DRAFT

Dockton Forest Stewardship Plan

January, 2014

DRAFT

King County

Report produced by:
King County Department of Natural Resources and Parks
Water and Land Resources Division
Parks and Recreation Division
201 South Jackson Street, Suites 600 and 700
Seattle, WA 98104-3855
(206) 477-4527

Suggested citation for this report:
King County. 2014. Dockton Forest Stewardship Plan. King County Department of Natural Resources and Parks, Seattle, Washington.

Executive Summary

The Dockton Forest Stewardship Plan provides natural resource analysis and management recommendations to guide the long-term stewardship of this forested open space property. The property is approximately 120 acres located in the south end of Maury Island. Dockton Forest 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.

Stewardship Goals

1. Provide opportunities for low impact trail based recreation. Maintain and enhance the trail system that already exists on the property.
2. Maintain and enhance forest health by increasing the structural complexity, wildlife habitat value, and species diversity through active management. Address root rot problems.
3. Thin plantations to accelerate the development of late seral stage characteristics. Ensure that plan is supported by community and user groups.
4. Retain deciduous species for ecological and aesthetic diversity.
5. Protect riparian and wetland resources.
6. Generate financial support for the ongoing forest stewardship on this and other Parks forestlands.

Desired Future Conditions in 50 years (2064)

The 120acres that comprise Dockton Forest will be managed to accelerate the development of old-growth structural complexity, while maintaining moderate stocking levels and volume growth. Specific characteristics include:

- An overstory cohort of large trees (>24” dbh) with full crowns
- Multiple canopy layers, including shrub and herbaceous layers.
- Horizontal patchiness, including gaps
- Wildlife trees: live trees with decadence and/or habitat structures

- Large snags (>15” dbh)
- Large course woody debris (CWD) (>12” small end diameter and >30’ in length)
- A diverse plant community including hardwood and conifer trees, tall shrubs, low shrubs, herbs, epiphytes, lichens, fungi, herbs, etc. Tree layers should contain a majority of conifers, but also contain a significant component of hardwoods.

The desired future conditions can be achieved through multiple variable density thinning and retention harvest entries over the next 50 years. Thinning will maintain recreational values while also producing a significant amount of revenue. No even age regeneration harvests should be necessary. After 50 years, the management goals can be reassessed based on forest conditions and social values at that time.

Introduction

This forest stewardship plan covers portions of eight King County parcels that make up all or part of Dockton Park, Dockton Natural Area and Dockton Forest. Collectively for the purpose of this plan these parcels will be known as Dockton Forest. The maps included with this plan clearly indicate the planning area. This document provides general property and acquisition information, a description of existing site conditions, management recommendations, and a forest stewardship timeline of these management recommendations for Dockton Forest.

General Property Information

Dockton Forest is owned and managed by the King County Department of Natural Resources and Parks, Parks and Recreation Division. Located on the south-central part of Maury Island on either side of SW 260th St., the property is comprised of eight adjacent parcels. The northeastern and central parcels are 19.5 and 26.4 acres respectively. The large, central parcel is 43.4 acres in size. This parcel was formerly leased to King County from Washington Department of Natural Resources (WA-DNR). The County bought all rights to the property with the exception of mineral rights in December 2013. The two northwestern parcels form the upland forest portion of Dockton Park to the west. Dockton Park is managed by the King County Parks and Recreation Division with an emphasis on water-based activities such as a boat launch and overnight boat moorage. The four southwestern parcels were all purchased together in 2008. South and east of Dockton Forest is the Maury Island Natural Area, a former gravel pit now owned and managed by King County Parks.

Table 1. Dockton Forest General Information.

Best Available Address	West end of SW 260th St on Maury Island
Thomas Guide Map Location	Page 713, G3
Legal Description	Section 29, Township 22, Range 03
Acreage	120
Drainage Basin	Vashon Island
WRIA	9
Council District	8

Table 2. Dockton Forest Parcel Information.

Parcel Number	Acreage*	Purchase Date	Ownership	Previous Names	Zoning	Funding Source	Recording Number
2051200315	14.8**	2/1/1936	Fee	Smith	RA-10-SO	Unknown	1582064000
2922039002	19.4	2/2/2005	Fee	WA DNR	RA-10-SO	WA-DNR Trust Land Transfer	20050202001614
2922039003	26.4	9/12/2007	Fee	Smith property	RA-10-SO	Conservation Futures	20070912000796
2051200370	3.5	3/24/2008	Fee	Dockton Heights LLC	RA-5-SO	Conservation Futures	20080324002261
2051200380	3.8	3/24/2008	Fee	Dockton Heights LLC	RA-10-SO	Conservation Futures	20080324002261
2051200365	4.3	3/24/2008	Fee	Dockton Heights LLC	RA-10-SO	Conservation Futures	20080324002261
2051200375	4.1	3/24/2008	Fee	Dockton Heights LLC	RA-10-SO	Conservation Futures	20080324002261

DRAFT

Parcel Number	Acreage*	Purchase Date	Ownership	Previous Names	Zoning	Funding Source	Recording Number
2922039004	43.2	12/27/2013	Fee	WA-DNR Dockton Forest Lease Site	RA-10-SO	WA-DOE open space acquisition funds	20131227000430

*acreage from King County Assessor's data. **The actual parcel size is 20.5 acres.

Acquisition History, Funding Sources and Deed Restrictions

As mentioned, this forest stewardship plan covers portions of eight King County parcels that make up all or part of Dockton Park, Dockton Natural Area and Dockton Forest. Collectively for the purpose of this plan these parcels total 120 acres and will be known as Dockton Forest. These parcels were acquired through a variety of funding sources.

In 2005, the 19.4 acre parcel number 9002 was acquired through the Washington State Department of Natural Resources (WA-DNR) Trust Land Transfer program. This program establishes a source of funding for WA-DNR to dispose of lands managed under the trust mandate that are determined to be ecologically sensitive and/or are not appropriate to manage for large-scale revenue generation. Prior to the transfer, the property was managed by WA-DNR primarily for timber production as an even-age working forest and was clearcut in the early 1980's. In the early 2000,s a variety of groups on Vashon Island, including the Vashon Maury Island Land Trust, the Vashon Forest Stewards, Vashon Audubon, the Vashon equestrian community, and the Vashon mountain biking community, advocated for the transfer and worked with King County and WA-DNR to make it happen. Lands that are transferred through the Trust Land Transfer program cannot be developed and must be managed as public open space. Timber harvest is not precluded on lands that are transferred through this process.

The 43-acre parcel number 9004 was not transferred in fee but was leased by King County from the WA-DNR for a 25-year period commencing in 2005. Due to the potential value of the gravel deposits on the site and the proximity of the (former) Glacier Northwest gravel mining operation, WA-DNR was not willing to dispose of the land outright. The lease option offered a good way for WA-DNR to transfer management of

the site to King County and free the site from the obligation of generating timber harvest revenue for the school Trusts. When King County took ownership of the former Glacier mine site in 2010, now called the Maury Island Natural Ara, the county approached WA-DNR about acquiring the former lease site. The 43-acre parcel was purchased from WA-DNR in December, 2013 using Washington Department of Ecology funds that had been appropriated for open space preservation on Vashon and Maury Island.

The Dockton Natural Area parcels 9003, 0370, 0380, 0365 and 0375, which total 42 acres, were acquired with Conservation Futures Tax funding as part of the Maury Island Initiative. The Maury Island initiative came about after money that was set aside to acquire the Glacier Northwest gravel pit on Maury Island became available when negotiations between King County and Glacier Northwest did not result in a sale in 2006. The money had been set aside for conservation efforts on Maury Island. King County worked with the Vashon-Maury Island Land Trust to identify several sites on Maury Island that would contribute to conserving the Maury Island shoreline. Although the Dockton Natural Area parcels do not contain shoreline, the large upland forest component provided an ecological connection to both Quartermaster Harbor and Dockton Forest. The Conservation Futures tax (CFT) levy is a dedicated portion of property taxes collected throughout King County. CFT collections are used to purchase open space lands in King County's cities and unincorporated areas.

The 21-acre Dockton Park was established in the 1930's as a waterfront park that provided a swimming beach, boat launch and dock moorage. Approximately 15-acres of the original park site is undeveloped upland forest on the east side of Dockton Road SW and is part of the Dockton Forest Stewardship Plan.

DRAFT

Natural Resource Analysis

Forest Assessment

King County DNRP partnered with the U.S. Forest Service, University of Washington and Forterra (formerly Cascade Land Conservancy) on a two-year (2010-2012) *American Recovery and Reinvestment Act* (ARRA) project called "Integrated Urban Forest Assessments (IUFA): Green Jobs and Other Public Values. The purpose of the assessment was to learn about the current composition of the forests in King County. All of these sites have been historically logged at least once and often multiple times. The assessment was done in order to provide detailed data about what our forests are like to help guide stewardship planning such as this.

Specifically, the ARRA grant provided 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.

A key partner in the development of the rapid assessment protocol was American Forest Management (AFM), formerly International Forestry Consultants, Inc. Working with Forterra and King County staff, AFM developed a Forest Landscape 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. The FLAT assessment of Dockton Forest was completed in summer of 2012.

