What policy and implementation factors drive the variability in protection and enhancement of the North Creek stream corridor within Snohomish and King County Washington?

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List of Acronyms

COB	City of Bothell
BMC	Bothell Municipal Code
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEMA	Federal Emergency Management Act
GPS	Global positioning system
GSRO	Governor's Salmon Recovery Office
HWS	Habitat Work Schedule
HPA	Hydraulic Project Approval
NCPA	North Creek Protection Area
NOAA	National Oceanic and Atmospheric Administration
R&E	Restoration and Enhancement
RCO	Recreation and Conservation Office
RCW	Revised Code of Washington
Reach 4	North Creek Protected Critical Habitat
Reach 5	North Creek Business Park
Reach 6	UWB/Cascadia College Protected Critical Habitat Wetlands

SMA	Shoreline Management Act
SMP	Shoreline Master Program
SWMP	Surface Water Management Program
SRA	Salmon Recovery Act
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UWB	University of Washington, Bothell
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	Washington Resource Inventory Area
WRIA 8	Lake Washington/Cedar/Sammamish River Watershed
WRIA 8 Plan	Chinook Salmon Conservation Plan
WSE	Watershed Science & Engineers

Table of Contents

List of Tables

List of Figures

List of Appendices

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Executive Summary

Twenty years after Washington State's Salmon Recovery Act, the Puget Sound Chinook population continues to decline and is in danger of extinction. Washington State and the federal government has invested over 350 million dollars in the Puget Sound region restoring Chinook habitat impacted by growth and development, inclusive of purchasing conservation easements and land acquisition. While the efforts over the past two decades have made many improvements to the Chinook habitats, there are still fish barriers and degraded habitats that need to be identified by local government and private landowner sponsors.

In 2005, public outreach identified a significant barrier along the North Creek Regional Trail where the North Creek stream flows through a 140-acre privately owned business park (*Reach 5*) located in the lower portion of the watershed where leveed shorelines constrain the stream, floodplains and associated wetlands within the jurisdiction of the City of Bothell, King County, Washington. This research focused on possible constraints posed by the leveed shoreline, existing local government policy, as well as options available to initiate the necessary restoration project.

Findings revealed that the Army Corps of Engineers requires removal of invasive species to facilitate inspection, maintenance operations and the integrity of leveed shorelines. Existing local policy advocates for protection, restoration and enhancement of all shorelines and associated wetlands, but only apply to publicly owned lands and new developments seeking permits. Policy does however, require local government to work with a private landowner and find ways to restore identified critical habitat through funding programs, tax breaks, or other motivating incentives.

A R&E project is vital to restoring critical area habitat in *Reach 5* to eliminate barriers to Puget Sound Chinook and other migratory fish species, connect two high quality COB protected habitats, as well as provide access to restored critical habitat upstream performed by other local jurisdictions along the North Creek watershed.

Recommendations are for COB to take action toward land acquisition making the wetlands publicly owned lands and protected into perpetuity. Alternatively, COB can work the R&E project through the landowner. Regardless of the option chosen, COB should initiate development of a project proposal and submit to SRFB for technical assistance and funding, USACE for a Section 404 permit, Ecology for a Section 401 Certification and WDFW for an HPA permit to move an R&E project forward in *Reach 5.*

Section 1: Introduction

Since the Washington State's Salmon Recovery Act of 1999 over one billion dollars has been spent on the recovery of sixteen endangered salmon species across the state. As of 2018, the Hood Canal Summer Chum and Snake River Fall Chinook were successfully approaching recovery goals; six other species were making recovery progress while another six species maintained current populations. Only Puget Sound Chinook and Upper Columbia River Spring Chinook populations continue to decline and are in jeopardy of extinction.[1]

There are many challenges facing the Puget Sound Chinook whose migratory corridors and critical habitats intertwine throughout the Puget Sound region where 4.2 million people reside.[2] Washington State and the federal government has invested over 350 million dollars in the Puget Sound region restoring Chinook habitat impacted by growth and development, inclusive of purchasing conservation easements and land acquisitions[3]. As of 2013, the RCW 77.85.050 stipulated that habitat restoration projects on private lands was solely dependent upon the landowner's willingness to participate in the program[4]. Therefore, incentive programs were developed to encourage private landowners to participate in conservation actions to restore and

[1] State of Salmon in Watersheds 2018. Executive Summary; 2, accessed Aug. 23, 2019: https://stateofsalmon.wa.gov/exec-summary/
[2] Puget Sound Regional Council, accessed Aug 23, 2019: https://www.psrc.org/whats-happening/blog/region-adding-188-people-day
[3] State of Salmon in Watersheds 2018. Statewide salmon recovery data, accessed Aug. 23, 2019: https://stateofsalmon.wa.gov/statewide-salmon-recovery-data/
[4] RCW 77.85.050. Habitat projects, accessed Aug 23, 2019: https://apps.leg.wa.gov/RCW/default.aspx?cite=77.85.050

protect critical area habitat; to include financial and technical assistance, tax relief, public recognition and marketing to name a few.[5]

This research is focused on the North Creek Watershed, a migratory corridor for historic runs of Puget Sound Chinook[6], where barriers presently exist in the lower portion of the watershed that threaten the overall success of restorative actions upstream taken by local jurisdictions. Specifically, identifying any constraints that has led to the failure of vegetation maintenance on the leveed shorelines, floodplains and associated wetlands in *Reach 5,* located in the City of Bothell, King County, Washington.

The North Creek Watershed

The North Creek Watershed is home to both seasonal migratory fish species and a growing population of human inhabitants, resulting in loss of significant critical habitat. The critical habitats of North Creek have historically supported documented populations of Chinook salmon, and other migratory species (sockeye, kokanee and coho salmon, rainbow, cutthroat and steelhead trout)[7]. However, all species have declined over the decades due to urbanized development along North Creek that has contributed to

[5] RCO Conservation Incentive Programs in Washington State: Trends, Gaps, and Opportunities, accessed Aug 23, 2019: https://rco.wa.gov/documents/biodiversity/ConservationIncentivesWA.pdf
[6] King County. North Creek Stream Report. accessed Aug. 17, 2019: https://green2.kingcounty.gov/streamsdata/watershedinfo.aspx?Locator=0474
[7] WRIA 8 North Creek Subarea retrieved from: https://www.govlink.org/watersheds/8/activities-partners/north-creek.aspx

habitat modifications and an increase of non-point pollutants entering the watershed from increased impervious surfaces and runoff. [8]

The North Creek stream flows through five urbanized government jurisdictions (City of Everett, City of Mill Creek, City of Bothell, Unincorporated Snohomish County, and King County). It is directly linked to three historically and ecologically significant regional parks (McCollum Pioneer Park, North Creek Park, and Centennial Park) numerous wetlands, and the North Creek Regional Trail currently under expansion to link the Interurban Trail in Everett, Snohomish County to the Sammamish River Burke-Gillman Trail in Bothell, King County[9].

North Creek is roughly 12.6 river miles long, predominately located within the boundaries of Snohomish County (11 miles), before discharging into the Sammamish River, approximately 4.5 river miles east of the its Lake Washington confluence[10], in King County. The headwaters originate in Everett, Washington and flow southward through the cities of Mill Creek and Bothell with boundaries in unincorporated Snohomish County and King County (Figure 1). The City of Bothell (COB) has designated all 6.76 miles of North Creek within their planning jurisdiction as *shoreline of the state* and thus regulated under COB's Shoreline Master Program (SMP).

[8] WRIA 8 North Creek Subarea retrieved from: https://www.govlink.org/watersheds/8/activities-partners/north-creek.aspx
[9] Snohomish County North Creek Regional Trail expansion, accessed Aug. 11, 2019: https://snohomishcountywa.gov/680/North-Creek-Regional-Trail---Mill-Creek-
[10] Snohomish County Shoreline Management Program Restoration Element. August, 2010. accessed: Aug. 11, 2019: https://snohomishcountywa.gov/DocumentCenter/View/7609/Restoration-Element?bidId=

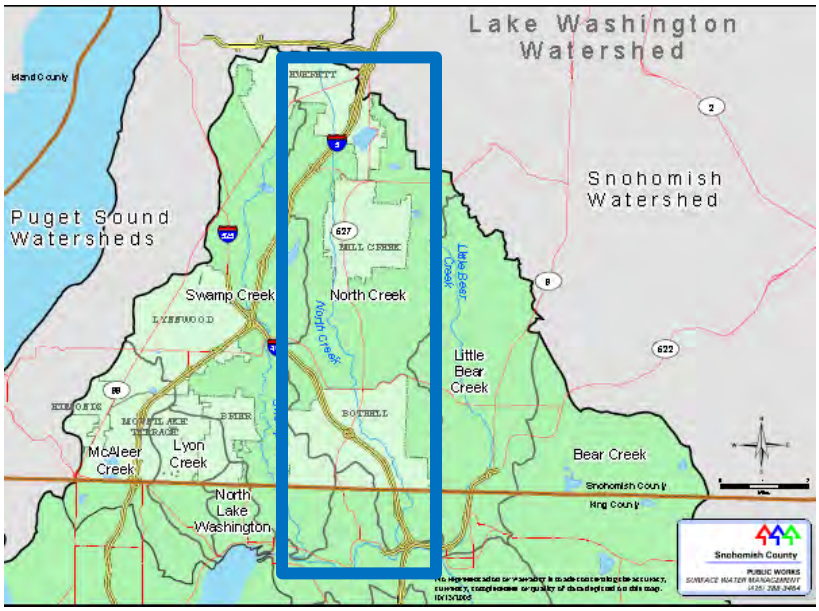

Figure 1. The North Creek Watershed (*Source: Snohomish County Public Works Surface Water Management watershed map*)

When Chinook salmon were listed as a threatened species in 1999 under the federal Endangered Species Act (ESA). The Washington State Legislature responded by adopting the Salmon Recovery Act (SRA) (77.85 RCW)[11] that subsequently formed the Governor's Salmon Recovery Office (GSRO) and the Salmon Recovery Funding Board (SRFB). The Washington State Recreation and Conservation Office (RCO) manages the funding program derived from the sale of Washington State bonds, the federal Pacific Coastal Salmon Recovery Fund, as well as the Puget Sound Acquisition and Restoration Fund for watersheds within the Puget Sound region. The RCO also provides support to the GSRO and the SRFB[12]. The SRFB is comprised of ten individuals (five state agency directors, and five Governor appointed citizens) for final

[11] Washington State Legislator. Salmon Recovery Act. accessed Aug. 9, 2019: https://app.leg.wa.gov/RCW/default.aspx?cite=77.85
[12] Recreation and Conservation Office, about. accessed Aug. 9, 2019: https://www.rco.wa.gov/about/index.shtml

project review and approval.[13] The GSRO is responsible for the development and implementation of statewide salmon recovery strategies. The results of which are sixteen coordinated long-term plans with specific watershed-based strategies to support salmon stock recovery.[14] The SRFB provides uncapped grants to local and state agencies, Native American Tribes, private landowners, nonprofit organizations and regional fisheries enhancement groups[15] covering 85% of approved project costs; which must address "habitat conditions or watershed processes that are important to salmon recovery."[16]

The Washington Water Resource Inventory Area (WRIA) was created by the State of Washington for the purpose of identifying unique watershed basins and their sub-basins geographical boundaries. The Lake Washington/Cedar/Sammamish Watershed is number 8 in the inventory, and thus referenced as WRIA 8. Because North Creek is a sub-basin to the Sammamish River, North Creek is included in the boundaries of WRIA 8.

The 2005 WRIA 8 Chinook Salmon Conservation Plan (WRIA 8 Plan), combined with 15 other watershed plans make up the Puget Sound Salmon Recovery Plan[17], federally approved by the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service in 2007. A total of 28 local governments within WRIA 8 signed an

[13] RCO, Salmon Recovery Funding Board. accessed Aug 9, 2019: https://www.rco.wa.gov/boards/srfb.shtml
[14] RCW 77.85, accessed Aug 9, 2019: https://app.leg.wa.gov/RCW/default.aspx?cite=77.85
[15] RCO, Salmon Recovery Grants. accessed Aug 22, 2019: https://www.rco.wa.gov/grants/salmon.shtml
[16] Governor's Salmon Recovery Office website accessed Aug. 9, 2019: https://stateofsalmon.wa.gov/
[17] NOAA Fisheries West Coast Region. Puget Sound Chinook Recovery Plan. accessed Aug. 12, 2019: https://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/puget_sound/puget_sound_chinook_recovery_plan.html

Interlocal agreement as a commitment to implement strategies addressing salmon recovery within their jurisdictions. [18]

The 2005 WRIA 8 Plan identified North Creek as a Tier 2 stream (secondary migratory spawning habitat) where actions are necessary to promote expansion of Chinook populations into their sub-basin tributaries where prime habitats are located. Tier 1 streams have the highest quality of habitat and therefore the highest populations of migratory salmon. Tier 2 streams while still a migratory corridor, have habitats that are less pristine and require preventative measures and restoration action in order to support the expansion of Chinook salmon populations.[19] A study by Steward and Associates (2004) on *City of Bothell Streams and Riparian Areas: Best Available Sciences* identified North Creek as playing an important role in present-day salmon migratory runs with "*portions of very high-quality habitat worthy of substantial levels of protection*"[20]

Watershed Restoration Activities

Local governments have been implementing restoration and monitoring activities for decades in the North Creek watershed to address water quality issues (fecal coliform, pollutants, temperature, dissolved oxygen, pH, etc.) from point and non-point

[18] WRIA 8 Salmon Conservation Plan. accessed Aug. 9, 2019: https://www.govlink.org/watersheds/8/reports/chinook-plan-update.aspx
[19] Snohomish County Shoreline Master Program. accessed Aug. 15, 2019: https://www.snohomishcountywa.gov/DocumentCenter/View/7612/Shoreline-Management-Program-2012?bidId=
[20] City of Bothell Streams and Riparian Areas: Best Available Sciences. accessed: http://www.ci.bothell.wa.us/DocumentCenter/View/3234/C-3a-Steward-and-Associates-Report-October-2004

contaminants entering the watershed from urban growth and development.[21] The *Snohomish County 1994 North Creek Watershed Management Plan* identified necessary actions such as public education, waste recycling events, monitoring programs, maintenance of outfalls, retrofitting of detention facilities, vegetation and stream maintenance, among others. King County just completed a three-year project retrofitting a 50-yr old (2-mile) sewer line (North Creek Interceptor) that crosses North Creek in two places in Unincorporated Snohomish County and COB,[22] which will also address overflow problems during peak storm events.

With funding from the SRFB and identified site-specific projects in the WRIA 8 Plan, North Creek projects have intensified as local governments began implementing salmon habitat restoration activities to encourage the expansion of the Chinook population (see Figure 7 in Section 3 for a map of project distribution).[23] This is particularly true in the northern portions of the watershed. Snohomish County identified projects completed along North Creek that targeted restoring riparian vegetation, stream enhancements, planting conifers, as well as a land acquisition with the COB to protect forested property with wetlands and groundwater recharge areas for North Creek[24]. The City of Everett projects for North Creek included drainage improvements, barrier replacements, planting native plants, restoration of streambed gravel, addition of large woody debris and re-vegetation for spawning and rearing habitat, as well as a

[21] Snohomish County 1994. North Creek Watershed Management Plan. Snohomish County Public Works, Surface Water Management. Ecology Approved September 6, 1994. Print
[22] King County Capital projects. North Creek Interceptor. accessed Aug. 12, 2019: https://www.kingcounty.gov/depts/dnrp/wtd/capital-projects/active/north-creek-interceptor.aspx
[23] Snohomish County Restoration Element pg. 28. accessed Aug 9, 2019: https://snohomishcountywa.gov/DocumentCenter/View/7609/Restoration-Element?bidId=
[24] WRIA 8 supported projects accessed: http://waconnect.paladinpanoramic.com/project/240/4967

stormwater treatment project to install a StormFilter vault (absorbs and retains pollutants) to safeguard water quality.[25]

Reach 5

At the lower end of the North Creek watershed, approximately 1.6 miles northeast of the North Creek/Sammamish River confluence, the stream flows through a 140-acre privately-owned business park, identified by COB as *Reach 5*. It includes 28 acres of public green space, recreational areas, an observational crossing bridge, and the North Creek Regional trail that runs on top of approximately 1.25 miles of leveed shoreline with 4.34 acres of wetlands[26], all located within the boundaries of COB where jurisdiction transfers from Snohomish County to King County (Figure 2). Because this portion of the North Creek includes public access to the North Creek Regional Trail along the leveed shorelines associated wetlands and floodplain, led to public outreach identifying *Reach 5* as a candidate for a restoration and enhancement project to restore Chinook critical area habitat.

[25] City of Everett Surface Water Comprehensive Plan, Volume II – Lake Washington Watershed Plan, Nov 2017. Accessed Aug. 11, 2019: https://everettwa.gov/DocumentCenter/View/14858/SWCP-Vol-2-North-Creek-Basin-Plan-PDF?bidId=

[26] BMC Shoreline Environment Designations. accessed Aug. 15, 2019: https://www.codepublishing.com/WA/Bothell/

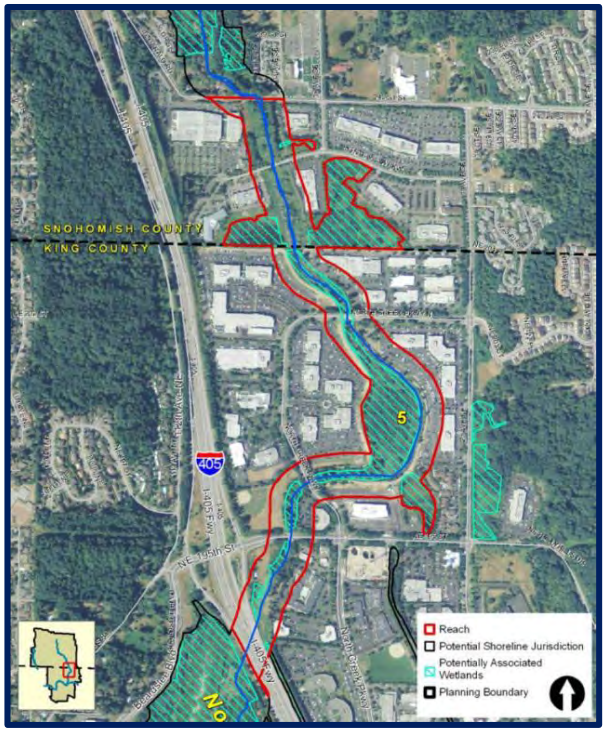

Figure 2. Aerial photo of *Reach 5* – North Creek Business Park *(Source: The Watershed Company report: Shoreline Analysis Report for the Cities of Bothell and Brier Shorelines: Sammamish River, North Creek, and Swamp Creek, 2012).*

Reach 5 is a significant ecological resource that provides an important link between Lake Washington/Sammamish River salmon habitats and upstream tributaries and restored habitats (Figure 3), and separates two significant stream segments designated as protected by COB (*Reach 4* and *6*). *Reach 5* is immediately upstream from the 1998-2002 successful multi-million-dollar wetland and stream restoration project at the University of Washington Bothell (UWB) / Cascadia College campus, and immediately downstream from a North Creek Protection Area (NCPA) zoned by COB to protect “exceptional fish and wildlife habitat"[27] (Figure 4).

