

# CULLY PARK

Remediating the Willamette Waterfront of Portland

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Remediating the Willamette Waterfront of Portland

A Design Thesis Submitted to the  
Department of Architecture and Landscape Architecture  
of North Dakota State University

By

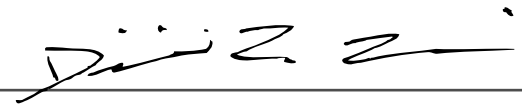
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In Partial Fulfillment of the Requirements  
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# Introduction

This thesis program is a waterfront greenway project focused on the remediation of the Willamette riverfront of Portland, Oregon. The following work has been a year long process of research, inventory, analysis, and design divided and shared between a fall and spring semester. Final design outcomes have been revised from beginning material and design processes displayed throughout this book.



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# Chapter One:

Introduction

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# Abstract

This thesis is a remediation greenway project with an emphasis on waterfront revitalization and phytoremediation. Researched greenways focus on the conservation, recreation, and non-motorized transportation of a maintained corridor of protected open space, however, very little research focuses on the incorporation of phytoremediation into these protected greenways. This thesis's research explores the relationship between phytoremediation and a waterfront park through studied principles comprising of: ecological movement, remediation educational practices, and transportation and circulation connections. These aspects are implemented through the design of a multi-level park, linking the Willamette River in the South Waterfront District of Portland to existing trail systems and the urban community of Downtown Portland.

# Statement of Intent

Rivers are primary resources across the world for food, drinking water, travel, wildlife habitat, connecting cities, and aesthetic appeal. Waterways are vital to the communities they are present in and have large impacts on the environment. The Willamette River has been a strong resource originating in the Cascade Mountains south and southeast of Eugene and Springfield, Oregon, before flowing north into Salem and finally through Portland, Oregon where it merges with the Columbia River. For several years now, the Willamette River has been undermined and polluted to the point of non-reliable resources for the environment. Portland, Oregon, is a large urban hub along the west coast of the United States. Setting a precedent for a “green” community since being established in 1851, Portland gives priority to bicyclists, pedestrians, and neighborhood communities in the city through their use of greenways, and complete streets.

The Willamette River, being such a major, polluted river flowing through the city, detracts from Portland's waterfront destination potential. As landscape architects, we are able to take advantage of this and remediate the water while creating ecological connections through trail systems and corridors. The physical connection of the Willamette River in the South Waterfront District and downtown Portland through a park and trail system is the basis of this thesis project.

Designing a trail system to connect to the city's existing greenway systems along the Willamette Riverfront will create a go-to destination while enhancing the growth of the South Waterfront District. The South Waterfront District is expanding at an enormous rate and is in dire need for public space and trail connections to those currently there. Healing the river through rhizofiltration processes within the greenway will establish a stable and interactive destination for the city of Portland, Oregon.



# Chapter Two:

Project Typology & Literature Review

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# Project Typology

- Phytoremediation Reclamation Greenway
- Waterfront Revitalization

Waterfronts play a large, important role for the history of the United States; starting out as ports for ships to escape strong storms, then used for travel and food transporting uses. Today, waterfronts are go-to destinations that bring recreational purposes for many people to enjoy. This phytoremediation reclamation greenway will revitalize the Willamette Riverfront while establishing a go to destination as the entryway into Portland, Oregon. Rhizofiltration is a form of phytoremediation that will be used in this thesis to filter water through a mass of roots to remove toxic substances or excess nutrients from the ground water and river water from the Willamette River.

# Research Questions

How can this thesis project successfully become a destination in Portland and connect the gap in the existing park and trail systems while remediating the Willamette waterfront?

- How effective is the use of phytoremediation for removing contaminants?
- Does phytoremediation vegetation have to be harvested?
- Which contaminants should be concentrated on extracting from the Willamette River?
- How important is the diversity of transportation paths?
- How will a strong sense of entrance enhance existing greenway connections?
- What design elements encourage people to stay on site short and long term?
- Will closing the gap between the existing greenways increase pedestrian traffic on site?

# Research Hypothesis

By incorporating phytoremediation into this greenway, wildlife habitats, and Willamette River uses will increase by 75% within the next fifty years, as well as physical health of pedestrians through alternate forms of transportation. I expect that this connection between Cully Park's remediation greenway and the existing greenways on either side of it will complete the balance between natural and built environments to develop the South Waterfront District further and bring a diverse set of users to the area.

This multi modal greenway will attract people to the site while the harvesting gardens will educate them on possibilities for future design in Portland and nationwide. Finally, the riverfront access will re-establish recreational elements to the Willamette River and serve as a hub for kayakers and fishermen to come to.



# Case Study

<b>Project Name:</b>	South Waterfront Greenway
<b>Project Location:</b>	South Waterfront District in Portland, Oregon
<b>Date Designed/Planned:</b>	December 8, 2004
<b>Constructed Completed–Construction Cost:</b>	Under Construction (Open to public in spring 2015)
<b>Size:</b>	4.7 Million Dollars
<b>Landscape Architect(s) Client/Developer:</b>	Patty Freeman: Walker–Macy Landscape Architects Allison Rouse, Irene Bowers: Portland Parks and Recreation (Project Managers) Portland Development Commission
<b>Consultants/Architects Managed By:</b>	Portland Parks and Recreation Portland Development Commission



<https://www.portlandoregon.gov/parks/article/175890>

## Context:

Portland's south waterfront is located in central Portland along its busy, downtown urban hub and the waterfront of the Willamette River. The Willamette River has always played a central role in the history and growth of Portland, Oregon. This waterfront has become more important in recent history as it has been introduced to many different wildlife habitats, open spaces, and recreational resources for the community to come to. Not only does this waterfront foster a sense of place for the city, but it also is a source for travel destinations for outside visitors to enter the city.

The city of Portland was started originally by the Willamette River in 1843, but then it was called Oregon Country. In 1845 the city name was switched to Portland and on February 8, 1851 Portland was official incorporated into a city. Portland was most popularly known to American, Canadian, and British traders, trappers, and settlers back in the 1830's to early 40's as a what was a small stopping place along the west bank of the Willamette River who were in route between Oregon City (now Portland) and Vancouver. In the late 19th century a huge fire broke through and burnt down 20 blocks of downtown Portland along the Willamette River causing damages payable up to 1.5 million dollars in repairs. Shortly after receiving its nickname of "the most filthy city in the northern states" due to its poor sewer and drainage systems, Portland gained recognition for the positive by hosting the Lewis and Clark Centennial Exposition, A World's Fair, which then lead to a double increase in population and residential development.

Eventually there was a large boom in the city due to its abundant nature, urban growth boundaries, cheaper rents, and opportunities for work. Since then, the south waterfront has been a perfect target for greenway systems, but left untouched for several years until 1966. The concept of a Willamette Greenway took root in the governor's race in 1966 between Tom McCall and Robert Straub. For the large governor's race each had different ideas for the Willamette River redesign, but both agreed that a greenway system was a necessity for the city of Portland and possibly further south for larger connections as well. After the race for governor was over, Tom McCall won and the Land Conservation and Development Commission (LCDC) established boundaries for the Willamette Greenway. Since then three regional parks and forty-three access areas have been created.

Since this time, the public perception of greenways and the importance of such systems have improved tremendously which has helped to create such a green city. "On November 11, 2004 the Portland City Council adopted the city's River Renaissance Vision which embraced the Willamette River as the city's front yard and sets the broad range of goals for how Portland embraces the concept of what role greenways play in the future development of the city" (Francesconi et al., 2004, p.6). Today Southwest Portland is under construction to develop the greenway along the Willamette Riverfront to be completed in the spring of 2015.

## Site Analysis:

Portland, Oregon is bordering Vancouver, Washington to the North with the Columbia River flowing between the two states, and Beaverton, Oregon to the south. The Willamette River originates in the mountains south/southeast of Eugene and Springfield, Oregon before flowing directly through downtown Portland before meeting up with the Columbia River to the north. This project specifically is located along the western bank of the Willamette River in the South Waterfront District of Portland, Oregon. The South Waterfront District is approximately 130 acres located adjacent to the city's central district just south of the Marquam Bridge in Southwest Portland. The actual greenway design will be 20 acres in area taking up 1.2 miles of the riverfront. "Combined, the greenway and district create one of the most exciting design and development opportunities in Portland to date. The district has the potential to reflect our commitment to both a high-density urban community and exemplary treatment of the banks of the Willamette River." (Francesconi et al., 2004, p.7).