Based on ortho-photos and GPS ground truthing, the property was divided into 10 management units (MU's). These MU's are areas with generally homogeneous plant communities which are stratified primarily by tree species and age. These MU's were further defined by existing roads, power lines, and other infrastructure features. For the purposes of this plan, similar MU'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. There are four ecotypes.

Prior to the collection of the FLAT data, a more in depth inventory was completed in 2007 by Stewardship Forestry Alternatives, a forestry consultant firm. Based on ortho-photos and a walk through, Dockton Forest was divided into 3 units. The four units of former WA-DNR land (MU 1, 3, 4, and 5) are similar and are treated as one ecotype (A). These four units were intensively inventoried as they are ready for a commercial thinning. This level of inventory will be completed on Ecotypes C and D prior to the future thinning and harvests. Variable radius plots were used with a 20 BAF, and 1 plot per every 2 acres was installed. As no commercial harvest is envisioned in Ecotype B, a less intensive inventory was conducted with 1 plot per every 5 acres. As the unit has a high density of small diameter trees, plus an older cohort of large trees, both 1/20th and 1/5th acre circular, fixed area plots were used for the respective cohorts. On all plots in each unit, shrub cover was estimated using a 1/50th acre circular plot. Snags were inventoried using a 1/5th acre plot, and downed log volume estimate using two 50' line transects. As shrub cover, snags, and downed wood were similar for MU's 1, 3, 4, and 5, the summary metrics were combined and summarized at the ecotype level.

DRAFT

Ecological Conditions & Management recommendations

<u>Ecotype A: Douglas-fir - Competitive Exclusion: 62.9 acres</u>

Current Conditions

The 4 units within this ecotype are plantation stands that originated after clear cutting in the early 1980's. They are likely 3rd growth forests. They were broadcast burned and then replanted with Douglas-fir. They appear to have been pre-commercially thinned to approximately 200 trees per acre (TPA) around age 15. Age at breast height ranged from 23-26. A number of large boulders, glacial erratic's are scattered through the stand.

The units are structurally simple, single story managed stands. The canopy tends to be relatively uniform in terms of crown class differentiation and horizontal spatial patterning, except for small gaps and hardwood pockets. The overstory is almost entirely Douglas-fir, with the occasional big leaf maple, red alder, madrone, willow, or western hemlock. Pockets of hardwoods are quite common in the small gaps that are scattered through both units. Densities are at or above the threshold for self thinning. Mortality of suppressed and intermediate trees is beginning to occur. Competition from high density is causing crown recession in the overstory trees and crown ratios range between 40-60% in the dominant and co-dominant trees, while height to diameter ratios are around 70. Table 3 displays current stand summary metrics.

Almost no understory trees are present and canopy closure has shaded out most shrubs, except in small gaps where shrubs are abundant (Table 4). Major species include salal, sword fern, evergreen huckleberry, and salmonberry. Invasive species are relatively uncommon and consist primarily of Himalayan Black Berry in gaps, although some holly and hawthorn was also found.

DRAFT

Table 3: Inventory metrics for Douglas-fir - Competitive-Exclusion Ecotype (MU 1, 3, 4, and 5).

Unit	Ac.	# Plots	TPA	Avg Dbh	Qmd	BA	Curtis RD	Gross Vol (mbf)	Net Vol. (mbf)	% Error	Avg Ht	Avg LCR	Avg HDR
3, 4, 5	19.5	10	214 (13)	11.5	11.9	160	47	12.5	11.8 (1.1)	9%	72	45	72
1	43.4	20	198 (10)	10.5	11.7	140	41	10.1	9 (0.8)	9%	69	48	66
Notes: See Appendix 1 for code definitions and specifics on forest characteristics ( ) Are 95% confidence intervals													

Table 4: Shrub cover, snags, and course woody debris (CWD) Douglas-fir-Hardwood-Competitive-Exclusion Ecotype (units 1 and 2 combined).

Shrub Species	Percent Cover	Mean Height (ft)
Salal	4	1
Evergreen Huckleberry	4	2.5
Salmonberry	4	5
Sword Fern	4.1	2
Willow	3	7
Red Huckleberry	1	3
Braken Fern	0.3	1
Himmal Blackberry	0.1	3

Decay Class	Snags (per acre)			CWD (ft^3/acre)
	<12" Dbh	12-24" Dbh	>24" Dbh	
1-2	2	1	0	0
3	0	0	0.25	0
4-5	0		0.25	466
Total	2	1	0.5	466

DRAFT

Management Recommendations

Without intervention, these units in the competitive exclusion-biomass accumulation stage of stand development (Franklin et. al. 2002) are likely to remain in it for another 50-80 years. This is the most structurally simple stage of stand development and supports the lowest levels of wildlife species (Carey and Curtis 1996, Franklin J.F. et al. 2002, Oliver and Larson 1996). Competition would continue to cause live crown ratios to recede and diameter growth to slow. Although pre-commercial thinning has maintained the understory plant community to varying degrees, canopy closure and competition are suppressing the development of a diverse and lush understory, shading out hardwoods, and preventing the initiation of multiple canopy layers. Large snags and downed logs will take many decades to develop. On their current trajectory, these units will remain structurally uniform with low habitat value for many decades.

If thinned, however, growth rates can be maintained, mortality of hardwoods can be prevented, habitat value can be improved, and the development of older forest structures can be significantly accelerated. As wood quality is currently low in these young, fast growing stands, thinning would not generate abundant revenue. Current log prices for this low grade are at a high point and a revenue positive project is possible. Management units 1 and 3 can be commercially thinned using ground based equipment, preferably a cut to length processor and forwarder system. Units 4 and 5 will be non-commercially thinned in conjunction with Ecotype B.

After this entry, a second thinning entry should be done in 10-15 years. Then after another 20-25 years, the need for a third entry should be evaluated. By doing multiple, lighter thinning entries, not all objectives have to be targeted in one entry. Natural disturbances and stand development can be factored in to future entries and relatively high canopy closure can be maintained. Variable density thinning (VDT) is recommended for all thinning entries. VDT works with natural stand development processes to mimic natural disturbances like low intensity fires or windstorms by thinning at different densities through the stand to create horizontal patchiness that is similar to the spatial complexity found in old growth forests.

<u>The VDT prescriptions should include:</u>

1. Creation of patches of different densities with a range, size, and pattern that is appropriate for habitat goals, operationally efficient, and based on the existing forest structure of each unit. Over time the goal is to promote the development of a contrasting understory light environment driven by a variably-spaced overstory and a patchy midstory that will lead to the development of a range of vegetation patch types at a scale of ¼ to 1 acre (Carey 2003). In general, 3 densities should be created: no-entry areas, moderate thin, and heavy thin.

- No-entry areas (10-20% of unit) to protect large snags, concentrations of large downed wood, and sensitive areas such as areas of blow down and steep slopes. No entry areas are also necessary to provide for continued recruitment of small diameter snags and dark areas with little understory development. No entry areas should vary from 1/10th acre to ½ acre and be scattered throughout each unit.
- Heavy thin patches (10-20% of unit) to promote rapid growth of dominant trees with large, "wolfy" crowns, development of understory tree and shrub layers, and release of hardwoods. During the first entry, the focus of these heavy thin areas should be heavily releasing dominant conifers and hardwoods that are at risk of suppression. This should be done in 1/10th – ½ acre patches thinned down to 20-50 TPA. In later thinning entries, actual gaps with 1-2 conifers in them can be created by expanding natural gaps or treating laminated root rot pockets.
- General thinning zone: The remainder of each unit should be thinned to a general target of 30-40 Curtis relative density (RD). This is the level where growing space is sufficiently opened up to allow for rapid growth of individual trees for 15-20 years, while maintaining overall stand volume growth (Curtis 1982, Oliver and Larson 1996, Reineke 1933). Ecologically, this is a balance between growing large trees while assuring adequate stand level biomass accumulation to meet future dead wood recruitment targets, as well as keeping canopy cover above 50%. Thinning to this level generally results in the removal of 25-35% of stand volume. Thinning should be primarily from below, but some trees in all diameter classes should be retained and some mid-sized trees removed. A maximum diameter cap may be set for all units to prevent high grading the largest 10-15% of the diameter distribution. These caps should be high enough to provide sufficient flexibility and efficiency during implementation and avoid unintended consequences. Even spacing should be avoided and closely spaced pairs and clusters of trees retained where they exist. This will result in some mini-gaps and denser clusters in the general thinning zone in each unit, and mimic the clumpy distribution of overstory trees found in natural, old-growth stands. Only Douglas-fir should be removed to increase the relative proportion of other species. Suppressed, non-merchantable Douglas-fir should generally be left where operationally feasible.

2. Protection & release of minor conifer species (i.e. western red cedar, western hemlock) and hardwoods. In early thinning entries, selected big leaf maple, madrone, and red alder should be released in heavy release areas and in the general thinning zone. In later entries when the alder is mature, it should be protected but not released.
3. Planting of under-represented conifer species to supplement natural regeneration with the following guidelines:

- In areas with high overstory stocking (>30 Curtis RD or >40% full sunlight), no planting should occur. Trees will grow too slowly to make the investment in planting and shrub control worthwhile.