[27] COB Municipal code Chapter 12.52 Fitzgerald/35th Avenue SE Subarea Regulations. Accessed Aug. 11, 2019: https://www.codepublishing.com/WA/Bothell/

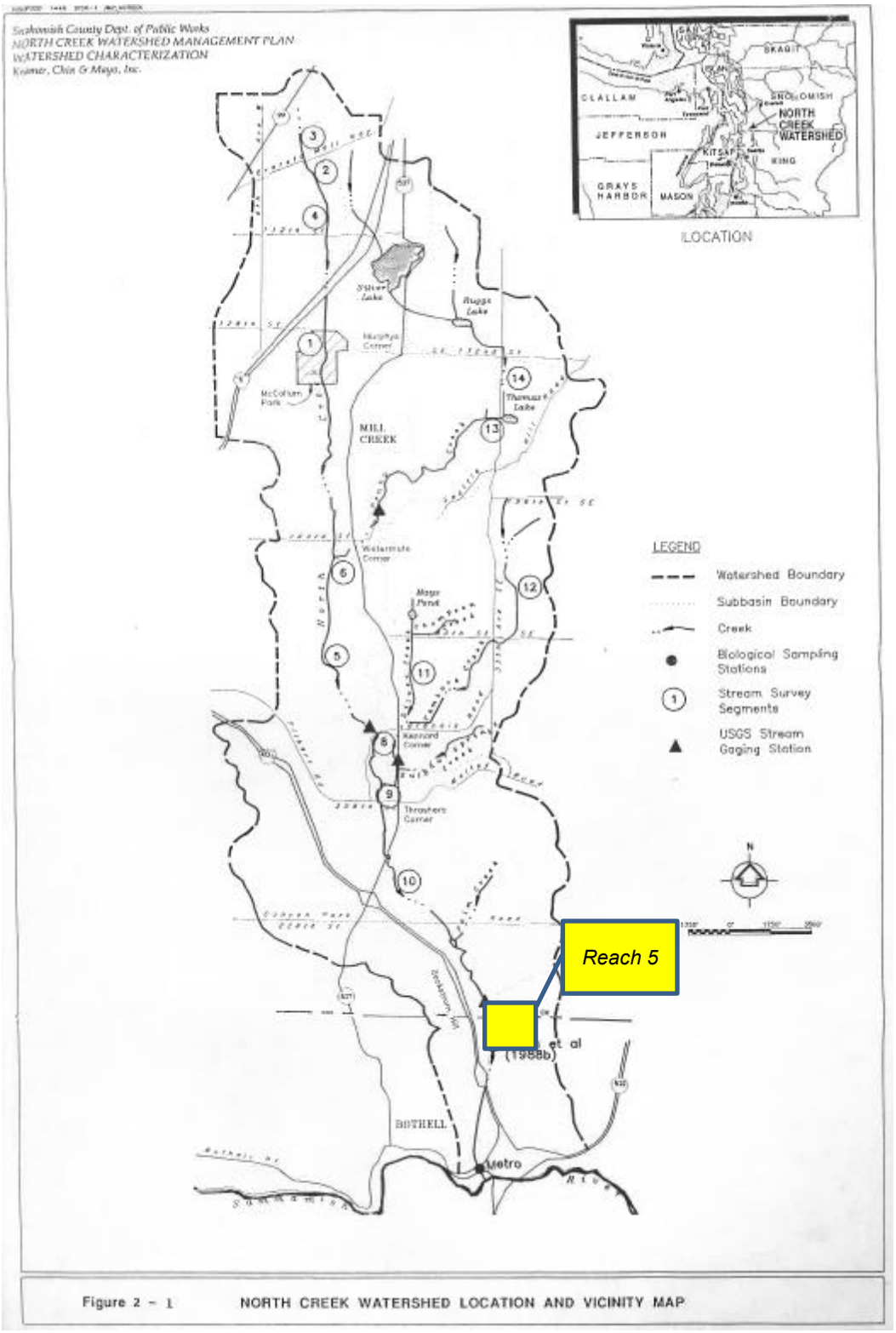

Figure 3. North Creek watershed map showing the location of reach 5. (*Source: Snohomish County Public Works Surface Water Management 1994 Watershed Management Plan*)

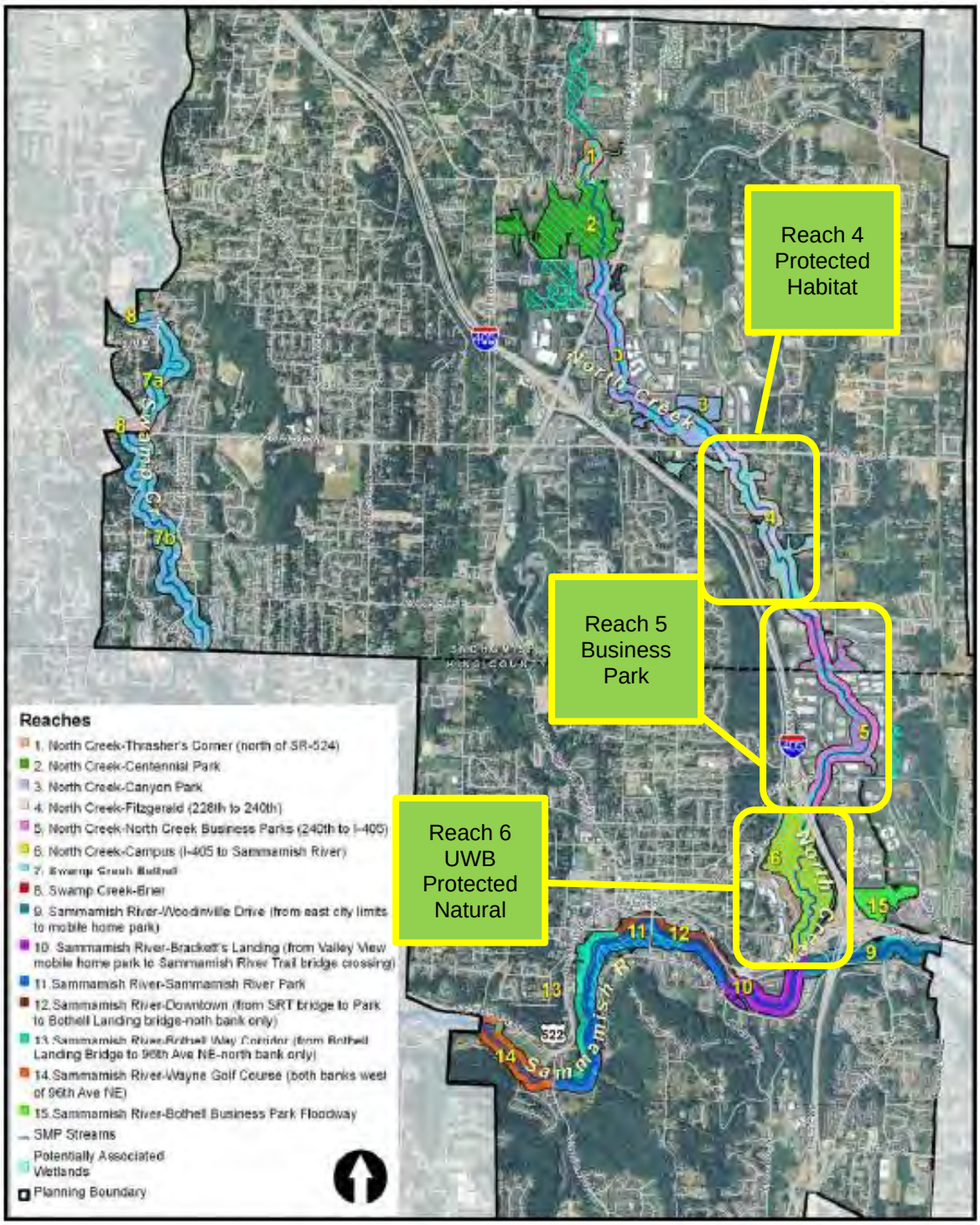

Figure 4. Overview of COB Reaches 1 through 15. *(Source: The Watershed Company. 2012 Shoreline Analysis Report for the Cities of Bothell and Brier Shorelines: Sammamish River, North Creek, and Swamp Creek. (pg. 12))*

Despite its importance, the riparian corridor and in-stream habitat in *Reach 5* are in a current state of ecological degradation and the natural habitat is in need of invasive species mitigation, as well as in-stream and wetland restoration that pose barriers to migratory fish species.

Reach 5 Projects

The 2005 WRIA 8 Plan identified a total of 14 site-specific projects for North Creek. Due to public comment, *Reach 5* was listed as a technical priority to work with the landowners for shoreline and in-stream vegetation restoration and enhancements.[28]

In a 2012 *Shoreline Restoration Plan* for COB, the Watershed Company listed three recommended projects for *Reach 5* (NC-3, NC-4 and NC-5) as potential restoration projects,[29] however, the projects were subsequently removed[30] .

[28] WRIA 8 Chinook Salmon Conservation Plan. pg. 15. accessed Aug 9, 2019: https://www.govlink.org/watersheds/8/planning/chinook-conservation-plan.aspx
[29] Bothell Resolution No. 1288 (2012), 2012 Shoreline Restoration Plan. page 126. accessed Aug. 14, 2019: http://mrsc.org/getmedia/87D70A52-4C37-4D59-9C1C-645BD6C718F4/b67r1288.aspx
[30] Bothell Resolution No. 1288 (2012), 2012 Shoreline Restoration Plan. page 127. accessed Aug. 14, 2019: http://mrsc.org/getmedia/87D70A52-4C37-4D59-9C1C-645BD6C718F4/b67r1288.aspx

Section 2: Focus of Analysis

In an effort to move restoration activities forward in Reach 5, this research is focused on reviewing the following government documents: USFWS Critical Area Regulations, USACE levee vegetation maintenance, levee monitoring reports, COB's Shoreline Master Program, Shoreline Management Regulations, and Critical Area Regulations in order to identify any limitations or constraints that could be restricting implementation of restoration efforts.

Environmental Policy Background

Environmental protection of North Creek is covered under numerous local, state and federal regulations due to its classification as shoreline of the state, critical habitat for endangered Chinook salmon, a migratory fish stream, wetlands, regional trails, and water quality monitoring. Adherence to environmental policy mandates are overseen by Washington State Department of Ecology (Ecology) and are drafted into all municipality plans and programs based on guidelines, templates and technical assistance provided by Ecology[31]. Once local governments develop environmental policies and plans related to the environment (e.g. water and shorelines, air and climate, waste and toxic, spills and cleanup, noise, etc.), they must be submitted to Ecology for a statutory review and comment period and are not considered official until final approval from Ecology[32]. This process ensures that all governmental environmental policy plans (e.g. SMP,

[31] Ecology. Shoreline Master Program Guidelines. accessed Aug. 12, 2019: https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Shoreline-coastal-planning/Shoreline-laws-rules-and-cases/Shoreline-Master-Program-guidelines

[32] Ecology. State Approved SMPs. accessed Aug. 16, 2019: https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Shoreline-coastal-planning/State-approved-Shoreline-Master-Programs

Comprehensive and Watershed Plans) are comprised of set standards, and current state and federal regulations for new development or land uses identified below.

Federal Regulations & Purpose:

- 1965 Anadromous Fish Conservation Act
    - Conserve, protect and enhance migratory fish habitats.
- 1970 National Environmental Policy Act
    - Environmental protection through required development assessment reports.
- 1972 Clean Water Act
    - Regulation of pollutant discharges into water.
- 1973 Endangered Species Act
    - Conservation of plants, animals and their habitats.

Washington State Regulations & Purpose:

- 1965 Water Quality Protection (90.48 RCW)
    - Water pollution limits through water quality standards.
- 1971 Water Resources Act (90.54 RCW)
    - Protect the waters of the state from pollutants.
- 1971 Shoreline Management Act (90.58 RCW)
    - Management and protection of shoreline environments and uses,
    - Prevent uncoordinated development of shorelines.

- 1971 State Environmental Policy Act (43.21C RCW)
    - Requires an environmental review process to negate environmental impacts.
- 1990 Growth Management Act (36.70A RCW)
    - Manage local growth and development while protecting critical areas and natural resources.
- 1997 Watershed Planning Act (90.82 RCW)
    - Framework for collaborative planning to address solutions to watershed issues.
- 2014 Hydraulic Code (220-660 WAC)
    - Projects where dredging, obstruction, diversion or change in the natural water flow in salt or fresh waters of the state, are regulated by Washington Department of Fish and Wildlife.

Local Municipality Policy & Regulations

The *Shoreline Master Program* (SMP) and *Imagine Bothell Comprehensive Plan* (IBCP) both contain COB's policies and objectives. COB's regulations are published online under Bothell Municipal Code (BMC). This research will focus on COB's policies found in the SMP and IBCP plan, Title 12 Zoning of Subareas, Title 13 Shoreline Management, and Title 14 Critical Area Regulations applicable to *Reach 5* and the two protected critical areas it currently separates (*Reach 4* and *Reach 6*). These plans and regulations are outlined below and summarized in Section 4.

Local Government Regulations & Code Location:

- Critical Area Regulations
    - BMC Title 14 Chapter 14.04
- Shoreline Management
    - BMC Title 13
- COB *Reach 5* specific and associated regulations:
    - North Creek / NE195th Street Subarea Plan
    - Fitzgerald / 35th Avenue SE Subarea Plan
        - BMC Title 12.52 and 12.62

Other *Reach 5* Technical Documents

Technical documents reviewed related to the *Reach 5* levee system were obtained from the COB's document center and are listed below. The USACE levee maintenance guidelines were obtained online and reviewed for constraints that would prohibit restoration and enhancement (R&E) to the leveed shorelines, floodplain or associated wetlands.

- USACE levee maintenance guidelines
- *Reach 5* Environmental Impact Statement
- *Reach 5* Levee Operation & Maintenance Plan
- *Reach 5* Levee Monitoring Reports, and
- *Reach 5* Wetland Monitoring Reports

Overview of Analysis

Reach 5 Background

Soil characteristics and vegetation records in early township and surveys suggest the lower portions of North Creek flowed through a seasonally-saturated forested floodplain. Starting around 1897, the North Creek stream corridor was straightened, diked, and partially relocated to transport harvested trees downstream to the Sammamish River headed to the sawmills located on the shorelines of Lake Washington[33].

From the late 1920s to 1933, a portion of the property operated as a golf course. When that business failed the property was truck farmed (i.e., grew vegetable crops for shipment to distant markets) from the 1940s to 1973. As a result of these two different land uses, North Creek was relocated sometime in the 1930s, and again in the 1960s to enable farming[34].

In 1981, in alignment with the COB North Creek Valley Plan[35] goals and objectives that addressed both growth and generation of tax revenue, COB re-zoned the vacant 140-acre property from agriculture to mixed-use for development of a business park.[36] As compensatory mitigation for allowing development to go forward, the relocated North Creek stream would need to be built and restored to a meandering channel with floodplains, that included 28 acres of public accessible natural open green

[33] Bothell. 1981. Department of Community Development, Koll Company, and Wilsey & Ham. Final Environmental Impact Statement for Koll Center. Bothell, Wash.: City of Bothell, 1981. Print. Pg. 109.
[34] Bothell. 1981. Final Environmental Impact Statement for Koll Center, Pg. 109
[35] Bothell. 1981. Final Environmental Impact Statement for Koll Center: p 5.
[36] Bothell. 1981. Final Environmental Impact Statement for Koll Center: p 5.

space, trails, foot bridges and shared parking to enhance the aesthetics of the business park.[37.]

Between 1983 and 1996 eleven office building were developed by The Koll Company, as well as the channelized stream corridor and wetlands that included a 10-year monitoring period. When the monitoring period ended, the business park property was sold to Schnitzer West Corporation in 1997, who continued to build and sell office buildings within the business park. In 2013, all remaining assets (11 buildings) were sold to Grosvenor Americas.[38] However, the business parks tenant's association (North Creek Maintenance District) is still managed by Schnitzer West on behalf of Grosvenor Americas.[39]

The wetlands and floodplains in *Reach 5* (Parcel number 392700-0360) are owned by North Creek Maintenance District (tenant's association), with an appraised and taxable value of one thousand dollars.[40] The shoreline levees are a separate parcel (392700-03100) also registered to the tenant's association for the same amount.[41] This is significant information because the wetland and floodplain are a separate parcel and could qualify for a COB or WRIA 8 sponsored land acquisition.

1984-85 North Creek Stream Restoration

[37] Bothell. 1981.Final Environmental Impact Statement. Pg. 110.
[38] Puget Sound Business Journal article accessed: https://www.bizjournals.com/seattle/news/2013/10/15/schnitzer-west-sells-two-eastside.html
[39] Parkland North Creek business park management. accessed Aug. 8, 2019: http://www.parklandsnorthcreek.com/contact/
[40] King County Department of Assessments. Parcel 3927000360. accessed Aug. 13, 2019: https://blue.kingcounty.com/Assessor/eRealProperty/Dashboard.aspx?ParcelNbr=3927000360
[41] King County Department of Assessment. Parcel 3927000310. accessed Aug. 13, 2019: https://blue.kingcounty.com/Assessor/eRealProperty/Dashboard.aspx?ParcelNbr=3927000310

The initial business park development included a massive undertaking to restore the North Creek stream and habitat corridor to more natural conditions with attention to habitat requirements for migratory and resident salmonids, waterfowl, shorebirds and mammals. However, functional compromises were necessary to protect buildings and constrain the floodplain, resulting in the construction of large levees on both sides of North Creek (Figure 5).

At the time, it was the "largest stream relocation that had been done in the United States", and built over a peat bog 80 feet deep" [42]. To meet salmon habitat requirements, vegetation needed to be incorporated into the restoration design to provide immediate shade cover to 70% of the stream. To accomplish this, helicopters were utilized to relocate 323 mature Cottonwoods and Willows to specified locations along the stream corridor, and included the following features: [43]

- A meandering stream channel 3,600 feet long
- An average stream width of 25 feet
- Gravel bottom stream for salmon rearing
- 18 fish habitat pools with logs and rockeries, and
- Over 300 mature native trees along the stream banks. [44]

Upon completion in 1985, the restoration project of North Creek was considered a success from multiple aspects; inter-agency cooperation, restored salmon habitat,

[42] Land Expressions, portfolio, commercial project descriptions. accessed Aug 10, 2019: https://www.landexpressions.com/portfolio/commercial-projects/koll-north-creek/
[43] Land Expressions, accessed Aug 10, 2019: https://www.landexpressions.com/portfolio/commercial-projects/koll-north-creek/
[44] Land Expressions. accessed Aug. 10, 2019: https://www.landexpressions.com/portfolio/commercial-projects/koll-north-creek/

successful relocation of native trees, and the creation of a viable natural habitat that after six months “the stream channel looked as though it had always been there.”[45]

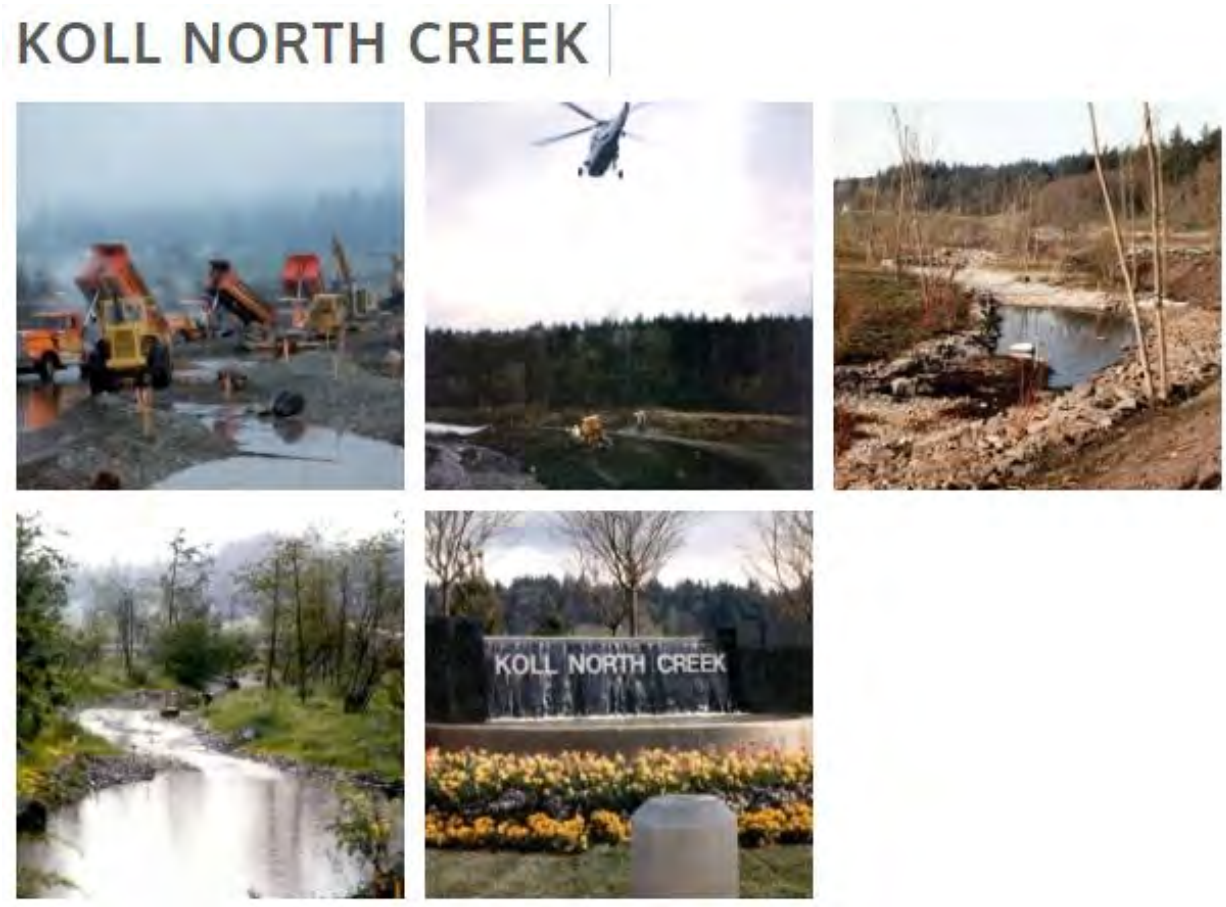

Figure 5. Construction of the North Creek stream channel at *Reach 5*. *(Source: Land Expressions website, commercial portfolio*)

Reach 5 Levee System

In 1984 when development began, levees were constructed to constrain the floodplain and channel migration, and protect the economic infrastructures. In 1994,

[45] Land Expressions. accessed Aug 10, 2019: https://www.landexpressions.com/portfolio/commercial-projects/koll-north-creek/

rapid development upstream in the watershed contributed to increased surface water runoff and sediment deposition in *Reach 5* resulting in Federal Emergency Management Agency (FEMA) to require the existing levees be raised 1-7 feet on both sides of North Creek to withstand the increased flows of a 100-year flood event.[46] As upstream development continued, another levee upgrade in *Reach 5* was necessary in 2009, with raising the height of the east and west levees another 1-3 feet along the stream corridor.[47].