## Project Background and History:

The South Waterfront District has been a part of Portland since the early 20th century and has been in the works for a greenway design since the mid 1960's. Starting out as part of the governor's race in 1966, the greenway system was developed as part of election goals. Since the election of the governor Tom McCall, the greenway design has become a realistic goal for the city of Portland and a public vision for the community.

In 2002, the South Waterfront Plan was adopted as the land use plan for the area of the South Waterfront District in Portland. The South Waterfront Plan and the Zoning Code for South Waterfront were officially adopted on November 13, 2002 to the City Council and call for "10,000 jobs and a minimum of 3000 housing units to be added to the district by the year 2019. The area is expected to be a vibrant mix of offices, educational and medical facilities, condominiums and apartments, retail uses, urban plaza, a neighborhood park and an exemplary riverfront greenway" (Francesconi et al., 2004, p.8). Following this plan's adoption into the city council, they also adopted the Phase One Report to Council on the Project Goals in 2003, recommending the Parks Bureau take the lead on the development of the greenway plan.

## Genesis of Project:

The South Waterfront has been the next big step in greenway planning for the City's commitment to enhance the visibility of the South Waterfront District and to implement their River Renaissance vision. Much of Portland, Oregon has waterfront greenways and trail systems to help with the walkability of the city and creating a complete streets vision. Starting back from the thought processes of this greenway the effort of the city staff and much of the public's input has helped tremendously on this greenway's approach and standards for development in this district. The South Waterfront Plan describes the project as, "To achieve the highest quality greenway for South Waterfront, there is a strong interest in designing the greenway as a unified whole with participation by all stakeholders. In addition, as well as efficient and coordinated permitting while ensuring a clean and healthy river for fish, wildlife and people." (Francesconi et al., 2004, p.8).

The River Renaissance vision is critical to this greenway plan to ensure the health of the river for its habitat, community, wildlife, enhancement of its working harbor, creating vibrant waterfront districts and neighborhoods. Along with this vision, the basis of this greenway and hopes for the future effects of this plan include job creation, the development of an exciting urban community, increased riverfront access for the people of Portland, innovative stormwater management, and enhanced fishing and wildlife habitat.

## Design, Development Process:

The South Waterfront has been through the first phase of development in June of 2012, and now onto the second and final phase which started in May of 2014, with the hopes of completing construction for public access in the spring of 2015. The design processes were derived from nearly ten years of city staff and public input to successfully create an in depth, fully functioning greenway system for the South Waterfront District. These processes and goals have included, but are not limited to, 1.) Ensuring a clean and healthy river to stabilize fishing and wildlife habitats, 2.) Maintaining and strengthening the city's prosperous working harbor, 3.) Embracing the river and the riverbanks as Portland's front yard and entryway, 4.) Creating a vibrant waterfront district and neighborhoods, 5.) Promoting and reinforcing partnerships, education, and leadership in the district.

## Role of Landscape Architects:

The project managers for the South Waterfront Plan are Allison Rouse, and Irene Bowers; with a large landscape architectural team from Walker-Macy Landscape Architects, working under the senior landscape architect in charge of this plan, Patty Freeman. With a large leadership role in this project, the team created by Walker-Macy Landscape Architects took much input from the public and the city staff, as well as many partnering firms including PAE Consulting Engineers, architectural cost consultants, FASLA, Watercycles Inc., Fishman Environmental Services, Geotechnical Resources, City Corps Advisory Team, Portland Parks and Recreation Public Involvement Program, etc., 2.

The Landscape Architectural team not only was able to establish an in depth design plan for this project, but also dive deep into Portland's history and plans for the city as Portland becomes more established. Creating two phases for this greenway plan helped to establish guidelines and ensure all details for this plan and any future development plans to follow the principles developed over ten years of thought processes by these teams of professionals.

## Program Elements:

The South Waterfront District has been under the zoning code and waterfront plan developed by the city council since 2002, which calls for 10,000 jobs and 3,000 housing units minimum to be added to this district by the year of 2019. This district has many different project programs and land uses for complete neighborhoods to be a successful beacon for Portland. This greenway plan allows for multiple site uses including biking, walking, roller blading, skating, with many resting areas for site and city views, resting, river access, fishing, etc.

## Maintenance and Management:

This greenway can either be a large asset for the South Waterfront District, or it can be huge liability. The security and maintenance of this project is a very important element to ensure the future success and extension of the greenway. With the greenway finished construction in the spring of 2015, the maintenance, security and operations are still in the planned faze to be put to the test upon the public opening. With large importance for the success and boom of this district's future and their plan for a complete community largely rides on these processes and maintenance of the greenway. "If design components are ill conceived the greenway could prove to be a liability and a deterrent to the early success of creating this district." (Francesconi et al., 2004, p.21.).

The transition from public to private space along this 1.2 mile stretch of greenway and the need to communicate the level of desired permeability were taken into careful consideration for the aspects of design and became very considerable goals in the project. The relation between security and maintenance were thought of as issues and possibilities to relate through the design and thought processes as well. The concept of "defensible space" is another key element in the program objectives for this project that build on the commitment of the neighborhood concept of "eyes on the greenway" that is being utilized in many neighborhoods in the Portland area.

"To help in the facilitation of the security issues, Parks convened a meeting of security experts to review the Plan. Participation in this discussion was a representative of the Portland Police and Fire Bureaus, Portland Parks Public Safety Office and Parks Security Ranger. To meet the security demands of the greenway, consideration has been given to lighting, pathway location and design, physical barriers to access the trails from heavy vegetated areas and the type and location of overall vegetation." (Francesconi et al., 2004, p.21.) This project has a critical goal derived from the beginning design processes that assures the final design can be affordably operated and maintained. Having multiple maintenance cost estimates set aside ensure that the up-keeping and security of the greenway will be a full time job upon the completion of construction phases one and two.

## Use/User Analysis:

The South Waterfront Plan is designed for a mixture of users to ensure the full use of the greenway. These users include, but are not limited to the following:

- Pedestrians from the South Waterfront District and Portlanders, and visitors to the area
- Bicyclists
- Rollerbladers, skaters, long boarders
- Fisherman/woman
- Boating traffic (private, industrial, and commercial)

Once construction is completed the design will offer beautiful scenery, natural surroundings with large vegetated areas, open spaces and amenities, riverfront connections, fishing and wildlife habitats, multi-uses for travel purposes, corridors, etc. All users will find this to be an entry for the city of Portland as you head north along Willamette River and into the downtown. Offering an escape from the busy city, this greenway encompasses nature with the built environment to create seasonal interest and year round use by site users. With the sites many different uses, all of the site users are able to meander for hours while still finding many things to do and enjoy on site while indulging in the strong sense of community and a fully constructed environment.

## Peer Reviews:

Since the South Waterfront Plan is still under construction and to be finished in the spring of 2015, it has not had many peer reviews yet. The ones that have been received are about the idea of the greenway and the design plans that have been provided. Since the public has been a large part of the entire development and design process much of the reviews have been positive for thought and design of the greenway. This greenway is the main attraction for the South Waterfront District currently to help the district take off and welcome in new homeowners and residents, so the success of the district rides on the review of all peers for the future success of the area.

## Criticism:

There have not been any recordings of criticism that I have been able to find in regards to the South Waterfront Plan. Upon completion, I'm sure findings of different criticisms will be easier to find as there may be un-thought-of and unexpected issues that arise. Different goals that have never been realized are bound to pop up and will receive criticisms that in turn should help the future success of this greenway and development of others.

### Significance & Uniqueness of Project:

This project is very unique to the area and significant in the future success and development of Portland, Oregon and more specifically the South Waterfront District. From its ten years of thought processes and program elements development, it has an edge in environmental and greenway/parkway planning. The With the large amount of collaboration, this project has included the public in each step of the design processes and invited input by everyone willing to give any. This greenway provides a model for planners across the country interested in greenway development and riverfront access, as well as “complete and green communities”.

