 360-acre Green Mountain forest predominantly covers the southeastern flank of Green Mountain. The elevation of the forest ranges from 320 feet above sea level near the southwest property corner to just over 700 feet along the western property boundary near the top of Green Mountain. A 500-foot elevation ridge extends to the east from Green Mountain bisecting the middle of the parcel.

The forest consists predominantly of an even-aged second growth coniferous forest that likely naturally regenerated across the property following either fire disturbance or clearcut harvesting. A forest inventory conducted in 2013 delineated eight stands on the property, ranging in size from 15 to 88 acres with an average size of 48 acres. These stands contain overstory structure dominated by Douglas-fir and big leaf maple. Minor species distributed in varying proportions across the forest include red alder, Oregon white oak, grand fir, and Western hemlock. Bitter cherry and willow were additional hardwoods typically found in the understory or open wet areas. Grand fir and big leaf maple are naturally regenerating through much of the understory, and occur both as lightly scattered seedlings and in dense groups.

Tree stocking was good overall, with a few exceptions, notably Stand 100, a 23-acre site with widely spaced open grown conifers. Stocking levels as measured by trees per acre (TPA) over 6 inches diameter at breast height (DBH) varied considerably across the property, ranging from 20 – 151, with an average of 83 TPA. Stocking levels as measured by tree basal area/acre also varied widely across the property from 63 to 293 ft^2/acre. Several areas, particularly in Stand I07 exhibited a high degree of tree patchiness, as evidenced by the variation in tree counts on inventory plots. Average diameters of the Douglas fir vary from 9 inches (DBH to 25 inches DBH and heights vary from 52 - 151 feet tall.

50-year site productivity, as measured by heights of dominant trees, varied on the property from 116 - 139. This corresponds with Site Class low III to low II. These values demonstrate Green Mountain contains good soils for growing conifers. Poorer soils for conifer production occur in areas currently dominated by hardwoods that have poorly drained soils. Conifer species, such as western red cedar, in addition to hardwoods may have historically occupied these sites.

Net stand volumes ranged from 8 - 60 MBF/acre depending on stand age, stocking level and composition. The weighted average net stand volume was 35 MBF/acre. Douglas-fir comprised the majority of stand volume in all stands except Stand 102, which was hardwood dominated. Total net volume for the ownership was 11,829 MBF. Tree defect by stand ranged from 5- 9 percent.

Stand density is one of the most significant influences on forest composition, affecting conditions such as understory species, natural regeneration, canopy stratification, and timber growth and quality. Highly stocked stands often tend towards more homogeneity as dense canopies have a suppressive effect on understory species and stand composition. Stands with lower stocking densities, or with periodic gaps in the forest canopy, whether created by wind events or root rot, tend towards greater heterogeneity with more species diversity, canopy stratification, and overall structural complexity.

Figure 2: The most highly stocked stand at Green Mountain, FMU 106, with 151 TPA.

The live crown ratio, or the percent of total tree height in live green crown, of individual trees is also an expression of canopy density. The lower density stands across Green Mountain are comprised of trees with significantly more live crown (>40 percent) than the higher density stands (<40 percent). A tree's live crown is directly proportional to its growth rate, and as the average live crown ratio across a stand diminishes, the overall growth of that stand also diminishes.

Canopy density and composition changes considerably across Green Mountain, resulting in highly variable patterns of understory growth. In general, the relatively open forest canopy provides a high degree of transparency and ample sunlight is able to reach the forest floor thereby stimulating a fairly robust and diverse population of understory vegetation. However, in areas of higher tree density, the resulting denser canopy suppresses much of this diversity, limiting understory species to only the most shade tolerant. In order of abundance, understory species include: sword fern (*Polystichum munitum*), red huckleberry (*Vaccinium parvifolium*), vine maple (*Acer circinatum)*, Oregon grape (*Mahonia aquifolium*), hazelnut (*Corylus cornuta)*, snowberry (*Symphoricarpos albus)*, and elderberry (*Sambucus racemosa)*. On wetter sites, salmonberry and willow (*Salix spp.)* occur.

Himalayan blackberry was identified as a major noxious weed problem on the property. This species occurred on plots in 5 of 7 stands. The most extensive blackberry coverage occurred in stands 100 and 107, due to the open overstories in portions of these areas. No other noxious weeds were found.

Important wildlife habitat features in a forest are snags and downed logs. Down wood levels ranged from 3 - 10 tons per acre. Average log diameter ranged from 7 – 11 inches with lengths between 13 - 23 feet. These levels of down wood are low compared to natural forests of the same age, or late successional forest stands, which contain much larger volumes of wood and bigger logs. They also fall below recommended levels for maintenance of healthy wildlife populations among the full range of species

that utilize down wood. For optimal habitat function, downed logs should exceed 12 inches diameter and 20 feet tall/long. Their relative scarcity is indicative of many managed stands where decadent wood is removed during harvesting.

Figure 3: Snags along southern edge off FMU 111 likely caused by root rot.

Standing dead tree density by stand ranged widely from 3 - 167 snags/acre with stand average diameters ranging from 7 – 18 inches DBH. The diameters of measured snags ranged from 6 – 55 inches DBH. Douglas-fir was the most common snag species. All snags greater than 23 inches DBH were Douglas-fir. High snag densities in two stands (Stand 103 and 111) is a normal trend caused by mortality of smaller trees due to suppression. Snag levels and dimensions vary compared to natural forests of the same age or late successional forest stands, which contain much larger volumes among generally larger snags. However, current snag levels are higher than many commercially managed forests in Western Washington.

Although there is an extensive network of horseback riding trails through the forest, there are no established or maintained forest access roads. A powerline maintenance easement road bisects the property from east to west, and provides opportunity for access along its route through the northern extent of the parcel. The closest access by County road is from NE 222nd Ave to the south of the property.

Forest Management Units

Forest management units (FMU's) are discrete polygons on a landscape that are defined by natural disturbances and forest management practices. This plan covers the following forest management units:

Table 1: Forest Management Units

FMU #	FMU Category*	Acres	Age
100	Commercial II	23	69
102	Commercial II	22	75
103	Commercial II	15	81
105	Commercial II	88	72
106	Commercial II	50	75
107	Commercial II	84	61
111	Commercial II	52	78
104	Non-commercial	4	NA
108	BPA Easement	22	NA
	Total Forested Acres	**334**	

**Commercial II indicates an FMU that can be managed for commercial timber production.*

FMU 100

Note: Priority: refers to the management priority of an FMU. Priority I indicates an FMU that should be thinned within the next 1- 5 years in order to maintain the health and vigor of the stand. Priority II should be thinned within the next 5 – 15 years. Priority III may not require additional thinning, or can be selectively thinned for specialty products.

Category/ Priority	Acres	Age 2014	PAI percent	Soil Type	Site Index	Site Class	Trees Per Acre
Commercial II Priority III	23	69	0.031	HcB	154	II	20
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
9.2	52	68		272.8	6,274	8.80	202

Stand 100 consists of 23 acres in the southeast corner of the property. It contains a widely scattered overstory of Douglas fir. This stand initiated approximately 60 years ago in a field/pasture, hence tree stocking is poor probably due to grass competition. Stocking of trees 6 inches DBH and greater is 20 TPA, all of which were Douglas-fir. Average tree diameter for all size classes is 9.2 inches DBH. Tree stocking is improving in places with in-growth from younger trees including red alder, Douglas fir, and cherry. These smaller tree classes contain 136 TPA among trees < 6 inches DBH. Due to the open development of this stand, commercial value is lower than most other forested areas on the property. Net stand volume averages approximately 8 MBF/acre. Average tree defect was 9 percent, the highest of all stands on the ownership.

Understory vegetation cover (shrubs, forbs, and grass) in Stand 100 averaged 60 percent and 4 percent among two canopy strata that averaged 4 and 7 feet, respectively. The top three dominant species by percent cover included Himalayan blackberry (22%) hazel (12%) and grass (9%).

No snags or down wood were inventoried in Stand 100. The low levels of dead wood in Stand 100 likely results from the lack of suppression mortality in this stand due to its open condition, and the lack of biological legacies because this stand initiated in a field. Total down wood was 4.6 tons/acre, and 304 ft^3/acre, distributed among logs with an average diameter of 8 inches and a length of 23 feet. All down wood were from Douglas-fir.

Management Recommendations

1. Control Himalayan blackberry using a combination of a rubber-tracked skid steer with brush masticator followed by herbicide application of resprouts.
2. Pre-commercially thin red alder to a 15 x 15 foot spacing.
3. Replant area with Douglas fir to bring total stocking density (existing trees plus planted seedlings) to a total stand density of 240 tpa.
4. As second cohort matures, follow structure-based management practices as described later in this plan.

FMU 102

Category/ Priority	Acres	Age 2014	PAI percent	Soil Type	Site Index	Site Class	Trees Per Acre
Commercial II Priority III	22	75	0.004	HcB	154	II	60
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
13.8	62	54		7.6	167	1.90	42

Stand 102 is the only hardwood dominated stand on the Green Mountain property. The main canopy is composed of an even-age tree cohort of big leaf maple that initiated approximately 60 years ago. Douglas-fir of the same age class occur widely scattered throughout the stand. Tree stocking of trees 6 inches DBH and greater is 60 TPA of which big leaf maple comprises 48 percent and 29 TPA. The remaining tree stocking contains Douglas-fir, red alder and willow. Understory tree canopy is sparse with only 20 TPA, of an equal mix big leaf maple and willow. Average tree diameter for all size classes is 9.2 inches dbh.

Due to hardwood dominance in Stand 102, board foot volume is the lowest of all inventoried areas on the property. Net board foot volume averages 7.4 MBF, with 6.8 percent defect.

Understory vegetation cover is extensive in Stand 102 and the highest of all stands. Percent cover is 143 percent and 7 percent among two canopy layers averaging 5 and 19 feet, respectively. The top three dominant species by percent cover include sword fern (48%), hazel (31 %), and willow (30%).

Down woody debris levels were low compared with mature natural Douglas-fir stands. Total down wood was 4.3 tons/acre, and 290 ft^3/acre, distributed among logs with an average diameter of 7 inches and a length of 22 feet. Down wood were from a mix of species including Douglas-fir, red cedar, red alder, and willow.

Forest inventory showed Stand 102 had 3.3 snags/acre. Average diameter was 12 inches DBH. Snags were equally represented by Decay Class 2, 3, and 5. The largest snag diameter class recorded was 21 inches dbh.

Management Recommendations

1. Pre-commercially thin big leaf maple by removing the lowest quality trees (e.g. excessive wane, low branches, etc.).
2. Cut back understory vegetation with a brush masticator. Replant unit with western red cedar at 200 TPA. Monitor seedlings to ensure survival and cut back competing vegetation as necessary until seedlings reach a free-to-grow height.
3. As second cohort matures, follow structure-based management practices as described later in this plan.

FMU 103

Category/ Priority	Acres	Age 2014	PAI percent	Soil Type	Site Index	Site Class	Trees Per Acre
Commercial II Priority III	15	81	0.015	HcB	154	II	56
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
25.1	151	72		865.65	12,985	59.70	896

Stand 103 consists of 15 acres of well-stocked even-aged approximately 70 year old Douglas fir in the northwest area of the property. Stocking of trees 6 inches DBH and greater is 56 TPA, all Douglas-fir. Average tree diameter for all size classes is 25 inches dbh. The < 6 inch DBH class contains 8 TPA of big leaf maple. Net stand volume averages approximately 56.7 MBF/acre. Tree defect was calculated at 5%.

Stand 103 has a dense understory vegetation cover. Percent cover is 108 percent and 26 percent among two canopy layers averaging 4 and 17, respectively. The top three dominant species by percent cover include sword fern (63%) vine maple (52%), hazel (6%).

Down woody debris levels were low compared with mature natural Douglas-fir stands. Stand 103 had a high density of snags (167 snags/acre) due to normal suppression mortality in smaller diameter classes. Average snag diameter is 10 inches DBH. Most snags (75%) are in hard stages of decay. Only 3 percent of snags are heavily decayed (class 4 and 5). The largest snags were 46 inches DBH.

Management Recommendations

1. Retain dominant Douglas fir indefinitely as legacy trees.
2. Cut back understory vegetation with a brush masticator. Replant unit with western red cedar at 200 TPA. Monitor seedlings to ensure survival and cut back competing vegetation as necessary until seedlings reach a free-to-grow height.
3. As second cohort matures, follow structure-based management practices as described later in this plan.

FMU 104

FMU 104 is currently considered non-commercial as the entire 4-acre unit is dominated by dense hardwood shrubs and trees. This unit may be considered a forested wetland by WA DNR standards. Scrubby, poorly growing willow, bitter cherry, and red alder have naturally regenerated in a dense thicket across this unit. Based on the presumed age of the trees and brush, this site was likely logged 25 – 35

Figure 4: Hardwood dominted pocket within Douglas fir stand.

years ago and either not replanted, or the existing hardwoods outcompeted the planted conifer seedlings. It is also possible that root rot may have a latent presence in the soil. There is currently no evidence of the fungal disease in the Douglas fir surrounding the site, but further monitoring is recommended.

Management Recommendations

This small unit lends an important amount of biodiversity and wildlife habitat value to the Green Mountain forest. The much wider range of hardwood trees and shrubs provide more forage for birds and mammals and a unique structural composition that supports different plant and wildlife species. Given its small scale relative to the other management units across this forest, it is recommended that this site be conserved as-is and allowed to naturally develop on its own.

FMU 105

Category/ Priority	Acres	Age 2014	PAI percent	Soil Type	Site Index	Site Class	Trees Per Acre
Commercial II Priority I	88	65	0.008	HcB	154	II	93
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
21.7	134	74		407.2	35,834	50.90	4,479

Figure 5: FMU 105

Stand 105 is the largest stand on the property, covering 88 acres of well-stocked even-aged Douglas fir. This stand includes areas south of the powerline from the central to east line of the property. Stand age is approximately 60 - 65 years. Stocking of trees greater than 6 inches DBH is 93 TPA. The composition of the dominant species is 78 percent Douglas-fir with the remainder in big leaf maple. Average tree diameter for all size classes is 22 inches dbh. Understory tree stocking is very sparse. Net stand volume averages approximately 47.5 MBF/acre. Tree defect was calculated at 7 percent.

Stand 105 has a dense understory vegetation cover. Percent cover is 107 percent and 8 percent among two canopy layers averaging 4 and 13 feet, respectively. The top three dominant species by percent cover include sword fern (37%) vine maple (36%), hazel (23%).

Down woody debris levels were low compared with mature natural Douglas-fir stands. However, Stand 105 has the highest level of down wood among stands on the property.

Total down wood was 10.2 tons/acre, and 683 ft^3/acre, distributed among logs with an average diameter of 10 inches and a length of 16 feet. Down wood included Douglas-fir, big leaf maple, and various hardwoods.