- In patches of moderate overstory stocking (20-30 Curtis RD or 20-40% full sunlight), only shade tolerant tree species should be planted.
- In gaps or patches of heavy thinning (<20 RD or >40% full sunlight), shade intolerant species, as well as some shade tolerant species, should be planted.
- Planting densities should be based on ensuring adequate stocking for future thinning entries and take into account natural regeneration, especially by Douglas-fir, red alder, maple, and other hardwoods.

4. Under-represented shrubs should be planted to supplement natural colonization. Species selection, planting densities, and planting locations should be based on wildlife habitat goals, eco-physiological requirements of shrub species, and composition of existing plant communities.
5. Ongoing monitoring and control of invasive species after thinning.

Ecotype B: Mixed - Alder - canopy closure: 28.5 acres

Current Conditions

A 26.4 acre and an adjacent 2.1 acre management unit comprise this ecotype. This 28.5 acre type is a two story forest that appears to be the result of a seed-tree type harvest approximately 30 years ago. From the numerous madrone and maple stumps that have re-sprouted and lack of conifer stumps, it is likely that most hardwoods were harvested and the dominant conifers left. Currently, approximately 7 large trees per acre, almost all Douglas-fir, are scattered in a clumpy pattern throughout the stand. A few large big-leaf maples are also present. The younger cohort consists of a very patchy, chaotic mix of hardwoods and conifers. The conifers are almost all Douglas-fir. Numerous shrubby gaps are also present through the unit. It appears that the unit was planted with Douglas-fir after harvest, but the seedlings were outcompeted by hardwoods and tall shrubs in most areas. It does not appear that any vegetation control or pre-commercial thinning was done. Age at breast height ranged from 24-28 in the younger cohort and 75-90 in the older cohort. Productivity is moderate with a site class III.

The unit is complex in terms of species diversity and horizontal patchiness. The older cohort provides some large tree structure and downed wood where trees have blown over. The younger cohort, or midstory, has stratified in many places due to the differences in height growth between different species. Species composition is well balanced between madrone, big leaf maple, red alder, and Douglas-fir. Red alder tends to dominate in the western half of the unit and in the small ravine in the northeast corner, while madrone dominates in the higher, flatter eastern half. Maple is scattered throughout the unit, while Douglas-fir tends to found in clumps. Many madrones and maples originated from stump-sprouting and have multiple stems. Willow, western hemlock, western red cedar, and bitter cherry are also present in minor amounts. Stocking is

high in some areas and low in others were shrubs dominate. Competition is causing crown recession and suppression on some trees in the younger cohort. Beneath this midstory cohort, an understory tree layer exists, primarily Douglas-fir that was overtopped and is now very suppressed. Table 4 contains current stand summary metrics.

The shrub layer is well developed in much of the unit (Table 5). In gaps, shrub are tall (>6') and likely produce significant berry crops. Under hardwood thickets, shrubs are smaller but cover is still high. Major species include salmonberry, salal, sword fern, Himalayan blackberry, and evergreen huckleberry. A few legacy snags exist, and almost no small diameter (8-15") second-growth snags are present. Green wildlife trees are also quite rare. Large downed logs are somewhat abundant, mainly from blow down of the overstory cohort. Invasive species are moderately abundant and consist primarily of Himalayan Black Berry in open areas. Some holly and ivy were found as well. No other forest health issues were found.

The headwaters of a small stream exist within a small ravine in the northeastern corner of the unit. This stream was flowing in December, but is likely an intermittent stream.

Table 4: Inventory metrics for Mixed – Alder - conifer-canopy closure (Ecotype B). Metrics are divided into 2 cohorts based on the structure of the unit.

Cohort	Ac.	# Plot	TPA	Avg Dbh	Qmd	BA	Crts. RD	Grs. Vol (mbf)	Net Vol. (mbf)	% Error	Avg Ht (ft)
Over-story	26.4	4	7 (6)	25	26	26	5	5.4	5.2 (5)	95%	150
Mid-Story	26.4	4	295 (165)	7.2	8.4	114	39	none	none	Na	47
Notes: See Appendix 1 for code definitions and specifics on forest characteristics ( ) Are 95% confidence intervals											

Table 5: Shrub cover, snags, and course woody debris (CWD) in Mixed - Alder-canopy closure (Ecotype B)

Shrub Species	Percent Cover	Mean Height (ft)
Salal	15	3
Evergreen Huckleberry	10	4
Salmonberry	10	6
Sword Fern	15	3
Willow	5	7
Red Huckleberry	3	3
Bracken Fern	3	2
Cascara	1	10
Filbert	3	10
Red Elderberry	5	8
Indian Plum	5	8
Ocean Spray	1	10
Himmal Blackberry	10	5

Decay Class	Snags (per acre)			
	<12" Dbh	12-24" Dbh	>24" Dbh	CWD (ft^3/acre)
1-2	0	1	0	0
3	0	0	0	0
4-5	0	0.25	0	866
Total	0	0.25	0	866

DRAFT

<u>Management Recommendations</u>

Although this unit is very diverse and complex, it is the product of management actions that were not necessarily designed to create natural old-forest structure. Left alone, the hardwoods in the midstory will top out in height growth at 80-100 feet, well below the height of the large, conifer cohort. As hardwoods dominate the midstory cohort, the stand will retain its two story structure for many, many decades. Many natural old-growth stands developed from high severity fire that left scattered live trees which formed a similar overstory cohort. However, younger cohorts in these old-growth stands are dominated by conifers, some of which eventually grow to the same height as the overstory. Instead of two story stand, a multi-story stand develops. Also, in this unit the high density of many patches of hardwoods will result in trees with small crowns that will be more susceptible to drought, insects, and pathogens. The life-spans of red alder and

madrone can be significantly shortened by these stressors. Finally, light and moisture competition from the well developed shrub layer make natural establishment of conifer seedlings very challenging. Thus when the red alder dies off at age 60-80, it is unlikely that a significant new cohort of conifers will develop. The existing understory Douglas-fir are suppressed and will likely die out before the hardwoods open up enough to stimulate release. In summary, this stand will not develop into natural, conifer dominated old-growth forest for several centuries without a significant natural disturbance or human intervention that initiates a new cohort of conifers.

However, managing for full stocking of marketable species is not necessary as the management objectives for this unit do not include producing revenue and timber volume. Instead, a non-commercial thinning treatment targeted at releasing large, vigorous conifers and hardwoods in the midstory should be done in the next 1-3 years (2014-2017). Fifteen to twenty trees per acre should be selected for release. They should be evenly balances between midstory Douglas-fir, madrone, big leaf maple, and red alder. For approximately ½ of these release trees, all midstory cohort trees within 25' should be removed. For the other half of the release trees, one or two healthy additional midstory trees should be left in the 25' circle. This will create mini clumps that get released in addition to individual trees.

During this entry, shrubs in these release areas as well as some areas of existing gaps should be cut down. A balanced mix of western red cedar, western white pine, and grand fir should then be planted to increase the relative abundance of conifers. An average of 40 trees per acre should be planted. Invasive species should also be removed and monitored. Follow up treatment of shrubs competing with planted seedlings will also be necessary until the trees are above the shrub layer and "free to grow". This cut and leave and planting entry should be done in conjunction with the thinning entry in units 1 and 2. Revenue from the commercial thinning in units 1 and 2 should be more than sufficient to cover the costs.

Unless a major disturbance or wave of climate induced mortality hits the unit, no additional treatment should be necessary for another 25 years; the only exception being periodic invasive species monitoring and control. After 25 years, the need for an additional entry should be evaluated. The red alder will be mature at this time. Felling some of it to release the conifer understory may be advisable. These trees could either be left to decompose or removed to generate revenue.

DRAFT

Ecotype C: Mature Douglas-fir – Hardwood - 17.2 acres

Current Conditions

This ecotype is dominated by mature Douglas-fir (60-80 years old) with a significant component of red alder and madrone growing throughout. The ecotype is found on the varied terrain of the east sides of the two westernmost units of Dockton Park and Dockton Natural Area. In general, stocking levels are moderate to high, averaging 125 TPA, with Douglas-fir QMD approximately 18" at breast height. In some areas competition is causing high height-to-diameter ratios, low crown ratios, and self thinning. In other areas, dominant and co-dominant trees have differentiated, competition is not as intense, and self-thinning is almost over. Pockets of mature red alder and madrone are common and frequently form dominant patches. Western red cedar, western hemlock, and big leaf maple are present but infrequent, primarily in the understory. Understory vegetation is dominated by salal and evergreen huckleberry. Invasive species are relatively uncommon and consist primarily of English holly and Himalayan blackberry. These units are at the end of competitive exclusion and entering maturation. Self-thinning mortality has created a moderate amount of small diameter snags and course woody debris (CWD). Legacy stumps and CWD are rare. Mortality from other causes is beginning to occur, primarily from wind throw in Douglas-fir and decadence in alder, and is creating some larger diameter snags and CWD. These stands are structurally simple and intermediate plant diversity, although the development of an understory tree layer is beginning and gap formation has begun. They have intermediate habitat value for most wildlife species.