### Limitations:

The South Waterfront District is still working on their plan for development which is going to be tremendously impacted by the completion of this greenway. There is a lack of land use diversity in the South Waterfront District area to create diverse users for the greenway. Diverse land uses depend on the successful completion of this greenway plan as proposed in the zoning laws that have been adopted to the district for the next five years, 6. There are many different laws for rivers and riverfront designs that had to be dealt with through the planning process to ensure the riverfront stayed intact and allowed for riverfront connections to be made.

### Generalizable Features and Lessons:

The depth of research and thought processes that have been put into this greenway through its program elements and models for development provide a great basis for all greenway projects to be completed in the future of Portland or anywhere in the world. The thorough documentation through the ten year process before construction serves as a workable environmental planning, greenway/parkway, and stormwater management manual for landscape architecture projects for others to follow. Once open to the public, this greenway will show the value of producing a strong, well developed, environmentally strong plan and its impacts on community development and growth.



## Comparison to Other Projects/Cases:

There are a large number of greenway case studies that help to develop communities and districts further in Portland alone. For North Portland there are currently seven greenway projects, for Northeast Portland there are seven, for Southeast Portland there are ten and three for Southwest Portland. Many of these projects are case studies that also work on developing communities and neighborhoods further for Portland's hope of becoming a complete green city. Many other famous greenway case studies have been recorded all over the country that includes:

- Manhattan Waterfront Greenway- New York, New York
- Midtown Greenway- Minneapolis, Minnesota
- Boulder Creek Path- Boulder, Colorado
- Burke-Gilman Trail- Seattle, Washington
- Minuteman Commuter Bikeway- Greater Boston, Massachusetts
- Lakefront Trail- Chicago, Illinois
- American River Bike Trail- Sacramento, California

## Future Issues/Plans:

There are several issues, but also plans for the future of South Waterfront District and its greenway plan that are being addressed through the planning processes of this project. The lack of basic infrastructure and an economic driver have been large issues that are now that have been major parts of redevelopment through adopted laws and plans for the area by 2019 are now underway in the district. Within the heart of the South Waterfront District there is a major redevelopment project underway that is being taken under the wing of Oregon Health and Science University, River Campus Investors, and North Macadam Investors, with the hopes of expanding the OHSU campus for additional research and academic space. Not only will expanding this campus add diversity to the district, the Central District will also bring more jobs (both office and laboratory), combined condominium towers, apartments, retail services, and the possibility for pocket parks, and neighborhood creation while being two blocks off of the South Waterfront Greenway.

The Greenway and Central District parks system intends to promote the livability in the South Waterfront District "while the aspirations for the greenway reflect local commitment to revitalize the Willamette River as a healthy natural system and to create an excellent recreational resource and connection to the river." (Francesconi et al., 2004, p.8). These are further objectives that plan to be further evaluated through the goals established in the Federal Clean Water and Endangered Species Act (ESA).

## Bibliography of Project Citations/References:

See references at end of report.

## Web Sites/Links:

See list of Websites in annotated bibliography.



<https://www.portlandoregon.gov/parks/45643>

# Critical Analysis of Cited Papers

The following research thoroughly analyzes Cully Park: Remediating the Willamette Waterfront of Portland; a proposal to revitalize the riverfront through a phytoremediation greenway to improve water quality, reconnect the community with the riverfront, and educate the general public on ecological design practices. The site in Portland is four acres long, located in the South Waterfront District on the Willamette River. Not only is there a disconnection from the community and river itself, but there are also large quantities of contaminants in the river that only fuel this issue that this thesis is attempting to resolve. Through the use of educational journals and articles, books, films, case studies, and research websites, the strengths and arguments that each author, or group of authors make, will display the strengths that this thesis's argument creates.

Cully Park is a unique project in the field of landscape architecture that has not always been thought of for urban riverfronts. Greenway systems have become a vital movement in landscape architecture across the United States in recent decades to get people out of their cars and reconnected with nature. As greenways have become popular in recent history, phytoremediation is still a slow-growing movement across America. Reconnecting the community to the Willamette River is a vital part of this thesis which relates to Greenways for America, a novel written by Charles E. Little, concentrating on the development and importance of greenways. Charles states that "to make a greenway is to make a community. (Little, 1990), this statement is a large focus to this thesis in that creating a community in the South Waterfront District is a large part of what I am trying to establish as an outcome from this remediation greenway.

As defined by the United States Environmental Protection Agency, "Phytoremediation is the direct use of green plants and their associated microorganisms to stabilize or reduce contamination in soils, sludges, sediments, surface water, or ground water." (EPA Website, 2012). This is the form of extraction that is being used in this thesis to restore Cully Park to its former clean state. Phytoremediation is the best form of revitalizing for this park to help educate the public, create breakout corridors for people to stop along the greenway, install a go-to destination along the river, and of course, rid the park of its pollutants. Phytoremediation is the only natural method to rid contaminants from soil, air, and water that has been tested on over 200 sites across the nation with positive outcomes. "Because it is a natural process, phytoremediation can be an effective remediation method at a variety of sites and on numerous contaminants." (EPA Website, 2012). As opposed to bioremediation, the direct use of chemicals to stabilize or reduce contamination in soils, sludges, sediments, surface water, or ground water, phytoremediation creates a landscape space within its natural setting that is not only aesthetically pleasing, but also rids the landscape of contaminants through natural processes rather than adding more chemicals to it.

The Oregon Poplar site, located in Clackamas, Oregon parallel to the Mt. Scott Creek stream, is a successful phytoremediation case study that comprises three to four acres within a vacant parcel to reduce multiple contaminants from illegal dumping activities. Since the Phytoremediation at Oregon Poplar Site in Oregon project is located in a fairly dense commercial and lightly industrial concentrated area, this is a perfect space for a phytoremediation project. “The ground water beneath the site is shallow (two to ten feet below the ground surface), locally confined, and in hydraulic contact with the Mt. Scott Creek stream. These characteristics along with low concentration of contaminants and little to no risk to human health make the site a good candidate for phytoremediation.” (EPA Website, 2012). The Phytoremediation at Oregon Poplar Site in Oregon project took place in 1997 and is still in motion today with the Poplar’s growing tremendously while still up-taking contaminants today. Phytoremediation is a fairly new practice happening across the nation, this project is a wonderful precedent as to why phytoremediation is the best choice for this thesis.

The potential for phytoremediation to create a connection with greenway systems is a large possibility for the future of landscape architecture since most greenways are developed along riverfronts where there is a depleted water quality. In the book *Designing Greenways: Sustainable Landscapes for Nature and People*, the authors Paul Cawood Hellmund and Daniel Somers Smith (2006) write about the ecological and social connections between water, wildlife, and human presence that are developed through greenways. Each of these connections is stated as follows:

Ecologically, greenways can protect natural areas and diminish the isolating, disruptive effects of habitat fragmentation on wildlife and water resources. Their effectiveness on both of these accounts, however, will vary according to factors such as their width, shape, location, and context. From a social and community perspective, greenways can provide important places for recreation; help maintains scenic quality of landscapes, or serve as regional separators between towns and cities. (Hellmund, Smith. 5, 2012)

These are two very important aspects of design that should be considered in future projects and is why it is relevant to Cully Park; the ecological design practices are what help tie together the greenway with its large phytoremediation aspect. The social aspects as described in *Designing Greenways: Sustainable Landscapes for Nature and People* are huge for the Willamette River itself with the aspect of education through minimal signage for the phytoremediation installments. With these two aspects of design, this thesis can become a beacon for the future of greenway and phytoremediation design while spreading ecological awareness throughout the nation. Overall, Cully Park is an innovative project that successfully incorporates these two measures of phytoremediation and greenways to create a more sustainable, complete waterfront for the South Waterfront District’s neighborhood in Portland, Oregon.

