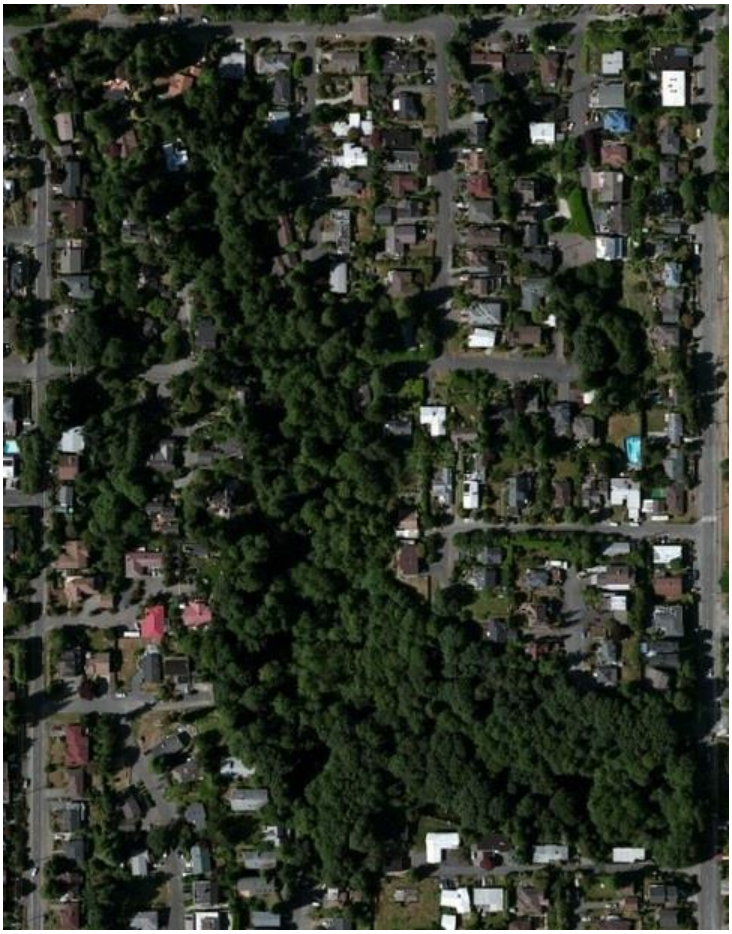
A Restoration Management Plan for North Beach Park



Luke McGuff

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Introduction

A Personal Note

In the formal language of this document is hidden a personal journey.

I first discovered North Beach Park in November 2008, while exploring the neighborhood with my wife. In the fall dusk, its narrow entrance was almost forbidding. I went back to the park and was immediately entranced by it. I'd long had a fascination for the plants that grow up in industrial settings, and this seemed the flip side of that coin: Plants that had taken over completely, smothering the trash in their midst – the water heaters, washing machines, tires, shopping carts, and more.

Figure 1: Washing Machine in Stream.

Uncredited photography by the author.

I was completely "plant blind" (Louv, 2005) and for all I knew everything I saw was a weed (I've since learned to identify some plants). I've also learned since then that late fall is when North Beach Park is least attractive to human eyes. The leaves have fallen and rotted just enough to lose their color. All the trash, some of it quite large, was visible – except for the trash so covered with holly or ivy that you wouldn't see it unless you stepped on it.

I returned to the park occasionally to photograph the trash. (See Figure 1, above.) Having grown up on the West Side of Chicago, exploring North Beach Park was my first experience with local nature. It became my special place that people usually discover in childhood.

In February of 2011, an assignment for a class at Antioch involved finding a "sit spot" and I immediately went to North Beach Park.

While researching the park, I came across a flyer about a community meeting in 2008 with an attached email address. I wrote to that person, who said she was no longer involved in park's community affairs and referred me to someone else. That set up a dialog in which every email that came back to me had more people added to the CC line. At first, they thought I was complaining about the park. When I said no, I wanted to clean it up, they pounced.

This lead to a meeting in the park on March 17, 2011. At that meeting were neighborhood residents who had long wanted to start a cleanup in North Beach Park; the district Plant Ecologist; the head of Urban Forestry; the GSP liaison from Forterra; the volunteer coordinator for Parks in the North End; and myself and my brand new copy of Pojar (2004) (since made less than brand new). Many of these people continue to support restoration at North Beach Park.

Urban restoration made a connection that I had lacked without realizing it. I've never thought of the city as evil, never thought of it as fallen and corrupt, with a supposedly-untrammeled nature as "pure." I quickly found out there is quite a lot of writing on this topic, from the relatively early days of Ian McHarg, up through William Cronon (1996), Lyanda Lynn Haupt (2009), and Jennifer Price (1999). The city is important to our future. Learning to restore it, to bring forth and integrate the natural world within it, will help us heal the larger natural world our urban systems connect to.

Friends of North Beach Park got off to a good start in 2011, aided by neighbors and volunteers who had long experience working to restore parks (particularly Carkeek Park, Golden Gardens, and Landover Woods). We continue to this day, with small, informal get togethers almost every week and formal, public volunteer events on the fourth Saturday of the month. (Friends of North Beach Park, and building a volunteer network, is discussed in more detail in "Volunteer Network" and "Stakeholders.")

I've sometimes wondered if they tried to warn me about what I was getting into. If they did, I didn't listen. In any case, I have no regrets.

The purpose of this document

This "Restoration Management Plan of North Beach Park" ("Plan") is intended to provide an outline and a strategy for restoring the different habitat management units ("HMU") of North Beach Park, following Green Seattle Partnership target forest type guidelines.

At the time of drafting (Summer, 2014), the fourth year of restoration in North Beach Park is in full swing. But the restoration of North Beach Park will take several more years and might be coordinated by different forest stewards as the work continues. It is hoped that this document will provide a thread of continuity through the change without precluding adaptation to changing circumstances.

There are 11 different HMUs in the park ranging in size from 0.18 to 1.97 acres. Two of the HMUs, North Passage and North Passage Wetlands, are surrounded by private property and inaccessible without trespass. This document will examine the other nine in detail. Three of the HMUs discussed are primarily wetlands with some slopes (see "Wetlands"). The remaining six are upland slopes that may contain parts of the wetland (see "Uplands and Slopes").

"Park and Restoration History" provides a history of the park from the grading of 24th Ave. NW in 1931 through current restoration efforts.

Volunteer-driven urban restoration is a cooperative effort, and the work of Friends of North Beach Park is supported by numerous organizations and individuals. We discuss this in "Stakeholders and Volunteer Network."

"Habitat Management Units and Target Forest Types" looks at reference communities and ecosystems. North Beach Park has nine habitat management units discussed in this book. To those HMUs are applied four target forest types and two reference ecosystems. We look at what criteria go into dividing a park into HMUs and applying target forest types to that HMU.

"Monitoring Protocols and Success Metrics" looks at how we examine the current state of the park and how we track and evaluate progress. "Monitoring Protocols" explains the protocols and rationale behind the Green Cities Monitoring Protocol and for the belt transect done in June, 2014. "Success Metrics" looks at the different phases of a GSP restoration and how we evaluate when an HMU or section moves from one phase to another.

The "Wetlands" and "Uplands and Slopes" chapters look at the individual HMUs in North Beach Park. We describe each HMU, the water flow, and the vegetation observed. We split each HMU into subareas (four each for the Headwaters Bowl and the Central Valley; two each for the remainder) depending on who can do the work: All volunteers, experienced forest stewards, Parks Department Natural Area Crew, or privately contracted crew. For each subarea, there is a list of suggested tasks intended to guide the restoration to the next phase. Because the situation of a volunteer restoration project can change rapidly, and is less time- or budget-bound than other restoration projects (such as wetland mitigation for a developer or state agency), these suggestions are not placed on a timeline. The evaluations discussed in "Success Metrics" will be applied here to the specific subareas of each HMU.

During the first three years of restoration, an amazing amount of work has been done, and early plans or ideas were later modified beyond recognition or abandoned. Although this document is intended to guide the further restoration efforts in North Beach Park, it is likely that the restoration needs will change, whether due to unexpected success or hindrances, changing climate, changing regulations, or some combination. "Conclusion" looks at some immediate tasks (through early 2015), predictions about 2021 and 2061 (ten and 50 years after restoration begins respectively) and the many areas for future research.

North Beach Park

North Beach Park ("NBP") is a nine-acre ravine park in Northwest Seattle. The public entrance is at the southwest corner of the intersection of NW 90th St. and 24th Ave. NW. North Beach Park is across the street from Olympic Manor and kitty-corner to North Beach Elementary. (See Figure 2, below).

Figure 2: North Beach Park.

North is to the top. Park boundaries are green, HMU boundaries are red. The stream is a blue line. Entrance to the park is at the lower right. The section of the park at the top left corner of this map is inaccessible without trespass and won't be discussed in detail in this document. (Map from Green Seattle Partnership ArcGIS Reference Map.)

Purchase of the lands that became North Beach Park started in 1970 (see "Park and Restoration History"). To the best of our knowledge, there was no official maintenance done in North Beach Park until restoration began in 2011.

There is a short official trail that feeds into a loop social trail. The social trail goes through most of the park, ranging through some very wet areas up to the upper reaches of the slopes. Until a few years ago, sections of it were informally maintained by a neighbor. Two stream crossings are built of coarse woody debris and scrap boardwalk pieces.

The stream is formed by numerous rivulets and seeps that come from the walls of the park. The stream is mostly groundwater fed, although there is some street runoff, primarily from the South Plateau.

NBP is surrounded by private property except for its entrance. Property lines frequently extend into the park, often on slopes that are too steep to be of any practical use. There is one fence built around a home in the park.

Given that the park is surrounded by private property, there was relatively little large trash in it. There is still some in the park, either too heavy to move (a safe and the front end of a car) or buried so deeply in the stream it would disturb the stream bed too much to remove it. The trash was impressive while we were carrying it out: washing machine bodies, water heaters, tires and wheels, and many bags of bottles'n'cans.

The park is used primarily by dog-walkers and joggers. During the school year, students from North Beach Elementary visit the park. There is some evidence of teen-age activity, namely litter and tagging on some trees. There is no evidence of anyone currently living in the park.

Nomenclature

Throughout this document plant names follow, as closely as possible, the taxonomy from the Germplasm Resource Information Network (GRIN 2014). Form resolution and taxonomic code follows the USDA Plants Database (Plants, 2014). Wetland status follows the US Army Corps of Engineers "2014 National Wetland Plant List" (Lichvar, et al, 2014).

Acknowledgments

I would like to take a few moments to acknowledge the contributions of all the people who have helped this process, both the writing of this document and the longer journey of restoring North Beach Park since 2011.

Kern Ewing, Jim Fridley, and Sarah Reichard, were my committee and provided many timely comments.

Tad Anderson and Drexie Malone – co-forest stewards and co-conspirators; their feedback is found throughout the following chapters.

Morry Browne, Doug Gresham, and Loren McElvain – invaluable support and mentoring from the beginning.

Lex Voorhoeve – Master Forester Class instructor, where Drexie, Tad, and I started collaborating on North Beach Park.

Andrea Mojzak (Forterra), Michael Yadrick (Seattle Department of Parks and Recreation) – GSP liaisons.

Donald Harris (Seattle Department of Parks and Recreation) – access to active files.

Transect participants: Tad Anderson, Drexie Malone, Loren McElvain, Rio Montana, Nancy Rauhauser, and Stewart Wechsler.

Julie McGuff – beloved, and very patient, spouse.

References

Cronon, W. 1996. "The Trouble with Wilderness; or, Getting Back to the Wrong Kind of Nature." In *Uncommon Ground: Rethinking the Human Place in Nature.* (Cronon, ed.) W.W. Norton, New York.

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Natural Heritage Rep. 2006-01. Washington Department of Natural Resources, Natural Heritage Program, Olympia, Wash. [http://www1.dnr.wa.gov/nhp/refdesk/communities/pdf/intro.pdf].

Haupt, L.L. 2009. *Crow Planet: Essential Wisdom from the Urban Wilderness.* Little, Brown, New York.

Kunze, L.M. 1994 Preliminary Classification of Native, Low Elevation, Freshwater Wetland Vegetation in Western Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, Wash.

Lichvar, R.W., M. Butterw ick, N.C. Melvin, and W.N. Kirchner. 2014. *The National Wetland Plant List*: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42.

Louv, R. 2005.*Last Child in the Woods: Saving our Children from Nature-Deficit Disorder.* Algonquin Books, Chapel Hill, NC.

Pojar, J., and MacKinnon, A. 2004. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska.* (2nd ed.) Lone Pine Publishing, Vancouver, B.C.

Price, J.1999. *Flight Maps: Adventures with Nature in Modern America.* Basic Books, New York.

USDA, ARS, National Genetic Resources Program.
Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland.
URL: http://www.ars-grin.gov/cgi-bin/npgs/html/queries.pl

USDA, NRCS. 2014. The PLANTS Database (http://plants.usda.gov). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Park and Restoration History

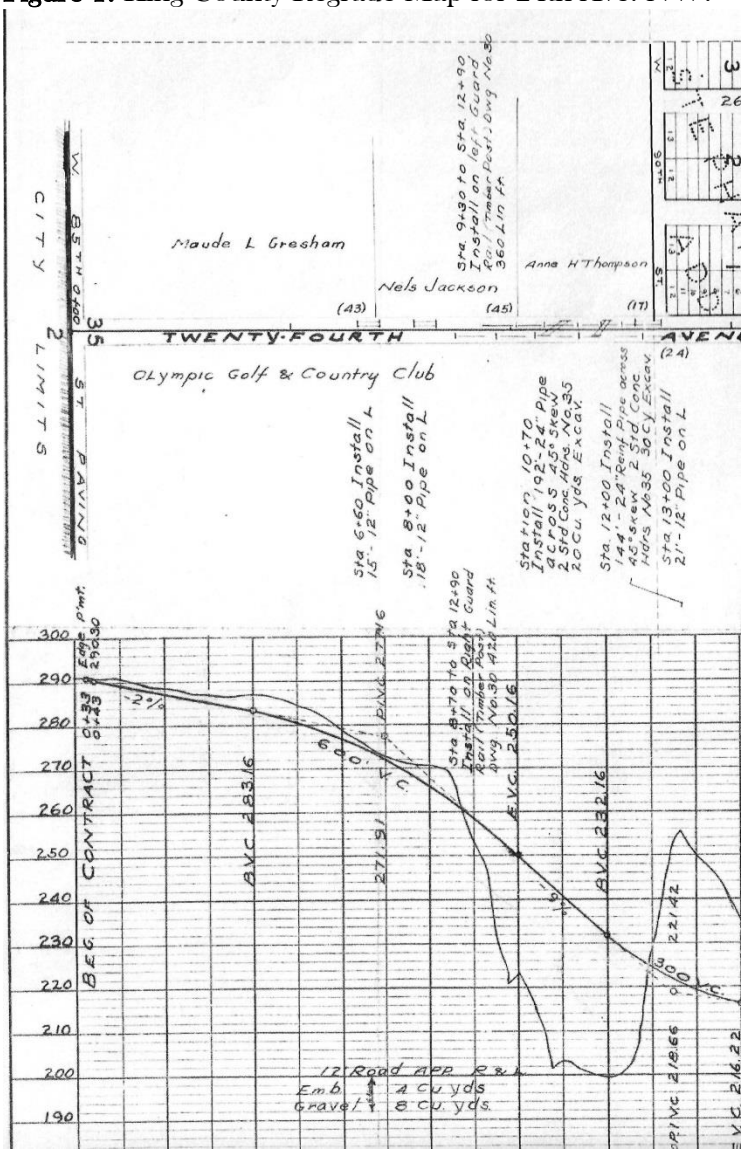
This chapter presents an outline history of North Beach Park, from the purchase of the first parcels through 2008.

In the Restoration History section, we talk about the early restoration efforts, their successes and failures, and what we learned.

Park History

King County regraded and paved 24th Ave. NW from 85th to 105th in 1931. Figure 1, below, shows a section of the plan for this regrade. The top half is a plan view, showing the street and parcels on both sides. The bottom half is a cross section, showing the altitude changes. The thicker line shows the planned regrade and the thinner line shows the pre-paving contours. Note the sharp dip where the lines cross at 260 feet, and the sharp rise where they cross again at 230 feet. The vertical written notes contain directions for installing pipes across the roadway, and guard rails on the right and left sides (King County Resolution No. 3924, 1930).

Figure 1: King County Regrade Map for 24th Ave. NW.



(Source: King County Engineers Office, 1930)

At that time, the ravine provided drainage for Olympic Golf Course and Country Club, which was open from 1924 until 1953, when it became Olympic Manor (Fiset, 2001).

Figure 2: North Beach ravine in 1936.

North Beach Ravine is in the center of this picture. Fletcher's Orchard, now Fletcher's Village, is at the top left of the picture. Note gap, center of picture, in what is now the Central Valley, and gappiness in what is now the Headwaters Bowl. (Source: King County Road Services Map Vault, #33486.)

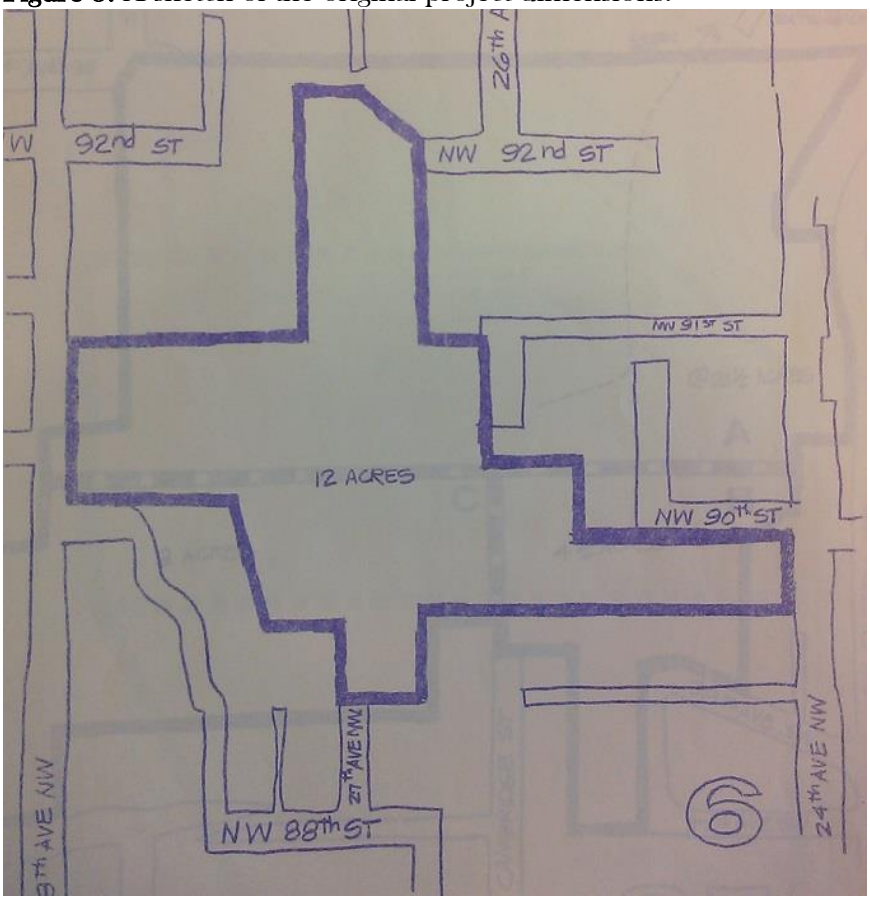
The aerial photo from 1936, Figure 2 above, shows the area that will become North Beach Park. The gap in the center today has large, old *Alnus Rubra* (Red alder) and a dense *Rubus spectabilis* cover. This is an indication of logging or other disturbance (Apostol, 2006). Evidence of disturbance also exists in the number of large cedar stumps that are now nurse logs in the stream.

Up until 1954, this area was unincorporated King County. In 1954, Seattle annexed all the areas between 85th St. and 145th St. (Crowley, 2006).

In 1968, King County voters approved a number of bond issues that included $118 million for new parks in Seattle (Williams n.d.). The Planning Division undertook a survey of ravines in the city, and in the "Summary and Recommendations from the Survey of Vacant and Undeveloped Natural Ravine and Creek Sites within the City of Seattle" (Planning Division 1969), North Beach Park is ranked second of the 23 properties surveyed. The property is described as:

> This ravine having a small creek fed by several springs has a wide variation of foliage and hence offers one of the best internal environments of all the ravines studied. This site also indicates a high potential for a pathway and local park of 12 acres adjacent to the North Beach Elementary school.

Figure 3: A sketch of the original project dimensions.