Following the 2009 levee upgrade, a long-term monitoring program was initiated to maintain levee integrity and function, and protect the business park infrastructure. Watershed Science and Engineers (WSE) begin monitoring flood levels and channel volumes to determine when sediment and vegetation maintenance would be required for flood control.[48]

In a 2016/2017 *Reach 5 Annual Monitoring Report*, WSE reported the levee base flood height was no longer in compliance with the three-foot minimum set by FEMA, due to constriction and sediment deposits at the North Creek Parkway bridge altering water levels. Recommended short-term solutions for consideration were: a) removal of sediment, b) raise the bridge, or c) raise the levees. However, the long-term solution must address "the constriction caused by the North Creek Parkway north bridge".[49]

[46] Geotechnical Engineering Services. 2008. North Creek Levee Evaluations, Bothell, Washington, for Schnitzer North Creek and Bothell Business Park. File No. 1460-007-25. Pg. 1
[47] Geotechnical Engineering Services. 2008. North Creek Levee Evaluations, Bothell, Washington, for Schnitzer North Creek and Bothell Business Park. File No. 1460-007-25. Pg. 1
[48] Watershed Science & Engineers. North Creek Annual Monitoring Report 2016/2017. Prepared for North Creek Maintenance District, Schnitzer West, LLC. Pg. III
[49] Watershed Science & Engineers. North Creek Annual Monitoring Report 2016/2017. Pg. 16

Remediation action is unknown because the 2018/2019 monitoring report was not on file at the COB document center at this time (August 10, 2019).

Levee vegetation management and maintenance (above the floodplain) is regulated by the USACE and out lined in *Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankments Dams, and Appurtenant Structures* (Appendix A). These guidelines are summarized below[50]:

1. Maintain a vegetation free zone (or clear zone) on the levee top where only perennial grasses are allowed for erosion control and visual inspections with adequate access for maintenance activities (Figure 6)
2. Plant native species adaptive to soil, climate and hydrologic functions to support the resilience of the riparian corridor.
3. Native vegetation planted along the slope of the levee should be maintained to exclude invasive species.
4. Repair and fill rodent holes in the levees.
5. Removal of damaged vegetation (e.g. tree trunks, stumps, or root balls) requiring excavation must have removal plans developed and submitted to USACE. For areas associated with endangered species and critical habitat, approval may also be required from Fish and Wildlife.

[50] US Army Corps of Engineers Engineering and Design: Guidelines for landscape planting and vegetation management at levees, floodwalls, embankment dams, and appurtenant structures. accessed Aug 3, 2019: https://www.publications.usace.army.mil/Portals/76/Publications/EngineerTechnicalLetters/ETL_1110-2-583.pdf

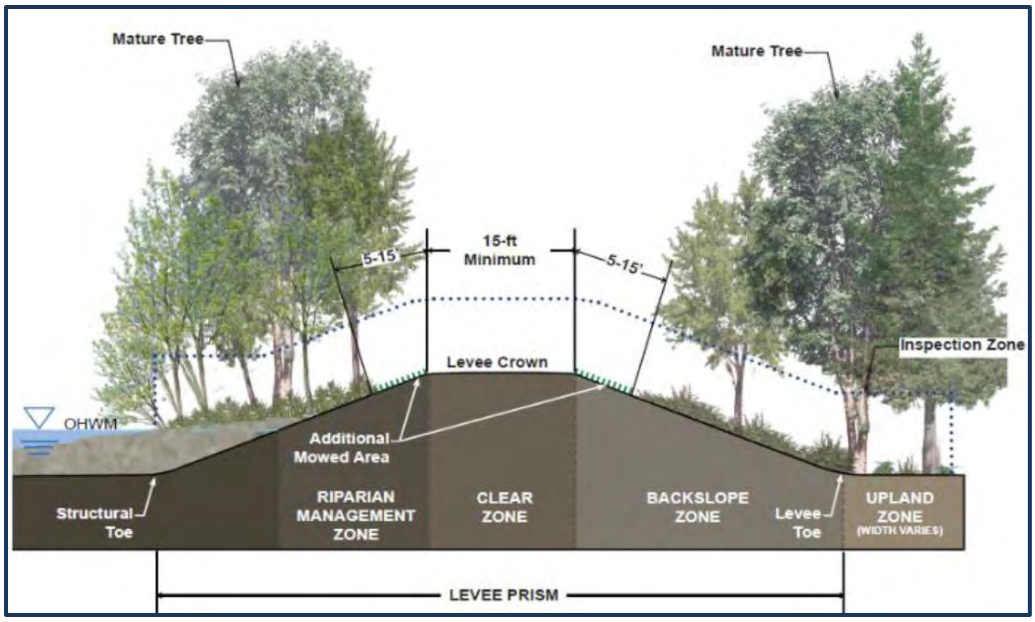

Figure 6. Illustration of a clear zone on a levee system. *(Source: Pierce County Levee Vegetation Management Plan: Strategy Chapter (pg.8)*[51]*)*.

Reach 5 Wetlands & Stream Banks

From fall 1984 through the winter of 1985, large vegetation was planted along the stream banks, marsh and detention pond for maximum shading in preparation for a staged stream diversion that took place in the summer of 1985. Monitoring surveys from 1985 through 1988 verified vegetation performance standards outlined in the Revised Restoration Plan[52] were met for the stream bank and detention pond. While the wetlands supported large numbers of wildlife with good water filtration, they did not meet performance standards for flooding the backwater pond.[53]

[51] Pierce County Public Works Surface Water Management, Levee Vegetation Management Strategies. accessed on Aug 4, 2019: https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/4622
[52] The Revised Restoration Plan could not be located, but is referenced in the ICS Associates. 1992 Annual Monitoring Report – Koll-North Creek Backwater Wetland Creation/Enhancement Plan; December 7, 1992.
[53] IES Associates. 1992 Annual Monitoring Report. Koll – North Creek Backwater Wetland Creation/Enhancement Plan. December 7, 1992. Appendix B, Pg. 6.

In 1991, the wetlands were graded and lowered two feet, flow level increased, 10,000 native plants were added, and an overflow weir with salmon passage was relocated from the north end to the south end. Irrigation sprinklers were added to support two seasons of growth until wetland emergent could became established. The 1992 and 1994 Annual Monitoring reports for *Reach 5's Backwater Wetland* are attached in Appendix B for additional detail on vegetation and wildlife present in 1994.

After the early monitoring requirements were satisfied, non-native, invasive plant species have gradually encroached on the wetlands. A 2008 *North Creek Levee Evaluations* report noted that vegetation along the shoreline of the levees had been allowed to grow without maintenance; consisting of "creeping nightshade, reed canary grass, Himalayan blackberry, and knotweed."[54]

Today, opportunistic invasive plant species are established along both leveed shorelines, wetlands, floodplain and in-stream habitats, consisting of reed canarygrass (*Phalaris arundinacea*), Himalayan blackberry (*Rubus armeniacus*), Scotch broom (*Cytisus scoparius*), English ivy (*Hedera helix*), creeping thistle (*Cirsium arvense*), creeping nightshade (*Solanum dulcamara*), and Japanese knotweed (*Fallopia japonica*), resulting in:

a) a reduction of critical habitat functionality (e.g., a reduction of shade, natural vegetation, and species contributing woody debris to the stream),

b) deterioration of aesthetics,

[54]Geotechnical Engineering Services. 2008. North Creek Levee Evaluations, Bothell, Washington, for Schnitzer North Creek and Bothell Business Park. File No. 1460-007-25 (pg. 2-3)

c) encroachment on the regional trail, and

d) altered human-valued ecosystem functions.

See Appendix C for current site photos of *Reach 5*.

North Creek Restoration Activities

Compiling restoration projects since 2010 in the North Creek watershed was a challenging task. None of the municipalities had a comprehensive list of past projects beyond what was listed in the current plans or published on their website. Previous versions of Plans are archived and can be requested through Ecology's regional planners[55]; due to time constraints they were not included in this research. All WRIA salmon recovery projects are found in the WRIA Habitat Work Schedule (HWS)[56] database where projects are documented and maintained. However, this was the only database found dedicated to maintaining R&E project data, updated progress reports, comments and project completion dates. It should be noted that several interested agencies, including the Adopt-A-Stream Foundation, suggested that creating a database of these projects would be an ideal undergraduate student capstone project.

The first 25 R&E projects identified in Table 1 below are completed projects. The last two (26 and 27) are targeted projects to take place by COB in the 2019/2020 timeframe. All projects listed in Table 1 were found in the following government documents or HWS, and accessible through dedicated websites. See Figure

[55] Ecology. Guideline Change Through Time. accessed Aug 13, 2019: https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Shoreline-coastal-planning/Shoreline-laws-rules-and-cases/Shoreline-Master-Program-guidelines

[56] Habitat Work Schedule (HWS). accessed Aug. 9, 2019 from: http://hws.ekosystem.us/home

The Snohomish County:

- 2010 SMP Restoration Element, and
- 2018 Stormwater Management Program Plan[57].

City of Everett:

- 2017 Surface Water Comprehensive Plan Volume 2; Lake Washington Watershed Plan, Chapter 3: North Creek Basin Plan.[58]

City of Mill Creek:

- WRIA HWS database[59].

City of Bothell

- 2015 Storm and Surface Water Master Plan Update
- WRIA HWS database
- Capital Improvement Projects on COB website.

Table 1. North Creek Watershed R&E projects from 2010-2019

ID No.	Snohomish County North Creek R&E Projects (*Source 2018 SCSWM Plan*)	
	Location Description	**Comments**
1	Stormwater facility retrofit – Olivia Court	Receiving water body: North Creek / Lake Washington
2	Stormwater facility retrofit – Redhawk	Receiving water body: North Creek / Lake Washington
3	West Richmond Rd	Culvert 30" pipe replaced with 11.5-foot pipe-arch culvert: Fish passage to tributary in North Creek

[57] Snohomish County, 2018 Stormwater Management Program Plan. accessed Aug. 11, 2019: https://snohomishcountywa.gov/ArchiveCenter/ViewFile/Item/5939
[58] City of Everett. 2017. SWCP Vol. 2 Lake Washington Watershed Plan accessed Aug 11, 2019: https://everettwa.gov/DocumentCenter/View/12631/SWCP-Vol-2-Lake-Washington-Watershed-Plan-PDF
[59] WRIA 8 Salmon Conservation and Restoration Implementation Report accessed Aug 11, 2019: https://www.govlink.org/watersheds/8/reports/progress-report-2015/first-ten-years.aspx

Snohomish County North Creek Restoration Projects (*Source 2010 SMP Restoration Element*)		
	Location Description	**Comments**
4	Mill Creek/Tambark	Habitat restoration
5	North Creek School 2008	Habitat restoration
6	North Creek School 2009	Habitat restoration
7	Forested wetland north of 240th	This reach has the highest spawning area in North Creek, protect through conservation easement
8	Palm Creek	Enhance mouth and lower 100 yards as cold-water refuge for juvenile Chinook
9	Creek in Thrashers Corner area	Enhance incised stream channel and restore riparian vegetation, plant conifers and add large woody debris
10	Monte Villa Center	Work with landowners to restore riparian vegetation and do stream enhancements
City of Everett North Creek projects (*Source 2016 North Creek Basin Plan*)		
	Location Description	**Comments**
11	Evergreen Way and Holly Drive	Drainage Improvements for water quality
12	E McGill Avenue	Habitat restoration
13	E McGill Avenue	Culvert Replacement for fish passage
14	3rd Ave SE and North Creek Restoration	Culvert Replacement for fish passage
15	3rd Ave SE	Stormwater Treatment
16	Jude Park	Habitat restoration
17	E Marilyn Avenue	Drainage Improvements for water quality
18	1st Place W	Drainage Improvements for water quality
19	109th Street SE	Drainage Improvements for water quality
WRIA 8 completed from 2005 – 2015 (*Source Habitat Work Schedule database*)		
	Location Description	**Comments**
20	UWB / Cascadia Co-campus	Add conifers to restoration project for future LWD recruitment (58 acres)
21	North Creek Forest protection	COB land acquisition of 31 acres; includes wetlands and groundwater recharge areas
22	Clearwater School property	Riparian restoration and invasive species removal
23	Mill Creek – North Creek	Habitat restoration and LWD within City-Owned Reach of North Creek
24	Penny Creek Fish Passage	Two degraded culverts / fish passage barriers
25	Twin Creeks project	Expanded project up and down stream, restore riparian vegetation, add LDW and enhance side channel habitat

City of Bothell North Creek Restoration Projects for 2020 (*Source: 2015 SWMP*)		
	Location Description	**Comments**
26	208th St SE Water Quality Facilities	Treatment of roadway surface water before it enters Filbert Creek and North Creek. Treatment could include installation of bioswales, filtration, or other methods
27	Royal Anne and Filbert Creek Restoration	Culvert and wetlands work that drains into North Creek at the north side of Bothell

The following map (Figure 7) illustrates the locations of projects identified in Table 1 where local jurisdictions have conducted R&E projects in support of Chinook expansion within the North Creek Watershed that are currently being hampered by derogated critical habitat and barriers present in *Reach 5*.

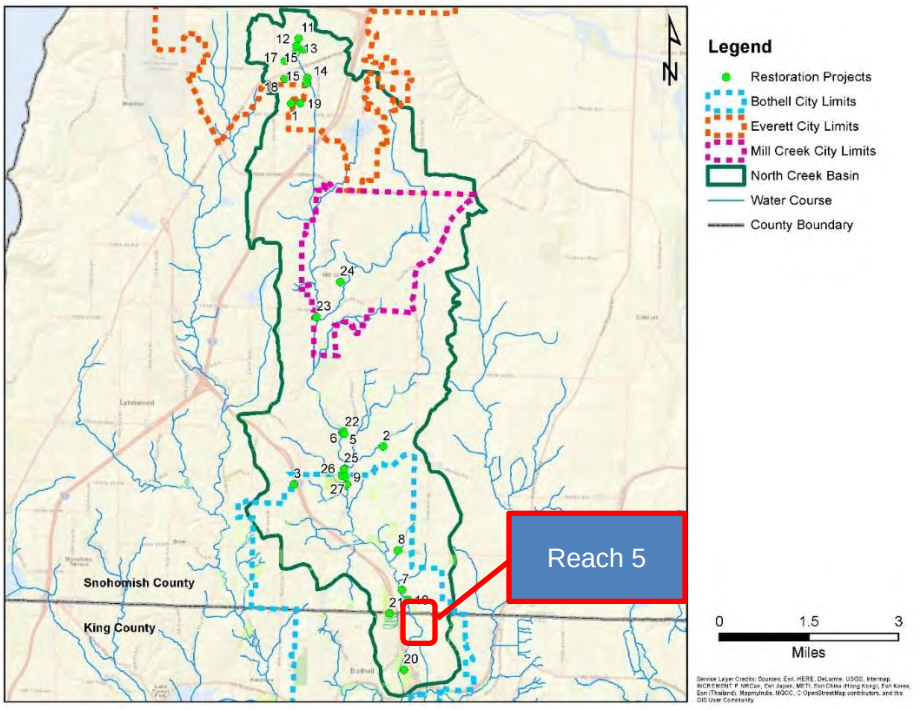

Figure 7. North Creek Restoration and Enhancement Projects Map (*Source: Map created by T. Allard & A. Graham using project location data identified in documents relevant to Table 1, August 22, 2019*)

Reach 5 projects

The only identified R&E project to take place in *Reach 5* occurred from 2009 to 2014 when COB worked with the landowners in the Snohomish County portion of *Reach 5* on .25 acres using volunteers to remove invasive species and plant native vegetation.[60] The last R&E project found for the King County jurisdiction of *Reach 5* was in 1991, described in the *Wetlands & Stream Banks* section above.

A R&E project for the King County portion of *Reach 5* was first identified in the 2005 WRIA 8 Plan and listed in the WRIA HWS database as Project number N379 as a technical priority. This project was driven by public outreach, subsequently tagged as dormant in 2015 due to the lack of a project proposal. A second project was listed as a conceptual plan as a potential project in *Reach 5* in 2008 under project number NC-R2-4LB submitted by COB, citing challenges posed by the FEMA certified levee system (Table 2)[61].

Table 2. Reach 5 projects listed in the WRIA HWS.

WRIA 8 HWS listed projects for *Reach 5* (*Source Habitat Work Schedule database*)		
Project Number	**Title & Description**	**Comments**
N379 Dormant	North Creek Reach 5 – Riparian restoration and stream enhancements	Project overlaps with Snohomish / King County. Work with Landowners to restore riparian vegetation and to do stream enhancements. Needs Report Project proposal.
NC-R2-3-RB Conceptual	Restore riparian wetland south of North Creek Parkway N – Add large wood, remove invasive plant species and plant native vegetation	Site experiences high peak flows, well connected with North Creek. Levee located here is certified by FEMA, very challenging site.

[60] Janet Geer personal interview. July 1, 2019.
[61] WRIA 8 Habitat Work Schedule accessed Aug. 11, 2019: http://hws.ekosystem.us/

Section 3: Overview of Policy and Regulations

Shoreline Master Program

Ecology describes the intent of the 1972 Shoreline Management Act (SMA) as a means to prevent impairment of Washington State's shorelines due to uncoordinated and fragmented development by integrating policies that protect the natural environment, regulate shoreline development, and provide public access to shorelines. Each county and municipality with state shorelines must develop a SMP that is based on the SMA guidelines, but also incorporates local shoreline-use policies and regulations that direct public and private uses of all marine waters, streams and rivers with greater than 20 cubic feet per second mean annual flow.[62]

All 6.76 miles of North Creek within COBs planning jurisdiction meet the mean annual flow requirements which is why North Creek is designated as *shoreline of the state*, and management policies are found in the COB's SMP. Therefore, the levees in *Reach 5* are *shoreline of the state*, and include all associated wetlands, floodways, 100-year floodplains and land within 200 feet of the ordinary high-water mark[63] (Figure 8).

[62] Washington Department of Ecology accessed Aug 11, 2019: https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Shoreline-coastal-planning/Shoreline-Management-Act-SMA
[63] BMC 13.05. accessed Aug. 11, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell12/Bothell1214.html

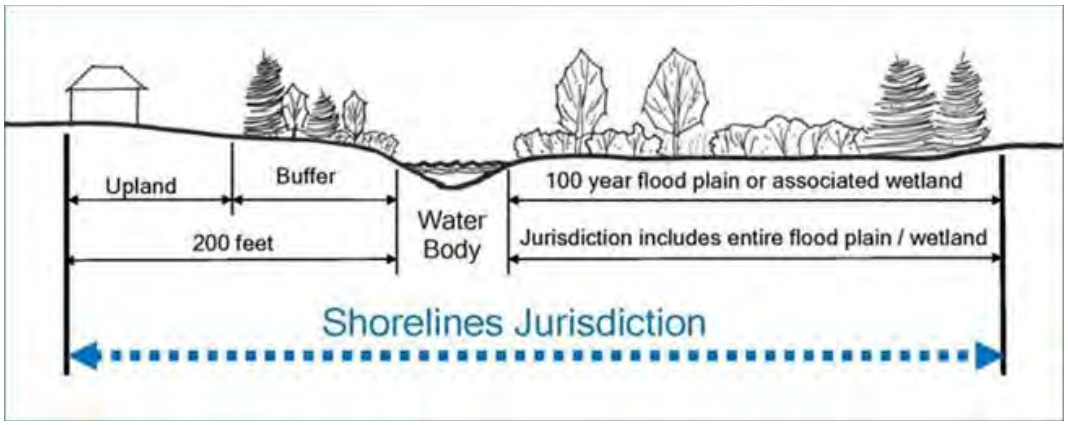

Figure 8. Shoreline Jurisdiction defined. (Source: *BMC Figure 13.05-1. Shoreline Jurisdiction Illustration*).

The COB's SMP has identified goals and policies organized under 10 different activity elements. The first eight are mandatory elements for every municipality with a SMP, the last two (Restoration and Process Elements) are left up to each municipality if deemed appropriate. The complete list of SMP Elements are as follows:

1. Shoreline Use Element
2. Economic Development Element
3. Public Access Element
4. Recreational Element
5. Circulation Element
6. Conservation Element
7. Historical/Cultural/Scientific/and Education Element
8. Flood Control Element
9. Restoration Element
10. Process Element.

Table 3 highlights eleven environmental and significant ecological policies found in the COB SMP. These policies are focused on protection and prevention of degradation to natural resources, and include land acquisition and conservation easements when necessary. However, it should be noted that they are no longer enforceable on an established development such as *Reach 5* that have been previously permitted and completed through the required monitoring period.