Greenways serve as connections between neighborhoods and cities, they create a starting point for newly developed areas, all while improving physical health for people by encouraging alternate forms of transportation other than vehicles. Currently in the South Waterfront District a 1.2 mile long greenway is under construction to help with the development of the district along the Willamette River. This greenway comes to an abrupt stop which is where my proposed phytoremediation greenway will pick up to create a connection between that district and downtown Portland, Oregon. The current greenway under construction is a huge step for the future of Portland and the Willamette River in many ways including:

- Ensuring a clean and healthy river to stabilize fishing and wildlife habitats
- Maintaining and strengthening the city's prosperous working harbor
- Embracing the river and the riverbanks as Portland's front yard and entryway
- Creating a vibrant waterfront district and neighborhoods
- Promoting and reinforcing partnerships, education, and leadership in the district

The criterion listed above from the South Waterfront Greenway Development Plan is a basis of criteria for the proposed phytoremediation greenway for the same district that this thesis is located in. By ensuring the above listed aspects of the South Waterfront Greenway Development Plan, the more complex the greenway is, and "the better it can function for different species groups and the more it is multi-functional in an ecological sense."

Rob Jongman and Gloria Pungetti state in their book, *Ecological Networks and Greenways: Concept, Design, Implementation* (2004). This book focuses on the relationship between greenways and ecological networks to the human environment and its development. Much concentration in the past has been on natural landscapes, but now is becoming a global movement to concentrate on the connection between natural environments and the built environments. This is where greenways come into the picture as a very important aspect as Reconnecting River develops the relationship between people and the natural and built environment around them. Jongman and Pungetti go on to say that, "If the previous focus was primarily on areas of high nature concentration, e.g. national parks, now the focus is moving towards linkages between them and linkages between nature and the human environment such as greenways, ecosystem coherence and ecological networks." (Jongman, Pungetti. 1, 2004.). This is a huge movement across the nation and is now known on not only a scientific, but public level as well as there is much community involvement with large scale greenway projects in many cities.

The connection between people and landscape and the built and natural environment are key components to the success for Cully Park. This connection brings many of the design aspects together to create a vibrant waterfront for the Willamette River, stabilized wildlife habitats, greenway/trail connections, diverse users, and a healthier river; without this concentration, this proposal would not be complete. This connection is also emphasized in *Designing Greenways: Sustainable Landscapes for Nature and People*:

It is important to recognize that greenways of all sorts, in all kinds of locales, have both natural and cultural aspects. For example, greenways that incorporate rail-trails or other human-engineered corridors can be enhanced with native vegetation, and remnant natural corridors, such as riparian greenways, that have been isolated by human actions exist within human-modified landscapes. (Hellmund, Smith. 14, 2012)

Therefore, successful greenways contain both these aspects and connections for diverse uses. With the slightest amount of human-engineered spaces, cultural aspects are then created in a space to give a balance between natural and built environments.

In conclusion, a proposal to revitalize the riverfront through a phytoremediation greenway to improve water quality, reconnect the community with the riverfront, and educate the general public on ecological design practices makes sense for this thesis, *Cully Park: Remediating the Willamette Waterfront of Portland*. The many books, articles, journals, and agencies works and research stated throughout this critical analysis prove this as well. As shown earlier, Charles E. Little states that "to make a greenway is to make a community. (Little,1990), which is exactly what this phytoremediation greenway will do for the community of the South Waterfront District in Portland, Oregon.







# Chapter Three:

Methodology

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# Approach to Research

The existing greenway systems in Portland, Oregon should be analyzed as a holistic system rather than independent systems seeing that this thesis's greenway system will close this gap between each. Portland, Oregon's South Waterfront District lacks a riverfront connection to downtown Portland. Designing a greenway system along the Willamette River will adjoin the two and create a notable entry into Oregon's largest city. Several factors such as circulation, population density, community diversity, surrounding building uses, access points, waterfront connections, downtown connections, and views influence the size, materials, existing greenway connection points, corridor locations, and path locations of the greenway system. The next objective is conducting an inventory and analysis on the thesis site and its surrounding context. The inventory and analysis is a critical stage that answers the predetermined research questions, qualitative and quantitative data measures and identify the optimal locations for the factors stated above. This thesis's greenway and the existing trail systems in Portland must be thought of as a holistic system and not separate greenways for the reason that there will constantly be circulation through each. The idea of this holistic system and the previously stated elements will affect the design factors and dynamics of the chosen site and therefore will be considered throughout the design process.

# Site Introduction





The South Waterfront District is located directly south of downtown Portland, Oregon. The thesis site is 25 acres (.04 Square Miles) directly west of the Willamette River. There is a greenway directly north of the site and one that is under construction (open to the public spring of 2015) directly south of the site. The topography of the site varies; on the northern end there is a gradual slope, while on the southern end there is a very steep slope. Currently there are University of Oregon campus buildings under construction directly west of the site, with heavy vehicular traffic on the western side of these buildings. This site is centered in a densely populated, urban community with diverse land uses.

#### Site Limitations:

- Currently under construction
- Disconnect from downtown Portland
- No access points to river or the public
- High vehicular traffic area

#### Site Strengths:

- Located in a dense urban setting
- Located on a highly polluted riverfront
- Views of the Willamette River & downtown Portland
- Diverse surroundings for diverse site users



<http://www.gerdingeden.com/ge-news/collective-conversations/article/controller/News/action/detail/item/downtown-portland-is-growing-up/>



Oregon Demographics:  
Oregon Population: 3,930,065  
Median Household Income: \$49,161

Portland Demographics:  
Portland Population: 609,456  
Median Household Income: \$52,158

# Client/User Description

## Client:

### **City of Portland | Portland Parks & Recreation | Portland Development Commission**

The City of Portland is the main client as the greenway system is a public project to enhance the city, its waterfront systems, and the city's "We Build Green Cities" initiative. Portland Parks & Recreation is a department working for the City of Portland that directly focuses on greenways and their green city initiative, and therefore is another important client. The Portland Development Commission must approve all construction projects before being constructed or being made available to public users. All three of these clients play vital roles since they are responsible for making future decisions for the residents and the growing city's success.

## User:

### **Community | Tourists | Boat Travelers**

Visitors and residents of the South Waterfront District and the City of Portland are the primary site users. Bicyclists, commuters, rollerbladers, skateboarders, boaters, and pedestrians are different groups of site users that are encouraged to use the greenway. These users can be people of all age groups as the greenway will have different paths, diverse path materials, and multiple access points. Tourists often come to Portland, Oregon, for their "We Build Green Cities" initiative, and are also important users for this greenway. The greenway systems in Portland give tourists alternative forms of transportation routes that also provide calming, scenic routes while getting them out of vehicles. Boat travelers go through Portland on the Willamette River, but typically continue to pass through unless it is for industrial needs. Greenway systems that have waterfront access create primary destinations for boat travelers.

# Data Measures

The methodology and research of this thesis involves both quantitative and qualitative measures to be collected through three primary methods: 1.) Personal site visits (observation and evaluation), 2.) Literature (digital and hard copies), and 3.) Studies and surveys (existing and still to be taken).

## Quantitative Data

- Head counts on people using existing greenway connecting to site.
- Population
- Average age of site users
- Modes of transportation
- Wind Angles
- Wind Speeds
- Surrounding Land Use
- Available site access points
- Willamette River contaminants
- Long/short term stay
- Site accessibility
- Sound Levels

## Qualitative Data

- Views
- Walkability
- Surrounding greenway appearance/materials
- Surrounding building appearance/materials
- Surrounding bridge appearance/materials

The quantitative data consisting of 1.) Head counts on people using existing greenways connecting to site, 2.) Average age of site users, 3.) Modes of transportation, 4.) Surrounding land use, 5.) Long/short term stay, 6.) Accessibility, and 7.) Sound levels will primarily involve personal site visits through observation and evaluation for measure results. Literature will be used to measure the results of 1.) Population, 2.) Wind angles, 3.) Wind speeds and, 4.) Willamette River contaminants. Studies and surveys (existing and still to be taken) will be used to measure 1.) Population, 2.) Wind angles, 3.) Wind speeds, 4.) Surrounding land use, 5.) Willamette River contaminants and, 6.) Sound levels. The qualitative data consisting of 1.) Views, 2.) Walkability, 3.) Surrounding greenway appearance/materials, 4.) Surrounding building appearance/materials and, 5.) Surrounding bridge appearance/materials will primarily involve site visits through observation and evaluation for measure results. Literature will also be used to determine the results of 1.) Surrounding greenway appearance/materials, 2.) Surrounding building appearance/materials and, 3.) Surrounding bridge appearance/materials.

