STEWARDSHIP PLAN

CHUCKANUT COMMUNITY FOREST
BELLINGHAM, WASHINGTON

Prepared for
Chuckanut Community Forest Park District

Prepared by
Herrera Environmental Consultants, Inc.

HERRERA

Note:
Some pages in this document have been purposely skipped or blank pages inserted so that this document will print correctly when duplexed.

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Prepared for
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June 30, 2022

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INTRODUCTION

BACKGROUND AND PURPOSE

This Stewardship Plan (Plan) has been developed to support the Chuckanut Community Forest Park District (CCFPD) mission to "ensure the entirety of the Chuckanut Community Forest (CCF), an 82-acre forested property, is protected in perpetuity in public ownership, with respect for its ecological, recreational, and educational functions." The property, located adjacent to and south of Fairhaven Park and west of the Interurban trail in southwest Bellingham, was purchased out of foreclosure in 2011 by the City of Bellingham (City) though the Greenways Endowment Fund. In 2013 the voter approved CCFPD was founded as a metropolitan park district to protect the property environmentally and to serve as a fiscal mechanism to repay the loan, via a tax levy. As repayment of the loan is almost fulfilled, the City has commenced a process to develop a Park Master Plan for City-owned properties. This Stewardship Plan has been prepared to provide a framework for the protection, conservation, and restoration of the CCF that is intended to contribute to the City's Park Master Planning process. On January 3, 2014, the City granted the CCFPD a conservation easement for the property and is currently in the process of updating it. This Stewardship Plan has also been prepared to support the development of this updated conservation easement, which will define the future use and management of the site.

The development of this Stewardship Plan built off the extensive scientific research and programmatic recommendations documented in the Chuckanut Community Forest Baseline Report prepared in 2017 by Ann Eissinger (Eissinger, 2017). The baseline report provides a thorough synthesis of the existing environmental documentation of the time. While it was extensively used as a technical resource in the development of this Stewardship Plan, this Plan does not include all the content in the Baseline Report. Readers seeking more information on the habitat in the CCF should consult the Baseline Report as well as the other sources listed in the reference section of this report.

METHODS

Development of this Stewardship Plan included a review of past studies of the site; regulatory guidance and planning support documents from public agencies; scientific literature; field investigations by Herrera Environmental Consultants, Inc. (Herrera) biologists on January 25, 2022, and February 7 and 16, 2022; and Herrera's past work at sites like the CCF.

No formal wetland or drainage delineations were performed by Herrera for this project. Visual evidence of wetland connectivity, seasonal surface water inundation and/or saturation at trail crossings, wildlife observations, habitat features, native and nonnative vegetation communities, and other data were recorded as handwritten notes, photographs, and/or digitally recorded as GPS mapped locations.

EXISTING CONDITIONS

LANDSCAPE SETTING

The CCF is situated within the foothills of the Chuckanut mountains in the Cascade Range. The Chuckanut mountains, part of the Puget Lowland Forest Ecoregion, are considered unique as the place "where the Cascades meet the sea." The CCF is positioned between several fish-bearing streams: Padden Creek, Hoags Creek, and Chuckanut Creek; and multiple wetlands are on site (Figure 1). The nearby Chuckanut Pocket Estuary and Mud Bay, located approximately 2,000 linear feet (LF) to the southwest of the CCF, provides valuable marine nearshore habitat for many species. The CCF provides terrestrial connectivity for species dependent on forested habitats and large contiguous migratory corridors. The CCF's unique landscape setting and habitat characteristics to provide refuge and connectivity for many species within the greater community has been the impetus for advocating for its protection through public process (Ballot Measure, 2013). Located amid a residential neighborhood in the southwest corner of Bellingham, the CCF is connected for recreational use via an existing extensive onsite and regional trail network to surrounding City parks, including Fairhaven Park, Lake Padden Park, Woodstock Farm, Teddy Bear Cove, Arroyo Park, and Happy Valley Park, as well as other adjacent open space properties. The CCF is served by direct connections to the Interurban trail, which provides linkage between trails at Galbraith Mountain, Larrabee State Park, and the Chuckanut Mountains

The CCF's landscape setting also provides historic and educational perspectives regarding land use practices, natural regeneration and or degradation of environmental ecosystems and other factors, which can be considered in regard to planning its future. In recognition of the site's pre-historic heritage, consultation with the Lummi and Nooksack Tribal Nations to designate a Coast Salish name for the site is encouraged.

WETLANDS

Previous wetland studies identified a total of 16 wetlands throughout the CCF (Figure 1). Although the most recent delineation was conducted in 2009, the wetland categorical ratings were updated according to Ecology's updated (2014) Washington State's Wetland Rating System for Wetlands in Western Washington in the Chuckanut Community Forest Baseline Report prepared in 2017 (Eissinger 2017). Washington State's rating system is designed to differentiate wetlands based on their sensitivity to disturbance, rarity, the habitat and water quality and hydrology functions they provide, and how replaceable they may be. Washington State classifies wetlands into the following four categories, as outlined in Table 1.

Table 1. Washington State Wetland Categories.	
Wetland Category[a]	**Description**
I	Wetlands that: ● Represent a unique or rare wetland type, such as old growth or forested wetlands; or ● Are more sensitive to disturbance than most wetlands; or ● Are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or ● Provide a high level of functions. The risk of any degradation to Category I wetlands is extremely high because of the irreplaceability of their functions and values.
II	Category II wetlands are difficult, though not impossible, to replace, and provide high levels of some functions. These wetlands occur more commonly than Category I wetlands, but still need a high level of protection.
III	Category III wetlands: ● Provide functions at moderate levels. ● Can often be adequately replaced with a well-planned mitigation project ● Include interdunal wetlands between 0.1 and 1 acre in size. Category III wetlands have generally been disturbed in some ways and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands.
IV	Category IV wetlands are often heavily disturbed and provide the lowest levels of functions overall, although they may provide some important functions and therefore also need to be protected. Category IV wetlands should be replaceable and potentially improved. However, Ecology recognizes that replacement cannot be guaranteed in any specific case.

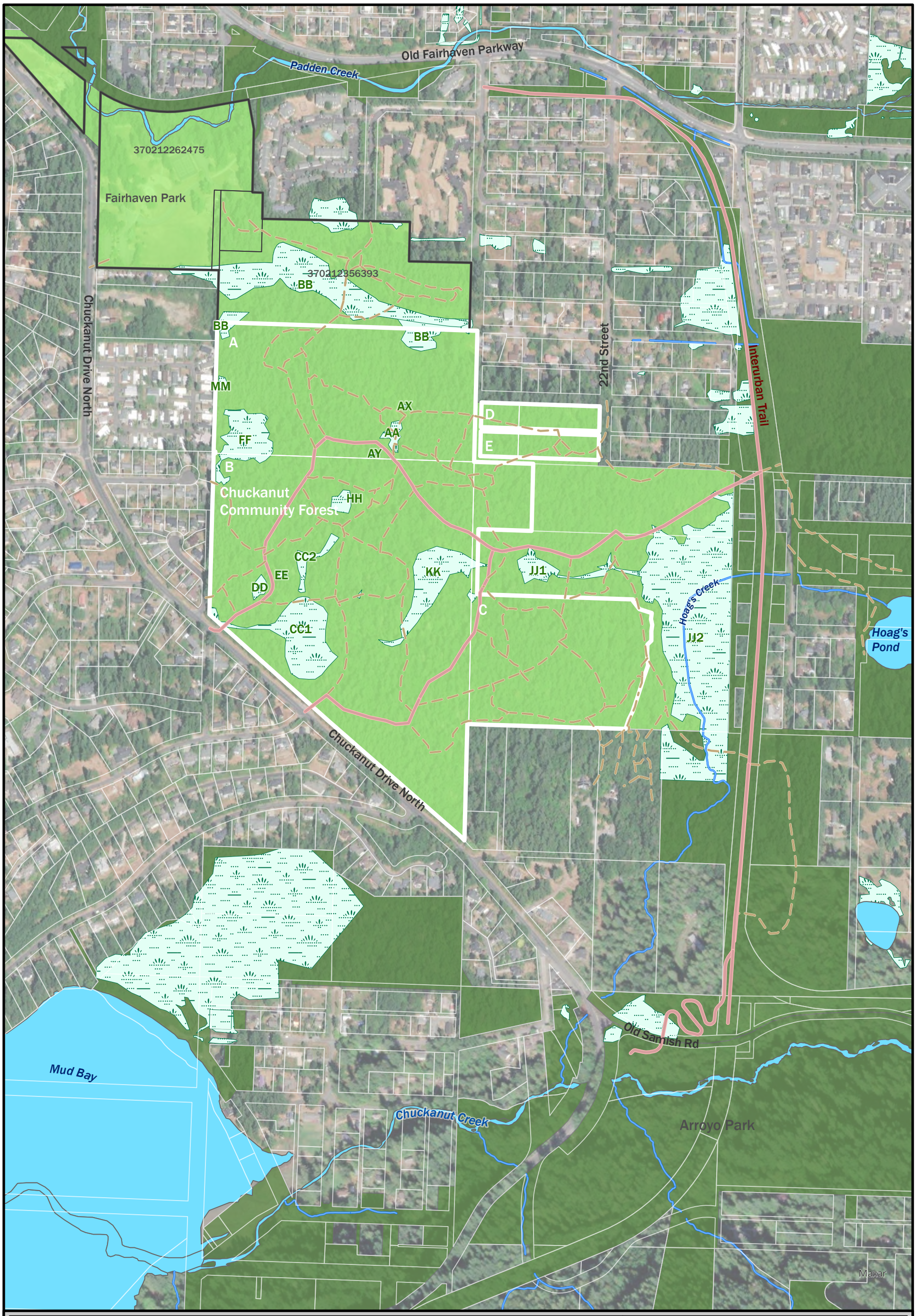
[a] Wetland Categories are defined by the Washington State Department of Ecology (Hruby 2014).

Of the 16 wetlands reported in the CCF's baseline report, 5 of the wetlands were evaluated to meet classification as Category I wetlands, 2 were rated as Category II wetlands, and 9 were classified as Category III wetlands (Eissinger 2017).

Reclassification of Wetlands CC1 and CC2

Wetlands CC1 and CC2 were originally delineated as one highly-functioning Category I wetland in 1990 (Shapiro and Associates 1992) and then separated into two wetlands (Category I CC1 and Category II CC2) in 2009 (NES 2009). The rational for the separation was a lack of hydric soils and an only seasonally connected surface water between the two wetlands. It was postulated that this was exacerbated by compacted soils from the existing bisecting trail.

Wetlands JJ1 and JJ2, previously delineated as one wetland prior to 2009, were similarly separated (Cooke, 2010). Observations of surface water connection during Herrera's 2022 field visits indicate that this area should be similarly reassessed and considered for recombining into one Category II wetland.



Legend

- Whatcom County Tax Parcels (2021)
- Chuckanut Community Forest Boundaries (COB 2021)
- Park Jurisdiction (COB 2021)
- Open Space (Private, Public; COB 2021)
- Water Bodies (COB 2021)
- Streams (COB 2021)
- Delineated Wetlands (COB 2021)

Existing Trails (Open Street Map 2022)

- Minor
- Major

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Figure 1. Chuckanut Community Forest – Land Ownership, Trails, and Wetlands.

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At the time of site visits performed by Herrera biologists in January, February, and March of 2022, surface water was observed flowing over the trail bisecting the CC1 and CC2 wetland areas (see Photos 5 and 6 in the Area B: Wetlands CC1 and CC2 Hydrology Connection Trail Crossing subsection). Hydrophytic vegetation was observed growing next to both sides of the trail alignment, and a large contiguous area of saturated soils was also present to indicate wetland connectivity. Although these hydrology connections were observed during the wet season, ditching and the placement of rocks to serve as ad hoc measures for conveying surface water flows across and or adjacent to the trail indicate that saturated and or inundated conditions between the wetlands is frequent. For the purposes of designating protection and restoration priorities in this stewardship plan, it is recommended that the CC1 and CC2 wetland areas be recombined as one Category I mature forested wetland. Future restoration to minimize impacts along this section of the existing trail will require compliance with City critical areas protection and permitting regulations which will depend on further evaluation of problematic soils and hydrology indicators during the growing season (Environmental Laboratory 2010). Additional information regarding Herrera's review of hydrology connectivity within the CCF and adjacent area is included in the Hydrologic Connections – Priority 3 subsection of the Ecological Significance section of this report.

Gravel Pit Wetlands

Wetlands AA, AX, and AY located at the site of a former gravel pit were observed to be highly disturbed by historical site use and by the current trail system (see Photos 1 through 4 in the Area A: Improvement of Main Trail and Former Gravel Yard Restoration subsection). Nonnative and invasive vegetation including creeping buttercup (*Ranunculus repens*), English ivy (*Hedera helix*), and English holly (*Ilex aquifolium*) were prevalent in these wetlands. The disturbed nature of these wetlands resulted in their lower rating as Category III wetlands. During Herrera's January and February 2022 site visits, a surface water connection was observed to flow downgradient from the gravel pit wetlands over the cross-roadbed trail to a small, delineated wetland and another suspected wetland area that had not been mapped within the adjacent historical gravel pit site area to the south. Invasive Himalayan blackberry (*Rubus armeniacus*) dominates the vegetation within the southern gravel pit site area.

Category I Mature Forested Wetlands

According to the Washington State Wetland Rating System, forested wetlands over 1 acre in size and meeting the WDFW's priority habitat criteria for the old-growth or mature forests are categorically assigned a Category I rating (Hruby 2014). WDFW's criteria for "old growth" forest (west of the Cascade Crest) includes stands of at least two tree species forming a multi-layered canopy with occasional small openings; with at least 20 trees/hectare acre (ha) (8 trees/acre) that are more than 81 centimeters (cm) (32 inches) diameter-at-breast height (dbh) or more than 200 years of age; and more than 10 snags/ha (4 snags/acre) over 51 cm (20 inches) diameter and 4.6 meters (15 feet) tall; with numerous downed logs, including 10 logs/ha (4 logs/acre) that are more than 61 cm (24 inches) diameter and more than 15 meters (50 feet) long (WDFW

2021). "Mature forests" (west of the Cascade Crest) includes stands where the largest trees are 80 to 200 years old ***OR*** the species that make up the canopy have an average diameter (dbh) exceeding 21 inches (53 cm); crown cover may be less than 100 percent; decay, decadence, numbers of snags, and quantity of large, downed material is generally less than that found in old growth. Ecology has noted that WDFW's criterion for dbh is based on measurements for upland forests and that 80- to 200-year-old trees in wetlands will often have smaller dbh because their growth rates are often slower (Hruby 2014).

