Danville-Georgetown Open Space Forest Stewardship Plan

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Executive Summary

The ***Danville-Georgetown Open Space Forest Stewardship Plan*** provides natural resource analysis and management recommendations to guide the long-term stewardship and public use of this forested open space property. The property is approximately 334 acres located east of the City of Maple Valley and was dedicated as public open space through King County's 4:1 program.

Vision

Danville-Georgetown Open Space will serve as a model of how active forest stewardship can provide and maintain a balance of ecological, economic, and social values that forests provide.

Goals

- Improve or maintain forest ecosystem health through active management; specifically addressing root rot problems.
- Thin plantations to accelerate the development of late seral stage characteristics.
- Generate revenue to continue to support forest stewardship.
- Ensure that plan is supported by community and user groups.
- Retain deciduous species for ecological and aesthetic diversity.
- Provide opportunities for education and trail based recreation for the public and maintain the high quality trail system that already exists on the property.
- Increase plant and animal bio-diversity by implementing forest practices that increase structural complexity.
- Improve or maintain wildlife habitat for a diversity of species; especially sensitive, threatened, or rare species.
- Protect riparian and wetland resources.

Recommendations

- Conduct inventory and analysis of the extent of the root rot infestation
- Thinning of 160 acres of 35-year old Douglas-fir plantation; initial thinning will remove approximately 30-percent of the existing trees; the largest trees will be retained
- Plant root rot resistant tree species in areas
- Monitor and control invasive plant species
- Keep trails open to all uses

Introduction

Danville-Georgetown Open Space is located in unincorporated King County, east of the city of Maple Valley. The northern boundary of the property is about 300 feet from the Cedar River. The elevation of the property varies from 450 feet above sea level just north of the Cedar River pipeline road, to just over 800 feet above sea level along the southeast boundary of the property.

The 2010 King County Open Space Plan recognized the importance of active, sustainable stewardship of all forest lands in the Parks Division inventory. The following policies are from the Open Space Plan:

> CIP-136 King County will promote forest management and restoration in order to conserve and enhance its vital natural areas with healthy forest canopies that contribute to improved water and air quality, surface water management, fish and wildlife habitat, aesthetics, climate change adaption, and energy conservation.
>
> CIP – 137 King County should be a leader in natural resource management by demonstrating environmentally sound and sustainable forest practices on county-owned open space sites that result in retention of forest cover and improved forest health.

The Open Space Plan also recommended an assessment of the forest conditions of all of the Park Division's forest lands. This assessment has been completed on Danville- Georgetown Open Space.

General Property Information

- **Location:** Property is located east of Maple Valley. .

- **Legal description:** SE ¼ NE ¼, SE ¼ SW ¼, NE ¼ SE ¼ of Section 23, T22N, R06E and NW ¼ NW ¼, NE ¼ Section 26, T22N, R06E and W fragment NW ¼ Section 25, T22N, R06E

Table 1. Danville-Georgetown Open Space Parcel Information

Thomas Guide Location	**Page 718**
Legal Description	
Parcel 5104512310	Maple Ridge Highlands (Tract OS-1A)
Parcel 5104512350	Maple Ridge Highlands (Tract OS-1E)
Parcel 5104512320	Maple Ridge Highlands (Tract OS-1B)
Parcel 5104512360	Maple Ridge Highlands (Tract OS-2)
Parcel 5104520940	Maple Ridge Highlands Div.2 Open Area (OS-7A)
Acreage	344 acres
Drainage Basin	Lower Cedar River-Cedar River/Lake Washington
WRIA	8
Council District	9
King County Critical Areas	Erosion, Seismic, Coal Mine, Class 1 & 2 Aquifer Recharge Area
King County Park Classification	Regional Recreation (Passive) and Multi-Use Park

History and Acquisition of the Property

The property is part of a large landscape of working forest lands that were historically part of the railroad land grants and subsequently owned and managed by Plum Creek Timber until 1998, when it was purchased by Polygon Northwest Inc. Plum Creek managed the land as a working forest. The forest north of Summit-Landsburg Road was harvested most recently in 1993. A portion of the forest south of Summit-Landsburg Rd. was harvested in 1987.

Polygon Northwest proposed to segregate the property into 20-acre parcels and sell each parcel as a residential lot. King County worked with Polygon to do a 4-to-1 development resulting in 575 homes on 150 acres and 600 acres set aside as open space. See Appendix A.

Formerly known as Maple Ridge Highlands Open Space, the sites were renamed by King County Ordinance as Danville-Georgetown Open Space and Henry's Ridge Open Space to reflect historical references. These two open space areas are bisected by Summit-Landsburg Road. The name "Danville-Georgetown" comes from the old rail road line that used to travel through the northern portion of the area and the name "Georgetown" comes from the old mining town

(now merged with Ravensdale) that was in the southeastern portion of the area. Henry's Ridge refers to an entertainment district during the mining era.

The Friends of Rock Creek Valley (FRCV), a citizen group focused on maintaining the quality of life in the Rock Creek Valley, expressed interest in the property from an ecological and recreational standpoint. In 2001, King County Council adopted a vision by FRCV to preserve the valley. In 2004, the FRCV released a more extensive Conservation Plan and Priorities report in which you can find these goals related to forestry:

- retain at least 65% forest cover in the Valley (Section 4.4),
- protect critical water resources (Section 4.2), fish, and wildlife habitat and corridors (Section 4.3),
- maintain a predominately rural / forested view shed along the primary and secondary arterials, trail corridors and active recreation sites within the Valley (Section 4.6).
- encourage King County to practice commercial forest management on non-sensitive County lands**.**

Surrounding Land Use and Adjacent Ownership

The property is bordered by the King County Rock Creek Natural Area to the west; 5-acre residential development to the north and southwest; the City of Kent watershed to the south; and a combination of 5-acre residential development and working forestland owned by Palmer Coking Coal to the east. Tahoma Junior High School is located on a school-district-owned property within and completely surrounded by the Danville-Georgetown site. The school property was formerly part of the same Plum Creek ownership as the Danville-Georgetown site.

In their document, Rock Creek Valley Conservation Plan and Priorities, the Friends of Rock Creek Valley identified Danville-Georgetown as an important component of their conservation effort. The property makes up a large percentage of one of the larger blocks of forestland in the Valley, and as such provides refuge for a variety of terrestrial wildlife and is capable of contributing to the working forest landscape that has historically been an important part of the Valley. The property also comprises a significant part of the urban-rural buffer that separates the rural area from the cities of Maple Valley and Black Diamond.

Access

There is a network of old logging haul roads on the property. Because the school site now occupies part of the original forest ownership, some of the former access points off the Summit Landsburg Road may need to be modified. On the South side of the Summit-Landsburg Rd. a logging road provides access to the property of Palmer Coking Coal. North of the school site, SE 252nd St. Crosses through a residential neighborhood and bisects the northern part of the property before re-entering another residential neighborhood.

Easements

The Danville – Georgetown Open Space site is permanently protected as public open space. The required open space ratio of four acres open space for each one acre of urban area development

shall be dedicated to King County with the recording of each development phase. The following note shall be placed on these tracts:

> This portion of the subject property with an open space land use designation shall remain uncleared with the exception of area to be utilized for active recreation by King County and to be placed into an open space tract. Use shall be limited to public, non-motorized outdoor recreation. Any alterations to the site are subject to King County Codes and King County Parks System review and approval.

Several entities hold easement rights upon portions of the subject open space area. These include City of Seattle, United States of America, Danville Coal Company, Northern Pacific Railway Company, Meridian Oil and Palmer Coking Coal Company. These easements grant rights to coal, gas, oil, "surface use rights", mineral extraction, "use of road" (ingress/egress), and utilities. As satisfaction to the King County 4-to-1 program, the Plum Creek Land company grants a "term deed of conservation easement" to King County

King County has sought legal advice regarding the clearing and grading requirements associated with the open space and have been advised that that it is up to King County to decide what is appropriate use/stewardship for the site, as long as it is consistent with policies for management of open space and does not allow other public uses other than outdoor, non-motorized uses (and the 5% active recreation). Forest stewardship actions that sustain forest health are consistent with King County's open space management policies identified in the *2010 Parks Open Space Plan.*

Natural Resource Analysis

Forest Assessment

King County DNRP has partnered with the U.S. Forest Service, University of Washington and Forterra (formerly Cascade Land Conservancy) on a four-year (2010-2013) *American Recovery and Reinvestment Act* (ARRA) project called "Integrated Urban Forest Assessments (IUFA): Green Jobs and Other Public Values". As a lead partner, DNRP has been collaborating with Forterra staff on field assessments of urban forest conditions in Seattle and King County. The purpose of the assessment is to learn about the current composition of the forests in Seattle and King County. All of these sites have been historically logged at least once and often multiple times. The assessment is being done in order to provide detailed data about what our forests are like, and the new information will help guide stewardship planning.

This funding came at an opportune time, as the adopted 2010 King County Open Space Plan (King County. 2010) promotes an assessment and inventory of forested open space properties to determine the health of ecological, economic and social resources of these properties. Specifically, the ARRA grant provides funding to develop, test, and implement rapid forest assessment protocols to obtain baseline forest conditions data to be used for forest stewardship planning including the prioritization of restoration projects. In addition the grant will evaluate

the feasibility of quantifying carbon storage and sequestration potential, and identify key sites for restoration to promote carbon sequestration.

A key partner in the development of the rapid assessment protocol was International Forestry Consultants, Inc. (INFO), now part of American Forest Management. INFO developed a Forest Land Assessment Tool (FLAT) which is a modified version of Tree-iage developed by the Green Seattle Partnership, a public-private partnership between the City of Seattle, Forterra, and Seattle's residents. Tree-iage is used by Forterra and associated organizations to conduct rapid assessments of urban forests for restoration action prioritization.

The FLAT assessment of Danville/Georgetown Open Space was completed in summer of 2010.

Based on ortho-photos and GPS ground truthing, the property was divided into 11 ecological management units (EMU's). These EMU's are areas with generally homogeneous plant communities which are stratified primarily by tree species and age. These EMU's are further defined by existing roads, power lines, and other infrastructure features. For the purposes of this plan, similar EMU's have been grouped together as an ecotype. Ecotypes are classified according to the type of dominant vegetation present and the successional stage. Successional stages from Franklin et al (2002) were used. Eight distinct ecotypes were identified within Danville/Georgetown Open Space. The EMU's within each ecotype are listed on Table 2.

Natural Resource Categories Existing Conditions

Ecological Types

Ecotype A: Douglas-fir – Competitive exclusion (EMU 11-160.6 ac.)
This 30-35 year old ecotype is the largest on the property at 160 acres. This ecotype is a result of a clear cut harvest and subsequent reforestation by Plum Creek Timber. The over story is composed of 80% planted Douglas-fir, 10% black cottonwood, 4% red alder, 4% western hemlock, and 2% bigleaf maple and miscellaneous other species.. There are minor amounts of hemlock and western red cedar sapling and pole-size regeneration in the understory. The forest landscape assessment tool (FLAT) rates the ecological value as high due to the density of the coniferous canopy.

The stand is overstocked as indicated by a basal area of 288 sq. ft. per acre and 277 trees per acre. This high rate of competition has resulted in high height-to-diameter ratios, low crown ratios, and self thinning. Increment cores indicate relatively slow current growth rates. The live crown ratios average less than 40%. There is a significant amount of wind, ice, and snow crown damage especially in the suppressed and intermediate 6 to 10 inch diameter trees. (Tree diameters are measured at 4.5 feet above the ground, or dbh, diameter at breast height)
The volume per acres is 35,000 board feet.

The shrub and herbaceous species present are primarily sword fern, vine maple, Oregon grape, trailing blackberry, salal, red elderberry, salmonberry, and hazelnut. Overall, invasive species do

not occupy more than 5% cover but there are some locally higher levels of Himalayan and evergreen black berry, scotch broom, herb Robert, and butterfly bush.

This plantation in its current state does not provide habitat for a wide range of wildlife species.

There appears to have been no forest management since the 1980s harvest and reforestation.

Ecotype B: Douglas-fir- (EMU's 1-26.2 ac., 3-20.3 ac., 5-73.7 ac., 10-15.7 ac.)
This 135 acre Douglas-fir dominated ecotype consists of EMU 1, 3, 5, and 10. Based on increment cores, the age of this ecotype is 20 years old. These units were harvested by Plum Creek Timber and replanted with Douglas-fir. The ecotype is well stocked with a crown closure in excess of 70%. The health of the Douglas-fir is quite variable. The southern areas of EMU 5 and EMU 10 are not as densely stocked as EMU's 1 and 3 due to well drained soils and a moderately severe laminated root rot infestation. EMU's 1 and 3 have moderately severe root rot areas interspersed with healthier Douglas-fir. Live crown ratios are between 45 and 60% and height to diameter ratios are between 50 and 65%. Natural seeding of western red cedar, western hemlock, black cottonwood, and bitter cherry occurred in varying densities in areas that were planted less densely or had poor survival rates. Understory species consist of salal, sword fern, cascara, vine maple, Himalayan blackberry, ocean spray, red huckleberry, scotch broom, bracken fern, and hazelnut. The ecotype contains areas of dead and dying Douglas-fir at a higher level than normal for a 20 year old forest (see Forest Health).