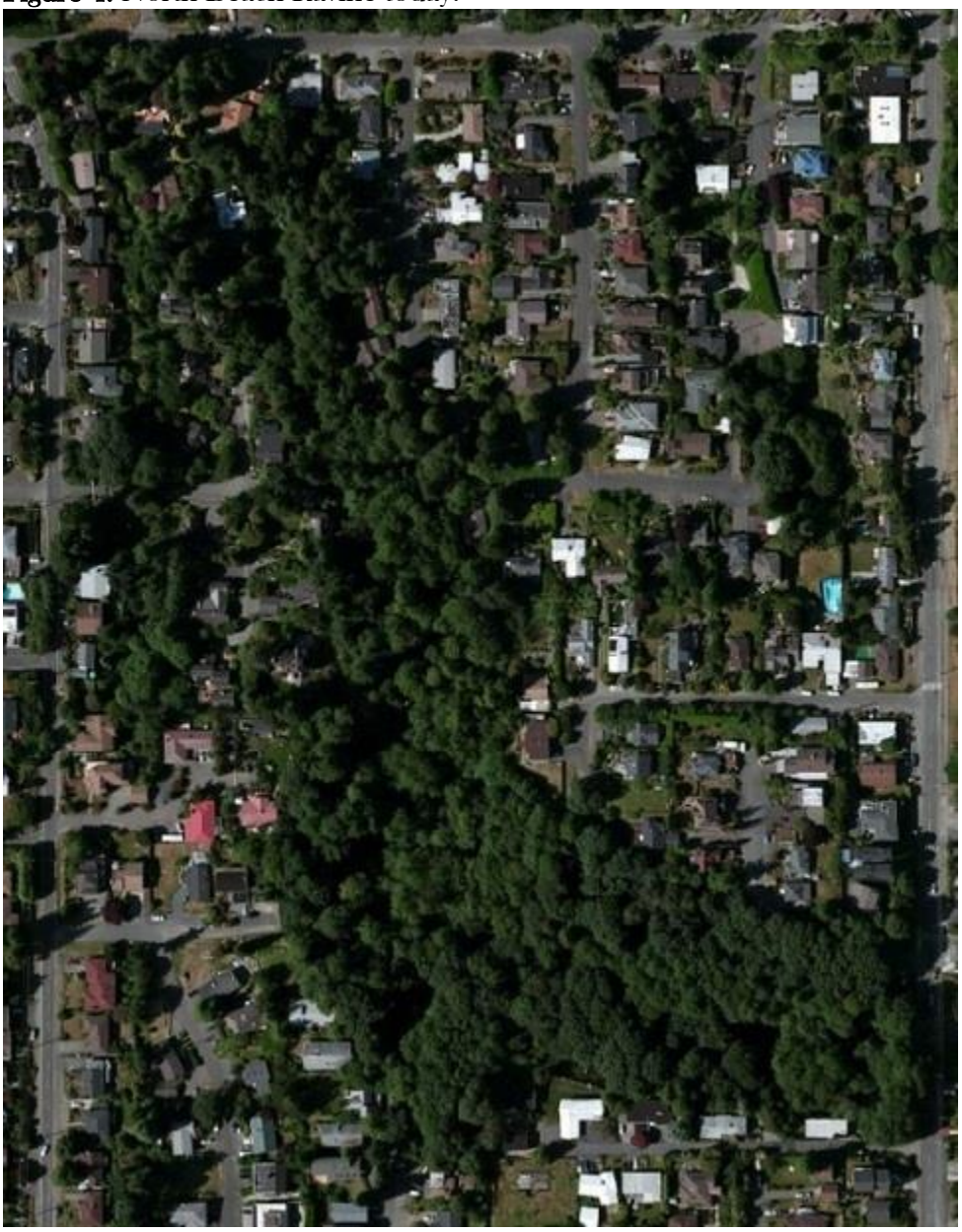
Source: Planning Division, 1969.

At a public meeting in February, 1970, neighbors expressed concerns about "hippies and undesirable type people" and the possibility of a "road into the park" (Alley 1970). However, the neighborhood was so in support of the project that someone unable to attend circulated a petition that eventually garnered nearly 500 signatures and "created a great deal of community interest" (Whitman 1970).

Purchase of the park property stopped in the 1970s. A 1980 letter from the then-presidents of the Olympic Manor Community Club and the North Beach Club expressed concern that the "five acre park" was receiving no attention from the city, and requested a meeting with a representative of the Parks Department to discuss the park (Malone 1988). Purchase of the property was completed with Green Space Levies in the 1990s and early 2000s.

In 2003, North Beach Park and North Beach Ravines (between 28th and 30th Avenues) was a heron rookery. (Seattle Parks and Recreation, n.d.)

Figure 4: North Beach Ravine today.



Source: GSP Reference Map on ArcGIS.com.

In 2008, serious neighbor problems lead to a contentious neighborhood meeting. There were accusations of illegal trail building, dumping, tree-topping and cutting, and worries about homeless encampments (Wong 2008). There was brief interest in a "Friends of…" group but nothing came of it (Wong 2008a).

Restoration began in 2011 and continues to this day. Please see next section.

Restoration History

This section is drawn from personal memories, work logs, and notes.

State of the Park at the Beginning of Restoration

Records of the condition of the park at the start of restoration weren't very well kept. There was (and still is) graffiti on the trees. There was trash throughout the park, ranging from bottles'n'cans, through tires and wheels, and up to water heaters and 300 gallon drums (that is still in the park). For the first several work parties, at least a couple dozen pounds of trash came out of the park, sometimes quite a lot more. (See Figure 6, below.)

At least 40% of the trees had serious ivy infestations reaching up into their crowns. In some cases, the ivy reached back down to the ground from overhanging branches.

When Luke, Drexie, and Tad took Lex Voorhoeve (instructor of the Master Forester Class) through the park for a site review (September 2011), he said there was a "depressing amount of work."

There were extensive ivy monocultures in the Headwaters Bowl, particularly along the rims and the dryer areas. There were also extensive ivy monocultures in the South Plateau and on the South and West Slopes.

The vast majority of the canopy was deciduous, with *Alnus rubra* (Red alder) on the bottomlands and *Acer macrophyllum* (Big leaf maple) on the slopes and dryer areas. For HMU-specific information about canopy coverage, please see the relevant sections in the "Wetlands" or "Uplands and Slopes" chapters.

2011

The first meeting about restoring North Beach Park took place on March 17, 2011. Attending were Michael Yadrick (Parks ecologist), Mark Mead (Urban forest manager), Joanna Nelson de Flores (Forterra/Green Seattle Partnership), Theresa McEwan (North End volunteer coordinator), Patrick Merriam (North End crew chief), Morry Browne (neighbor) and Loren McElvain (neighbor).

The first restoration work party was held April 30th, 2011 (the previous Saturday was Earth Day, and there were too many events already on the calendar). Fourteen people attended, an unusually high number.

From the start, Friends of North Beach Park (FoNBP) had five priorities for restoration work:

1. *Hedera helix* (ivy) off the trees – rough estimates (made long after the fact) are that 40% of the trees in the park had ivy up into their crowns.
2. Ivy off the ground – there were many places were ivy formed a groundcover monoculture that have been cleared. There are still monocultures on some slopes (See "Uplands and Slopes.")
3. Blackberry (*Rubus armeniacus*) off the ground and dug up.
4. Smaller laurel and holly pulled, larger marked for herbicide.
5. Invasive groundcover removed and replaced with native plants.

Work was both at the front of the park, to make visible changes that made the restoration work obvious; and in the forest, getting the ivy off the trees.

Figure 5: First Workparty Group Portrait

Photo by Drexel Malone. Six of the people in this picture (and the person taking it) are still involved in the restoration of North Beach Park.

Friends of North Beach Park settled on the 4th Saturday of the month because earlier weekends were taken: Golden Gardens GGREAT (Golden Gardens Restoration and Trails) meets on the 2nd Saturday, Friends of Llandover Woods meets on the 2nd Sunday, and Carkeek Park STARS (Streams, Trails, and Restoration Stewards) meets on the 3rd Saturday. We thought that the 4th Saturday presented the least conflict.

The 4th Saturday schedule does mean that the work party conflicts with Memorial Day in May and the Christmas – New Year holidays in December, so there is no work party on those months.

In summer of 2011, Luke McGuff, Drexie Malone, and Tad Anderson were taking the Master Forester Class taught by Lex Voorhoeve at Carkeek Park. We were assigned North Beach Park as our project.

In September, EarthCorps Science (Nelson Salisbury and Ella Elman) mapped North Beach Park and delineated the Habitat Management Unit boundaries.

At the end of 2011, Friends of North Beach Park had had 55 adult and three youth volunteers, for a total of 165 hours. We had planted a grand total of 13 shrubs and 8 herbaceous plants, and had more than 0.05 acre in active restoration.

In terms of public engagement, Luke spoke to the Olympic Manor Community Association and the Ballard High School "YES" (YMCA Earth Service group). There was a post to MyBallard.com in November about the restoration efforts (Mhoon, 2011). Friends of North Beach Park also began working with the Seattle Parks Foundation as fiscal sponsor.

2012

The Master Forester class concluded with a successful three-part presentation about restoration of North Beach Park. This was the same day as the work party would have been, so there was no 4th Saturday work party in January of 2012. However, January 2012 did have a very successful work party and trash removal with a group of 8th graders from a University District alternative middle school, on their "Rite of Passage" program. This was the largest amount of trash removed during a single work party.

Figure 6: Rite of Passage students

Early February featured the first annual Friends of North Beach Park potluck, which includes forest stewards and volunteers from Carkeek and Golden Gardens, as well as North Beach Park. At that potluck, we formed an official steering committee of seven.

In summer 2012, an independent forest steward worked in the South Plateau, a large, flat area about 80 feet above the main park. Working with residents of the Labateyah community, they cleared most of the ivy and blackberry off the .57 acre plateau in one summer of weekly work parties. They installed steps into the park, and had plans for a native plant demonstration garden modeled after the garden outside Daybreak Star Indian Center. However, when the rains returned, we found out that the South Plateau received street runoff that accumulated for blocks. The Parks Department had to remove the steps and put in fascines and rip rap. See "South Plateau" in the "Uplands and Slopes" chapter.

Also in the summer of 2012, Doug Gresham, of Gresham Environmental, delineated the wetlands. GPS points for the delineation flags were later established with Nelson Salisbury of EarthCorps Science.

In September of 2012, "Knotweed Hill" was created by Luke and a group of middle schoolers who were on a field trip to the park. They cleared a large area of ivy underneath a canopy gap. Before the clearance, the ivy had covered up some of the steepness of the slope. Removing the ivy revealed the slope to be much too steep for inexperienced volunteers. Also, we had been working on private property without realizing it. This lead to Luke, Drexie, and Tad spending many weekdays in the park, staking down burlap sacks, and workparties where dikes were built across the slope.

At the end of 2012, Friends of North Beach Park had had 343 adult and 162 youth volunteers, for a total of nearly 1150 volunteer hours. We had planted 227 trees, 112 shrubs, and 105 herbaceous plants. Nearly three-quarters of an acre was in restoration.

Public outreach in 2012 included tabling at "Art in the Garden" for the first time, and tabling at "Sustainable Ballard" with the Green Seattle Partnership. "Art in the Garden" is a neighborhood event located very close to the park. We meet neighbors of the park, including people who played in it as children. "Sustainable Ballard" is a much larger event, for the Ballard area as a whole. At this event, we're helping Green Seattle Partnership promote Green Seattle Day (the first Saturday in November).

In 2012, FoNBP participated for the first time in the Seattle Foundation "GiveBIG" day of online giving.

2013

2013 featured many different groups working in North Beach Park: EarthCorps, Parks Department contract and Natural Area crews, and Friends of North Beach Park.

EarthCorps

EarthCorps ran seven work parties in North Beach Park, from April through November. During this time, they mulched Knotweed Hill, and cleared along the trail from Headwaters Bowls through the Central Valley. During the planting work party, they added density to both sides of the trail through their cleared areas, and added density to Knotweed Hill.

Figure 7: EarthCorps volunteers mulch Knotweed Hill.

Contract Crew

The Parks Department Natural Area and contract crew worked on the North Slope, removing invasives, putting done jute net and coir logs, and planting. On the South Plateau, they installed rip rap, meanders, and fascines to help control the erosion. They also helped clear a trail of fallen alder trees.

Friends of North Beach Park

The FoNBP had their second annual potluck, again with forest stewards from other NW area parks, including Llandover Woods.

There were ten 4th Saturday work parties in 2013: January – April, June – November. The January work party featured some plants donated from the Swanson's Nursery "Trees for Salmon" program.

By the end of 2013, most of the safely accessible trees in the park needing ivy survival rings had been protected.

2013 had 189 adult and 20 youth volunteers, for a total of nearly 665 hours. Friends of North Beach Park planted 346 trees, 672 shrubs, and 675 herbaceous plants.

More than half an acre was brought into restoration, and nearly 1½ acres were in Phase 2 and Phase 3 of restoration.

Public outreach included an article in the Ballard News-Tribune (Bryan, 2013) and tabling at "Art in the Garden" and "Sustainable Ballard."

2014 (to date)

The start of 2014 featured nearly 200 extra plants from the Parks Department. The summer work parties have concentrated on after care of plants, mostly watering and weeding to help them deal with the heat stress of June and July.

There were numerous site reviews, from Seattle Public Utilities (with their drainage and wetland scientist), a big site review with the Parks Department to talk about target forest types, the South Plateau, and to plan crew time for the next couple years.

The forest stewards returned to working in the South Plateau once a month. We also wrote a letter to the neighbors of the South Plateau explaining our plans.

In June, we executed a cross-gradient belt transect, crossing three HMUs and going from the highest points on the rim to the lowest points of the park floor. The information this provided is used throughout this report.

In July and August, Friends of North Beach Park participated in Groundswell NW's open space inventory.

Public outreach this year has been limited to "Art in the Garden," which was very successful for us.

FoNBP participated in the Seattle Foundation's "GiveBIG" day of online giving again, and raised more than $800.

Grants and Recognition

November, 2012: Microgrant from Groundswell NW. Used for tool purchase and to publish a newsletter.

April, 2014: "Local Hero" award from Groundswell NW to Luke McGuff and Friends of North Beach Park.

June, 2014: Stewardship Grant from the Washington Native Plant Society – Puget Sound Chapter, for wetland plant purchase.

—: Elisabeth Carey Miller Scholarship in Horticulture, awarded by the Northwest Horticulture Society.

References

Alley, J. 1970. "North Beach Community Meeting." (Internal memo to Hans A. Thompson). February, 1970, Box 40, Folder 27, Record Series 5804-05, Seattle Municipal Archives

Apostol, D. and D.R. Berg. 2006. "Riparian Woodlands." In *Restoring the Pacific Northwest: The Art and Science of Ecological Restoration in Cascadia.* Island Press, Washington, D.C.

Bradley, J. 1991. "Bringing Back the Bush: The Bradley Method of Bush Regeneration." Ure Smith Press, Willoughby, NSW, Australia.

Bryan, Z. 2013. "Restoring North Beach Park." Ballard News-Tribune, Vol. 121 No. 16.

Crowley, W. 2006. "Seattle – Thumbnail History." Historylink.org. http://www.historylink.org/index.cfm?DisplayPage=output.cfm&file_id=7934 [accessed July 18, 2014]

Fiset, L. 2001. "Seattle Neighborhoods: Crown Hill – Thumbnail History." Historylink.org, http://historylink.org/index.cfm?DisplayPage=output.cfm&file_id=3452 [accessed July 18, 2014].

King County Engineer's Office, 1930. "24 Ave NW Grading and Graveling." Engineering map. Seattle: Map number 16-56. King County Road Services Map Vault. http://www.kingcounty.gov/mapvault (accessed June 26, 2014)

— 1937. "1937 Aerial Survey" Aerial photograph. Seattle: Map number 260335. King County Road Services Map Vault. http://www.kingcounty.gov/mapvault (accessed June 26, 2014)

Madden, H. 2010. "From Legends to Lights, the Story of Olympic Golf Club." Crown Hill Neighborhood Association. http://crownhillneighbors.org/wp/2010/05/from-legends-to-lights-the-story-of-olympic-golf-club/ [accessed July 18, 2014].

Malone, T. 1988. "Letter to Ms. H. Miller." Active files of the Seattle Department of Parks and Recreation, Property and Acquisitions Services.

Mhoon, K. "Volunteers Continue Cleanup at North Beach Park." http://www.myballard.com/2011/11/01/volunteers-continue-cleanup-at-north-beach-park/ [accessed August 19, 2014]

Planning Division, Department of Community Development. 1969. "Summary and Recommendations from the Survey of Vacant and Undeveloped Natural Ravine and Creek Sites within the City of Seattle." September, 1969. Box 40, Folder 27, Record Series 5804-05, Seattle Municipal Archives

Seattle Department of Parks and Recreation. n.d. "North Beach Park." http://www.seattle.gov/parks/park_detail.asp?id=247 [accessed August 19, 2014]

Whitman, J. E. 1970. Letter to Hans A. Thomspon. February, 1970, Box 40, Folder 27, Record Series 5804-05, Seattle Municipal Archives.

Williams, D.B. n.d. "Donald Harris '70: Making the Emerald City greener." University of Puget Sound Office of Communications. http://www.pugetsound.edu/about/offices-services/office-of-communications/arches/back-issues/arches-archive/summer-2004/donald-harris-70/ [accessed August 19, 2014]

Wong, D. 2008. "Neighbors upset over illegal trails." Ballard News-Tribune, Vol. 116 No. 21.

— 2008a. "North Beach gets help to stay green." Ballard News-Tribune, Vol. 116 No. 27.

Stakeholders and Volunteer Network

Stakeholders are users of North Beach Park, homeowners who live on the rim of the park, and any individual or organization concerned with its restoration. Some, such as dog walkers or joggers, might not consider themselves stakeholders, but they still benefit from the restoration. Others, such as the forest stewards, take an active hand in the restoration.

Supporting Organizations

A number of supporting organizations help Friends of North Beach Park ("FoNBP") in its restoration efforts. These descriptions focus on what the organizations do for North Beach Park and do not attempt to describe the entire organization. For more information, visit their websites, listed in the references section. After FoNBP, the listing is alphabetical.

Friends of North Beach Park

FoNBP sponsors and coordinates the monthly 4th Saturday work parties, and does the Monday morning forest steward work parties. FoNBP is responsible for the long-term planning of the restoration of North Beach Park. The actions of FoNBP are detailed in "Restoration History" in "Park and Restoration History."

EarthCorps

EarthCorps mapped North Beach Park in 2011 and provided GPS assistance with the wetland delineation. It sponsored seven work parties in NBP in 2013. It also coordinates the city-wide forest monitoring program.

Fellow Stewardship Groups

Three nearby stewardship groups have also helped Friends of North Beach Park. They are Carkeek Park STARS (Streams, Trails, and Restoration Stewards), Golden Gardents GGREAT (Golden Gardens Restoration and Trails), and Friends of Llandover Woods. They have assisted in providing tools, volunteers, expert assistance and mentoring, and plant storage. (There are no websites for these groups.)

Green Seattle Partnership

Green Seattle Partnership provides training, resources, materials, logistical support, best management practices, plants, and coordination with the Parks Department. It was formed in 2005 with a 20 year plan to have 2,500 acres in Seattle's forested parks and nature areas in restoration.

Groundswell NW

Groundswell NW provides financial and logistical support to park and greenspace community efforts in Ballard and other NW neighborhoods. The first grant assistance FoNBP received, a "microgrant" of $500 in 2012, was from Groundswell NW. Groundswell NW also awarded Luke McGuff one of two "Local Hero" awards for 2014. FoNBP assisted Groundswell NW with its open space inventory in the summer of 2014.

Seattle Parks Foundation

Seattle Parks Foundation provides financial support, grantwriting assistance, and 501(c)3 fiscal sponsorship for FoNBP and numerous other "Friends of" groups. It also coordinates such programs as the South Park Green Vision and was a major player in bringing the Metropolitan Parks District to a vote.

Washington Native Plant Society

The WNPS – Puget Sound Chapter has provided assistance with Plant ID and volunteers. It also awarded FoNBP its second grant, $500 for stewardship of the wetlands.

Other Stakeholders

The remaining stakeholders take a more passive role in the restoration of North Beach Park, but still have a valid concern for the restoration's success.

Neighbors of the Park

Neighbors of the park are the homeowners who live along the rim of the ravine. There are two small gated communities: Olympic Terrace on 24th Ave. and Fletcher's Village on 28th Ave. As far as we know, only one person who lives on the park has come to a work party, although some are on the email list. We have done physical mailings to all the neighbors of the park twice, and a special mailing to the people who lived near the South Plateau once. The Olympic Terrace parcel boundaries extend into the park.

In many cases, the boundary lines between the neighbors and the park are obscure. Sometimes that is due to the parcel line being on a very steep part of a slope. In one or two cases, it's because the homeowner has deliberately obscured it. There is one fence in the Fletcher's Slope HMU.