An in-depth analysis measuring the dbh of trees growing within Wetlands CC, FF, and KK and the onsite portion Wetland BB, which extends north of the CCF property on City-owned land associated with Fairhaven Park, was conducted by City Parks Arborist James Luce in January 2009 in association with the proposed Fairhaven Highlands development project (Luce – City of Bellingham, January 2009). The trees measured within Wetlands CC, FF and KK meet Ecology's criteria for these areas to be classified as Category I mature forest wetlands. At least five of the trees documented in each of these wetlands measured greater than 32 inches dbh, and thus were more representative of old growth habitat. The trees documented within the onsite portion of Wetland BB included three Douglas firs, one measuring 50 inches dbh and two each measuring 23 inches dbh. The trees are indicative of the extended forest conditions within the larger offsite portion of the wetland to the north of the CCF property, therefore meeting the Category I mature forested wetland criteria. Mature tree species documented within the wetlands included Douglas fir (*Pseudotsuga menziesii*), red cedar (*Thuja plicata*), grand fir (*Abies grandis*), red alder (*Alnus rubra*) and paper birch (*Betula papyrifera*).

Wetland HH and several other of the forested wetlands are likely to meet the tree size criteria representative of mature forest. However, based on each of these wetland's dimensions measuring less than 1 acre in size, Ecology's threshold for rating as a Category I wetland based on special characteristics as mature or old growth forest is not positively met. The smaller-sized forested wetlands, evaluated for rating based on their functions, were assigned ratings of Categories II and III.

Wetland Buffers

Since the most recent 2009 wetland study, the City's protective buffers to protect wetland areas, based on land use, wetland categorization ratings, and habitat have been updated. However, the City's updates do not incorporate Ecology's 2014 updated recommended Wetland Rating habitat score point values. In essence, the buffers indicated in the original reports no longer reflect regulatory updates and should be modified. Using Ecology's guidance in Table 2 (Ecology 2022), a crosswalk was performed to merge this information, converting the originally evaluated habitat scores in 2009 to the new habitat scoring criteria updated in the 2014 Wetland rating system and Ecology recommended point ranges.

Table 2. Crosswalk of Ecology-Recommended Functional Scores from 2004 to 2014 Rating System.		
Function Score	**2004 Rating System Previous Point Range as Recommended by Ecology**	**2014 Rating System Point Ranges as adopted by the City of Bellingham (BMC 16.55.340)[a]**
Habitat – Low	≤19	3 to 4
Habitat – Moderate	20 to 28	5 to 7
Habitat – High	29 to 36	8 to 9
Water Quality – High	24 to 32	8 to 9[b]

[a] Ecology has provided updated recommended point ranges as of July 2018, which is not reflected in BMC 16.55.340 (Ecology 2022).

[b] City of Bellingham does not use water quality function scores to determine buffer widths.

BMC = Bellingham Municipal Code

Table 3 and Figure 2 provide details regarding the site wetlands updated categorical ratings and City-designated standard protective wetland buffer widths.

Table 3. Wetlands and Buffer Widths in the CCF.				
Wetland	**Wetland Size (square feet)**	**Category**	**Habitat Score**	**Buffer (moderate intensity land use)**
AA	8,998	III	Medium	100
AX	130	III	Medium	100
AY	449	III	Medium	100
BB	21,516 (on site, wetland extends off site to the north of CCF property)	I	Medium	110
FF	57,543	I	Medium	110
MM	2,402	III	Low	60
CC1 + CC2	93,964 + 12,791	Combined I	High	190
DD	5,919	II	Medium	110
EE	919	III	Low	60
GG	329.3	III	Low	60
HH	8,764	II	Medium	110
KK	72,181	I	High	190
LL	1,631	III	Low	60
JJ1	28,842	III (previously COB category II)	Medium	100
JJ2	estimated to be >10 acres	I	Medium	110

Buffer functions are typically served at high, moderate, and low levels based on the existing vegetation. Forested buffers typically provide functions at high levels, while open, cleared vegetation areas serve functions at the lowest levels. Table 4 provides a summary of the levels of wetland buffer functions that can be provided by various vegetation communities.

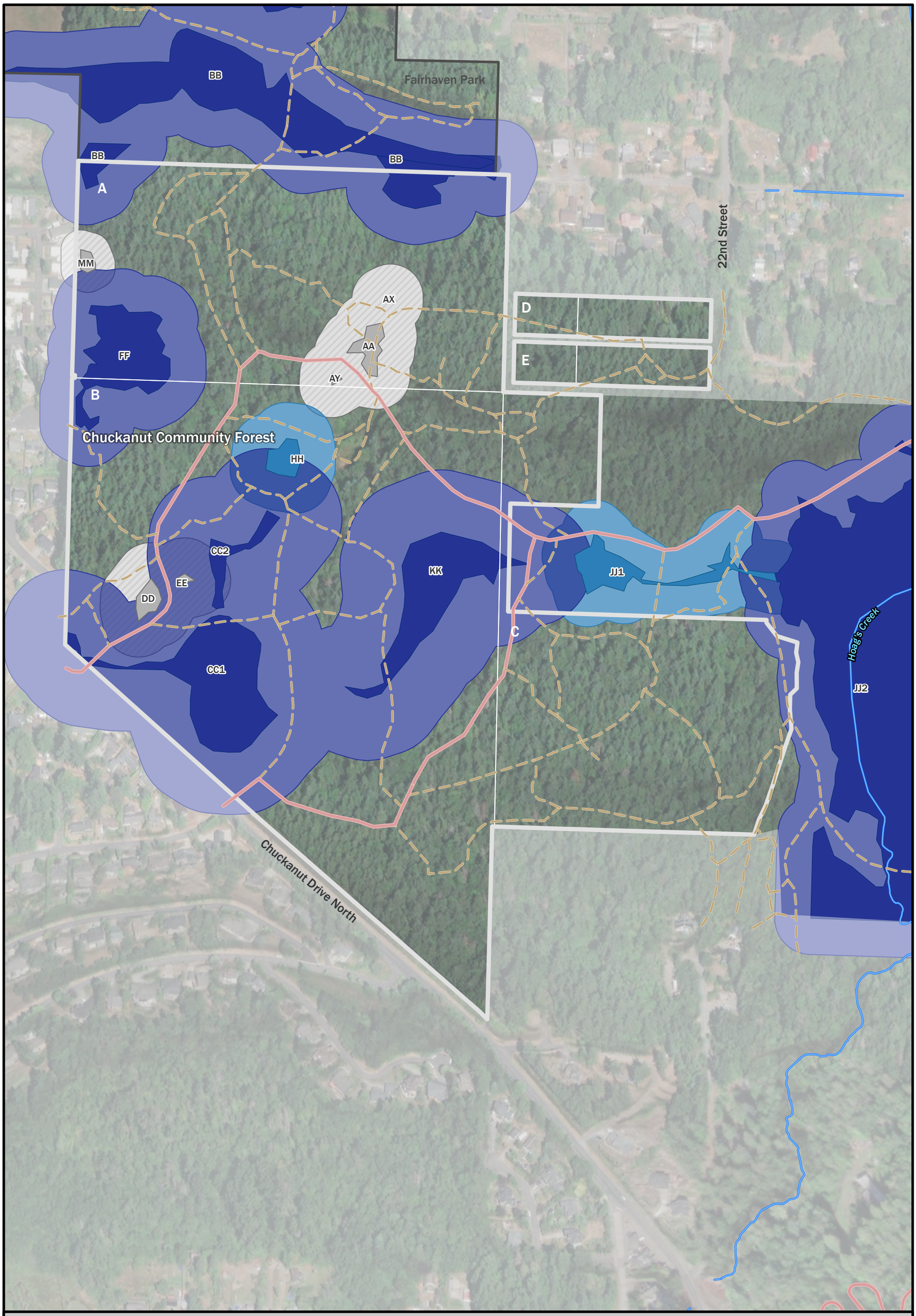
Table 4. Levels of Buffer Functions Typically Served By Vegetation Class.			
	Existing Buffer Vegetation		
Buffer Function	**Forest**	**Scrub-Shrub**	**Open Meadow/Grass**
Water Quality: Stormwater run-off infiltration	High: Trees and woody stemmed plants provide year-round infiltration	Moderate	High – Low – Dense herbaceous vegetation can provide high levels of water quality treatment, seasonally, when grass is not dormant by drought
Shoreline/Soil Stability	High	Moderate	Low
Temperature Moderation (shade)	High	Moderate	Low
General Wildlife Habitat	High	Moderate	Low
Recruitment of Large Woody Debris in Aquatic Area	High	Moderate	Not Applicable

Although the CCF's upland forested buffers provide relatively high levels of buffer functions, the ability of the site to perform the highest levels of wildlife habitat connectivity, shelter, and refuge functions is reduced due to disturbances associated with the existing trail system that surrounds, and in some cases directly bisects, the site wetlands. For each of the site's wetlands, the City's standard buffer width designated to provide its protection is reduced by a bisecting trail, as illustrated on Figure 2.

The former gravel pit wetlands, AA, AX, and AY, are bisected by multiple trails; only Wetland AX's City-regulated standard buffer width of 100 feet along its northern edge remains relatively undisturbed because it is not directly bisected by a trail.

The Wildlife Habitat section of this report provides details regarding disturbances to wildlife associated with trail uses within 100 meters (328 feet). Regardless of the wetland's categorical ratings, the CCF wetlands support diverse aquatic, emergent, shrub and forest vegetation plant communities that provide habitat for a variety of insect, amphibian, mammal, and bird wildlife species. Freshwater fairy shrimp (*Branchinecta sp.*) have been documented within the CCF's vernal pool wetlands and there are plenty of habitat opportunities for beavers.

The effectiveness of the wetland buffers can be reduced when bisected by trails. The existing trails in wetland buffers should be prioritized for removal in the City's Master Planning process. The buffers situated between the outer edge of the Category I mature forested wetland KK and the nearest trail range in widths from 0 feet where a trail bisects the wetland's southern end to approximately 40 feet near the wetland's western edge. These limited buffers are not adequate for protecting wildlife species from disturbances associated with trail use, as described the Wildlife Habitat section of this plan. The wetland's buffer width to the north is 84 feet, and the buffer along the wetland's eastern boundary is equal to or greater than the City's standard regulated buffer width of 190 feet, which provide more than double the distance of the smaller buffer width to allow refuge for wildlife.



Legend

- Chuckanut Community Forest Boundaries (COB 2021)
- Fairhaven Park
- Streams (COB 2021)

Trails (Open Street Map 2022)

- Minor
- Major

Delineated Wetlands (COB 2021)

- Category I wetlands
- Category II wetlands
- Other wetland categories

Wetland buffer

- Category I buffer
- Category II buffer
- Other wetland buffer

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Figure 2. Chuckanut Community Forest – Updated Wetland Categories and City-Regulated Buffer Widths.

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The existing buffers extending from the outer boundary of Wetland HH, a Category II forested wetland, to the nearest trail range in width from 42 feet to 84 feet. The undisturbed portion of Wetland HH's buffer situated between the wetland's other boundary to the nearest trails represents a buffer width reduction of 24 percent to 61 percent of the City's standard designated protective buffer width of 110 feet.

FOREST

Previous Studies

Previous reports identify coniferous, and mixed coniferous/deciduous within the CCF. Mature (stands more than 80 years old) forested wetlands were also identified. These studies have provided qualitative forest descriptions, and some quantitative measurements. Although delineation efforts have described many wetlands within the CCF as mature forested, the Baseline Report identified a further need to evaluate upland trees for forest maturity (Eissinger 2017).

Forest Structure and Maturity

The City of Bellingham Phase 1 Urban Forestry Management Plan (UFMP) – Canopy and Forest Structure Analysis Summary report classifies forest structure into the following five categories: Old Forest, Mature Forest, Young Forest Tall, Young Forest Short, and Pole Saplings and Shrub (Diamond Head 2021). The vegetation structure identified for the majority of the CCF in the UFMP is Tall Forest Young, which is characterized as trees aged between 50 and 80 years with heights ranging between 82 feet to less than 115 feet (Figure 3). Old and Mature Forest areas are identified to the south of Old Samish Road within areas adjacent to Arroyo Park and Whatcom County's Chuckanut Mountain Park. The Mature Forest vegetation structure is characterized by trees aged 80 to 240 years with heights between 115 feet to less than 148 feet. The locations of the ground truthing plots to support the UFMP Phase 1 analysis, which is primarily based on 2013 LIDAR interpretation, are not identified in the report; and therefore, any data specific to the CCF is not transparent.

The Washington Department of Fish and Wildlife (WDFW) describes mature forest west of the Cascade crest as forest stands of generally 80 to 200 years old. Old growth forest is described as more than 200 years old. Mature forest is defined by stands where average dbh is 21 inches or greater. Old growth requires stands at least 8 trees/acre with a dbh greater than 31 inches. Old growth also requires 4 snags/acre measuring 20 dbh and greater than 15 feet tall, and 4 logs/per acre averaging 24 inches in diameter and at least 50 feet in length. Generally, mature forests exhibit less decay and decadence and contain fewer snags and logs than old growth forests (WDFW 2021).