Table 3. Reach 5 significant SMP Policies

Policy No.	**COB SMP - Shoreline Policy**
Section: Shoreline Habitat and Natural Systems Enhancement Projects (pg. SH-15)	
SMP-P47	Include provisions for shoreline vegetation restoration, fish and wildlife habitat enhancement, and low impact development techniques in projects located within the shoreline, where feasible.
SMP- P48	Encourage and facilitate implementation projects and programs included in the SMP Shoreline Restoration Plan (*There are No projects listed*).
Recreation Element (pg. SH-19)	
SMP-P90	Identify unique shoreline features (views, topography, vegetation, wildlife, etc.) and assign acquisition and preservation priorities for each feature.
Conservation Element: Environmental Protection (pg. SH-21)	
SMP-P99	Work with other jurisdictional agencies in the region and with the private sector to deal effectively with regional and watershed-wide natural environmental issues and the protection, preservation, and enhancement of all shorelines as fish and wildlife habitat.
SMP-100	Enhance and restore areas which are biologically and aesthetically degraded to the greatest extent feasible while maintaining designated uses of the shoreline.
Conservation Element: Critical Areas & Wetlands (pg. SH-21)	
SMP-P101	Conserve and protect critical areas within shoreline jurisdiction from loss or degradation.
SMP-P103	Protect and manage shoreline-associated wetlands, including maintenance of sufficient volumes of surface and subsurface drainage into wetlands, to sustain existing vegetation and wildlife habitat.

Policy No.	COB SMP - Shoreline Policy
Fish and Wildlife Habitat Conservation Areas (pg. SH-21)	
SMP-P104	Protect and restore critical freshwater habitat and other areas that provide habitat for endangered, threatened or sensitive fish and wildlife species.
Restoration Element (pg. SH-24)	
SMP-P126	Develop and implement a Shoreline Restoration Plan that contains goals, policies and prioritized actions for restoration of impaired shoreline ecological functions.
SMP-P128	Work with the public and any other interested parties to investigate and identify any environmentally sensitive areas within shoreline jurisdiction which are deserving of public reclamation, restoration, or preservation and inclusion within the city's open space system.
Shoreline Process and Administration Element (pg. SH-25)	
SMP-P136	Implement shoreline improvements annually through the City's Capital Facilities Element and Capital Investment Program processes.

Shoreline Environment Designations

Described in BMC 13.07, Shoreline environmental designations are developed by COB based on current or planned land use, as well as the ecological condition of the shoreline. These environmental designations are then used by city staff to determine what regulation to use when processing variance applications for conditional use of shorelines.[64] There are a total of six environmental designations:

- natural
- urban conservancy
- shoreline residential
- high intensity

[64] BMC 13.07 Shoreline Environmental Designations. accessed Aug. 11, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell12/Bothell1214.html

- marina
- aquatic

There are no marinas or aquatic designations in North Creek; the other four designations are described below in context with the protected critical habitats *Reach 5* currently separates (*Reaches 4* & *6*).

- *Reach 4* is residential lands predominately designated as Urban Conservancy, with a few Residential Shorelines. However, *Reach 4* includes a zoning overlay of North Creek Protection Area (NCPA) which incorporates additional constraints to protect "exceptional fish and wildlife habitat"[65], while allowing for low-impact development.[66]
- *Reach 5* is designated as both High Intensity to account for public access to the North Creek Region Trails; and Urban Conservancy that includes the shoreline side of the levees (riparian corridor), associated wetlands and floodplains.
- *Reach 6* is the UWB/Cascadia stream corridor, associated wetlands and floodplains; designated as Natural shoreline invoking the most restricted management policies.

Presented in Table 4 are the four environmental designations along with abbreviated SMP management policies (excludes new development policies) applied to *Reaches 4* through *6*.

[65] BMC 12.04.085. accessed Aug. 11, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell12/Bothell1214.html
[66] BMC 12.52 Fitzgerald/35th Avenue SE Subarea Regulations. accessed Aug. 11, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell12/Bothell1214.html

Table 4. Shoreline Environmental Designations for Reaches 4-6.

City of Bothell – SMP Policy & Shoreline Management Regulations ***Shoreline Environmental Designations (Source: Title 13 Chapter 13.07)***		
Shoreline Environmental Designations	**Purpose**	**Abbreviated Management Policies**
Shoreline Residential Reach 4	• To accommodate current and planned residential development.	• Standards for density, setbacks, lot coverage limitations, lot dimensions, buffers, shoreline stabilization, vegetation conservation, critical area protection, and water quality shall be set to assure no net loss of shoreline ecological functions. • Visual and physical access should be allowed where feasible and adverse ecological impacts can be avoided. • Continuous public access along the shoreline should be provided, preserved or enhanced.
Urban conservancy Reach 4 & 5 Shoreline & Wetlands	• To protect and restore ecological functions of open space, parks, floodplains and floodways and lands containing critical areas.	• Allow uses that preserve the natural character of the area and/or promote restoration within critical areas and public open spaces either directly or over the long term. • Allow uses that result in restoration of ecological functions. • Restoration of shoreline ecological functions should be a priority. • Public access and recreation objectives should be permitted whenever feasible and significant adverse ecological impacts can be mitigated
High Intensity Reach 5 NC Regional Trail	• To accommodate intensive land uses in shoreline areas that have been previously degraded.	• Manage development so that it enhances and maintains the shorelines for a variety of urban uses. • Non-water-oriented uses as they exist on or before February 2013, or when associated with public access or ecological restoration. • Continuous public access along the shoreline should be provided, preserved or enhanced. • Aesthetic objectives should be implemented and maintenance of natural vegetative buffers where they exist.
Natural Reach 6 – UWB/Cascadia	• To protect those shoreline areas that are relatively free of human influence or that include intact or minimally degraded shoreline functions intolerant of human use.	• Limit or prohibit use and development. o Prohibit commercial, industrial, non-water-oriented recreation uses. • Controlled and restricted access may be permitted for scientific, historical, cultural, educational purposes provided there are no adverse or ecological impacts.

Only when the environmental designations are reviewed in conjunction with the protected critical habitat overlay in *Reach 4*, does it become apparent that two protected critical habitats of *Reaches 4* and *6* are separated by the unprotected and degraded habitat of *Reach 5* (Figure 9).

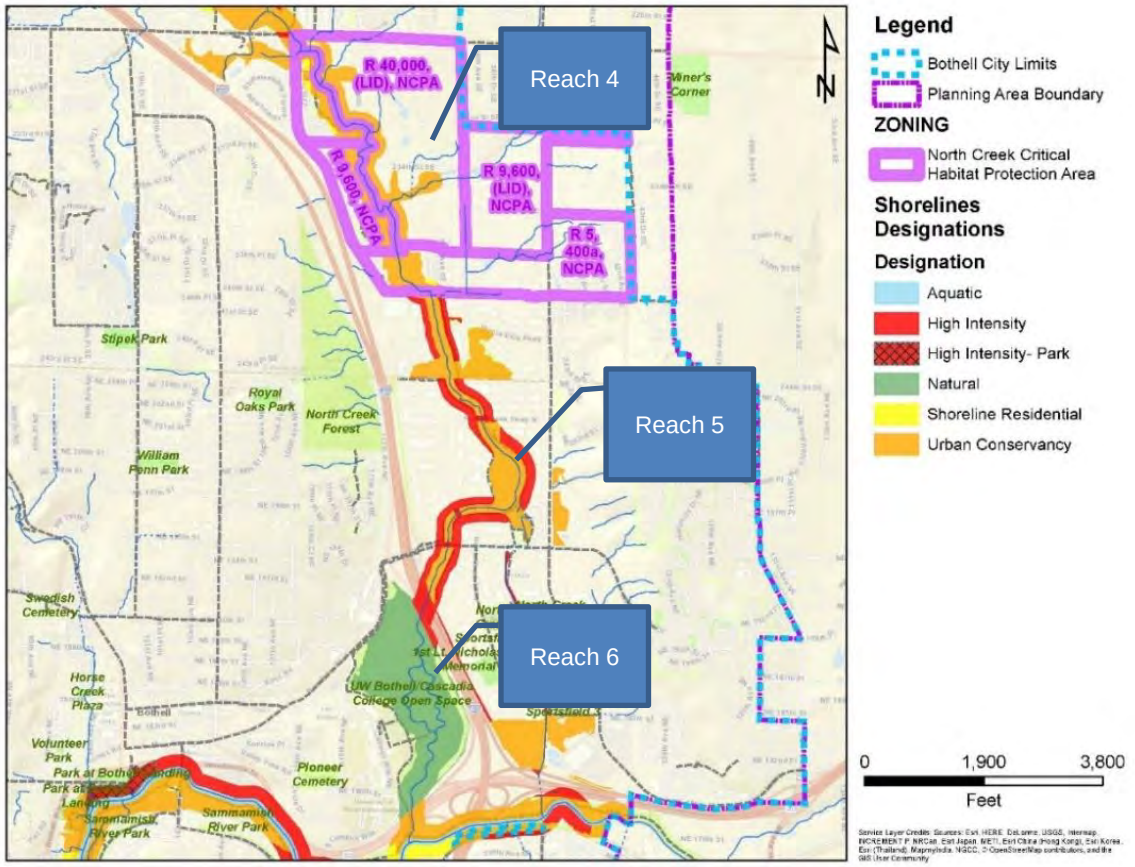

Figure 9. Reach 5 zoning map illustrating proximity to designated Natural and NCPA. (*Source: Map created by A. Graham with COB public GIS data (Aug. 2019)*)

Wetland Categories

NOAA describes wetlands as fragile ecosystems along waterways and floodplains that are permanently or seasonally inundated with water and essential to all life forms. A properly functioning wetland provides vital ecosystem benefits that include

food and physical habitat for fish and wildlife. Wetlands also serve as a water purification system that absorbs pollutants, extra nutrients, sediments and floodwaters that threaten local communities[67]. Due to varying stages of degradation, wetlands begin to lose functionality and are categorized by their current condition, as well as the ability to replace or reinvigorate their ecosystem functions through mitigation measures.

Ecology regulates the protection and preservation of wetlands through a rating system, that can then be used to assist city staff in the decision process for permitting development, land use and necessary buffers as a means to protect natural resource.[68] Table 5 below was developed from BMC 14.04.500 Wetland Ratings, in accordance to Ecology's guidelines and describes the overall characteristics of each wetland category:

Table 5. Wetland Categories (*Source: BMC 14.04.500*)

Wetland Categories	**Ecological Functions**
Category I	Wetlands that are unique or rare; or more sensitive to disturbances than most wetlands; or relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime.
	or provide a high level of functions (e.g., bogs, old growth forested wetlands, multifunction.
Category II	Estuarine or inter-dunal wetlands; or wetlands that are difficult but not impossible to replace with high levels of some functions that need protection.
Category III	Wetlands with moderate levels of functions.
Category IV	Wetlands that have the lowest levels of functions.

[67] NOAA. What is a wetland. accessed Aug 14, 2019: https://oceanservice.noaa.gov/facts/wetland.html
[68] Ecology. Wetland rating systems. accessed Aug 14, 2019: https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources/Rating-systems

The wetland ratings and functions for *Reaches 4* through *6* are listed below. The highest rated wetland is located in *Reach 6* at the UWB/Cascadia where the restored wetlands are also designated as Natural. *Reach 4* is rated as a category II along the fish and wildlife critical habit corridor. *Reach 5* wetlands are rated as a category III with some functionality remaining. (see Figure 10):

- *Reach 4* – Category II (high levels of wetland function)
- *Reach 5* – Category III (moderate wetland function)
- *Reach 6* – Category I (high levels of ecological function(s))

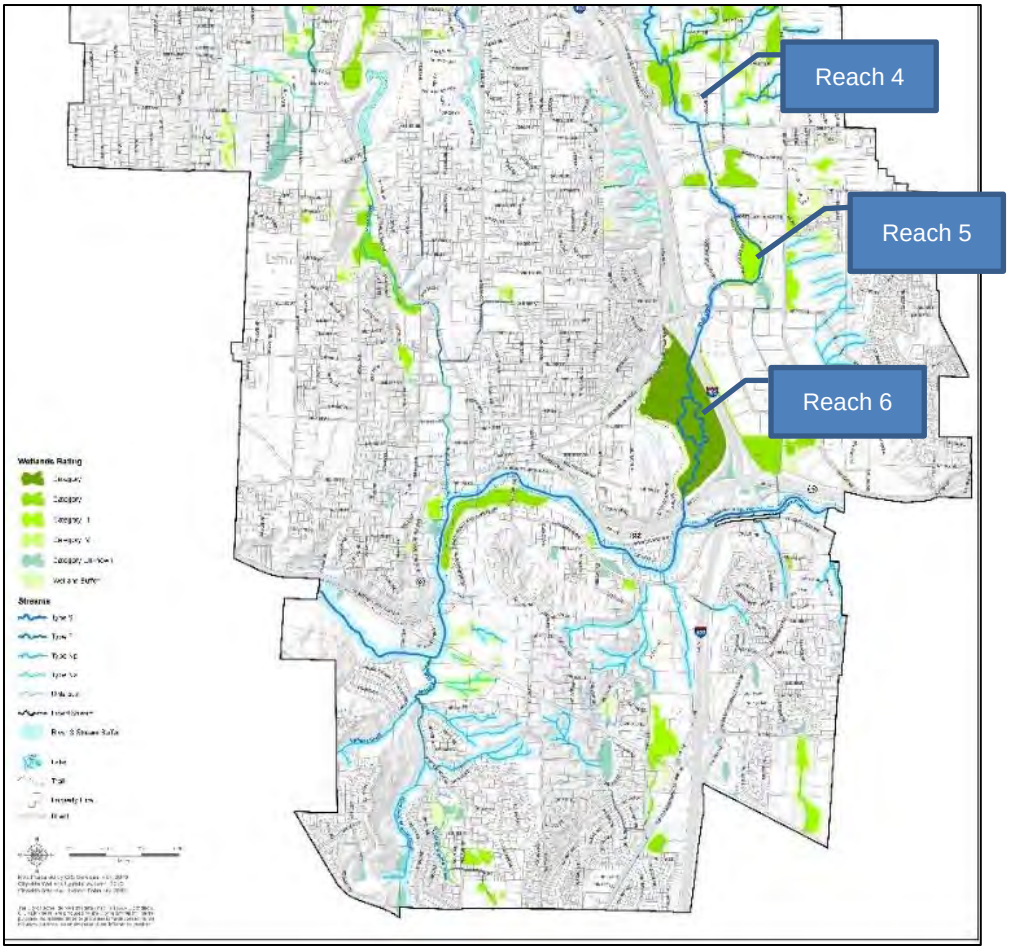

Figure 10. COB Wetlands map. (*Source COB wetlands and stream printable map*.)

Critical Area Buffers

Under BMC 14.04 Critical Area Regulations, COB defines a buffer zone as an "area that is contiguous to and protects a critical area which is required for the continued maintenance, functioning, and/or structural stability of a critical area."[69] The required type and width of wetland buffers are tied to the habitat functionality and the rating category of the wetland. Stream buffers are dependent on whether or not the stream supports migratory salmon, other perennial or seasonal fish, or designated as a shoreline of the state. In any instance of categorization or designation, the largest buffer required takes precedence. COB applies the same 100-foot buffer to *shoreline of the state*, migratory streams, and category II wetlands, meaning *Reach 5* stream and wetland buffers are the set standard of 100 feet (Table 6). Both, *Reach 4* and *6* have 150-foot buffers due to shoreline designation, high functioning wetlands, as well as a protected critical habitat for fish and wildlife overlay.

Table 6. Reach 4-6 Environmental designations and buffers.

REACH	Shoreline Designation	Wetland Category	Buffer Type	Buffer Applied
4	Urban Conservancy, Shoreline Residential	II	NCPA Overlay[1]	150
5	Urban Conservancy, High Intensity	III	Standard Wetland	100
6	Natural	I	Wetland	150

[1] North Creek Protection Area for Fish and Wildlife Critical Habitat

COB Reach 5 Subarea Plan

[69] BMC Shoreline Management. accessed Aug 13, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell13/Bothell1301.html&?f

In 1996, COB replaced the 1979 North Creek Valley Plan with the North Creek/NE 195th Street Subarea Regulations,[70] which applies to an area of 1.38 sq. miles (885 acres) and includes *Reach 5* (see Figure 11). The *Reach 5* Plan outlined management goals, objectives and policies.

The *Reach 5* Plan describes the natural environment as dominated by North Creek and associated wetlands. Reiterating that as *shoreline of the state* it fell under jurisdiction of the SMP. It identified the North Creek Regional Trail as privately owned and maintained with public access shared by pedestrians and bicyclists.

The Land Use Element; Natural Environment under Polices for *Reach 5* stated the following:

1. Preserve and protect the wetland, stream, and floodplain.
2. Improve, protect and preserve fish habitat to the greatest extent possible.
3. Protect the stream and wetlands resources located in *Reach*.[71]

The environmental regulations for *Reach 5* developed from these policies are found in BMC Chapter 12.56 and control development standards, setbacks, landscaping, impervious surface coverage, and public access. (Appendix C).

[70] BMC 2.56. accessed Aug. 13, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell12/Bothell1214.html
[71] COB North Creek / NE 195th Street Subarea Plan. Pg. NC-6. accessed Aug. 13, 2019: http://www.bothellwa.gov/DocumentCenter/View/455/North-Creek-Northeast-195th-PDF?bidId=

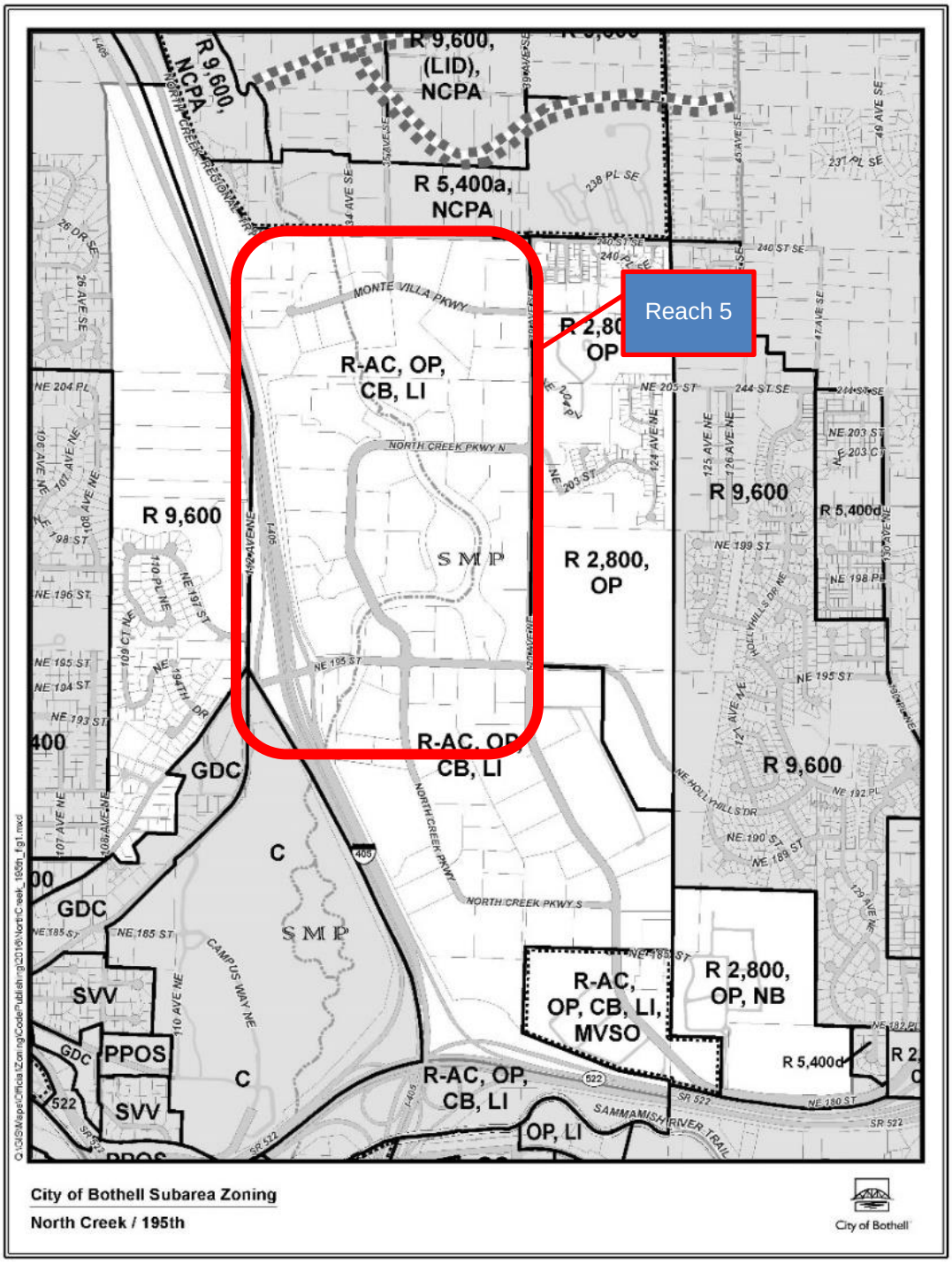

Figure 11. Reach 5 within the boundaries (red rectangle) of the Subarea Plan. (*Source BMC 12.56 North Creek/NE 195th Street Subarea boundaries map*)

Section 4: Discussion

Policy & Regulations

All policy and regulatory statutes reviewed in Section 4 advocated protection and prevention of degradation to natural resources, and include land acquisition and conservation easements when necessary. Protecting and restoring shorelines, wetlands and critical habitat are a high priority of *shorelines of the state* when making decision on land use, development and setbacks involving new construction. It also includes directives to work with the landowner of existing developments to restore critical habitat that is degraded.