Both quantitative and qualitative data results gathered through the personal site visits (observation and evaluation) will be done so November 8th through November 11th of 2014. In those days, specific times will be set up for site and context observation, as well as personal interviews with existing greenway users on their modes of transportation, and what they would like to see for the future of greenways. Data measures collected through the use of Literature (digital and hard copies), studies and surveys (existing and still to be taken) are being gathered from credible resources such as:

- City web pages
- National/state/county/regional geographical information systems (GIS) data and surveys
- The Bureau of Planning and Sustainability
- Walkscore online web page
- Weatherspark online web page
- Portland Parks and Recreation
- Government web pages
- Willamette-river keeper online web page
- Oregon Environmental Council

The results of the quantitative and qualitative data will be analyzed to verify appropriate features needed for the success and unique design of the greenway. The analysis of this information will also determine the design element locations based on the provided measures. The data can be evaluated and portrayed effectively through hand graphics while on site, and also through computer software to be displayed digitally through compatible design programs.







# Chapter Four:

Results

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# Research Findings

- How effective is the use of phytoremediation for removing contaminants?
- Does phytoremediation vegetation have to be harvested?
- Which contaminants should be concentrated on extracting from the Willamette River?
- How important is the diversity of transportation paths?
- How will a strong sense of entrance enhance existing greenway connections?
- What design elements encourage people to stay on site long and short term?
- Will closing the gap between the existing greenways increase pedestrian traffic on site?

## Pollutants

70–80% of the Willamette River's pollutants come from non-point sources. This primarily consists of stormwater runoff from streets, grasslands, sidewalks, rooftops, drainage systems, and agricultural activity. Non-point pollution accounts for increased levels of polychlorinated biphenyls (PCB's) and bacteria in the river. In Oregonian's study of the Willamette, Bill Monroe states, "PCB's in fish were ten times above warning standards used by Oregon and three times the federal standards." (Monroe, 2000). Since this and many other studies completed by USGS, the Willamette River has been added into the Clean Water Act 303 for its many violations of water quality seen as early as the late 1800's.

## Phytoremediation

Phytoremediation is defined as, "Phytoremediation is the direct use of green plants and their associated microorganisms to stabilize or reduce contamination in soils, sludges, sediments, surface water, or ground water.," by the United States Environmental Protection Agency. Although phytoremediation is a fairly new method of taking in contaminants, first being used at waste sites in the early 1990's, it has proven to be very efficient in removing pollutants. By using this method of extraction, there are aesthetic appeals and reduced amounts of chemicals being added to the river to remove pollutants.

## Amenities

On site observation resulted in the connection between length of stay per pedestrian and site amenities provided.

The sites that had diverse site amenities and larger amounts of each amenity had longer average stays per visitor. These amenities are not limited to, but include:

- Benches & Tables
- Restrooms
- Trash Cans
- Educational Signage
- Lighting
- Docks
- View Finders
- Drinking Fountains
- Bike Stations

# Site Observations

## Site One: Waterfront Park Trail, Portland, Oregon

Site Size: 4 Acres

Observation Length: One Hour

Measures observed in survey:

- Pedestrian's movement
- Site amenities
- Site materials
- Transportation

The graphic presented to the right outlines the site while giving movement density patterns, as well as breakout groups of long term stay on site.

On average, traffic volume remained steady, and most people walked directly through the site.

Average Site Stay Time: Fifteen minutes

Maximum Site Stay Time: Thirty Minutes



## Amenities



## Transportation



## Results:

Pedestrians on site were 4 times greater than any other mean of transportation. Bicyclists and handicap pedestrians were limited to their paths taken. The crushed gravel and small pavers prevented them from being able to take the quickest and most popular route across this site.

There were a large amount of benches on site, but not many pedestrians used them when they were staying for longer periods of time. Most pedestrians remained standing and read the educational signs provided along the greenway. There were litterers due to lack of trash cans available throughout the entire site. At night time the site was lit well with no unsafe dark spaces. The amount of people walking the site remained the same during the afternoon due to wide open, well-lit spaces.

## Site Two: SW Naito Parkway & Waterfront Park Trail, Portland, Oregon

Site Size: 3.4 Acres

Observation Length: One Hour

Measures observed in survey:

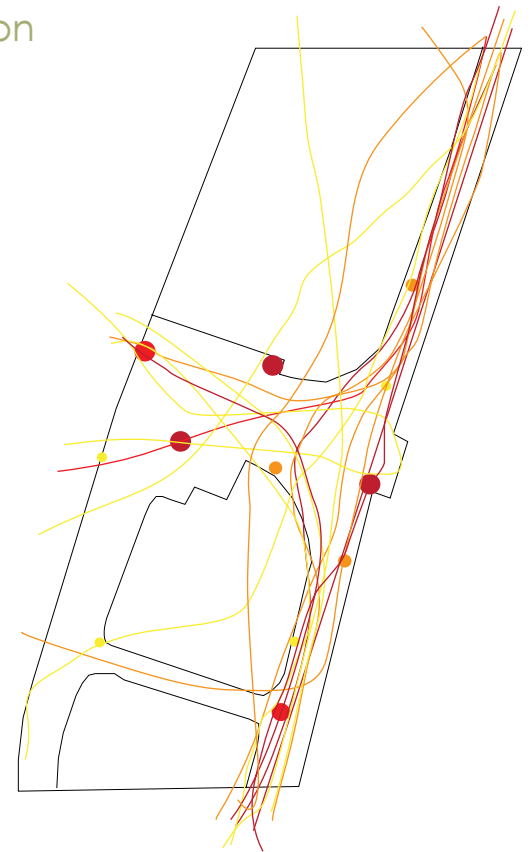
- Pedestrian's movement
- Site amenities
- Site materials
- Transportation

The graphic presented to the right outlines the site while giving movement density patterns, as well as breakout groups of long term stay on site.

On average, traffic volume remained steady, and most people stopped occasionally before leaving.

Average Site Stay Time: Twenty minutes

Maximum Site Stay Time: Sixty Minutes



## Amenities



## Transportation



## Results:

Pedestrians were far greater than any other mean of transportation on this site. This site was handicap friendly with all concrete paths and ramps next to steps for spaces with level changes. This was also more bicyclist and jogger friendly with the wide paths with proper materials for these forms of transportation.



### Site Three: Sellwood Riverfront Park, Oak Grove, Oregon

Site Size: 3.7 Acres

Observation Length: One Hour

Measures observed in survey:

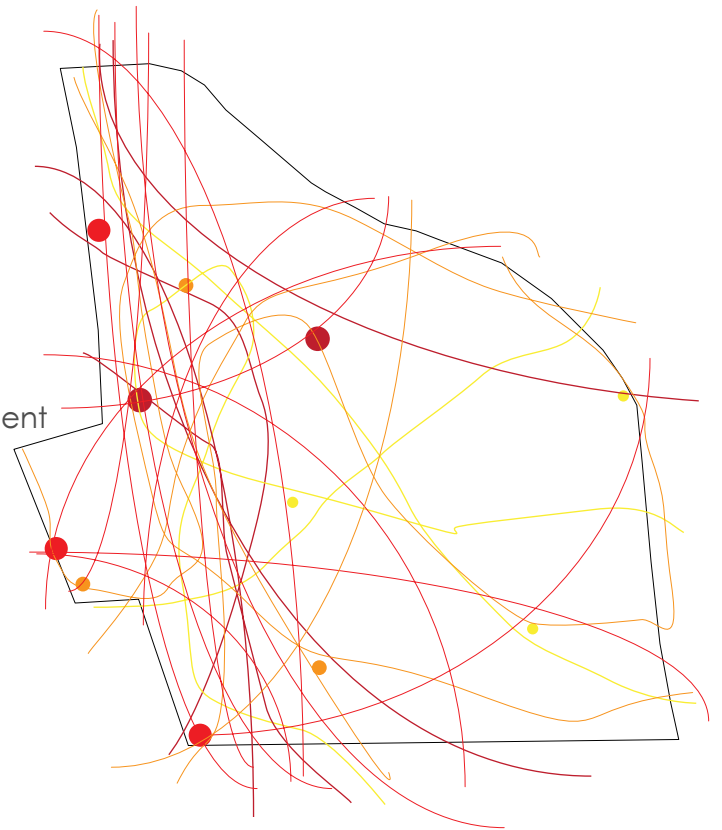
- Pedestrian's movement
- Site amenities
- Site materials
- Transportation

The graphic presented to the right outlines the site while giving movement density patterns, as well as breakout groups of long term stay on site.