One neighbor drains their roof run off into the stream. Another has a large patch of *Lamium galeobdolon* (Yellow archangel) growing from their property into the park.

Contact with neighbors has been limited. One was upset with some clearing done on the slope underneath his house but has since been mollified with the subsequent work. We've talked to two who are concerned that we will "open up" the park.

Efforts to contact and work with the homeowners around the park continue. Lack of neighbor participation has felt frustrating at times, but contact, at least, is improving.

Users of the Park

North Beach Park is underutilized. A better trail system would increase users, but the sides of the ravine are too steep to support trails, and the soil structure is too friable when dry. Although we've seen all the groups below in the park at one time or another, we never see more than a two or three people an hour, and sometimes nobody else.

There is no evidence of anyone currently living in the park.

North Beach Elementary

Students from North Beach Elementary, located across the street, occasionally visit the park when school is in session. In the fall of 2012, we tried to arrange regular visits with the first and second grade classrooms, but scheduling became too difficult. A fourth grade teacher would take her students through every month, but she was transferred to kindergarten. Starting in the fall of 2014, North Beach Elementary will be temporarily relocated to a school in Wallingford while it is rebuilt.

Dog Walkers and Joggers

These are the users we see most often in the park. Of these two, dog walkers are more common than joggers. And, luckily enough, the majority of dogs are leashed.

Adolescents

Evidence of adolescent use of the park is more circumstantial than concrete. There is graffiti on the trees and sometimes marijuana paraphernalia. The fresh litter looks like it was from adolescents -- candy bar wrappers and juice bottles.

Volunteer Network

Friends of North Beach Park has been as successful as it has been because of the people who live near (but not on) the park and frequently come to work parties. Our work parties are usually five to seven people, a good number for the spaces we work in. We have a semi-regular crew of people who attend eight out of ten work parties a year. This greatly improves the consistency and amount of work we're able to do.

FoNBP has tried many avenues to get volunteers for our work parties. We feel the best approach is to consider it like sowing seed: try a lot of things, and some of them will take.

Email

Everyone who signs in to a volunteer event is added to the email list for the park. We send out one large email announcing the work party, generally two weeks in advance. It usually includes some other information about the park or about other organizations. Shortly after a work party, an email is sent to the attendees with a little report.

This email list is maintained by hand, so to speak, using the contacts in Yahoo! mail. FoNBP will be switching to a contact manager program soon.

Tabling

FoNBP has tabled at two different community events, three times at "Art in the Garden" and twice at "Sustainable Ballard."

"Art in the Garden" is our most successful outreach event. It is located in the Ballard p-patch, at 25th Ave. and 86th St. This is very close to North Beach Park, and many of the people who stop at our table have been there. Success at this event is getting names for our email list. Most important in 2014 was making contact with a neighbor of the South Plateau and meeting someone who had lived near the park and illicitly maintained the social trails (he's since moved away). We consider this very worthwhile, but also very pleasant.

"Sustainable Ballard" is held on a Sunday in late September at Ballard Commons Park. FoNBP has tabled at this event twice with Green Seattle Partnership, to promote Green Seattle Day (first Saturday in November). The first time was very successful, as the weather was beautiful and the festival was jammed with people all day long. The GSP liaison at the table was very satisfied with the number of names we were getting for their mailing list. The second time was much less successful, as it was cold and drizzling rain all day. The organizers tried to group presenters into "alleys," with the idea we'd put our canopies together in such a way that people could stay dry as they walked between tables. Unfortunately, none of the other presenters in our alley had canopies so we attracted very little attention.

Print

Up until recently in 2014, Ballard had its own newspaper, the Ballard News-Tribune. There was a front-page article about Friends of North Beach Park that at least produced a very nice picture.

Print (as in newspapers) is not a viable option for promoting work parties. The surviving newspapers (both weekly and daily) only print parks-related news items when it fits their agenda.

Blog posts

In 2011 the Ballard blog, MyBallard.com, was very active and posted a couple stories a day. It had an avid readership, and got many comments, both on its own site and on Facebook. MyBallard posted a few articles about Friends of North Beach Park. In 2012, the editors were forced by economic circumstances to make the blog part time, which decayed it considerably.

"Nature Intrudes" is a blog written by Luke McGuff. It has reviews of books about restoration, occasional think pieces, and news about North Beach Park.

Service Groups

There are many service groups in the Seattle area that are potential sources of volunteers.

OneBrick Seattle

This is the local group of a nationwide organization. The focus of OneBrick is to get people in their 20s and 30s to volunteer. They use social media extensively, and have a large online presence on Facebook, Twitter, and the web.

Four volunteers from OneBrick participated in a work party with Friends of North Beach Park. Considering the time of year (July) this was a good turn-out. And it was appropriate for the amount of work we had to do.

We might work with OneBrick again in the future.

YMCA Earth Service Corps (YESC)

YESC is a city-wide program to attract environmentally interested high school students into service programs. Most of the programs focus on on-campus projects, but some groups work with forest stewards on restoration projects.

FoNBP spoke to the Ballard HS YESC chapter in 2011, and three members attended a work party, but follow-up attempts at contact haven't worked out.

High School Community Service

All high school students in Seattle are required to do some community service. Only Ballard HS has a community service coordinator, however. FoNBP has work parties listed in the Ballard HS community service newsletter.

Private high schools also frequently have a community service requirement. We need to contact these high schools individually.

College service groups

FoNBP is working with Seattle Pacific University to participate in their annual "City Quest" program. This will be the September work party. We are having it in the South Plateau, which has room for a large number of volunteers. If this works out, it might become an annual thing.

ESRM 100 students

Our experience with ESRM 100 students appears to be better than most. We get a few students and they usually work well. It might be because they have to travel across the city to get to NBP work parties, as opposed to walking down from the dorm.

Other UW groups

We plant to start working with other UW groups, particularly the fraternity and sorority umbrella organizations, and ENVIR 100 students, in the fall.

Corporate community service

FoNBP did have one large, fun work party with Nordstrom employees. However, the size of the spaces available to all volunteers precludes corporate events.

References

Art in the Garden: http://ballardppatch.org/art-in-the-garden/

EarthCorps: http://www.earthcorps.org/

Friends of North Beach Park: http://www.natureintrudes.net/

Green Seattle Partnership: http://greenseattle.org/

Groundswell NW: http://www.groundswellnw.org/

OneBrick Seattle: http://seattle.onebrick.org/

Seattle Pacific University CityQuest: http://www.spu.edu/depts/perkins/students/cityquest/

Seattle Parks Foundation: http://seattleparksfoundation.org/

Sustainable Ballard: http://www.sustainableballard.org/

YESC: http://www.seattleymca.org/Locations/YESC/Pages/Home.aspx

Habitat Management Units and Target Forest Types

Habitat Management Units

Green Seattle Partnership splits each park into different zones called "habitat management units" (HMUs). This allows GSP to assign different target forest types and reference ecosystems to the different HMUs, and the forest stewards to use techniques and approaches best suited to each HMU.

North Beach Park is split into 11 HMUs; nine of these are discussed in this document. The other two are only accessible by crossing private property lines.

The HMUs were delineated by Nelson Salisbury and Ella Elman when they mapped North Beach Park for EarthCorps in late summer of 2011. The names of the HMUs were decided by the forest stewards. All of the names are descriptive in some way.

The HMUs in North Beach Park are based on two basic characteristics: slopes and uplands, and wetlands. There is some mixture: all the wetland areas contain some upland slopes, and the upland areas frequently contain some seeps or wet areas in their lower regions.

Within these two divisions, slopes and uplands are assigned their name based on nearby property (ie, Fletcher's Slope is below Fletcher's Village, 91st St. Slope is below 91st St.; 92nd St. Wetlands is below 92nd St.), characteristics (the South Plateau is the largest flat area of the park and 80 feet above the rest of the park), or aspect (South Slope, West Slope, North Slope). The "Headwaters Bowl" is where the groundwater enters the park and begins to form the stream; the Central Valley is in the middle of the park.

Each of these HMUs received a reference ecosystem at the time of mapping, based on broad category of the plant species seen. There are two reference ecosystems for NBP: "mesic-moist conifer and conifer-deciduous mixed forest" and "riparian forest and shrubland." These are based on NatureServe classifications.

Table 1 shows the nine HMUs discussed in this book sorted by size, and listed with their target forest type and reference ecosystem. The target forest types are explained in "Target Forest Types," below.

Table 1: Habitat Management Units of North Beach Park.

Name	Size	Target Forest Type	Reference ecosystem
Central Valley	1.97	ALRU/RUSP/CAOB-LYAM	Riparian forest and shrubland
Headwaters Bowl	1.39	ALRU/RUSP/CAOB-LYAM	Riparian forest and shrubland
North Slope	1.14	TSHE-PSME/POMU/DREX	Mesic-moist conifer and conifer-deciduous mixed forest
West Slope	0.84	TSHE-PSME/POMU/DREX	Mesic-moist conifer and conifer-deciduous mixed forest
South Slope	0.76	TSHE-PSME/POMU/DREX	Mesic-moist conifer and conifer-deciduous mixed forest
92nd St. Wetlands	0.69	THPL-TSHE/OPHO/POMU	Mesic-moist conifer and conifer-deciduous mixed forest
South Plateau	0.57	TSHE-PSME/POMU/DREX	Mesic-moist conifer and conifer-deciduous mixed forest
91st St. Slope	0.54	TSHE-PSME/POMU/DREX	Mesic-moist conifer and conifer-deciduous mixed forest
Fletcher's Slope	0.53	TSHE-THPL-ACMA/ACCI/ LYAM	Riparian forest and shrubland

The Central Valley, Headwaters Bowl, and 92nd St. Wetlands are all discussed in the "Wetlands" chapter. The other six HMUs are discussed in the "Uplands and Slopes" chapter. Within each chapter, the HMUs are discussed in the order of greatest amount of restoration effort they have received.

Target Forest Types

Definition of Forest Types

Target forest types are reference communities for the forest steward to target in their plant selections.

The "forest type" is based on research by Chappell (1999, 2006) for the Washington Department of Natural Resources. Each forest type is based on an observed community in areas that are as undisturbed as possible. Chappell's research concentrates on the Puget Trough Ecoregion (the lowland areas surrounding the Puget Sound), the region Seattle occupies. Selecting which forest

types specifically applied to Seattle was based on research by Larson (2005) and by using a key based on GSP inventory site data (Denovan 2012). There are currently twenty-three target forest types assigned to Seattle forests and natural areas. Four of these (discussed below) have been assigned to North Beach Park.

The name of the target forest type is derived from the dominant plant species at every canopy layer. The species are listed by their four letter code in the order of constancy with which they occurred in the sampled plots. Dashes separate species at the same canopy layer, slashes separate canopy layers.

For example, "THPL-TSHE/OPHO/POMU" is *THuja-PLicata – TSuga HEterophylla / OPlopanax HOrridus / POlystichum MUnitum*" (Western red-cedar – Western hemlock/Devil's club/Sword fern). This means that there was more Western red-cedar than hemlock in the sampled plots, Devil's club is the dominant species at the shrub layer, and sword fern the dominant species at the groundcover layer.

A long list of forest plant associations can look bewilderingly similar. The diversity comes with the non-dominant species, especially at the herbaceous level.

Why Target Forest Types

Target forest types were selected by Parks Department plant ecologists to promote heterogeneity among the natural areas undergoing restoration in Seattle. They noticed that, over the years at the city scale, plant selections were very similar.

At first, target forest types were promoted as prescriptive; that is, forest stewards had to consider the TFTs for their park a goal, and select their plants accordingly.

This lead to pushback and confusion from forest stewards. Now forest types are grouped into the seven reference ecosystems as a more general planting palette. Of the two reference ecosystems for North Beach Park, "mesic-moist conifer and conifer deciduous mixed forest" has four target forest types; "riparian forest and shrubland" has nine.

All information about the target forest types is taken from the descriptions by Chappell at the website referenced below. The descriptions are attached to this book as Appendix C, "Target Forest Type Descriptions." The TFTs are discussed in the order of number of HMUs to which they are assigned.

TSHE-PSME/POMU-DREX

This target forest type is assigned to the following HMUs: North Slope, 91st St. Slope, West Slope, South Slope, South Plateau.

This forest type is dominated by Western hemlock and Douglas-fir at the canopy level, with sword fern and spreading wood fern at the ground cover level. It is found almost everywhere in the Puget Trough except in San Juan County.

This association is found in moist sites with nutrient-rich soils, and more commonly on lower slopes and riparian terraces. This relates well to the reference ecosystem of mesic-moist conifer and conifer-deciduous mixed forest.

Other plants in this community include *Berberis nervosa* (Dull Oregon-grape) which grows with sword fern in many places in North Beach Park.

Chappell says that Red alder regenerate after disturbance and that alder typically die out after 80-100 years. The alder canopy in North Beach Park is very mature, and is decaying at the rate of one to three trees per year.

ALRU/RUSP/CAOB-LYAM

This target forest type is assigned to the Central Valley and Headwaters' Bowl HMUs.

This forest type has *Alnus rubra* (Red alder) almost exclusively in the canopy layer, with a dense shrub layer formed mostly of *Rubus spectabilis* (salmonberry). The herbaceous layer is dominated by *Tolmiea menziesii* (piggyback). We saw this combination pretty continuously through the Central Valley during the belt transect.

In North Beach Park both *Carex obnupta* (slough sedge) and *Lysichiton americanum* (skunk cabbage) were growing before restoration, but not together. In general, the herbaceous layer in these HMUs is not as well developed as described for this community.

Chappell describes this community as existing in palustrine scrub-shrub wetlands, which fits with the riparian forest and shrubland reference ecosystem.

THPL-TSHE/OPHO/POMU

This forest type has *Thuja plicata* (Western red-cedar) and *Tsuga heterophylla* (Western hemlock) dominant in the canopy layer, with *Oplopanax horridus* (Devil's club) in the shrub layer and *Polystichum munitum* (Sword fern) in the ground layer.

Red alder and Big leaf maple are the current dominant trees in the canopy of North Beach Park. The 92nd St. Wetlands, to which this target forest type is assigned, is the only HMU where the coniferous canopy cover is more than 10%.

Although Chappell rates this community as secure at both the global and state level, he says there are "very few good quality stands remaining."

We attempted to reintroduce Devil's club into the park from seed but were unsuccessful. We look forward to reintroducing it soon, perhaps as part of the Washington Native Plant Society Stewardship Grant.

TSHE-THPL-ACMA/ACCI/LYAM

This forest type is assigned to the Fletcher's Slope HMU.

Unlike the rest of the target forest types assigned to North Beach Park, this forest type is based on research by Kunze (1994). In general, Chappell is preferred because he provides constancy across sampled plots and percent cover of all species. Kunze provides percent cover for only indicator species. All information below was taken from a PDF excerpt of her work supplied by Green Seattle Partnership and attached as part of Appendix C, "Target Forest Type Descriptions."

In North Beach Park, Fletcher's Slope has greater than 10% Western hemlock in the community, with some Douglas-fir. Kunze says either TSHE or THPL can dominate this community. *Acer macrophyllum* (Big leaf maple) is the dominant deciduous tree in the dryer sections of the park. *Lysichiton americanum* (skunk cabbage) grows throughout the park, but we have not seen *Acer circinatum* (vine maple) that wasn't planted during restoration activities.

This once-common community has few undisturbed examples. Kunze describes it as occurring in conditions that are very similar to North Beach Park: on flat ground, in depressions, with small streams and seeps, with the water level at or slightly below the soil surface.

Adapting the TFT concept to specifics of North Beach Park.

Examining the target forest types above against the current conditions in North Beach Park indicates that more restoration needs to happen at the herbaceous level. To date, we've concentrated mostly on the tree and shrub layers. We plan to increase our reintroduction of under-represented herbaceous plants.

Putting different forest types into the buckets of reference ecosystems both allows for a greater planting selection and strategy, and perhaps even a climate change adaptation.

Research with grasslands shows that productivity increases with biodiversity (Tilman, 2001). Making several TFTs available for every reference ecosystem can help with climate change and prevent biodiversity loss through both *component redundancy* (increased species and community redundancy) and *functional redundancy* (introduction of ecologically equivalent species or novel associations) (Dunwiddie 2009).

References

Chappell, C.B. 1999. Ecological Classification of Low-Elevation Riparian Vegetation on the Olympic Experimental State Forest: A First Approximation. Washington Department of Natural Resources, Natural Heritage Program, Olympia , Wash.

— 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Natural Heritage Rep. 2006-01. Washington Department of Natural Resources, Natural Heritage Program, Olympia , Wash. [http://www1.dnr.wa.gov/nhp/refdesk/communities/].

Dunwiddie, P.W., S.A. Hall, M.W. Ingraham, J.D. Bakker, K.S. Nelson, R. Fuller, E. Gray. 2009. "Rethinking Conservation Practice in Light of Climate Change." Ecological Restoration 27:3 320-329

Kunze, M. 1994. Preliminary Classification of Native, Low Elevation Freshwater Wetland Vegetation in Western Washington. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA.

Larson, R.J. 2005. The Flora of Seattle in 1850: Major Species and Landscapes Prior to Urban Development. (Unpublished thesis).

Tilman, D., P.B. Reich, J. Knops, D. Wedlin, T. Mielke, C. Lehman. 2001. "Diversity and Productivity in a Long-Term Grassland Experiment." Science, Vol. 294, 843-845

Denovan R., and Salisbury, N. 2012. GSP Target Forest Type Assignment Key Using GSP Site Inventory Data. (unpublished document)

Monitoring Protocols and Success Metrics

Green City Monitoring Protocol

In order to evaluate progress, Green City Partnerships have established a set of forest monitoring protocols to be used in Green City restoration sites (Green City Partnerships, 2012).

This protocol establishes a 1/10 acre circle in an area just before restoration begins. The location of the plot is recorded by the GPS coordinates of the center of the circle, walking directions from the entrance to the park or a nearby major landmark, and the bearing of at least two reference objects from the middle of the circle.

The circle is split into four quadrants, and the following data are collected:

- Height, DBH (diameter at breast height), species, and health of trees.
- Percent cover of all shrub and undergrowth plants, native or invasive.
- Snags and coarse woody debris, grouped into three decay classes.
- Basic site characteristics, such as slope, aspect, soil compaction and moistness, canopy cover, general habitat type.
- Photographs of the monitoring site are taken at the cardinal directions (Green City Partnerships, 2012).

Percent cover is usually decided by consensus of the people working on the plot, and is reported in broad categories (i.e., "1-5%," "6-15%") to standardize data recording across the city.

The first report establishes a pre-restoration baseline. Ideally, the plot would be visited once a year for three years during the same month of that the baseline was taken. Budget and logistical constraints make that infeasible. After the fourth visit, monitoring drops to once every five years.

Green City forest monitoring is a citizen science project. The volunteers are knowledgeable about native plants, or taking the opportunity to learn more. Many of the volunteers are forest stewards themselves.

A practical minimum for this monitoring protocol is three people: two observers and one recorder. A good number is five, which has one observer in each quadrant and one recorder. Larger groups don't make the process happen faster, but do make the observations more complete.

The data is entered into a web form, and at the end of the summer, summary reports are sent to the monitoring team and the forest steward (see Appendix C, "Forest Monitoring Reports"). GSP uses this data to assess restoration progress and to assign restoration phases to a restoration site (which is generally a subset of a Habitat Management Unit). See "Success Metrics," below.

North Beach Park has three official forest monitoring plots, one each in the South Plateau, the Headwaters Bowl, and the Central Valley. These plots were initially established in 2012 and revisited in 2013. Two more plots, each 1/2 the standard, in the Central Valley and the 92nd St. Wetlands, were established as training exercises for an Edmonds Community College class in 2013.

For discussions of the data from these reports, please see the South Plateau section of "Uplands and Slopes" and the Headwaters Bowl, Central Valley, and 92nd St. Wetlands sections of "Wetlands."

Belt Transect

Introduction

In June, 2014, forest stewards and volunteers performed a cross-gradient belt transect of North Beach Park, following the 90th St. right of way (see Figure 1, below). This area for the transect was selected because it crosses every gradient of the park, from highest to lowest, and three habitat management units: the West Slope, the Central Valley, and the North Slope. It is also the only cross-gradient transect route that stays completely on public property.

On the West Slope, 4' square plots were established; in the Central Valley and the North Slope, the plots were 4'x16'. The plots were established every 40' on alternate sides of the transect line, and situated 2' off the transect line to avoid trampling. For each plot, we listed species found and percent cover. Per cent cover included mature canopy trees leaning over the plot. The transect provided data for comparing the unrestored state of the areas transected to their target forest types and target ecosystems. Although we were unable to take accurate GPS readings, the transect is still replicable given the definition of its space.

Figure 1: North Beach Park.