Because North Creek is a *shoreline of the state*, COB has jurisdiction and custodial duty to safeguard all resources found in *Reach 5*. However, COB's inability to enforce policy compliance on privately owned lands, as well as COB not successfully working with the landowner of *Reach 5* has perpetuated the continual degradation of the wetlands, in-stream corridor and shoreline vegetation.

Wetlands

The floodplain and associated wetlands in *Reach 5* that were created in 1985 have not had any R&E since 1991 and have since lost ecological functionality. More concerning is the fact these degraded wetlands separate two COB protected critical area habitats (*Reaches 6 and 4*), and currently present barriers for migrating fish to

upstream restored habitat. There are two options that can be implemented in order to move a R&E project forward in the floodplains and associated wetlands:

1. COB can work with the landowner as a sponsor to develop a project proposal for submittal to:

    - SRFB for technical assistance and funding of the project though RCO's PRISM Online application program.[72]
    - Ecology for a Section 401 Certification for state water quality standards and federal enforcement under the Clean Water Act.[73]
    - USACE for a Section 404 Permit as regulated by the Clean Water Act.[74]
    - WDFW for an environmental Hydraulic Project Approval (HPA) permit which is reviewed for protection of critical habitat.[75]
    - COB for a critical area project review process (BMC 14.04.160), and for shoreline habitat and natural systems enhancement projects (BMC 13.11.140).

2. COB can acquire the wetlands through purchase in which they become the sponsor of public lands and submit to SRFB, Ecology, USACE and WDFW for the required permits and funding.[76]

[72] WRIA 8 Funding for Salmon Conservation, accessed Aug 26, 2019: https://www.govlink.org/watersheds/8/funding/default.aspx
[73] Ecology. Clean Water Act – Section 401 Water Quality Certifications, accessed Aug. 26, 2019: https://ecology.wa.gov/Regulations-Permits/Permits-certifications/401-Water-quality-certification
[74] Washington State Department of Transportation. USACE jurisdiction, accessed Aug. 26, 2019: https://www.wsdot.wa.gov/environment/technical/disciplines/wetlands/jurisdiction/US-Army-Corps-Engineers
[75] WDFW HPA application process, accessed Aug. 26, 2019: https://wdfw.wa.gov/licenses/environmental/hpa/application
[76] COB BMC 13.11.140 / BMC 14.04.160, accessed Aug. 26, 2019: https://www.codepublishing.com/WA/Bothell/?Bothell12/Bothell1214.html

Reach 5 Levee System

This research investigated R&E levee constraints because it was a primary concern noted on a *Reach 5* project in the WRIA HWS. To the contrary, USACE *Guidelines for Landscape Planting and Vegetation Management at Levees* requires invasive vegetation maintenance on the levees[77]. Several conversations with local monitoring engineers did not reveal any constraints either.[78]

Private Landowner Project

The landowner of the *Reach 5* business park has been required to perform levee maintenance multiple times over the decades and might be motivated to engage in an R&E project if educated about how a properly functioning wetland could reduce stress placed on the levee system by flood waters. The RCO identified incentive programs offered to private landowners is another approach that could be implemented to encourage conservation actions initiated by the landowner. Either way, action will be required from COB to work with the landowner in order to ensure awareness and the importance of a R&E project to restore the derogated critical habitat and what options are available to assist them.

Challenges and Limitations in Research for this Project

The main limitation in researching *Reach 5* was private landownership with no way to identify what documents had been generated, or by whom. Documents obtained

[77] USACE Guidelines for vegetation management at levees. accessed Aug 3, 2019: https://www.publications.usace.army.mil/Portals/76/Publications/EngineerTechnicalLetters/ETL_1110-2-583.pdf
[78] Chris Frei, personal interview, July 17, 2019; Phil Chestman personal interview, July 17, 2019.

through the COB Document Center were only discovered through references in other reports; making for a long tedious process. Not all documents on file could be identified. Another limitation pertaining to private landowner was the inability to maintain relevant dialog with professional contractors; once the subject of this research was disclosed communication halted after the initial interview; going forward phone calls, voice mail, and emails went unanswered. Finally, the full extent of restoration projects in the North Creek watershed is a limitation that needs to be further developed.

Section 5: Recommendations

A R&E project is vital to restoring critical area habitat in *Reach 5* to eliminate barriers to Puget Sound Chinook and other migratory fish species, connect two high quality COB protected habitats, as well as provide access to restored critical habitat upstream performed by other local jurisdictions along the North Creek watershed.

Recommendations are for COB to take action toward land acquisition making the wetlands publicly owned lands and protected into perpetuity. Alternatively, COB can work the R&E project through the landowner. Regardless of the option chosen, COB should initiate development of a project proposal and submit to SRFB for technical assistance and funding, USACE for a Section 404 permit, Ecology for a Section 401 Certification and WDFW for an HPA permit to move an R&E project forward in *Reach 5.*

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Appendix A

1992 & 1994 ICS *Reach 5* Annual Monitoring Reports

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June 6, 1995

The Koll Company
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22118 - 20th Avenue S.E., Suite 138
Bothell, WA 98021

RE: 1994 Monitoring Report - Koll-North Creek
By-Pass Channel Wetlands

Introduction

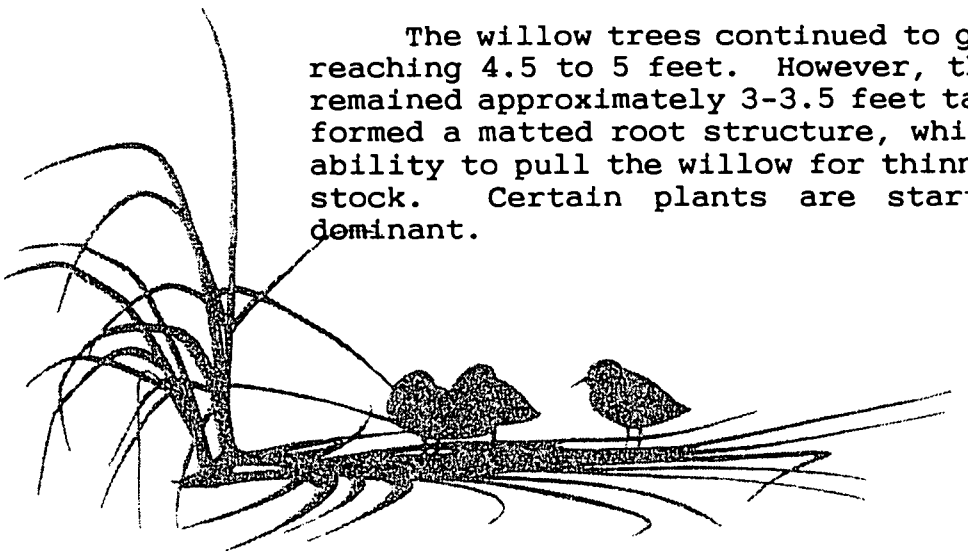
Three site investigations were complete during 1994, to monitor the over-flow channel wetland. The survey was a continuation of the 1993 monitoring report, which was continued into the spring of 1994, in an effort to evaluate the survival and spread of willows in the back-water, by-pass channel area.

The site was walked and photographed from the surrounding area. The interior of the area was mapped to document the extent of the willow invasion, open-water components, island and other wetland species.

Wildlife data was collected in each of the three site visits to record nesting activity (during the summer of 1994), fall migration figures and wintering data, through December 31. Wildlife data is a compilation of IES Associates field data and data from resident observers (who have maintained bird lists for the past 5 years).

Vegetation

The dramatic increase and spread of Sitka willow (*Salix sitchensis*), that was observed in 1993, continued into 1994. The extent of willow has not changed significantly; however, there are scattered patches of willow further south, within the bounds of the overflow wetland.



The willow trees continued to grow, with some plants reaching 4.5 to 5 feet. However, the majority of plants remained approximately 3-3.5 feet tall. The willows have formed a matted root structure, which has eliminated the ability to pull the willow for thinning or use as nursery stock. Certain plants are starting to become more dominant.

In portions of the area, the willow stand has become a mono-culture, with no vegetative ground cover. In other areas, buttercup and patches of reed canarygrass are still present; however, the willow has successfully "out-competed" reed canarygrass, isolating it to small clumps or individual stems.

The north end of the mitigation wetland is still dominated by reed canarygrass, with scattered soft rush. In this area, the black cottonwood and river willow are being stressed by the competition for nutrients. There is a low area, along the east side that parallels the berm separation (between North Creek and the emergent marsh area), that has standing water and reed canarygrass throughout.

South of the willow, the vegetative composition is varied. The area immediately north of the island, still supports a mixed stand of river bulrush, small-fruit bulrush, soft rush, buttercup and reed canarygrass.

The drainage channel, along the east side of the island, has willow and emergent plants, but is still dominated by reed canarygrass. The area west of the island, which was planted to river bulrush, has a mix of soft rush, river bulrush, three-square bulrush, cattail, and reed canarygrass. During the winter 1994-1995, willow had not become established in this area. The depression, west of the island and the backwater area to the west of this, still have a predominance of mixed emergent marsh plants, with a mixed (but relatively dense) stand of reed canarygrass becoming established. The dominant plant is still soft rush, with willow becoming scattered throughout.

Pacific willow, which is planted on the island, is growing and may be contributing to the spread of willow in this area.

The open-water component, south of the island, is still covered with water during the early stages of the year, up to approximately June 15. Beyond June 15, the area goes dry, leaving an un-vegetated mud flat.

Willow weed became established in this area in early August, once the water was shallow or gone, and the mud was still saturated. The willow weed expanded across the area and stayed viable to the end of the growing season. Reed canarygrass and scattered patches of cattail are starting to become established in this area.

The area south of the log structure is still dominated by a near monoculture of reed canarygrass. The channel, extending from the rock structure to the creek is so overgrown with reed canarygrass, that it is impossible to observe water movement in this area.

Willow, black cottonwood, red-osier dogwood, and Pacific ninebark, which are planted along the stream, are still alive and competing with reed canarygrass. There are places where reed canarygrass extends over the creek and forms an over-hanging canopy. In other areas, the willow cover has shaded out the reed canarygrass, providing a shrub overstory, with limited ground cover.

Black cottonwood are spreading on the flat, south of the dike, and along the west side of the mitigation area.

Photographs 1 through 10, Appendix A, document conditions during the summer and fall of 1994.

It is evident, from on-going activities, the willow will eventually be the dominant species over most of the overflow/back-water by-pass area, with the exception of the north end, where the area is drier and the reed canarygrass is dominant, and the area south of the island, where the water remains for much of the summer.

The open water and deeper component south of the island will also remain open or become established with an emergent marsh species that is more tolerant to seasonal inundation. The species that are currently growing in the area include cattail, hard-stem bulrush and reed canarygrass.

Wildlife Use

Three site visits were completed -- two during the summer months when foliage was on the trees, and one in the winter when the deciduous trees were barren. Nests were located, counted, and (when possible) identified. An effort was made to count only nests which showed current activity (not filled with leaves or showed evidence of winter degradation).

The wildlife study was extended to the stream and stream corridor to monitor the overall wildlife utilization of the wetland

and stream habitat component. No survey was conducted in the trees or shrubs surrounding the detention pond; however, records were kept of all birds and broods observed on the pond.

Wetlands

Waterfowl broods and the majority of waterfowl activity, recorded during the summer of 1994, was recorded when there was water in the open-water component and in the backwater areas that had formed in the wetlands adjacent to North Creek. During the summer and fall, the dominant wetland bird activity, i.e., ducks and geese, was in the stream.

Only five (5) broods of mallards, one (1) brood of pintail, and a brood of gadwall were observed. Six (6) broods of Canada geese were observed in the area. Because of their behavior, it was determined they were probably hatched on the site and were not migrants from upstream to the north.

The island was examined for goose nests. Two nests that were present in 1993 were present; however, the southern-most nest appears to have been destroyed by a predator. This was determined by the condition of egg shell and the early abandonment of the nest, allowing grass to grow up through the nest. Birds that loafed on the open-water component, south of the island were predominantly mallard and pintail, with an occasional Canada goose.

During fall migration, a wave of approximately 100 first year pintail spent about 10 days on the site.[1] These were mixed with early migrant green-wing teal and local mallards that had moved from more open streams into this area for protection. After the first rainfalls, when the open-water component at the south end of the island became flooded, the bird activity increased on a day-by-day basis, with birds moving in, apparently for protection during the night, then moving out to feed.

In the fall, when the water dropped and the mud-flats south of the island were exposed, the area was visited by dunlins, western sandpipers, and killdeer. No shorebirds were observed using the site, once the by-pass channel flooded. Because of the log structure, the water reached a depth of one foot to 18 inches fairly rapidly in this area, which would prevent utilization by

[1] Personal contact with local "birders."

most shorebirds, which are limited to very shallow water or mud-flats.

Great blue heron were seen along the creek and in the by-pass channel, during the period when the water was decreasing and the area was going dry. It is believed they were catching frogs; however, there are no observations of actual feeding activity. Heron also used the area along the creek and the retention/detention pond.

An assortment of waterfowl used the detention pond. During the spring migration, the area was visited by mallard, pintail, gadwall, bufflehead, teal, lesser scaup, and shoveler. For the first time in four years, no rail were observed in the retention/ detention pond area. Snipe, however, were nesting in the grass at the edge of the lawn area, adjacent to the clubhouse. At least one brood of snipe were none to be hatched.

Non-wetland Birds

Non-wetland bird nesting was limited to identification of nests in the trees and shrubs and from observations of young birds being fed during the summer visit.

As has been identified each year, the most common nests were robin. Swainson's thrush nests were either hidden or there was a reduction of thrush activity on the site. At least three species of sparrows are believed to have nested in the trees or in the grass area.

Long-billed marsh wren and winter wren nests or breeding pairs were observed along the creek and in the area of the retention/detention pond. There appears to be chickadee and nuthatch nesting in two of the older snags, which are becoming decadent. The top blew out of one of these, eliminating a single downy woodpecker nest, which was identified in 1993.

With the increase in the size of trees, the woodpecker activity continues to be relatively common. Two most common species observed were the downy woodpecker and western flicker. Ring-necked pheasants nested on the island and in the reed canarygrass area, at the north end of the site.

Total birds observed, nesting results, and waterfowl use days[2] are recorded on Tables 1-3, Appendix B.

Mammals

For the first time in three years, no coyotes were recorded on this site, although there is a high probability they are present, since they were observed in the dairy area to the north. Columbia black-tailed deer moved in the area and were seen in the backwater area, in the midst of the willows. With the increase of willow shoots, it is expected that gnawing and browsing mammal use could increase.

Conclusions

The diversity of vegetation within the backwater area is slowly decreasing with reed canarygrass and willow becoming the two dominant species. The only area with a distinct absence of these two species is the seasonally flooded, deeper area at the south end of the island. Reed canarygrass is slowly disappearing in certain areas along the creek bank, as the shade increases. However, the overflow channels adjacent to the creek are still dominated by the grass.

With the amount of reed canarygrass north of the site and the amount of seeding reed canarygrass on the site, it will be impossible to reduce or eliminate the reed canarygrass. With the increase in willow and the density of downed reed canarygrass, the foraging habitat for waterfowl and other seed eating or probing birds is gradually reducing. Currently, the expanding willow stand has not reached a level of maturity where it can provide nesting habitat or cover for birds or mammals.

The reed canarygrass is providing excellent water quality treatment. The amount of sediment and silt in the reed canarygrass portions of both the overflow channel (adjacent to the creek) and the south end of the by-pass channel, indicate that during winter floods, when there is heavy amounts of silt and other contaminants from the north in the water, the area does filter out large amounts

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[2]Assumes birds observed for one day on the site equals one use day - U.S. Fish & Wildlife Service.

of sediment from the water, before it passes down-stream to Sammamish Slough.

Wildlife use is still high. The majority of use is in the riparian border, adjacent to the creek; the shrub area around the detention pond; the open-water area at the south end of the island, during the winter when there is sufficient water; and in late summer, when the area becomes a rich insect-ladened mud-flat.

This completes the 1994-95 Monitoring Report for North Creek, with an emphasis on North Creek By-pass Channel vegetation.

Sincerely,

R. L. "Rex" Van Wormer
Senior Biologist
IES Associates

Koll.mon

Appendix A - KOLL NORTH CREEK PHOTOGRAPHS

Photo 1 - Looking southeast, across the By-Pass Channel wetlands from the northwest corner; note reed canarygrass and willow stand (June 1994).

Photo 2 - Looking southeast in the By-Pass Channel, showing willow in summer of 1994.

Photo 3- Looking south from the south edge of the willow stand at the open-water component, island, and mixed canarygrass/ soft rush area, at the south end of the By-Pass Channel mitigation area (June 1994).

Photo 4 - Deep-water component south of island at the south end of mitigation area; note waterfowl use (June 1994).

Photo 5 - Taken from the north edge of Koll Creek, looking northeast. Shows density of reed canarygrass in area surrounding the center core of wetland.

Photo 6 - Taken December '94 - showing standing water, reed canarygrass and willow stand in By-Pass Channel wetland.

Photo 7 - Willow stand in winter; showing density and height of Sitka willow.

Photo 8 - Looking north, along the east side of the island; showing open-water, emergent-marsh component blocked in by reed canarygrass (winter 1994-95).

Photo 9 - December '94 - Overflow channel, showing the invasion of reed canarygrass.

Photo 10 Red-osier dogwood/willow stand at the edge of creek, with reed canarygrass in the overflow area.

Appendix B - TABLES

Table 1. Stream Bank Nesting[1]

Non-Waterfowl

Species	Year 1	Year 3	Year 5	1993	1994
Common Bushtit	0	0	2	0	0
Fox Sparrow	0	3	2	0	1
Junco	1	4	5	1	4
Lng-bill'd Marsh Wren	0	2	3	2	2
Robin	4	4	7	11	14
Rufous Hummingbird[2]	0	0	1	1	0
Song Sparrow[3]	1	3	6	4	3
Starling	0	0	2	0	0
Towhee[4]	0	2	6	2	1
White-crown Sparrow	1	0	0	0	2
Winter Wren[3]	0	3	5	4	6
Yellowthroat[3]	0	3	7	2	1
Swainson's Thrush	0	0	0	5	2
Oriole (spp)	0	0	0	2	0
Ring-necked Pheasant	0	0	0	2	3

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[1] Based on limited surveys.

[2] Only nest located

[3] Based on territorial males.

[4] Based on young birds.

Table 2. Backwater Wetland/Stream Bank Shorebird and Wading Bird Use[5]

Species	Pre-Const	Year 1	Year 3	Year 5	1993	1994
Dunlin	0	25	50	280	40)	
					)--	75
Lng-bill'd Dowitcher	0	0	0	40	77)	
Great Blue Heron	4	6	7	5	7	9
Green Heron	0	0	0	3	1	2
Killdeer	4	10	15	28	14	10
Least Bittern	0	0	0	1	1	0
Lesser Yellowlegs	0	0	3	10	18	6
Semipalmated Plover	0	0	0	11	0	0
Spotted Sandpiper	0	6	6	10	6)	
					) --	40
Western Sandpiper	0	0	10	200	119)	

[5] Maximum number at any one time.

Table 3. Backwater Wetland/Stream Bank Waterfowl Use

Pre-Const	Peak Numbers	Use Days	Broods	Total Young[6]
Year 1	50	2250	0	0
Year 2	850	47,500	10	53
Year 3	1140	63,400	16	72
Year 5	900	64,000	15	68
1993				
Ducks	1150	41,400	10	52
Geese	200	4,000	6	19
1994				
Ducks	400	12,600	6	32
Geese	30	600	3	10

[6] Field Counted.