The presence of invasive species is low. In approximate order of percent cover, the invasives include Himalayan and evergreen blackberry, scotch broom and herb Robert.

There is little course woody debris. Plant diversity is better than average for young plantations.

Other than the construction of trails, there have not been any stewardship activities in the ecotype since it was planted.

Ecotype C: Mixed Species (EMU's 8-3.7 ac., 9-6.4 ac.)
This 10 acre ecotype is 20 years old and was harvested the same time as Ecotype B. The stocking level of the Douglas-fir component is lower than in Ecotype B and there is a higher percentage of mature red alder, hemlock, and bigleaf maple in the over story compared with adjacent Ecotypes F and B. The density of the over story varies within the unit.

The stocking level of the understory also is variable. Species present include cedar, hemlock, bigleaf maple, and cascara.

The ground cover consists primarily of sword fern, salad, and trailing blackberry. Invasive species are low in occurrence and consist primarily of Himalayan and evergreen blackberry, herb Robert, Scotch broom, and English holly.

There have not been any active stewardship practices in this ecotype since it was planted.

Ecotype D: Hardscape (EMU 4-1.4 ac.)
This ecotype comprises 1.5 acres of paved road which is SE 248th St.

Ecotype E: Hardwood-Riparian Wetland Complex (EMU 12-3.8 ac.)
This 3.8 acre long, narrow, ecotype consists of a wetland, which drains into two stream systems. Stream 3 flows south east into Georgetown Creek. This stream is perennial, non-fish bearing (NP) based on physical characteristics. Stream 4 flows northerly and goes sub-surface approximately 550 feet after crossing the Berry Bear Trail through a culvert. The wetland portion occupies the northwestern end of the ecotype and is most likely a Type B based on Washington Department of Natural Resources (WA-DNR) forest practice rules.

The FLAT assessment classified this ecotype as natural land cover, defined as areas of natural vegetation with less than 25% forest canopy cover. The trees include alder and black cottonwood. Invasive species are low in occurrence and consist primarily of Himalayan and evergreen blackberry, herb Robert, and Scotch broom.

Ecotype F: Hardwood/Douglas-fir (EMU 7- 20 ac.)
This 20 acre ecotype is located in the Northwest corner of the property adjacent to the Cedar River Pipe Line Road. The stand was harvested at the same time as Ecotype B. The northern two thirds of the unit were naturally seeded in with red alder, which is generally outcompeting the planted Douglas-fir. Understory species consist of hemlock and Alder. The ground cover contains primarily salmonberry, sword fern, and vine maple.

Invasive species are low in occurrence and consist primarily of Himalayan and evergreen blackberry, Scotch broom, herb Robert, and butterfly bush.

Approximately 4 acres in the southern end of the unit is a stream wetland complex (Stream 1). In the summer of 2012 there was no water present. Vegetation consists of willow, black cottonwood, alder, spirea, and sedges.

E*cotype G: Hardwood (EMU 2- 4.3 ac.)*
This 4.3 acre ecotype is an area that seeded in with significantly more alder than Ecotype B. In addition to red alder the over story contains Douglas-fir and bigleaf maple. Some western hemlock has naturally seeded in the understory.

There is a moderate amount of invasive species consisting of Himalayan and evergreen black berry, scotch broom, herb Robert, and butterfly bush.

E*cotype H: Hardwood/Conifer-Mature (EMU 6- 4.8 ac.)*
This ecotype is located on the north side of the Cedar River Pipeline Road. There is hemlock, Douglas-fir, and bigleaf maple in the over story which range from 14 to 34 inches Dbh. There are shade tolerant hemlock and cedar saplings that have naturally regenerated in the understory. The primary ground cover consists of vine maple and sword fern. There is a low occurrence of invasive species consisting of English ivy and herb Robert.

Table 2: Summary of Assessment Data For All Ecological Management Units

EMU	ECOTYPE	AC.	EST. TREES PER AC.	AGE	SITE INDEX[1]
1	B: DF-Competitive Exclusion	26.2	300	20	107
2	G: Hwd-Competitive Exclusion	4.3	300	20	107
3	B: DF- Competitive Exclusion	20.3	300	20	100
4	D: Hardscape-Road	1.5	NA	NA	100
5	B: DF-Competitive Exclusion	73.7	300	20	100
6	H: Conifer/Hardwood- Mature	4.8	150	20	100
7	F: Hwd/DF- Competitive Exclusion	20	unknown	20	100
8	C: Mixed Species- Competitive Exclusion	3.7	unknown	20	100
9	C: Mixed Species- Competitive Exclusion	6.4	unknown	20	100
10	B: DF_ Competitive Exclusion	15.7	300	20	100
11	A: DF_Can-Close	160.6	180	30-35	108
12	E: Hwd-Rip_ Competitive Exclusion	3.8	unknown	30	108
[1] Site index based on NRCS soils data					

Natural Resource Categories Existing Conditions

Forest Health

The main forest health concern on the property is the impact of the laminated root rot fungi Phellinus sulphurascens on Ecotype A and B. P. sulphurascens is the Douglas-fir form of the fungus genus, Phellinus. It was recently recognized as a distinct species from Phellinus weirii. Ecotypes A and B account for 86% of the acreage of this property. The FLAT assessment noted the presence of root rot in both of these ecotypes.

Phellinus sulphurascens can be either aggregated or dispersed in forest stands. Infected trees may have a reduction in height growth with abnormally short leaders. Indicators of infection include crowns that are sparsely foliated, and often chlorotic. Infected trees may produce a distress crop of cones when the trees are as young as 15 years. The pathogen spreads primarily via root contact and can kill trees throughout their life cycle. It can lower stand volume by 40–70% on infected sites. The fungus persists from tree generation to generation if highly susceptible host species are retained or replanted. Because of this it is considered a disease of the site.

In preparing this plan we consulted with the Washington State Department of Natural Resources Forest Pathologist. He visited the site in September 2012 and verified the presence of Phellinus sulphurascens in both Ecotype A and B. He also pointed out hardwood pockets which had grown into root rot pockets in the previous stand when the Douglas-fir died. The replanting of only Douglas-fir, the primary host species, has resulted in forests with significant potential for Phellinus sulphurascens. The state pathologist indicated that the degree of infestation would not preclude commercial thinning, but there are risks for further tree mortality if the fungi are present in higher populations than what has been observed to date.

This visit and subsequent field work provided sufficient qualitative data to rate the severity of the root rot infestation of Ecotype A and B. There are a relatively low number of root rot centers (aggregated infection) or disbursed indicators in Ecotype A. Therefore Ecotype A is in the low severity class which is based on 0 to 20 percent canopy reduction. Ecotype B has more crown reduction and mortality. The visible indicators of root rot are extremely variable in Ecotype B. Based on a canopy reduction between 15 and 20% it appears to be in the upper range of the low severity classification. There has not been a quantitative field assessment of the severity of the root rot infestation.

King County also hired American Forest Management to conduct an analysis of the root rot infestation in Ecotype A and B. The report is in Appendix C. In late 2014 or early 2015 county staff will evaluate the feasibility of implementing the non-commercial group selection harvest recommendations in this report. If deemed feasible a Request for Proposal (RFP) will be prepared and sent out by mid-2015.

Invasive/Noxious Weeds

The FLAT assessment indicated a low presence of invasive weeds in all ecotypes with the exception of EMU 2, which had a moderate level consisting primarily of Himalayan and evergreen blackberry. Each of the ecotype descriptions provide the dominant weed species based on percent cover. Given the property as a whole, the primary invasive species present are Himalayan and evergreen blackberry, followed by scotch broom and herb Robert.

Fire

Currently the fuel levels are moderate with an average risk for wildfire. The overstocked condition in Ecotype A and ongoing mortality from root rot in Ecotype B will result in increased fuel loads which would increase the intensity and severity of any fire that might occur.

Animal Damage

There is normal typical amount of tree damage from deer antler rubbings, primarily on deciduous species in Ecotype B. Local residents have reported seeing bear on the property.

Timber and Wood Products

Ecotype A was harvested in the mid 1980's with the last harvest occurring in 1987. Ecotype B, F, and G were harvested in the early 1990's with the last harvest in 1993. These harvests were replanted with mostly Douglas-fir which has resulted in young forest stands with only minor species diversity provided by natural regeneration of alder, maple, cottonwood, hemlock and cedar. Most of the property currently supports these relatively young Douglas-fir dominated stands with the exception of Ecotype C and H which contain more mixed conifers and hardwood species. Everett soil series is predominant with a site class of III (50-year site index 100), the middle range for productivity. This site class normally would yield 16 to 21+ MBF per acre at 40 years of age, but the presence of laminated root rot will contribute to lower than expected annual volume accrual.

There are 2 riparian/wetland complexes that create operability constraints. One of these is Ecotype E which is surrounded by Ecotype A. The other is a tributary of Rock Creek, Stream 1, which flows southwesterly through EMU 7. Streams and wetlands will be buffered based on their specific physical characteristics according to WA-DNR forest practice rules. These streams and wetlands are further described in the Streams and Wetlands section of this plan.

Soils and Slope Stability

The topography north of the Summit-Landsburg Rd is moderately sloping. The elevation in this area ranges from 450 – 610 ft above sea-level. South of the Summit-Landsburg Rd, the land rises fairly steeply to the south. There are two hills in EMU 11. One hill is approximately 830 feet above sea level in the east end of EMU 11 and the other in the south west corner is approximately 730 feet above sea level. Slopes on the site range from 4 – 30%, but the majority are less than 15%. Average precipitation is 50 inches/year.

There are two soil associations on the site: Everett in the northern two-thirds, and Alderwood in the southern third of the site.

The Everett association is found in glacial outwash areas and is typically 60 or more inches deep. It is very gravelly with 35-70% rock fragments and is thus very permeable. There is low potential for compaction, puddling or erosion. Its excessive permeability can lead to insufficient moisture levels which negatively stress the forest and leave it prone to drought damage from disturbance agents. Douglas-fir is the major tree species associated with this soil association. The site index is 100 based on a 50 year Douglas-fir site index. This equates to a WA-DNR site class III.

The Alderwood association is a dark brown, gravelly, sandy loam associated with glacial till. It is typically 20-40 inches thick and moderately drained. There is moderate potential for puddling or compaction, but little potential for erosion. The site index is 108 based on a 50 year Douglas-

fir site index. This equates to a WA-DNR site class III. There is a high potential for drought and high likelihood of plant competition following harvest.

Streams and Wetlands

The property is just south of the Cedar River and east of Rock Creek, which joins the Cedar approximately ½ mile northwest of the property. The property drains into both Rock Creek and the Cedar. The Cedar River is closest to the property along the east property line of EMU 1 which is about 150 feet west of the river. None of the streams located on the property have been mapped by King County's iMap or are shown in the Cedar River Basin Plan. Stream 1 is a small tributary of Rock Creek that drains into the Cedar River Watershed. On site, Stream 1 flows through a section of the forest that was harvested approximately 20 years ago. This has left the stream with immature riparian cover and relatively little large woody debris. Stream 3 flows south out of a headwater wetland (EMU 12) eventually joining Rock Creek.

Stream 1 is a low gradient tributary of Rock Creek; it flows south westerly through EMU 7. The upper reaches of this stream off the property are likely non-fish bearing. The portion of the stream on the property in EMU 7 appears to be fish bearing based on physical characteristics. Stream 3 is a low gradient, perennial, non-fish bearing stream associated with 3.8 acre Wetland A in the southern portion of the property in EMU 12. It flows south-easterly out of the wetland and off the property. Wetland A is a type B wetland based on WA-DNR forest practice rules. Stream 4 is a perennial non-fish bearing stream (NP) which flows northerly out of Wetland A. It goes sub-surface before reaching the Summit-Landsburg Road. Stream 2 is a seasonal non-fish bearing stream in the northwest corner of EMU 11. The channel is undefined in places and flows sporadically in the rainy season. There is no apparent culvert to carry water across the Summit Landsburg Road.

Fish and Wildlife Habitat

Large tracts of forested land provide habitat for fish and wildlife. These habitats are important in maintaining biological diversity and protecting native species. The Danville-Georgetown forests play a role in providing a variety of habitat functions, including refuge, nesting and feeding sites.