On average, traffic volume remained steady, and most people stayed on site long term before leaving.

Average Site Stay Time: forty-five minutes

Maximum Site Stay Time: Sixty Minutes



## Amenities



## Transportation



## Results:

This site was different from the two previous due to its riverfront access. The most popular form of transportation on this site once again was pedestrians. Most pedestrians walked directly down to waterfront and stayed for extended periods of time. There were several fishermen that remained on site for the entire hour of observation. The materials on site were selected well with multiple paths for each form of transportation.

# Applicable Site Values

## Connectivity

Currently there is a disconnection between the existing greenways in Portland, specifically where this thesis is located. Creating connectivity increases pedestrian traffic, diversity of site users, and length of greenway space.

## Environmental Education

Harvesting gardens are located throughout the park that include indicator lighting and harvesting access paths while intimate seating areas develop interactive spaces for pedestrians with the environment.

## Water Quality

The Willamette River is a highly contaminated river in Oregon that is creating an unsafe habitat for humans and wildlife. Rhizofiltration, a form of phytoremediation, cleans the water from the plants used in the greenway to purify the water back to a healthy state.

## Uniqueness

This greenway has many materials, corridors, and paths that elevate the design for each site user. The use of phytoremediation is a new process to the United States and separates this greenway from the surrounding trails and park systems in Portland.

## Sense of Place

Cully Park creates a sense of place for the South Waterfront District by connecting existing transit stops, trail systems, and creating a go-to destination for pedestrians from the district and downtown Portland.

# Plan for Proceeding

Sunday 21st-27th:	Begin AutoCAD site base material.	January	February
Sunday 28th-3rd:	Complete AutoCAD base map with polylines specific to layers for SketchUp models.		
Sunday 4th-10th:	Continue various base material maps in AutoCAD.		
Sunday 11th-17th:	Complete base material AutoCAD maps.		
Sunday 18th-24th:	Begin analysis based off of inventory taken fall semester.		
Sunday 25th-31st:	Complete analysis and project vision by Friday, January 30th.		
Sunday 1st-7th:	Begin design process and functional diagrams.	February	
Sunday 8th-14th:	Continue design process and conceptual master plans.		
Sunday 15th-21st:	Complete master plan and conceptual designs for presentation.		
Sunday 22nd-28th:	Make edits needed to master plan design and begin site plan and details design.	March	
Sunday 1st-7th:	Continue site plan and detail design.		
Sunday 8th-14th:	Complete site plan and detail design for presentation.		
Sunday 15th-21st:	Spring Break: Work on edits for site plan and details from presentation critiques.		
Sunday 22nd-28th:	Continue editing design details and master plan until completion.	April	
Sunday 29th-4th:	Continue design material and detailing phase.		
Sunday 5th-11th:	Complete design material and begin physical presentation.		
Sunday 12th-18th:	Continue physical presentation renderings and digital model.		
Sunday 19th-25th:	Complete physical presentation with digital model.		
Sunday 26th-2nd:	Prepare verbal presentation for May 4th.	May	
Sunday 3rd-9th:	Complete verbal presentation and begin thesis program.		
Sunday 10th-14th:	Complete thesis program and repository material, then graduate!!		

# Design Goals

## Immediate:

- Create a sense of place in the South Waterfront District and entry into downtown Portland.
- Attract a diverse group of site users from the riverfront, existing greenways, the university, and downtown.
- Connect existing greenways in Portland, Oregon, to increase pedestrian traffic.

## Future:

- 25 years: Remove 30% of major Willamette River contaminants through phytoremediation.
- 100 years: Remove 90% of major Willamette River contaminants through phytoremediation.
- Establish a pedestrian safe zone for site visitors.

## Physical:

- Use materials to enhance runners, bikers, and walkers.
- Establish connections at busiest end points of existing greenways.
- Intake and remove as many contaminants on site as possible through plant material.