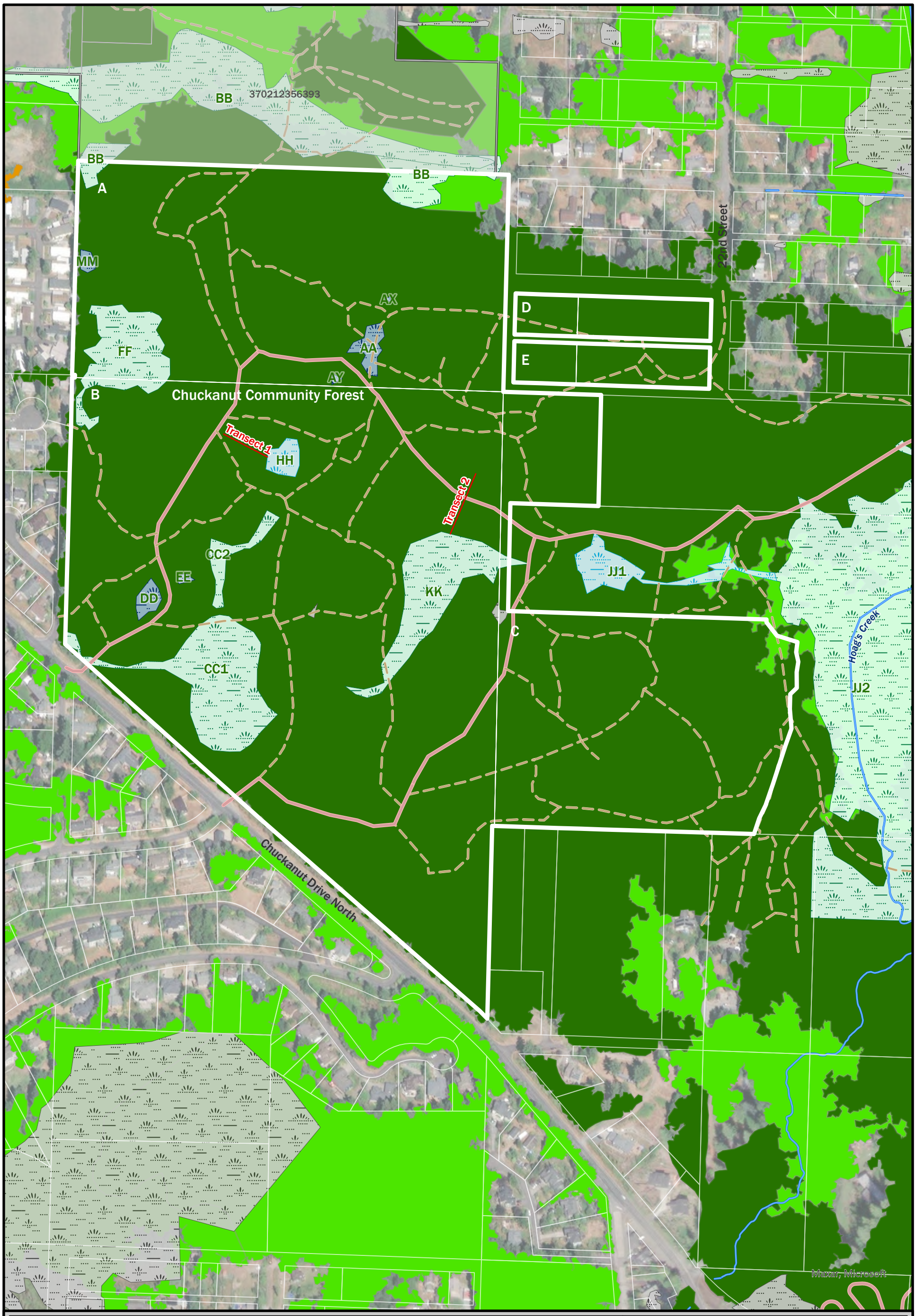
It should be noted that forest ratings based on average diameters, or averages of most other characteristics, may be misleading. Averages can introduce bias by under-rating forests due to

skew in tree size distributions: abundant small trees lead to averages that underestimate forest age. Characteristics used by the US Forest Service to define old growth/mature forest may provide better source material to develop criteria to assess forest maturity and is identified as a data gap in this report (Ruggiero et al. 1991).

As a preliminary means for examining forest maturity within the CCF, Herrera documented trees and large woody debris along two transects. on February 6, 2022 (Appendix A). Transect 1 encompassed an area of 2,700 square feet (18 feet wide by 150 feet long). Transect 2 was a total of 3,600 square feet (18 feet wide by 200 feet). Transects were located within the City's designated protective buffers associated with the forested wetlands HH and KK, respectively (Figure 3). Both transects were bisected by existing trails; Wetland KK's buffer was bisected by two paralleling trails.

Species and dbh were recorded for all live trees that were partially or fully rooted within the forest transects. Diameter and average length were recorded for all snags and logs occurring in the transects and evaluated according to WDFW's criteria for mature and old growth forest, as well as priority habitat features. Due to the level of decay of some of the downed logs and snags, species identification was not determined for all recorded habitat features, although some were at least simply identified as deciduous when applicable. WDFW describes snags and logs that exhibit sufficient decay to enable cavity excavation and use by wildlife as habitat features. Priority habitat snags are identified of having a dbh greater than or equal 20 inches and are at least 6.5 feet tall. Priority logs have an average diameter of 12 inches and are a minimum of 20 feet long (WDFW 2021). Upland forest transects indicate approximately 7 priority snags and 62 priority logs per acre.

The average dbh for trees present along both transects was approximately 15 inches. Transect 1 met WDFW's old growth criteria for snags only. Based on this information, it was determined that the evaluated upland forest buffer areas within the transact areas did not meet the WDFW criteria for old growth or mature forest. The existing snags and downed logs, however, meet the criteria described by WDFW as priority habitat features. Qualitative observations made throughout the CCF suggest priority snags and logs are present throughout the site. Further characterization and study are recommended since Herrera's evaluation, limited in size and scope, was not intended to be statistically significant. The long-term preservation of the CCF will allow the site's trees to continue to mature and provide habitat complexity typical of mature and old growth forests. Qualitative observations indicate that the CCF is dominated by a mature forest community and that future management decisions should be based on this assumption.



Legend

- Whatcom County Tax Parcels (2021)
- Chuckanut Community Forest Boundaries (COB 2021)
- Fairhaven Park
- Streams (COB 2021)
- Water Bodies (COB 2021)

Forest Structure (COB 2021)

- Young Forest Tall
- Young Forest Short
- Pole Sapling

Trails (Open Street Map 2022)

- Minor
- Major

Delineated Wetlands (COB 2021)

- Category I - Mature Forested
- Category II
- Category III
- Wetlands outside project area

Study Transect Lines

Figure 3. Chuckanut Community Forest – Forest Maturity, Trails, and Wetlands.

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Understory Conditions

Data collected from the upland forest transects were also used to evaluate understory vegetation conditions (Appendix A). Understory vegetation in the forest transects were representative of upland forest conditions found throughout the CCF. Dominant species include western sword fern (*Polystichum munitum*), dull Oregon grape (*Mahonia nervosa*), Pacific trailing blackberry (*Rubus ursinus*), and salal (*Gaultheria shallon*). Some invasive vegetation was identified in the transects and throughout the forest. Invasive vegetation identified includes English holly (*Ilex aquifolium*), English ivy, Himalayan blackberry, cherry laurel (*Prunus laurocerasus*), and periwinkle (*Vinca minor*). Community members have additionally identified European mountain ash (*Sorbus aucuparia*) , Scotch broom (*Cytisus scoparius*), English hawthorn (*Crataegus monogyna*), herb Robert (*Geranium robertianum*), sweet woodruff (*Galium odoratum*), bohemian knotweed (Fallopia × bohemica), lesser celandine (*Ficaria verna*), and giant hogweed (*Heracleum mantegazzianum*) (James, F., CCFPB, 2022). The Baseline Report describes areas within the CCF where invasive non-native plants are present and in need of restoration (Eissinger, 2017). The Whatcom County noxious weed list lists giant hogweed Class A which is required for control (Whatcom County 2022). Knotweed is listed as a Class B designated weed and control is required. Lesser celandine and Scotch broom are listed as Class B or targeted control, mapping and educational or biological efforts.

The shrub layer within the CCF appears to be underrepresented in comparison to conditions that are typical of upland forests of the region. As an example, native common snowberry (*Symphoricarpos albus*), a hardy shrub that is highly adaptive to many habitat conditions, is sparsely represented in portions of the CCF where it would be typically present, if not dominant, in similar forest conditions. The lack of a dense native shrub layer within portions of the CCF may be due to historical vegetation clearing and or soil compaction from other past land use disturbances.

Soils

Three main soil types are mapped by the Natural Resources Conservation Service within the CCF (Figure 4): Everett-Urban land complex, 5 to 20 percent slopes; Chuckanut gravelly ashy sandy loam, 15 to 30 percent slopes; and Squalicum-Urban land complex, 5 to 10 percent slopes.

These soil types are thoroughly described in the 2005 Wetland Delineation Report (NES) and the 2017 Baseline Report (Eissinger 2017). Many test pits and borings have examined existing wetland and upland soils throughout the site (NES 2005; GeoEngineers 2009).

The majority of the site's wetlands are situated within depressional areas of the Everett-Urban Land Complex. Although the non-hydric Everett-Urban Land Complex is characterized by excessively drained gravelly ashy sandy loams and very gravelly sand, undrained hydric Labounty silt loams are included as a minor (3 percent) soil component in landform depressions. Hoag's Pond located to the east of the CCF is associated with artificially drained Panghorn muck, hydric Soil Unit #116.

Several historical gravel or borrow pits are located on the CCF site. Throughout its post-colonial history, the site has also undergone logging operations and other resource extracting practices. Historical land uses, as well as recent trail development, have disrupted and likely compacted the native topsoil on much of the site, thus straining growing conditions and preventing the reestablishment of native forest understory while also aiding in the establishment of nonnative vegetation in some areas.

Wildlife Habitat

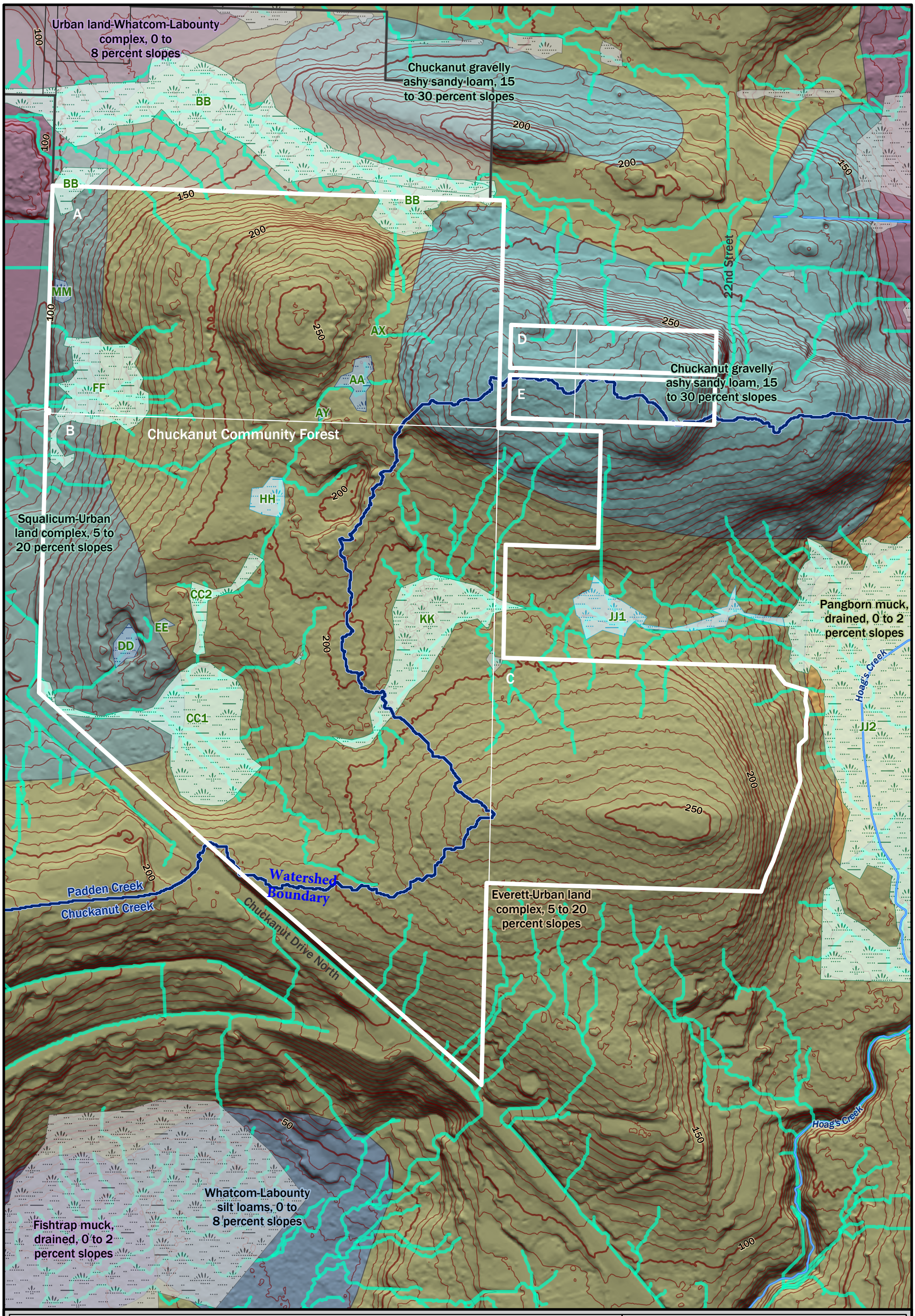
The presence and residence of wildlife species is highly dependent on the suitability, diversity, and quality of available habitat. Forested patches and large trees provide canopy cover, forage, and refuge habitat for many organisms. "Significant tree" is a regulatory term adopted by many local agencies that provides baseline measurements for determining their value on the landscape. The City of Bellingham defines significant trees as trees of any species that are 6 inches in diameter or greater as measured 4.5 feet from the base of the tree (BMC 16.60.040). A formal inclusive survey of the CCF has not been done to date; however, qualitative observations indicate that most trees with the CFF meet the City requirements of significant.

In general, forested wetlands support a large diversity of wildlife that are dependent on the intersection of terrestrial and aquatic habitats including beaver, muskrat, waterfowl, songbirds, and amphibians. Snags are dead trees that are left upright and decompose naturally. Although there are no regulatory minimums for snags, the City encourages preservation of snags and downed wood (BMC 16.550.080, 16.55.490.C.2) because they provide important forage, perching, and roosting habitat for wildlife. However, City code on removal hazardous trees (BMC 13.40.080) may undermine snag retention efforts in many instances. Appropriate management of CCF, including explicit protection of snags, would provide an opportunity to maintain this rare and important habitat component within the city.

Use of the forest and wetland habitat in the CCF has been thoroughly documented in previous studies (Shapiro and Associates 1992; Aqua-Terr Systems 1994; Eissinger 2003; NES 2007). The Environmental Baseline Report identifies that these studies are outdated, and additional field survey is needed to collect data to identify and map specific priority habitats (Eissinger 2017).

Adjacent Habitats

Whatcom County identifies a large montane area south of the CCF including Chuckanut Mountain as the Chuckanut Wildlife Corridor (Whatcom County GIS). The Chuckanut Creek riparian area is also identified by WDFW as a terrestrial biodiversity area and corridor. Agency notes describe the area as containing a known bald eagle nest site, wood duck (*Aix sponsa*) breeding area, and hairstreak butterfly (subfamily Theclinae) and several bat species including Townsend's big-eared bat (*Corynorhinus townsendii*), Yuma myotis (*Myotis yumanensis*), and little brown bat (*M. lucifugus*).