Fish

The WA-DNR forest practice water type GIS layer (WCHYDRO) indicates that Stream 1 is a fish bearing stream (see Streams and Wetlands Map). The GIS layer indicates that Stream 2 is a seasonal non-fish bearing stream and Stream 3 is a perennial, non-fish bearing stream. The data dictionary for the WCHYDRO GIS layer indicates that these stream types are all based on the WA-DNR water type model.

The site is located in the Rock Creek sub basin. Rock Creek provides outstanding fish habitat and is an important stream for all species of salmonids found in the Cedar River Basin (KCSWM, 1993).

Wildlife

The majority of the property was historically managed as commercial forest land. The stands on the property are dominated by planted Douglas-fir. The property currently provides marginal wildlife habitat and poor legacy tree recruitment due to limited species and age diversity and a lack of crown differentiation.

There are significant areas of snags in EMU 5 due to laminated root rot. These snags are beneficial as they increase ecosystem diversity. A second habitat benefit is that the dying Douglas-fir provides growing space for desirable habitat species such as maple, cottonwood, cherry, and shrub species, such as, elderberry, evergreen huckleberry, and hazelnut. The disease also contributes to the presence of down wood beneficial to bird species, frogs, snakes, and salamanders.

A segment of the King County Wildlife Habitat Network along the Cedar River ends approximately 1000 feet east of the property. Another segment is located approximately 1500 feet south west of the property. This network was established in the King County Comprehensive Plan to identify potential travel corridors and protect them from development. This plan does not recommend any use that would conflict with the purpose of the Wildlife Habitat Network.

Understory species present that provide food for wildlife are vine maple, salmon berry, Indian plum, Oregon grape, salal, trailing blackberry, bitter cherry, red elderberry, red huckleberry, cascara, trailing blackberry, ocean spray, hazelnut, and snowberry.

Mammals observed or expected on a forested site like this include black-tailed deer, coyote, elk, Virginia opossum and raccoon. Bird species include spotted towhee, black-capped chickadee, bushtit, Bewick's wren, Stellar's jay and migratory species: black-throated gray warbler, Pacific wren, spotted towhee, Swainson's thrush, solitary vireo, yellow-rumped warbler, and yellow warbler. A complete list of species that may use the property for nesting or feeding based upon habitat that is present are listed in Appendix B.

Threatened and Endangered species

There are no known threatened or endangered species on the property.

Cultural Resources

The forests of Danville-Georgetown Open Space are only about 150 feet from the Cedar River at Landsburg Reach Natural Area. Areas of the Cedar River played an important role for local Native Americans.

Ethnographic evidence indicates that local tribes had a hunter-gatherer mode of existence. The Duwamish people had longhouses in several places along the Cedar River. The Duwamish people also had an elaborate ceremonial complex that included the Duwamish spirit canoe ritual. After the ceremony, Indian doctors who participated in the soul recovery disposed of the spirit canoes and other paraphernalia in trees in remote places away from the village.

In preparing this plan, we consulted WA-DNR about the presence of cultural resources. They stated that based on their maps there are no cultural resource issues on site.

Aesthetics, Recreation and Public Use

The 1997 King County Comprehensive Plan policy I-204(p) and the 1997 Memorandum of Understanding between Polygon, city of Maple Valley and King County require that "95% of the dedicated open space is to remain as natural areas or passive recreation, including activities such as hiking and equestrian trails, and 5% of the open space may be used for low-intensity active recreation such as trails, picnic areas, informal mowed grassy meadows, and children's facilities." The 5% dedicated to active recreation will likely consist of 11 acres adjacent to the school.

There are currently multiuse trails throughout the site that are enjoyed by hikers, equestrians, mountain bikers and runners. The Friends of Rock Creek Valley and the Backcountry Horsemen Tahoma Chapter built and mapped many of these trails. King County Parks is preparing a trails map brochure that will serve as a guide for trail users. An eagle scout constructed and installed a kiosk that has a trails map poster. The Tahoma Junior High School uses the site for cross-country running and a student mountain bike club, as well as for science classes.

One part of the Danville/Georgetown trail predated either the rail line or the town. The Old Indian trail along the south side of the Summit-Landsburg Road is part of an old native American trail that went up to Rattlesnake Lake and is probably over 200 years old. The trails on the south side of Summit-Landsburg are an amazing maze of forested trails bisected by Three Elk Creek and Three Elk Bog. On the eastern edge of these trails (on Palmer Coking Coal's property) is the Ravensdale Canyon. The Ravensdale Canyon was formed when an old, horizontal mine shaft collapsed. Ravensdale Canyon is about ¾ of a mile long, often more than 40 feet deep with steep walls and has three land bridges spanning the Canyon. The trails have been constructed and maintained through active support by the local Back Country Horsemen chapter, King County staff, and other affiliated groups.

Agro-forestry/Special Forest Products

The property has not been assessed for the feasibility of agro forestry or the presence of special forest products. However, the proliferation of salal throughout the site may provide an opportunity to establish a contract with a floral greens vendor.

Management Recommendations

Forest Health

The main forest health concern on the property is the low to moderately severe occurrence of Phellinus sulphurascens. The following recommendations are proposed to reduce Douglas-fir mortality and promote a more diverse stand, which will be more resistant to natural disturbances.

These recommendations are based in part on the consultation with WA-DNR pathologist and the current literature regarding management of laminated root rot. The management strategies in Ecotype A and B will attempt to minimize the severity of the laminated root rot infestation.

The overstocked condition of **Ecotype A** has resulted in abundant snow and wind breakage in the tops and crowns of the 6-10 inch diameter suppressed and intermediate trees. The overstocked state also has created optimum conditions for laminated root rot. Currently there is a low severity of root rot based on indicators. This supports the following thinning recommendations.

Ecotype A will be commercially thinned in 2013-15 using variable density thinning (VDT) guidelines. This thinning will create patches of different densities that are operationally efficient and reduce the severity of laminated root rot. The thinning will include no-thin areas, light thin areas, and gaps. This thinning will be light, not removing more than 30 percent of the basal area. Whenever root rot areas are thinned there is the risk of wind damage. If a severe wind storm occurs within 5 years of thinning, the area will be evaluated for a salvage sale followed by re-planting.

Areas where no thinning will take place will be laid out to widen buffers around Wetland A, along streams, Summit-Landsburg Road and adjoining properties... In root rot centers dead and near dead trees will be left for wildlife habitat. Adjacent to these root rot centers thinning removals will concentrate on providing more growing space for the largest, healthiest most wind firm trees. The stocking of co-dominant and intermediate Douglas-fir between 12 and 18 inches in diameter will be reduced. Trees larger than 18 inches will be retained. Gaps mimicking root rot centers will be created in dense areas of pure Douglas-fir. No gaps will be within 150 feet of root rot centers, Summitt-Landsburg Rd., or openings on adjacent properties. Gaps will be under a fifth of an acre in size. Areas adjacent to these gaps will be thinned lightly or not at all to lessen the probability of wind throw. The thinning will reduce the total stocking 25% from a basal area of 288 sq.ft./ ac. to an average of 215 sq.ft./ ac. Red alder, bigleaf maple, red cedar, black cottonwood, bitter cherry, which are all resistant species, will be retained throughout the ecotype. Promoting the growth of these non-target species will lessen the long term impact of laminated root rot on the residual Douglas-fir. . Follow the thinning with the planting of species resistant to laminated root rot such as western white pine and western red cedar in gaps larger than 1/10 of an acre (approximately 70ft. by 70 ft.) The cedar will be protected from deer browse with plastic vexar tubes or other methods.

The severity of the root rot infestation in **Ecotype B** as a whole is moderate. It is extremely variable based on visual indicators. Some areas have no visible root rot damage and while others have severe visible damage. If left untreated, the ecotype could be vulnerable to bark beetle infestation, other root rot pathogens, and invasive weeds as the severity of the laminated root infestation increases. The highest rates of infection in Ecotype B are in EMU's 5 and 10 along the Summit Landsburg Rd. These areas may be excessively stressed due to well drained, droughty soils. The pathogen appears to have reduced both diameter and height growth in these areas. Approximately 40 acres in the northeast and northwest areas of EMU 5 has a lower severity of root rot infestation, but the variability, age, and low volume per acre precludes commercial thinning.

In order to better determine treatment options, a quantitative inventory of **Ecotype B** should be done in 2013-15. Based on this inventory a variety of possible treatments options will be considered such as replanting of non-target species, thinning with root rot control measures, Douglas-fir uprooting and chipping followed by planting of non-target species, cutting and chipping of visually impacted Douglas-fir followed by planting of non-target species, and areas of no treatment (control). This no treatment area would provide wildlife habitat in the form of small snags and course woody debris. In addition this area would act as a control area to see how the root rot will progress naturally and how the public reacts to this regime as opposed to other control measures. An amendment to this plan will be prepared based on analysis of the quantitative inventory.

Any thinned areas of **Ecotype B** should remove all Douglas-fir with any visible indicators of laminated root rot. Immediately adjacent healthy Douglas-fir should also be cut, as roots from these trees can carry the infection into healthy areas of the stand. Resistant species should not be cut. The severity of infestation appears to be lower in EMU's 1, 3, and the north eastern portions of EMU 5. The thinning can generally be from below removing approximately a third of the basal area. Wherever possible avoid cutting hemlock, cedar, alder, maple, cottonwood, and cherry as they are resistant species.

Ecotype C will be managed to continue to provide a variety of wildlife habitats not available on the rest of the property. The maple, some of which exceed 30 inches Dbh. will be retained for their value as snags. We are not recommending any active management in this ecotype.

Ecotypes F and G seeded in with higher levels of red alder than adjacent areas of Ecotype B. The alder has overtopped the fir in many areas. Both ecotypes are 20 years old, past the optimum time to thin alder. Therefore these two ecotypes will be allowed to develop naturally without human intervention for the term of this plan. If sufficient Douglas-fir survives the ecotype may consist of a mixed species composition in the future. Given the extent of the area of Douglas-fir dominated plantation, retaining the red alder will provide diversity and may help lessen the spread of Phellinus sulphurascens.

The mature maple, hemlock, and fir growing on steep slopes of **Ecotype H** provide mature forest habitat which is rare on this and surrounding properties. This area will be a permanent reserve on this property with no active management activities scheduled within the time period of this plan.

Invasive/Noxious Weeds

The scheduled thinnings will be followed by periodic monitoring for invasive/noxious weeds. Areas of Ecotype B that are left un-thinned or have significant amounts of Douglas-fir removed will need weed monitoring as the Douglas-fir canopy dies. Appropriate control measures will be implemented as necessary.

Fire

The prescribed thinning of Ecotype A and B will lessen the fuel loads and decrease the potential intensity of any fire that might break out. When considering the risk of wildfire it is important to remember that the property is very much in the urban-rural interface with its high risk of ignition sources.

Timber and Wood Products

Commercial thinning will be designed to protect the ecological resources of the site, improve forest health, and provide revenue. Thinning units should be cruised prior to the sale of timber.

An area of approximately 150 acres is recommended for commercial thinning in the near term (2013-2015). Phasing of this thinning is not practical as the risk of mortality from root rot increases for each year the forest grows untreated

Streams will be buffered based on habitat potential, which presumes fish presence. The existing network of old haul roads will be used as much as possible. There may be the need for some minor upgrades or spur roads. Specific thinning guidelines will be incorporated into the timber sale contract.

Soils and Slope Stability

Slopes on the property are moderate and can be harvested, using low-ground-pressure, tracked machinery. Timber sale contracts should specify adequate suspension of logs (½ to ¾ length suspended) to minimize or prevent disturbance to duff and ground vegetation. Yarding should be limited to periods when soils are not saturated, ideally late spring through early fall.

The commercial thinning planned for 2013-15 will require a combination of upgrades to old roads grades and new construction of access roads meeting the current forest practice standards. The existing gravel haul roads do provide a fairly good access network and new construction should be minimal. Whenever possible new roads should be temporary and either converted to trails or decommissioned after harvest. It should not be necessary to cross any streams in constructing access roads. These roads will be constructed on Alderwood and Everett soils,

which support roads well, requiring low to moderate ballast. Road surfacing will depend on what time of year the roads will be used.

Streams and Wetlands

All streams and wetlands will be buffered at a minimum as required by WA-DNR Forest Practice Rules and according to best available science. Streams will be buffered according to presumed habitat.

The thinning of EMU 11 will incorporate riparian and wetland buffers on Streams 2, 3 and 4. The wetland associated with Stream 3 will have an average buffer of 25 feet. All stream buffers will be determined based on physical characteristics as determined in the field and will meet or exceed WA-DNR forest practice rules. This level of assessment will be done when laying out the commercial thinning unit in the field. Based on the existing road network, there should not be a need to cross any streams with any haul roads or skid trails.