The green lines indicate park boundaries. The 90th St. Right-of-Way is the gap between the southern and northern halves of the park. Red lines indicate habitat management unit boundaries. (Source Green Seattle Partnership Reference Map on arcgis.com.)

Methods

In advance of the main survey, a transect line was established by two volunteers. Waypoints were established at intervals dictated by visibility and varied from 105' to 16'. The line was maintained using a compass.

The transect itself was done by seven volunteers. Three worked in advance of the sampling, setting up the plots. On the West Slope, because of its steepness and dense herbaceous cover, two plots, four square feet each, were set up. In the Central Valley, nine 4x16' plots were set up. On the North Slope, eight 4x16' plots were set up. Each plot alternated sides, and was two feet away from, the transect line. The plots were spaced 40 feet apart.

Two people did the plant identification, with one person making the decision about per cent cover for efficiency and consistency. A third person recorded all the details.

The last person recorded GSP data using the smartphone app GPS Test, version 1.2.9, by Chartcross Ltd. However, the nature of working in a ravine and the inaccuracy of the phone made

this data unreliable. Despite this, given the definite boundaries of the route, we think we can replicate the transect. See "Acknowledgments" for a list of participants.

The belt transect provided a wealth of data in comparison to the circle method of forest monitoring. We were able to compare results across eight plots in the Central Valley and nine on the North Slope. These results suggested methods for invasive removal and further monitoring based on the status of the areas transected. However, the logistics involved in preparing for the transect, and the size of crew necessary to implement it, make it much more difficult to execute than the circle method.

For a detailed discussion of the findings, please see the "West Slope" and "North Slope" sections of "Uplands and Slopes," and the "Central Valley" section of "Wetlands."

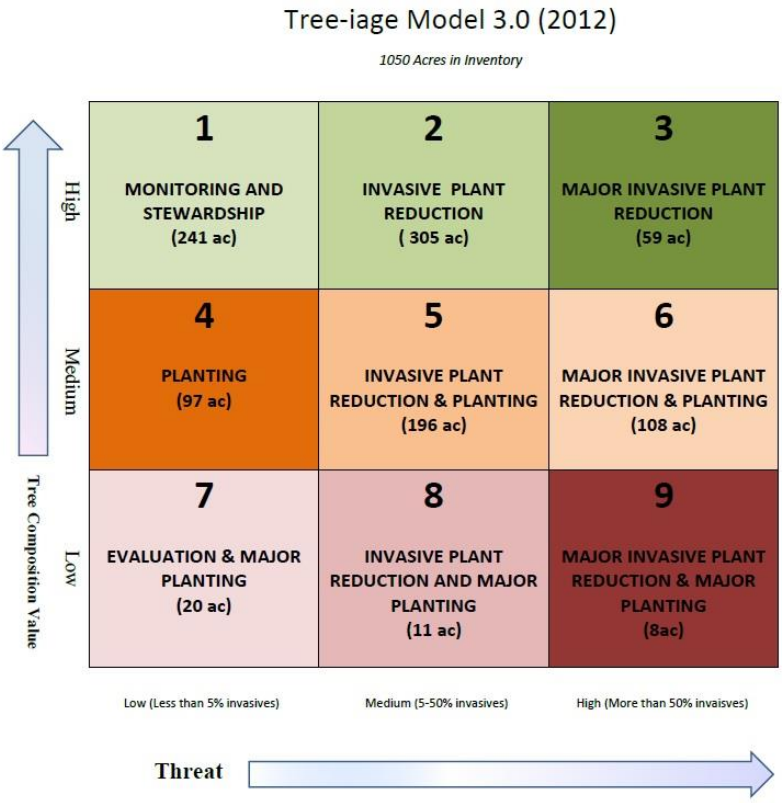
Success Metrics

Information in this section is taken from a variety of Green Seattle and Green City publications and unpublished materials provided by Seattle Department of Parks and Recreation Plant Ecologist. These are listed in the "References" section, below.

Tree-iage Grid

At the start of restoration, each HMU in a park is evaluated according to a 9-square "tree-iage" grid, rating from high composition/low threat to high threat/low composition. This helps GSP estimate how much time and effort the restoration will take. Please see Figure 2, below.

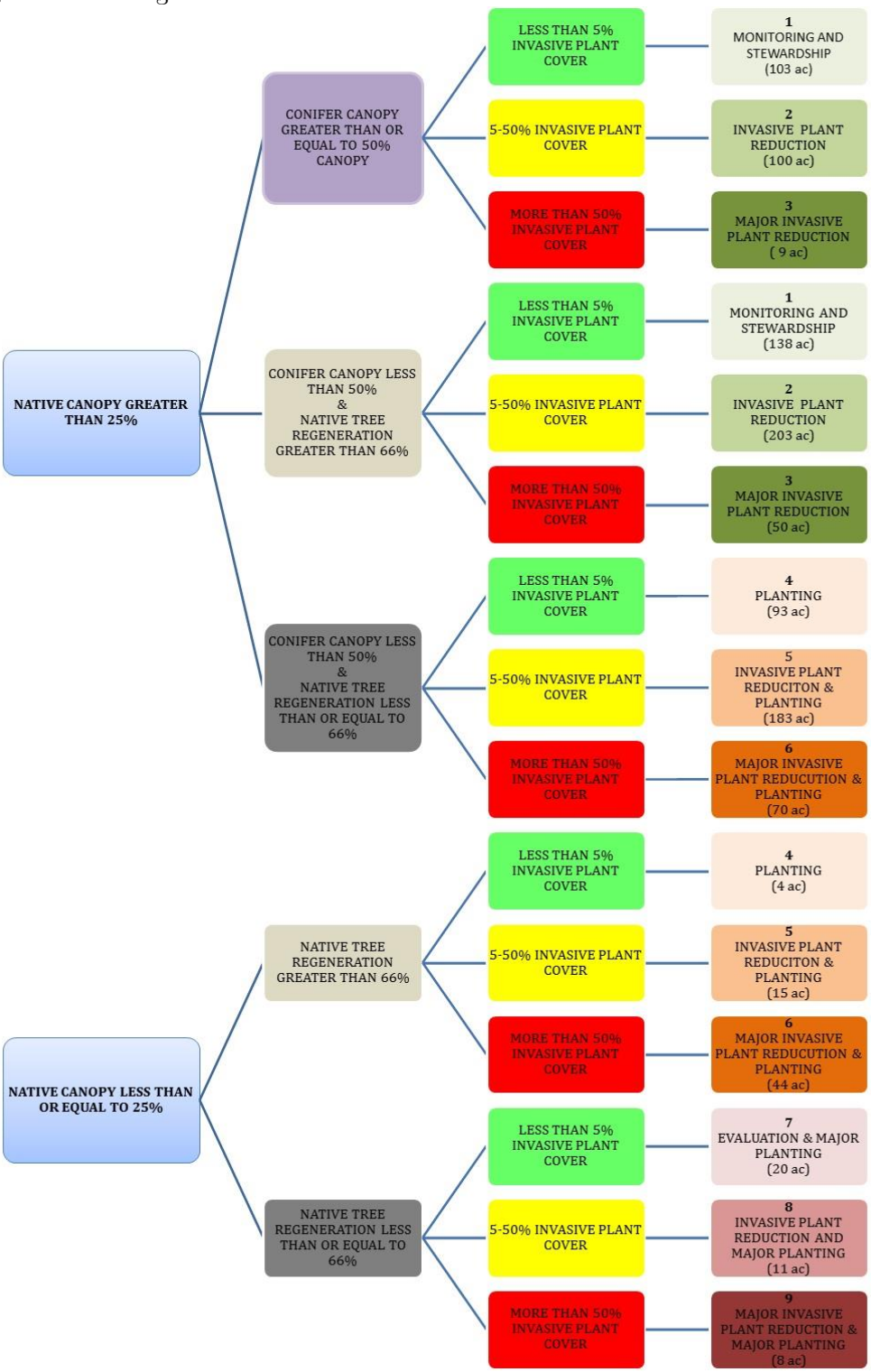
Figure 2: GSP Tree-iage grid



Source: GSP unpublished document.

To place an HMU into the tree-iage grid, the observer follows the flow chart in Figure 3, below. North Beach Park has a native canopy of greater than 50%, but the tree regeneration rate is very low. At the start of restoration, almost the entire park had areas of greater than 5% invasive cover, and many areas had greater than 50% invasive cover. This put most of the park in square 6 of the tree-iage grid. As of summer 2014, some areas (the areas in blue in Figure 4, below) have moved into square 4, and some areas that were in square 6 have moved into square 5.

Figure 3: Tree-iage evaluation flow chart



Source: Green Seattle Partnership.

Phases 1-3 Mapping and Assessment

Once restoration begins, that area is mapped as a restoration site in the larger HMU zone. Many large parks have HMUs of several acres, and restoration sites within those HMUs as large as the largest HMU in North Beach Park.

Green Seattle Partnership has four phases of restoration, to track and evaluate progress as a site is restored. The phases are listed in Table 1, below, along with their estimated average labor investment. A restoration site always starts out in phase 1. How long a site stays in the first three phases is suggested by its placement in the tree-iage grid. With North Beach Park starting in squares 5 and 6, the table below applies pretty directly.

Table 1: Green Seattle Partnership restoration phases

Phase	Tasks	Average Labor Investment
1	Invasive removal	400 hours/acre
2	Secondary removal and planting	100 hours/acre
3	Continued invasive removal, watering and mulching	40 hours/acre for up to three years
4	Stewardship and maintenance	5 hours/acre annually

Source: Green Seattle Partnership, 2012

Some acreage in Seattle has been provisionally approved for phase 4, but exactly what thresholds qualify for the transition from Phase 3 to Phase 4 is under discussion. Figure 4, below, shows the phases of restoration in North Beach Park.

Figure 4: North Beach Park by restoration phase.

Beige areas are not yet in active restoration. Phase 1 (invasive removal) is brown. Phase 2 (planting) is green. Phase 3 (establishment) is blue. Phase 4 would be dark green.

Deciding what phase a restoration site is in is determined by a number of factors:

- Work logs filled in by the forest steward, contract crew, or Parks staff.
- Volunteer hours on a site.
- GSP -protocol forest monitoring reports (discussed above).
- Visual inspection and transect by a GSP or Parks Department employee.

After a restoration event (which includes both public work parties and any restoration work done in a park), the forest steward enters data into a web form that includes information on volunteer attendance and total hours, square footage of area cleared, invasives removed, plants installed or watered, square footage of area mulched, and amount of maintenance activities.

Visual inspections and transects are currently on an 18-24 month cycle, with preference going to sites in Phase 1 or 2. Sites in Phase 3 might receive inspection at the longer end of the cycle. North Beach Park was last visited for phase evaluation in October and November of 2013.

The inventory protocols are very similar to the forest monitoring protocols discussed above, with the difference being that the monitoring protocols apply to samples within an HMU, and the inventory is done to an entire HMU. The inventory work is done during the same season as forest monitoring, mid-May through mid-October.

Each HMU receives a profile, taken while walking a transect. Depending on the size of the zone, it also receives a number of plots that assess regeneration or tree density. Because all the HMUs in North Beach Park are less than two acres, each HMU would receive one regeneration plot and two tree density plots.

The zone-wide measurements look at slope, aspect, soil conditions, litter depth, coarse woody debris, canopy cover and average tree diameter; and then special features such as trails, camps, wetlands, or dumps. The tree assessment tallies every native and non-native tree within sight of the transect, and giving estimated heights and DBH (diameter at breast height) measurements. The vegetation assessment records species and estimated percent cover for every species intersecting the inventory line.

The tree regeneration plots are 16' diameter circles, approximately 1/50th of an acre. Within that circle, all trees less than 5" DBH of every species are tallied and a per-species estimate of percent cover is taken.

The tree density plot starts with a tree close to the transect line greater than 5" DBH. This becomes the center of a circle, and the distance to the nearest 5 trees greater than 5" DBH is measured.

The phase-mapping assessment compares field observations of a site in restoration against work logs submitted by the forest steward. For phases 1-3, the observations are fairly basic. The assessment for phase 4 is much more rigorous and is discussed below.

Phase 4 Assessment

Phase 4 assessment is a more rigorous, quantitative assessment than Phases 1-3. If a site under consideration fails to meet any of the thresholds below, it is kept in Phase 3.

Table 2: Canopy Threshold for Phase 4 Assessment

Reference Ecosystem	Density (TPA)	Cover	Diversity	Regeneration	Regen. Diversity
Mesic-Moist Conifer and Conifer Deciduous Mixed Forest	100	80%	4	200	4
Riparian Forest and Shrubland	75	75%	2	125	2

NOTE: "TPA" is Trees Per Acre.

Table 3: Understory, Woody Debris, and Invasive Regeneration Threshold for Phase 4 Assessment

Reference Ecosystem	Cover	Diversity	Snag	CWD	Invasive Regen. Max (TPA)
Mesic-Moist Conifer and Conifer Deciduous Mixed Forest	50%	14	30	2,000	10
Riparian Forest and Shrubland	150%	14	20	3,000	10

NOTE: CWD is "Coarse Woody Debris" and the value is linear feet greater than 5" diameter.

The South Plateau is roughly half an acre. To apply these tables, the TPA, Regeneration, Snag, and CWD numbers would all be halved, but the percentages and diversity thresholds would remain the same.

References

Green City Partnerships. 2012. "Monitoring Data Collection Methods." Green City Partnerships, Seattle.

Green Seattle Partnership. 2012. "Forest Steward Field Guide." Green Seattle Partnership, Seattle.

— 2014. "Inventory Protocols 2014." Green Seattle Partnership, Seattle.

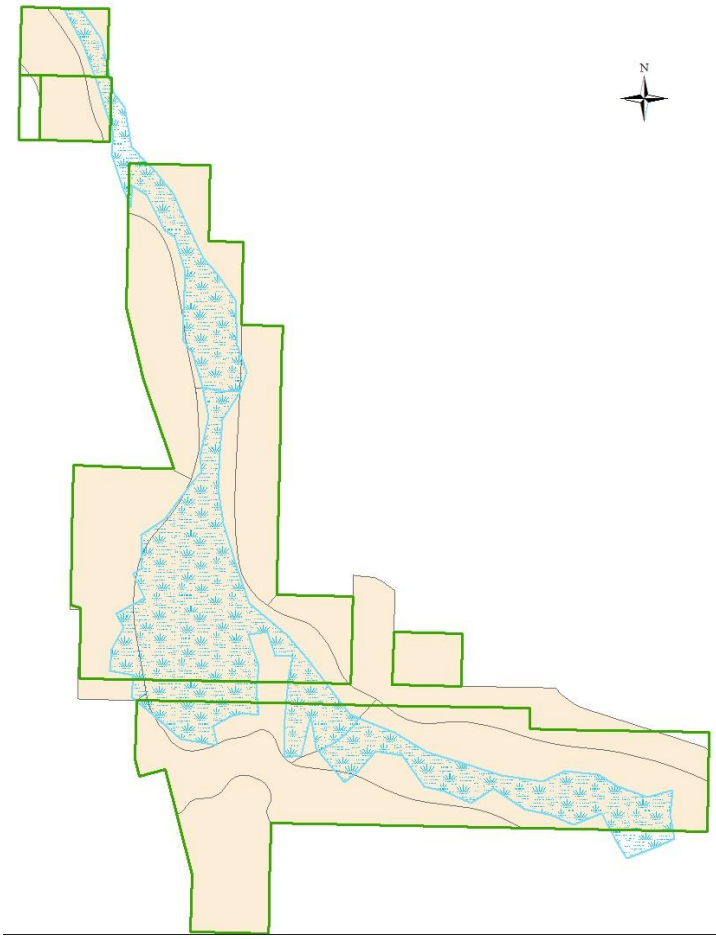
Wetlands

This chapter discusses the wetland-containing Habitat Management Units (HMUs) of North Beach Park. They are the Headwaters Bowl, the Central Valley, and the 92nd St. Wetlands. All three of these HMUs include upland slopes as well as wetlands, leading to a mixture of plants and plant communities.

Approximately 4.5 acres of North Beach Park are designated as wetlands. These wetlands are formed by broad, horizontal, groundwater seeps emerging from the sides of the ravine. These join to form the stream that leaves the park. The seeps are perennial, and have lasted through record droughts.

The wetlands have many areas that are permanently saturated, and walking in them quickly disrupts whatever soil structure there is. Other places are more stable.

Figure 1: Wetlands in North Beach Park



Thick green lines indicate park boundaries. Light grey lines indicate HMU boundaries. The filled blue area are the wetlands. Wetland delineation by Doug Gresham of Gresham Environmental (2012). (Map by the author.)

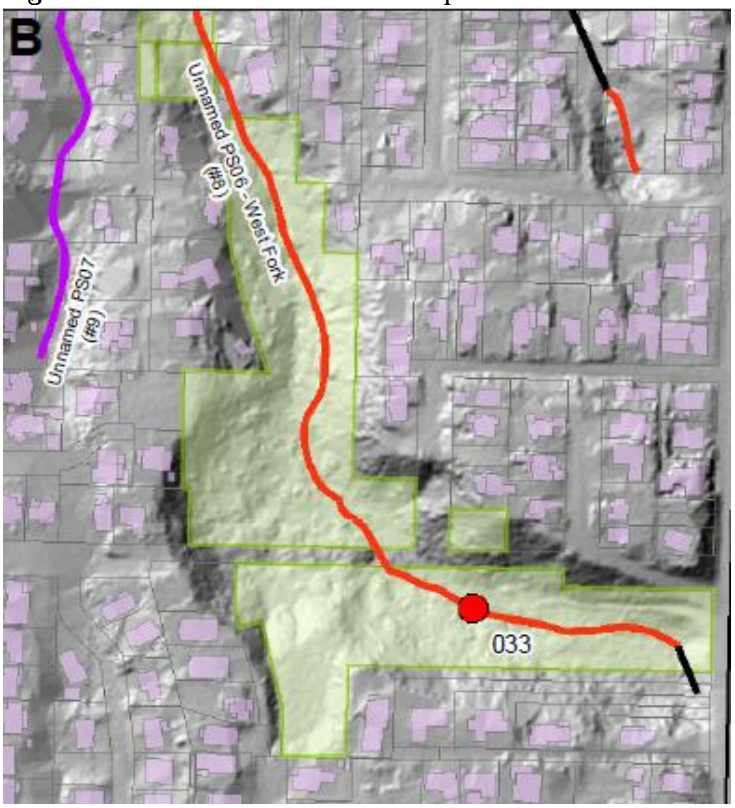
Doug Gresham, of Gresham Environmental, delineated and typed the wetlands in 2012:

> North Beach has both Palustrine (freshwater) and Riverine (riparian) wetlands. The plant community is scrub/shrub and the water regime ranges from saturated soil to permanently flowing streams. The groundwater seep wetlands would be called palustrine, scrub/shrub, saturated (PSSc). The stream would be called riverine, upper perennial, unconsolidated shore, permanently flooded (R3USh).
>
> The hydrogeomorphic classification system groups wetlands based on functions and values. ... The groundwater seep wetlands would be called slope wetlands and the stream is a riverine wetland.
>
> The Washington Department of Ecology classifies wetlands into four categories based on their hydrogeomorphic class and score from a rating form. King County and City of Seattle governments rely on this classification system to create their critical area ordinances. The highest quality wetlands (Category I) are rare, while low quality wetlands (Category IV) are somewhat rare also. Most wetlands fall into the Category II and III level depending on how

well they function. North Beach would probably be Category III because it is degraded. (Gresham, 2014)

In October, 2005, the US Fish and Wildlife Service did a fish habitat survey of streams in the Seattle area. "Unnamed PS08 West Fork" is the stream that flows through North Beach Park (see figure 2, below). At their sample site (which would now be in the Headwaters Bowl HMU), they found the stream to have a mean wetted width of 1 meter (m); a mean depth of 0.03m with a max depth of 0.1m; and to consist of 100% riffles with no pools or glides. The substrate was 100% silt/sand. They did not catch any fish in the sample site. (Tabor 2010)

Figure 2: Location of USFWS sample in North Beach Creek.



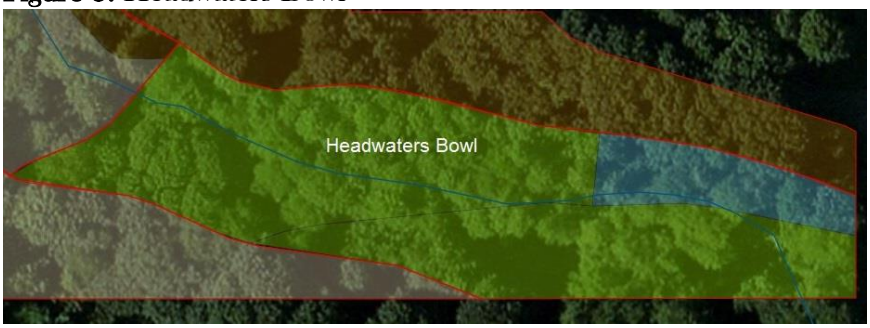
The Central Valley, at 1.97 acres, and the Headwaters Bowl, at 1.39 acres, are the two largest HMUs in North Beach Park. For restoration purposes, we have split them into four subareas each. The subdivision is based on who can do the work: all volunteers, experienced forest stewards, Parks Department Natural Area Crew, or privately-contracted restoration crew.