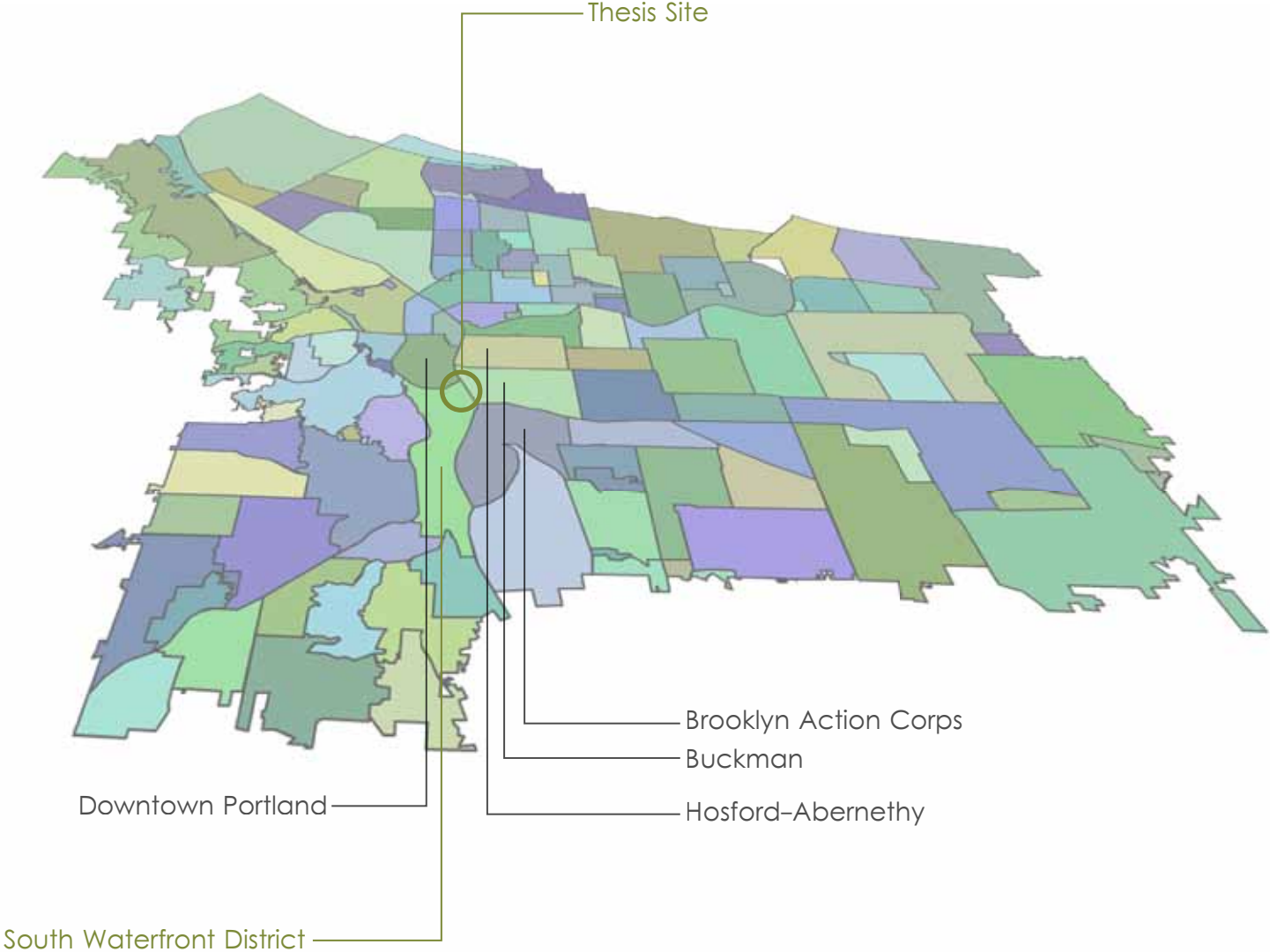


# Chapter Five:

Site Inventory

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# Site Location



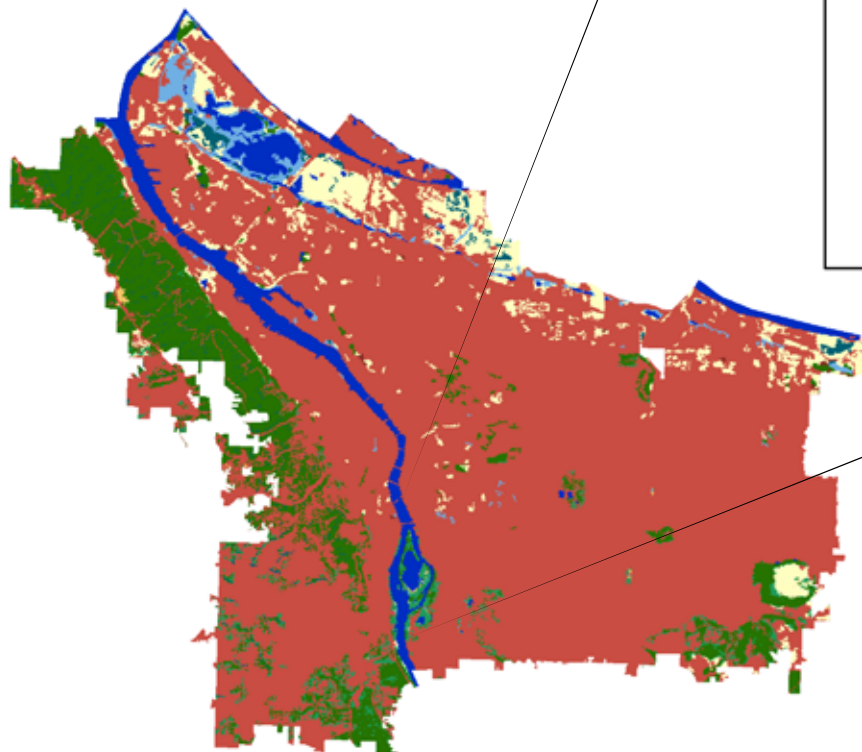


# Site Location

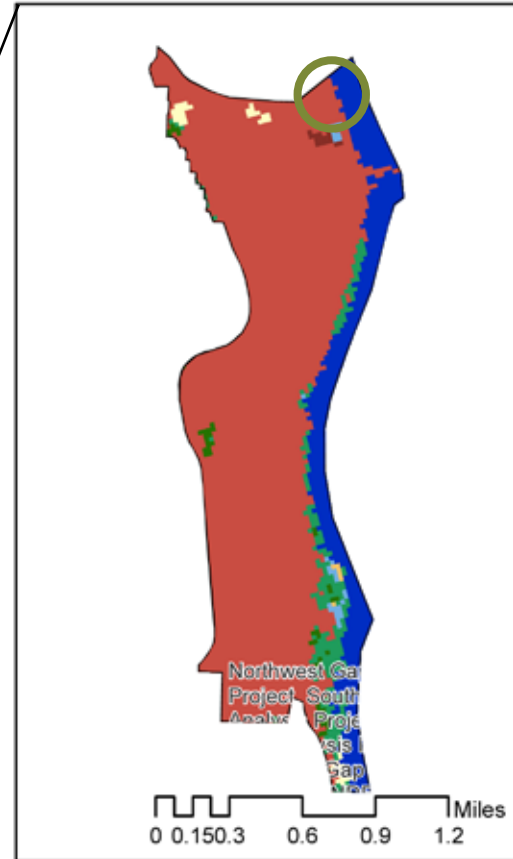


# Land Use

Shown on the maps below and to the right, Portland is nearly developed and urban land use, with areas of cool temperate forests primarily on the western edge of the city. When zoomed into the extents of the South Waterfront District you can see a little more details with zoning. There is again, most developed and urban land, but there is also construction directly west to the site. This construction site is to add university buildings from the downtown campus. There are small green spaces with minimal herbaceous agricultural vegetation as well as open water which is the Willamette River.

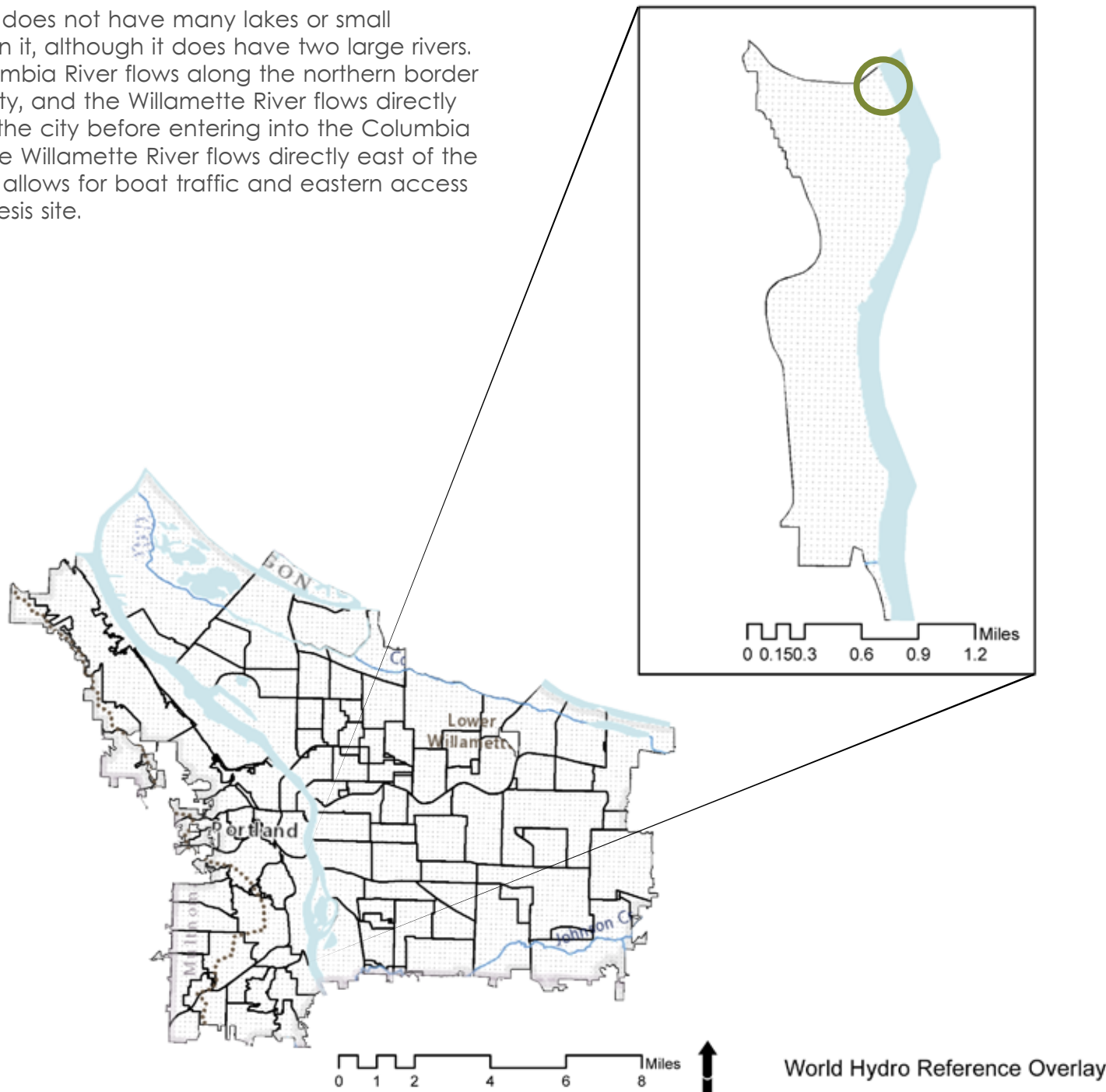


0 1 2 4 6 8 Miles



# Hydrology

Portland does not have many lakes or small streams in it, although it does have two large rivers. The Columbia River flows along the northern border of the City, and the Willamette River flows directly through the city before entering into the Columbia River. The Willamette River flows directly east of the site, and allows for boat traffic and eastern access to this thesis site.