Legend

- Chuckanut Community Forest Boundaries (COB 2021)
- Fairhaven Park
- Delineated Wetlands (COB 2021)
  - Category I - Mature Forested
  - Category II
  - Category III
  - Wetlands outside project area
- Streams (COB 2021)
- 5 FT contours (from 2013 LiDAR)
- Soils (NRCS 2020)
  - Chuckanut gravelly ashy sandy loam, 15 to 30 percent slopes
  - Everett-Urban land complex, 5 to 20 percent slopes
  - Fishtrap muck, drained, 0 to 2 percent slopes
  - Pangborn muck, drained, 0 to 2 percent slopes
  - Squalicum-Urban land complex, 5 to 20 percent slopes
  - Urban land-Whatcom-Labounty complex, 0 to 8 percent slopes
  - Whatcom-Labounty silt loams, 0 to 8 percent slopes
- Modeled Hydrologic Connections (from 2013 LiDAR)
- Modeled Watershed Boundaries (Herrera 2022)

Figure 4. Chuckanut Community Forest – Soils and Topography.

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A series of caves in Chuckanut Mountain County Park have been recorded as Townsend's big-eared bat hibernacula (Whatcom County Wildlife Advisory Committee 2021; Whatcom County 1994). In addition, a Whatcom County report from 1994 provides indicates Chuckanut Mountain area provides habitat for several WDFW priority species including Vaux's swift (*Chaetura vauxi*), band-tailed pigeon (*Patagioenas fasciata monilis*), and breeding habitat for black-tailed deer (*Odocoileus hemionus columbianus*). The estuarine habitat in Mud Bay is identified by WDFW as habitat for hard-shell clams, and shorebird concentrations including dunlins (*Calidris alpina*).

The City of Bellingham 2021 Wildlife Corridor Analysis used geospatial modeling to identify important habitat areas and connectivity linkages between habitat patches within the Bellingham city limits (COB 2021). The City identifies the CCF and the surrounding natural habitats as a part of a terrestrial wildlife habitat network (Figure 5). Several wildlife corridors were identified that connect habitat in the CCF to surrounding habitats including Chuckanut Mountain and the Chuckanut Bay. The City analysis indicates a wildlife corridor that crosses Chuckanut Drive North at the southernmost point of the CCF and connects to habitat at Chuckanut Bay. No formal wildlife crossing exists at this location. The road is likely a linear movement barrier for some terrestrial wildlife species. Additionally, Interstate 5 was identified as a Significant Movement Barrier between habitat in the region of Hoag's Pond (and the CCF) and habitat around Lake Padden. It should be noted that the Wildlife Corridor Analysis provides a high-level overview of habitat within the entire city. Information used to inform management decisions with the CCF should be site specific and informed by best available, peer-reviewed science, which has been accepted for use by regulatory agencies.

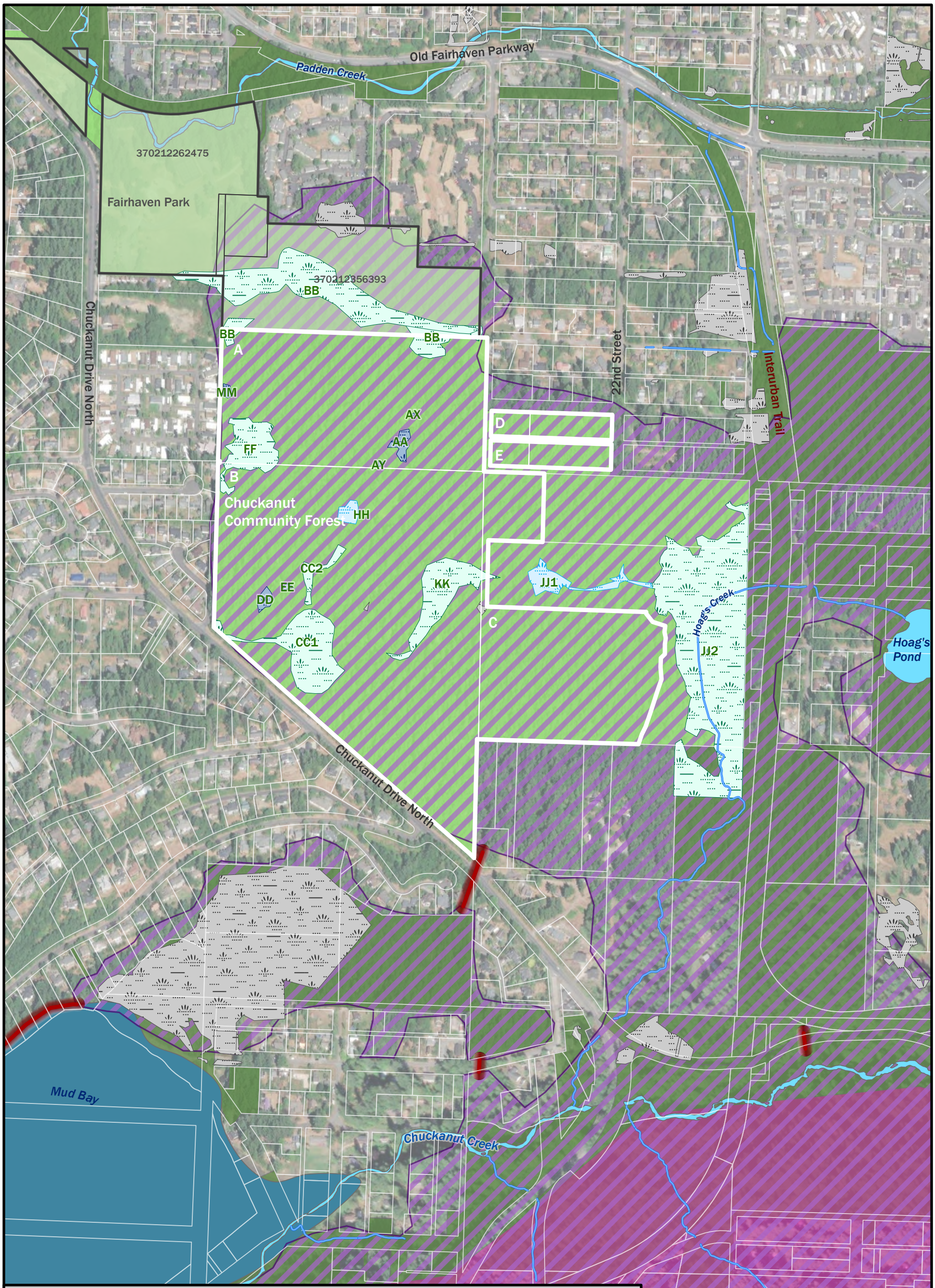


Figure 5. Chuckanut Community Forest – Natural Areas and Habitats.

ECOLOGICAL SIGNIFICANCE

PRIORITY AREAS

Based on the baseline existing conditions information and mapping as described in the above sections, areas within the CCF can be prioritized based on their presumed ecological value. Areas assigned a high numerical value should be prioritized for preservation, restoration and or enhancement activities as necessary (Figure 6). Table 5 and the following sections summarize these priorities into five areas with Priority 1 being the highest priority for preservation and restoration. It should be noted that the CCF functions as an integrated whole for many species and ecological functions. Aggregating spatial data into discrete units may diminish the interconnectedness of ecosystem functions. For example, forested wetlands would be affected by impacts to upland forest. This ranking system was intended only to provide a high-level overview so that managers may prioritize immediate management actions. Restoration, protection, and development activities should consider a holistic approach regarding the larger ecosystem in the CCF.

Table 5. Ecological Priority Areas for Preservation and Restoration.

Priority 1	Priority 2	Priority 3	Priority 4	Priority 5
Mature Forest Wetland	All Other Wetlands	Non-Wetland Drainages	Buffers	Upland Forest (non-buffers)

Mature Forested Wetlands – Priority 1

The site's mature forested Category I wetlands represent a rare ecosystem in Washington State. The functions provided by the mature forested wetlands may take longer than a century to develop the relatively undisturbed wetlands that provide high levels of functions and contain attributes deemed irreplaceable within a human lifetime.

Therefore, impacts to the site's mature forested wetlands have an associated temporal loss of function. In addition to the hydrologic and water quality functions provided by all wetlands in the CCF, the mature forest wetlands provide significant functions habitat functions including high biodiversity and habitat for unique and sensitive species.

Due to the rarity, sensitivity, and irreplaceably of this ecosystem, these areas are deserving of the highest level of protection in the CCF. Where human activities have already disturbed areas of these wetlands, targeted restoration and rehabilitation should occur.

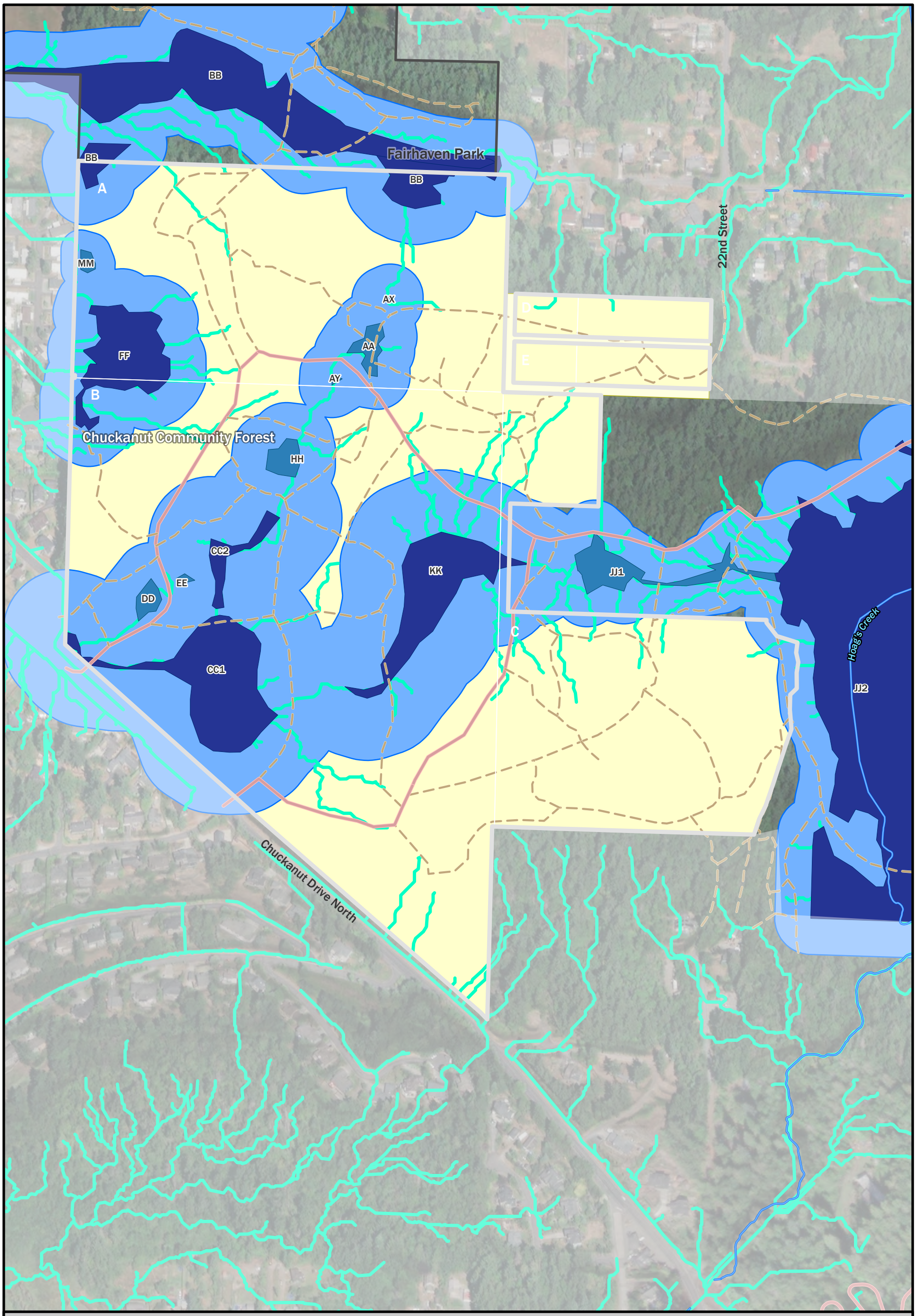
Other Wetlands – Priority 2

Non-mature forested wetlands in the CCF are providing significant ecosystem functions. These include connectivity between habitats (terrestrial forest, wetland, aquatic, vernal pool) hydrology and water storage functions, water quality filtration, and nutrient cycling. Protection of these wetlands is also a high priority; and impacted areas where trails can be reduced, forest canopy restored and or enhanced through nonnative species removal, and native plant species and structure diversity increased is recommended.

Hydrologic Connections – Priority 3

Areas providing seasonal connectivity between wetlands are important for many of the same reasons as wetlands. These areas provide seasonal habitat and connectivity between wetlands for water dependent species. Wetland connections help maintain hydrology in wetlands located downgradient. Subsurface flows through these areas provide water quality functions through filtration. For these reasons, hydrologic connections deserve protections and corrective actions where they are intersected by trail development or other disturbances.

The 2017 CCF Baseline report suggests that seasonal surface flows and seeps occur throughout the site and are related to seasonal precipitation and water movement downslope from seeps potentially exiting from wetland areas (Eissinger 2017). Seasonal hydrologic connectivity between the CCF site wetlands was estimated by Herrera based on a desktop topography/LiDAR analysis, on-the-ground hydrology observations, and examining previous reports. A formal wetland delineation was not performed for this study to determine if these areas are contiguous with the mapped wetlands. Analysis suggests that many of the wetlands occurring in the CCF, as well as wetlands off site, are hydrologically connected via wet season surface or shallow subsurface water (Figure 5). During the 2022 Herrera site visits, observations of ponded or flowing surface water, saturated soils, and or hydrophytic vegetation were made in topographic low points between wetland features. Where wet conditions existed between wetlands, a GPS point was recorded and documented with photographs. This data led to identifying those areas where bisecting trails should be improved to accommodate hydrology connections and/or to rehabilitate soils from compacted conditions, as described in the Needs and Opportunities section of this report. Although not formally documented as a stream, an offsite drainage that flows west through Wetland BB is present directly north of the CCF on the adjacent Fairhaven Park property. The existing boardwalk crossing of this drainage feature and associated wetland is typical of that recommended for some of the trail crossings of Priority 4 and 5 wetlands and Priority 3 non-wetland drainage areas in the Needs and Opportunities section (Photo 17).



Legend

- Chuckanut Community Forest Boundaries (COB 2021)
- Fairhaven Park
- Streams (COB 2021)
- Water Bodies (COB 2021)

Trails (Open Street Map 2022)

- Minor
- Major

Delineated Wetlands (COB 2021)

- Category I wetlands (Priority 1)
- Other wetlands (Priority 2)
- Modeled Hydrologic Connections (Priority 3)
- Wetland buffer (Priority 4)
- Upland forest non-buffer (Priority 5)

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Figure 6. Chuckanut Community Forest - Priority Areas for Preservation and Restoration

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Buffers – Priority 4

Prioritizing the preservation/restoration and/or rehabilitation of the City's designated buffer areas is important for regulatory compliance, as well as for maintaining and or increasing the level of critical areas functions performed at the site. Trail removal and vegetation restoration within the site's wetland buffers is highly recommended to provide increased benefit to wildlife and long-term preservation of the site's wetlands and forest structure.