Stand 105 had 11snags/acre. Snags were distributed across a wide range of diameters (6 - 54"). The largest snags were all highly decayed and remnants from the original old growth stand. Most snags (67%) are in hard stages of decay. Thirty percent of snags are heavily decayed (class 4 and 5).

Management Recommendations
See 2014/2015 harvest prescription in Appendix II.

This is a Priority I FMU, which indicates that short-term management activities are scheduled for this unit.

1. Commercially thin 20 – 30 percent of the basal area within next 1-5 years by thinning across the diameters. Underplant stand with Douglas fir at 100 TPA following harvest.
2. Create snags and downed logs during thinning operations. Target: 3-10 snags and downed logs per acre.
3. Conduct second-entry variable density thinning in 10 - 20 years, removing 20 – 30 percent of basal area.
4. Conduct third-entry variable density thinning in another 10 - 20 years and reduce canopy to 30 percent to allow for natural (or planted) understory regeneration of a second conifer cohort.
5. Follow other structure-based management practices as described later in this plan.

FMU 106

Category/ Priority	Acres	Age 2014	PAI percent	Soil Type	Site Index	Site Class	Trees per Acre
Commercial II Priority I	50	75	0.009	HcB	154	II	151
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
15.2	112	88		540	27,000	60.00	3,000

Stand 106 contains 50 acres of well-stocked even-aged Douglas fir, in the southwest corner of the property. This stand has the highest tree density on the property. Stocking of trees 6 inches DBH and greater is 151 TPA. Tree composition in this class is 85 percent Douglas-fir, with remainder in big leaf maple (14%) and grand fir (1%). Average tree diameter for all size classes is 15 inches DBH. Understory tree stocking in the less than 6 inch DBH class is 81 TPA of a mix of species (from highest to lowest density) including big leaf maple, cascara and Douglas-fir. Net stand volume averages approximately 55.3 MBF/acre. Average tree defect was 8 percent.

Stand 106 has a dense understory vegetation cover. Percent cover is 113 percent and 15 percent among two canopy layers averaging 3 and 11 feet, respectively. The top three dominant species by percent cover include sword fern (36%) vine maple (49%), and trailing blackberry (17%).

Figure 6: Douglas fir dominated area within FMU 6 with big leaf maple and grand fir in understory.

Down woody debris levels were low compared with mature natural Douglas-fir stands. Total down wood was 3.3 tons/acre, and 221 ft^3/acre, distributed among logs with an average diameter of 8 inches and a length of 13 feet. Down wood included Douglas-fir, big leaf maple, and various hardwoods.

Stand 106 had 20 snags/acre. Snags were distributed across a wide range of diameters (6-30"), although most snags were in the 6 – 10 inch DBH class, resulting from suppression mortality. Most snags (92%) are in hard stages of decay. Eight percent of snags are heavily decayed (class 4).

Figure 7: High timber quality.

Management recommendations

See 2014/2015 harvest prescription in Appendix II.

This is a Priority I FMU, which indicates that short-term management activities are scheduled for this unit.

1. Commercially thin 20 – 30 percent of the basal area within next 1-5 years by thinning across the diameters.
2. Create snags and downed logs during thinning operations. Target: 3-10 snags and downed logs per acre.
3. Conduct second-entry variable density thinning in 10 - 20 years, removing 20 – 30 percent of basal area.
4. Conduct third-entry variable density thinning in another 10 - 20 years and reduce canopy to 30 percent to allow for natural (or planted) understory regeneration of a second conifer cohort.
5. Follow other structure-based management practices as described later in this plan.

FMU 107

Category/ Priority	Acres	Age 2011	PAI percent	Soil Type	Site Index	Site Class	Trees Per Acre
Commercial II Priority II	84	61	0.028	OmF	139	II	79
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
12.1	68	67		663.6	55,742	23.70	1,991

Stand 107 includes 84 acres of well-stocked to open even-aged Douglas fir. The stand occupies forestland south of the powerline from the center of ownership to the west property. Stocking of trees 6 inches DBH or greater DBH is 79 TPA. Tree composition in this class is 64 percent Douglas-fir, with remainder in big leaf maple (19%) and a mix of grand fir, red alder and cherry (17%). Average tree diameter for all size classes is 12 inches DBH. Understory tree stocking in the less than 6 inch DBH class is 110 TPA of a mix of species (from highest to lowest density) including willow, grand fir, big leaf maple, and Douglas-fir. The variable stocking of Douglas-fir is evident in the low stand volume. Net stand volume averages approximately 22.3 MBF/acre. Tree defect was calculated at 5 percent.

Figure 8: Lightly stocked Douglas fir stand in FMU 7.

Figure 9: Dense patch of big leaf maple in FMU 7.

Stand 107 has a dense understory vegetation cover. Percent cover is 109 percent and 6 percent among two canopy layers averaging 6 and 13 feet, respectively. The top three dominant species by percent cover include sword fern (33%) vine maple (23%), and hazel (21%).

Down woody debris levels were low compared with mature natural Douglas-fir stands. Total down wood was 4 tons/acre, and 264 ft^3/acre, distributed among logs with an average diameter of 10 inches and a length of 16 feet. Down wood included Douglas-fir, big leaf maple, and various hardwoods.

Stand 107 has an average of 10 snags per acre. Snags were evenly distributed across a wide range of diameters (6-54"), although snags in the largest diameter classes were

greater than 10 feet tall. Snags are well distributed across decay classes as well with 50 percent in hard and remainder in soft stages of decay.

Himalayan blackberry has colonized several open gaps in the canopy.

Management Recommendations

This is a Priority II FMU, indicating that thinning or other management activities should be delayed until all Priority I FMU's have been treated.

1. Control Himalayan blackberry using a combination of a rubber-tracked skid steer with brush masticator followed by herbicide application of resprouts. Re-establish native vegetation in areas of heavy blackberry infestation after control of weeds.
2. Commercially thin 30 percent basal area by thinning across the diameters and species in 5-10 years. Patch cuts of 1-6 acres may be utilized to increase stand-level heterogeneity and regenerate Douglas fir.
3. Following thinning, underplant unit with a 50:50 combination of Douglas fir and western red cedar.
4. Increase downed log volumes by retaining non-merchantable log segments throughout the unit.
5. Conduct second entry variable density thinning of 30 percent basal area no sooner than 10 years following previous harvest.
6. Conduct third entry variable retention harvest of 30 percent basal area no sooner than 10 years following previous harvest.
7. Follow other structure-based management practices as described later in this plan.

FMU 108

This 17-acre unit encompasses the Bonneville Power Administration's (BPA) high-tension power line and service road easement. The BPA has sole maintenance authority over this site, and management is strictly limited to suppression of tree growth. As such, both native and non-native shrubs proliferate across the site. Scotch broom and Himalayan blackberry are the most pernicious non-natives.

Figure 10: BPA power line easement.

FMU 111

Category/ Priority	Acres	Age 2011	PAI percent	Soil Type	Site Index	Site Class	Trees Per Acre
Commercial II Priority II	52	78	0.013	HgD	154	II	126
Avg. DBH	**Avg. HT.**	**HDR**	**LCR**	**Growth/ Acre/Yr (BF)**	**Total Growth/Yr (MBF)**	**Total Vol/ Acre (MBF)**	**Total Vol. Gross (MBF)**
16.6	108	**78**		478.4	24,877	36.80	1,914

Stand 111 includes 52 acres of well-stocked to open even-aged Douglas fir. The stand occupies forestland along a narrow east-west corridor along the north edge of the powerline, extending the entire length of the property. Average age of overstory trees is approximately 70 years. Stocking of trees 6 inches DBH and greater is 126 TPA. Tree composition in this class is 52 percent Douglas-fir, with remainder in big leaf maple (29%) and a mix of red alder, Oregon white oak, and western hemlock (18%). This stand contains the greatest concentration of Oregon white oak on the property. Average tree diameter for all size classes is 17 inches DBH. Understory tree stocking in the greater than 6 inch DBH class is very sparse and contains only 4 TPA of big leaf maple. Net stand volume averages approximately 34.5 MBF/acre. Tree defect was calculated at 6 percent.

Figure 11: Edge of FMU 111 along BPA power line easement.

Figure 12: Interior of FMU 111.

Stand 111 has a dense understory vegetation cover. Percent cover is 120 percent among two canopy layers averaging 4 and 12 feet, although understory cover is composed mainly of vegetation in the 4 foot strata dominated by sword fern. The top three dominant species by percent cover include sword fern (65%) vine maple (32%), and hazel (14%).

Down woody debris levels were low compared with mature natural Douglas-fir stands. Total down wood was 4 tons/acre, and 276 ft^3/acre, distributed among logs with an average diameter of 11 inches and a length of 15 feet. Down wood included Douglas-fir, big leaf maple, and various hardwoods.

Stand 111 had 127 snags/acre, less than 2 percent of which are greater than 13 inches DBH. Snags occurred across a wide range of diameters (6 - 43" DBH). Snags tended to be in low decay classes with 80% in hard and remainder in soft stages of decay.

Management Recommendations

This is a Priority II FMU, indicating that thinning and other management activities should occur in approximately 5-10 years after all Priority I FMU's have been treated.

1. Commercially thin 30 percent basal area by thinning across the diameters in 5 – 10 years. Thin more heavily around Oregon Oak in order to release this species. Patch cuts of 1 - 6 acres may be utilized to increase stand-level heterogeneity and regenerate Douglas-fir.
2. Increase downed log volumes by retaining non-merchantable log segments throughout the unit.
3. Conduct second entry variable density thinning of 30 percent basal area in no less than 10 years following previous harvest. Underplant unit with a 50:50 mix of Douglas fir and western red cedar at 100 tpa.
4. Conduct third entry variable density thinning of 30 percent basal area in no less than 10 years following previous harvest.
5. Follow other structure-based management practices as described later in this plan.

Streams & Wetlands

The entirety of the Green Mountain forest is spread across the relatively dry slopes of the eastern flank of Green Mountain. The soils are well drained, slowly permeable, and have minimal water retention capacity. Surface runoff is rapid to very rapid, and the hazard of erosion is severe to very severe if the surface is left bare.

The 7-acre unit comprising FMU 104 may meet the WA DNR definition of a forested wetland. It is currently colonized by red alder, willow, cherry and other species that are indicative of wet soils.

A Type Ns (non-fish seasonal) stream emerges from the slopes along the southwest corner of the property and flows off the property

Both sides of Green Mountain drain towards tributaries of Lacamas Creek. As such, the forests and soils across Green Mountain serve as an important water retention function as they moderate storm events and groundwater recharge of streams down slope from the property.

Management Recommendation

1. Retain a minimum of a 75 foot forested buffer on either side of the seasonal stream. Avoid heavy equipment use within 75 feet of stream.
2. Conserve FMU 104 as-is and retain a 75' forested buffer around unit.
3. Prohibit road building across or adjacent to stream.
4. Protect water retention function of soils by maintaining perpetual forest cover across Green Mountain by limiting timber harvesting to thinning or small patch cuts of less than six acres.

Wildlife and Habitat

Fish, waterfowl, upland birds, deer, and other kinds of wildlife provide diversity, recreation and a source of income in Clark County. To maintain this valuable fish and wildlife resource, a well-planned conservation program is necessary.

In Clark County, the many tributaries of the Columbia River are important waters for steelhead trout, Chinook and silver salmon, and for other fish that come into the fresh waters of the Columbia River from the Pacific Ocean to spawn. Tributaries provide good fishing for these fish and for rainbow and cutthroat trout.

Flocks of geese and ducks feed and rest in the wet lowlands along the Columbia River during their fall and spring migrations. Blue-winged teal and mallard commonly nest in the fields in this area. The colorful wood duck nests in depressions in the groves of cottonwood trees that border the many sloughs of the Columbia River. The farmland of the county provides pheasant hunting in fall. Band-tailed pigeon, blue grouse, and ruffed grouse are also taken by hunters. The population of black-tailed deer is steadily increasing as their habitat improves through timber harvest or accidental fires. Black-tailed deer are also common in farmland thickets.

The kinds and numbers of wildlife that live in a particular area depend on the kind of habitat available. In Clark County, there are four general types of wildlife, and these have varying habitat needs. They are described in the following list:

Table 2: Wildlife habitats and species in Clark County

Habitat	Wildlife Species
Farmland	Chinese pheasant, California quail, mourning dove, band-tailed pigeon, and western meadowlark.
Wetland	Ducks, geese, western and Brewer's blackbirds, Wilson's snipe, and killdeer.
Brush	Cottontail rabbit, western grey squirrel, numerous kinds of songbirds, and ruffed grouse.
Forest	Black-tailed deer, mountain beaver, Townsend's chipmunk, black bear, blue grouse, red squirrel, Steller'sjay, and Washington hare.

Wildlife species at risk

Federal Listed Species

The following federally listed species may occur on or in the vicinity of Green Mountain:

Table 3: Federally Listed Species

Listing	Wildlife Species
Species of Concern	• Tailed frog (*Ascaphus truei*) • Northwestern pond turtle (*Clemmys marmorata*) • Larch Mountain salamander (*Plethodon larselli*) • Cascades frog (*Rana cascadae*) • Pacific western big-eared bat (*Corvnorhinus (Plecotus*)

	• Long-eared myotis (*Myotis evotis*) • Long-legged myotis (*Myotis volans*) • Northern goshawk (*Accipiter gentilis*) • Olive-sided flycatcher (*Contopus borealis*) • Clackamas corydalis (*Corydalis aquae-gelidae*)
Candidate Species	• Spotted frog (*Rana pretiosa*)
Threatened Species	• Bald eagle (*Haliaeetus leucocenphalus*)
Endangered Species	• Northern spotted owl (*Strix occidentalis*)

State listed species

The following species listed by the Washington Department of Fish and Wildlife may occur on or in the vicinity of Green Mountain:

Table 4: WA State Listed Species

Listing	Wildlife Species
Monitored	• Tailed frog (*Ascaphus truei*) • Cope's giant salamander (*Dicamptodon copei*) • Cascade torrent salamander (*Rhyacotriton cascadae*)
Endangered	• Northern spotted owl (*Strix occidentalis*)

No additional information on the occurrence of rare or endangered species or natural conmmunities is known at this time. This does not mean that other state or federally listed species may not be present within the areas of interest. An on-site inspection by appropriate state and federal personnel may be necessary to verify the presence, absence or location of listed species, or natural communities if remedial action is recommended as part of the final monitoring process.