The sections below go into much greater detail for the plant communities and restoration procedures for each HMU.

Headwaters' Bowl

Description

Figure 3: Headwaters Bowl



The Headwaters Bowl is the area in light green (planting) and blue (establishment). The blue line is the stream. North is to the top. (Source: GSP Reference Map on ArcGIS.com.)

The Headwaters Bowl ("HWB") is the easternmost HMU of North Beach Park.

The northern boundary is the main trail of the park, the eastern boundary is 24th Ave. NW, the southern boundary is property lines and the South Slope, and the western boundary is the stream crossing and the social trail between the Headwaters Bowl and the Central Valley.

The property lines cut the bottom of the bowl and the 24th Ave. slope in half, and remove the southern slope entirely. Parks Department volunteers and Natural Area Crew are not allowed to work on private property. This complicates restoration of the HWB as discussed below in "Invasive Removal and Restoration Plan."

At the start of restoration, nearly half the trees in the HWB had severe *Hedera helix* (ivy) infestations which frequently reached into the canopy. There were large pockets of ivy monoculture on the ground.

The percent cover for trees was approximately 70% deciduous, with *Alnus rubra* in the wetlands and *Acer macrophyllum* on the dryer slopes and uplands. There was 5-10% conifer cover, exclusively *Thuja plicata* (Western red-cedar). The remaining 15-20% cover was open gaps, either over areas too wet to sustain trees or where *A. rubra* had fallen. The percent cover of the regenerative trees (tall enough to be above the shrub layer) were less than 5% for deciduous and less than 1% for coniferous trees.

Ilex aquifolium (English holly) and *Prunus laurocerasus* (English laurel) formed occasional dense thickets. Most of these have been removed, either by uprooting or cutting and painting with herbicide.

The HWB native plant communities at the start of restoration were very similar to the *Alnus rubra/Rubus spectabilis* (Red alder/ Salmonberry; ALRU/RUSP) and Alnus rubra/Lysichitum

americanum (Red alder/skunk cabbage; ALRU/LYAM) communities described by Kunze (1994). The differences were largely that the communities in the park lacked herbaceous diversity.

These communities are dominated by an *Alnus rubra* (red alder) canopy, with either *Rubus spectabilis* (salmonberry) or *Lysichitum americanum* (skunk cabbage) as the undercanopy. Kunze describes the ALRU/LYAM community as being wetter than ALRU/RUSP, and that is the case in NBP. (Plant communities are discussed in more detail in "Target Forest Types").

There is a canopy gap over the most saturated, eastern part of the HWB. This area is dominated by skunk cabbage and horsetail, with some *Salix sitchensis* (Sitka willow) shrub. The invasive plants here include *Rubus armeniacus* (blackberry) and *Calystegia sepium* (bindweed). Numerous *A. rubra* lean over this part of the HWB from the slopes. As they die and fall, the gap will enlarge. This will also increase the amount of coarse woody debris in the wetland and the number of rootballs on the slope walls.

Progressing to the west, the topography and soils become more complicated. Some areas are more stable, and some are seeps that have reached down to the gleyed soils. As the ravine narrows, *Acer macrophyllum* (Big leaf maple) on the south slope add their shade.

The majority of the HWB is in phase two, "planting," of restoration. A section of Subarea C is considered to be in "establishment," phase 3. For a discussion of the phases, please see "Monitoring Protocols and Success Metrics."

Water Flow

Groundwater emerges from several places at the base of the 24th Ave. slope. One of these areas has a number of displaced conduits. During heavy rainfall, water emerges from a conduit in the southeastern corner of the hillside.

Through the rest of the Headwaters Bowl, the water emerges as seeps or occasionally channels from the south slope of the ravine. In many places the seeps have carried away most of the soils.

These seeps join the stream, which runs along the northern edge of the headwaters bowl.

Water flow in North Beach Park, in general, needs a lot more research and observation.

Vegetation

As discussed above, the plant communities in the HWB are currently a mixture of ALRU/LYAM (to the east) and ALRU/RUSP (to the west).

The reference ecosystem for the Headwaters Bowl is "riparian forest and shrubland." The target forest type is ALRU/RUSP/CAOB-LYAM (Red alder/salmonberry/slough sedge – skunk cabbage) as described by Chappell (2006).

There has been one circular, 1/10th-acre, monitoring plot established in the Headwaters Bowl. Baseline monitoring was taken in August 2012, with a follow-up in August 2013. See "Green City Monitoring Protocol" in "Monitoring" for a discussion of this protocol. This monitoring plot was established in the middle of the most saturated section of the Headwaters Bowl.

The following table presents the vegetation findings from the 2012 and the 2013 monitoring and the change. Native plants listed as 0 in the "2012 % Cover" column were planted in autumn 2012. Percent cover was determined by consensus of the people doing the monitoring plot, and is reported in broad categories to enable the data to be consistent across the city.

Table 1: Forest Monitoring Plot report, Headwaters Bowl.

		% Cover		
Scientific Name	**Common Name**	**2012**	**2013**	**Change**
Athyrium filix-femina	Lady fern	1-5%	1-5%	None
Cardamine hirsuta	Shotweed	0	<1%	Increase
Carex obnupta	Slough sedge	0	<1%	Increase
Convulvus arvensis	Field bindweed	<1%	6-15%	Increase
Crataegus douglasii	Black hawthorne	0	<1%	Increase
Epilobium ciliatum	Willowherb	<1%	<1%	None
Equisetum arvense	Horsetail	26-50%	26-50%	None
Fraxinus latifolia	Oregon ash	0	<1%	Increase
Glyceria elata	Tall mannagrass	<1%	<1%	None
Hedera helix	English Ivy	26-50%	26-50%	None
Lonicera ciliosa	Orange honeysuckle	1-5%	1-5%	None
Lysichiton americanum	Skunk cabbage	1-5%	6-15%	Increase
Malus fusca	Pacific crab apple	0	<1%	Increase
Oenanthe sarmentosa	Water parsley	<1%	<1%	None
Polystichum munitum	Sword fern	<1%	<1%	None
Ranunculus repens	Creeping buttercup	6-15%	6-15%	None
Rubus armeniacus	Himalayan blackberry	26-50%	16-25%	Decrease
Rubus spectabilis	Salmonberry	26-50%	26-50%	None
Rumex crispis	Curly dock	<1%	<1%	None
Salix sitchensis	Sitka willow	1-5%	1-5%	None
Scirpus microcarpus	Small-fruited bulrush	0	<1%	Increase
Solanum dulcamara	Bittersweet nightshade	<1%	<1%	None
Spiraea douglasii	Hard hack	0	<1%	Increase

Only one invasive plant decreased in cover, *Rubus armeniacus* (blackberry). This was the plant we most vigorously removed. The native plants that went from 0 to <1% cover had been planted in the fall of 2012. *Lysichiton americanum* (Skunk cabbage) increased from the seed bank. *Calystegia sepium* increased noticeably all over the park in 2013.

Although this gives a good representation of the most-saturated areas of the HWB, it does not give a good representation of the HWB as a whole. A couple dozen feet to the west of this monitoring plot, there is a stand of *A. rubra* that indicates dryer conditions. This allows greater shrub establishment.

For the complete list of plants observed in the Headwaters Bowl and all the HMUs of the entire park, and citations for name resolution, form, and wetland status indicator, please see Appendix A, "Plants."

Invasive Removal and Restoration Plan

I have divided the Headwaters Bowl into four subareas, based on who can perform the needed restoration work (see Figure 4, below).

Figure 4: Headwaters Bowl and subareas

A: All volunteers can work here. B: Forest stewards and experienced volunteers. C: Parks District Natural Area Crew (slope). D: Privately contracted crew (slope, private property).

Subarea A

Subarea A is between the main trail and the stream bank. It is relatively flat and dry, making it accessible to all volunteers. It measures approximately 16,500 square feet (all areas calculated using the measurement tool on GSP Reference Map on Arcgis.com).

Subarea A has received the most attention of any area in the park, beginning with the very first work party. As a consequence of it receiving such early attention, no good record was kept of its pre-restoration state; the notes below are reconstructed from memory.

There were few areas of *Hedera helix* (English ivy) monocultures in Subarea A. There were some areas of *Ilex aquifolium* (English holly) and *Prunus laurocerasus* (Cherry laurel) dominance. The ivy has been removed by hand. The holly was removed by uprooting. The laurel was removed by cutting and painting.

In late summer and fall of 2013, several EarthCorps work parties concentrated on invasive removal in this section.

Plants have been installed and invasives removed every year, and it is now in an establishment phase.

Suggested tasks for Subarea A:

- Explore the western end in further detail.
- Continue monitoring the planted area for native plant establishment and invasive resurgence
- Track mature *Alnus rubra* and naturally regenerating *Thuja plicata* and *Acer macrophyllum*.
- Start a new generation of deciduous trees.
- Add to the herbaceous diversity annually.
- In 2021 (ten years after restoration began), add a new generation of conifer trees.

Subarea B

Subarea B is the center of the bowl, and because of the saturation and fragile soil structure is more difficult to work in than Subarea A. This makes it accessible to small groups of experienced forest stewards only. It measures about 45,000 square feet.

The widest part, to the right in the image, is permanently saturated. It receives invasive removal in the late summer, when it's relatively dry. It has received plantings of graminoids and shrubs. The eastern edge of Subarea B is the location of the circle monitoring plot discussed above. The part of Subarea B not in park property needs further exploration.

The narrower part has many seeps, separated by tongues of soil held in place by *Carex obnupta* (slough sedge) and/or *Rubus spectabilis* (salmonberry). In the spring and summer, these seeps contain forbs such as *Oenanthe sarmentosa* (Water parsley). However, there is no woody vegetation to hold the seeps during winter.

Some *Picea sitchensis* (Sitka spruce) and *Thuja plicata* (Western red-cedar) have been planted in the seeps.

In June 2014, Friends of North Beach Park received a $500 stewardship grant from the Puget Sound Chapter for the purchase of wetland plants. These plants will be installed along the streambank and in the seeps of the western (left) edge of Subarea B of the Headwaters Bowl, and across to Subarea B of the Central Valley. This grant is discussed in more detail in "Stewardship Grant," below.

Suggested tasks for Subarea B, in the lobed area to the east:

- Continue removing blackberry.
- Establish shrubs where possible, graminoids elsewhere.
- Explore the base of the slope and the bowl during a rain event.

Suggested tasks for Subarea B, in the narrow part to the west:

- Implement the WNPS Stewardship Grant in autumn of 2014.
- Continue removing invasives as necessary.
- Monitor seeps for erosion.
- Establish obligate wetland plants in the seeps.

Subarea C

Subarea C measures roughly 10,200 square feet. It is the slope along 24th Ave NW and around the entrance to the park along the main trail. Because it is a greater than 40% grade, only Parks Department Natural Area crew or contract crew can work on it. Volunteers have worked on it in the past, however.

In 2011, trees along the rim and slope received survival rings and there was some clearing of the slope.

In 2012 and 2013, the rim received some planting by the Friends of North Beach Park. During the summer months, these plants are watered and weeded. These plants include shrubs such as *Aruncus dioicus var. acuminatus* (Goatsbeard), *Rosa nootkana* (Nootka rose) and trees such as *Pseudotsuga menziesii* (Douglas-fir) and *Pinus contorta var. contorta* (Shore pine).

In 2013, the slope was partially cleared by a group of EarthCorps volunteers. The clearing was completed by a contract crew, who also put down jute rolls and planted in the fall.

Figure 5: Steep slope jute erosion control by contract crew.

The remainder of the clearing, following the curve of the slope along 24th Ave. and ending at the property line, will happen in 2014 or 2015.

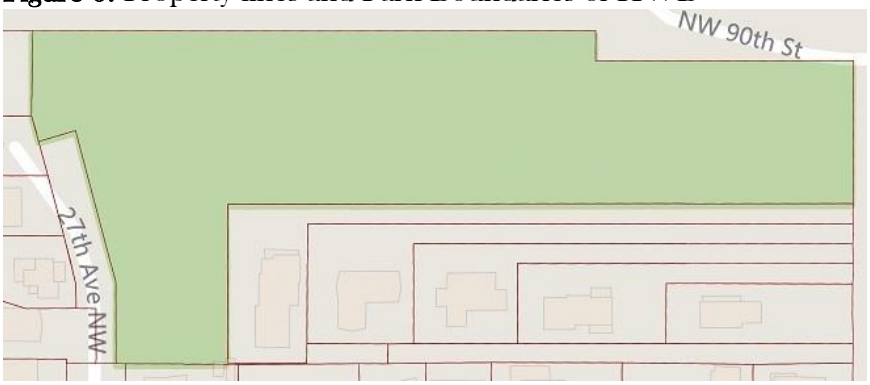
Volunteers and forest stewards can maintain the plants at the rim and the base, but further tasks along the slope in this subarea will be executed by the Parks Department.

Subarea D

Subarea D measures approximately 13,800 square feet. It has not been explored in any great depth. Some trees were given survival rings during the first work parties in 2011. One house appears to have impermeable erosion control fabric, held down by sandbags, on the slope beneath it.

Subarea D is entirely private property on a very steep slope. The houses were built between 1959 and 1963 (King County Parcel Viewer), long before there was any movement to make the ravine a park or any attempt to preserve urban wetlands. The property lines in Figure 6, below, extend into the bowl of the park, which allows the owners to have addresses on 24th Ave. This group of houses, as a whole, is called Olympic Terrace.

Figure 6: Property lines and Park Boundaries of HWB



The green area is North Beach Park. The red lines are parcel lines for private property. (Source: Seattle Department of Public Development DPDGIS.)

Due to the steepness of the slope, and the fact that it is private property, Subarea D can only be worked on by a privately contracted crew.

Working in Subarea D depends on securing the cooperation of the homeowners. We plan to contact them in autumn 2014 or early 2015 by doorbelling or leaving door hangers. If this contact is successful, we will:

- Explore the area along the bowl and the base of the slope to get an estimate of its invasiveness and what work needs to be done.
- Design restoration plans that range from one-year brute force through multi-year phased work (which plan gets executed would depend on the size and time span of the grant).
- Work with neighbors to write a grant that can be applied to private property (with King Conservation District or other organization).
- Restore Subarea D per grant.

The large contingencies in this plan are (a) successfully contacting and securing the cooperation of the neighbors and (b) obtaining the very competitive King Conservation District grants.

The constraints against working in Subarea D would make it low priority if it were in another section of the park. However, its proximity to the headwaters increases its importance.

Central Valley

Description

Figure 7: The Central Valley

The Central Valley is the area in light green (planting)and pale yellow. The blue line is the stream. (Source: GSP Reference Map on ArcGIS.com.)

At 1.97 acres, the Central Valley ("CV") is the largest HMU in North Beach Park. Its northern border is a stream crossing; its eastern border is the main social trail; its southeastern border is a stream crossing and the start of the south loop social trail; its western border is the south loop social trail. The gradient between the eastern side of the central valley and the main social trail varies from almost nothing to very steep. The gradient between the south loop social trail and the floor of the valley is very steep throughout.

The slopes of the valley are heavily invaded, but explorations of the middle of the valley reveal an area not in such bad shape. The *Rubus spectabilis* (salmonberry; RUSP) layer of the canopy is so dense that it makes exploration very difficult. In the summer of 2014, we did a belt transect through the widest part of the CV; please see "Vegetation" below for a discussion of the results of the transect, and "Belt Transect" in "Monitoring" for a discussion of the protocol.

The tree canopy percent cover for the CV is 60% deciduous, almost exclusively *Alnus rubra* (Red alder). There is less than 1% coniferous cover, *Thuja plicata* (Western red-cedar), located in the southwest corner. There is about 5% cover of regenerating deciduous trees, and less than 1% of regenerating coniferous trees. The CV has the largest canopy gaps in the park, allowing *Calystegia sepium* (bindweed) to establish in the sunlight.

The reference ecosystem and target forest type for the CV are the same as for the Headwaters Bowl: "riparian forest and shrubland" for the ecosystem and ALRU/RUSP/CAOB-LYAM (Red alder/salmonberry/slough sedge – skunk cabbage) (Chappell 2006) for the target forest type.

The existing plant community is ALRU/RUSP (Kunze), and the soil is correspondingly relatively dry. The saturated areas of the CV are much smaller than those in the Headwaters Bowl.

The RUSP layer is so dense that it forms a closed canopy and prevents any other shrubs or trees from establishing. The most noticeable groundcover under the RUSP canopy is *Tolmiea menziesii* (Piggyback) and *Hedera helix* (ivy). Care must be taken during restoration not to disrupt the RUSP canopy lest the ivy take off.

The southeastern section of the CV (part of Subarea A, below) is in phase one of restoration, invasive removal. See "Monitoring Protocols and Success Metrics."

As with the Headwaters Bowl, the CV is split into four sub areas, depending on who can do the work or the technique for best restoration. See "Invasive Removal and Vegetation Plan," below.

Water Flow

Again, as with the Headwaters Bowl, most of the water flow in the Central Valley is from the southern wall of the park towards the stream channel. The water appears to be more channelized than in the HWB; perhaps this is because the RUSP canopy provides greater soil control.

Vegetation

There was one 1/10th acre circular forest monitoring plot established in the south eastern corner of the Central Valley (Subarea B in Figure 8, below). Please see "Green City Monitoring Protocol" in "Geology, Hydrology, and Monitoring" for a discussion of this protocol. The baseline monitoring was taken in September 2011, and the plot was revisited in August 2012. As with the HWB plot (above), percent cover was determined by consensus of the people doing the surveying, and reported in broad categories for city-wide consistency.

Figures 8 and 9, below, compare the 2011 and 2012 groundlayer and tree invasive species. There has been some removal of invasive species.

Figure 8: 2011 invasive cover in Central Valley forest monitoring plot

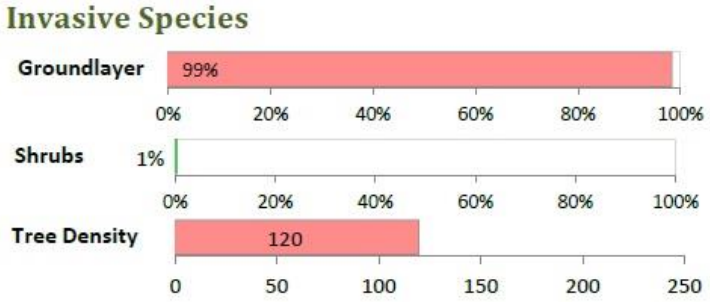
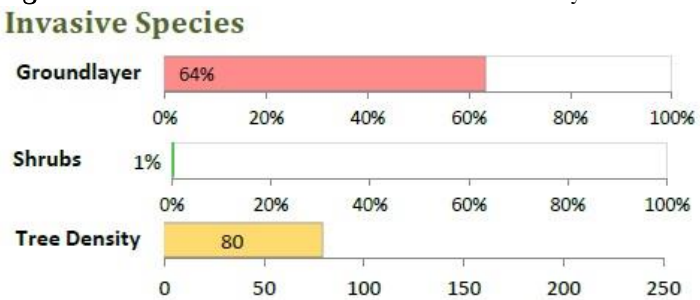


Figure 9: 2012 invasive cover in Central Valley forest monitoring plot



Key: Groundlayer and shrub percentages are for percent cover. Tree density is trees per acre. Red bar indicates immediate attention needed; light orange bar means attention needed soon. Source: EarthCorps, 2011 and 2012.

Figures 10 and 11 below compare native groundlayer change between 2011 and 2012. Note in particular the return of *Hydrophyllum tenuipes* (Pacific water leaf) and *Lysichiton americanum* (skunk cabbage) both of which returned from the seed bank.

Figure 10: 2011 native groundlayer cover in the Central Valley forest monitoring plot.