Upland Forest – Priority 5

The upland forest vegetation community is a priority for preservation within the CCF. However, the ranking of City-regulated buffers is higher in priority than those areas of upland forest where no critical areas regulations are applied. Maintaining the integrity of the upland forest is important for the wildlife habitat connectivity, species diversity, and defense against invasive species encroachment.

Wildlife Habitat

Significant, species-specific habitat areas and mapping have been identified as a data gap (Eissinger 2017). Recreational activities, even quiet forms, can have significant impacts to wildlife and biodiversity (Gaines et al. 2002; Tulalip Tribes 2021). Recreational activities such as horseback riding, hiking, jogging, ecotourism, and mountain biking can negatively impact wildlife as well as plant ecosystems. These activities can lead to soil compaction, erosion, spread of disease and introduction of exotic species. On and off leash dogs can also negatively affect the wildlife by trampling habitat and disturbing wildlife. Although there is a lack of site-specific data in this regard for the CCF a large body of literature indicates that recreation activities influence wildlife behavior, physiology, and reproduction.

A literature review by the US Forest Service (USFS) suggests that wildlife is impacted by recreational trails by altering habitat use through displacement and avoidance behaviors (Gaines et al. 2002). Fragmentation resulting from trail establishment has been shown to affect forest bird species that require large forest patches. The paper indicated that trails may break up forest patches and increase nest predation and parasitism rates. Hiking trails were noted to have a zone of influence of 100 meters for some bird species. The USFS study also indicates that while roads negatively affected cavity dependent species such as pileated woodpeckers, recreational activity is unlikely to have the same effect as their nests are more secure from nest predation than any other group of forest birds (Gaines et al. 2002).

A 2021 literature review by the Tulalip Tribes indicates that recreational activities can have significant impacts to wildlife and biodiversity and that recreational pressures on the environment may be increasing. Repeated disturbance may trigger spatial or temporal avoidance behaviors in wildlife. Spatial avoidance may displace wildlife to less desirable, less ecologically significant habitat (Tulalip Tribes 2021). Some research suggests that disturbance

may vary slightly by activity. Direct approaches caused greater disturbance than tangential approaches, rapid movement by joggers was more disturbing than slower hikers, children and photographers were especially disturbing to birds (Jordan 2000). Ecotourists created lower nesting rates and lower reproductive success in Least Tern colonies than other types of human disturbance (Koshak 2005). Studies have indicated that hiking and biking activities may have a similar level of impact on ungulates (Taylor and Knight 2003). However, there is little evidence to suggest that bikers cause more wear to trails, damage to vegetation, or negative behavioral responses in wildlife than other forms of trail recreation (Sprung 2003).

However, wildlife is more negatively impacted by trails that allow dogs (Lenth and Knight 2008; Miller et al. 2001). A 2001 study found that upon approach of hikers with leashed dogs, deer became alert at 280 feet and flushed at 160 feet, compared to 150 feet and 112 feet from hikers without a dog (Miller et al. 2001). Apart from behavioral responses, wildlife may experience physiological stress, which has not been well studied or documented. Dog presence triggers an avoidance behavior in most species which temporarily reduces the amount of functionally available habitat. It is important to understand that people with dogs substantially increase the amount of wildlife habitat affected and are more detrimental to wildlife than people without dogs. The scent of dogs or urine may last several days and repeated disturbances lead to chronic stress and may reduce wildlife health, reproduction, growth, impair the immune system and increase vulnerability to parasites and diseases. Off-leash dogs not under control may chase and kill wildlife species (Hennings 2016).

Key factors that influence the overall magnitude of impact of recreational activities include:

- The spatial distribution of trails (i.e., high density trail networks have greater impacts on wildlife and habitat).
- Less predictable forms of recreation (off-trail use, off-leash dogs) have a stronger negative impact on wildlife.
- Recreation type and seasonality influence the degree of wildlife disturbance.
- Disturbance to wildlife is directly related to the volume of trail users.

Various recreational activities can be mitigated through effective management strategies to reduce negative impacts and increase ecosystem health. Because various ecological components are interrelated, recreation impact on a single ecological element can eventually result in effects on multiple components (Leung 2000). In addition, trails and their visitors have the potential to generate undesirable impacts on wildlife from population to ecosystem levels, with significant implications for biodiversity conservation. A principal goal for managing wilderness visitation is to avoid impacts that are avoidable and to minimize those that are not. To achieve this goal, wilderness managers must effectively educate and regulate visitors and manage wilderness resources (Leung 2000). This can be accomplished by reducing the width of trails (creating less foot traffic), reducing the number of trails in species sensitive areas, excluding dog access to sensitive areas, and using signs to educate and deter visitors from these high impact areas.

NEEDS AND OPPORTUNITIES

There are multiple opportunities for preserving, restoring, and rehabilitating portions of the CCF to allow for the long-term protection of ecological habitat, including priority wetlands, associated upland forest buffers, and the overall connectivity of the site's hydrology and wildlife corridors.

PRESERVATION

The existing Chuckanut Community Forest Conservation Easement, recorded on January 6, 2014 (AF# 2140100259), is the primary legal instrument currently ensuring the protection of the CCF. The purpose of the easement is to ensure that the natural features, functions, and values of the CCF are protected in perpetuity including the existing wetlands, forest, wildlife habitat, wildlife habitat corridors, and other features of ecological significance, while also allowing for nature-oriented, non-motorized public recreational, scientific, and educational uses, and the construction of appropriate facilities to enhance these uses may be allowed provided that they are sited, designed, maintained, and operated so as to minimize the impact to the natural attributes of the site.

The existing easement's provision for public use is not limited to passive recreation. Additional allowances pertaining to maintenance and site improvements, including associated authorized motorized vehicles access and limited tree clearing for public safety, are also permitted provided that any potential adverse impacts to critical areas is mitigated as required by the City's Critical Areas Ordinance, BMC Chapter 16.55. Incompatible activities and developments have not occurred in the time since CCF establishment however, ecological conditions have degraded. This degradation increases the importance of restoration, and it reinforces the need to restrict allowed activities and development in the Conservation Easement. Recognizing the CCFPB's unique mission towards the long-term preservation of the CCF's natural habitat and ecological condition, the conservation easement's prescribed uses for the site could be designated according to more restrictive prescriptions of a forest or ecological preserve rather than those uses typical of the City's managed Parks.

The 2017 Baseline report states that several of the identified allowed uses stated in the conservation easement would permanently alter, impact, or change the CCF's current conditions and that monitoring of the Conservation Easement will require close consideration of the original easement purpose and values, which is the standard reference for compliance (Eissinger 2017). As the CCFPD is currently negotiating a new conservation easement with the City, it is anticipated more restrictive uses and allowances will be defined for the further protection of the site.

The Stewardship Plan has identified that each of the site's wetlands and their City-regulated buffers are of highest priority for preservation. Their hydrologic connections to adjacent site wetlands, including Wetland JJ1 to the east of the CCF are also prioritized. Where existing trails or previous development activities have intersected a priority area, restoration/rehabilitation or other corrective actions are needed.

This Stewardship Plan is intended to be a resource to both the City's Master Planning process and the process to update the Conservation Easement so the CCF can be managed to limit and focus recreational uses and other development to preserve and enhance existing wildlife habitat. The Conservation Easement is expected to establish legally binding minimum criteria for the care and use of the site, the Master Plan is intended to provide an aspirational vision for the ultimate plan for the care and use of the site, and this Stewardship Plan is intended to support both with technically sound analysis.

Restoration/Rehabilitation

The CCFPD's restoration priorities adopted by Resolution No. 16 include the following:

- Remove, realign, and narrow trails, and add boardwalks.
- Remove invasive species and restore vegetation.

Implementation of the CCFPD's restoration priorities will:

1. Improve natural conditions by adding three-dimensional volume through added vegetation.
2. Increase vegetation, which filters noise and improves soundscape.
3. Improve wildlife habitat by adding vegetation for cover, forage material, and structure for animals
4. Restore soil porosity.
5. Increase sense of solitude by filling in open spaces between different trails.
6. Deter re-use or establishment of removed trails.
7. Protect wetlands areas by adding boardwalks (preventing people from walking around wet spaces and compacting soils), which also aids hydrologic connection.

Further descriptions of actions recommended to support the CCFPD's restoration goals and intended benefits are described in the following sections of this report.

Trail Removal and Improvement Priorities and Techniques

As a part of its Park Master Plan process, the City is proposing that the existing main trail on the existing roadbed be rebuilt to a shared use path standard and used as the major route to connect users to Fairhaven Park to the north and the Interurban Trail network to the east (Figure 7). Utilizing the existing roadbed as the main trail connector route will reduce direct site impacts that would be required for a new main trail alignment; however, to meet City standards for a multi-use hard-surface trail and to support the City's maintenance operations, improvements are planned for its surfacing and width to support more pedestrian traffic and permit City-only authorized vehicle access for maintenance and public safety. Standard trail improvements would include the City's standard specifications for a crushed limestone surface course over a gravel base course, however trail improvement methods discussed in the below section, *Method for Reducing the Ecological Impacts of Trails,* should be considered where feasible. On-going monitoring and adaptive management should be implemented in conjunction with any trail improvements to ensure compatibility with the Master Plan.

This existing roadbed appears to have been informally built many years ago, potentially as part of historical logging or gravel mining operations. In some locations the roadbed crosses water courses and other wet areas without adequate drainage practices. These impacts can be addressed to support the restoration of the interruptions to the site hydrology and support aquatic habitat using culverts, bridges, and replacing the subgrade with permeable ballast rock wrapped in geotextile fabric. These techniques are discussed further below.

In some cases, retrofitting trails with drainage connections is insufficient to protect or restore habitat, and the trails need to be removed altogether when they are located within critical habitat areas or their buffers. In evaluating trails for removal, the existing trail network was overlaid onto the mapping of the priority areas identified in this Plan for preservation and restoration. The current trail use from Strava data was also considered; and the trails identified by the City that appear to be redundant, paralleling major trails, or that are sited in challenging topographically steep areas, were also prioritized for removal. Based on this analysis, 7,863 linear feet (LF) of existing trails, as indicated on Figure 7, are recommended for removal to support the health and function of wetlands, their buffers, and the wildlife that rely on these areas for habitat. Although a reduced network of trail connections would result from the recommended trail removal, 37,027 LF of existing trails would be retained. Some sections of these will need improvements to reduce impacts. Seven locations where existing trails are causing major environmental impacts are identified and labeled on Figure 7 as sites A through G. Recommendations for restoration actions to be implemented at each of these areas are described below.

Figure 8 illustrates the proposed site conditions after recommendations for trail removal and improvements are implemented. Existing buffer areas, currently impacted by trails, will be restored, as feasible, to comply with the City's standard regulated buffer widths ranging between 60 feet and 190 feet.

Area A: Improvement of Main Trail and Former Gravel Yard Restoration

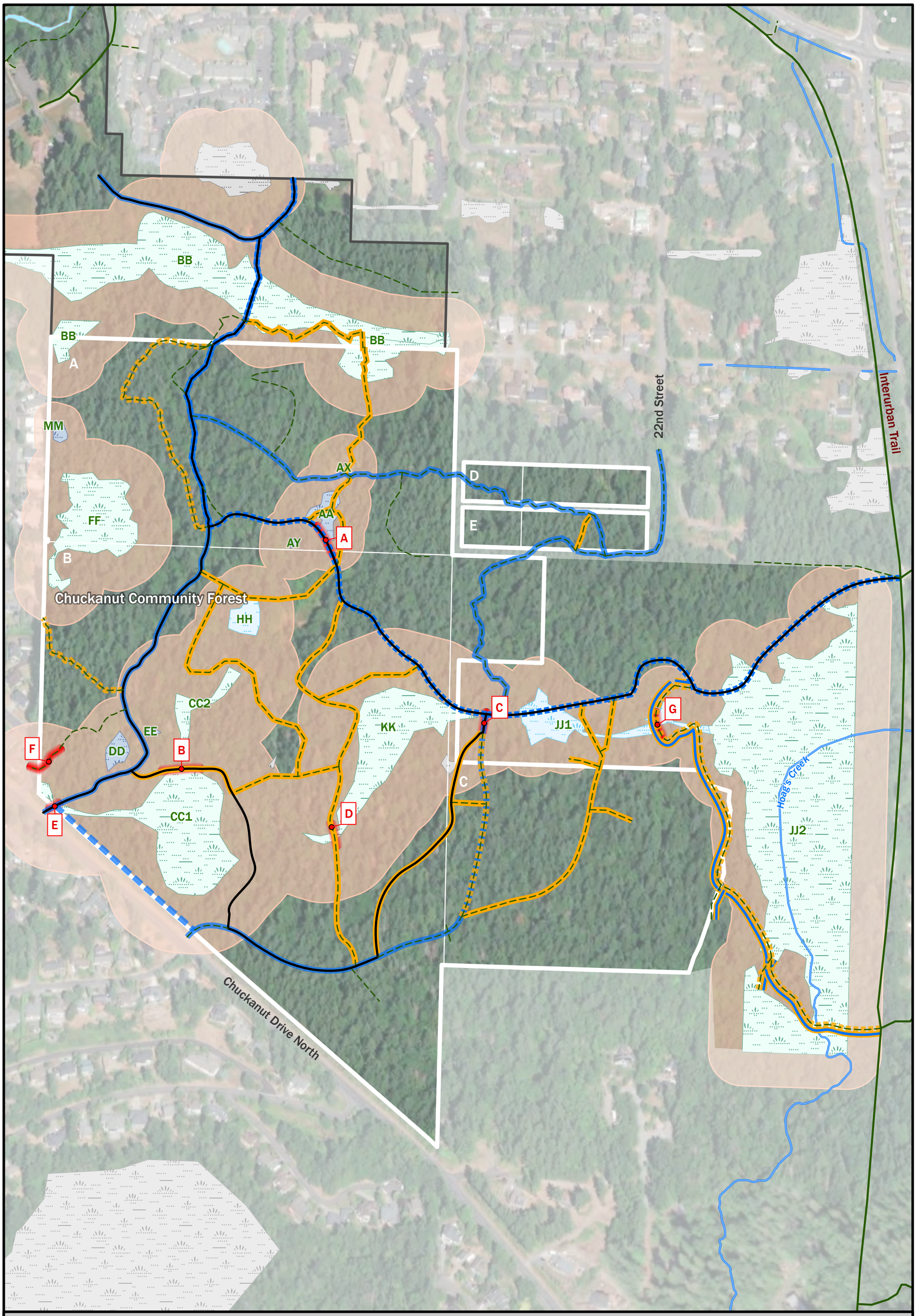
The City's proposal to utilize the existing roadbed, which constitutes a historical site disturbance near a former gravel yard, as a major cross-property trail connector between Fairhaven Park to the north and the Interurban Trail to the east is also recommended in the CCF's Baseline Report (Eissinger 2017) (Figure 7). However, one section of this roadbed trail was observed to intersect seasonal surface water flows from Wetland AY downslope to a small wetland on the south side of the trail (Photos 1 through 4). In order for the City to continue utilizing and improving this trail for major use, the installation of a culvert, bridge, or boardwalk structure or other low-impact development measures (such as a ballast rock base or "burrito") is recommended in order to preserve the seasonal surface water hydrologic connections while also minimizing impacts.