1992 ANNUAL MONITORING REPORT

KOLL - NORTH CREEK
BACKWATER WETLAND

CREATION/ENHANCEMENT PLAN

For

The Koll Company
19515 North Creek Parkway N.
Bothell, Washington 98011

by

IES Associates
1514 Muirhead Avenue
Olympia, WA 98502
(206) 943-0127
FAX (206) 943-2791

December 7, 1992

Introduction

In the fall of 1991, the backwater wetland area of the Koll - North Creek project was sprayed with Rodeo to kill the reed canary grass in the 5 acres, extending from the south end of the backwater wetland out-flow area, north to a point where North Creek overflows during high flood periods into the backwater wetland. The purpose of the spraying was to kill as much of the reed canarygrass and its rootstock as possible, prior to grading.

The area was graded, being lowered on an average of 1 to 2 feet, across the site, removing reed canarygrass and lowering the elevation to a point where it was consistent with the 45 CFS line in North Creek, just north of the backwater wetland area. The main island in the south-central portion of the site was retained. The general contours were retained only lowered. The overflow weir was moved from the north end of the site to the south end and installed with a notched log to regulate the out-flow of water, yet allow salmon to escape the wetlands as the water decreased. (Photograph # 3)

A sloped, rocked drainage was dug from North Creek, with the invert elevation equal to the 45 CFS line through this section of North Creek.

With this scenario, water now flows into the wetlands anytime North Creek exceeds 45 CFS, as compared to the previous system, which required the stream to exceed 150 CFS before water entered the backwater wetland. The water is

blocked by the exit weir, backing the water up and holding it at a depth of 2 to 3 feet (depending upon the location) through the wetland. Water is metered out of the wetland to the south, by the notched weir log. It re-enters North Creek along its east-west reach.

Under this scenario, when the flood water reaches 150 CFS, it will back into the wetland from the south, until it reaches the weir. Water entering from the north will mix with this water, blanketing the wetland area, creating a 5.5 acre pond. As the water decreases, the water south of the weir drops rapidly with the creek elevation; whereas, the water north of the weir is metered out through the structures.

Under the current design, water will be retained north of the weir for a minimum of 96 hours after each event. This means that after the last rainfall in the spring, there would be a period of 96 hours, from the time the water stopped flowing into the wetland at the north, until it stopped flowing out of the wetland to the south. As long as water continues to flow into the wetland at the north end, the time release continues, which creates standing or intermittently pooled water on the wetland.

A watering system was installed to sprinkle irrigate during the first two growing seasons or until wetland emergent vegetation had become established on the site. This was intended to increase the wetness of the area in an effort to enhance the survival of wetland plugs and seed, and to allow it to compete more effectively with reed canarygrass.

1992 Annual Monitoring Report
Koll - North Creek Backwater Wetland
December 7, 1992

1992 Maintenance

In the spring of 1992, spot spraying of reed canarygrass was initiated and continued (with Rodeo) through the early portion of the summer or until the reed canarygrass had become so intertwined with other species, that control would impair the spread of competitive species and eliminate the diversity we were seeking with the enhancement/restoration plan.

1992 Planting Plan

During the spring of 1992 additional soft rush (*Juncus effusus*), slough sedge (*Carex obnupta*), willow-weed (*Polygonum lapathifolium*), and three-square bulrush (*Scirpus americanus*) were plugged or seeded onto the site. The entire site was then over-seeded with a mix of redtop (*Agrostis alba*), meadow foxtail (*Alopecurus pratensis*) and red fescue (*Festuca rubra*). This planting and seeding was a supplement to the planting and seeding that took place in the late fall of 1991, as part of the approved restoration plan. New planting added an additional 10,000 plants and 150 lbs of seed to the area.

1992 Monitoring

Monitoring was initiated in January 1992 to evaluate the flood/detention system to see if it was meeting the proposed goals and objectives of the Revised Restoration Plan. The total days of total inundation were recorded. Total days when there was 75% inundation, 50% inundation and 25% inundation were also recorded. The dates of rejuvenated flooding were

noted and a curve was created showing the frequency and duration of flooding.

The area was photographed at different periods to document physical conditions. These photos are included as Appendix A.

Vegetation was monitored in April, May, June and October, 1992. The survey included: species composition and distribution; density; height; percent of non-native invaders; and wildlife use.

In April, it became apparent that the major competition for survival of wetland plants planted and seeded into the site was waterfowl and shorebird use and not invasive non-native species. Through April to late June, the waterfowl and shorebird use on the area was consistent. The dominant species was western sandpipers, dunlin, mallard, pintail, green-winged teal, cinnamon teal, gadwall and Canada geese. Plant survival during this period appeared to be low; however, inspection of the roots of planted material (other than cattail) demonstrated that plants were still viable and growing. (Photographs, Appendix A)

Bird use on the area was recorded, as it has been for the past 5 years. A table of bird use and waterfowl use on the backwater wetland and stream bank are included as Tables 1 - 3. In July and August, when shorebird and waterfowl use decreased, the plants that were planted on the site were able to sustain growth and reach maturity. Plants species which were dominant in one or more of the areas were: three-square

bulrush, river bulrush (*Scirpus fluviatilis*), soft rush, slough sedge, creeping spikerush (*Eleocharis palustris*), willow-weed and water smartweed (*Polygonum amphibium*).

Reed canarygrass has re-established itself on the northern end, in the overflow apron, where the water first enters the site from North Creek. A portion of this area is adjacent to the stream bank vegetation along the west side of the creek, which is predominantly a reed canarygrass stand. Black cottonwood (*Populus trichocarpa*), Pacific willow (*Salix lasiandra*) and Sitka willow (*Salix sitchensis*), which were planted on the site, have maintained their vigor and are growing. In addition, black cottonwood and hardhack (*Spiraea douglasii*) have become established in two different areas in the northern part of the wetland, creating a precursor of a tree/shrub wetland community, which may dominate a portion of the site.

One of the large weeping willows, that was planted during the original scheme, has died and is being used by birds as a perch area (Photograph #21).

A plant distribution map, indicating the approximate areas with different dominant species, is included as Figure 1. A total list of plants with their dominance, either "abundant", "common", or "uncommon", is included as Table 4.

Based on the requirements of the City of Bothell Permit and the Army Corps of Engineers, Section 404 Permit, it is the opinion of IES Associates that the wetland has developed to a

sustainable, diverse, wetland community, which is providing excellent waterfowl, shorebird and other water dependent bird activity on the site.

It the opinion of IES Associates that the area has satisfactorily met the conditions of the permits, as of November 15, 1992.

In the summer of 1992, the overall project was evaluated and a joint report was developed by IES Associates and the Watershed Company. A paper was presented at the International Society of Ecologists conference in Columbus, Ohio. An abstract of the report, with tables identifying the biological use of the area over the past five years, is included as Appendix B.

R. L. Van Wormer
Senior Biologist
IES Associates

Backwater Wetland/Stream Bank

Waterfowl Use

Pre-Const	Peak Numbers	Use Days	Broods	Total Young
Year 1	50	2,250	0	0
Year 2	850	47,500	10	53
Year 3	1,140	63,400	16	72
Year 5	900	64,000	15	68

TABLE 1

Backwater Wetland/Stream Bank

Shorebird and Wading Bird Use[1]

Species	Pre-Const	Year 1	Year 3	Year 5
Dunlin	0	25	50	280
Great Blue Heron	4	6	7	5
Green Heron	0	0	0	3
Killdeer	4	10	15	28
Least Bittern	0	0	0	1
Lesser Yellowlegs	0	0	3	10
Long Billed Dowitcher	0	0	0	40
Semipalmated Plover	0	0	0	11
Spotted Sandpiper	0	6	6	10
Western Sandpiper	0	0	10	200

[1] Maximum number at any one time.

TABLE 2

Stream Bank Nesting[1]

Non-Waterfowl

Species	Year 1	Year 3	Year 5
Common Bushtit	0	0	2
Fox Sparrow	0	3	2
Junco	1	4	5
Long-billed Marsh Wren	0	2	3
Robin	4	4	7
Rufous Hummingbird[2]	0	0	1
Song Sparrow	1	3	6
Starling	0	0	2
Towhee[3]	0	2	6
White-crowned Sparrow	1	0	0
Winter Wren[4]	0	3	5
Yellowthroat	0	3	7

[1] Based on limited surveys.

[2] Only nest located.

[3] Based on young birds.

[4] Based on territorial males.

TABLE 3

Table 4 - List of Existing Plants In Restoration Wetland

Method of Introduction[1]	Common Name	Botanical Name	Location[2]	Occurance[3]
Trees				
P, N	Black cottonwood	Populus trichocarpa	NC,	A
P	Weeping Willow	Salix Babylonica	NC,	U
P	Pacific willow	Salix lasiandra	P	U
P	Quaking aspen	Populus tremuloides	I	
P	Red alder	Alnus rubra	N,S	U
P	Western red cedar	Thuja plicata	WP	U
Shrubs				
P	Sitka willow	Salix sitchensis	P	C
P	Scouler willow	Salix scouleriana	P,WP	U
P	Red-osier dogwood	Cornus stolonifera	I,N,WP	C
P	Snowberry	Symphoricarpos albus	I	U
Other				
P	Willow-weed	Polygonum lapathifolium	All	A
P	Three-square bulrush	Scirpus americanus	NC,E,W,WP	A
P	River bulrush	Scirpus fluviatilis	NC,E,W	A
P,N	Soft rush	Juncus effusus	N,NC,WP,S	A
P	Small-fruit bulrush	Scirpus microcarpus	S	U
P	Slough sedge	Carex obnupta	NC,WP	C
P,N	Creeping spikerush	Eleocharis palustris	NC	U
N	Three-stamen rush	Juncus ensifolius	NC,S	U
N	Toad rush	Juncus bufonius	NC,E,S,WP	U
N	Sierra rush	Juncus nevadensis	NC	U
N	Baltic rush	Juncus balticus	NC,E	U
P	Broad-leaf cattail	Typha latifolia	S,WP	C
P	Hard-stem bulrush	Scirpus acutus	S,WP	U
P	Canada mint	Mentha arvensis	NC,E	U
N	Spearmint	Mentha	NC	U
N	Reed canarygrass	Phalaris arundinacea	N,E,WP,S	C
N	Common velvet grass	Holcus lanatus	N,NC	C
P	Redtop	Agrostis alba	N,NC,E,WP	C
P	Creeping bentgrass	Agrostis palustris	N,NC	U
N	Field horsetail	Equisetum arvense	N,WP,E	U
N	Fireweed	Epilobium angustifolium	N,E,WP	C
N	[not fireweed]		N,NC	U
N	Creeping buttercup	Ranunculus repens	E,WP,S	U
N	Meadow buttercup	Ranunculus acris	E,WP	U

[1] P = Planted; N= Naturally Introduced

[2] Location in wetland - N=north end; I=Island; NC=north-central (north of island); E=east (east of island); W=west (west of island); P=peninsula (west of island); WP=west of peninsula; S= south end; WA=Weir area

[3] A= abundant; C= common; U= uncommon

1992 Annual Monitoring Report
Koll - North Creek Backwater Wetland
December 7, 1992

Appendix A - Photographs

Photo #1 -- Graded area flooded in May 1992. Note irrigation system.

Photo #2 -- Same as 1 - Shows island and elevated finger near center of area, May 1992.

Photo #3 -- Outlet structure - Looking north into flooded wetland, May 1992.

Photo #4 -- Planted stock and irrigation system at edge of flooded area, Dec. 1991.

Photo #5 -- Mudflat area between flooding, May 1992. Note emergent vegetation.

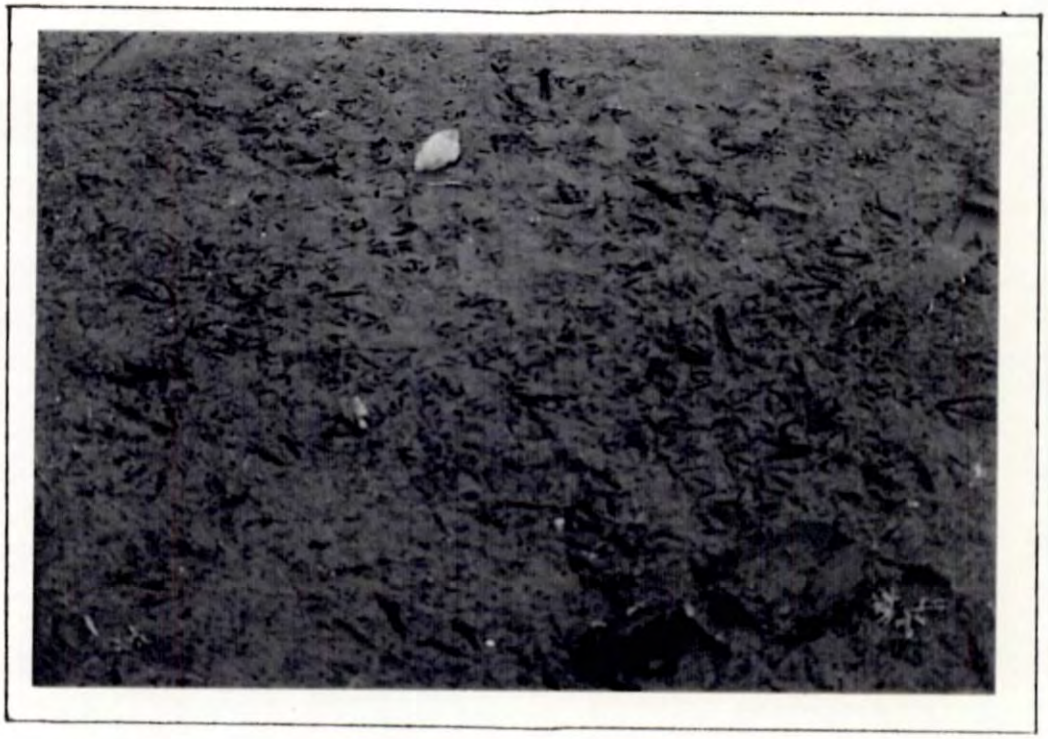


Photo #6 -- Mudlfat area on high peninsula west of island. Note diversity and number of tracks.

Photo #7 -- Dunlins at edge of flooded area, April 1992.

Photo #8 -- Waterfowl in grass edge, late flooding period, June 1992.

Photo #9 -- Goose broods -- During flood period, April 1992.

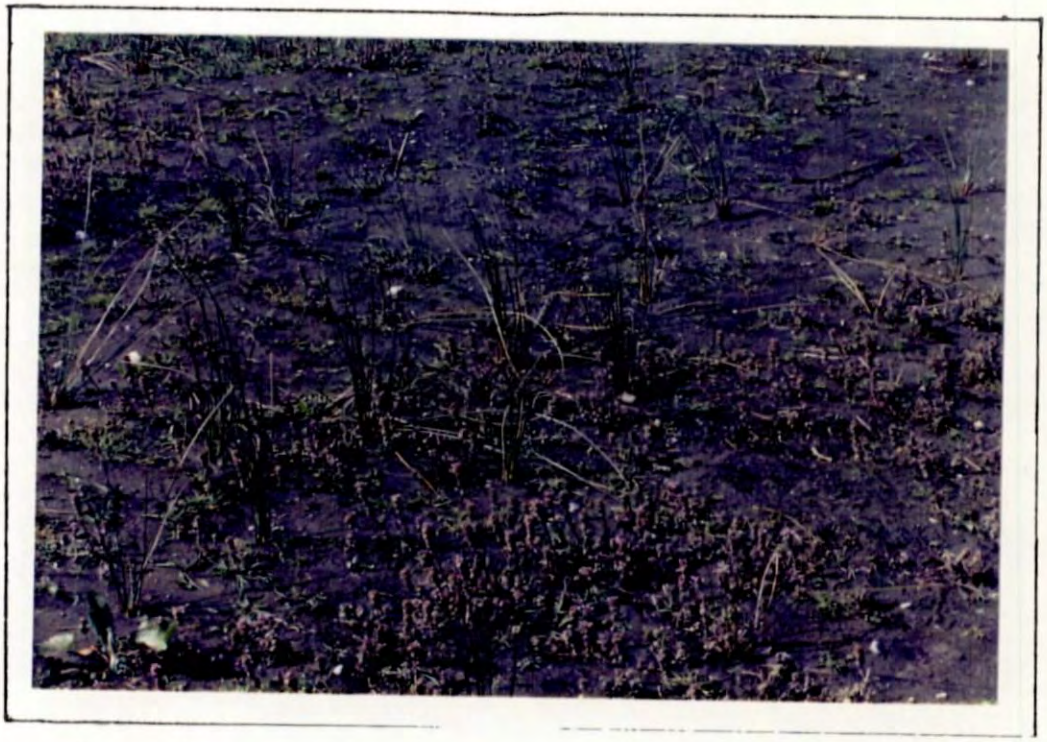


Photo #10 -- Soft rush and smartweed in southwest depression, May 1992.

Photo #11 -- Smartweed/soft rush northeast of island, June 1992.

Photo #12 -- Canada geese on island, June 1992.

Photo #13 -- North end looking south along east side. Note black cottonwood invasion.

Photo #14 -- North end looking south along west side. Reed canarygrass prominent in this area.

Photo #15 -- Northwest side -- Small-fruited bulrush, curly dock and fireweed mixed with canarygrass.

Photo #16 -- Cottonwood/smartweed mix in northeast corner.

Photo #17 -- Same area as Photo #11 taken October, 1992.

Photo #18 -- Smartweed/bulrush are due north of island.

Photo #19 -- Bulrush stand west of island.

Photo #20 -- Soft rush stand in southwest depression, October 1992.

Photo #21 -- Cottonwood/bulrush/soft rush on ridge along southwest side.

Photo #22 -- Smartweed/bulrush along east side of island.

Photo #23 -- Log berm at south end of backwater wetland.

Photo #24 -- Seed head of bulrush.

1992 Annual Monitoring Report
Koll - North Creek Backwater Wetland
December 7, 1992

Appendix B - Abstract Of Report

STREAM AND WETLANDS CREATION, RESTORATION AND ENHANCEMENT NORTH CREEK, WASHINGTON

Van Wormer, R. L. and Way, W. W.
1992

In 1982, the Koll Company initiated a study to evaluate wetlands and a channelized section of North Creek in the vicinity of Highway 405 and 195th Street in Bothell, Washington, U.S.A.

Initial studies included:

1. A topographic survey by Horton Dennis Associates, Kirkland, Washington, to determine the elevational difference between the upstream border of the property and the point where the stream left the property.

2. A wetlands identification, delineation and classification by IES Associates, Olympia, Washington. A values analysis and potential impacts analysis were also determined.

3. Soil surveys to determine the depth and extent of known peat beds by Earth Consultants, Kirkland, Washington.

4. A computer modeled potential stream channel was completed by Timberline Association, Boseman, Montana and the Watershed Company, Kirkland, Washington.

The project site was an abandoned truck farm that had been ditched for drainage and plowed annually for over 50 years. North Creek had been placed in a vertical banked channel with farm roads along both sides. Through this area, the creek supported 2 species of salmon, steelhead and cutthroat trout. The center of the property contained a large peat deposit, nearly 80 feet deep at the deepest location, and approximately 5.5 acres of mixed wetlands.

The proposed mitigation plan included (1) the movement of the creek channel to a meandered configuration around the side of the deep peat deposits, (2) the creation of replacement wetlands and (3) the creation of a wetland storm water detention and purification system.

The model stream increased the stream length by 1,000 feet and created 18 ponds and 17 pool and riffle systems using of a variety of log, rock and root mass structures.

The wetlands were divided into two segments: (1) the wet riparian border of the stream and (2) a backwater overflow emergent marsh. The pond/detention system consisted of a deep peat-lined pond with a shallow, overflow marsh apron and a biofiltration outlet channel. All site water and upstream dairy farm run-off was directed away from North Creek into this system by a series of underground pipes.

In 1983, permit negotiations were initiated with the Army Corps of Engineers (ACOE), Environmental Protection Agency (EPA), Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW (Game)) and the City of Bothell, Washington. Permits required included:

1. Section 404, Dredge and Fill Permit.
2. State of Washington Hydraulic Permit approval (HPA).
3. City of Bothell Grade and Fill Permits.
4. Section 401 Water Quality Certification

Permits for the stream channel, based on the model and projected water quality and fish and wildlife improvements, were readily attained from WDF and ACOE.

Permits for the wetlands were more cumbersome because of conflicting agency interests. The original wetland design included ponds, marshes and a shrub/tree marsh area. The plan included the entrapment of winter stream flow to form the ponds, shallow marshes and wet swamps and meadows. WDF refused to issue the necessary permits for this system or any system that included the potential entrapment of anadromous fish.

Federal Emergency Management Agency (FEMA) opposed the inclusion of the additional vegetation in the flood plain. Their contention was that it would increase the flood friction coefficient, raising the potential for future flooding or erosion of a dike system.

Through negotiations with WDW (Game), WDF, ACOE and the consultants, a backwater wetland was designed that allowed the water to back into the wetland anytime water exceeded 75 cfs (U.S.G.S flow gauge, 35-year average summer low flow). At 150 cfs, the water would overflow an upstream sill and flow through the wetland. As the water receded, the water would leave the wetland, preventing the possibility for fish entrapment.