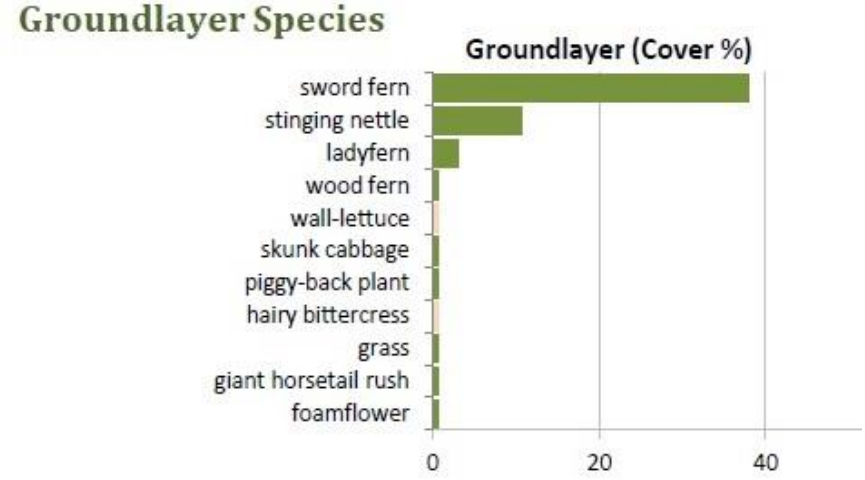
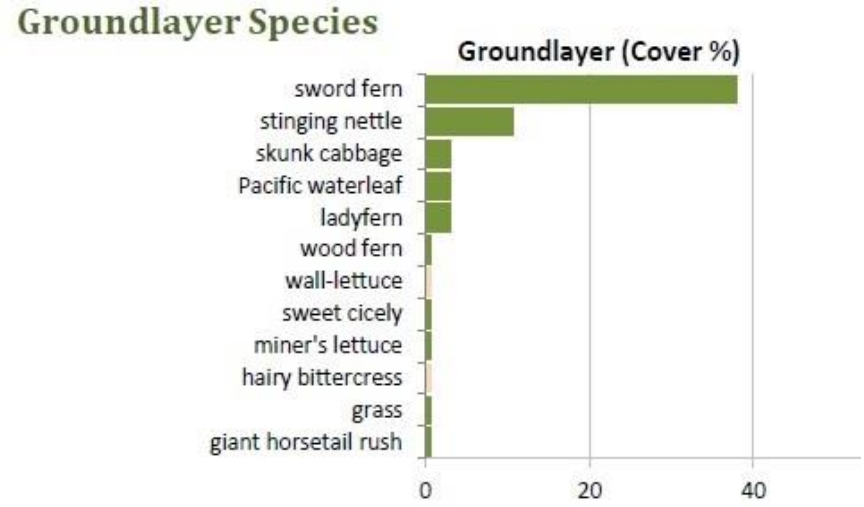


Figure 11: 2012 native groundlayer cover in the Central Valley forest monitoring plot.



In the summer of 2014, a cross-gradient belt transect was done in North Beach Park that crossed the Central Valley along the 90th St. right of way. Eight 4'x16' plots were established in the Central Valley. The transect went from west to east, through subareas C, D, and A, shown in Figure 8, below.

The following table lists the target forest type species for the Central Valley, all the species found in the belt transect, their percent cover across the entire transect, and what the percent cover of their TFT goal is. Percent cover was determined by one person consistently, and is given in specific amounts. Please see the key below the table for a full explanation of the numbers.

Table 2: Central Valley belt transect

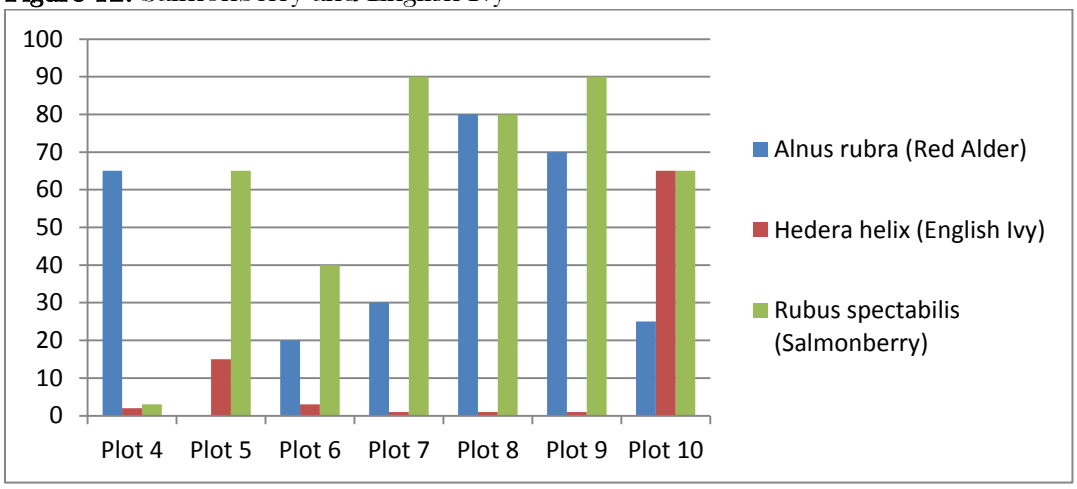
Scientific Name	Common Name	Pct. Cover	TFT Goal
Acer circinatum	Vine maple	0.00	4.00
Acer macrophyllum	Big leaf maple	26.11	
Alnus rubra	Red alder	32.22	93.00
Angelica genuflexa	Kneeling angelica	0.00	20.00
Athyrium filix-femina	Lady fern	2.44	4.00
Atrichum selwynii	Crane's-bill moss	0.33	
Calystegia sepium	false bindweed	0.33	0.00
Carex amplifolia	Bigleaf sedge	0.89	
Chrysosplenium glechomifolium	Pacific golden saxifrage	0.00	15.00
Circaea alpina	Enchanter's nightshade	0.00	3.00
Dryopteris expansa	Spiny wood fern	0.22	
Equisetum telmateia	Giant horsetail	2.22	
Erhythranthe guttata	Yellow monkey-flower	0.00	4.00
Hedera helix	English Ivy	14.28	0.00

Scientific Name	Common Name	Pct. Cover	TFT Goal
Hydrophyllum tenuipes	Pacific waterleaf	3.33	
Ilex aquifolium	Holly	3.00	0.00
Lysichiton americanum	Skunk cabbage	5.22	30.00
Moss		0.44	20.00
Mycelis muralis	Wall lettuce	0.06	0.00
Oenanthe sarmentosa	Water parsley	0.67	6.00
Oxalis oregana	Oregon oxalis	0.00	8.00
Picea sitchensis	Sitka spruce	0.00	8.00
Poa trivialis	Rough-stalk bluegrass	0.00	30.00
Polystichum munitum	Sword fern	3.06	6.00
Prunus laurocerasus	Cherry laurel	0.39	0.00
Ranunculus repens	Creeping buttercup	0.33	0.00
Ribes bracteosum	Stink currant	0.11	
Rubus armeniacus	Himalayan blackberry	0.67	0.00
Rubus spectabilis	Salmonberry	53.89	57.00
Sambucus racemosa	Red elderberry	0.44	
Stachys chamissonis var. *cooleyae*	Coastal hedgenettle	0.00	4.00
Stachys mexicana	Mexican hedge-nettle	0.00	4.00
Tolmiea menziesii	Piggyback	2.17	34.00
Urtica dioica	Stinging nettle	2.72	

Key: "0.00" in Pct. Cover column indicates a target forest type indicator species not found during the survey. No value in the TFT Goal column indicates a native species not listed in the target forest type. "0.00" in the TFT Goal column indicates an invasive species to be removed.

Plots 4 through 10 of the transect were on the floor of the Central Valley. The following chart illustrates the relationship between density of salmonberry and red alder cover and ivy. How this will affect restoration is discussed in "Subarea D," below.

Figure 12: Salmonberry and English Ivy

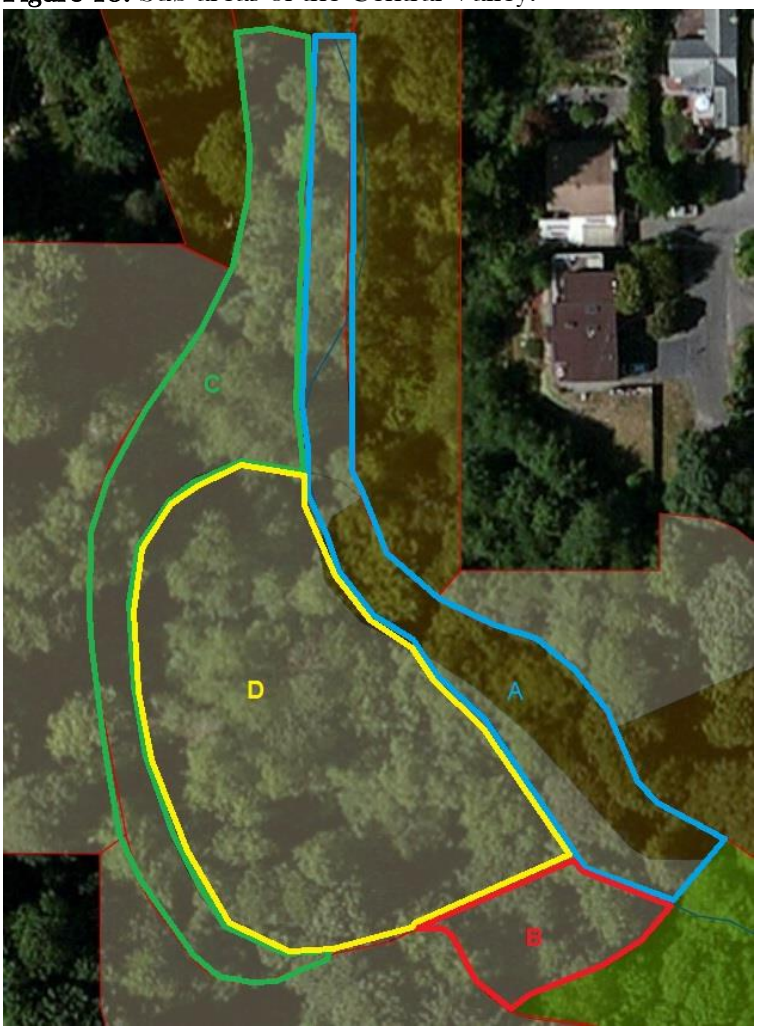


For the complete list of plants observed in the Central Valley and all the HMUs of the entire park, and citations for name resolution, form, and wetland status indicator, please see Appendix A, "Plants."

Invasive Removal and Restoration Plan

There are four distinct subareas to the Central Valley (See Figure 13, below.)

Figure 13: Sub areas of the Central Valley.



North is to the top. A: All volunteers can work here. B: Forest stewards and experienced volunteers. C: Parks District Natural Area Crew (slope). D: Forest stewards and experienced volunteers.

Subarea A

Subarea A (outlined in blue in Figure 13) measures approximately 17,350 square feet. It lies between the social trail and the stream and is relatively flat and accessible. A holly thicket was cleared from the southeastern portion in 2011. The ground returned with *Hydrophyllum tenuipes* (Pacific waterleaf) and was replanted with shrubs and ferns in the subsequent planting seasons.

The dark green section of Subarea A (approximately 9,600 square feet) was cleared and planted by EarthCorps volunteers in 2013. This work will be extended and monitored by the Friends of North Beach Park. In January 2014, Friends of North Beach Park cleared about 800 square feet of black berry past the north end of the dark green section of Subarea A. This received some Deschampsia cespitosa (Tufted hair grass) and Fraxinus latifolia (Oregon ash) in March that has

established well. Stink currant is spreading into the cleared area from nearby. The clearing did not reach the streambank because the ground was still very wet.

Work in Subarea A can be done by any volunteers or forest stewards. Parks Department Natural Area Crew will be requested for large laurel and holly removal.

Care must be taken working close to the stream to not disrupt the streambank. A section of Subarea A lies across the trail from an area called Knotweed Hill (see "Restoration History" in "Park and Restoration History" and "91st St. Slope" in "Uplands and Slopes). This area should receive extra attention and monitoring.

Suggested tasks for Subarea A:

- Plant newly cleared area in Fall of 2013.
- Work with Parks Department crews to eradicate the holly and laurel.
- Monitor invasive resurgence and native establishment in the Earthcorps-cleared areas.
- Connect the cleared areas.

Subarea B

Subarea B, outlined in red in Figure 13, measures approximately 4,800 square feet. It is a large, active seep with water flowing from the south wall of the ravine. The soils are permanently saturated and can bear little or no walking. The ground is too wet for all but such obligate plants as *Oenanthe sarmentosa* (Water parsley) and *H. tenuipes*.

This seep is bordered by a social trail, the soil compaction of which provides a little stability. There are also three large *Acer macrophyllum* (Big leaf maple), two of which are visible in Figure 13, below, taken before any restoration work was done.

Figure 14: Central Valley subarea B, 2011.

There is a large conifer nurse log (obscured in the photo above) lying across the seep that provides some stability. *Tsuga heterophylla* (Hemlock) trees have been planted into the nurse log and are doing well.

Hedera helix (English ivy) grows down from the slope, under the trail, and then over the seep. The ivy is not firmly rooted in the seep and provides little or no stability or erosion control. However, clearing the ivy would destabilize the sides of the seep and disrupt the trail.

In November, 2013, some planting was done in Subarea B. Table 6, below, lists those plants.

Table 6: Plants installed in Subarea B.

Scientific Name	Common Name	#
Alnus rubra	Red alder	1
Carex deweyana	Dewey sedge	6
Carex obnupta	Slough sedge	4
Cornus stolonifera	Redtwig dogwood	6
Juncus acuminatus	Tapertip rush	6
Picea sitchensis	Sitka spruce	1
Physocarpus capitatus	Pacific ninebark	4
Salix lucida	Pacific willow	4
Scirpus microcarpus	Panicled bulrush	2

The *C. stolonifera* were livestakes. All others were potted.

These were installed in two locations in Subarea B. In both cases, only the minimum amount of clearing was done to allow planting. As of summer 2014, all the plants appear to be doing well. We've also spread seed berries from *Lysichiton americanum* (skunk cabbage) into bare areas.

Suggested tasks for Subarea B:

- Plant shrubs in areas of stable soil, at the base of the slope and around the trees and nurse log.
- As these establish, spread planting into less stable areas.
- When the shrub layer establishes, remove ivy from beneath it and increase groundcover diversity.

For further plans for Subarea B, please see "Stewardship Grant," below.

The ivy comes down to Subarea B from the West and South Slopes. For a discussion of the plans for those HMUs, please see the "Uplands and Slopes" chapter.

Subarea C

Subarea C, outlined in green in Figure 13, above, is the least volunteer-accessible area of the Central Valley. It measures approximately 26,490 square feet. The western border is the south loop social trail, and the eastern border is on the floor of the valley. The social trail is frequently 50 and more feet above the floor of the valley, with well over 40% grade. Work here will have to be done by contract or natural area crew, either arranged through Green Seattle Partnership or secured through a grant.

Subarea C is heavily invaded by *Rubus armeniacus* (Blackberry), *Calystegia sepium* (Bindweed), and many other ornamental and invasive plants. The true extent of the invasiveness, or what remnants of native plant cover under the blackberry or bindweed, is not known at this time.

Subarea D

Subarea D, at approximately 38,970 square feet (yellow outline in Figure 13, above), is the largest area of the Central Valley. The belt transect cut across it at the widest point, but the rest of Subarea D has not been fully explored.

As discussed in "Vegetation," above, the dense salmonberry and red alder canopy might be controlling the ivy and other invasives – at the cost of preventing tree succession or shrub and groundcover diversity. Care must be taken not to disrupt the salmonberry layer, as this would allow the ivy to take off, and perhaps choke out restoration plantings.

We plan to remove the ivy from underneath the salmonberry in test sections beginning in early spring 2015, before the salmonberry and red alder are fully leafed out. This will allow the sun to reach the soil and promote any seedbank or native growth resurgence. In the summer, we'll spread seeds from piggyback and other plants already growing in Subarea D. Live stakes from other shrubs growing in the park will be introduced as well, drawing from a number of different plants to avoid problems caused by dense cloning. Deep-shade groundcover will be planted or spread by seed.

As diversity increases, we will remove more ivy and thin the salmonberry to start tree succession. We'll begin with *Alnus rubra*. Although this is already the dominant tree cover, it is mainly large, old trees, with no seedlings or sub-canopy examples yet seen. As the next generation of *A. rubra* establishes, we will begin planting *Thuja plicata* (Western red-cedar) and *Tsuga heterophylla* (Western hemlock).

This is a modification of the Bradley method (Bradley, 1988). Although it might sound like it would take longer than the general clearing and replanting, it will have less disruptive impact on existing habitat and aquatic systems (Apastol & Berg, 2006)

Suggested tasks for Subarea D:

- Remove ivy from under *Rubus spectabilis* before leaf out

- Monitor for native plant return from seedbank
- After seed set, spread seeds from plants already growing under the salmonberry (mostly *Tolmeia menziesii* [piggyback]).
- Live stake with stakes taken from other shrubs in the park, particularly *Sambucus racemosa* (Red elderberry) and *Rubus parviflorus* (Thimbleberry).
- In the fall, spread seeds of plants that like deep shade under the salmonberry.
- All tasks are to be done with as little disturbance to the salmonberry cover as possible.
- When an alder falls, take advantage of the extra light to encourage conifer succession.

Stewardship Grant

In June of 2014, Friends of North Beach Park received a $500 stewardship grant from the Puget Sound Chapter of the Washington Native Plant Society.

Purpose of grant

The purpose of the grant is to help rebuild the wetland basins of the park into a scrub-shrub plant community, with trees surrounding the wetlands to stabilize the upland slopes. The planting pallet will follow recommendations for the reference ecosystem, riparian forest and shrubland.

The replanting will be done in phases, using obligate wetland plants to begin holding the soil, followed by reintroducing woody plants to build deeper root structures.

Timeline

- September: Invasive removal in the wetlands. This will be done by small groups of forest stewards. Care will be taken not to overclear an area and not to disturb the soil structure too much.
- Early October: installation of obligate wetland plants. This is done just prior to rain return, so the ground is relatively stable. The work will be done by experienced forest stewards.
- Late October: installation of facultative shrubs and woody plants at the wetland borders. This work can be done by volunteers during a regular Friends of North Beach Park work party.

Plan

The work will be carried out in HWB Subarea B and CV Subarea B, which are separated by a social trail. Within these areas, plants will be installed at the base of the slopes (if possible) and along the stream bank.

Table 7, below, is the plant list submitted to the WNPS for the grant. The quantity and species of the plant list as installed will vary from this list.

Table 7: Plant list and estimated planting time.

Early October				
Genus	**Common Name**	**Wetland**	**Size**	**# plants**
Carex deweyana	Dewey's sedge	FAC	bareroot	100
Carex obnupta	Slough sedge	OBL	bareroot	100
Fraxinus latifolia	Oregon ash	FACW	6-12"	50
Glyceria elata	Tall mannagrass	FACW	bareroot	100
Viburnum opulus v. americanum	Highbush cranberry	FACW	3-6"	50
Late October				
Genus	**Common Name**	**Wetland**	**Size**	**# plants**
Holodiscus discolor	Ocean spray	FACU	6-12"	50
Lonicera involucrata	Black twinberry	FAC	6-12"	50
Berberis nervosa	Low oregon-grape	FACU	3-6"	100
Sambucus racemosa	Red elderberry	FACU	crown	50
Vaccinium parvifolium	Red huckleberry	FACU	2" pots	50

92nd St. Wetlands

Description

The 92nd St. Wetland is the northernmost of North Beach Park's contiguous HMUs. The southern boundary is the upper stream crossing. The southeastern corner borders the 91st St. slope, and most of the western boundary is Fletcher's Slope.

Figure 15: The 92nd St. Wetlands and Fletcher's Slope

To date, it has not received any restoration efforts and none is scheduled in the next few years. Just north of the stream crossing is a small gap (visible above the red horizontal line in Figure 14, above) over a very saturated wetland. At the north end of that gap is an overflow control structure. We think this area was once dammed as a pond.

The 92nd St. Wetlands has the most extensive conifer canopy in the park, about 10-20%, mostly *Tsuga heterophylla* (Western hemlock). The regenerating trees were a mixture of *T. heterophylla* and *Thuja plicata* (Western red-cedar).

Past the dam structure, the trail vanishes in a small hemlock grove. The ravine becomes much shallower, and property lines approach or cross the stream. The dam structure is where park tours generally turn around to continue on the south loop social trail.

The 92nd St. Wetlands has a unique target forest type for North Beach Park and different reference ecosystem than the HWB or the CV. The target forest type is *Thuja plicata – Tsuga heterophylla/Oplopanax horridus/Polystichum munitum* (Western red-cedar – Western hemlock/Devil's Club/Sword fern; THPL-TSHE/OPHO/POMU). The reference ecosystem is mesic-moist conifer and conifer-deciduous mixed forest.

Water Flow

The stream is channelized by the time it reaches the 92nd St. Wetlands. In places, there is a bank of a foot or two (uncommon in the rest of the park). The seeps flow from both walls of the ravine in this area. The seep closest to the stream crossing is permanently saturated, and contains mostly herbaceous wetland-obligate plants. Seeps a little further upstream contain a mixture of plants and more woody debris.