Wildlife Habitat Enhancement Strategies

Increase snags and downed woody debris

Given the history of even-age management and the necessity to protect public safety, large snags (>10 inches DBH) are uncommon through the majority of the forest. Additionally, large coarse woody debris (>10 inches diameter) are also lacking throughout the forest floor. Snags can provide important structure for cavity dependent bird and small mammal species, a food source for woodpeckers and other foragers and a slow release nutrient source for the forest in general. West of the Cascades in Oregon and Washington, 39 species of birds and 14 species of mammals depend on cavity trees for their survival. Terrestrial amphibians, small mammals, and birds also depend on large coarse woody debris for protection and foraging for insects, fungi, and seeds.

Snags fall into two primary decay class categories:

1. Hard snags, with the bark is still intact and with firm heart and sapwoods, and
2. Soft snags, which may have some bark remaining but with the wood beginning to soften.

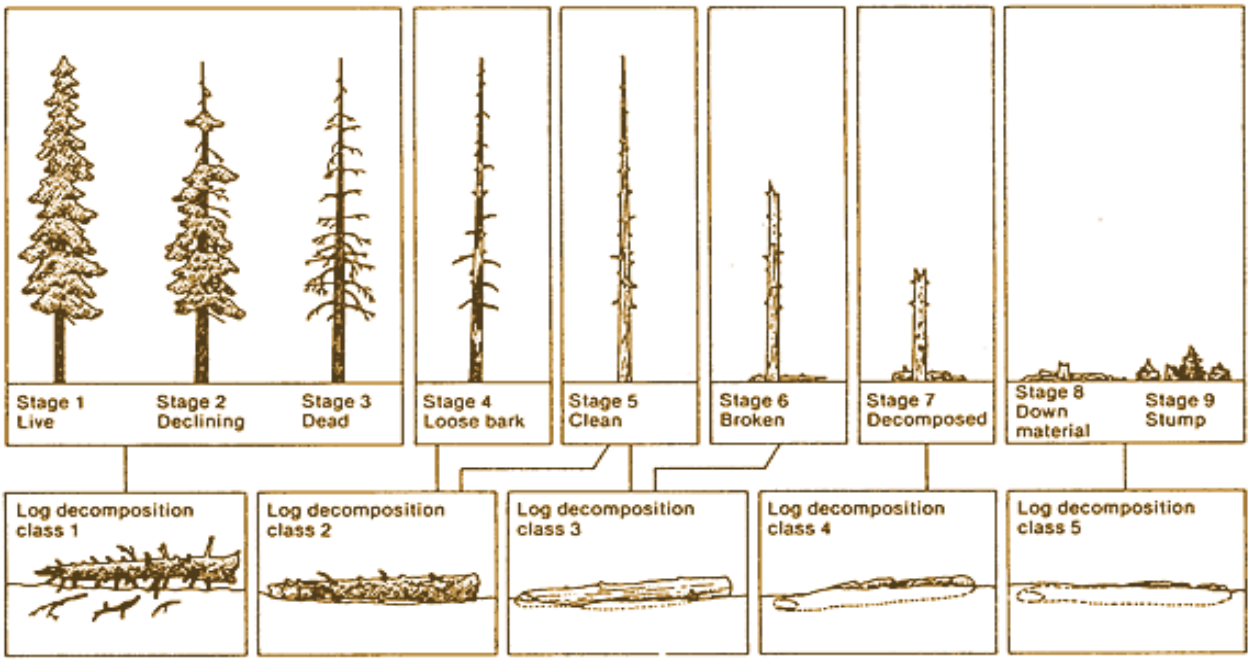
Downed logs fall into four primary categories based on their decay class (see Figure 2 on next page):

1. Class 1, bark is still intact and heart and sapwood is still firm
2. Class 2, log is in contact with ground; bark is beginning to deteriorate and inner wood is soft.
3. Class 3, log is in contact with ground; bark has completely fallen off and log is beginning to become incorporated into the forest floor
4. Class 4, log is partially buried and wood is very soft
5. Class 5, log is barely distinguishable from surrounding forest floor

Clark County will strive to recruit an average of 3-10 snags and 3-10 downed logs across each decay class per acre. Where snags and downed logs either don't exist, or exist in insufficient numbers or dimensions, manual recruitment will be necessary. Downed logs can be artificially created by cutting live trees and bucking the logs into a minimum of 16' sections. Snags can be artificially created through two primary methods:

1. Girdling: With a chainsaw, two horizontal rings are cut six inches apart entirely around the circumference of a tree deep enough to severe the cambium layer.
2. Topping: Using either a mechanical harvester or by climbing, a tree is topped a minimum of 30' above the ground.

Figure 13. Decay classes of snags and downed logs



The following table summarizes snag and downed woody debris targets for the forests at Green Mountain:

Table 5: Snag and downed log recruitment targets

Snag	Minimum Size	#/acre
Hard	17' tall x 15" DBH	2-5
Soft	17' tall x 15" DBH	2-5
Downed logs	Minimum size	#/acre
Class 1	16' x 20" dia.	1-3
Class 2	16' x 20" dia.	1-3
Class 3	16' x 20" dia.	1-3
Class 4	16' x 20" dia.	1-3
Class 5	16' x 20" dia.	1-3

Plant trees and shrubs

Planting multiple species of native trees promotes diversity and structural complexity in a forest. Managed stands often have insufficient tree regeneration to provide a midstory of shade-tolerant trees. The midstory connects the lower branches of the tree crowns to the upper branches of the tall shrubs, establishing a full vertical foliage profile. Underplanting helps to increase a forest's resistance and resilience to disturbance and improves wildlife forage and habitat.

As root rot pockets and wind events continue to create openings in the forests, as well as following thinning operations, Clark County will continue to underplant a variety of native conifer and hardwood trees, as well as shrubs that provide wildlife forage. The following table lists some of the species that are endemic to the area and will be considered for introduction back into the park's forests:

Table 6. Native plant species recommended for planting in understory

Common name	**Taxonomic name**	**Shade tolerance class**	**Function**	**Location**
Western red cedar	*Thuja plicata*	Very shade tolerant	Canopy stratification	Understory of thinned Doug-fir, canopy gaps
Western hemlock	*Tsuga heterophylla*	Shade tolerant	Canopy stratification	Understory of thinned Doug-fir
Grand fir	*Abies grandis*	Shade tolerant	Canopy stratification	Understory of thinned Doug-fir
Western white pine	*Pinus monticola*	Moderately shade tolerant	Canopy stratification	Understory of thinned Doug-fir, canopy gaps
Douglas-fir	*Pseudotsuga menziesii*	Moderately shard tolerant	Canopy stratification	Canopy gaps greater than 1 acre
Pacific yew	*Taxus brevifolia*	Very shade tolerant	Canopy stratification	Understory of thinned Doug-fir
Big leaf maple	*Acer macrophyllum*	Shade tolerant	Canopy stratification, wildlife forage, nutrient cycle	canopy gaps
Red alder	*Alnus rubra*	Intolerant	Canopy stratification, wildlife forage,	Canopy gaps greater than 1 acre

			nutrient cycle	
Oregon ash	*Fraxinus latifolia*	Moderately shade tolerant	Canopy stratification, wildlife forage	Canopy gaps
Pacific madrone	*Arbutus menziesii*	Shade tolerant	Canopy stratification, wildlife forage	Understory of thinned Doug-fir on dry sites
Pacific dogwood	*Cornus nuttallii*	Shade tolerant	Canopy stratification, wildlife forage	Understory of thinned Doug-fir
Hazelnut	*Corylus cornuta var. californica*	Shade tolerant	Canopy stratification, wildlife forage	Understory of thinned Doug-fir
Cascara	*Cascara sagrada*	Shade tolerant	Canopy stratification, wildlife forage	Understory of thinned Doug-fir
Bitter cherry	*Prunus emarginata*	Intolerant	Canopy stratification, wildlife forage	Canopy gaps
Western crab apple	*Malus fusca*	Intolerant	Canopy stratification, wildlife forage	Canopy gaps
Service berry	*Amelanchier alnifolia*	Shade tolerant	Wildlife forage	Understory of thinned Doug-fir
Indian plum	*Oemlaria cerasiformis*	Shade tolerant	Wildlife forage	Understory of thinned Doug-fir
Red elderberry	*Sambucus racemosa*	Shade tolerant	Wildlife forage	Understory of thinned Doug-fir
Blue elderberry	*Sambucus caerulea*	Intolerant	Wildlife forage	Canopy gaps
Red osier dogwood	*Cornus sericea*	Shade tolerant	Wildlife forage	Understory of thinned Doug-fir in wet sites
Pacific rhododendron	*Rhododendron macrophyllum*	Shade tolerant	Aesthetics	Understory of thinned Doug-fir
Ocean spray	*Holidscus discolor*	Shade tolerant	Wildlife forage	Understory of thinned Doug-fir on wetter sites

Forest Roads & Trails

Although there is an extensive network of horseback riding trails through the forest, there are no established or maintained forest access roads. A power line maintenance easement road bisects the property from east to west, and provides opportunity for access along its route through the northern extent of the parcel. The closest access by County road is from NE 222nd Ave to the south of the property.

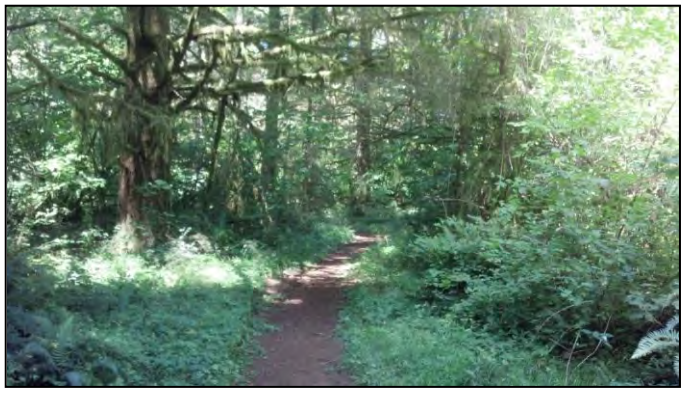


Figure 14: Horse trail through FMU 105.

Future timber management activities across Green Mountain will require the construction of forest access roads and landings. As such, the following guidelines will be adhered to during road construction and subsequent maintenance.

Table 7. Forest road construction and maintenance

Standard	Source
The forest road system will be pre-planned, designed, located, constructed, maintained, and/or reconstructed to minimize the extent and impact of the system and its potential cumulative adverse effects on the surrounding environment.	FSC U.S. Standards 6.5.g.
Logging operations and the use of roads and skid trails occur only when soil compaction, erosion, and sediment transport do not result in degradation of water quality, site productivity, or habitats.	FSC U.S. Standards 6.5.a.
Landings will be designed and constructed to minimize soil erosion.	FSC U.S. Standards 6.5.h.
Access to temporary and permanent roads will be controlled to minimize impacts to soil and biota while simultaneously allowing legitimate access (e.g. recreationalists, forest workers, etc).	FSC U.S. Standards 6.5.i.
Access will be restricted and erosion controlled on infrequently used roads.	FSC U.S. Standards 6.5.k.
Unnecessary roads will be permanently decommissioned or put to bed.	FSC U.S. Standards 6.5.l.

Management Strategies

Introduction to Structure-based Management

The Douglas-fir forest types across Green Mountain tend to be even-aged older stands (60+ years) that are relatively homogenous and highly simplified stand structures. Clark County proposes to implement a plan of uneven-aged *structure based management* that will utilize Green Mountain, along with Camp Bonneville, as an experimental forest with the goal of demonstrating strategies for managing structurally homogenous stand types towards increasing heterogeneity.

Structure-Based Management (SBM) prescribes a mix of active forest management techniques that produce an array of forest stand structures across the landscape - from areas where new trees are being established, to older forest structure featuring old growth, or late successional characteristics such as numerous large trees, multi-layered canopies, and substantial numbers of down logs and large snags. Individual stand types may change constantly, through management and natural disturbance, but the range of stand types and their relative abundance across the land base is reasonably stable. Because the structures are in a dynamic balance across the landscape, the forest provides a steady flow of forest products, habitats, clean air and clean water.

Using an SBM approach, stand density is actively managed to accelerate stand successional development while simulating natural conditions and disturbance regimes. This is done through a combination of variable retention and variable density thinning. SBM techniques can be used to produce a variety of results. Some prescriptions will result in fast-growing, well-stocked stands with higher structural homogeneity. Other prescriptions will develop more complex stand structures, with rapid tree diameter growth, enough sunlight on the forest floor to maintain understory plants, and a complex forest canopy. The latter will be the dominant approach used by Clark County. Thinning can also be used to create or maintain other important structural components, such as snags, down wood, gaps in the canopy, and multiple canopy layers. A diversity of stand structures will provide for a broad range of ecosystems and biodiversity -- including a wide range of wildlife habitats. The structural components associated with the range of stand structures will benefit long-term forest productivity by maintaining the key structural linkages for nutrient cycling and soil structure. The high level of biodiversity should result in a more resilient forest that will be less prone to large-scale disturbance from environmental or climatic stresses.

The main emphasis of SBM is on the use of sound silvicultural approaches for producing timber, but equally combined with the production of a range of habitat types or forest structures that will provide for the vast majority of species and biodiversity. Instead of focusing on individual species, forest managers focus on producing habitats that will accommodate the range of indigenous species. If forest managers find that the broad scale production of habitats may be inadequate to provide for some indigenous species, then they use more site-specific or species-specific strategies as needed.

SBM emulates many aspects of natural stand development and produces structural components found in natural stands, but does so in a shorter period of time through active management. By anticipating future patterns of forest development, foresters predict the potential for individual stands to produce specific characteristics, such as a multi-layered canopy. Foresters can then develop appropriate silvicultural prescriptions, and influence the rates of stand development and the types of structures and products that forest stands actually produce. Individual stand management will vary greatly under SBM. Stands will be managed to emulate habitat conditions normally associated with older forests. These stands will also produce highly viable timber yields. A major emphasis in managing stand structures will be to move stands through the early and middle forest stages as quickly as possible. This emphasis will require extensive thinning. These activities will produce significant volumes of smaller diameter timber from young stands. Final harvests of stands that have been intensively managed will result in the harvest of high volumes of large diameter wood. The stand structures are not an end in themselves: they represent the diversity of conditions historically associated with conifer forests in the Coast and Cascade ranges of Washington and Oregon. The management techniques used to produce the structures are sound timber management approaches that encourage vigorous tree and stand growth and that are applied to produce more diverse understory vegetation, snags, and coarse woody debris.

Primary silvicultural objective

The primary silvicultural objective for the Green Mountain forest is to develop, at a landscape level, a forest structure that emulates natural forest conditions that would result under typical natural disturbance regimes for the site, while producing a steady flow of high quality timber products. To this end, the forest will be managed to provide a variety of habitat types, including: early, mid and late seral forests, and forested and non-forested wetlands. To achieve these habitat types, it will be necessary to gradually alter existing forest conditions to achieve the desired results. Given the long history of even-aged management, some dramatic alterations may be necessary in order to introduce greater spatial and structural complexity into otherwise fairly homogenous stands.