Management Recommendations

Existing natural processes will likely create desired older forest structures and habitat over time in these 60-80 year old Douglas-fir and hardwood-dominated units. These processes include: natural disturbance agents (laminated root rot, wind, etc.); and natural stand development processes: self-thinning, crown class differentiation, and understory re-initiation. However, the timeframe required for older forest habitats to develop could be accelerated through thinning in large, dense Douglas-fir patches. This would consist of a thinning of 40-60% of the area of these units in 5-7 years (2019-2021). While Douglas-firs are beyond the age of optimal response to thinning, over time the trees will significantly increase in size compared to un-thinned stands. Releasing healthy madrone by removing competing trees to accelerate growth of large trees with healthy crowns will increase their resistance to canker diseases. Bigleaf maple and red cedar can also be promoted. As older forest habitats are in short supply on Vashon, accelerating their development is ecologically desirable from both a stand and landscape perspective.

DRAFT

Ecotype D: Mixed - Alder - canopy closure: 11.3 acres

Current Conditions

This ecotype is found on the western side of the Dockton Park and Dockton Natural Area. The ecotype is dominated by red alder, but has a significant component of Bigleaf maple, madrone, and Douglas-fir. Western red cedar, and western hemlock are present but infrequent, typically found in the understory. Density is approximately 120 TPA, with red alder QMD approximately 14" at breast height and madrone QMD approximately 13". The dominant cohort is about 60 years old. The red alder are large but have suffered significant top die back in the last decade and are in decline. The longer-lived madrones are typically healthy though dense patches show mortality due to canker diseases and competitive stress. A number of healthy, medium sized maples occur in the overstory, while many more are present in the midstory. The Douglas-firs are variable in size, averaging approximately 12" DBH. In some areas, alder mortality has opened up the canopy and the diverse shrub layer is tall and dense, and dominated by salmon berry with some salal. Invasive species are present at low levels and consist primarily of English holly and Himalayan blackberry. Small to large-diameter snags and CWD are moderately abundant, and consist primarily of red alder. Red alder snags and CWD provide important foraging and cavity habitat, but they decompose quickly. Overall these stands are currently high in plant diversity and habitat value.

Management Recommendations

The dominant species, red alder, will continue to decline over the next few decades and the overstory will continue to open up. Currently, low to moderate numbers of understory and midstory trees are present. Without disturbance to the shrub layer, natural regeneration will be very slow. Over time, the forest will transition to moderately stocked stands of big leaf maple, madrone and large conifers over a dense, tall shrub layer. While this forest type provides high quality habitat, it will be relatively common on Vashon as maturing alder declines across the island. Also, these open stands are very susceptible to invasion by Himalayan blackberry. By harvesting a portion of the alder before it dies, some revenue can be generated and an understory tree layer can be established through planting and natural regeneration. Sufficient alder should be left for soft snags, CWD, and aesthetic values. Approximately 50-75% of the alder would be removed. Releasing healthy madrones by removing competing trees will accelerate growth of large trees with healthy crowns. The conifer overstory is sparse but already approaching the size and structure of older forests and the shrub layer is high in diversity. Planting low levels of Douglas-fir and red cedar in openings following alder harvest or natural mortality will establish a future cohort of conifers. Shrub control will be critical to seedling survival and invasive species control will also be necessary. Sufficient big maple is already present and red alder will seed in naturally after disturbance. These natural and planted seedlings will approach maturity as the madrones decline many decades into the future. A diverse, patchy older forest structure will be achieved

relatively quickly as the mid and understory tree layer develops. If alder can be harvested before wood quality declines, revenue from harvest will cover expenses and provide additional revenue for forest stewardship. Thinned madrone may be sold as high-quality firewood. If wood removal is done, planting along with shrub control will be necessary as the alder opens up to ensure that a diverse, complex forest develops. This will require significant effort over 10+ years to ensure success.

Forest Stewardship Timeline

Ecotype	Recommendation	Year
All	Annual monitoring for invasive species.	Ongoing
A	Variable density thinning to reduce competition for sunlight and nutrients.	2014-2015
A	Following the thinning, plant shade intolerant species in gaps or patches of heavy thinning, as well as some shade tolerant species, in areas more lightly thinned.	2015-2016
B	Non-commercial thinning to release conifers and hardwoods in the midstory.	2014-2017
B	Following the thinning, plant cedar, white pine, and grand fir at average density of 40 trees per acre	2015-2018
C	Commercial thinning of 40-60% of the ecotype.	2019-2021
D	Retention harvest which removes 50-75% of the alder to release healthy madrone and conifers in understory.	2017-2023
D	Follow the harvest with planting of Douglas-fir and red cedar.	2018-2024

DRAFT

Forest Health

A primary concern on the property is the overstocked condition of Ecotype A. Stands left too long in the competitive exclusion stage are prone to insect and disease epidemics, stagnation, simplification of wildlife habitat, understory decline and simplification, and foregone revenue and scenic values.

There is one laminated root rot pocket in unit 1 and several small areas where shallow soils and a high water table has caused wind throw also in unit 1.

Both the FLAT assessment and previous inventory indicated a low presence of invasive weeds in both ecotypes. The primary invasive species in Ecotype A are Himalayan blackberry and English holly. In addition there are minor amounts of scotch broom, and poor Robert. The main invasive in Ecotype B is European mountain ash. There is also some scattered holly.

Currently the fuel levels are moderate with an average risk for wildfire. The overstocked conditions in Ecotype A have resulted in ladder fuels which increase the intensity and severity of any fire that might occur.

There is the normal amount tree damage from deer antler rubbings primarily on deciduous species.

Management Recommendations

The specific forest health management recommendations are under the Ecological Conditions section above.

Laminated root rot pockets should be treated on a case by case basis. As currently there is very little root rot in these units, no special treatment is needed in the first thinning entry. During later entries, the need for more intensive treatment can be evaluated.

Slash and tops should be left in the forests to recycle nutrients and used on skid trails to minimize soil compaction.

The scheduled thinnings will be followed by periodic monitoring for invasive/noxious weeds. Areas of Ecotype B that are left un-thinned will need weed monitoring. Appropriate control measures will be implemented as necessary.

The prescribed thinning of Ecotype A 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 and relatively high amount of public use.

DRAFT

Soils and Slope Stability

The soils throughout the site are Everett-Alderwood Gravelly Sandy Loam. This soil is a dark brown, gravelly sandy loam that is moderately permeable and subject to slight erosion hazard. These soils tend to be 20 to 40 inches deep, underlain by compacted till. This soil can become saturated during the rainy season. The low available water capacity creates drought potential in the dry months. The primary use of this soil type is for growing timber. The main considerations for this soil type are its medium compaction and puddling potential and the tendency for severe plant competition. There is potential for wind throw of exposed trees due to the rooting depth restricted by the till layer.

Productivity is generally average for King County as indicated by a site index of 100 based on a 50 year Douglas-fir site index. This equates to WA-DNR site class III.

Dockton Forest is fairly flat with a gradual rise from west to east from 160 feet elevation to 340 feet.

Management Recommendations

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. If trees are limbed at the landing the slash will be returned to the woods and redistributed. This slash can be incorporated on main skid trails to prevent compaction and limit the chance for erosion in wet weather.

The variable density thinning planned for 2014-15 will require a minor amount of temporary road construction. Following the thinning these roads should be partially decommissioned and possibly converted to trails. It will not be necessary to cross any streams or wetlands in constructing these access roads. These roads will be constructed on Everett-Alderwood 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

Dockton Forest is primarily upland forest. However, there are several small seasonal streams that originate on the site and flow northwest to drain into Quartermaster Harbor. Middle Dockton Creek flows just to the northeast of the site, and it appears on the LIDAR image that there is a drainage fork of this creek that originates on the site, though there is no stream mapped in this drainage. There are no wetlands on the site.

Although both the WA-DNR and King County mapping websites show 2 streams in unit 2, no flowing water or scoured channels were found at the time of the inventory. Several areas with standing water were found in the northern edge of unit 1, although no obligate wetland plants were observed.

Management Recommendations

As prescribed in this plan, the thinning of Ecotype A and B will have negligible impacts on hydrologic functions of the site.

Fish and Wildlife Habitat

Ecotype A is dominated by planted Douglas-fir. These Douglas-fir plantations have simple canopy structures which currently provide marginal wildlife habitat and poor legacy tree recruitment due to limited species diversity and a lack of crown differentiation. A few legacy snags exist from previous harvests that range from 24-36" in diameter and 10-50' tall. An impressive cluster of tall legacy snags exists in a draw in the western portion of unit 1. Almost no small diameter (8-15") third-growth snags are present. Green wildlife trees (trees with broken tops, bole decay, branch platforms, cavities, etc.) are moderately abundant due to ice breakage early in stand development that has caused crooks and multiple tops in a significant number of trees. Large, legacy downed logs are rare, while wind throw has created some third growth downed logs. Overall, course woody debris levels are generally low with percent cover estimated to be less than 1%.

Ecotypes B, C, and D provide significantly more horizontal and vertical structural diversity than Ecotype A. A wider range of vegetation diversity is also present in Ecotypes B, C, and D.

Management Recommendations

All active stewardship will incorporate the protection and creation of snags, wildlife trees, and Course Woody Debris (CWD). Large diameter pulp wood should be left, and snags protected unless operational safety is a concern. High stumping can be used to create short snags efficiently.