The WA-DNR water type layer delineated Stream 1 further south than where it is actually located. The discrepancy varies from 400 feet in the east to 1000 feet near the boundary with Rock Creek Natural Area. The Streams and Wetlands map indicates a more accurate location based on current aerial and Orthophotographs, LIDAR data, and the FLAT assessment. The WA-DNR data model identifies this stream as fish bearing (F), which appears accurate based on field reconnaissance. This water type will be field verified as part of the field layout of the thinning of EMU 5. Riparian buffers widths will exceed state forest practice rules.

All thinning on the property will be laid out in a manner so that hauling or yarding across streams on the property will be avoided or minimized to avoid negative impacts to water quality and fish and wildlife habitat. In addition, yarding requirements will be designed to avoid or minimize disturbance to ground vegetation and duff layers, which will help prevent soil erosion and compaction.

Fish and Wildlife Habitat

Fish

The fish bearing portions of Stream 1 will be buffered with a 94 foot no cut riparian buffer based on current WA-DNR forest practice rules. This will assure future large woody debris recruitment, shade provision, and hydrologic cover. Assuming Stream 3 and 4 are verified as perennial, non-fish bearing, they will have a 50 foot no cut buffer on both sides. The wetland associated with Stream 3 will have a buffer that averages 25 feet. If Stream 2 is verified as a seasonal, non-fish bearing (NS) stream there are no cutting buffers, but a 30 foot equipment limitation zone (ELZ) will apply.

Wildlife

Forest thinning will incorporate prescriptions that provide for the protection and improvement of wildlife habitat.

The commercial thinning will incorporate guidelines to increase the diversity of wildlife habitats the property provides. Specifically;

- Canopy gaps common in old forests are included in the thinning prescription.
- Desirable tree and shrub food sources such as bigleaf maple, black cottonwood, bitter cherry, vine maple, cascara, and red elder berry will not be cut.
- Existing snags will be protected unless operational safety is a concern. High stumping can be used in some places to create short snags.
- No thin areas (skips) will be laid out to widen buffers of wetlands and riparian zones.
- One or two root rot pockets will be left untreated to provide snags and course woody debris for birds and small mammals.

Additional recommendations which will improve or maintain habitat include;

- The retention of some untreated root rot areas of Ecotype B will provide wildlife habitat in the form of small snags and course woody debris.
- Retention of mature maple in Ecotype C for their value as snags.
- The mature maple, hemlock, and fir of Ecotype H provide wildlife trees and snags for birds and other species.
- Ecotype E will remain in natural state to provide wetland and riparian habitat.

Cultural Resources

Washington DNR reviews all forest practice applications to determine if they involve cultural resources. All forest stewardship activities will be evaluated to determine if there are any impacts to cultural resources.

Table 3. Timeline of Forest Stewardship Recommendations

Eco-unit	Recommendation	Year
All	Annual monitoring for invasive species.	Ongoing
11	Light forest health thinning of Ecotype A top reduce competition for sunlight and nutrients,	2013-2015
1, 3,5	Ecotype B: Gather quantifiable data about the severity of root rot infestation and determine feasible, cost effective measures to ensure objectives of the plan are achieved.	2013-2015
11	Ecotype A: Follow commercial thinning with the planting of root rot resistant species in major gaps. Deer browse protection measures will be implemented in conjunction with the planting of cedar.	2014-2016
1, 3, 5	Ecotype B: Amend the Management Recommendations section of this plan based on quantitative inventory of laminated root rot.	2015-2016

Aesthetics, Recreation and Public Use

The commercial thinning of Ecotype A will incorporate measures to help minimize negative aesthetic impacts from the logging operation. Where possible the thinning unit will be configured to avoid disturbance of trail aesthetics. King County Parks staff will map trails that need to be protected from excessive disturbance and slash. These trails will be flagged before the Invitation to Bid (ITB) is offered. The ITB will clearly indicate the purchasers' responsibility for trail protection and restoration when yarding and hauling operations are completed. The ITB will include language that specifies slash reduction standards for slash piles left on log landings. Operators will be encouraged to leave slash in the woods if their log processing equipment allows.

Trail use at Danville-Georgetown Open Space and Henry's Ridge Open Space

King County gathered public input regarding appropriate use of the trails at Danville-Georgetown and Henry's Ridge, including non-motorized users such as: hikers, mountain bikers and equestrians.

The respective forest stewardship plans for both Danville-Georgetown and Henry's Ridge will include trail use recommendations.

King County held a public meeting on April 24, 2013 at Tahoma Junior High School and a second follow-up meeting on July 23, 2013 at the Lake Wilderness Lodge.

Both meetings highlighted four trail use proposals:

1. Trails at both sites will be open to all trail users with no restrictions.
2. Trails at both sites will be open to all users with no restrictions and with the following conditions:
    a. Signage at trailheads would identify which trail group predominantly uses the site and performs the majority of stewardship for that site.
    b. For example, signage would alert trail users that Danville-Georgetown is used and stewarded by the Backcountry Horsemen, and Henry's Ridge is used and stewarded by the Evergreen Mountain Bike Alliance.
    c. The respective groups would work together to communicate to their respective members that any separation of use is voluntary.
3. Trails at both sites would be restricted to hiking and equestrian use only at Danville-Georgetown, and hiking and mountain bike use only at Henry's Ridge, with the following conditions:
    a. At Danville-Georgetown, the area south of the Seattle pipeline would be dedicated as a horse trail training area.
    b. The Tahoma Junior High School mountain bike club would be allowed to use the Danville-Georgetown trails on a weekly basis and under a King County special use permit.
    c. A trail link between the pipeline and the school via the Skunk and Putnam trails would be open to mountain bikers.
4. Trails at both sites would be formally dedicated for specific uses with no exceptions:
    a. Danville-Georgetown would be used exclusively by equestrians and hikers.
    b. Henry's Ridge would be used exclusively by mountain bikers and hikers.

As a result of the two meetings, over 125 public comments were received. Most of the comments reflected the following major ideas:

1. There are minimal conflicts, therefore leave the current use as is.
2. Trails should be open to all uses.
3. Trails should be open to everyone, particularly the junior high students and neighbors.
4. Equestrians should have a dedicated public trail network.
5. Equestrians need a public trail training site for "green" riders and horses.
6. Horses and mountain bikes cannot share the trails safely.
7. It is only a matter of time before someone is injured.

Trail use determination

After careful consideration, trail use proposal number 2 was adopted by King County Parks' managers:

- Trails at Danville-Georgetown Open Space and Henry's Ridge Open Space will be open to all users with no restrictions and with the following conditions:
  a. Signage at trailheads would identify which trail group predominantly uses the site and performs the majority of stewardship for that site.
  b. For example, signage would alert trail users that Danville-Georgetown is used and stewarded by the Backcountry Horsemen, and Henry's Ridge is used and stewarded by the Evergreen Mountain Bike Alliance.
  c. The respective groups will work together to communicate to their respective members that any separation of use is voluntary.

Public Use -- Next steps

In addition, King County Parks will implement the following actions:

1. Work with respective equestrian, mountain bike and school organizations to educate trail users about appropriate trail etiquette.
2. Develop and install new trail safety and etiquette signage.
3. In conjunction with respective equestrian and mountain bike organizations, improve trail conditions and address trail safety issues.
4. Coordinate with equestrian organizations to identify an appropriate site for location of a dedicated equestrian trail training site.
5. Revise and update trail maps and webpages to reflect appropriate uses at Danville-Georgetown Open Space and Henry's Ridge Open Space.

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Appendix A. Four to One Program Policy

The Danville Georgetown Open Space was dedicated to King County as an element of the Maple Ridge Highlands Four-to-One residential subdivision. The open space, including Danville-Georgetown and nearby Henry's Ridge, was dedicated to King County in exchange for the ability to develop a portion of the site at urban residential density.

The goal of the Four-to-One program is to create a contiguous band of open space running north and south along the Urban Growth Boundary (UGB). The details of this open space portion of the policy are described below.

U-185 Through the Four-to-One Program, King County shall actively pursue dedication of open space along the original Urban Growth Area line adopted in the 1994 King County Comprehensive Plan. Through this program, one acre of Rural Area land may be added to the Urban Growth Area in exchange for a dedication to King County of four acres of permanent open space. Land added to the Urban Growth Area for naturally appearing drainage facilities in support of its development does not require dedication of permanent open space.

U-186 King County shall evaluate Four-to-One proposals for both quality of open space and feasibility of urban development. The highest-quality proposals shall be recommended for adoption as amendments to the Urban Growth Area. Lands preserved as open space shall retain their Rural Area designations and should generally be configured in such a way as to connect with open space on adjacent properties.

U-187 King County shall use the following criteria for evaluating open space in Four-to-One proposals:

a. Quality of fish and wildlife habitat areas;
b. Connections to regional open space systems;
c. Protection of wetlands, stream corridors, ground water and water bodies;
d. Unique natural, biological, cultural, historical, or archeological features;
e. Size of proposed open space dedication and connection to other open space dedications along the Urban Growth Area line; and
f. The land proposed as open space shall remain undeveloped, except for those uses allowed in U-188.

U-188 King County shall preserve the open space acquired through this program primarily as natural areas, passive recreation sites or resource lands for farming or forestry. King County may allow the following additional uses only if located on a small portion of the open space, provided that these uses are found to be compatible with the site's natural open space values and functions such as those listed in the preceding policy:

a. Trails;
b. Compensatory mitigation of wetland losses on the urban designated

portion of the project, consistent with the King County Comprehensive Plan and the Critical Area Ordinance; and

c. Active recreation uses not to exceed five percent of the total open space area. Support services and facilities for the active recreation uses may locate within the active recreation area only, and shall not exceed five percent of the active recreation area. An active recreation area shall not be used to satisfy the active recreation requirements for the urban designated portion of the project as required by K.C.C. Title 21A.

Additional policy language describes the requirements associated with the residential development allowed through the program.

Appendix B. Wildlife List

Animals species potentially present at Danville-Georgetown Open Space based upon the type of habitat present, not based upon actual surveys.

Species	Animal Type	Activity
Bald Eagle	**Bird**	**Feeds and Breeds**
Cooper's Hawk	**Bird**	**Feeds and Breeds**
Red-tailed Hawk	**Bird**	**Feeds and Breeds**
American Kestrel	**Bird**	**Feeds and Breeds**
Ring-necked Pheasant	**Bird**	**Feeds and Breeds**
Ruffed Grouse	**Bird**	**Feeds and Breeds**
Spotted Sandpiper	**Bird**	**Feeds and Breeds**
Band-tailed Pigeon	**Bird**	**Feeds and Breeds**
Mourning Dove	**Bird**	**Feeds and Breeds**
Western Screech-owl	**Bird**	**Feeds and Breeds**
Great Horned Owl	**Bird**	**Feeds and Breeds**
Barred Owl	**Bird**	**Feeds and Breeds**
Northern Saw-whet Owl	**Bird**	**Feeds and Breeds**
Vaux's Swift	**Bird**	**Feeds and Breeds**
Anna's Hummingbird	**Bird**	**Feeds and Breeds**
Rufous Hummingbird	**Bird**	**Feeds and Breeds**
Belted Kingfisher	**Bird**	**Feeds and Breeds**
Red-breasted Sapsucker	**Bird**	**Feeds and Breeds**

Downy Woodpecker	**Bird**	**Feeds and Breeds**
Hairy Woodpecker	**Bird**	**Feeds and Breeds**
Northern Flicker	**Bird**	**Feeds and Breeds**
Pileated Woodpecker	**Bird**	**Feeds and Breeds**
Olive-sided Flycatcher	**Bird**	**Feeds and Breeds**
Western Wood-pewee	**Bird**	**Feeds and Breeds**
Willow Flycatcher	**Bird**	**Feeds and Breeds**
Pacific-slope Flycatcher	**Bird**	**Feeds and Breeds**
Hutton's Vireo	**Bird**	**Feeds and Breeds**
Warbling Vireo	**Bird**	**Feeds and Breeds**
Steller's Jay	**Bird**	**Feeds and Breeds**
American Crow	**Bird**	**Feeds and Breeds**
Tree Swallow	**Bird**	**Feeds and Breeds**
Violet-green Swallow	**Bird**	**Feeds and Breeds**
Black-capped Chickadee	**Bird**	**Feeds and Breeds**
Chestnut-backed Chickadee	**Bird**	**Feeds and Breeds**
Bushtit	**Bird**	**Feeds and Breeds**
Red-breasted Nuthatch	**Bird**	**Feeds and Breeds**
Brown Creeper	**Bird**	**Feeds and Breeds**
Bewick's Wren	**Bird**	**Feeds and Breeds**
Pacific Wren	**Bird**	**Feeds and Breeds**
Golden-crowned Kinglet	**Bird**	**Feeds and Breeds**
Ruby-crowned Kinglet	**Bird**	**Feeds**