The County is interested in developing a silvicultural system that allows the forest to achieve habitat conditions that would have resulted through normal natural disturbance regimes for the area. The primary natural disturbance regimes for the area include high winds, ice storms and fire. Forests that evolve naturally under these conditions tend to achieve a *patchiness* of varying age-classes, stocking densities and species mixes.

Structure-based Management Strategies

Restoring structural and plant species complexity into even-age, single species stands can facilitate the development of habitat features that attract a broader range of wildlife. Strategies such as variable density thinning, patch cuts, snag creation, downed coarse woody debris augmentation and underplanting can allow younger forests to begin providing similar habitat functions as much older forests.

Carey (1998) defines four key structuring processes that contribute to greater habitat diversification:

1. Crown class differentiation
   Competition among trees of the same age results in dominant, codominant, subordinate, and suppressed trees.
2. Decadence
   Trees get damaged, infected with fungi, break down, and recycle within the ecosystem.
3. Understory development
   Variability in light, temperature, and soil moisture promotes structurally-diverse growth on the forest floor.
4. Canopy stratification
   Trees of different ages and growth habits produce multiple layers of vegetation, including a well-developed midstory.

Providing for these four key processes can lead to two primary levels of structural complexity within a forest - individual and stand level. Examples include:

1. Individual structures
   a. Trees of diverse heights, diameters, branch sizes, and bark characteristics
   b. Large, dead standing trees (snags)
   c. Coarse woody debris (stumps and logs) in various states of decay
2. Stand-level structures
   a. Vertical heterogeneity—ever-changing distributions of foliage from the forest floor to the tree tops
   b. Horizontal heterogeneity—patchiness in the overstory, midstory, and understory

Additionally, Carey (1998) identifies two key processes influencing vegetative species composition that can lead to greater habitat diversification:

1. Development of habitat breadth
   Patchy canopies produce variability in light, temperature, and soil moisture, leading to patches of different types in the understory.
2. Pre-interactive niche diversification
   Expansion in forest structure and plant species composition provides diverse niches for animals, plants, and fungi; additional niche diversification occurs after species interact.

Complex forest structure and complex species composition lead to greater complexity in forest function. Primary benefits of more complex forest function include:

1. High carrying capacities for diverse animals
2. High productivity for plants
3. Effective regulation of nutrients and water cycling
4. Healthy, resilient forests

General silvicultural prescriptions

In early 2014 Clark County will embark on a process of variable density thinning within the Priority I forest types across Green Mountain. In general, stands will be thinned from below to reduce stocking density and create a spacing pattern that will allow the remaining trees to develop late seral characteristics over the next 50+ years. Groups of trees in root rot pockets, as well as poorly performing sites, will be targeted for removal. This combination of thinning from below and group tree selection, also called skip and gap harvesting, will result in a highly variable structure to the forest with small openings (gaps), small patches of dense trees (skips) and otherwise a generally well spaced stand throughout. This approach will, over time, effectively break up the homogenous structure of the stands and set them on a trajectory to achieve greater spatial, structural and species diversity than the stands would have achieved if left unmanaged.

Thinning

Over the next five years, Clark County will embark on a series of forest management practices that include commercial thinning, tree planting and wildlife habitat enhancement across each of the four properties. When thinning, stands will either be thinned from below or thinned across the diameters in order to promote greater structural complexity in the stand. This approach to thinning will employ a best tree selection approach where the healthiest and most dominant trees are retained within the stand, almost regardless of species. Groups of trees in root rot pockets, as well as poorly performing sites will be targeted for removal. This combination of thinning from below and group tree selection, will result in a highly variable structure to the forest with small openings (gaps), small patches of denser trees (skips) and otherwise a generally well spaced stand throughout. This approach will set all stands on a trajectory to achieve greater spatial, structural and species diversity than the stands would have achieved if left unmanaged. Additionally, while contractors are thinning with mechanized equipment, they can create snags by topping trees at a minimum of 20 ft, as well as scatter non-merchantable large logs throughout the understory. Through successive thinning entries, the targets for snag and downed log recruitment described later in this document will eventually be met.

Thinning from below

Thinning from below is a technique typically used during the first commercial thinning entry in a stand. Approximately one-third of the overall trees are removed, typically from the suppressed and intermediate canopy classes, in order to promote the growth of the co-dominant and dominant trees. Best Tree Selection methods are used similar to pre-

commercial thinning. This means that co-dominant or dominant trees may be removed if they have defect or will release more desirable species in the understory. Thinning is *across the species*, retaining the best quality tree of each species, both hardwood and conifer. 20 – 30 percent of pre-harvest basal area, or approximately 1/3 of the existing trees are removed during harvest. For example, if pre-thinning stand density is approximately 350 TPA, then stands will be thinned to approximately 200 – 250 TPA.

Variable density thinning

Variable density thinning techniques will be employed during the second and subsequent thinning entries of a stand. Variable density thinning involves varying the thinning intensity to produce a mosaic of unthinned, moderately thinned, and heavily thinned patches. Thinning with skips and gaps can also create this mosaic. Variable density thinning helps generate complex structures by promoting tree growth at different rates. It also encourages understory development through a diversity of species, a variety of patch types, and growth of tree seedlings and saplings. Variable-density thinning can improve forest health by increasing (a) resistance to disturbance, (b) ability to recover after disturbance, and (c) biological diversity that allows ecosystems to function well through climatic variation.

Variable density thinning typically occurs across both species and diameters, reducing stand density by no more than one-third of the standing trees per entry. If pre-thinning stand density is approximately 200 – 250 TPA, then the second entry will reduce the density to 120 – 160 TPA. During the third entry thinning, stand density will be reduced further to approximately 90 – 105 TPA. The following thinning entry will likely follow variable retention harvesting methods as per below. In selecting for harvest across the diameters, most thinning is still conducted from below. However, dominant overstory trees may be selected for harvest if they will release a vigorous understory tree that has ample live crown. Thinning in this manner produces a more complex forest canopy and stimulates natural regeneration in the understory, thereby minimizing the need for manual planting.

Variable retention harvesting

Variable retention harvesting is typically applied to older stands (50+ years) during the third or fourth thinning entry. During a variable retention harvest (VRH), all dominant and co-dominant trees are removed, with the exception of 25 – 75 dominant trees per acre. These leave trees will not be harvested at a later time, and will be retained as permanent biological legacies, whether standing or downed. VRH objectives include providing habitat for wildlife and retaining some of the original forest floor, including shrubs, plants, and populations of beneficial mycorrhizal fungi. Retaining these biological legacies enhances the diversity of plant and animal life in the regenerating forest stand over a long time. Operationally, VRH must plan for future access to avoid injuring trees that are left on the site forever. Because the economic value of retained trees will not be realized, there is a tendency for poor quality (from a market perspective) trees to be chosen for retention.

If, during previous harvests, the stand was thinned using variable density thinning techniques, then there may be sufficient natural regeneration in the understory to avoid manually replanting the site. A post-harvest inventory must be made to quantify the species and stocking density to determine if the stand has a desirable composition. If planting will be used to regenerate the stand, retaining large, limby trees with thick, tapered boles reduces the likelihood of blow down. Trees with forked or dead tops are also good candidates for retention. These defective trees provide perching or nesting habitat for a variety of birds and small mammals.

Extended harvest rotation

Longer harvest rotations can produce healthy, complex forest landscapes. On industrial and private lands, rotations of 40 to 50 years are used to maximize profits and maintain cash flow. Public ownerships, which must consider other values in addition to timber revenues, use rotations of 60 to 80 years or longer. A shift to extended harvest rotations of 70 to 230 or more years has the advantages of:

1. Producing a variety of tree sizes and wood products over time,
2. Improving the age distributions of trees in the landscape,
3. Promoting healthier wildlife habitat,
4. Increasing carbon storage, and
5. Preserving options for adaptive management. Thinning also helps to establish diversity and minimize tree overcrowding.

Laminated Root Rot

Laminated root rot (*Phellinus weirii*) is a naturally occurring soil based fungus that infects the roots and lower stems of Dougals fir and Western hemlock. As per the name, the fungus de-laminates the soft sapwood between the rings of a tree's roots and stem, essentially weakening the tree's support system. Root rot systematically spreads through a stand via root grafts and almost always eventually kills the host tree. Root rot pockets in a Douglas-fir stand are distinguishable by sudden openings in the stand that are occupied by snags, downed logs and/or regenerating in hardwoods (typically alder and/or big leaf maple). Left unmitigated, root rot can create significant impacts to forests that are predominantly stocked with Douglas-fir.

Attempting to completely eradicate root rot from a forest is difficult and can lead to significant impacts in the way of large patch cuts within the forest. Limiting its spread and impact is typically the preferred approach and can be accomplished through removing infected trees within a root rot pocket, and heavily thinning potentially infected trees around the perimeter of the pocket. Additionally, introducing non-host conifer species such as western cedar or white pine, or hardwood species such alder or big leaf maple can also help mitigate laminated root rot's effect in the forest.

Clark County recognizes laminated root rot as a naturally occurring soil fungus that functions as an agent of stand diversification. Therefore, management practices will be adapted to accommodate its effects. When root rot pockets occur in areas where optimum timber production is preferred, more aggressive thinning and mitigation

measures will be employed. Where root rot pockets do not pose a threat to facilities, public safety, or long-term timber production objectives, they will be allowed to recruit snags and coarse woody debris into the forest system. As openings in the stand occur, they will be replanted as necessary with western cedar, white pine and/or a mix of hardwoods and wildlife forage.

Annual Allowable Harvest

The annual timber growth rate of a forest is, in very simplified terms, a combination of tree species, age and soil types. The annual allowable harvest, or sustained yield, of a forest is then established at a rate that does not exceed the forests annual growth rate. An inventory and analysis of the Green Mountain forest conducted by Clark County in 2013 determined that in its current condition the forest is capable of producing, on average, between 400 – 600 board feet of timber volume per acre per year. With 334 productive acres, this translates to a total annual growth rate ranging from 133 – 200 mbf per year. Assuming a maximum sustained yield of 90 percent of annual growth, the annual allowable harvest will be between 120 – 180 mbf/year.

In 2014 and 2015, commercial thinning operations are planned for 138 acres that comprise two of the most highly stocked stands in the Green Mountain forest (FMU 5 & 6). These harvests will yield approximately 3.2 mmbf of timber. Following these initial harvests, the remainder of the forest will be thinned periodically on a sustained yield basis that yields approximately 1.2 – 2.8 mmbf every 10 years.

Chemical use policy

The Vegetation Management Division of Clark County DES provides weed control across all Clark County-owned lands, primarily by chemical application, secondarily by cultural or mechanical methods. Most of the spray work is conducted using ATVs and trucks, with a small amount conducted by backpack. The bulk of time is spent controlling meadow knapweed, bull thistle, Canada thistle, non-native blackberry, Scot's broom, and tansy ragwort. Forest management systems will be developed over time to promote environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides in the future.

Herbicides used include:

- Triclopyr amine (Garlon 3A);
- Aminopyralid (Milestone), used primarily in open areas;
- Glyphosate (Aquamaster/Roundup), used along rights-of-way and fences;
- Surfactants derived from either pine sap or soybean oil.

World Health Organization Type 1A and 1B and chlorinated hydrocarbon pesticides; pesticides that are persistent, toxic or whose derivatives remain biologically active and accumulate in the food chain beyond their intended use; as well as any pesticides banned by international agreement, will be prohibited. If chemicals are used, proper equipment and training shall be provided to minimize health and environmental risks.

Records of chemical use will be maintained, including the type of chemical, when and where it was applied, on what species it was applied and the effectiveness of the application. Clark County will abide by the following guidelines for chemical use.

Table 8. Chemical use guidelines

Standard	Source
Chemical pesticides, fungicides, and herbicides will be used only when and where research or empirical experience has demonstrated that less environmentally hazardous, non-chemical pest/disease management practices are ineffective.	FSC U.S. Standards 6.6.b.
When and where chemicals are applied, the most environmentally safe and efficacious chemicals are used. Chemicals are narrowly targeted, and minimize affects on non-target species.	FSC U.S. Standards 6.6.c.
Chemicals will be used only when and where they pose no threat to supplies of domestic water, aquatic habitats, or habitats of rare species.	FSC U.S. Standards 6.6.d.
When chemicals are used, the effects and impacts will be monitored and the results used for adaptive management. Records will be kept of pest occurrences, control measures, and incidences of worker exposure to chemicals.	FSC U.S. Standards 6.6.e.

Forest Stewardship Council Standards

Clark County is committed to managing its forests to the highest silvicultural standards in the world as certified by the Forest Stewardship Council (FSC). The following chart of generalized silvicultural prescriptions has been extrapolated from the FSC U.S. Forest Management Standards and applies to all forest stands where active forest management activities will take place.

Table 9: FSC Forest Management Guidelines

Prescription	Source
If patch cuts exceed 6 acres in size, 10-30 percent of pre-harvest basal area will be retained following harvest. The levels of green-tree retention will depend on such factors as: opening size, legacy trees, adjacent riparian zones, slope stability, upslope management, presence of critical refugia, and extent and intensity of harvesting across the forest management unit. Retention will be distributed as clumps and dispersed individuals, appropriate to site conditions. Retained trees will comprise a diversity of species and size classes, which includes large and old trees.	FSC U.S. Standards 6.3.e.5.
Streams, vernal pools, lakes, wetlands, seeps, springs, and associated riparian areas are managed to maintain and/or restore hydrologic processes, water quality, and habitat characteristics. Forested riparian buffers will be maintained around all rivers, streams, ponds and wetlands as per the guidance provided below.	FSC U.S. Standards 6.5.m
Legacy trees, old and large trees, snags and woody debris will be retained (or, if absent, recruited) to sustain populations of native plants, fungi, and animals, both within the harvest unit and across the FMU.	FSC U.S. Standards 6.3.e.1.
Habitat components necessary to support native species (e.g. vertical and horizontal structural complexity, understory species diversity, food sources, nesting, denning, hibernating, and roosting structures, habitats and refugia for sedentary species and those with special habitat requirements) will be protected, maintained, and/or enhanced within each harvest unit and across the entire forest management unit.	FSC U.S. Standards 6.3.b.3
Where necessary to protect against wind throw and to maintain microclimate, green trees and other vegetation are retained around snags, down woody debris, and other retention components.	FSC U.S. Standards 6.3.e.2.
Native hardwoods and understory vegetation will be retained as needed to maintain and/or restore the natural mix of species and forest structure.	FSC U.S. Standards 6.3.e.3.
Live trees and native understory vegetation will be retained within the harvest unit in proportions and configurations that are consistent with the characteristic natural disturbance regime in each community type, unless retention at a lower level is necessary for purposes of restoration.	FSC U.S. Standards 6.3.e.4.
Logging operations and the use of roads and skid trails occur only when soil compaction, erosion, and sediment transport do not result in degradation of water quality, site productivity, or habitats.	FSC U.S. Standards 6.5.a.
Silvicultural systems, integrated pest management, and strategies for controlling pests and/or unwanted vegetation will be developed that result in the least adverse environmental impact, with the goal of reducing or eliminating chemical use.	FSC U.S. Standards 6.6.b.
All major forestry operations (e.g. thinning, road building, etc.) will only occur outside the primary bird breeding season (April 15th – June 15th).	BMP

Appendix I. Forest management timetable

Timeline	FMU #	Acres	Activity
2014 - 2015	105 106	138	Variable density commercial thin.
2015 – 2016	105	88	Underplant unit with DF at 100 tpa
2015 – 2020	107	84	Variable density commercial thin. Underplant site with 50:50 DF & RC at 100 tpa.
2015 – 2020	100	23	PCT dense alder. Control Himalayan blackberry. Replant open areas to DF at 100 tpa.
2015 – 2020	102	22	PCT maple. Control brush and replant unit to RC at 200 tpa
2015 – 2020	103	15	Control brush and replant unit to RC at 200 tpa.
2020 - 2025	111	52	Variable density commercial thin. Release Oregon Oak.
2025 – 2030	106	50	Variable density commercial thin. Underplant units with DF at 100 tpa.
2030 - 2035	105	88	Variable density commercial thin. Underplant units with DF at 100 tpa.
2035 – 2040	106	50	Variable density commercial thin. Underplant units with DF at 100 tpa.
2035 – 2040	107	84	Commercial variable density thin.
2040 – 2045	111	52	Variable density commercial thin. Underplant with 50:50 mix of DF and RC at 100 tpa.