Cultural Resources

Washington WA-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. All forest stewardship activities will be reported to the King County DNRP Historical Preservation Program staff for review.

Aesthetics and Recreation

The 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. Parks staff will identify trails on the Recreation Map which need to be protected from excessive disturbance and slash. This map may be included in the Invitation to Bid (ITB) which becomes the sales contract. These trails will be flagged before the ITB is offered. Language will be included in the ITB which clearly indicates 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 there log processing equipment allows.

The contract for the thinning of Ecotype B will incorporate similar measures to minimize aesthetic impacts from the trees cut and left near the trails. A map will identify trails which are to be cleared of brush following thinning operation.

Public Use and Trail Recreation

There is a substantial amount of public use on Dockton Forest. A 3-mile trail system that connects to the Maury Island Natural Area is used by hikers, equestrians and mountain bikers. Dockton Park is a shoreline facility that provides a boat launch, moorage dock, restrooms, picnic shelter and play area. It is also the starting point for the Dockton Historical Walking Trail, which includes a series of historical and cultural interpretive signs located throughout the Dockton community.

Trail Access

There is a trailhead and gravel parking lot that can accommodate horse trailers on Dockton Road SW across from the park and boat launch. There is trail access and shoulder parking along SW 260th St. and a small gravel parking area at SW 264th St. and 94th Ave. SW.

Trail Planning

The existing trail network was established over the years by trail users but without the benefit of a trail use and development plan. King County Parks staff will be engaging trail users to determine appropriate trail use and improvements, which may include new trails, features, signage and other amenities, as well as closing or re-routing poorly designed trails.

References

Carey AB. 2003. Managing For Wildlife: A Key Component for Social Acceptance of Compatible Forest Management. Pages 401-425 in Monserud RA, Haynes RW, Johnson AC, eds. Compatible Forest Management. . Dordrecht, The Netherlands: Kluwer Academic Publishers.

Curtis RO. 1982. A simple index of stand density for Douglas-fir. Forest Science 28: 92-94.

Franklin JF, et al. 2002. Disturbances and Structural Development of Natural Forest Ecosystems with Silvicultural Implications, using Douglas Fir Forests as and Example. Forest Ecology and Management 5624: p 1-25.

Oliver CD, Larson BC. 1996. Forest stand dynamics. New York: John Wiley & Sons, Inc.

Reineke LH. 1933. Perfecting a stand density index for even-aged forests. Jour. Agric. Res. 46: 627-638.

Smith DM, Larson BC, Kelty MJ, Ashton PMS. 1997. The Practice of Silviculture: John Wiley & Sons.

DRAFT

Appendix 1

Trees Species Codes

DF: Douglas-fir

RA: Red Alder

RC: Western Red Cedar

WH: Western Hemlock

BM: Bigleaf Maple

MD Madrone

WO Willow

CH Bitter Cherry

Forest Characteristic Codes

TPA: trees per acre

BA: Basal area in ft^2/acre

All Volumes are: mbf (thousand board feet). Scribner board feet, 6" top, 32' logs. This was chosen as a conservative estimate of volume.

Site Index: DF King 50 year; RA: 25 year

95% CI: 95% Confidence interval

D_q: Quadratic Mean Diameter

Relative Density: Curtis (1982)

Definition of Forestry Terms

(From Holmberg P., Aulds B., Biesecker R, (2003). Thinning forest stands, Westside. Washington State Department of Natural Resources, Silviculture & Regeneration, Land Management Division)

Basal Area (BA) is the composite horizontal cross section area of all tree boles at breast height (DBH), expressed in square feet per acre.

Live Crown Ratio is the ratio of the length of live crown to total tree height. For example, a 100-foot tree supporting 40 feet of live crown has a crown ratio of 40 percent. Crown ratios of 35 percent or more are usually required for thinning response.

DBH (diameter, breast height**)** is the diameter of a tree measured at 4.5 feet above ground level (or 1 foot above the butt-swell, whichever is the higher on the bole) on the uphill side of the tree.

Decay Class: A 1-5 system that classifies the stage of decay for snags and course woody debris. A 1 classification signifies recent mortality and little decay, while a 5 is extensive decay.

Height/Diameter (H/D) Ratio is the ratio of a tree's height and DBH, both measured in feet. Leave tree H/D ratios of less than 90 are generally considered both wind-firm and able to respond to thinning with increased growth.

Landscape is an area, often on the scale of a drainage or more in size, whose objectives relate to orders of magnitudes greater than for individual FMUs.

Precommercial thinning (PCT) is thinning wherein cut trees have no commercial value and are therefore left on the site.

Quadratic mean diameter (D_q) is the diameter at breast height (DBH) as computed for a tree of average basal area for the stand in question.

Relative density (RD), or Curtis' RD, is a mathematically derived stand parameter that indicates level of intra-stand competition between trees, and consequently, a theoretical optimum for thinning. RD is calculated by the formula $RD = BA \div \sqrt{D_q}$, where BA is stand basal area per acre, and D_q is quadratic mean diameter.

Site Index is the predicted height of dominant trees for a species on a particular site at a given index age and is expressed as height at the index age (usually 50 or 100 years at breast height for conifers and 20 years for red alder). Site class refers to groups of site indices as follows: Site class I equals King site indices 135 to 160; II, 115 to 135; III, 100 to 115; IV, 75 to 100; and V equals site indices 50 to 75.

DRAFT

Dockton Forest
Forest Stewardship Plan
Ecotypes & Management Units

Dockton Forest Parcels

ECOTYPE

A - Douglas-Fir

B - Mix - Alder

C - Conifer

D - Mixed - Alder

King County Parcels

Roads

86th Pl SW

Dockton Rd SW

SW 260th St

SW Dock St

Ecotype A - Douglas-Fir
3.6 Ac.
Mangagement Unit 5

Ecotype A - Douglas-Fir
1.3 Ac.
Mangagement Unit 4

Ecotype B - Mix - Alder
26.4 Ac.
Mangagement Unit 2

Ecotype A - Douglas-Fir
14.6 Ac.
Mangagement Unit 3

Ecotype B - Mix - Alder
2.1 Ac.
Mangagement Unit 6

Ecotype D - Mixed - Alder
6 Ac.
Mangagement Unit 10

Ecotype C - Conifer
6.7 Ac.
Mangagement Unit 7

Ecotype A - Douglas-Fir
43.4 Ac.
Mangagement Unit 1

Ecotype D - Mixed - Alder
5.3 Ac.
Mangagement Unit 9

Ecotype C - Conifer
10.5 Ac.
Mangagement Unit 8

King County

The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice.
King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information.
This document is not intended for use as a survey product.
King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map.
Any sale of this map or information on this map is prohibited except by written permission of King County.

N

190 95 0 190 380 570 760 Feet

WM. Loeber G:\Forestry\Forst_GIS\KC_Forest\Dockton Forest\FSP Maps\Dockton_ForestEMUS_Ortho.mxd