The project was constructed during the fall/winter of 1984-85. The stream channel was dug in the dry and gradually flooded through a staged diversion. The old stream was blocked at the outflow, forcing all water to flow into this dead-ended channel or the new stream. The old stream was shocked to remove all fish before it was completely dewatered. The diversion occurred in the summer of 1985.

Stream bank vegetation and the backwater marsh and detention pond were planted during the fall/winter 1984-85. Large-sized plants were used to maximize bank stabilization and shade during the first summer after diversion.

Monitoring was initiated during the spring of 1985 to determine the success ratio of the stream, vegetation and water quality. Studies included:

1. Fish studies to determine numbers of salmonids and redds.
2. Vegetative success.
3. Goals accomplishment.
4. Water quality at the retention pond outlet.

Electrofishing was conducted on a 100-foot section of the to-be-relocated channel and on a 100-foot control section located just upstream in October 1984 and August 1985. On October 22, 1987, and again on October 4 and 5, 1989, follow-up data was collected by electrofishing the original control section and two 100-foot sections of the relocated North Creek channel. Changes in salmonid fish populations between 1984 and 1989 are compared in the accompanying table (Table 1). Salmonid fish populations in the test sections at Stations 5 and 11 are compared to those from the old channel before 1985, since the old channel section was abandoned and the test section at Stations 5 and 11 were created at that time.

In addition, spawner surveys were conducted on four days, one month apart, in the fall of 1984 with no redds observed on-site. Follow-up surveys were conducted on October 21, 1987, and again on October 17, 1989. Seventeen adult salmon and 12 redds were observed on October 21, 1987, consisting of 12 sockeye, 3 chinook and 2 coho. Of the redds, one was presumed to be chinook and the remainder were presumed to be sockeye redds due to their size and the date. On October 17, 1989, a live coho and sockeye and a chinook carcass were observed. The sockeye appeared to be a spawned out female guarding her redd, the only redd observed on that date. Though the spawner survey data and the electrofishing data both indicate a generally lower level of fish use in the fall of 1989 compared to the fall of 1987, fish use remains substantially higher in North Creek on the Koll property than it was before it was relocated and rehabilitated.

Stream bank vegetation and vegetation around the detention pond met goals and performance standards.

However, the low-flow channel flow averaged only 38 cfs between 1985 and 1988, virtually eliminating flooding of the backwater pond. The projected 276 days of flooding was reduced to 86, with the longest duration being 10 days. The wetland provided good water treatment and supported high numbers of waterfowl, shorebirds and mammals, but it did not meet the goals of the plan.

In 1991, the wetland was graded two feet lower and the outlet structure and intake were altered to allow all flows in excess of 40 cfs to pass through the wetland. The outlet was raised and notched to allow fish escapement. In two years, the wetland has started to recover and provide the plant and water depth diversity planned. Portions of the area have met standards, while other areas have been converted to mudflat areas which were not a part of the original plan, but were included in the redesign to provide shorebird and dabbling duck habitat.

The wetland, riparian border and pond are providing improved fish and wildlife values, as well as stream health improvement by lowering in-stream water temperature by 1 to 2 degrees (F.) and reducing downstream sediments and coliform concentrations. The increased level of fish use supports the conclusion that the in-stream fish habitat has improved as a result of the relocation. The trees and shrubs planted along the banks of the relocated portions of North Creek have continued to flourish, thus providing

ever increasing levels of shade and cover to the creek itself. Rearing habitat, in particular, should continue to improve on the site as stream side vegetation continues to proliferate, providing shade, cover, food and habitat diversity.

Van Wormer, R. L., President/Senior Biologist
IES Associates, Olympia, Washington 98502

Way, W.W., Owner, The Watershed Company
Kirkland, Washington

Table 1: Salmonid Fish Population Changes

	Oct 84	Oct 87	Times Previous[1]	Oct 89	Times Previous	Oct 84[1]
Trout						
Old Channel	10	--	--	--	--	--
Station 11	--	28	2.8	12	0.43	1.2
Station 5	--	63	6.3	23	0.37	2.3
Station 0	--	12	0.86	25	2.1	1.8
Coho						
Old Channel	1	--	--	--	--	--
Station 11	--	202	202	83	0.41	83
Station 5	--	14	14	36	2.6	36
Station 0	0	45	--	22	0.49	--
All Salmonids						
Old Channel	13	--	--	--	--	--
Station 11	--	230	17.7	95	0.41	7.3
Station 5	--	77	5.9	59	0.77	4.5
Station 0	14	57	4.1	47	0.82	3.4

[1] Populations in the new channel after diversion are compared to populations in the old channel before diversion.

Table 2: Stream Bank Nesting[1]

Non-Waterfowl

Species	Year 1	Year 3	Year 5
Common Bushtit	0	0	2
Fox Sparrow	0	3	2
Junco	1	4	5
Long-billed Marsh Wren	0	2	3
Robin	4	4	7
Rufous Hummingbird[2]	0	0	1
Song Sparrow	1	3	6
Starling	0	0	2
Towhee[3]	0	2	6
White-crowned Sparrow	1	0	0
Winter Wren[4]	0	3	5
Yellowthroat	0	3	7

---

1 Based on limited surveys.

2 Only nest located.

3 Based on young birds.

4 Based on territorial males.

Table 3: Backwater Wetland/Stream Bank Shorebird and Wading Bird Use[1]

Species	Pre-Const	Year 1	Year 3	Year 5
Dunlin	0	25	50	280
Great Blue Heron	4	6	7	5
Green Heron	0	0	0	3
Killdeer	4	10	15	28
Least Bittern	0	0	0	1
Lesser Yellowlegs	0	0	3	10
Long Billed Dowitcher	0	0	0	40
Semipalmated Plover	0	0	0	11
Spotted Sandpiper	0	6	6	10
Western Sandpiper	0	0	10	200

[1] Maximum number at any one time.

Table 4: Backwater Wetland/Stream Bank

Waterfowl Use

Pre–Const	Peak Numbers	Use Days	Broods	Total Young
Year 1	50	2,250	0	0
Year 2	850	47,500	10	53
Year 3	1,140	63,400	16	72
Year 5	900	64,000	15	68

Surface Water Detention Pond

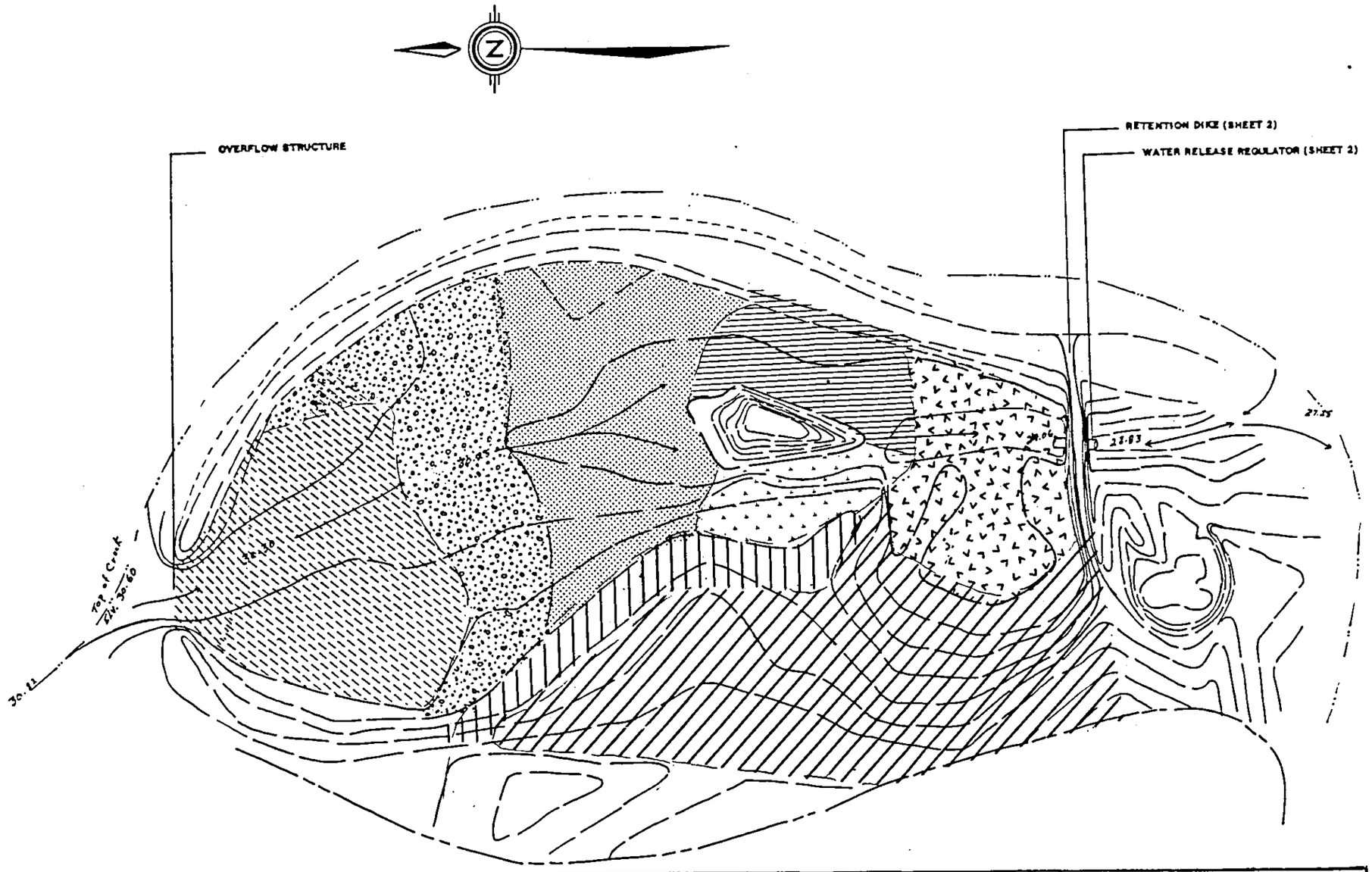
Nesting and/or Maximum Numbers Observed

Species	Pre-Const Nests	Pre-Const Max #	Year 1 Nests	Year 1 Max #	Year 3 Nests	Year 3 Max #	Year 5 Nests	Year 5 Max #
Bewick's Wren[1]	0	0	0	0	1	*[2]	2	*[2]
Blue-winged Teal	0	0	0	0	0	6	0	0
Brewer's Blackbird	0	0	0	0	1	4	4	15
Bufflehead	0	0	0	10	0	10	0	12
Canada Goose	0	0	0	2	1	10	3	22
Cinnamon Teal	0	0	0	0	0	4	0	11
Common Snipe	0	0	0	4	0	10	2	15
Dunlin	0	0	0	25	0	20	0	40
Emperor Goose	0	0	0	0	0	2	0	0
Gadwall	0	0	0	4	1	6	0	10
Great Blue Heron	0	0	0	5	0	7	0	5
Green Heron	0	0	0	0	0	0	1	3
Green-winged Teal	0	0	0	30	2	32	3	60
Lesser Yellowlegs	0	0	0	0	0	3	0	2
Long-billed Marsh Wren	0	0	1	2	2	6	2	5
Mallard	0	0	0	40	3	25	4	30
Pintail	0	0	0	5	0	40	0	75
Red-winged Blackbird	0	0	0	2	1	4	3	10
Shoveler	0	0	0	0	0	15	2	25
Virginia Rail	0	0	0	0	2	10	3	13
Western Sandpiper	0	0	0	30	0	10	0	12
Winter Wren	0	0	1	2	3	6	3	6
Yellowthroat	0	0	1	*[2]	2	*[2]	4	15

[1] Based on territorial males.

[2] No accurate count.

TABLE 5



LEGEND

- TOP CREEK BANK
- 100 YEAR FLOOD DIKE
- EXISTING CONTOURS
- NEW CONTOURS

Frequency of Overflow Flooding

cfs	times/year	flooding duration
Existing		
150	5	10.5
250	1	2.5
Proposed		Est
75	35	inflow time hrs x 40 = 170
90	25	inflow time hrs x 50 = 31
150	5	inflow time hrs x 80 = 31
250	1	inflow time hrs x 80+12 = 1.5

REED CANARYGRASS/SOFTRUSH

SOFTRUSH/SMARTWEED

SMARTWEED/SEDGE

BULRUSH

SMARTWEED/RUSH

PENINSULA/WILLOW

SEDGE/SOFTRUSH/SMARTWEED

SEDGE/CATTAIL

IES ASSOCIATES
1614 MUIRHEAD AVENUE
OLYMPIA, WA 98502

KOLL NORTH CREEK WETLAND ENHANCEMENT PLAN

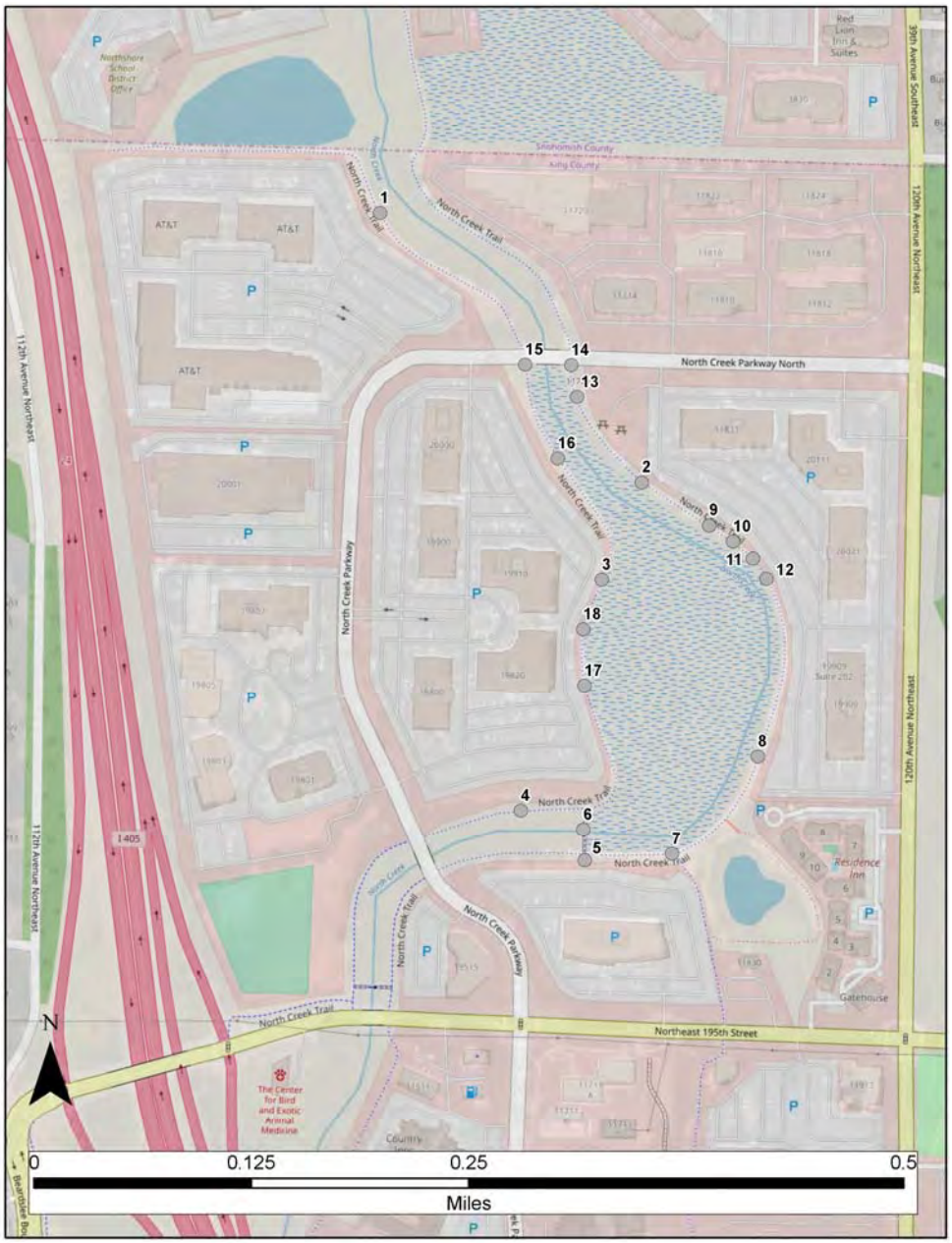
REVISED OVERFLOW ELEVATIONS

FIGURE 1

Appendix B

Reach 5 Current Site Photographs

Reach 5 digital photographs were taken using global positioning system (GPS), sequentially numbered by date and time, with the locations shown on the map below and presented in the following pages. All photographs were taken by Teresa Allard from the North Creek Regional Trail on top of the levee system.



Reach 5 map identifying the location of photographs (*Source: T Allard and S. Gumr using ARC GIS software*)

Photograph 1. East side levee North Creek Regional Trail encroachment by Himalayan blackberries. (T. Allard, November 19, 2018)

Photograph 2. East side levee looking west into the wetlands during the fall season (T. Allard, November 19, 2018).

Photograph 3. Scotch broom growing on the west levee next to the North Creek Regional Trail (T. Allard, May 11, 2019).

Photograph 4. West side levee looking east from North Creek Parkway; were English Ivy is growing around the tree trunks (T. Allard, July 2, 2019).

Photograph 5. Reed canarygrass and English Ivy at the base of the trees in the floodplain and wetlands; looking northeast from the North Creek observation bridge (T. Allard, July 2, 2019).

Photograph 6. Trees and Himalayan blackberries next to the North Creek observation bridge (T. Allard, July 2, 2019).

Photograph 7. A Willow tree by the detention pond consumed by Himalayan blackberry (T. Allard, July 2, 2019).

Photograph 8. East side levee looking west at the stream (T. Allard, July 2, 2019).

Photograph 9. East side levee looking south into the wetlands. (T. Allard, July 2, 2019)

Photograph 10. East side levee looking west into the wetlands. (T. Allard, July 2, 2019).

Photograph 11. East side levee looking south; Himalayan blackberries growing throughout the trees (T. Allard, July 2, 2019).

Photograph 12. East side levee looking north toward North Creek Parkway North; dead trees (T. Allard, July 2, 2019).

Photograph 13. South side of North Creek Parkway North bridge looking west. (T. Allard, July 2, 2019).

Photograph 14. South side of North Creek Parkway North bridge looking east. (T. Allard, July 2, 2019).

Photograph 15. West side levee looking south into the floodplains (T. Allard, July 2, 2019).

Photograph 16. West side levee looking south into the floodplains (T. Allard, July 2, 2019).

Photograph 17. West side levee looking east; Koll Company information board on the importance of wetlands (T. Allard, July 2, 2019).

Photograph 18. West side levee looking south along the tree line with dense Himalayan thickets growing into the trees (T. Allard, July 2, 2019).

Appendix C

Reach 5 Subarea Regulations (BMC 12.56)

Chapter 12.56
NORTH CREEK/NE 195TH STREET SUBAREA REGULATIONS

Sections:

12.56.010 Purpose.

Subarea zoning regulations implement subarea-specific policies in the Imagine Bothell... Comprehensive Plan. The subarea zoning regulations in this chapter apply specifically to land within the North Creek/NE 195th Street Subarea. Subarea zoning regulations are in addition to city-wide zoning regulations or, where more restrictive, take the place of city-wide zoning regulations. (Ord. 1946 § 2, 2005; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996).

12.56.020 North Creek Valley special district – Coterminous with North Creek Valley/NE 195th Street subarea.

The North Creek Valley special district shall be coterminous with the North Creek Valley/NE 195th Street Subarea. This special district is established as an overlay zoning classification pursuant to the Bothell comprehensive land use plan for the purpose of implementing the goals, policies and actions of that plan. Subarea zoning regulations are in addition to city-wide zoning regulations, or, where more restrictive, take the place of city-wide zoning regulations. (Ord. 1946 § 2, 2005; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996).

12.56.030 Subdistricts.

The North Creek Valley special district shall be divided into two subdistricts as follows:

A. Subdistrict A shall comprise all lands zoned R-AC, OP, CB, LI; R 2,800, OP, NB and R-AC, OP, CB, LI, MVSO in the southeast corner of the subarea; and R 2,800, OP in the southwest corner of the subarea.

B. Subdistrict B shall comprise all lands zoned R 9,600 within the western portion of the subarea and R 2,800, OP in the eastern part of the subarea. (Ord. 2252 § 11, 2018; Ord. 1946 § 2, 2005; Ord. 1921 § 1, 2003; Ord. 1876 § 2, 2002; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996).

12.56.040 PUD required – Subdistrict B.

Repealed by Ord. 1921. (Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996).

12.56.050 Impervious and hard surface planning allotment.

Properties within the North Creek/NE 195th Street Subarea shall have a hard surface coverage allotment of 60 percent. Impervious surfaces proposed shall be subject to the maximum hard surface allotment as well as environmental review, and shall comply with impervious surface requirements as set forth in BMC Title 14, Environment. (Ord. 2200 § 2 (Exh. B), 2016; Ord. 2025 § 2 (Exh. C), 2009; Ord. 1946 § 2, 2005; Ord. 1924 § 1, 2004; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.090.).