Swainson's Thrush	**Bird**	**Feeds and Breeds**
Hermit Thrush	**Bird**	**Feeds**
American Robin	**Bird**	**Feeds and Breeds**
European Starling	**Bird**	**Feeds and Breeds**
Cedar Waxwing	**Bird**	**Feeds and Breeds**
Orange-crowned Warbler	**Bird**	**Feeds and Breeds**
Yellow Warbler	**Bird**	**Feeds and Breeds**
Yellow-rumped Warbler	**Bird**	**Feeds**
Black-throated Gray Warbler	**Bird**	**Feeds and Breeds**
Townsend's Warbler	**Bird**	**Feeds and Breeds**
Common Yellowthroat	**Bird**	**Feeds and Breeds**
Wilson's Warbler	**Bird**	**Feeds and Breeds**
Western Tanager	**Bird**	**Feeds and Breeds**
Spotted Towhee	**Bird**	**Feeds and Breeds**
Fox Sparrow	**Bird**	**Feeds**
Song Sparrow	**Bird**	**Feeds and Breeds**
Golden-crowned Sparrow	**Bird**	**Feeds**
Dark-eyed Junco	**Bird**	**Feeds and Breeds**
Black-headed Grosbeak	**Bird**	**Feeds and Breeds**
Red-winged Blackbird	**Bird**	**Feeds and Breeds**
Brown-headed Cowbird	**Bird**	**Feeds and Breeds**
Purple Finch	**Bird**	**Feeds and Breeds**
House Finch	**Bird**	**Feeds and Breeds**
Red Crossbill	**Bird**	**Feeds and Breeds**

Pine Siskin	**Bird**	**Feeds and Breeds**
American Goldfinch	**Bird**	**Feeds and Breeds**
Evening Grosbeak	**Bird**	**Feeds and Breeds**
Northwestern Salamander	**Amphibian**	**Feeds and Breeds**
Long-toed Salamander	**Amphibian**	**Feeds and Breeds**
Rough-skinned Newt	**Amphibian**	**Feeds and Breeds**
Western Toad	**Amphibian**	**Feeds and Breeds**
Pacific Chorus (Tree) Frog	**Amphibian**	**Feeds and Breeds**
Red-legged Frog	**Amphibian**	**Feeds and Breeds**
Northwestern Garter Snake	**Reptile**	**Feeds and Breeds**
Common Garter Snake	**Reptile**	**Feeds and Breeds**
Black Bear	**Mammal**	**Feeds and Breeds**
Black-tailed Deer	**Mammal**	**Feeds and Breeds**
Bobcat	**Mammal**	**Feeds and Breeds**
California Myotis	**Mammal**	**Feeds and Breeds**
Common Porcupine	**Mammal**	**Feeds and Breeds**
Coyote	**Mammal**	**Feeds and Breeds**
Creeping Vole	**Mammal**	**Feeds and Breeds**
Deer Mouse	**Mammal**	**Feeds and Breeds**
Douglas' Squirrel	**Mammal**	**Feeds and Breeds**
European Rabbit	**Mammal**	**Feeds and Breeds**
Hoary Bat	**Mammal**	**Feeds**
Little Brown Myotis	**Mammal**	**Feeds and Breeds**

Long-tailed Vole	**Mammal**	**Feeds and Breeds**
Mountain Beaver	**Mammal**	**Feeds and Breeds**
Mountain Lion	**Mammal**	**Feeds and Breeds**
Muskrat	**Mammal**	**Feeds and Breeds**
Raccoon	**Mammal**	**Feeds and Breeds**
Shrew-mole	**Mammal**	**Feeds and Breeds**
Silver-haired Bat	**Mammal**	**Feeds and Breeds**
Townsend's Chipmunk	**Mammal**	**Feeds and Breeds**
Townsend's Vole	**Mammal**	**Feeds and Breeds**
Trowbridge's Shrew	**Mammal**	**Feeds and Breeds**
Vagrant Shrew	**Mammal**	**Feeds and Breeds**
Western Spotted Skunk	**Mammal**	**Feeds and Breeds**
Yuma Myotis	**Mammal**	**Feeds and Breeds**

Appendix C. Root Rot Infestation Analysis

American Forest Management conducted an analysis of the root rot infestation in Ecotypes A and B. Please see the report that follows.

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ASSESSMENT & ANALYSIS OF ROOT DISEASE SEVERITY

Danville-Georgetown Open-Space Tract
Ecological Management Units 1, 3, 5 and 10

July 31, 2013

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Addenda

I. Danville-Georgetown Root Rot Survey Map
II. Site/Tree Photos

Summary

The quantitative assessment of the severity of root disease within the Danville-Georgetown Open Space forested tracts was a primary recommendation outlined in the Danville-Georgetown Open Space Forest Stewardship Plan. The stewardship plan was written based on information provided through the Integrated Urban Forests Assessments (IUFA) Project initiated by the American Recovery and Reinvestment Act. The project developed a methodology to rapidly assess the composition of vegetation on large areas of open space. This protocol is known as the Forestland Assessment Tool (FLAT). The FLAT assessment was completed on the subject area in the summer of 2012. The FLAT assessment indicated a noteworthy amount of tree mortality caused by root disease.

One of the major goals or objectives of the Forest Stewardship Plan is to 'Improve or maintain forest ecosystem health through active management; specifically addressing root rot problems'. To that end, the root rot analysis project was initiated. The FLAT assessment indicated the most severe root disease issues in Ecological Management Units (EMU) 1, 3, 5, and 10.

A thorough walk-through inspection of the subject EMU's and mapping of infected areas does indicate a significant occurrence of root disease infection centers. Root disease is widespread across the site and found in small groupings of one to several trees. Inoculum levels are high and have been for many decades.

Whether the effects of the disease are considered good or bad depends on the management objectives for the site. In an otherwise monoculture of Douglas-fir, the root disease pathogen is creating many small openings in the forest and allowing for the establishment of other native species.

There are large diseased areas within the EMU's where active management is necessary to meet forest stewardship goals and objectives. In these areas, the future health of the forest can be enhanced by removing host species through group selection harvest and establishing variations of both deciduous and coniferous species that are either resistant or immune to the root rotting pathogen. Over the next several decades, management goals will concentrate on diminishing inoculums levels.

Introduction

Background

The Danville-Georgetown Open Space Tracts were dedicated to King County during the development of surrounding areas through the Four-to-One Program. In simple terms, one acre of rural land may be added to the urban growth area to be developed in exchange for a dedication of four acres of permanent open space.

The County has developed a forest stewardship plan for the subject property to address forest conditions and provide management recommendations to guide long-term stewardship of the forest. In developing the plan, the severity of root disease was determined to be a priority issue of concern.

The subject tracts have been historically managed as commercial forestland. The subject areas were harvested in the early 1990's and artificially reforested with Douglas-fir seedlings. A complete description of forest conditions (Ecotype B) is discussed in the forest stewardship plan.

Assignment

The primary goal of the forest stewardship plan is to 'improve and maintain forest ecosystem health through active management, specifically addressing root rot problems'. Our assignment is to assess the severity of root disease on the property and to provide management recommendations in conjunction with stewardship goals. The assignment includes:

1. Conduct a thorough inspection of EMU's 1, 3, 5 and 10
2. Document and map root disease infection centers and/or areas of high tree mortality
3. Map priority areas for active management to improve forest health

4. Describe and discuss best management practices for addressing root disease issues

Limits of Assignment

The assignment is limited to the information gathered during the site visit on June 6th, 2013 and references noted in this report. Information from published sources cited herein is assumed to be reliable.

Purpose and Use of Report

The purpose of this report is to assess the severity and extent of root disease within the subject EMU's. This report will be used to amend the recommendations section of the Danville-Georgetown Open Space Forest Stewardship Plan to properly address root disease concerns.

Observations

The composition of the forest within the subject EMU's is fairly consistent. The subject areas were harvested and reforested within a relatively short time frame. The age of the planted Douglas-fir trees ranges between 20 and 24 years. Douglas-fir growth rates vary by soil conditions. Tree growth is better in EMU's 1 and 3 and the east portion of EMU 5 where soils are likely deeper and less rocky. Dominant Douglas-fir trees on the higher site ground range between 9" and 13" DBH (diameter at breast height – 4 ½' above ground) and 50' to 70' in total height.

No management activities appear to have taken place since the time of planting. No evidence of pre-commercial thinning was observed. In many areas, Douglas-fir trees have been outcompeted by native hardwood species of red alder, bitter cherry, big leaf maple and black cottonwood. Natural decline and mortality of Douglas-fir by suppression was observed in all EMU's. Heaviest suppression of Douglas-fir by hardwood species was observed in EMU 1.

The occurrence of Laminated root rot, *Phellinus sulphurascens*, formerly referred to as *Phellinus weirii* was observed in all subject EMU's. This is evident by the presence of wind-thrown Douglas-fir trees with decayed root wads characteristic of the disease; dead and dying Douglas-fir trees, tree crowns with reduced height growth; and chlorotic and sparse foliage. Dead Douglas-fir trees are primarily found in very small groupings, where tree species that are resistant to the disease are naturally regenerating. Infection centers are small averaging less than an eighth of an acre in size and scattered throughout the subject EMU's. The largest and most notable infection centers have been delineated on the root rot survey map, which can be found in the appendix.

EMU 5 has the highest concentrations of root disease. Larger infection centers were observed in most portions of the EMU, as well as diffuse small pockets of disease killed trees. The northwest portion of EMU 5 has less tree density than other portions of the EMU, but this is attributable to poor site conditions (rocky soils) rather than the prevalence of root disease.

All root disease areas are regenerating naturally to a mix of native hardwood species and lesser components of western hemlock and western red cedar. Hardwood species regenerating these disturbance areas are primarily comprised of cascara, big leaf maple, and vine maple; with moderate to lesser components of red alder, bitter cherry, black cottonwood and Scouler willow. Western hemlock was observed as well in most infection centers and does not appear to be affected by the disease. Western red cedar was observed regenerating naturally in roughly half of the larger infected areas.

The presence of sawdust from Douglas-fir beetles was observed on several dead trees. No bark beetle infestations were observed on live trees.

Discussion

Phellinus sulphurascens, like most other root rotting pathogens is believed to be a natural part of the forest ecosystem, having coevolved with the host species. Although it is not clearly understood, the pathogen may be

a necessary and vital component of that forest ecosystem. Fortunately, it will not destroy entire stands of timber over large areas and does not threaten the existence of any host species.

The disease is spread when the roots of a healthy tree come into contact with infected roots or stumps. After roots are infected, it can take 5 to 15 years for declining crown symptoms to occur and up to another 10 years beyond that for mortality to ensue.

In the subject EMU's the distribution of laminated root rot is diffuse or scattered throughout. Infected trees are widely scattered but fairly uniform across the timber stands. Small groupings of one to several trees are being affected.

Phellinus sulphurascens is a disturbance agent that generally increases ecosystem diversity (Thies). Host tree species are selectively killed making growing space available for immune tree species. These disturbed areas or infection centers develop a distinctive stand structure with a big component of large woody debris and snags. Wildlife habitat is usually enhanced by the disease. Often time's resource managers will elect a "no action" option because of the beneficial effects caused by the disease; which are increasing plant diversity and enhancing wildlife habitat.

Managing the root disease will require long-term planning and effort. The objective is to decrease the amount of inoculum over time by introducing and/or allowing resistant and immune species to develop. The ability of the disease to intensify is directly related to the amount of initial inoculum and the prevalence of host species. Much of the original *Phellinus sulphurascens* inoculum was likely left undisturbed during the last timber harvest 20 plus years ago. With the immediate reintroduction of a highly susceptible species, the disease has remained and perhaps intensified. The pathogen can survive in large infested stumps for as long as 50 years and can live in small diameter roots for at least 8 years (Thies). The natural regeneration of host species within infected areas will maintain inoculum densities; therefore host species should be removed during management activities.

Recommendations

The subject open-space properties are to serve as a model for forest stewardship in providing ecological, economic and social benefits to the community. Active management is an essential part of good forest stewardship.

The attached root rot analysis map identifies priority areas for active management. The most significant root disease infection centers in the subject EMU's are identified on this map. Many root rot infested areas only comprise a few dead or dying trees and were not mapped. The sum of the mapped root rot infection areas is 8.2 acres or 6% of the total area of 135.9 acres. Priority areas for active management are also delineated on the map. These areas encompass the largest infection centers and total an additional 10.1 acres. Total areas identified as high priority for active management total 16.5 acres or 12% of the total subject area.