January 14, 2014

Dockton Forest
Forest Stewardship Plan
Forest Stewardship Treatments

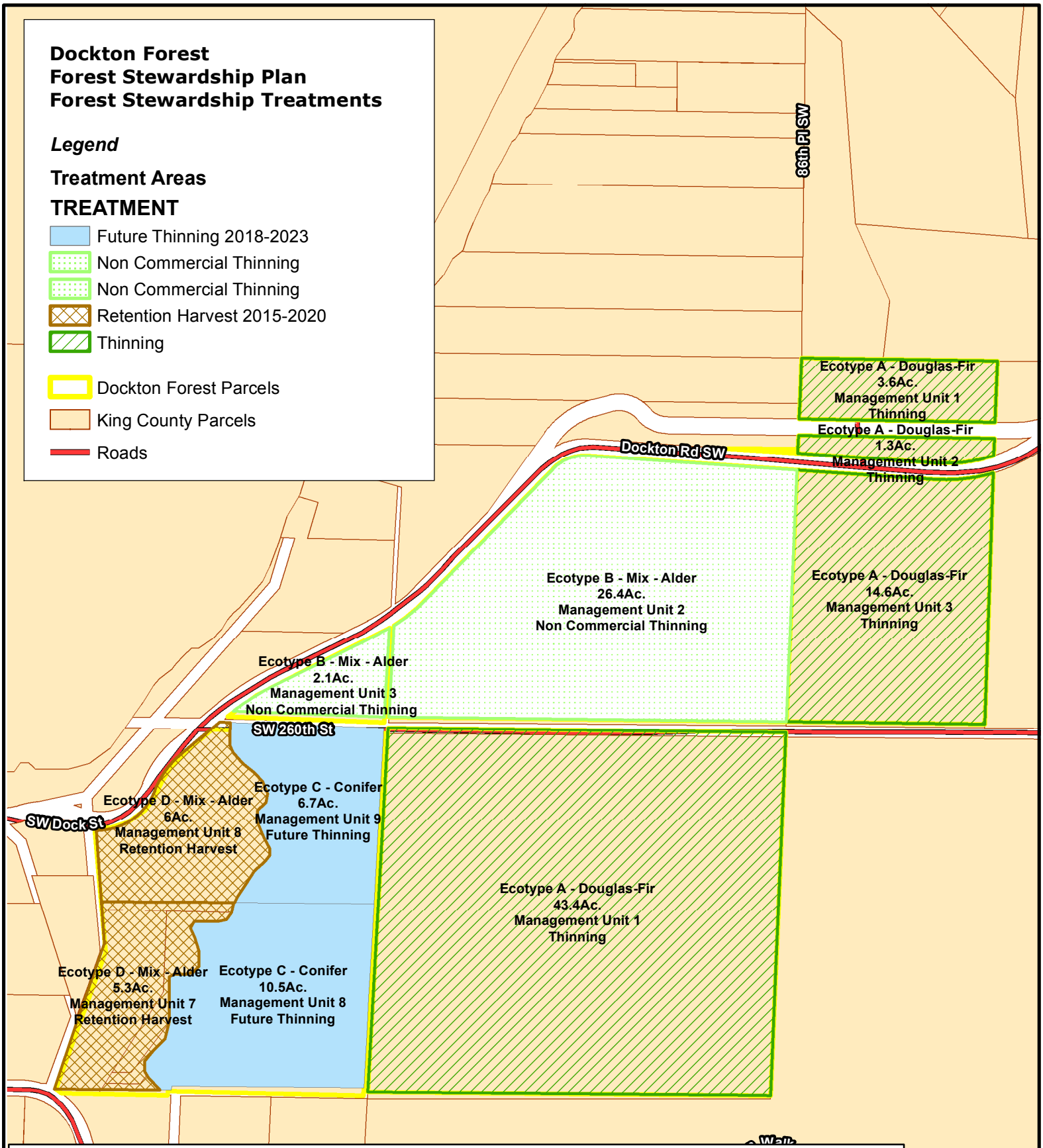
Legend

Treatment Areas

TREATMENT

- Future Thinning 2018-2023
- Non Commercial Thinning
- Non Commercial Thinning
- Retention Harvest 2015-2020
- Thinning

- Dockton Forest Parcels
- King County Parcels
- Roads



King County

Department of
Natural Resources and Parks

Water and Land Resources Division

The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

N

220 110 0 220 440 660 880 Feet

WM. Loeber G:\Forestry\Forst_GIS\KC_Forest\Dockton Forest\FSP Maps\Dockton_Forest_Treatments.mxd January 10, 2014

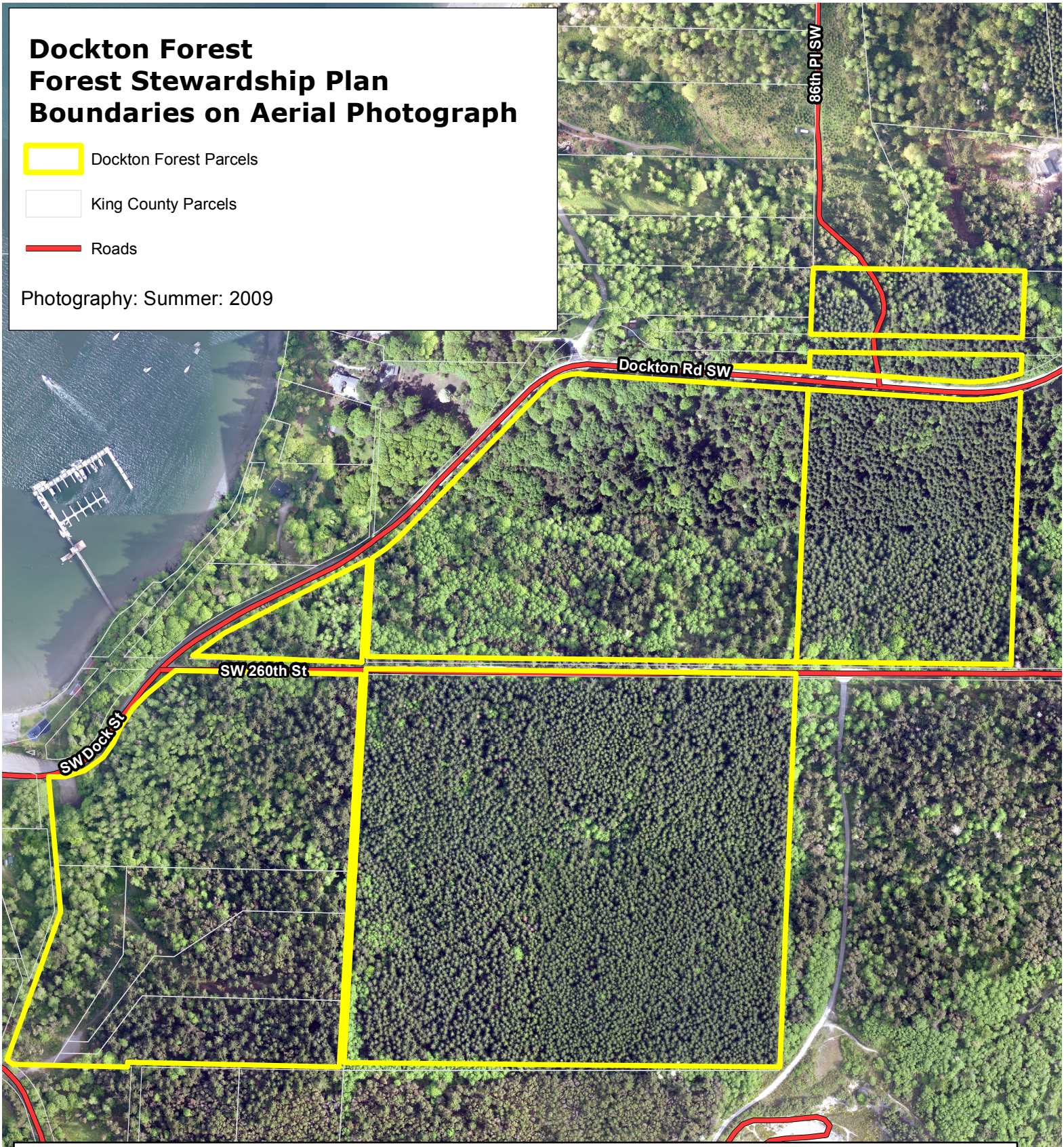
Dockton Forest
Forest Stewardship Plan
Boundaries on Aerial Photograph

Dockton Forest Parcels

King County Parcels

Roads

Photography: Summer: 2009



King County

Department of
Natural Resources and Parks

Water and Land Resources Division

The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

N

17587.5 0 175 350 525 700 Feet

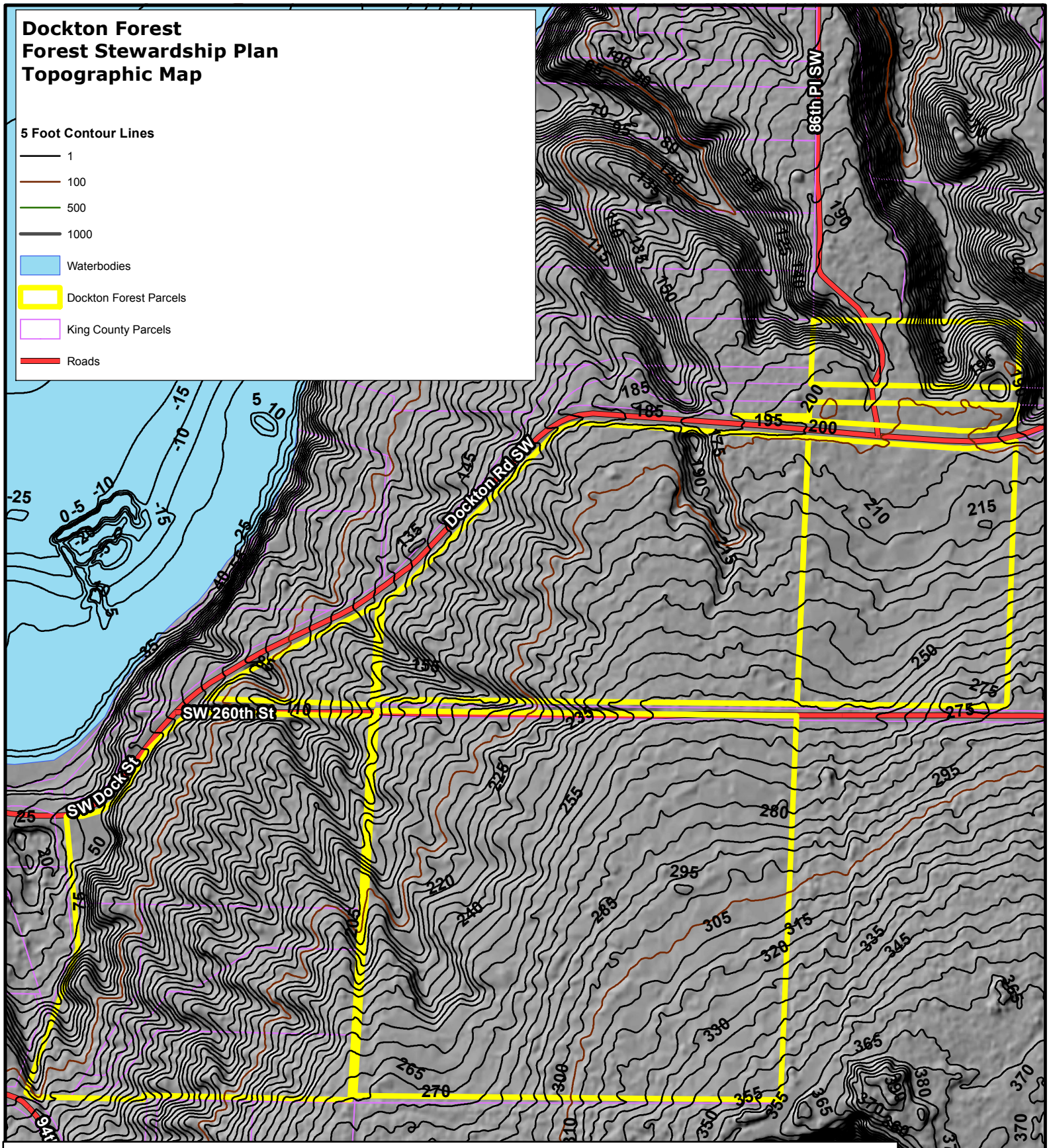
WM. Loeber G:\Forestry\Forst_GIS\KC_Forest\Dockton Forest\FSP Maps\Dockton_ForestOrtho_Boundary.mxd