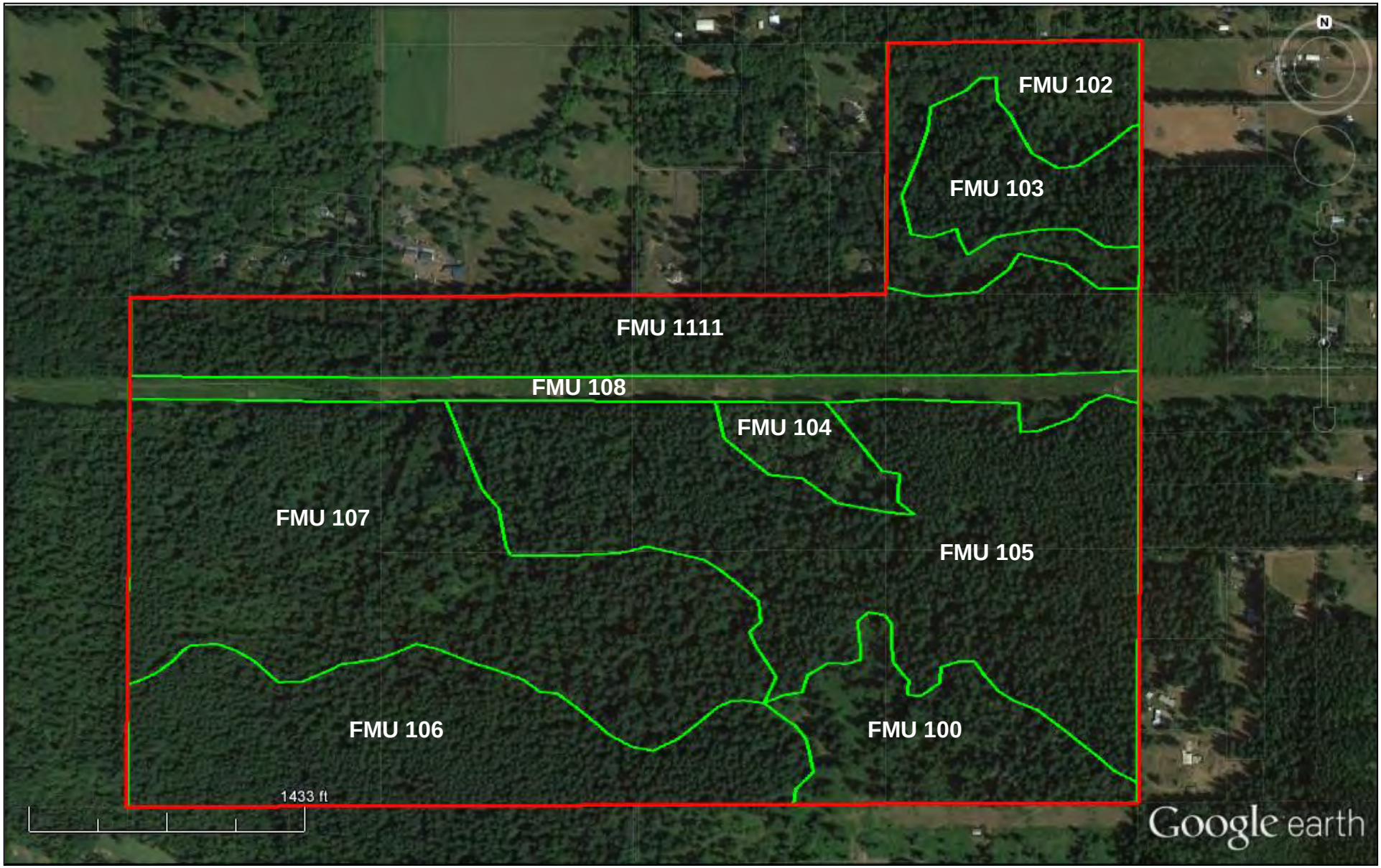
Appendix II: Green Mountain 2014/2015 Prioritized Workplan Metrics

	2014 Inventory		USFS DFSIM ver.1.0		Calc. Thinning			2014 Thinning Prescrip		
FMU #	BA / Acre	TPA	BA / Acre	TPA	BA / Acre	< percent >	TPA	MBF / Acre	Acres	Tot. MBF
105	247	96	232	62	15	6	32	16.96	88	1,492
106	293	151	232	62	61	21	89	35.6	50	1,780
										3,272

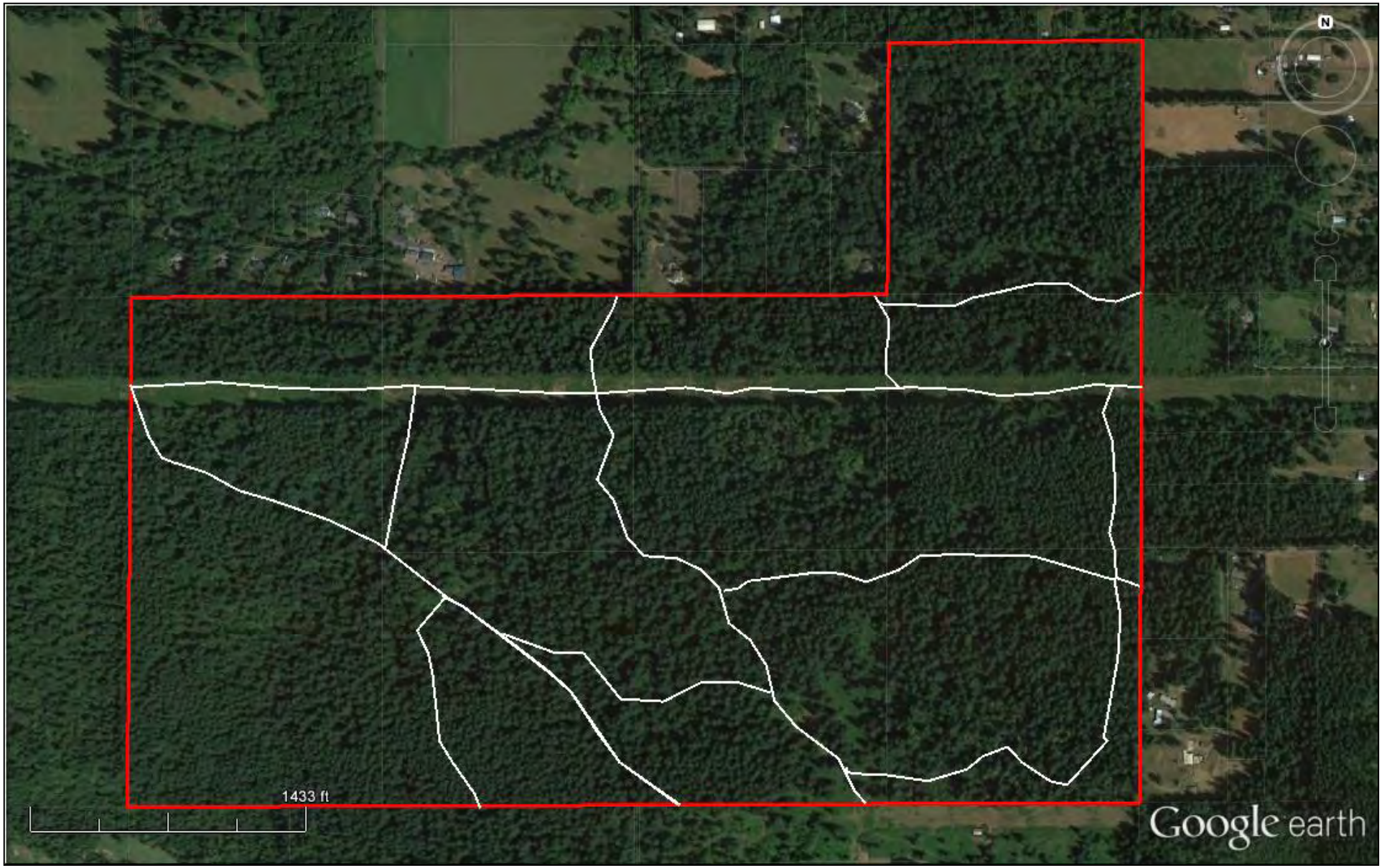
Appendix III. Maps

Forest Management Units
Historic Aerial Photos
Topography
Slopes
Landslide Hazard Areas
Soil Type
Hydrology
Zoning
Priority Habitats & Species