12.56.060 Pedestrian and bicycle access.

All development within the North Creek special district shall include provisions for pedestrian and bicycle access in accordance with the adopted pedestrian and bicycle facilities plan within the Imagine Bothell... Comprehensive Plan. Special consideration shall be given to developing a complete nonmotor vehicle traffic network, including connections to a trail system along North Creek and access to such system. (Ord. 1946 § 2, 2005; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.150.).

12.56.070 Standards relating to freeways.

A. The negative visual impact resulting from buildings with their rear elevation facing I-405 or SR-522 shall be avoided or substantially minimized through building orientation and design and/or effective screening.

B. Commercial development in the North Creek Valley special district shall not include businesses which are dependent upon attracting freeway motorists for a substantial portion of their business. Retail and service businesses located within the North Creek Valley special district are prohibited from orienting signs toward I-405 and SR-522. Signage shall be oriented to the street serving the business.

C. All development constructed in the vicinity of I-405 or SR-522 shall be designed and/or positioned so as to buffer freeway noise. (Ord. 1946 § 2, 2005; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.170.).

12.56.080 Architectural standards.

In order to further the purposes of this chapter as set forth in BMC 12.56.010, protect property values, minimize discordant and unsightly surroundings and visual blight, avoid inappropriate and poor quality design and to promote aesthetic quality for the community as a whole, in addition to the design standards contained in Chapter 12.14 BMC, the following architectural standards shall be complied with:

A. Glare.

1. Mirror glass is permitted only when it can be demonstrated to produce no detrimental visual effect upon adjacent areas.

2. Lighting shall be directed toward the interior of the project and away from residential areas.

B. The major portions of the exterior building and fence materials shall be of natural and earth tones. Accent colors will be permitted on the minor portions of such materials.

C. Buildings should be designed to encourage overall compatibility. Modular units, tilt-up construction, and other cost-effective techniques are allowed and the final visual effect should be one of quality and permanence.

D. All vents, air conditioning units, mechanical, electrical and other equipment located on the roof of any structure shall be screened as needed to avoid an unsightly appearance as viewed from surrounding property, including hillside locations. The building roof design and covering/screening materials shall be described in detail, and it shall be demonstrated how these items will mitigate the visual impact of the equipment. These items shall be incorporated as an integral part of the overall building design. Projections of the view to the proposed site development, of roofs, and of rooftop equipment screening from adjacent hillsides, elevated roadways and residential areas shall be submitted.

E. Building Height.

1. The following special height regulations apply:

a. Within the portion of Subdistrict A zoned R-AC, OP, CB, LI, the maximum allowable height is 100 feet, except that buildings may be up to 150 feet to accommodate manufacturing processes which require structures taller than 100 feet. In such cases, the applicant shall demonstrate why the process cannot be conducted in a building of 100 feet or less. Only that portion of the structure containing the manufacturing process may exceed 100 feet; offices and other areas of intensive employee activity are prohibited above this height.

b. Within the portion of Subdistrict A zoned R 2,800, OP, NB; and R-AC, OP, CB, LI, MVSO the maximum allowable height is 65 feet.

c. Within the portion of Subdistrict B east of 120th Avenue NE and 39th Avenue SE zoned R 2,800, OP, the maximum allowable height is 65 feet.

d. Building heights within the remainder of Subdistricts A and B shall be regulated in accordance with Chapter 12.14 BMC.

e. Building height shall be measured as set forth in BMC 12.14.110 through 12.14.130.

2. When buildings exceed 35 feet, in accordance with subsection (E)(1) of this section, the mandatory setbacks from, and mandatory landscaping buffers adjacent to, any abutting R zoning (not including combination zones) shall be increased as follows:

a. The mandatory setbacks from any abutting R zoning, as set forth in BMC 12.14.070(D), shall be increased three feet horizontally for each foot of building height exceeding 35 feet. These increased setbacks shall apply to the entire building, rather than only to those portions of the building which may be higher than 35 feet. Where a property within any area described in subsection (E)(1)(a), (b), (c) or (d) of this section abuts R zoning along a street, the increased setbacks shall be measured from the street property line of such property.

b. The mandatory landscaping buffers adjacent to any abutting R zoning, as set forth in BMC 12.18.110, shall be increased 0.25 feet (three inches) for each foot of building height exceeding 35 feet, up to a maximum of 10 feet of additional landscaping. In such cases, the entire buffer shall consist of Type I landscaping. (Ord. 2252 § 11, 2018; Ord. 2025 § 2 (Exh. C), 2009; Ord. 1946 § 2, 2005; Ord. 1876 § 2, 2002; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.180.).

12.56.090 Setbacks.

A. In Subdistrict A, building setback requirements along public rights-of-way shall be 25 feet, except as otherwise provided in BMC 12.56.080(E). Such setbacks shall be landscaped in accordance with the landscaping standards of BMC 12.56.100.

B. The setback requirements from all other property lines in Subdistrict A which do not abut R zoning (not including combination zones) shall be 10 feet. The setback requirements from property lines which abut R zoning shall be as set forth in BMC 12.14.070(D), except as otherwise provided in BMC 12.56.080(E) for buildings higher than 35 feet.

C. In Subdistrict B, the setback requirements shall be governed by the standards of the zoning classification in which the development is located as set forth in Chapter 12.14 BMC, except as otherwise provided in BMC 12.56.080(E) for buildings higher than 35 feet, and in BMC 12.56.120(H) for properties zoned R-AC, OP, NB.

D. In Subdistrict A, when adjoining properties are developed simultaneously, setback requirements, except setbacks on public rights-of-way, may be waived. (Ord. 1946 § 2, 2005; Ord. 1876 § 2, 2002; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.190.).

12.56.100 Landscaping standards.

A. Planting of shade trees native to the area shall be required along public access routes to the North Creek shoreline.

B. Service, loading, storage and other areas which tend to be unsightly shall be oriented away from dedicated streets and private roadways and screened from view with landscaping or fencing of an attractive material.

C. The perimeter of parking areas shall be landscaped with solid screen evergreen plant material four feet high or fencing in combination with planting. Landscaped earth berms at least three feet high may substitute for the solid screen planting.

D. Mechanical equipment shall be screened with landscaping or attractive architectural features integrated into the structure itself.

E. To lessen the visual impact of outdoor parking lots, not less than seven percent of the interior of a parking lot with at least 15 parking stalls shall be landscaped. Landscaped strips between parking bays with appropriate ground cover and the planting of deciduous trees to achieve a canopy-like screening shall be required. Berms are also encouraged in the interior planted areas. Planting which is required for screening along the perimeter of any parking lot shall not be considered as fulfillment of the interior landscaping requirement. Planted areas within a parking lot shall be considered as part of the open space requirement.

F. All plant material used for parking lot landscaping shall be of sufficient size and development to have a significant impact on the screening of the lot immediately though the full effect will not be realized for several years.

G. Indigenous plant material with emphasis on trees and shade cover shall be required for landscaping along North Creek. (Ord. 2200 § 2 (Exh. B), 2016; Ord. 2025 § 2 (Exh. C), 2009; Ord. 1946 § 2, 2005; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.200.).

12.56.110 Parking standards.

A. Required number of stalls shall be in accordance with Chapter 12.16 BMC;

B. Cooperative joint usage of parking lots by two or more commercial businesses within a development shall be encouraged when the suitability of this cooperative agreement is determined. Criteria for such a determination includes:

1. The size of the joint parking lot which shall be governed by the timing of customer usage of the space and of the peak business periods of participating businesses.

a. When peak periods of business overlap for two or more businesses wishing a joint parking lot, the required number of parking stalls may be reduced to 75 percent of the total parking stalls required for all businesses.

b. The number of parking stalls for two businesses shall be the same as that required for the larger of the two when it is shown that one of the two cooperating businesses is relatively inactive during peak periods of the other.

c. The number of parking stalls for three or more businesses with nonoverlapping peak hours shall be at least the same as that required by the largest business. Additional parking stalls may be required by the community development director;

2. Location of the parking area either on the same lot or within 200 feet of the building it is intended to serve. For longer term parking, such as employee or proprietor parking, portions of the parking may be located up to 500 feet from the building if such an arrangement is found by the community development director to adequately serve the needs of the development for parking;

3. Adequate signing in the parking area and entrance to the cooperative establishments to clarify for customers that the parking area is common to both;

4. Safe and adequate pedestrian connections between the parking area and the businesses;

C. A minimum of 50 percent of the space saved on a site through joint use of parking areas must be set aside as open space with pedestrian access and allocated equally among businesses;

D. All approved joint uses of parking areas, including use by the public of private lots adjacent to public recreation areas, shall be made permanent by the execution of a written agreement approved by the city attorney which makes the agreement continuous during the occupancy of the business unless satisfactory alternative arrangements are authorized by the community development director. This agreement shall be filed with the city clerk and recorded with the King County department of records and elections or the Snohomish County auditor’s office at the expense of the applicant;

E. Where pedestrian walks are used in parking lots for the use of foot traffic only, they shall be curbed, or raised six inches above the lot surface;

F. Parking lots utilizing material that is to some degree pervious and creates the visual impression of natural ground coverage are encouraged, but no compensating increase in hard surface allotment shall be given;

G. 1. The feasibility of reducing the number of parking stalls required to be provided as part of the development through the use of transportation system management (TSM) techniques shall be addressed. Examples of TSM techniques include, but are not limited to, the following:

a. Carpooling,

b. Vanpooling,

c. Subsidized bus passes,

d. A monthly charge for parking,

e. A monthly subsidy for use of ridesharing,

f. Use of flextime;

2. The number of and length of time per day stalls will be available for carpool/vanpool use, the percentages of employees which will use each system, the economic incentives to be used to encourage ride-sharing use, the use of flextime and/or joint parking facilities, the level of bus service provided to the site, and any other strategies which will be utilized to decrease the amount of traffic generated by the development should be addressed. If an applicant demonstrates these techniques will be successful and obligates himself or herself to implement and maintain them on an ongoing basis, the city may reduce the required number of parking stalls below the number required by this title. The land for the required but unprovided parking stalls shall be set aside as open space until/if it is needed for additional parking. If the city finds the techniques were not successful, an applicant shall provide the additional parking stalls or reduce the building area utilized by the use. (Ord. 2200 § 2 (Exh. B), 2016; Ord. 2025 § 2 (Exh. C), 2009; Ord. 1946 § 2, 2005; Ord. 1815 § 1, 2000; Ord. 1629 § 1, 1996. Formerly 12.56.220.).

12.56.120 Nonemergency motor vehicle connections from 112th Avenue NE to roads in Maywood/Beckstrom Hill Subarea prohibited.

Road connections from 112th Avenue NE to streets in the Maywood/Beckstrom Hill Subarea for use by nonemergency motor vehicles shall be prohibited, in accordance with BMC 12.14.180(A)(1). Connections for police, fire and emergency medical service vehicles, pedestrians and bicyclists may be provided, subject to BMC 12.14.180(A)(2) and (3). (Ord. 2025 § 2 (Exh. C), 2009; Ord. 1946 § 2, 2005. Formerly 12.56.180.).

12.56.130 Motor Vehicle Sales Overlay.

Exterior motor vehicle sales and display are permitted on properties containing Community Business (CB) zoning and a Motor Vehicle Sales Overlay (MVSO) designation subject to the following special regulations:

A. Illumination for motor vehicle sale properties shall be consistent with the following:

1. A lighting plan prepared by a qualified lighting engineer shall be submitted with any motor vehicle sales building permit application. The plan shall demonstrate consistency with these provisions.

2. All light fixtures shall be shielded to prevent off-site glare and shall direct light downward onto the sales lot. Shielding shall be installed to prevent the light bulb, filament or light source within the fixture from being directly visible from all residential zones.

3. Lighting fixtures shall be designed and installed in such a manner that no more than one footcandle of power of light at five feet above grade crosses a residential zoning boundary in accordance with BMC 8.64.030.

B. Landscaping within motor vehicle sales areas shall be consistent with the following:

1. A minimum 25-foot-wide Type I landscape buffer shall be installed along the common property line between any motor vehicle sales use and any existing residential use. All other property lines shall have the landscape perimeter installed in accordance with Chapter 12.18 BMC.

a. Trees within the 25-foot-wide perimeter buffer shall consist of 100 percent coniferous species;

b. Coniferous trees within the 25-foot-wide perimeter buffer shall have a minimum height of 12 feet at time of installation.

2. Street right-of-way, front lot line, interior parking lot landscaping and all other required landscaping shall be installed pursuant to Chapter 12.18 BMC and BMC 12.56.100.

C. Paging systems for employees of motor vehicle sales operations shall be wireless pagers, cellular phones, or other devices that do not allow voice or sound transmittal through the air, except that external employee paging systems that allow voice or sound transmittal through the air may be permitted subject to the following requirements:

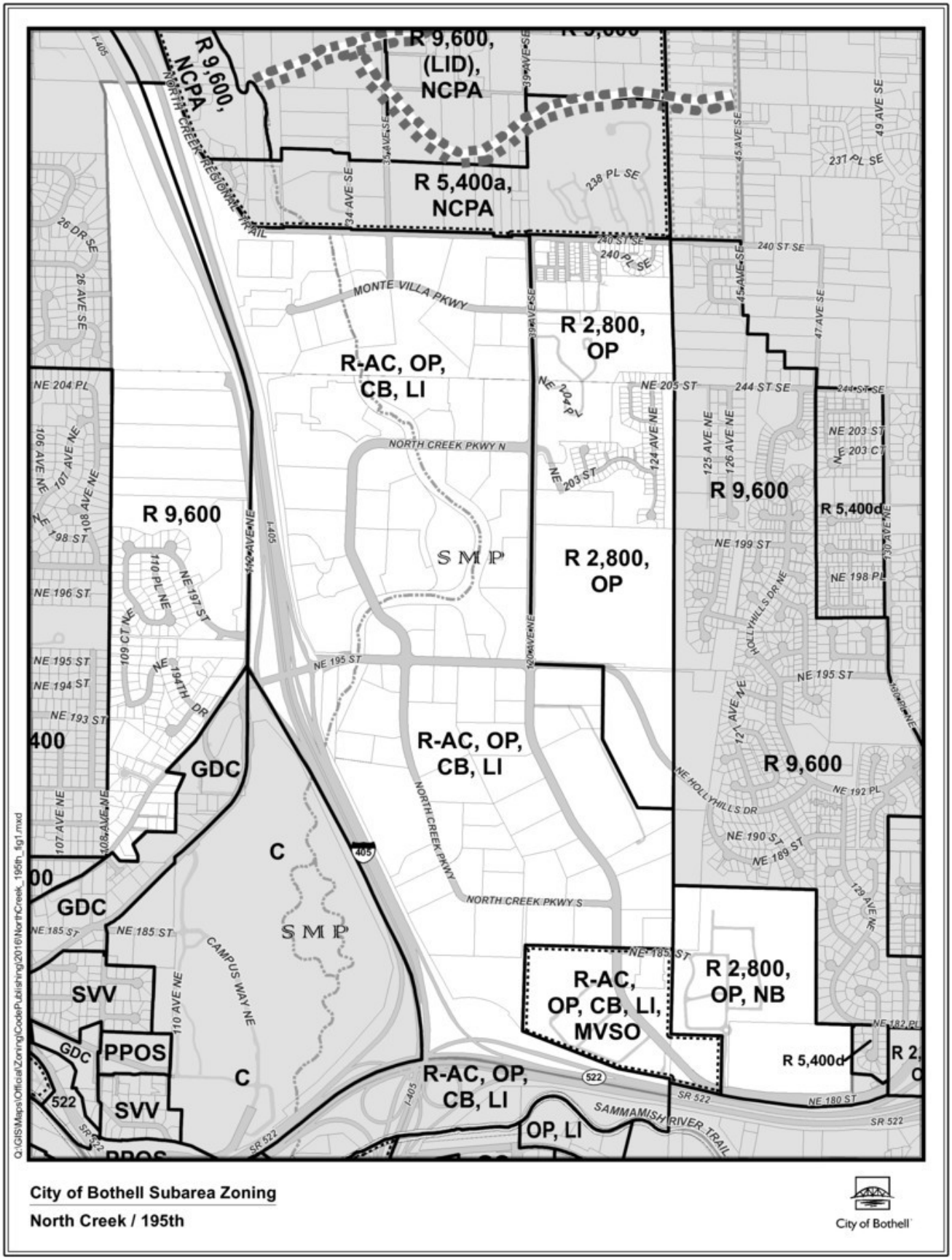
1. An external paging system plan with specifications designed and prepared by a licensed acoustical engineer shall be submitted to the department of community development for review and approval.

2. The paging system shall be designed consistent with the following:

a. All external speakers installed for the paging system shall be oriented away from existing residential uses and all residential zones.

b. The paging system shall be designed to be consistent with the maximum noise levels established under WAC 173-60-040.

3. Prior to issuance of any certificate of occupancy, or, in cases where the system is installed in an existing motor vehicle sales lot, use of the paging system, the acoustical engineer shall provide written verification to the city that the paging system is consistent with these standards. (Ord. 2025 § 2 (Exh. C), 2009; Ord. 1946 § 2, 2005; Ord. 1853 § 1, 2001. Formerly 12.56.190.).



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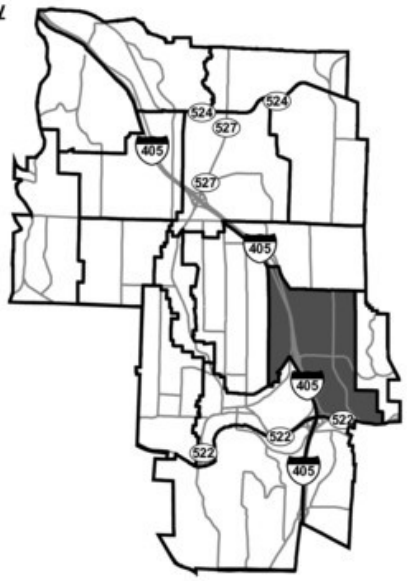
Zoning Classifications

AG	Agriculture
R 40,000	Residential 40,000 sq. ft. minimum lot size
R 9,600	Residential 9,600 sq. ft. minimum lot size
R 8,400	Residential 8,400 sq. ft. minimum lot size
R 7,200	Residential 7,200 sq. ft. minimum lot size
R 5,400d	Residential 5,400 sq. ft. minimum lot size (only detached units permitted)
R 5,400a	Residential 1 dwelling unit per 5,400 sq. ft. of net buildable area (attached or detached units permitted)
R 4,000	Residential 1 dwelling unit per 4,000 sq. ft. of net buildable area
R 2,800	Residential 1 dwelling unit per 2,800 sq. ft. of net buildable area
R-AC	Residential-Activity Center (no specific density: number of units controlled by site and building envelope regulations)
OP	Office-Professional
NB	Neighborhood Business
CB	Community Business
GC	General Commercial
LI	Light Industrial
MHP	Mobile Home Park
KGC	Kenmore Gun Club
MVSO	Motor Vehicle Sales Overlay
SSHO	Specialized Senior Housing Overlay
NCPA	North Creek Protection Area
(LID)	Low Impact Development
	Wildlife Corridor Approximate Location
S M P	Shoreline Master Program

Subarea Key



Downtown Classifications

DC	Downtown Core
DN	Downtown Neighborhood
DT	Downtown Transition
522	SR 522 Corridor
GDC	General Downtown Corridor
SVV	Sunrise/Valley View
C	Campus
PPOS	Park and Public Open Space

Notes:

1. The Planning Area is divided into 17 subareas. Subareas within the City Limits are subject to subarea-specific regulations. Subarea regulations expand upon the zoning classifications depicted on this map. Please refer to the Planning Subareas Map and to the appropriate subarea regulations.
2. The Downtown Subarea includes zoning districts that are not found elsewhere in the City, as indicated in the legend. Please refer to the Downtown Subarea Plan and Regulations for detailed, downtown-specific development regulations.
3. The Shorelines Master Program (SMP) contains regulations which apply to portions of the City within 200 feet of the ordinary high water mark of North Creek and the Sammamish River, plus associated wetlands. Please refer to the Shorelines Master Program.
4. The development potential of any individual property under the zoning classifications of the Bothell Municipal Code shall be based on the net buildable area of that property, and shall be further subject to planned unit development provisions, availability of necessary utilities, critical area regulations, impact mitigation, and other applicable development policies, regulations and standards. Net buildable area as defined in the Code shall mean the gross land area, measured in acres, minus land area in roads and other rights of way, surface stormwater retention / detention / water quality facilities, critical areas, critical area buffers, and land dedicated to the City.
5. Where a district combines multiple zoning classifications (e.g. R 2,800, OP, CB) the most permissive regulations of the individual zoning classifications shall apply, unless specifically provided otherwise.
6. Buffers are required between uses of different intensities or densities. Subarea regulations may specify buffer widths different from those applicable City-wide.

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City of Bothell Subarea Zoning

North Creek / 195th

City of Bothell

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