Thinning is not a recommended action in the subject EMU's due to the potential for wind-throw. Because the distribution of the disease is diffuse, the potential for wind-throw post thinning will be very high. Given the high amount of recreational use on the property, actions to minimize the amount of wind-throw are important.

Group selection harvest to target priority areas for treatment is the recommended course of action. This will help to prevent the spread of disease into non-infected areas. Group selection harvests shall be delineated to include any host tree within 30' of an infected tree, even though it may appear healthy there is a good chance the tree is infected. This will ultimately help to minimize the spread of the disease. Group selection harvests are appropriate to meet forest stewardship goals. The mapped areas can be expanded or combined to generate revenues as part of potential bio-solid/wood fiber research projects on the property. Group selection harvests can range from 1 acre to 20 acres depending on manager goals.

Areas that are harvested shall remove all of the host species (Douglas-fir) regardless of size from the treatment unit. The goal is to diminish the amount of inoculum over time. As long has host species exist, the innoculum

will remain. Treatment areas shall be reforested with resistant and immune tree species. Western red cedar has naturally established itself across the site and would do well if artificially regenerated. All of the native hardwoods are immune. Treatment areas can be converted to small red alder plantations to meet stewardship goals by producing fiber on a short rotation. To improve forest diversity, each treatment area should be uniquely reforested based on site conditions.

Conclusions

The occurrence and spread of root rotting pathogens is significant. Root disease is widespread across the site and found in small groupings of one to several trees. Whether the effects of the disease are considered good or bad depends on the management objectives for the site. In an otherwise monoculture of Douglas-fir, the root disease pathogen is creating openings in the forest and allowing for the introduction of other native species.

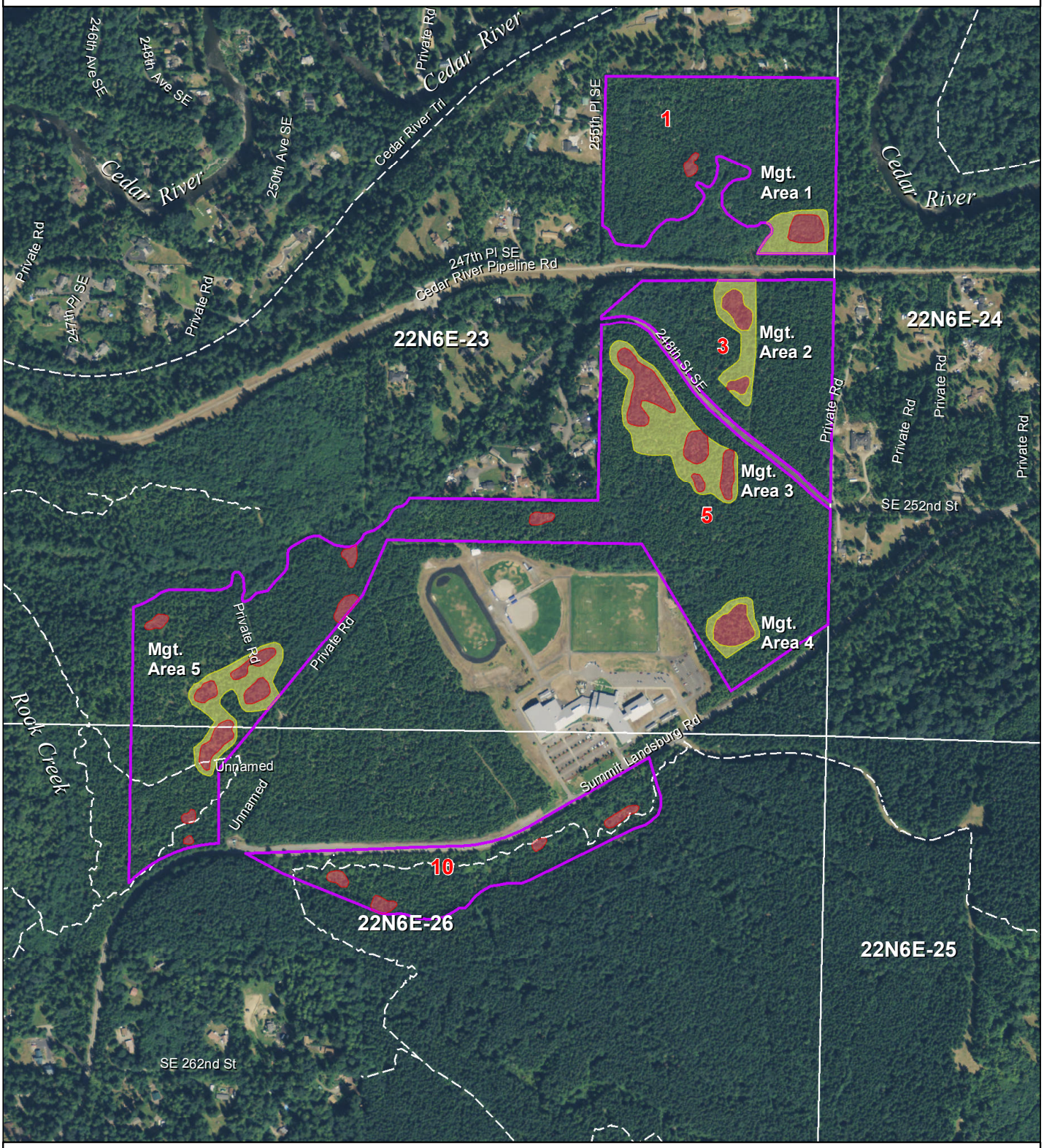
There are some larger diseased areas within the EMU's where active management is warranted and necessary to meet stewardship goals. In these areas, the future health of the forest can be enhanced by removing highly susceptible species through group selection harvest and establishing variations of both deciduous and coniferous species that are either resistant or immune to the root rotting pathogen.

Bibliography

Thies, Walter G.; Sturrock, Rona N. 1995 Laminated Root Rot in Western North America. Resource bulletin PNW-GTR-349 USDA Forest Service, Pacific Northwest Research Station

Goheen, E.M. and E.A. Willhite 2006. Field Guide to Common Diseases and Insect pests of Oregon and Washington Conifers. R6-NR-FID-PR-01-06. Portland OR: USDA Forest Service, Pacific Northwest Region

Danville Georgetown Root Rot Survey Map



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PNW

AFM
American Forest Management

Map by AFM, Kirkland, WA **7/24/2013**

N

1 inch = 800 feet

0 800 Feet

- Laminated root rot infection area
- Active management
- HMU bdy.
- Trail
- Section line

Appendix B – Site/Tree Photos

Wind-throw of infected Douglas-fir tree

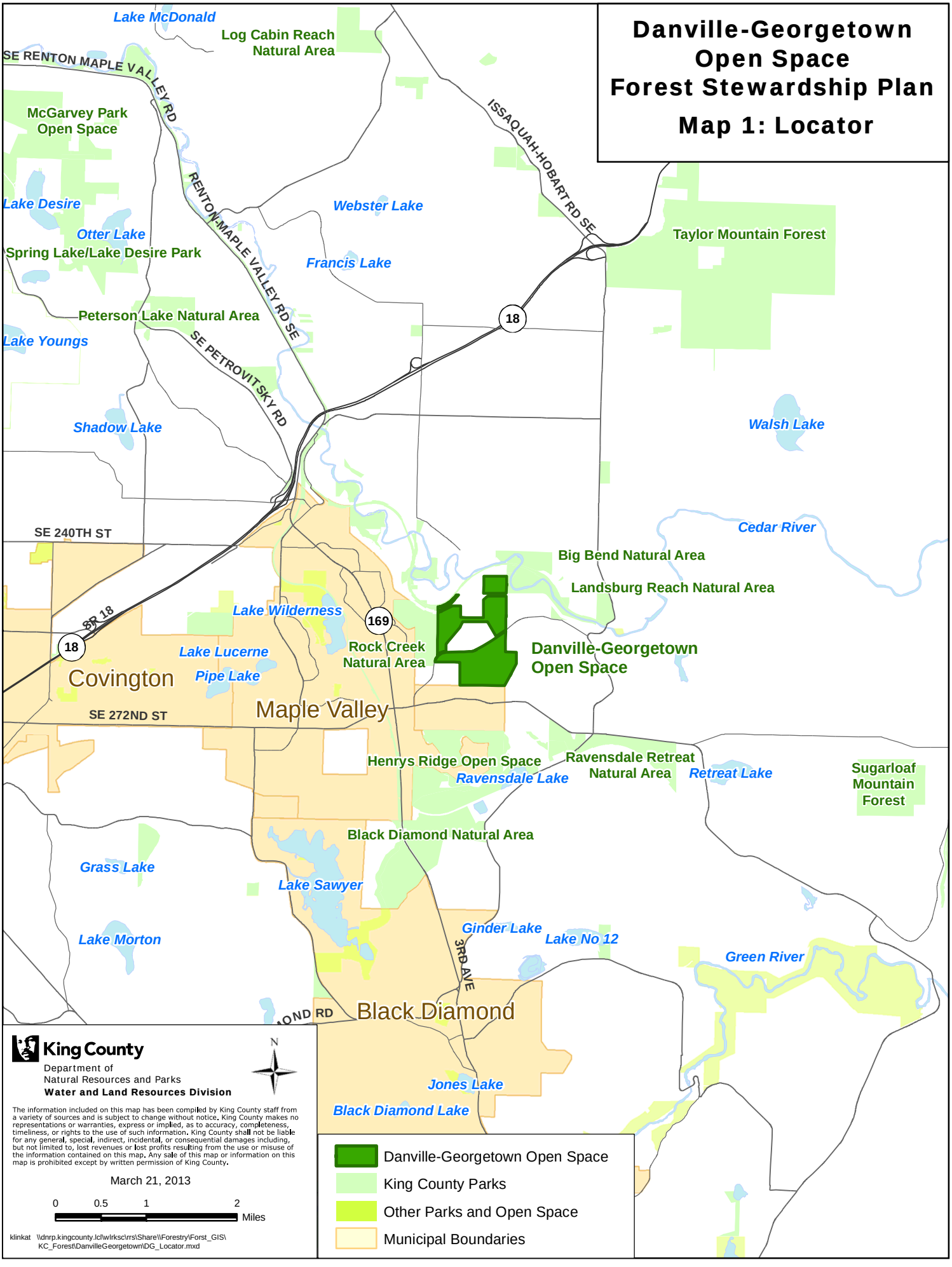
Recent mortality and crown symptoms caused by *Phellinus*