Vegetation

In May of 2013, forest steward Tad Anderson, working with Lauren Urgenson and students from the Edmonds Community College horticulture program, installed a 1/20th acre monitoring plot following the Green City protocol. Table 8, below, lists the groundcover and shrub species they found, along with percent cover.

Table 8: 2012 Monitoring Plot, 92nd St. Wetlands

Scientific Name	Common Name	% Cover
Geum macrophyllum	Large-leaved avens	7.5
Glyceria spp.	Mannagrass	12.5
Juncus effusus	Common rush	1.25
Cicerbita muralis	Wall lettuce	<1
Oenanthe sarmentosa	Water parsley	23
Osmorhiza berteroi	Sweet cicely	<1
Poa spp.	grass	2.5
Ranunculus repens	Yellow buttercup	13.75
Rubex sp.	Dock	<1
Rubus armeniacus	Himalayan blackberry	3.75
Rubus spectabilis	Salmonberry	57
Sambucus	Elderberry	9.75
Tolmiea menziesii	Piggyback plant	16.5

North of the dam site is a patch of Lamium galeobdolon (yellow archangel).

Invasive Removal and Preparation Plan

The open area is too saturated to directly support large trees. This could be planted with a similar mixture of plants as in the bowl of the Headwaters Bowl.

In the course of writing this plan, we realized that the 92nd St. Wetlands is relatively unexplored. We've already begun to explore it further.

References

Apostol, D., and Berg, D.R. 2006. "Riparian Woodlands" in *Restoring the Pacific Northwest: The Art and Science of Ecological Restoration in Cascadia.* Society for Ecological Restoration International, Island Press, Washington, DC.

Bradley, J. 1988. *Bringing Back the Bush: The Bradley Method of Bush Regeneration.* Ure Smith Press, Willoughby NSW, Australia

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Natural Heritage Rep. 2006-01. Washington Department of Natural Resources, Natural Heritage Program, Olympia , Wash. [http://www1.dnr.wa.gov/nhp/refdesk/communities/].

Department of Planning and Development. 2007. City of Seattle Department of Planning and Development GIS map. http://web1.seattle.gov/dpd/maps/dpdgis.aspx (dates of accession various).

EarthCorps. 2011. North Beach Park Central Valley Baseline Report. (unpublished document). EarthCorps, Seattle.

— 2012. North Beach Park Central Valley Monitoring Report. (unpublished document). EarthCorps, Seattle.

— 2011. North Beach Park Central Valley Baseline Report. (unpublished document). EarthCorps, Seattle.

— 2012. North Beach Park Central Valley Monitoring Report. (unpublished document). EarthCorps, Seattle.

Green Seattle Partnership, 2014. GSP Reference Map on ArcGIS.com. http://www.arcgis.com/home/webmap/viewer.html?webmap=9be9415001144aa383e5b86e481d2c45&extent=-122.5312,47.374,-121.7945,47.7577 Dates of accession various.

Gresham, D. 2014. Personal communication. www.greshamenvironmental.com

King County Parcel Viewer 2.0, http://gismaps.kingcounty.gov/parcelviewer2/. Accessed July 29, 2014.

Tabor, R.A., D.W. Lantz, and S.T. Sanders. 2010. "Distribution and Habitat Use of Fish in Seattle's Streams: Final Report, 2005 and 2006." U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office Fisheries Division. Lacey, WA.

Uplands and Slopes

There are six habitat management units (HMUs) in North Beach Park that are primarily or exclusively slopes: the South Plateau, the North Slope, the 91st St. Slope, Fletcher's Slope, the West Slope, and the South Slope.

Other than the South Plateau (see below), all of the upland and slope HMUs are very steep. Experienced forest stewards have worked on the slopes to put survival rings on trees as necessary. There are some less steep sections, and many trail side sections, that are accessible to all volunteers.

The upland plant community in North Beach Park is very similar to the *Acer Macrophyllum – Alnus Rubra/Polystichum munitum/Tellima grandiflora* (Big leaf maple – Red alder/Sword Fern/Fringecup; ACMA-ALRU/POMU/TEGR) community described by Chappell (2006).

Chappell describes this community as occurring on steep slopes prone to slides and mass movements. There is evidence of slumping and in 1994 a section of the park below 26th Ave NW collapsed.

The shape of the park means that all aspects are represented in the slopes. Experienced volunteers can work on the slopes to put ivy survival rings on trees.

The upland areas are discussed in decreasing order of restoration work they've received.

South Plateau

Description

The South Plateau is an isolated upland with a separate, unofficial entrance. If you think of North Beach Park as a boot, the South Plateau is the heel. The floor of the plateau is surrounded by steep, short walls.

The South Plateau, at 25,000 square feet, is also the largest flat area in the park. As explained in "Park and Restoration History," the South Plateau was intensively cleared in the summer of 2012 by an independent forest steward.

For more than a year, the only work done in the South Plateau was by Parks Department Natural Area Crew. This summer, forest stewards watered and did some after care for the plants in June and July. We will return in late August.

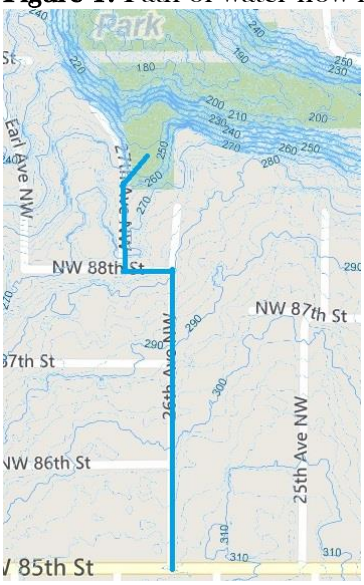
The South Plateau has less than 1% conifer cover, but at least 75% deciduous cover.

The target forest type for the South Plateau is *Tsuga heterophylla – Pseudotsuga menziesii/Polystichum munitum – Dryopteris expansa* (Western hemlock – Douglas fir/Sword fern – Spreading wood fern; TSHE-PSME/POMU-DREX). The reference ecosystem is Mesic-moist conifer and conifer-deciduous mixed forest.

Water Flow

During the rainy season, water accumulates from NW 85th St. and 26th Ave NW (310 feet) (all elevations from Seattle DPD GIS map). It runs to the north uninterrupted by any green scape or drainage system the length of 26th Ave. to 88th St., where it turns to the west. Once at 27th Ave., it turns again to the north and enters the park. The floor of the South Plateau is at 250 feet, giving this run about a 5% grade.

Figure 1: Path of water flow into the South Plateau



Blue line indicates path of water, which flows toward the top of the map, from 85th St. to the South Plateau. (Source: Seattle Department of Public Development DPDGIS map.)

Before clearing, the dense ivy and blackberry cover dissipated a lot of the energy of this water flow, spreading it out over the surface of the plateau. However, invasive removal caused a serious erosion problem was caused.

The Parks Department has installed rip rap and forced meanders into the water flow using plantings and fascines (water barriers made of bundles of salmonberry live stakes).

Figure 2: Water flow in May, 2014

All uncredited photography by the author.

There is still some water flow control to be done on the South Plateau, and it will have to be studied during rain events of different sizes during the fall and winter.

Water control can be improved in this area by adding meanders to the downstream end of the storm runoff, maintaining the existing meanders and fascines, and working with the stream to slow it down and let the water percolate through the plateau.

During the summer drought, the South Plateau has no water source. This leads the soil to dry and harden, becoming very compact. Plant establishment is very slow, but improving.

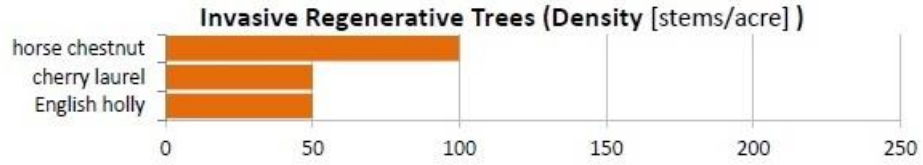
Vegetation

At the start of restoration, the South Plateau was a mix of *Acer macrophyllum* (Big leaf maple) and *Alnus rubra* (red alder), with a shrub layer almost exclusively of *Hedera helix* (English ivy) and *Rubus armeniacus* (Himalayan blackberry). Other notable invasives included *Lamium galeobdolon* (Yellow archangel) and *Clematis vitalba* (Wild clematis).

There is still a fair amount of remnant and resurgent *Hedera helix* (ivy). *Calystegia sepium* (bindweed), *Lapsana communis* (nipplewort), and *Geranium robertianum* (herb robert) have also made inroads.

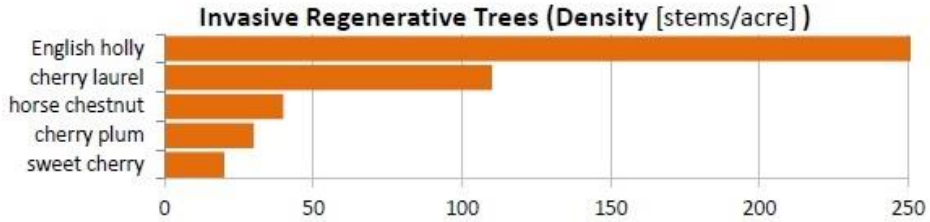
A forest monitoring plot following the Green City protocol was established in the South Plateau in July, 2012, and revisited in August, 2013. Note the difference, in Figures 4 and 5 below, in regenerative invasive trees. This is what happens with overclearing followed by neglect.

Figure 4: Invasive regenerative trees, South Plateau, 2012.



Source: EarthCorps, 2012

Figure 5: Invasive regenerative trees, South Plateau, 2013



Source: EarthCorps, 2013

Invasive Removal and Restoration Plan

Figure 3: South Plateau

South Plateau: A: Accessible to volunteers. B: Contract or Natural Area Crew. (Source: GSP Reference Map on ArcGIS.com)

Subarea A

Subarea A (outlined in blue in Figure 3, above), at 13,000 square feet, is the largest and driest flat area of the park and the most volunteer friendly. Even though it's surrounded by Subarea B, it can be accessed by walking carefully down some rip rap. This was the area the independent forest steward and her crew worked in.

The over-clearing followed by neglect has left the South Plateau with a plant community that is still very much out of balance. It's in better shape than when the ivy and blackberry dominated, but it's still at risk of an invasive-only plant community.

There is still a lot of invasive removal in Subarea A, including annuals such as *Lapsana communis* (nipplewort). Subarea A could use a lot of wood mulch, both around the establishing plants, and in large areas of relatively bare ground. In the long term, this would ease the compaction of the soil and aid in plant establishment.

Suggested tasks for Subarea A:

- Mulch around existing plants, and spread mulch to a depth of at least 4" in bare areas of South Plateau.
- Monitor water flow during rain events. Adjust and repair fascines as necessary.
- Add meanders to further reaches of South Plateau. The goal is to slow and spread the water, so it stays on the South Plateau and percolates into the soil.
- Investigate mycelium inoculation as a means of improving soil conditions.
- Forest stewards continue working in South Plateau one day a month for after care and weeding.
- Have two work parties a year (one for planting, one for invasive removal and/or after care).

Subarea B

Subarea B is the walls surrounding the plateau part of the South Plateau. It measures approximately 12,000 square feet. The walls are nearly vertical, making it only available for work by the Parks Department Natural Area Crew. There is a rim of the plateau accessible from 27th Ave NW, but it is so narrow that the best approach is to have the Natural Area Crew work on the rim, and the forest stewards or volunteers do aftercare.

Either the Parks Department Natural Area Crew or the volunteers in the summer of 2012 (or both) have done some work on the western slope. On the eastern and southern slopes of the wall, property lines might be an issue.

Further work on Subarea B will be done by the Parks Department Natural Area Crew. Some of the work could be done at the same time as working on the South or West Slopes (see below).

Suggested tasks for Subarea B:

- Remove resurgent invasives and increase density in cleared areas.
- Remove ivy and put survival rings on trees on the northern edges of the South Plateau.
- Coordinate work on the northern edges of the South Plateau with work done on the South Slope.

North Slope

Description

The North Slope starts at the main entrance to the park and runs between the main trail and NW 90th St., as it rises up to 25th Ave. from 24th Ave. At 1.14 acres, it is the third largest HMU in North Beach Park.

The trail side has vertical stretches, with bare dirt and roots exposed. These stretches occasionally have heavy trees on top of them. These have been protected with wattles (burlap sacks half-filled with woodchips) held in place with ninebark stakes.

Further into the park, some of the trailside reaches of the slope widen out and become more volunteer accessible. There is still a lot of slope above the accessible areas, however.

The percent tree cover is about 85% deciduous, almost exclusively *Acer macrophyllum* (Big leaf maple); 5-10% is *Thuja plicata* (Western red-cedar), and the remaining 5-10% is gaps. The regenerating tree cover is less than 5% deciduous and less than 1% conifer.

The target forest type for the North Slope is *Tsuga heterophylla – Pseudotsuga menziesii/Polystichum munitum – Dryopteris expansa* (Western hemlock – Douglas fir/Sword fern – Spreading wood fern; TSHE-PSME/POMU-DREX). The reference ecosystem is Mesic-moist conifer and conifer-deciduous mixed forest.

Water Flow

The coniferous tree canopy over most of the North Slope is dense enough that it intercepts most of the water that would fall onto the slope. However, there are places where water flows from the North Slope onto the main trail during heavy rains. The main trail could use some water bars to help deal with this situation.

Furthermore, there are bare places in the groundcover that should get some attention. See "Invasive Removal and Restoration Plan" below.

In the summer of 2013, the Natural Area Crew put coir logs underneath the intersection of 90th St. and 25th Ave.

Figure 4: Coir logs on the North Slope.

Vegetation

No invasive plants had established an area of monoculture on the North Slope. What is visible from the trail is a canopy of *Acer macrophyllum* (Big leaf maple) and a shrub layer of *Polystichum munitum* (Sword fern) and *Berberis nervosa* (Low Oregon-grape). This association is encouraged through occasional spreading of *Berberis* berries.

Observed during the belt transect (see below) was a stand of *Holodiscus discolor* (Ocean spray), the first observed in the main body of the park, and the only known of *Stellaria crispa* (Crisp sandwort) that we know of in the park. (Neither of these were in a transect plot.)

The upper reaches of the North Slope have many daffodils, bluebells and other garden plants and other escaped ornamentals.

The June, 2014 belt transect laterally crossed the North Slope; eight plots were established from the trailside up to the street end. See "Monitoring" for a full discussion of the belt transect protocol.

Most of the area crossed by the transect had received some restoration, by volunteers at the lower end and Natural Area Crew at the upper end.

Table 1, below, shows the target forest type indicator species for the North Slope and all species found in our survey. Please see the Key, below the table, for a full explanation of the numbers.

Table 1: Target forest type and transect species for the North Slope

Binomial	Common Name	% Cover	TFT Goal
Abies grandis	Grand fir	0.06	14.00
Acer circinatum	Vine maple	0.00	20.00
Acer macrophyllum	Big leaf maple	83.88	18.00
Aesculus hippocastanum	Horse chestnut	0.06	0.00
Alnus rubra	red alder	11.25	9.00
Athyrium filix-femina	Lady fern	2.00	2.00
Berberis nervosa	Dull Oregon-grape	11.38	4.00
Blechnum spicant	Deer fern	0.00	2.00
Bromus vulgaris	Columbia brome	0.00	2.00
Calystegia sepium	false bindweed	0.13	0.00
Carex deweyana	Dewey's Sedge	0.00	2.00
Claytonia sibirica	Siberian miner's lettuce	0.38	
Corylus cornuta	Beaked hazelnut	0.38	3.00
Cymbalaria muralis	Kenilworth ivy	0.06	0.00
Dryopteris expansa	Spiny wood fern	0.00	3.00
Eurhynchium oreganum	Oregon beaked moss	0.13	
Galium aparine	cleavers	0.44	
Galium triflorum	Sweet-scented bedstraw	0.00	2.00
Gaultheria shallon	Salal	0.00	2.00
Geranium robertianum	Robert's geranium	0.81	0.00
Geum macrophyllum	Large-leaved avens	0.06	
Hedera helix	English Ivy	1.63	0.00
Holcus lanatus	velvet grass	0.06	0.00
Hyacinthoides hispanica	Bluebells	0.13	0.00
Hydrophyllum tenuipes	Pacific waterleaf	7.19	
Lapsana communis	Nipplewort	0.75	0.00
Lunaria annua	Silver dollar	0.13	0.00
Moss		1.63	
Mycelis muralis	Wall lettuce	0.81	0.00
Oemlaria cerasiformis	Indian plum	0.06	
Oenanthe sarmentosa	Water parsley	0.13	
Osmorhiza berteroi	Sweet cicely	0.31	
Polystichum munitum	sword fern	12.88	54.00
Prunus avium	Bird cherry	0.63	0.00
Pseudotsuga menziesii	Douglas-fir	0.00	45.00
Pteridium aquilinum var. pubescens	Bracken fern	0.00	3.00
Ranunculus repens	Creeping buttercup	0.06	0.00

Binomial	Common Name	% Cover	TFT Goal
Ribes sanguineum	Red flowering currant	0.19	
Rubus spectabilis	Salmonberry	0.06	4.00
Rubus ursinus	Trailing blackberry	0.19	3.00
Sambucus racemosa	Red elderberry	0.06	2.00
Symphoricarpus albus	Snowberry	0.13	
Taraxacum officinale ssp. officinale	Common Dandelion	0.06	0.00
Tellima grandiflora	Fringecup	0.19	
Thuja plicata	Western red-cedar	0.00	33.00
Tiarella trifoliata var. trifoliata	Threeleaf foamflower	0.00	5.00
Tolmiea menziesii	Piggyback	0.75	
Trientalis borealis ssp. latifolia	Western starflower	0.00	1.00
Trillium ovatum	Western trillium	0.06	1.00
Tsuga heterophylla	Hemlock	0.06	36.00
Urtica dioica	Stinging nettle	12.00	
Vaccinium parvifolium	Red huckleberry	0.00	3.00
Vancouveria hexandra	Inside out flower	0.00	7.00

Key: "0.00" in Pct. Cover column indicates a target forest type indicator species not found during the survey. No value in the TFT Goal column indicates a native species not listed in the target forest type. "0.00" in the TFT Goal column indicates an invasive species to be removed.

Invasive Removal and Restoration Plan

Figure 5: North Slope

A: Trailside, less-steep area accessible to volunteers. B: Steeper, needs work by contract crew.

Subarea A

Subarea A measures approximately 13,200 feet. Volunteers can work in the trailside sections and along some of the more gradual slopes at the western edge. Of particular interest are gullies and washes that form from the steeper parts of the slope. These could be controlled with dikes and careful live staking and planting at the lower sections, and coir logs or other erosion control methods above. The soil in these washes is uncompacted, and likely to slip if too heavily stepped on.

Trailside sections of Subarea A have received plantings every year, by both Natural Area Crew and volunteers. The western edge of Subarea A has received plantings of Abies grandis (Grand fir) and Tsuga heterophylla (Western hemlock).

Suggested tasks for Subarea A:

- Continue spreading Berberis grapes, as possible.
- Add dikes and wattles to areas experiencing erosion. Live stake above the wattles.
- Plant trees along the lower reaches of the slopes to provide buttressing.

Subarea B

Subarea B measures nearly 36,400 square feet. The rim along 90th St. has received some plants and mulch from volunteers. Below the rim, the Parks Department Natural Area Crew did invasive removal (by hand), erosion control, and planting in 2013.

Forests stewards can visually monitor this area from the street rim and the trail, but further work in this area will have to be done by the Natural Area Crew.

91st St. Slope

Description

The 91st St. Slope is a long, narrow strip that runs between the main social trail at the lower end and property lines at the upper. It is 23,313 square feet. Because of its steepness, it's relatively unexplored.

The southeast corner is known as "Knotweed Hill" because it had a thicket of Reynoutria japonica (Japanese knotweed) that was treated in 2012. There is some knotweed resurgence that has been

reported and is being monitored. For the full story of Knotweed Hill, please see "Park and Restoration History."

The majority of the 91st St. Slope has no conifer canopy and less than 1% conifer regeneration. However, at the north end, where the 91st St. Slope abuts the 92nd St. wetlands, there is close to 10% *Tsuga heterophylla* (Western hemlock).

The target forest type for the 91st St. Slope is *Tsuga heterophylla – Pseudotsuga menziesii/Polystichum munitum – Dryopteris expansa* (Western hemlock – Douglas fir/Sword fern – Spreading wood fern; TSHE-PSME/POMU-DREX). The reference ecosystem is Mesic-moist conifer and conifer-deciduous mixed forest.

Water Flow

One section of the trail bordering the 91st St. Slope dips below the water table. No other water flow has been observed from the 91st St. Slope.