Photo 1.

Photo 2.

Photo 3.

Photo 4.



Legend

- Chuckanut Community Forest Boundaries (COB 2021)
- Fairhaven Park
- Water Bodies (COB 2021)
- Streams (COB 2021)

Existing Trails (COB 2021)

- Main Loop Trail
- Primary Trail (6-12')
- Minor Trail (1-4')

Maintain Trails

- Main Loop Trail (Herrera 2022)
- Improve Trail (COB '21)

Add Trails

- New Connector Trail/Main Loop Trail (Herrera 2022)

Remove Trails

- Remove Trail (Herrera 2022)
- Remove Trail (COB '21)
- Remove or Rehabilitate (Herrera 2022)

- Trail Modification Areas

Delineated Wetlands (COB 2021)

- Category I - Mature Forested
- Category II
- Category III
- Wetlands outside project area
- Wetland regulatory buffer

Figure 7. Chuckanut Community Forest - Trail Recommendations - DRAFT

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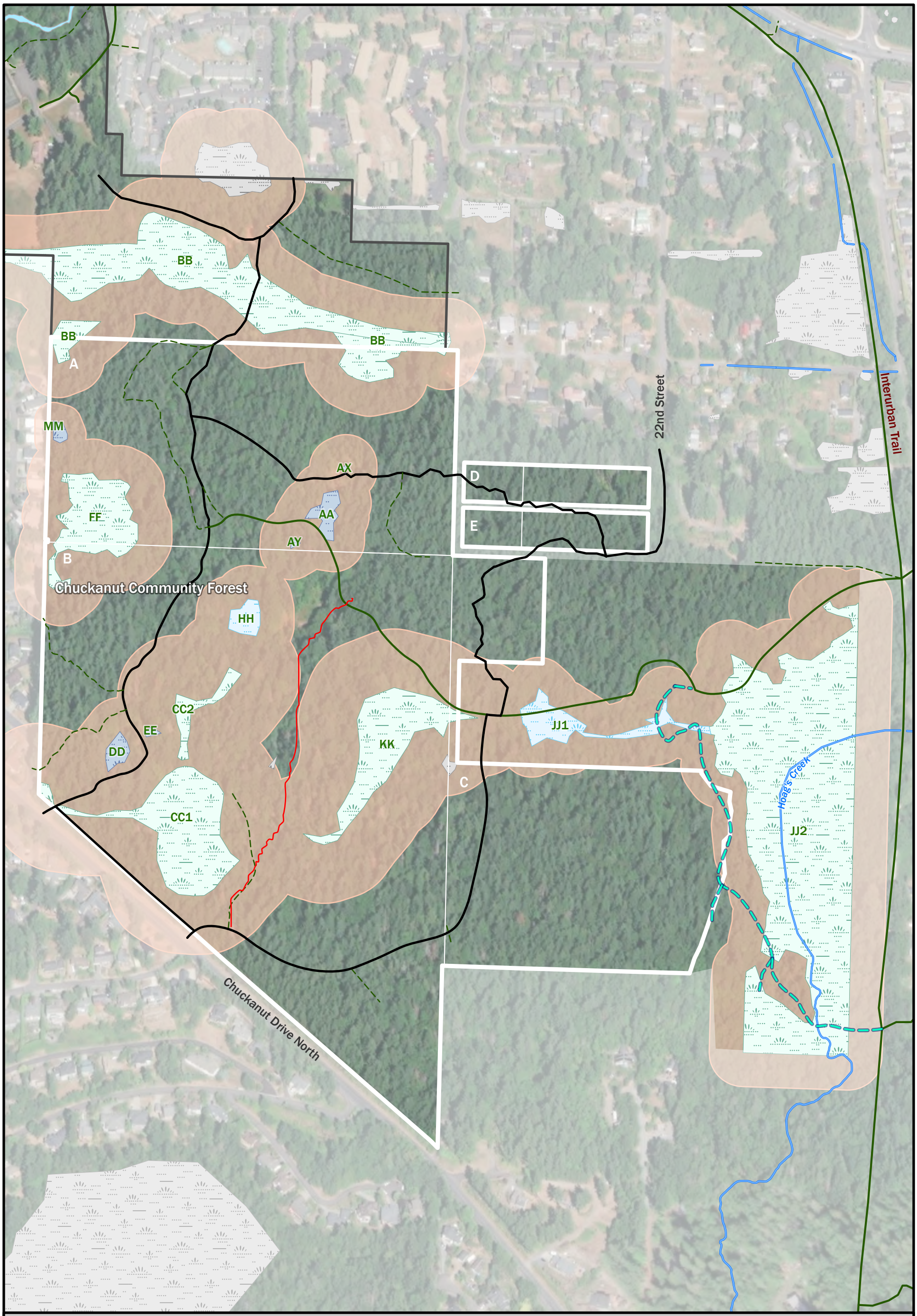

Legend

- Chuckanut Community Forest Boundaries (COB 2021)
- Fairhaven Park
- Water Bodies (COB 2021)
- Streams (COB 2021)

Stewardship Plan Recommended Trails (Herrera 2022)

- Main Loop Trail
- Primary Trail (6-12')
- Minor Trail (1-4')
- Remove or Rehabilitate

City Proposed Potential Loop Connector

Delineated Wetlands (COB 2021)

- Category I - Mature Forested
- Category II
- Category III
- Wetlands outside project area
- Wetland regulatory buffer

Figure 8. Chuckanut Community Forest - Stewardship Plan Trail Configuration - DRAFT

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The existing trails adjacent to and crossing through Wetlands AA, AY, and AZ are also directly impacting wetland hydrology, habitat, and buffer functions; and their removal is imperative for the site's recovery. Existing vegetation in this area is low functioning; and invasive nonnative species establishing within the exposed area should be removed and replaced with native tree, shrub, and herbaceous plant installations. A fence that does not impede wildlife migration, but that discourages pedestrian access from the trail into natural habitat areas, such as a two-rail fence (see the Wildlife Habitat Protection section below for more information) should be installed. This area, due to its historical land use and proposed process for its restoration, also presents an excellent educational opportunity. Accessible overlooks from the trail crossing toward the historical gravel pit areas to the north and south are possible locations for interpretative signage additions.

Nonnative and invasive Himalayan blackberry (*Rubus armeniacus*) dominates the vegetation in the adjacent depressional area to the south of the trail, also a remnant from former land use gravel extraction. Its removal and replacement with native plant installations is recommended; however, this work is not as critical as the recommended trail improvement and restoration of the wetlands to the north of the trail crossing.

Area B: Wetlands CC1 and CC2 Hydrology Connection Trail Crossing

Current review of the CC1 and CC2 wetlands indicates that these areas should be combined as a single Category I mature forested wetland under City Environmental Critical Areas regulations with a standard designated protective buffer width of 190 feet. The existing trail, accessed from Chuckanut Drive North, which bisects the wetland, is impacting the system's natural hydrologic surface water connectivity (Photos 5 and 6). The highest level of preservation recommended for this area would be to remove the trail, as alternative trails connecting the View Crest trail access with the existing main roadbed trail to the northern portion of the site are already present.

Photo 5.

Photo 6.

Trail abandonment may be readily implemented through the installation of large logs, stumps with root wads, two-rail fencing, and dense native vegetation plantings. Herrera biologists, when in the eastern interurban trail network, noticed that a minor trail had apparently been abandoned as a natural circumstance of a fallen tree that had impeded easy pedestrian access. Signage alerting users to the sensitivity of the CC1/CC2 wetland complex and its associated wildlife habitat and therefore a need to restrict its access could also be installed in this location.

City Parks staff, in reviewing the potential for a more direct north/south loop trail connector trail on this portion of the forest, identified a route that could minimize potential direct buffer impacts by utilizing portions of existing trails while also extending new trail segments within the unregulated forest areas between the CC and KK wetland complexes, as illustrated on Figure 8. As a component of the City's permitting and critical areas compliance review for any new trails or proposed improvements to existing trails, a previously mapped small wetland within the vicinity of this proposed route will need to field investigated and its critical areas regulatory status updated according to current municipal code for impacts analysis. The proposed route would result in maintaining the Wetland CC and Wetland KK complexes as two eco-regions bisected by trails, rather than consolidating these complexes into one larger relatively undisturbed protected habitat corridor with no bisecting trails, as recommended by Herrera.

Area C: East Cross Road Trail Improvement – Wetlands KK and JJ

Seasonal surface water connectivity between the mature forested Category I Wetlands KK and JJ is at a crossroad on this portion of a well-used but oversized trail located within and adjacent to the CCF's eastern boundary (Figure 7; Photos 7 and 8). The installation of a culvert, bridge, or boardwalk structure, or other low-impact development measure (such as a ballast rock base or "burrito") is recommended, as well as reducing the overall width of the trail to 6 feet or less. Exposed soil areas outside of the 6-foot width should be revegetated with densely planted native shrubs and ground cover plants.

Photo 7

Photo 8

Area D: Category 1 Wetland KK Southern Trail Crossing – Recommended for Elimination

The existing ad hoc trail crossing at the southern end of Wetland KK, a Category I mature forested wetland, is recommended for removal. The proposed main trail loop does not include this portion of the site, and therefore trail-related impacts to Wetland KK and its associated buffers can be avoided. By eliminating this trail crossing, the total extent of the City's standard 190-foot-wide buffer designated to protect the wetland at this location can be restored and protected. To remove the trail and restore the area to a natural state, the procedure outlined in Method for Trail Removal below should be followed. Photo 9 shows the existing trail at the southern end of Wetland KK that is recommended for removal.

Photo 9

Area E: 16th Street and Chuckanut Drive Entrance Access

The existing access to the CCF from Chuckanut Drive and across from 16th Street crosses a piped segment of a ditch that discharges seasonal surface water flows from the Category I mature forested Wetland CC1 to a storm water drainage system within the Padden Creek subbasin (Figure 7; Photos 10 and 11). Although not formally delineated, a degraded reed canarygrass dominated Palustrine Emergent (PEM) wetland that parallels the ditch extends north to the road corner. This area needs restoration to improve the diversity of native vegetation and appropriate sizing of the existing conveyance pipe should be evaluated to ensure that site hydrology is managed. A new trail corridor that would provide connectivity along Chuckanut Drive between View Crest Road and 16th Street is recommended for consideration to support the removal of existing trails that surround and directly impact Wetland CC1 at the site. Improvements along the new roadside trail corridor to provide additional parking are also recommended.

Photo 10

Photo 11

Area F – 16th Street Entrance

The existing pedestrian access into the CCF from the residential community at the east end of 16th Street is encumbered by an open roadside ditch that conveys seasonal surface water flows west from the corner of Chuckanut Drive (Figure 7; Photos 12 and 13). Crossing of the ditch, which is currently spanned by a single wood plank to provide ad hoc trail access, should be improved through the installation of a properly-sized culvert pipe (12-inch diameter, minimum).

Photo 12

Photo 13

Area G: Wetland JJ Drainage Improvement

Although not located directly within the CCF, Herrera biologists identified a sizable drainage along the Wetland JJ open space corridor that is creating the potential for continued site degradation and soil erosion downslope (Figure 7). Management of the hydrology of this drainage with a properly sized culvert pipe (12-inch diameter, minimum) is recommended.

Method for Trail Removal

The following steps for trail removal are to be implemented in the dry season (June 1 through September 30). Planting should occur early in the wet season to maximize survivability:

1. Secure permits for all work within wetlands or their buffers.
2. Remove plank crossings and other debris.
3. The entire width and length of the trail should be ripped to a minimum depth of 18 inches with a machine-mounted soil ripper.
4. A topsoil layer with a minimum organic matter content of 10 percent dry weight should be established in the ripped area by placing 3 inches of coarse compost meeting the requirements of Section 9-14.5(8) of the Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction over the entire ripped area.
5. After placing the compost, rototill it into 5 inches of native soil (a total amended depth of about 9.5 inches, for a settled depth of 8 inches).
6. Densely plant the area with native plants and shrubs.
7. Install 30 to 50 LF of two-rail fence where the trail to be removed connects to other trails as per City of Bellingham Drawing 2840.06.
8. Install one "Stay on Trail" sign in the center of the new fence section per City of Bellingham Drawing 10430.10.

Method for Reducing the Ecological Impacts of Trails

The following methods can be implemented to reduce the ecological impact of the trails to remain.

Establishing Trail Standards

A set of trail standards should be established for the site and each trail segment to remain should be assigned a surface and a width as part of the master planning process. The City of Bellingham Parks Department has published standards for gravel surface trail sections but does not have standards for narrow foot paths with native soil surfacing. The May 2021 Bellingham Trail Guide lists a width of 6 to 12 feet for "Primary Trails" and 1 to 3 feet for "Minor Trails." Table 4 from the *Seattle Parks and Recreation Soft Surface Trails Management Plan* (Figure 9) shows the Seattle Parks Department's "Recreation Trail Classification and Maintenance Goals."

Table 4. Seattle Parks and Recreation Trail Classification and Maintenance Goals.

Soft-Surface Trails	Surface	Width	Level of Service Goals
Secondary Trail: No vehicle access.	Crushed rock	2' – 4'	• Inspection: 1x/year • Routine Maintenance: 1x/1–4 years • Major Maintenance: rare • Wood Replacement: 1x/10–15 years
Primitive Trail: Pedestrian only. Allows some obstacles, such as a log that can be stepped over.	Mineral soil	1' min.	• Inspection: 1x/2–3 years • Routine Maintenance: rare (as needed) • Major Maintenance: rare (as needed) • Wood Replacement: 1x/10–15 years

Source: *Seattle Parks and Recreation Soft Surface Trails Management Plan*

Figure 9. Table 4 from Seattle Parks and Recreation Soft Surface Trails Management Plan.