Infection center regenerated by native hardwood species

Infection center regenerated by native hardwood species and western hemlock

Danville-Georgetown Open Space Forest Stewardship Plan

Map 1: Locator



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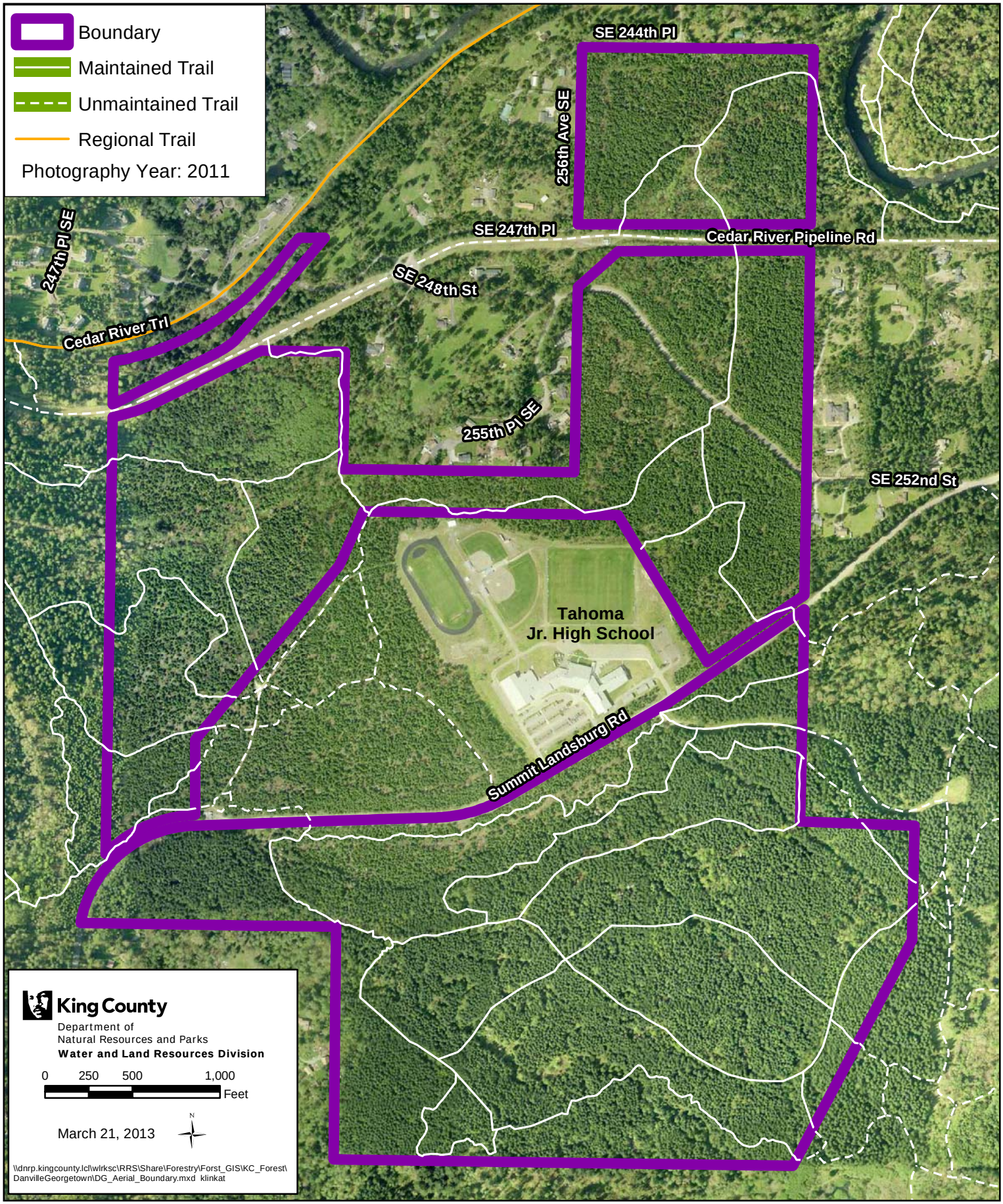
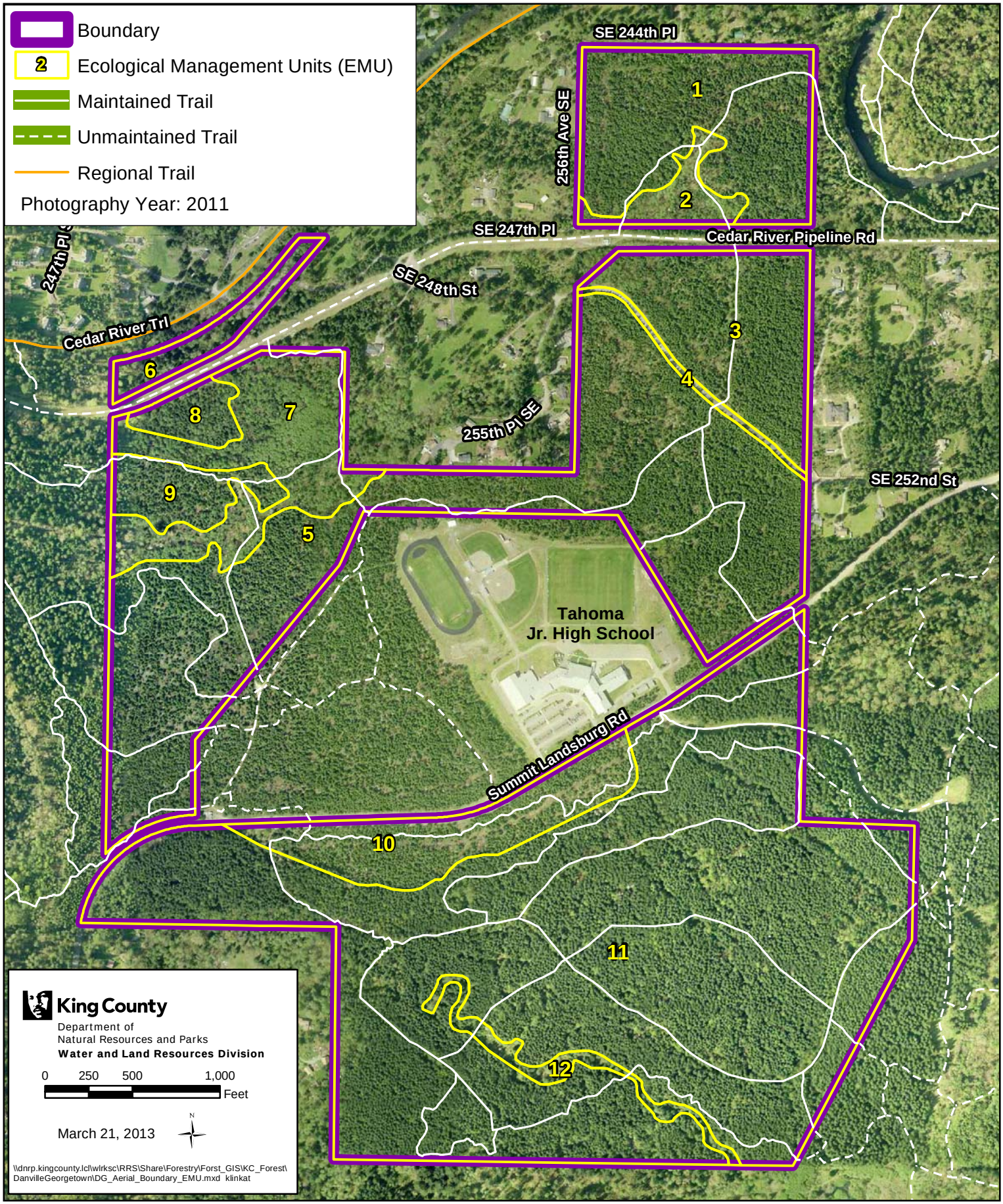
Danville-Georgetown Open Space Forest Stewardship Plan

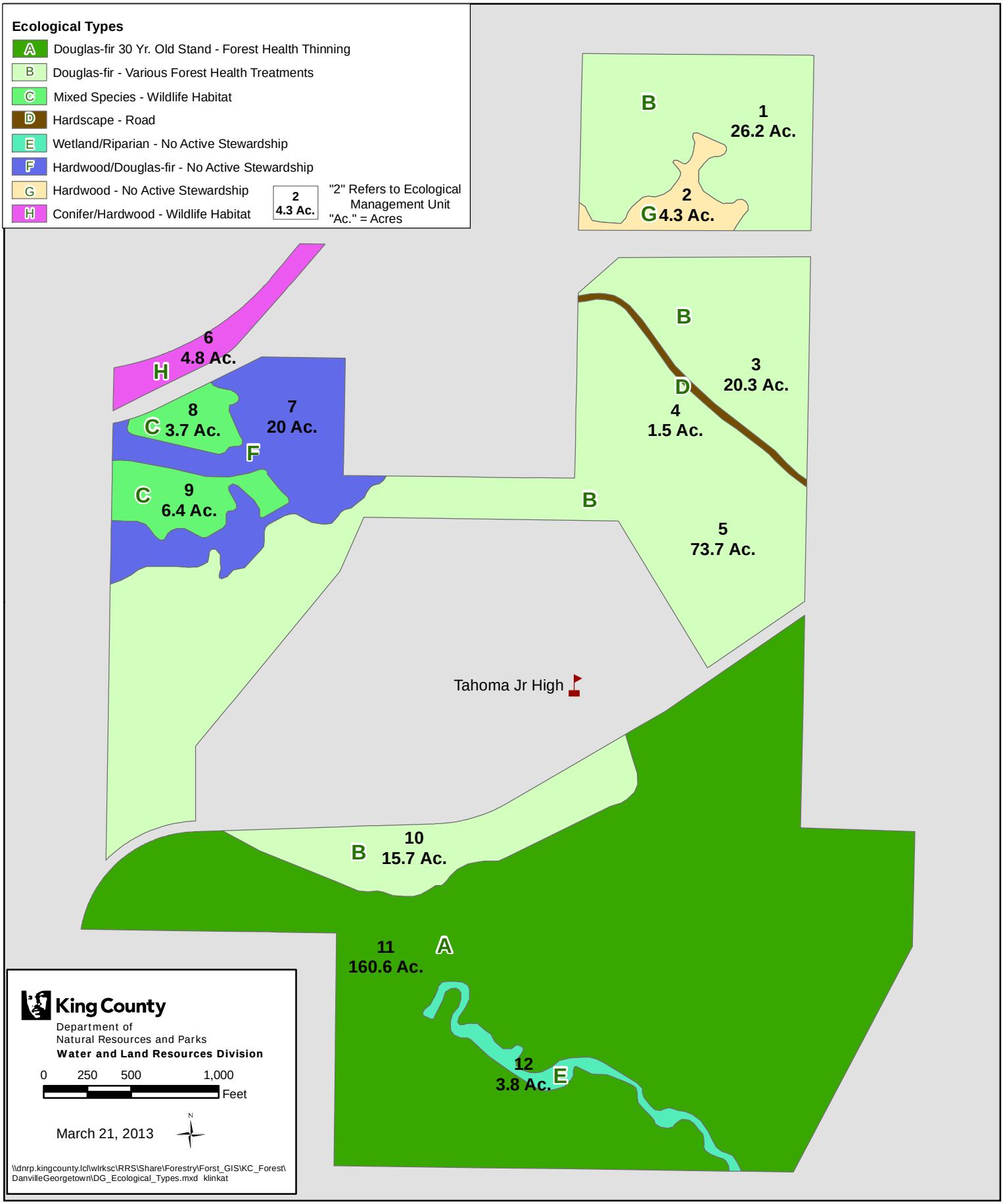
Map 2: Boundary on Aerial Photo



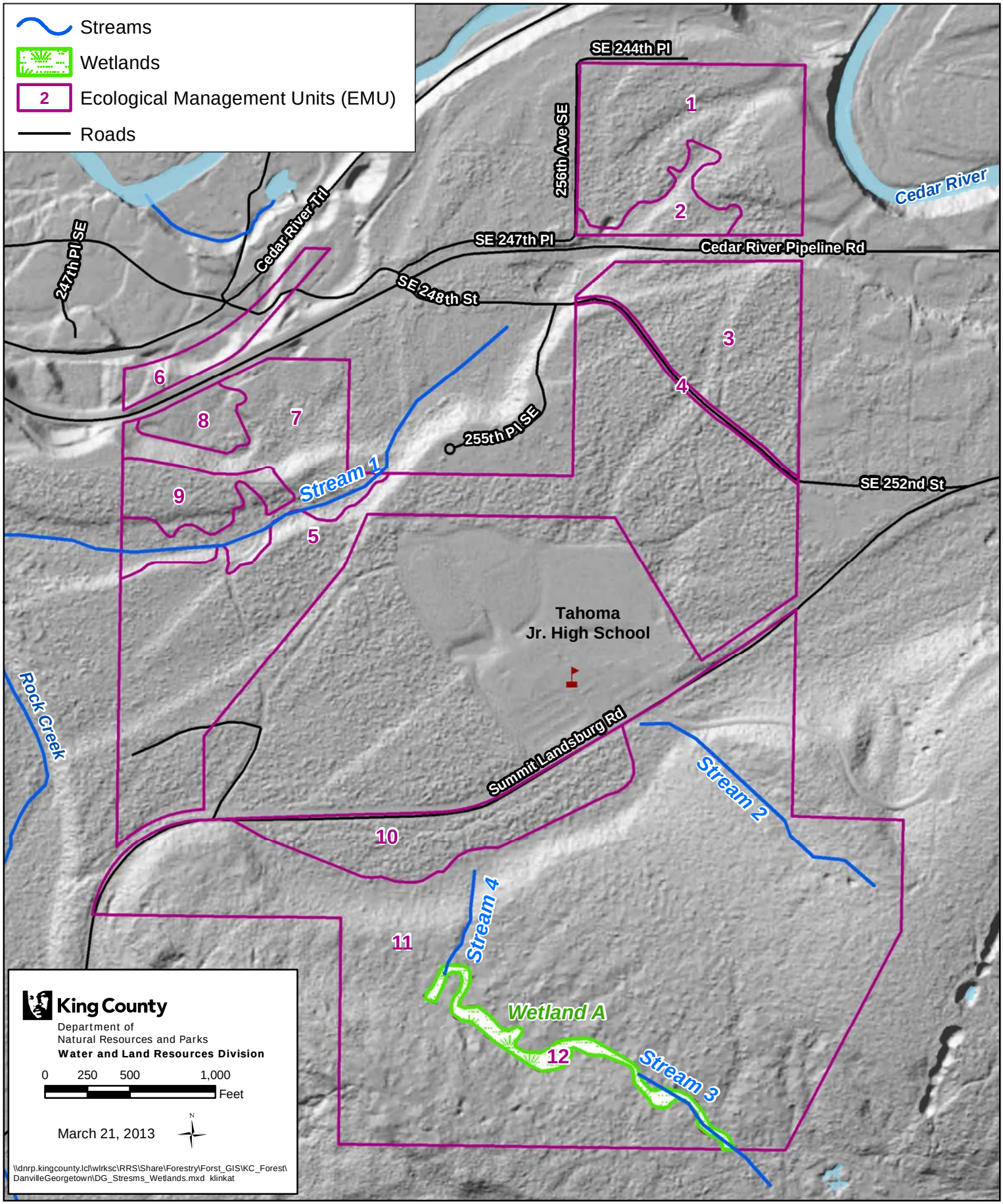
Danville-Georgetown Open Space Forest Stewardship Plan
Map 3: Boundary and Ecological Mgmt. Units on Aerial Photo