Vegetation

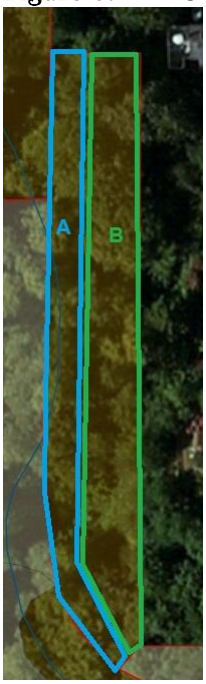
Trailside, there are canopy gaps along this HMU that encourage the growth of blackberry and even grasses. There are dense laurel thickets, which have been reported and will be treated later this summer with either stem injection or cutting and painting. Most of the rest of the trailside vegetation is *Rubus armeniacus* (blackberry) with *Hedera helix* (ivy) and some *Rubus ursinus* (trailing blackberry).

In October, 2012, three *Alnus rubra* (Red alder) trees fell from the 91st St. Slope across the main social trail and into a laurel thicket. This enlarged a canopy gap and blocked the trail until February, 2013, when it was cleared by the Natural Area Crew.

Because of the steepness of the rise from the trail, it's difficult to see what is on the slope. The 91st St. Slope still has some trees that need ivy survival rings, but they are on nearly vertical sections of the slope.

Invasive Removal and Restoration Plan

Figure 6: 91st St. Slope



A: Accessible to volunteers. B: Contract Crew.

Subarea A

Subarea A measures 9,400 square feet and is accessible to all volunteers. It parallels a similar volunteer-accessible area in the Central Valley HMU.

EarthCorps, in the fall of 2013, did some invasive removal in the Central Valley adjacent to the 91st St. Slope, reaching to about the dogleg in Figure 6, above.

In the winter of 2014, Friends of Norh Beach Park leap-frogged this restored area and cleared about 800 square feet on both sides of the trail of blackberry brambles. This included some late-season planting of *Deschampsia cespitosa* (Tufted hair grass) and *Fraxinus latifolia* (Oregon ash). These were in areas wet enough that they appear to have established well. The *Fraxinus*, unfortunately, was planted a little too close to the trail and will have to be moved. *Ribes bracteosum* (stink currant) appears to be spreading into this cleared area.

Our intention was to continue clearing back towards the EarthCorps-cleared area over the summer months. However, that has been derailed by the extreme heat and drought of the spring and summer, and we have turned our attention to after care for plants near the main entrance to the park.

Suggested tasks for Subarea A:

- Survey the area to be cleared between where the Friends of North Beach Park worked in January 2014 and EarthCorps worked in Fall of 2013.
- Plan a series of public and forest steward workparties to bring the two areas together.
- Work closer to the trail during wet weather, move to the streambank in the summer.
- User burlap and mulch to cover bare areas.
- Use GSP provided plants to fill in in the fall.

Subarea B

Subarea B is unexplored at the time of this writing (Summer 2014). It is lower priority than the South or West Slopes, which have a much higher extent of invasion; consequently, there is no crew time scheduled or predicted for this subarea.

Suggested tasks for Subarea B:

- Explore as much as possible
- Put survival rings on any trees that need them.

South Slope

Description

The lower end of the South Slope is bordered by the south loop social trail to the west and the Headwaters Bowl to the east. The upper ends are a mixture property lines and the South Plateau HMU.

Some trees in the South Slope have received ivy survival rings. There has been some planting at the lower reaches of the east section of the South Slope, along the border to the Headwaters Bowl. Other than that, the South Slope has received little or no attention.

The South Slope is split by a very steep social trail that connects the South Plateau to the rest of the park. During the dry months, this trail is very fragile and breaks into powder with very little traffic. During the rainy months, it is more stable but also more slick. There are also different levels of invasiveness, and different water regimes on the two sides of the trail. Because of this, the trail splits the South Slope into two subareas. This is the only HMU subdivision not based on who can do the work.

The lower reaches of Subarea A (Figure 7, below) are accessible to forest stewards. The trailside reaches of Subarea B are accessible to all volunteers. These are very small sections in the South

Slope. Because the South Slope has about the steepest slopes in the park, the vast majority of it is accessible only to Natural Area Crew.

The South Slope has less than 1% conifer cover and no observed regeneration of any trees. The canopy is mostly *Acer macrophyllum*, with 75% percent cover.

The target forest type for the South Slope is *Tsuga heterophylla – Pseudotsuga menziesii/Polystichum munitum – Dryopteris expansa* (Western hemlock – Douglas fir/Sword fern – Spreading wood fern; TSHE-PSME/POMU-DREX). The reference ecosystem is Mesic-moist conifer and conifer-deciduous mixed forest.

Water Flow

Subarea A (Figure 7, below) is above a number of seeps in the Headwaters Bowl that feed into the stream. These seeps flow over gleyed soils. Water and soil movement has been observed in these seeps even in high summer. The slopes above the seeps might receive some attention from the Stewardship Grant, but most attention will focus on the Headwaters Bowl ("HWB") and the Central Valley (as discussed in "Wetlands").

Subarea B (Figure 7, below) receives the run off from the South Plateau. It is critical that we explore this area during the first heavy rain of the fall. There is evidence that the run off from the South Plateau is eroding a section of the south loop social trail and affecting the immediately adjacent section of the Central Valley. How the runoff is affecting the slope, underneath the ivy, needs to be examined.

Vegetation

To the west side of the trail, the South Slope is heavily invaded, with mature *Alnus Rubra* (Red alder) and *Acer Macrophyllum* (Big leaf maple) standing above a near-monoculture of Hedera helix (ivy). There is some remnant *Polystichum munitum* (Sword fern) and a stand of *Rubus parviflorus* (Thimbleberry).

To the east side of the trail, the section bordering the Headwaters Bowl and the Olympic Terrace properties is less invaded.

Invasive Removal and Restoration Plan

Figure 7: The South Slope.

Subarea A

Subarea A lies between the property lines of Olympic Terrace and the Headwaters Bowl. This means it will be affected by the work done in Subarea D of the Headwaters Bowl. It also lies above the seeps in the HWB that will receive some of the attention of the Stewardship Grant. Work here will have to be coordinated with these other projects.

Subarea A has received numerous tree and shrub plantings in the last two years. These appear to have established well. Unfortunately, we did not keep accurate records, so we only have the survivors to go by.

In the parts of Subarea A that have been explored, there are few invasive plants. The efforts here will be to control what invasiveness is there and add to diversity, particularly at the shrub and groundcover layers.

Suggested Tasks for Subarea A:

- Continue exploration and control of existing invasives. This can be done by forest stewards.
- Monitor plantings for survival and growth. Replenish as necessary. Plant trees for buttressing in the lower sections; above that, plant shrubs for diversity and to maintain view corridors into the park.
- Coordinate work in Subarea A with the Stewardship Grant from the Washington Native Plant Society (HWB Subarea B) and with the homeowners of Olympic Terrace (HWB Subarea D) as necessary.

Subarea B

Trailside reaches of Subarea B are accessible to forest stewards and volunteers. There is a stand of Rubus parviflorus (Thimbleberry) along the trailside that can be spread through berry spreading and live staking.

Suggested Tasks for Subarea B:

- Spread the *Rubus parviflorus* (Thimbleberry) with a mixture of berries and live stakes.
- Attend to the trailside weeds such as *Lapsana communis* (nipplewort) and *Cicerbita muralis* (wall lettuce).
- Subarea B cannot receive crew attention until water control efforts on the South Plateau have improved.

West Slope

Description

The West Slope is bordered by property lines above and the south loop social trail below. The northeastern and southeastern corners touch Fletcher's Slope and the South Slope, respectively. It is more than 36,600 square feet in size.

The northeastern corner of the West Slope has a large gap that provides an expansive view of the Central Valley. The southwestern corner of the West Slope is the west end of the 90th St. right of way. Two plots of the June belt transect were established there (see "Vegetation" below).

Other than several *Pseudotsuga menziesii* (Douglas fir) that were planted below the 90th St. end, the West Slope has received no restoration efforts. The Natural Area Crew will work on this area after the South Slope.

The West Slope has the largest *Tsuga heterophylla* (Western hemlock) in North Beach Park, but no other coniferous cover. There is no observed regeneration of either deciduous or conifer trees. Between the large gaps, and the extent of *Prunus laurocerasus* (Cherry laurel) cover in the middle, the West Slope has the least amount of native tree cover of any HMU.

The target forest type for the West Slope is *Tsuga heterophylla – Pseudotsuga menziesii/Polystichum munitum – Dryopteris expansa* (Western hemlock – Douglas fir/Sword fern – Spreading wood fern; TSHE-PSME/POMU-DREX). The reference ecosystem is Mesic-moist conifer and conifer-deciduous mixed forest.

Water Flow

There has been no observed water flow on the West Slope. It is too far above the floor of the Central Valley to be affected by any seeps emerging from the walls of the ravine.

Vegetation

The West Slope is currently among the most heavily invaded HMUs in North Beach Park. There is an extensive canopy of *Prunus laurocerasus* (laurel); *Lamium galeobdolon* (Yellow archangel) is spreading down from a house; and, at 90th St., there are a number of sun-tolerant grasses and ornamentals. Bindweed is rampant in the sunnier parts of the West Slope.

Two 4x4' plots of the belt transect were established in the West Slope. The different size of these plots (compared to the others in the belt transect) was due to the density of herbaceous cover in this area.

Table 2, below, shows the target forest type indicator species for the North Slope and all species found in our survey. Please see the Key, below the table, for a full explanation of the numbers.

Table 2: Target Forest Type and transect species for the West Slope.

Binomial	Common Name	% Cover	TFT Goal
Abies grandis	Grand fir	0.00	14.00
Acer circinatum	Vine maple	0.00	20.00
Acer macrophyllum	Big leaf maple	20.00	18.00
Agrostis spp.		2.00	0.00
Agrostis stolonifera	Creeping bent grass	2.50	0.00
Alnus rubra	Red alder	0.00	9.00
Athyrium filix-femina ssp. cyclsosorum	Lady-fern	0.00	2.00
Blechnum spicant	Deerfern	0.00	2.00
Bromus vulgaris	Columbia brome	0.00	2.00
Calystegia sepium	false bindweed	0.50	0.00
Carex deweyana var. deweyana	Dewey's sedge	0.00	2.00
Corylus cornuta var. californica	Beaked hazelnut	0.00	3.00
Dactylis glomerata	Orchard grass	1.75	0.00
Dryopteris expansa	Spreading wood fern	0.00	3.00
Equisetum telmateia	Giant horsetail	1.00	
Galium triflorum	Sweet-scented bedstraw	0.00	2.00
Gallium aparine	cleavers	7.50	
Gaultheria shallon	Salal	0.00	2.00

Binomial	Common Name	% Cover	TFT Goal
Geranium robertianum	Robert's geranium	1.50	0.00
Hedera helix	English Ivy	3.50	0.00
Holcus lanatus	velvet grass	4.00	0.00
Hypochaeris radicata	Hairy cat's ear	0.25	0.00
Berberis nervosa	Dward Oregon-grape	0.00	4.00
Mycelis muralis	Wall lettuce	0.25	0.00
Plantago lanceolata	Narrow-leaf plantain	0.25	0.00
Polystichum munitum	sword fern	20.00	54.00
Pseudotsuga mensiesii var. menziesii	Douglas-fir	0.00	45.00
Pteridium aquilinum var. pubescens	Bracken fern	0.00	3.00
Ranunculus repens	Creeping buttercup	3.00	0.00
Rubus armeniacus	Himalayan blackberry	5.00	0.00
Rubus spectabilis	Salmonberry	0.00	4.00
Rubus ursinus	Trailing blackberry	0.00	3.00
Rumex obtusifolius	Bitter dock	0.25	0.00
Sonchus oleraceus	Common sowthistle	0.25	0.00
Tanacetum vulgare	Common Tansy	35.00	0.00
Taraxacum officinale ssp. officinale	Common Dandelion	0.75	0.00
Thuja plicata	Western red-cedar	0.00	33.00
Tiarella trifoliata va. Trifoliata	Threeleaf foamflower	0.00	5.00
Trientalis broealis ssp. latifolia	Western starflower	0.00	1.00
Trifolium repens	White clover	0.25	0.00
Trillium ovatum ssp. ovatum	Western trillium	0.00	1.00
Tsuga heterophylla	Western hemlock	0.00	36.00
Urtica dioica	Stinging nettle	0.25	0.00
Vaccinuium parvifolium	Red huckleberry	0.00	3.00
Vancouveria hexandra	Inside-out flower	0.00	7.00

Key: "0.00" in Pct. Cover column indicates a target forest type indicator species not found during the survey. No value in the TFT Goal column indicates a native species not listed in the target forest type. "0.00" in the TFT Goal column indicates an invasive species to be removed.

Of the 26 TFT indicator species, only two were found in this survey. Only five of the 22 species found in the survey were native. There are 24 indicator species for the target forest type. 22 species were found in the two plots, of which only five were native. No native species was found in more than one plot, and four of them were in the plot further from the street end.

The restoration plantings of *Pseudotsuga menziesii* (Douglas fir) were close to, but not in, the first plot. They are planted more densely than recommended and a little too high on the slope. The dense planting is to allow for infant mortality. The intention is that they will shade out the sun-requiring invasive species.

Heavy pulling of the weeds on this steep, dry slope would disturb the soil too much and possibly lead to a slope collapse. After the Douglas fir establishes, we will look into cardboard sheet mulching. We have also discussed with the homeowner adjacent to the street end the possibility of a native hedgerow, both to shade the slope and to prevent illicit access to the park.

Having said all that, this is an atypical section of the West Slope. But given the variety of aspects to the slope and the number of escaped ornamentals, there is no "typical" section of this HMU.

Invasive Removal and Restoration Plan

Figure 8: The West Slope

No part of the West Slope is accessible to volunteers. Some parts, bordering the social trail, are accessible to forest stewards.

In general, the West Slope is very low priority. The large, spreading cover of *Lamium galeobdolon* (Yellow archangel) has been reported to Green Seattle Partnership. It will either be treated later this year, or we will work with the homeowner to eradicate it.

Fletcher's Slope

Description

Fletcher's Slope adjoins the 92nd St. Wetlands at the far north end of the park. Although park tours go through more of Fletcher's Slope than the 92nd St. Wetlands, the slope is similarly little explored.

There is a remnant brick structure that looks like the foundation or kitchen wall of an old settlement house. A homeowner has run their roof pipe down to the stream.

Like the 92nd St. Wetland, Fletcher's Slope has a target forest type not assigned to any other HMU. It is *Tsuga heterophylla – Thuja plicata – Acer macrophyllum/Acer circinatum/Lysichiton americanum* (Western hemlock – Western red-cedar – Big leaf maple /Vine maple/Skunk cabbage; TSHE-THPL-ACMA/ACCI/LYAM). The reference ecosystem is riparian forest and shrubland, the same as assigned to the Central Valley and the Headwaters Bowl.

Water Flow

Parts of Fletcher's Slope are very wet, nearly saturated.

Vegetation

Fletcher's slope has the only known instance in the park of *Vancouveria hexandra* (Inside-out flower). Whether this is naturally growing or an escaped ornamental is unknown. However, it is spreading.

Invasive Removal and Restoration Plan

Fletcher's Slope is low priority, due to its distance from the end of the park and its low level of invasiveness. It will have to be explored further before a definite plan can be formulated. Any work done here will be done in conjunction with work on the 92nd St. Wetlands.

References

Department of Planning and Development. 2007. City of Seattle Department of Planning and Development GIS map. http://web1.seattle.gov/dpd/maps/dpdgis.aspx (dates of accession various).

EarthCorps. 2012. North Beach Park South Plateau Baseline Report. (unpublished document). EarthCorps, Seattle.

EarthCorps. 2013. North Beach Park South Plateau Monitoring Report. (unpublished document). EarthCorps, Seattle.

Green Seattle Partnership, 2014. GSP Reference Map on ArcGIS.com. http://www.arcgis.com/home/webmap/viewer.html?webmap=9be9415001144aa383e5b86e481d2c45&extent=-122.5312,47.374,-121.7945,47.7577 Dates of accession various.

Conclusion

Immediate plans

The most important tasks facing the park are the implementation of the WNPS stewardship grant and further monitoring and control of the street runoff and erosion problem in the South Plateau.

The rest of 2014

The August work party will return to the areas cleared in January and February to prepare them for planting in November.

The September work party will be held in the South Plateau, and will feature a number of students from Seattle Pacific University participating in their "City Quest" program. Tasks will include mulching some bare areas, weeding in areas that still have invasive cover, and some watering or after care of installed plants.

During September and October, the forest stewards will work on implementing the WNPS Stewardship grant.

The October work party will feature either some implementation of the WNPS Stewardship grant, expansion or more preparation of the area cleared last winter, or both. Participating with the forest stewards in the October and November work parties will be a small group of foreign exchange students from North Seattle Community College.

The November work party (the last of 2015) will be centered on planting in the newly cleared area.

2015

During the January work party we will install new plants in the South Plateau, and do any maintenance on the water channels necessary.

The forest stewards will produce documentation of the WNPS Stewardship grant.

In 2015, the West and South Slope HMUs will get crew time from the Parks Department Natural Area Crew.

2016

Proposition 1 comes into effect in 2016, and this will increase funding for natural areas and Green Seattle Partnership. However, there is such a large maintenance backlog in more actively used parks all over the city that it might be a while before better funding affects the FoNBP. Even so, it's important to the future efforts of FoNBP to continue to work on writing and getting grants so that we have more than one source of funding.

2021

2021 is ten years after the start of restoration. If FoNBP is able to keep working with the same energy and quality of work, it's likely that all of the volunteer and forest steward-accessible areas of the park will be in at least Phase 1 of restoration, and that all the slopes requiring crew time will have received at least an initial invasive removal.

The existing monocultures will have been eradicated, and forest stewards will work on restoration using methods that avoid disrupting the soil and shrub layer as much as possible. During the early stages of Phase 1 of new restoration, we will introduce a new conifer generation. During the Phase 2 and 3 restoration, we will increase shrub and groundlayer diversity and introduce a new deciduous generation.

Some well-established areas of restoration, such as the South Plateau and the Headwaters Bowl, will be approaching Phase 4. When a restoration site enters Phase 4 restoration, we will introduce a new conifer generation.

On the other hand, NBP loses one to three *Alnus rubra* (Red alder) a year to age and failure. This means that by 2021 we will have lost between 10 and 30 *A. rubra,* with a consequent enlargement of the canopy gaps. This will make the park more susceptible to sun-loving weeds, particularly *Calystegia sepium* and lawn grasses, and may slow or set back the reintroduction shade-dependent herbaceous plants.

2061

This is much more difficult to predict, not least because of the possible effects of climate change on a ravine.

It's likely that by 2061 North Beach Park will have a well-established young conifer forest. *Pseudotsuga menziesii* will do well on the warmer, dryer slopes and rims. Because of the wet, nutrient-rich soils, the other trees might be doing well on the lower slopes and bottomlands of the park.

However, even optimistic scenarios say that the average temperature will be noticeably warmer mid-century than it is now. It is likely the increasing warmth will disrupt existing plant communities. There will be new invasive plants, both from North American plants moving north and introduction of new exotic species.

My hope is that the steep, narrow walls of the ravine, and the saturation of the soils at the bottom, will mitigate the effects of climate change on North Beach Park, and that this ravine (and other ravines in the Puget Trough) will be refugia for the temperate lowland plants otherwise threatened by climate change.

Further research

Although writing this has taught me more about North Beach Park and GSP requirements and processes than I knew before, I feel like I've only scratched the surface. The nature of restoration is of constant research and experimentation – the "intelligent tinkering" suggested by Aldo Leopold and proposed by Cabin (2011).

But focusing more on North Beach Park, understanding how the street runoff pulses are affecting the South Slope and the Central Valley is very important. Understanding the hydrology of the entire park is also important.

I would like to find someone who is experienced at birding by ear to visit the park regularly. I have no idea if the restoration has improved bird populations or not.

Other than that, most of following are "it'd be interesting to find out about..." ideas.

I'd like to examine Larson's thesis and plant list in detail, with an eye towards reintroducing plants on his list that have become locally extirpated.

I'd like to continue work on the bloom time chart (Appendix B). Increasing the selection of very early and very late bloomers in a restoration project would help pollinators.

Using the currently-assigned target forest types as a baseline, look at the other forest types in the same reference ecosystem for North Beach Park. Add those plants, at the shrub and herbaceous level that are not already listed in a TFT assigned to North Beach Park.

On a personal note, restoration work is the first experience I've had in my life that has made me feel connected to the future. I hope to continue it as long as I'm able or can afford to.

References

Cabin, R.J. 2011. *Intelligent Tinkering: Bridging the Gap between Science and Practice.* Island Press, Washington DC.