In addition to the gravel and mineral/native soil surfacing, trails can also be built on structures (i.e., bridges over streams and elevated boardwalks through wetlands) and can be paved with hard surfacing such as concrete or asphalt, which can be designed to be pervious. The following trail standards are presented by surfacing type from the most to least formal. For each segment of the onsite trail network to remain, a trail/surface type and width should be assigned and then maintained.

Herrera developed the planning level costs shown in Table 6 for developing new 6-foot to 8-foot-wide crushed limestone primary trails per City of Bellingham Standards through undeveloped areas. These costs are fully burdened and reflect a full project cost inclusive of project management, planning, design, permitting, mitigation, and trail construction including all amenities (i.e., bollards, benches, signage, sidewalks and ramps, etc.). These costs are based on bid tab analysis from built projects in Bellingham over the past few years.

Table 6. Planning Level Trail Construction Costs.

Trail Type (6 feet wide)	Trail Cost ($ per LF)
Pervious Concrete Trail in Uplands	$300
Crushed Limestone Trail in Uplands	$160
Crushed Limestone Trail in Wetlands Buffer	$410
Crushed Limestone Trail on old roadbed in Wetlands Buffer	$210
Wetland Boardwalk	$1,000

Paved Hard Surface Trail

Trails in the highest traffic locations can be paved with a hard and durable surface such as asphalt (such as the segments of the Whatcom Creek trail from Railroad Avenue to Ellis), or concrete (such as a typical sidewalk). In some cases where the soil and site conditions are appropriate, a hard-surface trail can be made pervious (such as the trail from Westridge Place to Magrath Road near Northridge Park; see Photo 14).

Hard-surface trails are not appropriate for use in the Chuckanut Community Forest and are presented only for completeness.

Photo 14. Pervious Concrete Trail, Westridge Place, Bellingham, Washington.

Gravel Soft Surface Trail

The majority of the developed trails in the City of Bellingham's park system are considered "Primary Trail" and are surfaced with 1/2-inch minus crushed limestone in varying widths (most commonly 6 to 8 feet); the trails are designed in compliance with Chapter 1515 of the WSDOT Design Manual for "Shared-Use Paths," available here: <https://wsdot.wa.gov/publications/manuals/fulltext/M22-01/1515.pdf>. As per WSDOT, shared-use paths are designed for both transportation and recreation purposes and are used by pedestrians, bicyclists, skaters, equestrians, and other users. The existing roadbed in the Chuckanut Community Forest is proposed by the City to be this type.

The City's standard plan (Drawing 2505.1) for limestone shared-use paths can be found here: <https://cob.org/wp-content/uploads/02505.01-typical-trail-section.pdf>. An example of this type of trail is shown below in Photo 15. Managers should weigh the needs for city maintenance, ADA accessibility, and recreational users against the importance of preserving ecosystem functions within the CCF before installing this type of high impact trail.

These trails frequently have 8 foot wide hard surfaces and therefore can accommodate occasional use by park maintenance vehicles

Photo 15. Typical Crushed Limestone Trail from Herrera's Design at Julianna Park, Bellingham, Washington.

Trails on-Structure

The preferred method to cross wetlands or streams with a trail is with a bridge or boardwalk structure. Several vendors (such as Contech or Big R) provide pre-fabricated pedestrian bridges that meet the City of Bellingham's standards for crossing streams. Using a pre-fabricated bridge is typically the most cost-effective approach to providing stream crossings when compared to a custom-designed and site-fabricated bridge; see Photo 16.

Boardwalks with open grating can be built on pin piles or other low-impact pier foundations within wetlands and largely avoid impacts requiring mitigation; see Photo 17.

Photo 16. Example Pre-Fabricated Pedestrian Bridge from Herrera's Design at Pressentin Park, Marblemount, Washington.

Photo 17. Example Wetland Boardwalk Design from Herrera's Work at Fairhaven Park Adjacent to the Site, Bellingham, Washington.

Narrow Foot Path

Narrow foot paths 1 to 3 feet wide are surfaced with native soil and represent the secondary trail network. Most of the existing trails on site are this type; however, many of them are wider than the 1 to 3 feet necessary, and minimizing their footprint is encouraged.

Installing logs along the outer edges of a redefined narrower trail width is a low-cost measure that will restrain but not impede current trail uses. Native shrub and ground cover plant installations along the outer edges of the formerly wider trail can aid in restoring the impacted areas within a short time frame of only a couple of years. Mulch can also be applied along the trail's formerly wider edges to discourage nonnative plant encroachments and retain soil moisture for regenerating plants.

In addition to the City of Seattle reference above, the USFS Trail Class Matrix (<https://www.fs.fed.us/recreation/programs/trail-management/documents/trailfundamentals/National_Trail_Class_Matrix_10_16_2008.pdf>) can be useful in classifying less formal tails. The existing narrow footpaths on the site are a combination of Trail Class 2 and 3, as shown in Figures 10 and 11.

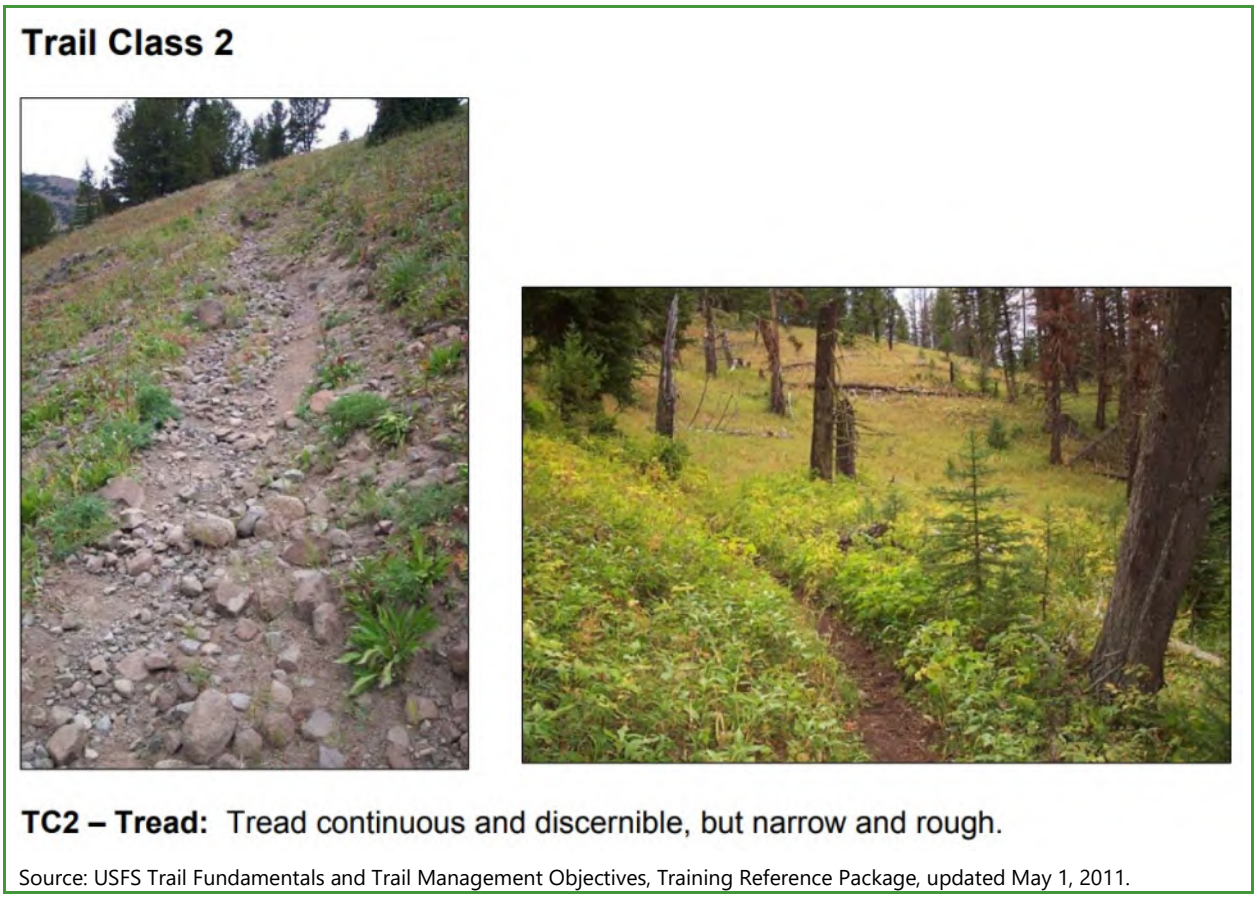
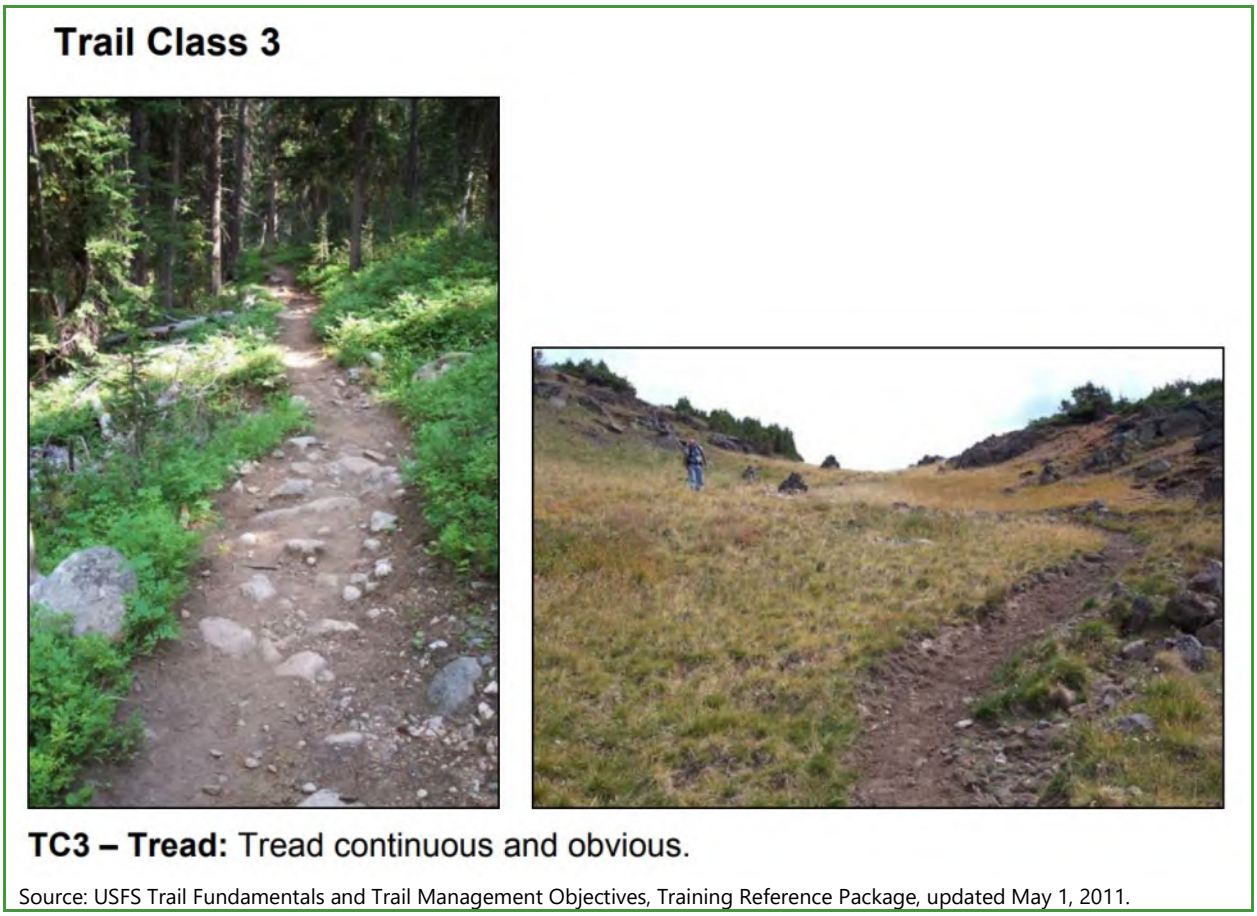


Figure 10. Trail Class 2 Example Photographs, USFS.



Source: USFS Trail Fundamentals and Trail Management Objectives, Training Reference Package, updated May 1, 2011.

Figure 11. Trail Class 3 Example Photographs, USFS.

The images below show examples of Trail Class 3 narrow foot paths in the Chuckanut mountains.

Photo 18. Trail Class 3 Chuckanut Mountains Example Photograph, Whatcom County Parks & Recreation.

Photo 19. Trail Class 3 Stimpson Nature Reserve Example Photograph, Whatcom County Parks & Recreation.

Maintain Site and Wetlands Hydrology

In many locations on site, trails and the existing roadbed were built by compacted soils that interrupt the flow of both the sheet flows on the surface and the shallow groundwater flows, also called interflow. In some locations stormwater flows are on the surface and concentrated in a watercourse that does not rise to the level of being classified as a "stream."

To convey shallow concentrated flows, a simple culvert can be used (see Photo 20 for an example).

Photo 20. Example Culvert Installation Under a Trail.

Sheet flow and interflow interrupted by the compacted soils below the trail can be restored by replacing the subgrade with permeable ballast rock wrapped in geotextile fabric (informally referred to as "burritos"), as shown in City of Bellingham Drawing 2505.04 for "TRAIL W/RAILROAD BALLAST," which can be found here: <https://cob.org/gov/rules/standards/park-design-standards>.

Wildlife Habitat Protection

The USFS recognizes adaptive management and monitoring as important management tools to conserve ecosystem processes and functions while providing recreation opportunities (Gaines et al. 2002). To minimize habitat fragmentation and disturbances to wildlife from trail users, trail density should be minimized or reduced from its current state. Trails that intersect high-priority areas should be assigned a higher priority for removal or restoration.

Several studies emphasize that the "area of influence" around trails is of importance (Tulalip Tribes 2021; Taylor and Knight 2003). Implementing buffers can help managers calculate the amount of area potentially unsuitable for specific species due to trails. Trail buffers can also help managers address spatial zonation in conjunction with temporal restrictions and the creation of suitable habitats away from highly used trails (Tulalip Tribes 2021).

To change recreation behavior or timing, increasing the knowledge of trail users may be an effective tool for detouring off-trail activity and improving the acceptance of management strategies (Tulalip Tribes 2021).