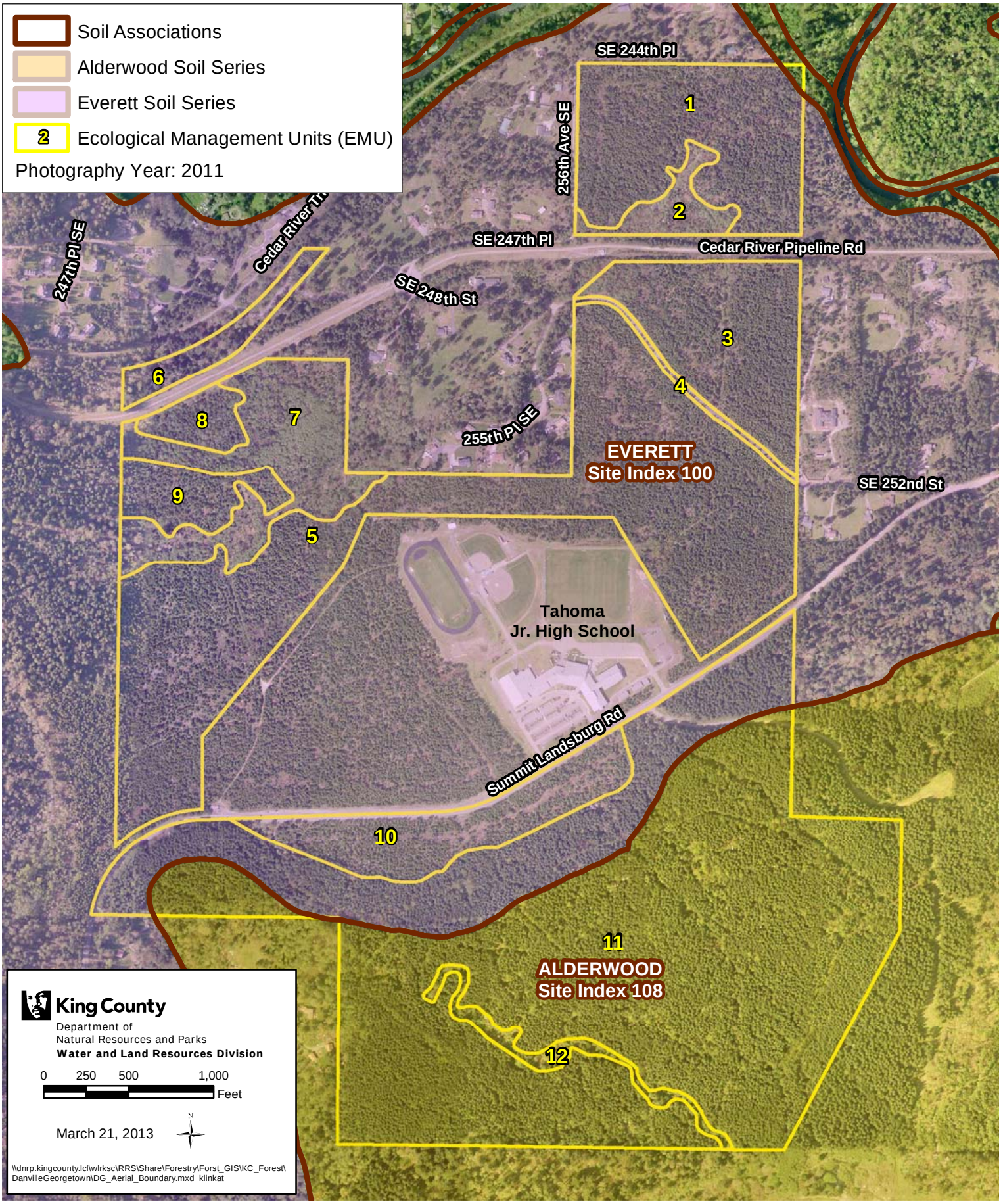
Danville-Georgetown Open Space Forest Stewardship Plan
Map 4: Ecological Types with Stewardship Treatments



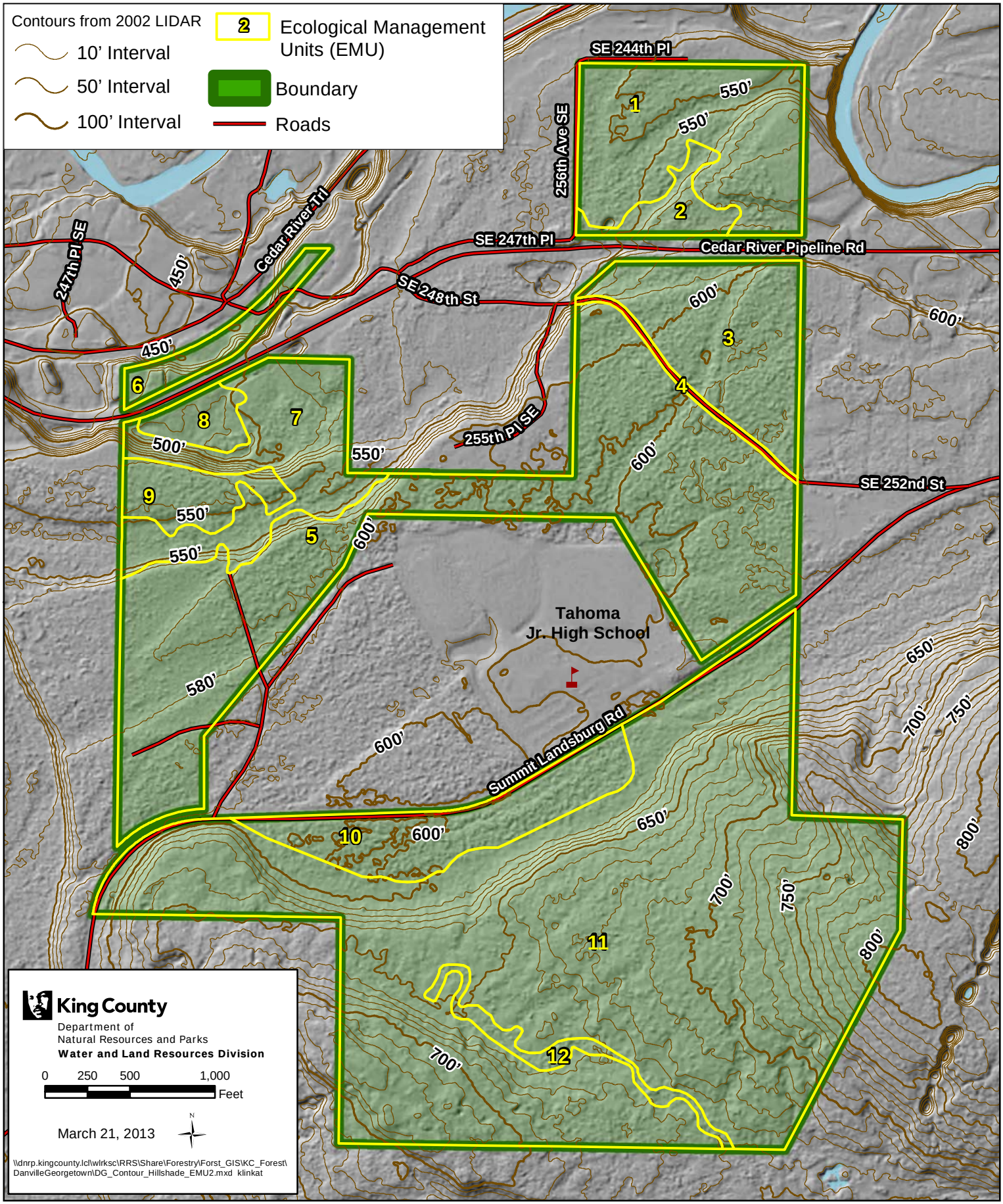
Danville-Georgetown Open Space Forest Stewardship Plan
Map 5: Streams and Wetlands



Danville-Georgetown Open Space Forest Stewardship Plan
Map 6: Soil Associations



Danville-Georgetown Open Space Forest Stewardship Plan
Map 7: Contours, Hillshade and Ecological Management Units



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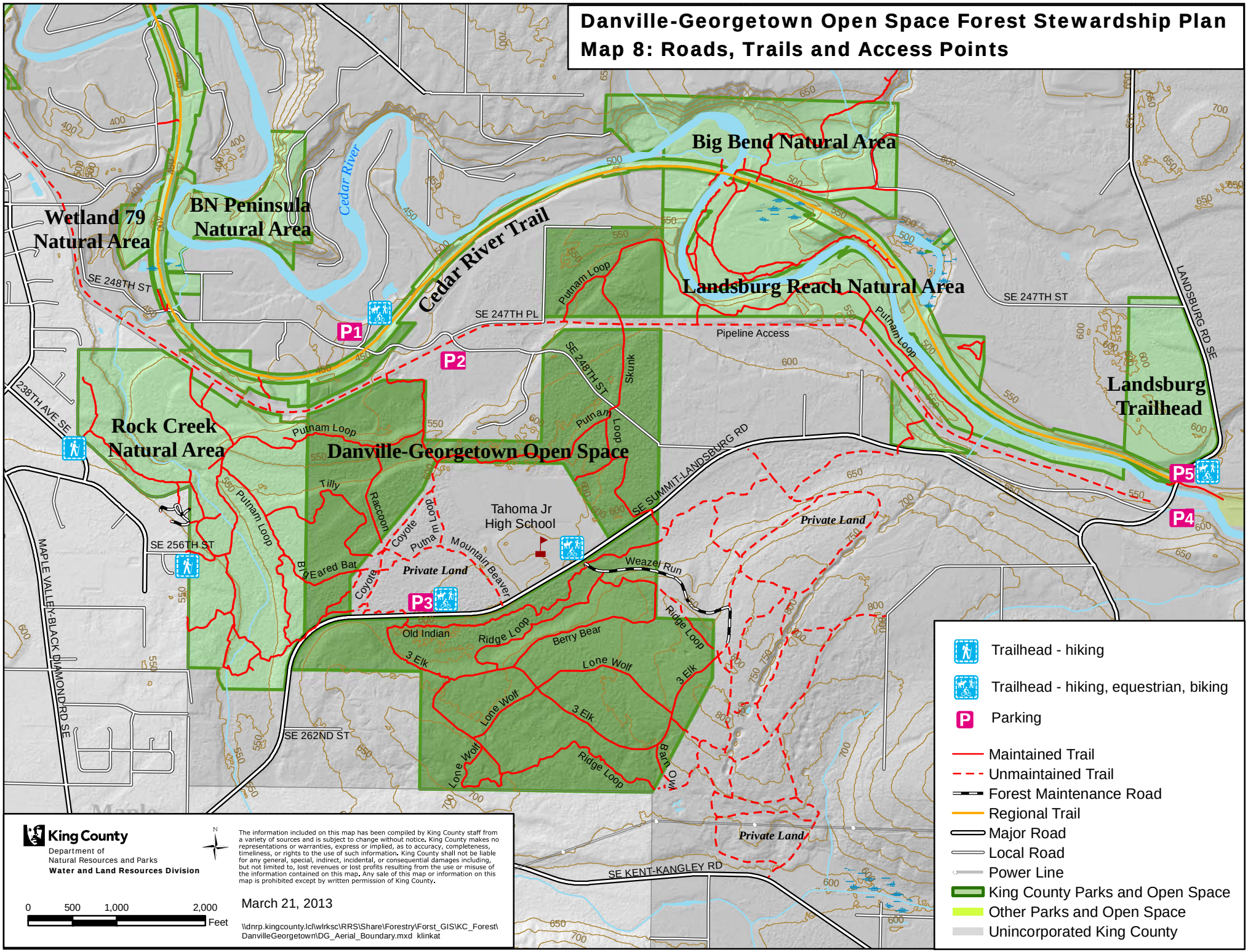
Danville-Georgetown Open Space Forest Stewardship Plan
Map 8: Roads, Trails and Access Points



Trailhead - hiking

Trailhead - hiking, equestrian, biking

P Parking

Maintained Trail

Unmaintained Trail

Forest Maintenance Road

Regional Trail

Major Road

Local Road

Power Line

King County Parks and Open Space

Other Parks and Open Space

Unincorporated King County

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March 21, 2013

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