January 14, 2014

Dockton Forest
Forest Stewardship Plan
Topographic Map

5 Foot Contour Lines

- 1
- 100
- 500
- 1000
- Waterbodies
- Dockton Forest Parcels
- King County Parcels
- Roads



King County
Department of
Natural Resources and Parks
Water and Land Resources Division

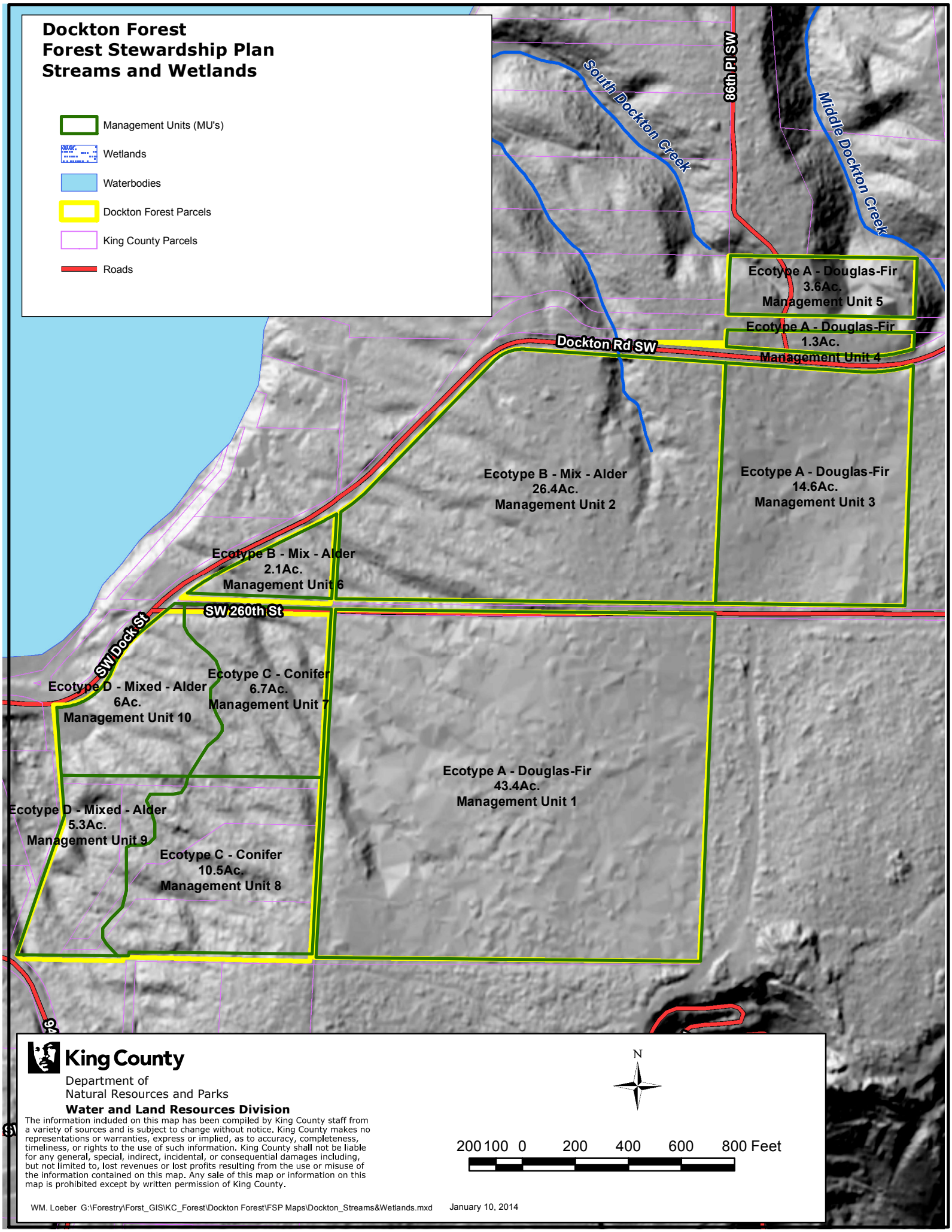
The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

N

200 100 0 200 400 600 800 Feet

WM. Loeber G:\Forestry\Forst_GIS\KC_Forest\Dockton Forest\FSP Maps\Dockton_ForestOrtho_Boundary.mxd January 10, 2014

Dockton Forest
Forest Stewardship Plan
Streams and Wetlands



King County

Department of
Natural Resources and Parks

Water and Land Resources Division

The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

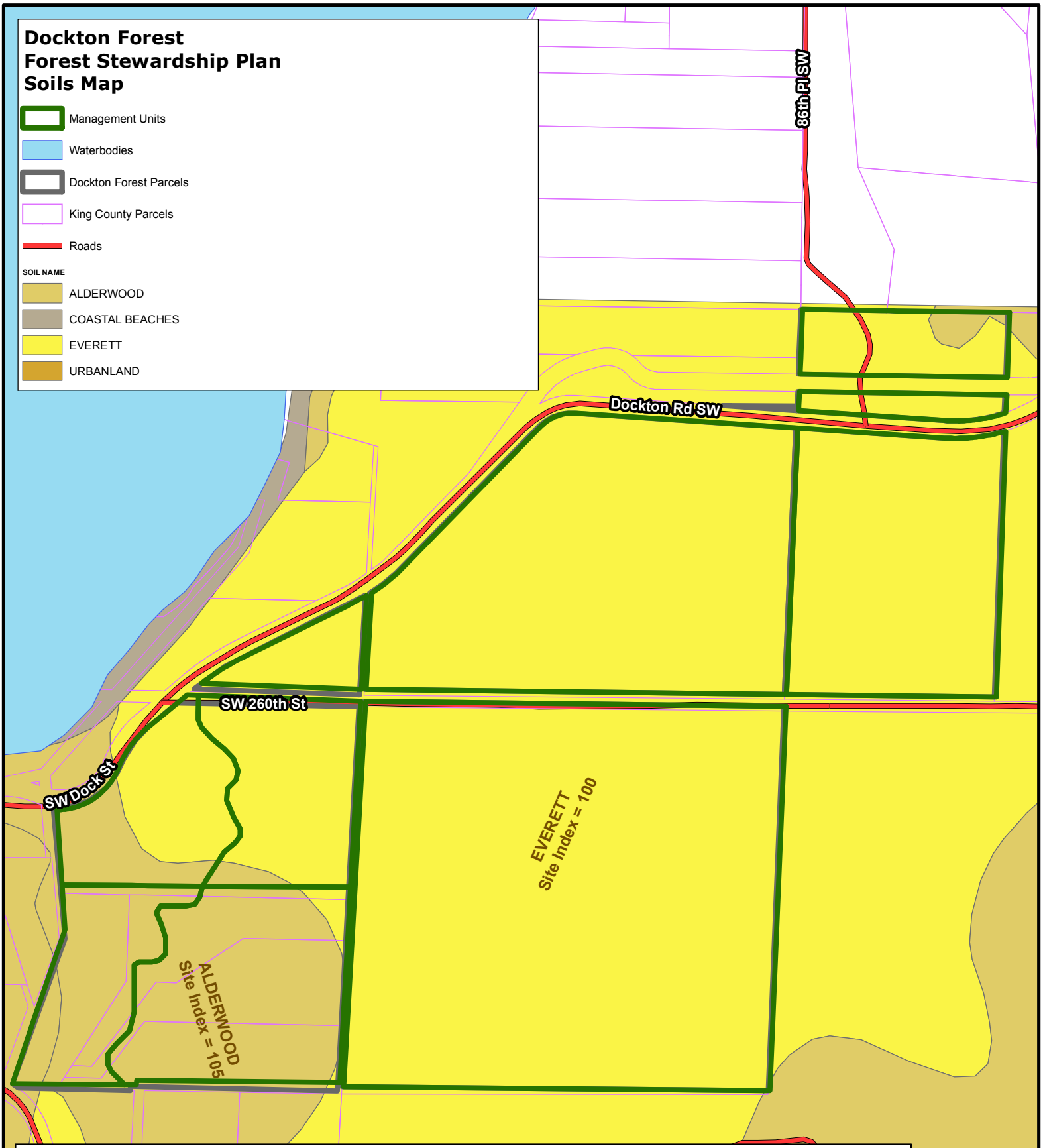
WM. Loeber G:\Forestry\Forst_GIS\KC_Forest\Dockton Forest\FSP Maps\Dockton_Streams&Wetlands.mxd January 10, 2014