Specific actions that should be considered for incorporation into CCF management include:

- Minimize displacement/avoidance interactions for species of interest by creating a spatial separation of humans and dogs and in key habitats (i.e., Priority Areas).
- Establish or restore natural corridors free from trails that connect significant habitats located adjacent to the CCF (Padden Creek, Hoag's Pond, Chuckanut Creek, Mud Bay).
- Incorporate temporal separation of humans and species of interest at critical periods such as breeding and nesting periods which may include seasonal closures of trails.
- Provide information and education to recreational users to minimize human behaviors that may impact wildlife. Ideas include increasing educational signage, implementing a docent stewardship program, or engaging the public in a citizen science monitoring approach.
- Create recreational and restoration designs that incorporate wildlife habitat values and special features during all phases of project design.
- Create wildlife crossings at major roads by creating underpasses or overpasses..

Two techniques for separating people from wildlife and protecting habitat include fencing and dense native vegetation installations, such as are shown below in Photos 21 and 22. The fencing shown in the images is two-rail fence, as per City of Bellingham Drawing 2840.06. Along with this fencing, a "Stay on Trail" sign per City of Bellingham Drawing 10430.10 should also be installed. Both of these can be found here: <https://cob.org/gov/rules/standards/park-design-standards>.

Photo 21. Wildlife Separation and Habitat Protection with Dense Vegetation.

Photo 22. Wildlife Separation and Habitat Protection with Two-Rail Fence.

Additional Habitat Opportunities

Abundant snags and large woody debris within the CCF provide excellent foraging, shelter, and refuge opportunities for a variety of insect, amphibian, bird, and small mammal species that utilize wetland and forest habitats. Retaining large trees and snags are essential roosting and

foraging habitat for many species. Roosting habitat, while best provided by natural forest processes, may be supplemented by adding special habitat features, such as bat boxes, to encourage bat roosts and nesting boxes for birds which can increase opportunities for various wildlife in the near term, presumably while recruitment of these structures is developing naturally under proper forest management. Underplanting with native species should be targeted to areas where understory vegetation was sparse. Plants that provide high value for wildlife forage, such as beaked hazelnut (*Corylus cornuta*) can be used to increase forage opportunities throughout the CCF.

Photo 23.

Photo 24.

Bat Houses Provide Refuge for Area Bats.

MONITORING AND ADDITIONAL STUDIES

Ongoing Monitoring and Maintenance

Monitoring and maintenance will be essential to the success of the Master Plan over both short and long-time scales. Because CCF differs from other COB Parks in many ways, it will require a unique monitoring program. Monitoring will be essential to adaptive management and any other programs or decisions to address changing conditions.

Monitoring to ensure no new trails are constructed or illegal camping occurs should be a regular Parks operational management measure. Ongoing invasive plant monitoring and removal as prescribed by the Parks operational guidelines is recommended. However, the use of pesticides and herbicides is discouraged. Manual pulling of invasive plants and disposal off site is preferred. The Washington State and Whatcom County Noxious Weed Programs should be consulted for additional information on the proper removal methods, safe handing, and disposal of noxious weeds (Washington State NWCB 2022, Whatcom County NWCB 2022).

The City coordinates educational and volunteer stewardship programs related to ecology restoration and trail maintenance activities based on an annual plan and schedule for implementing effective invasive plant removal and native plant installation according to growth habits.

Monitoring the success of restoration efforts, where native vegetation and habitat features are installed and soil decompaction measures and hydrology connections are implemented, shall be conducted according to site specific performance standards and time periods. Typically, environmental regulatory agencies authorizing restoration of forested upland and wetland areas require the proponent's submittal of monitoring compliance reports in Years 1, 2, 3, 5, 7 and 10 after installation. When monitoring indicates that the prescribed restoration measures are not meeting the site's performance standards, contingency measures or plans to re-evaluate the restoration actions are to be developed. Representative performance standards for monitoring plans may include, but may not be limited to, installed native plant survival, native plant species diversity, percentages of canopy and non-native and invasive plant vegetation cover, hydro-period durations and use of habitat features by wildlife.

Table 1 in the 2017 Baseline report provides a framework for tracking the CCF's ecological health, functions and value over time, such as its ability to both capture/store water and carbon and produce oxygen, which will be extremely important as the climate changes (Eissinger, 2017). Adding additional quantified data to track the CCF's existing conditions, including conducting additional studies, as recommended below, will ensure that future changes in the CCF are measurable for adaptive planning.

Additional Studies

The detailed plant and animal lists presented in the 2017 Baseline Study for the CCF can serve to initiate monitoring for species use and habitat conditions. Within the Bellingham city limits, wetland delineations and ratings are valid for a period of 5 years (BMC 16.55.280E; BMC 16.55.290C). Before any project actions are conducted, applicable wetlands will need to be re-evaluated to determine if any changes in wetland conditions have occurred and to assess whether updates to the 2014 Rating System or the City of Bellingham code alter buffer widths. Based on observations of connectivity between the site wetland hydrology and buffer areas, re-evaluation of the CCF as one connected habitat complex could be considered to justify categorical wetland ratings and or higher buffer protection. The City's director has the authority to increase the standard buffer width on a case-by-case basis when a larger buffer is required by an approved habitat assessment as outlined in BMC 16.55.480(C).

Several additional research needs were identified during the development of this report. These include:

- Long-term effects on forest health due to changing climate conditions were not investigated for this report. Future areas of study should include this analysis to help inform forest fire and drought planning.

- An assessment of forest maturity using peer-reviewed, science-based sources is needed to accurately depict forest community at the CCF.

- Habitat connectivity should be informed by site specific analysis using best available science.

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APPENDIX A

Upland Forest Structure Transect Results

Summarized Data (February 6, 2022) Forest Structure Based on Washington Department of Fish and Wildlife Criteria

		Transect ID and Area	
		Transect 1	Transect 2
		150' long x 18' wide	200' l x 18' w
		2700 square feet	3600 square feet
		0.062 Acre	0.0826 Acre
Vegetation Structure	WDFW criteria	# of Features Recorded	
Mature forest	Mature trees (>21 diameter at breast height [dbh])	4	7
	Small trees (<21 dbh)	12	16
	Average tree dbh	14.8	15.5
Old growth snags	Large snags (>20" diameter, 15' tall)	1	0
	Small snags (<20"diameter or <15' tall)	4	6
	Snags/acre	16.1	0
Old growth logs	Large logs (>24" diameter)	0	0
	Small logs (<24"diameter)	12	10
	Logs/acre	0	0
Priority Snags and Logs	Priority snags (>20"dbh, 6.5' tall)	1	0
	Priority logs (>12"diameter, 20' long)	3	6

Transect 1

Transect 1 Size: 150' long by 18' wide

Date: February 6, 2022

Location: Upland Forest Buffer of Category II Wetland HH, 1 trail bisects buffer

Feature Number	Feature type	Species		Circumference	Diameter at Breast Height (DBH) / diameter (inches)	Length (Feet)
		Scientific Name	Common Name			
1	Tree	*Thuja plicata*	Western Red Cedar	4'6"	17.2	
2	Snag	*Pseudotsuga menziesii*	Douglas fir	6'6"	24.8	>40
3	Tree	*Betula papyrifera*	Paper birch	5'5"	20.7	
4	Log	*Betula papyrifera*	Paper birch	3'	11.5	>20
5	Tree	*Thuja plicata*	Western Red Cedar	4'6"	17.2	
6	Log	Unknown		2'6"	9.6	>20
7	Tree	*Thuja plicata*	Western Red Cedar	4'	15.3	
8	Tree	*Thuja plicata*	Western Red Cedar	7'11"	30.3	
9	Log	*Thuja plicata*	Western Red Cedar	2'	7.6	>20
10	Tree	*Thuja plicata*	Western Red Cedar	7'10"	29.9	
11	Log	Unknown		2'6"	9.6	
12	Tree	*Thuja plicata*	Western Red Cedar	7'	26.8	
13	Snag	Deciduous		4'2"	15.9	>10
14	Tree	*Pseudotsuga menziesii*	Douglas fir	2'6"	9.6	
15	Log	Unknown		2'3"	8.6	
16	Tree	*Pseudotsuga menziesii*	Douglas fir	3'10"	14.6	
17	Log	Deciduous		2'	7.6	>20
18	Snag	*Betula papyrifera*	Paper birch	3'9"	14.3	>40
19	Snag	*Betula papyrifera*	Paper birch	3'6"	13.4	>20
20	Snag	*Betula papyrifera*	Paper birch	3'2"	12.1	>40
21	Tree	*Thuja plicata*	Western Red Cedar	1'4"	5.1	
22	Log	*Betula papyrifera*	Paper birch	3'5"	13.1	>20
23	Log	*Betula papyrifera*	Paper birch	3'	11.5	>20
24	Log	*Betula papyrifera*	Paper birch	1'6"	5.7	>20
25	Log	Deciduous		2'6"	9.6	>20
26	Tree	*Thuja plicata*	Western Red Cedar	1'	3.8	
27	Tree	*Thuja plicata*	Western Red Cedar	2'6"	9.6	
28	Log	*Thuja plicata*	Western Red Cedar	1'10"	7	>20
29	Log	Unknown	Unknown	1'9"	6.7	>20
30	Tree	*Thuja plicata*	Western Red Cedar	3'	11.5	
31	Tree	*Thuja plicata*	Western Red Cedar	2'7"	9.9	
32	Tree	Deciduous		2'6"	9.6	
33	Tree	*Pseudotsuga menziesii*	Douglas fir	1'9"	6.4	

Transect 2

Size: 200' long by 18' wide

Date: February 6, 2022

Location: Upland Forest Buffer of Category I Mature Forested Wetland KK, 2 trails bisect buffer

Feature Number	Feature type	Species		Circumference	Diameter at Breast Height (DBH) / diameter (inches)	Length (Feet)
		Scientific Name	Common Name			
1	Tree	*Thuja plicata*	Western red cedar	8'9"	33.4	
2	Log	*Thuja plicata*	Western red cedar	3'9"	14.3	>20
3	Log	*Thuja plicata*	Western red cedar	4'4"	16.6	>20
4	Tree	*Thuja plicata*	Western red cedar	1'10"	7	
5	Log	Deciduous		2'	7.6	>20
6	Tree	*Thuja plicata*	Western red cedar	1'4"	5.1	
7	Tree	*Pseudotsuga menziesii*	Douglas fir	7'3"	27.7	
8	Tree	*Thuja plicata*	Western red cedar	1'7"	6.1	
9	Tree	*Pseudotsuga menziesii*	Douglas fir	4'	15.3	
10	Snag	Deciduous		3'3"	12.4	>40
11	Tree	*Pseudotsuga menziesii*	Douglas fir	5'4"	20.4	
12	Tree	*Pseudotsuga menziesii*	Douglas fir	7'5"	28.3	
13	Log	Unknown		4'	15.3	>20
14	Log	*Tsuga heterophylla*	Western hemlock	1'6"	5.7	>20
15	Tree	*Thuja plicata*	Western red cedar	2'6"	9.6	
16	Snag	Deciduous		2'10"	10.8	>20
17	Log	*Betula papyrifera*	Paper birch	2'10"	10.8	>20
18	Tree	*Thuja plicata*	Western red cedar	3'6"	13.4	
19	Snag	*Betula papyrifera*	Paper birch	2'5"	9.2	>40
20	Tree	*Thuja plicata*	Western red cedar	2'4"	8.9	
21	Snag	Abies grandis	Grand fir	1'6"	6.7	>40
22	Log	*Pseudotsuga menziesii*	Douglas fir	6'	22.9	>20
23	Log	*Pseudotsuga menziesii*	Douglas fir	4'8"	18.2	>20
24	Tree	*Thuja plicata*	Western red cedar	3'3"	12.4	
25	Tree	*Thuja plicata*	Western red cedar	9'4"	35.7	
26	Tree	*Thuja plicata*	Western red cedar	3'	11.5	
27	Snag	*Betula papyrifera*	Paper birch	2'2"	8.3	>20
28	Tree	*Thuja plicata*	Western red cedar	7'4"	28	
29	Snag	*Thuja plicata*	Western red cedar	2'9"	10.5	>20
30	Tree	*Prunus emerginata*	Bitter cherry	3'	11.5	
31	Tree	*Prunus emerginata*	Bitter cherry	3'	11.5	
32	Tree	*Acer macrophyllum*	Big-leaf maple	3'4"	12.7	
33	Log	Deciduous		2'7"	9.9	>20
34	Log	*Betula papyrifera*	Paper birch	3'3"	12.4	>20
35	Tree	*Acer macrophyllum*	Big-leaf maple	2'2"	8.3	
36	Tree	*Thuja plicata*	Western red cedar	2'2"	8.3	
37	Tree	*Thuja plicata*	Western red cedar	1'3"	4.8	
38	Tree	*Thuja plicata*	Western red cedar	4'3"	16.2	
39	Tree	*Thuja plicata*	Western red cedar	5'2"	19.8	

Chuckanut Community Forest Stewardship Plan – Understory Vegetation Recorded Along Transects
February 6, 2022

	Species		
	Scientific Name	Common Name	Origin
Transect 1	*Ilex aquifolium*	English holly	Non-Native
	Hedera Helix	English Ivy	Non-Native
	Polystichum muniturm	Western sword fern	Native
	Rubus urisinus	Dewberrry	Native
	Mahonia nervosa	dull Oregon grape	Native
Transect 2	*Prunus laurocerasus*	Cherry laurel	Non-native
	Ilex aquifolium	English holly	Non-Native
	Thuja plicata	Western red cedar sap	native
	Polystichum muniturm	Western sword fern	Native
	Rubus urisinus	Dewberry	Native
	Gaultheria shallon	Salal	Native
	Mahonia nerevosa	dull Oregon Grape	Native

Chuckanut Community Forest Stewardship Plan – Wildlife Observations During Herrara Site Visits (January 25, 2022, and Feburary 6 and 16, 2022)

Species			species abbrieviation on dataform
Common Name	Scientific name	observation type	
Dark-eyed junco	*Junco hyemalis*	audio, visual	DEJU
Black cap chickadee	*Parus atricapillus*	audio, visual	BCCH
Anna's humingbird	*Calypte costae*	audio, visual	ANHU
Stellar jay	*Cyanocitta stellleri*	audio, visual	STJA
american robin	*Turdus migratorius*	audio, visual	AMRO
Red breasted nut hatch	*Sitta canadensis*	audio	RBNU
Varied thrush	*Ixoreus naevius*	audio	VATH
Common raven	*Corvus cryptoleucus*	audio, visual	CORA
Northern flicker	*Colaptes auratus*	audio, visual	NOFL
Pileated Woodpecker	*Drypocopus pileatus*	evidence	PIWO
Red breasted sap sucker	*Sphyrapicus ruber*	evidence	RBSA
Spotted towee	*Pipilo fuscus*	audio	SPTO
Great blue heron	*Ardea herodias*		GBH
Bald eagle	*Heliaeetus leucocephalus*	audio, visual	HALI
Unidentified to species			
owl, juvenule		visual	
weasel		visual	