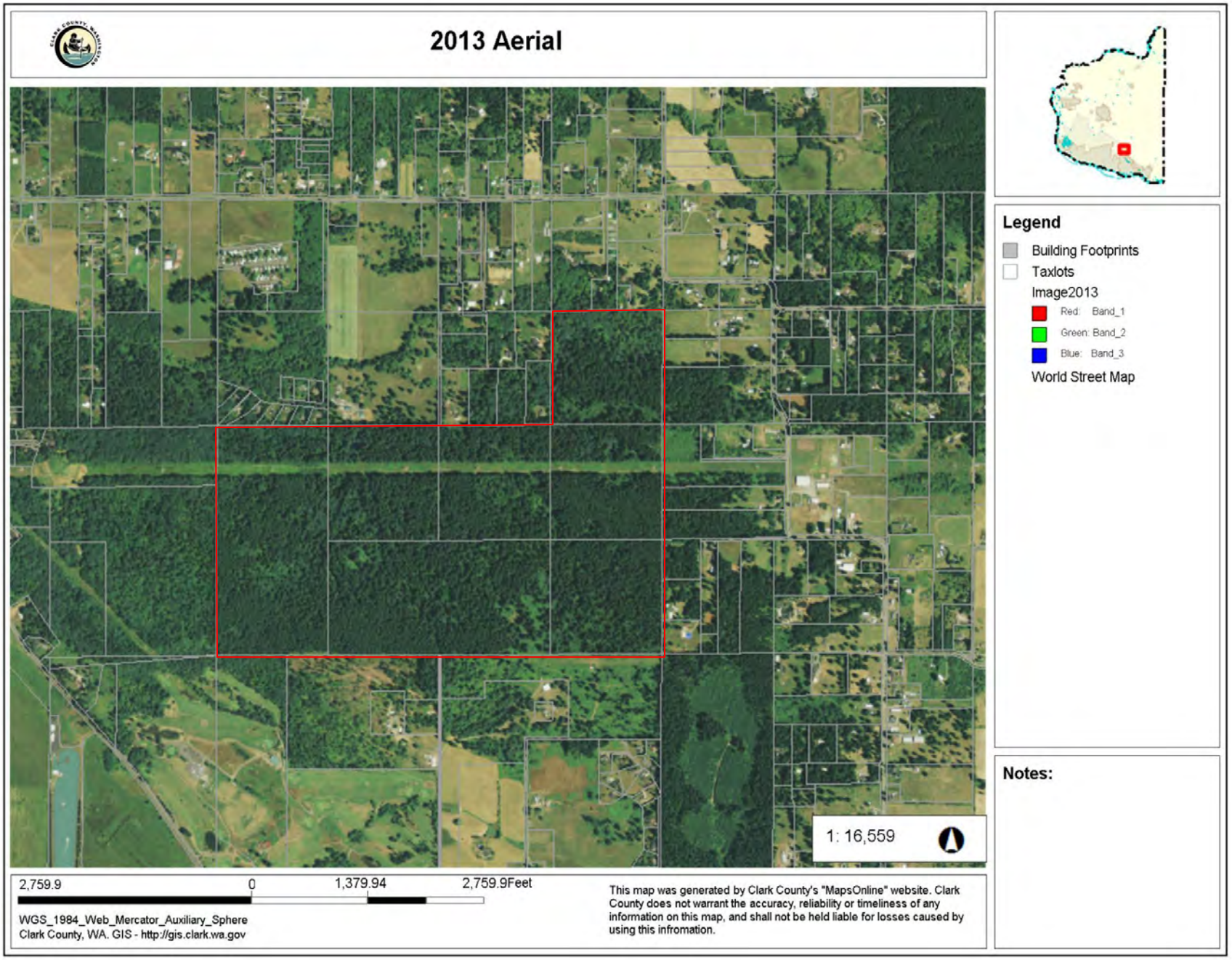
Forest Management Units



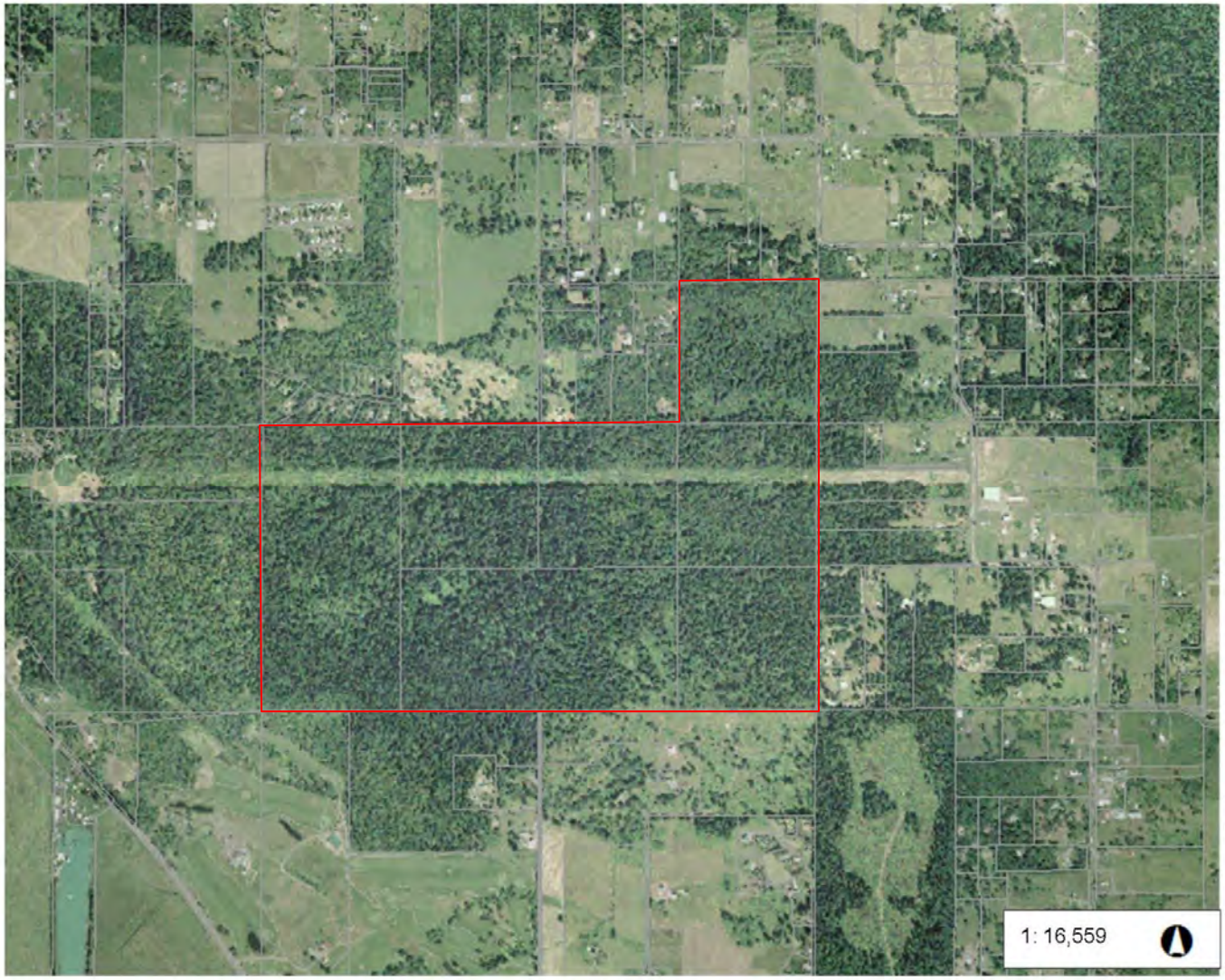
Forest Trails



Historic Aerial Photos



2005 Aerial



Legend

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- Taxlots
- Image2005
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  - Green: Band_2
  - Blue: Band_3
- World Street Map

Notes:

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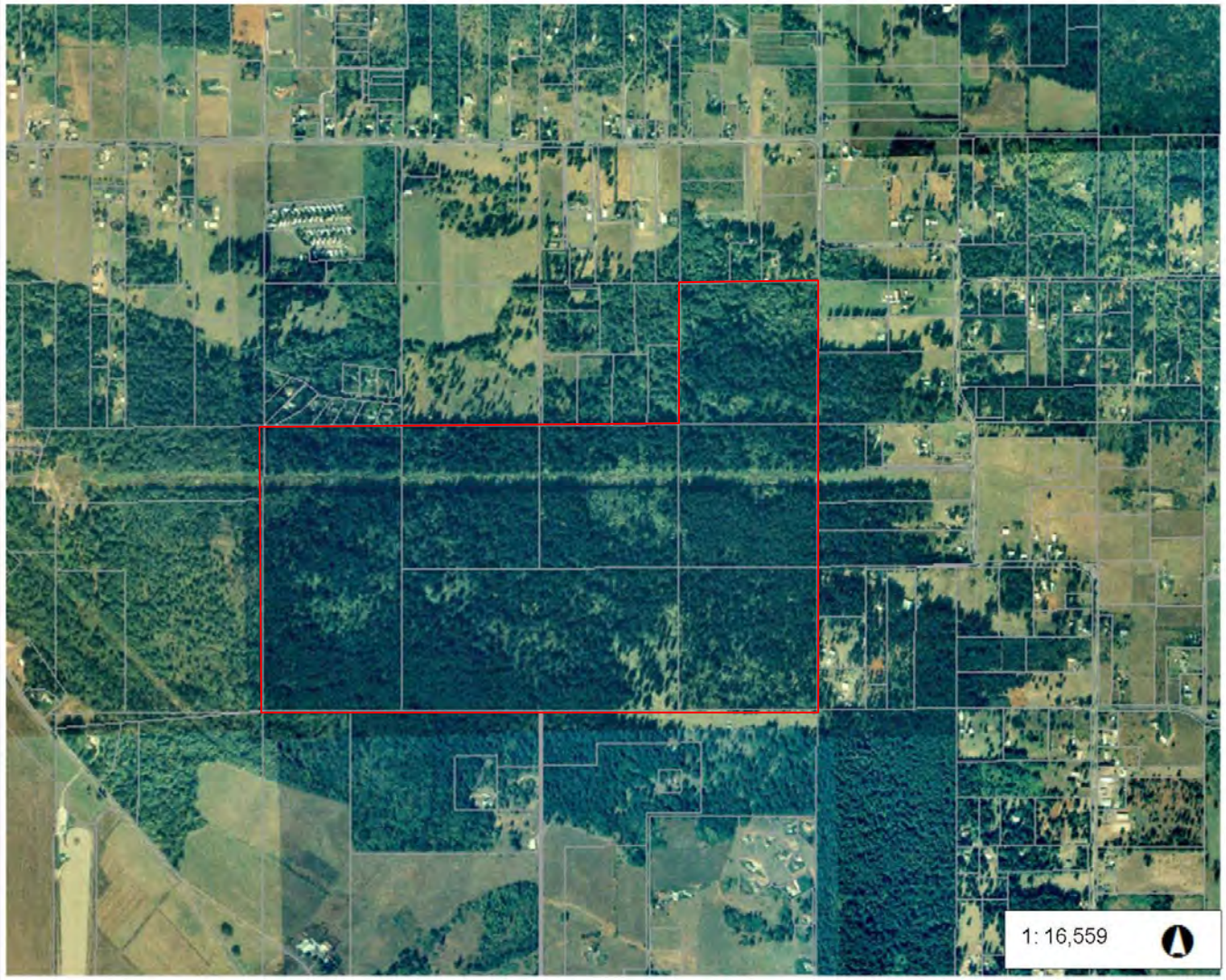
WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

This map was generated by Clark County's "MapsOnline" website. Clark County does not warrant the accuracy, reliability or timeliness of any information on this map, and shall not be held liable for losses caused by using this infromation.

1994 Aerial



Legend

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- Taxlots
- Image1994
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  - Green: Band_2
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- World Street Map

Notes:

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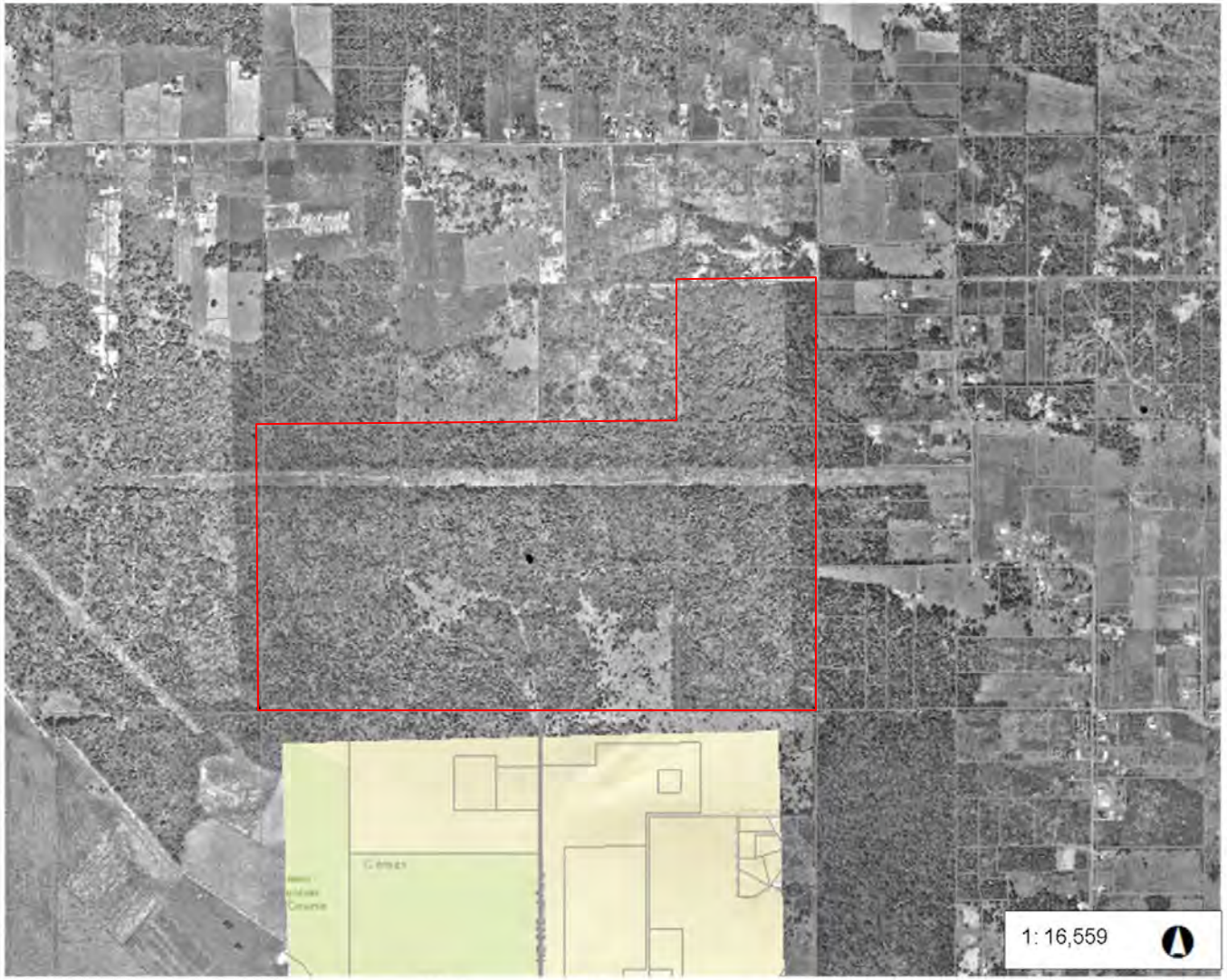
1974 Aerial



Legend

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- Taxlots
- Image1974
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- World Street Map

Notes:

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Clark County, WA. GIS - http://gis.clark.wa.gov

This map was generated by Clark County's "MapsOnline" website. Clark County does not warrant the accuracy, reliability or timeliness of any information on this map, and shall not be held liable for losses caused by using this infromation.

1955 Aerial

Legend

- Building Footprints
- Taxlots
- Image1955
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- World Street Map

Notes:

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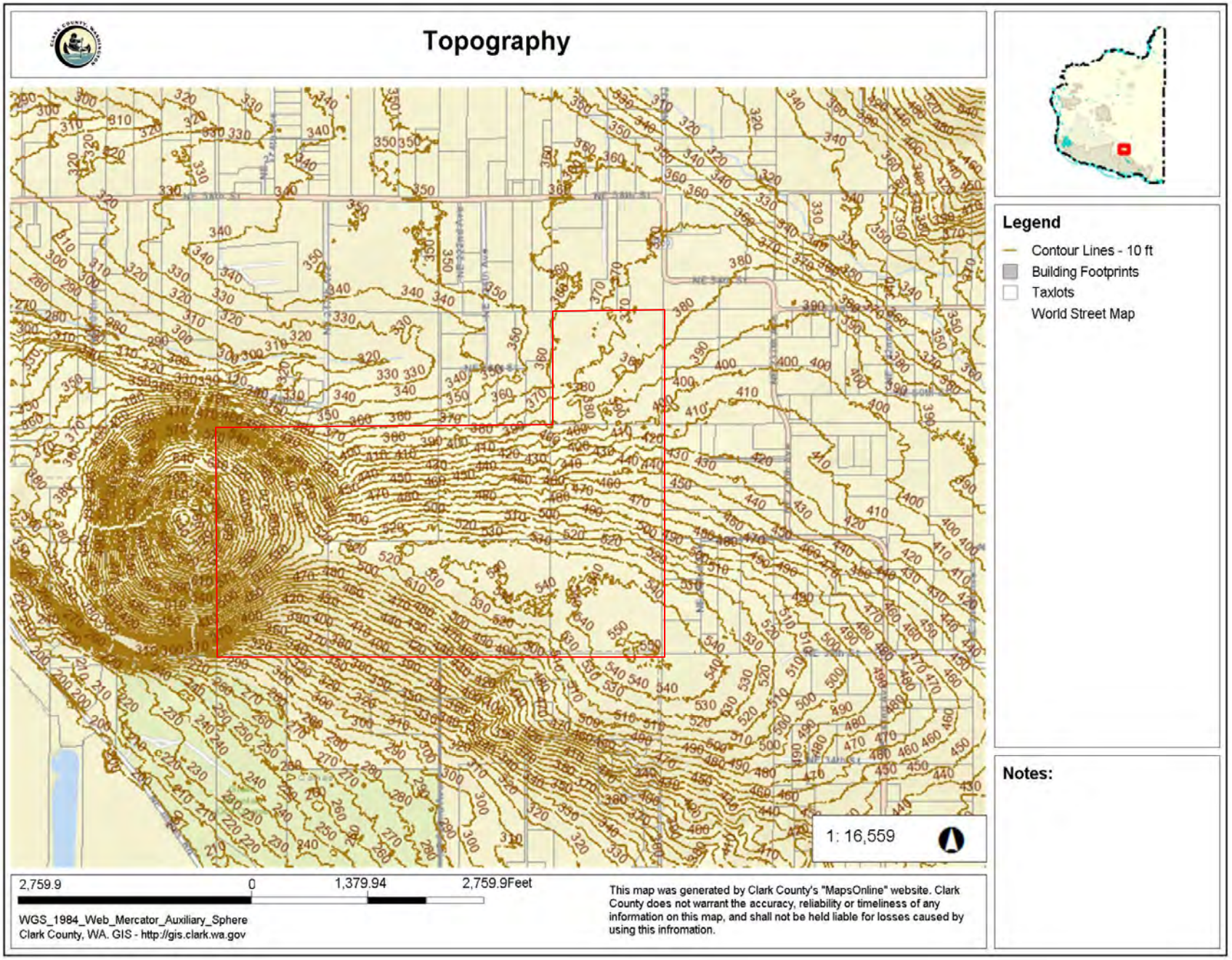
WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