Dockton Forest
Forest Stewardship Plan
Soils Map

- Management Units
- Waterbodies
- Dockton Forest Parcels
- King County Parcels
- Roads

SOIL NAME

- ALDERWOOD
- COASTAL BEACHES
- EVERETT
- URBANLAND



King County

Department of
Natural Resources and Parks
Water and Land Resources Division

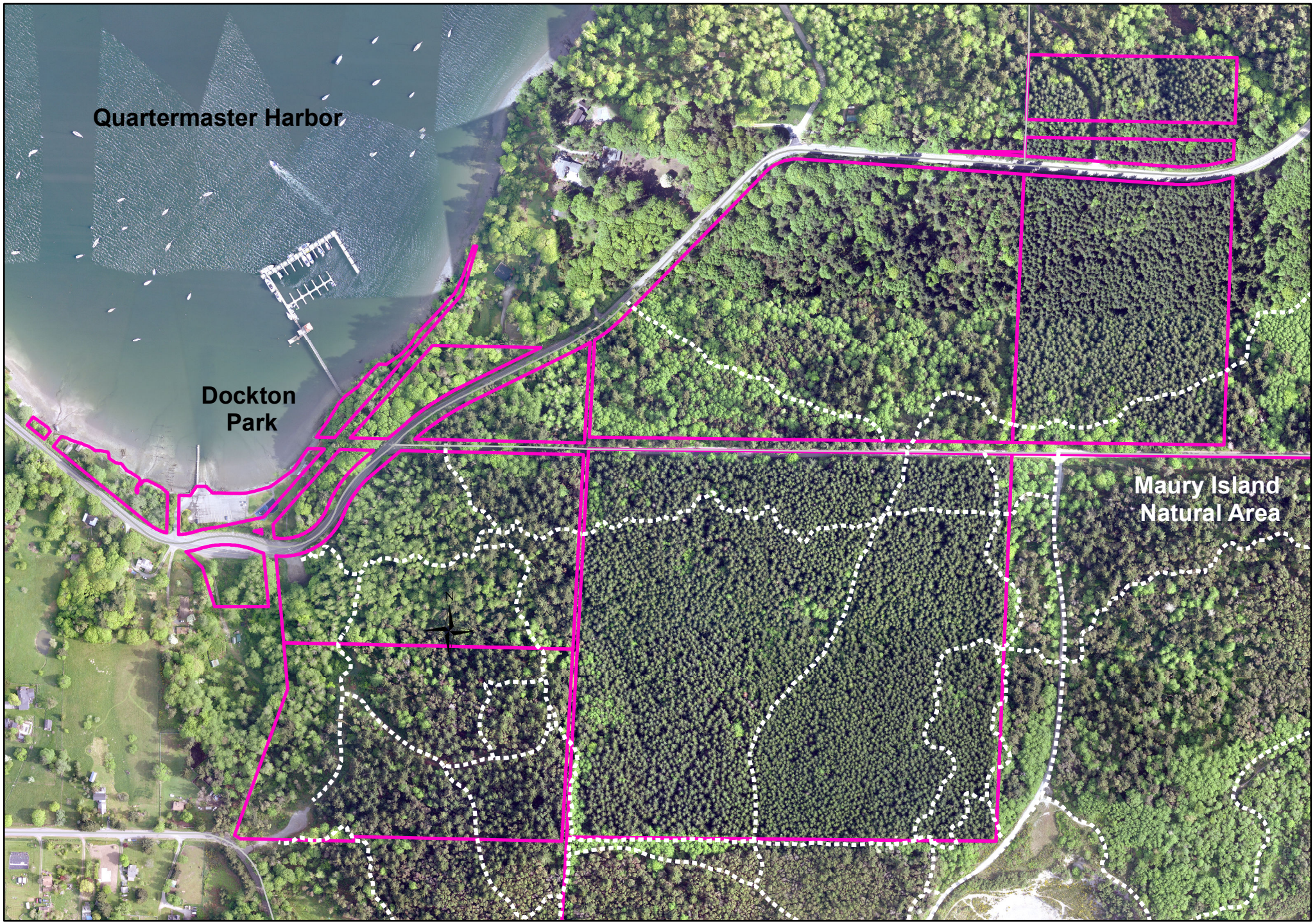
The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

N

200 100 0 200 400 600 800 Feet

WM. Loeber G:\Forestry\Forst_GIS\KC_Forest\Dockton Forest\FSP Maps\Dockton_Soils.mxd

January 10, 2014



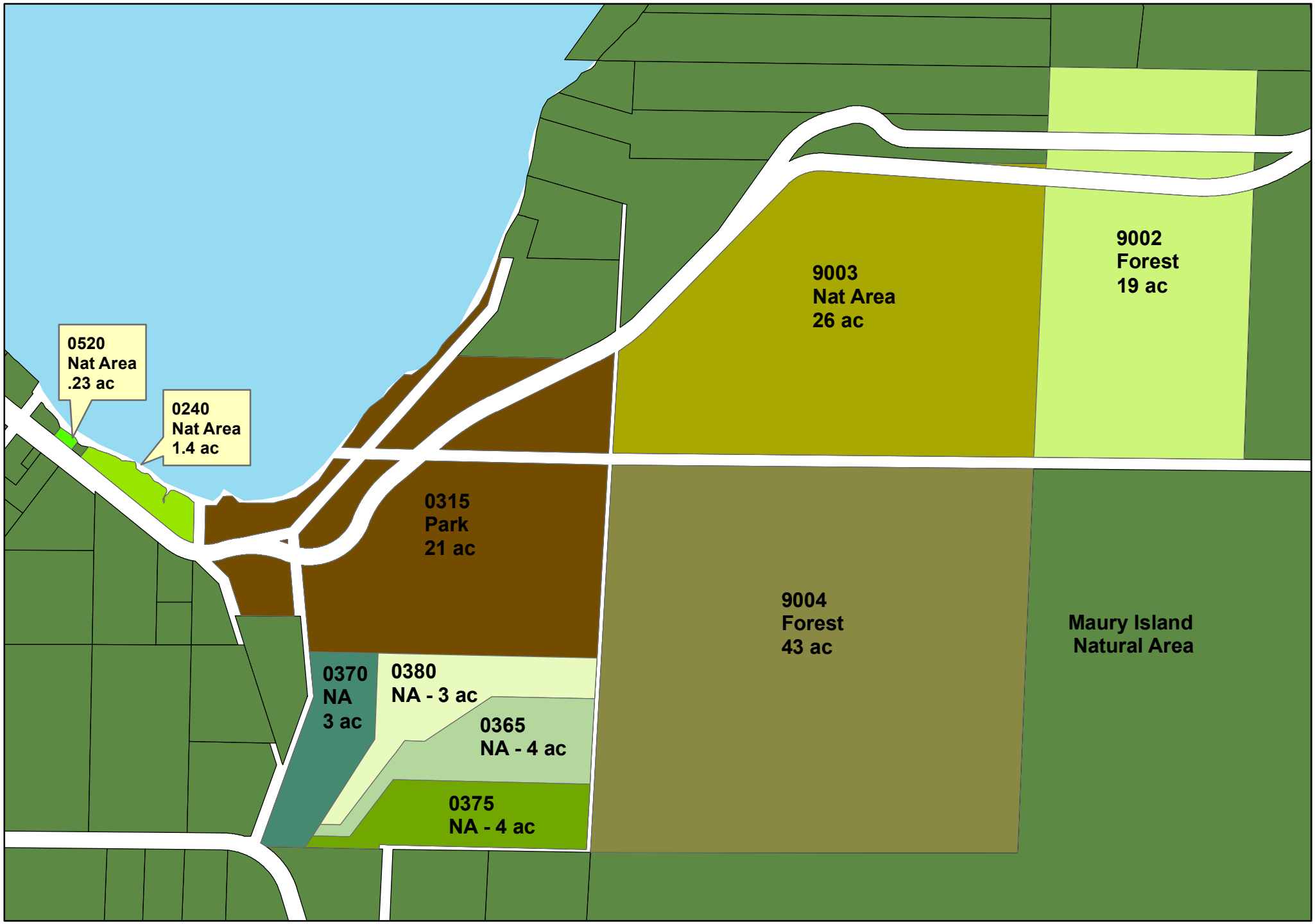
Dockton Forest Trails

0 315 630 1,260 Feet

N

February 2014

King County
Department of Natural Resources and Parks
Parks and Recreation Division



Dockton Park, Forest & Natural Area Parcels

0 320 640 1,280 Feet

N

Feb. 10, 2014

King County
Department of
Natural Resources and Parks
Parks and Recreation Division