Topography


Topography
Legend
Contour Lines - 10 ft
Building Footprints
Taxlots
World Street Map
Notes:
1: 16,559
2,759.9
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1,379.94
2,759.9Feet
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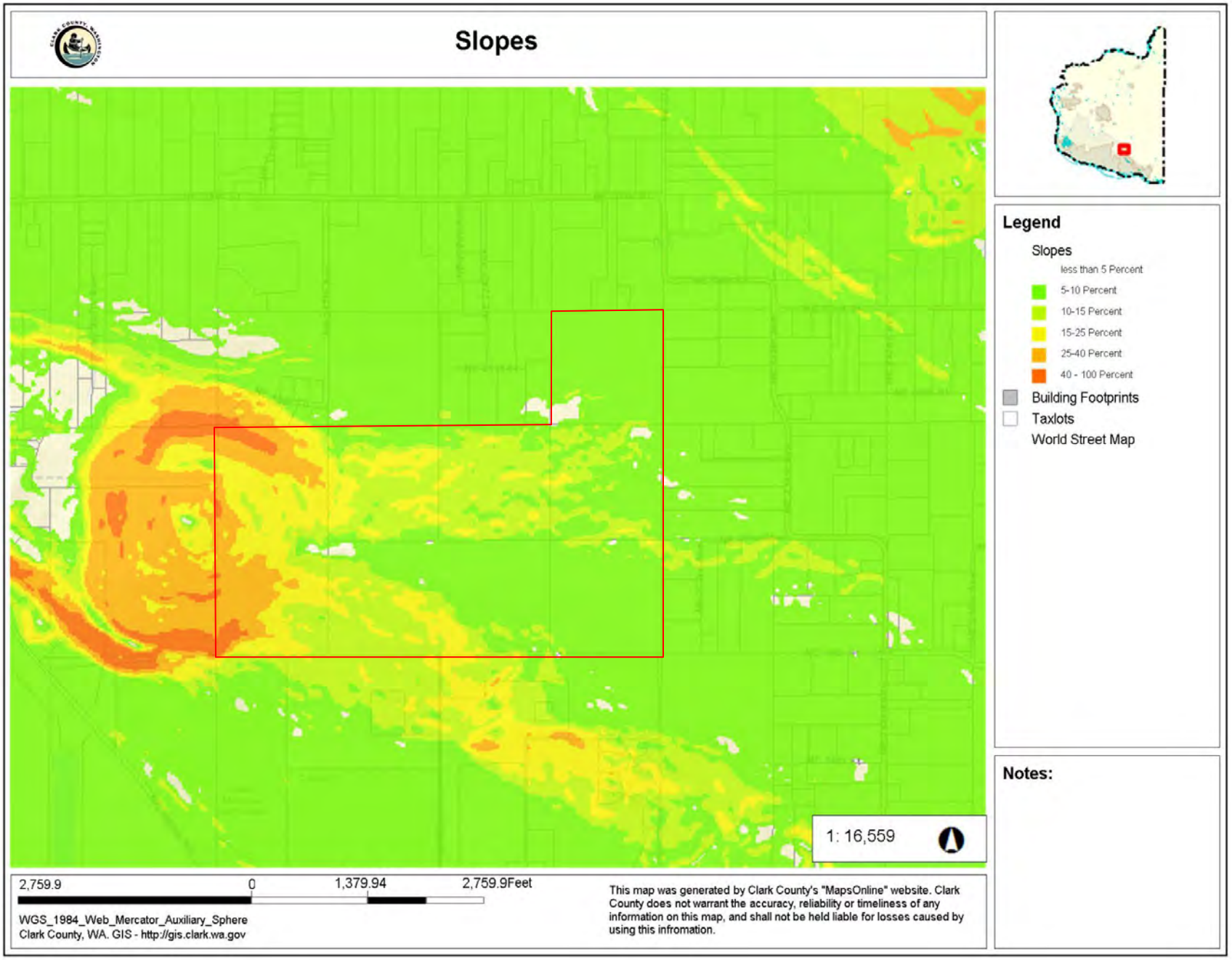
Slopes


Slopes
Legend
Slopes
less than 5 Percent
5-10 Percent
10-15 Percent
15-25 Percent
25-40 Percent
40 - 100 Percent
Building Footprints
Taxlots
World Street Map
Notes:
1: 16,559
2,759.9
0
1,379.94
2,759.9Feet
WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov
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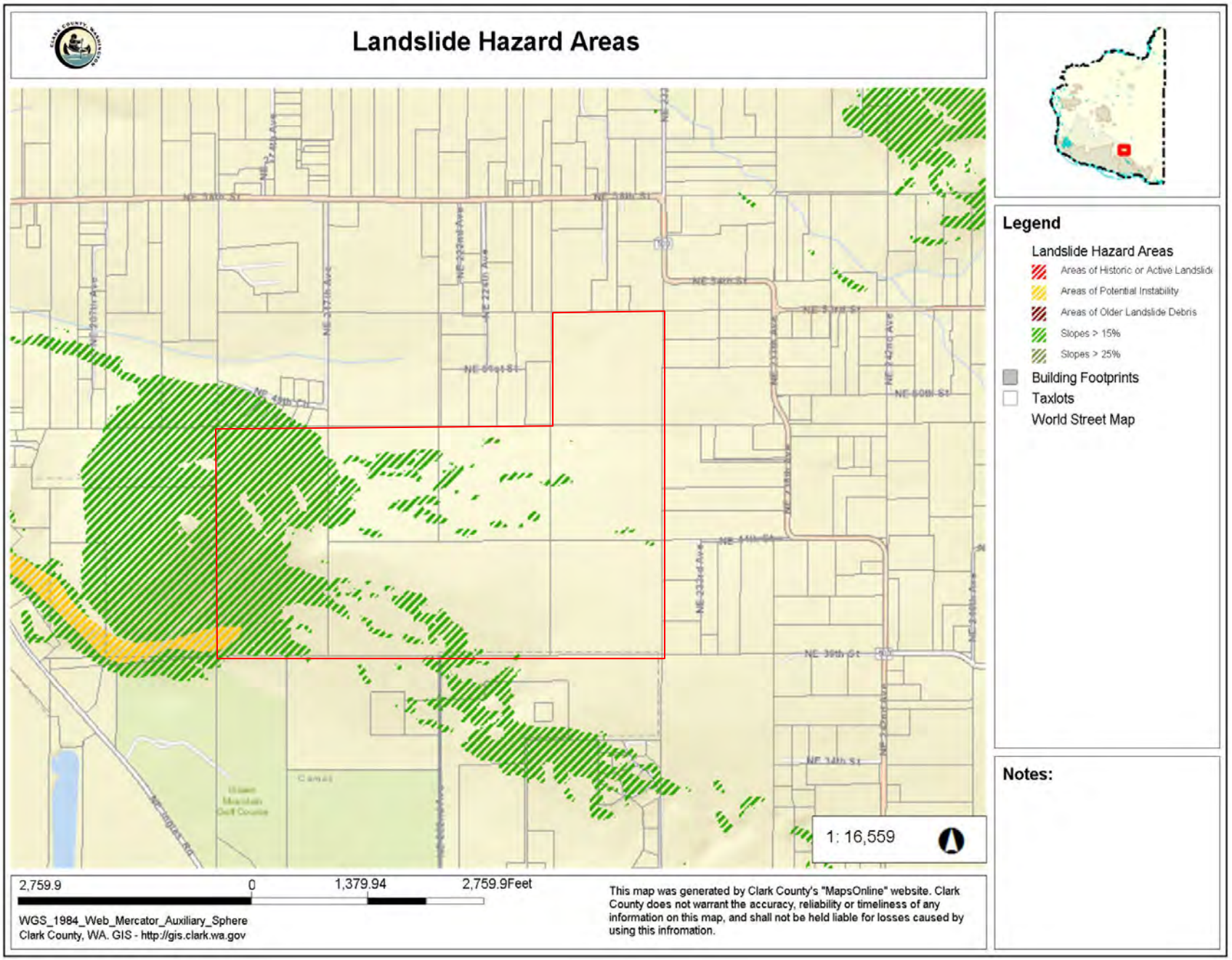
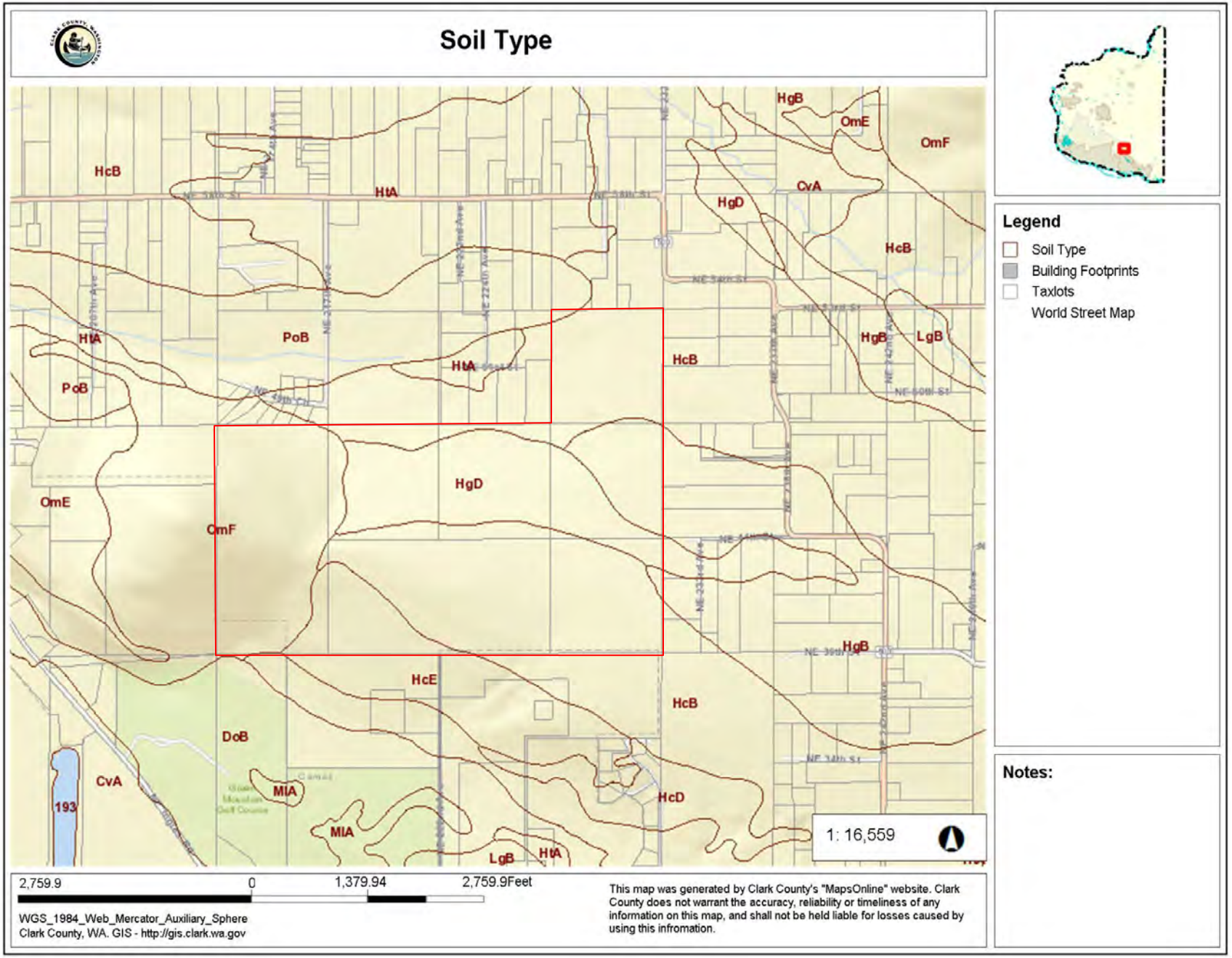
Landslide Hazard Areas



Soil Type


Soil Type
HcB
HtA
HgB
OmE
OmF
CvA
HgD
PoB
LgB
HcE
DoB
MIA
193
1: 16,559
Legend
Soil Type
Building Footprints
Taxlots
World Street Map
Notes:
2,759.9
0
1,379.94
2,759.9Feet
WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov
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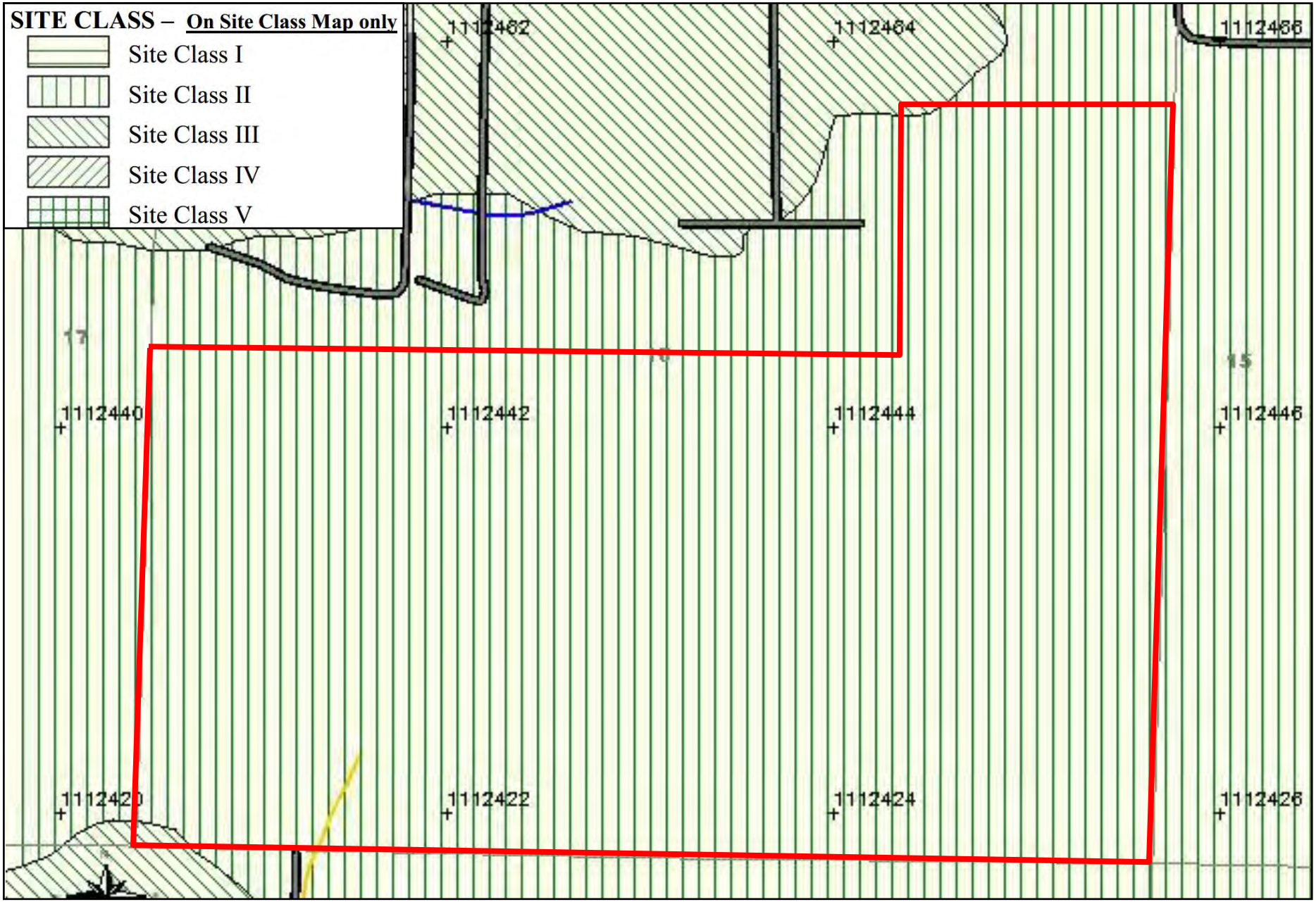
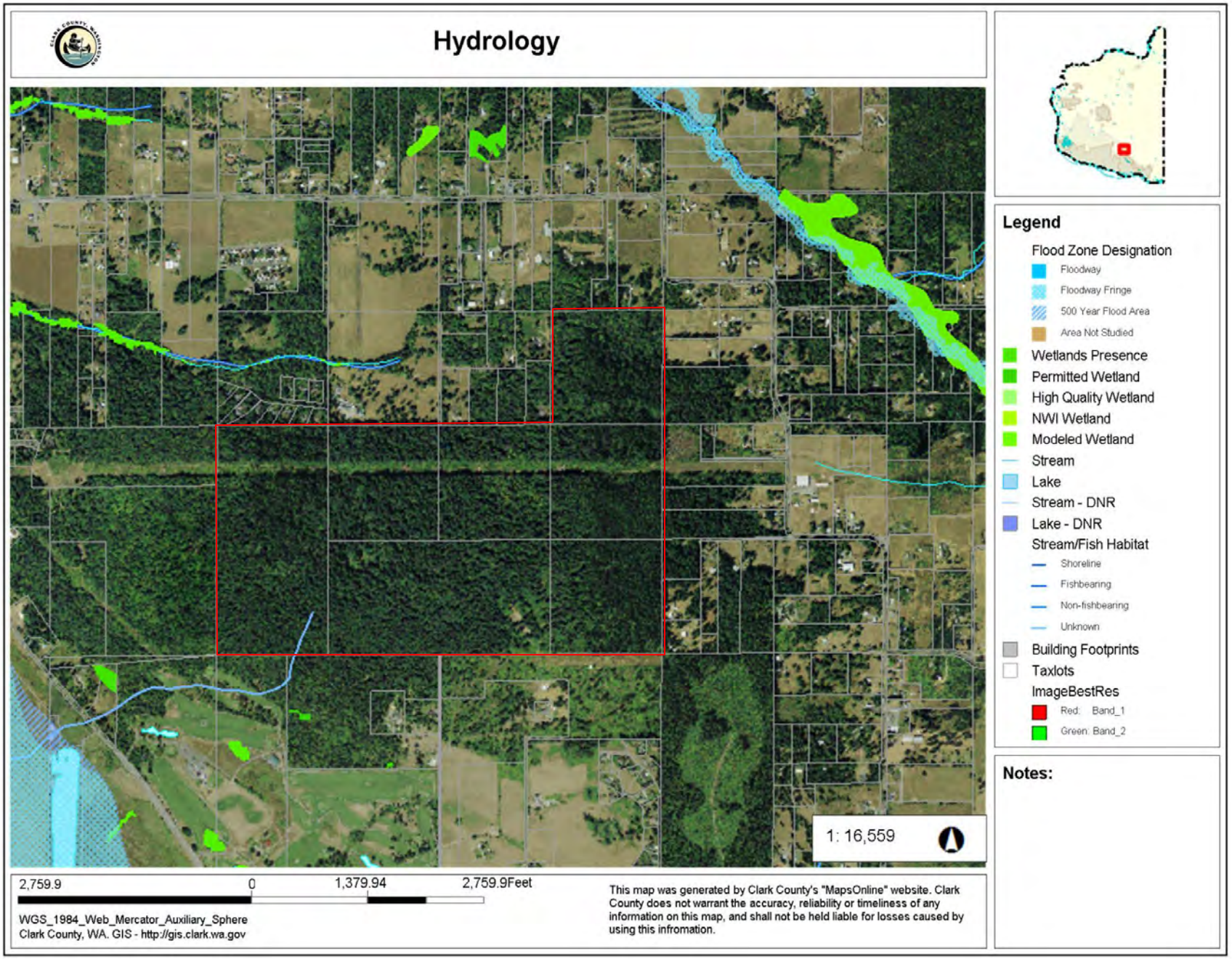
Soil Site Class



Hydrology


Hydrology
Legend
Flood Zone Designation
Floodway
Floodway Fringe
500 Year Flood Area
Area Not Studied
Wetlands Presence
Permitted Wetland
High Quality Wetland
NWI Wetland
Modeled Wetland
Stream
Lake
Stream - DNR
Lake - DNR
Stream/Fish Habitat
Shoreline
Fishbearing
Non-fishbearing
Unknown
Building Footprints
Taxlots
ImageBestRes
Red: Band_1
Green: Band_2
Notes:
1: 16,559
2,759.9
0
1,379.94
2,759.9Feet
WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov
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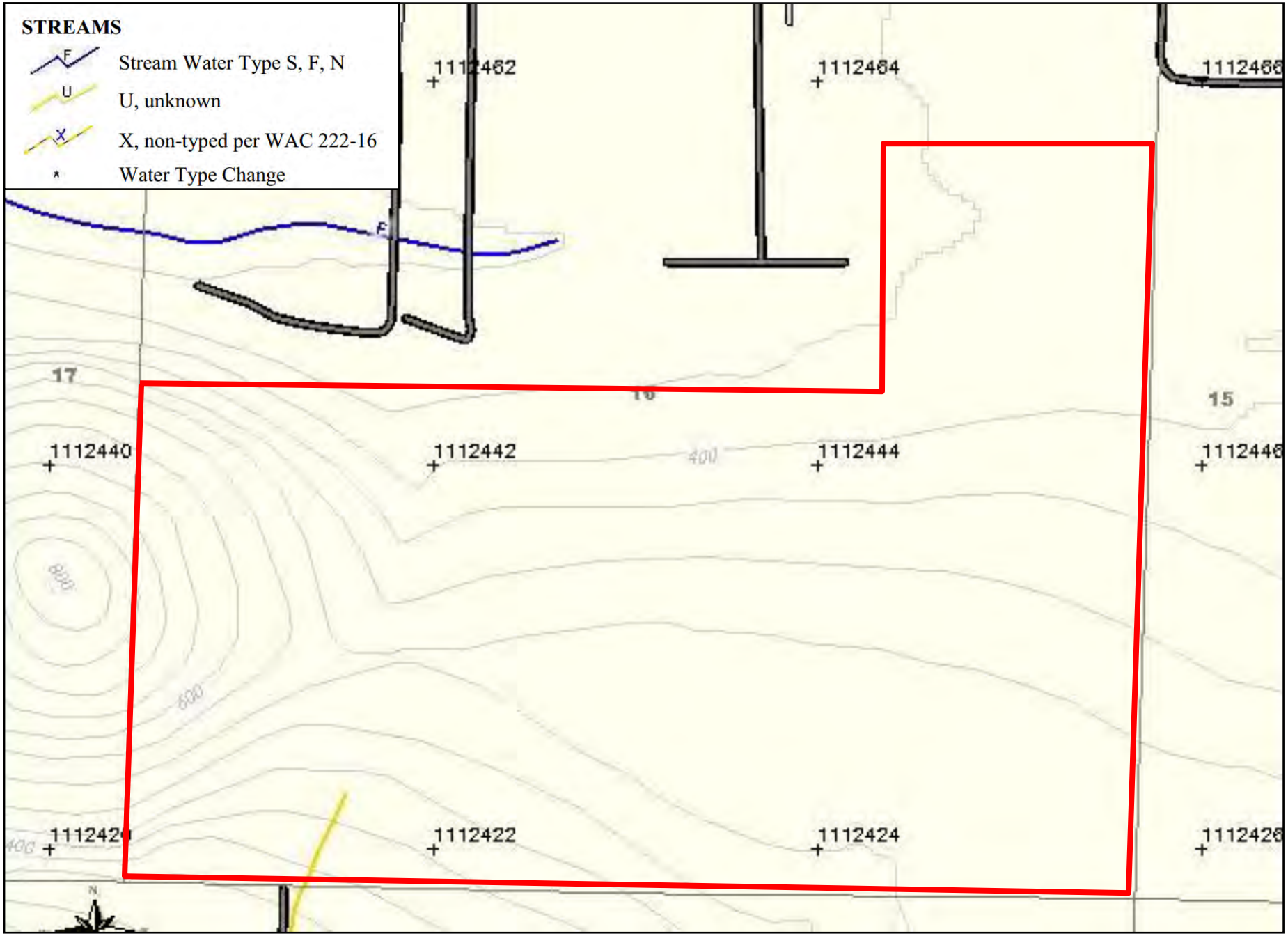
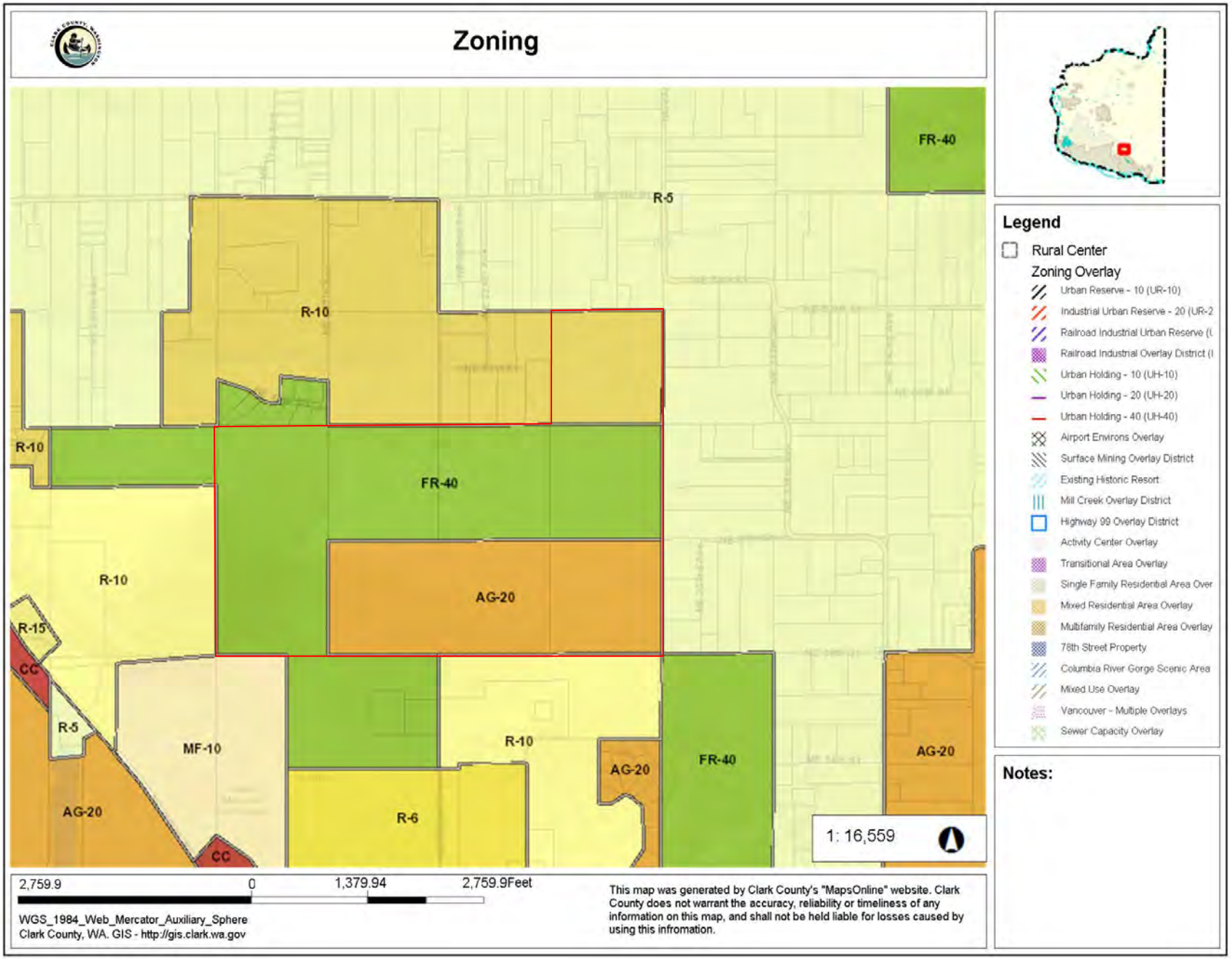
DNR Water Types



Zoning


Zoning
FR-40
R-5
R-10
R-10
FR-40
R-10
AG-20
R-15
CC
R-5
MF-10
AG-20
CC
R-6
R-10
AG-20
FR-40
AG-20
1: 16,559
Legend
Rural Center
Zoning Overlay
Urban Reserve - 10 (UR-10)
Industrial Urban Reserve - 20 (UR-2
Railroad Industrial Urban Reserve (
Railroad Industrial Overlay District (I
Urban Holding - 10 (UH-10)
Urban Holding - 20 (UH-20)
Urban Holding - 40 (UH-40)
Airport Environs Overlay
Surface Mining Overlay District
Existing Historic Resort
Mill Creek Overlay District
Highway 99 Overlay District
Activity Center Overlay
Transitional Area Overlay
Single Family Residential Area Over
Mixed Residential Area Overlay
Multifamily Residential Area Overlay
78th Street Property
Columbia River Gorge Scenic Area
Mixed Use Overlay
Vancouver - Multiple Overlays
Sewer Capacity Overlay
Notes:
2,759.9
0
1,379.94
2,759.9Feet
WGS_1984_Web_Mercator_Auxiliary_Sphere
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Priority Habitats & Species