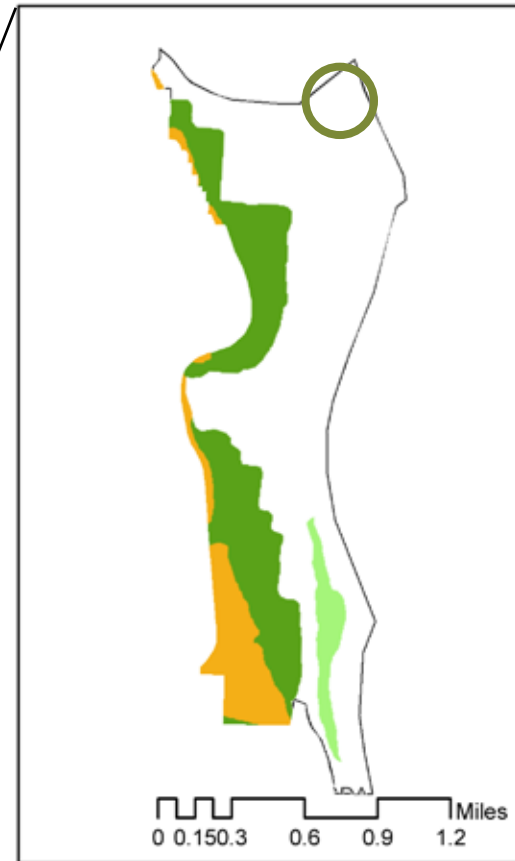
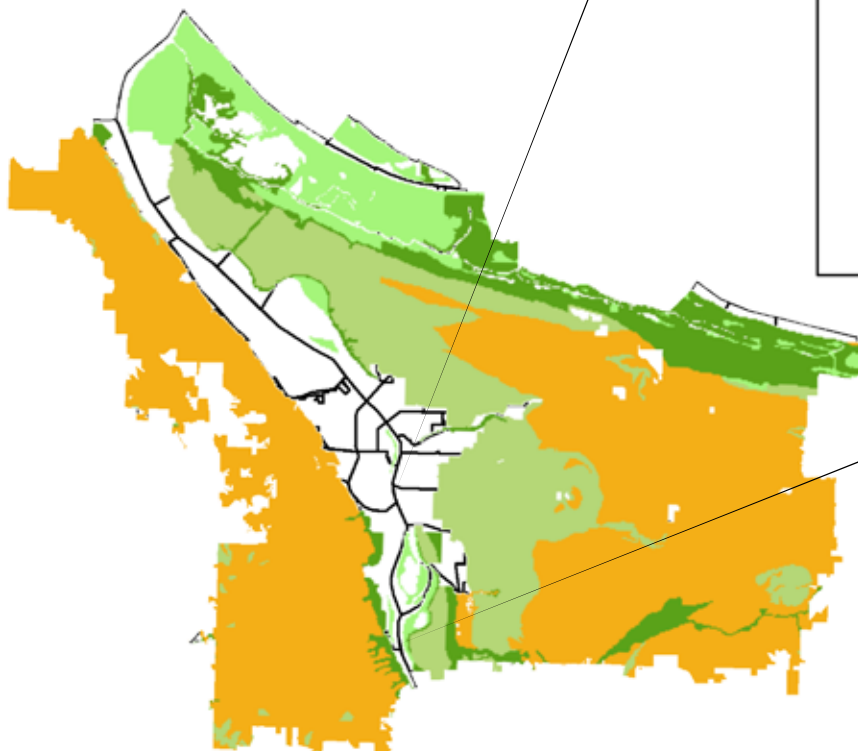
# Soils

75% of the landscape is covered in inceptisols soils. Inceptisols soil is a soil of an order comprising of freely draining soils. In inceptisols soil the formation of distinct horizons is not far advanced, such as brown earth.

10% of the landscape is covered in alfisols soils. Alfisols soil is a soil of an order comprising leached basic or slightly acidic soils with clay-enriched B horizon subsoil.

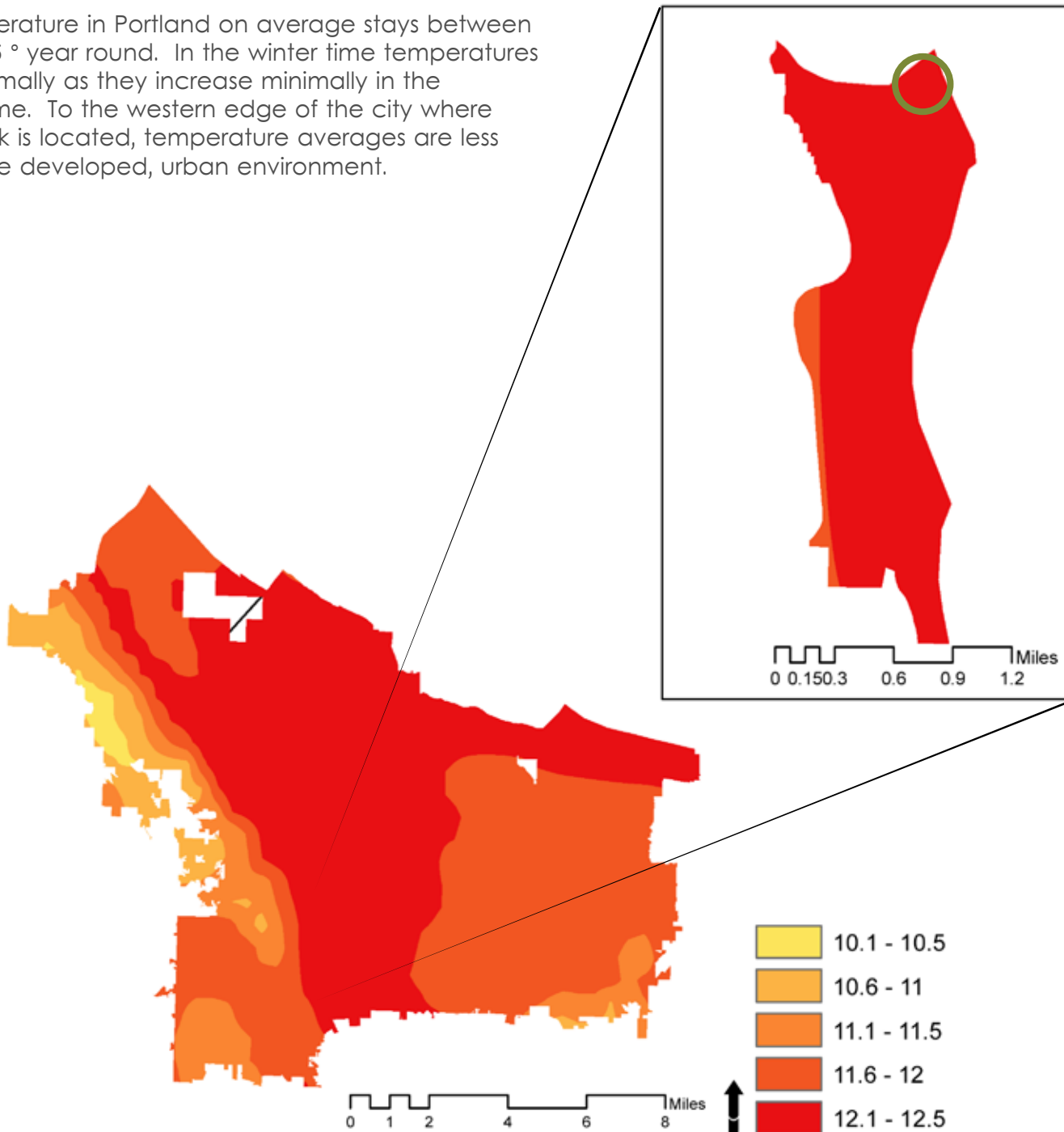
10% of the landscape is covered in Histosols soils. Histosols soil is a soil of an order comprising peaty soils, with a deep surface layer of purely organic material.

5% of the landscape is covered in Entisols soils. Entisols soil is a soil of an order comprising mineral soils that have not yet differentiated into distinct horizons.



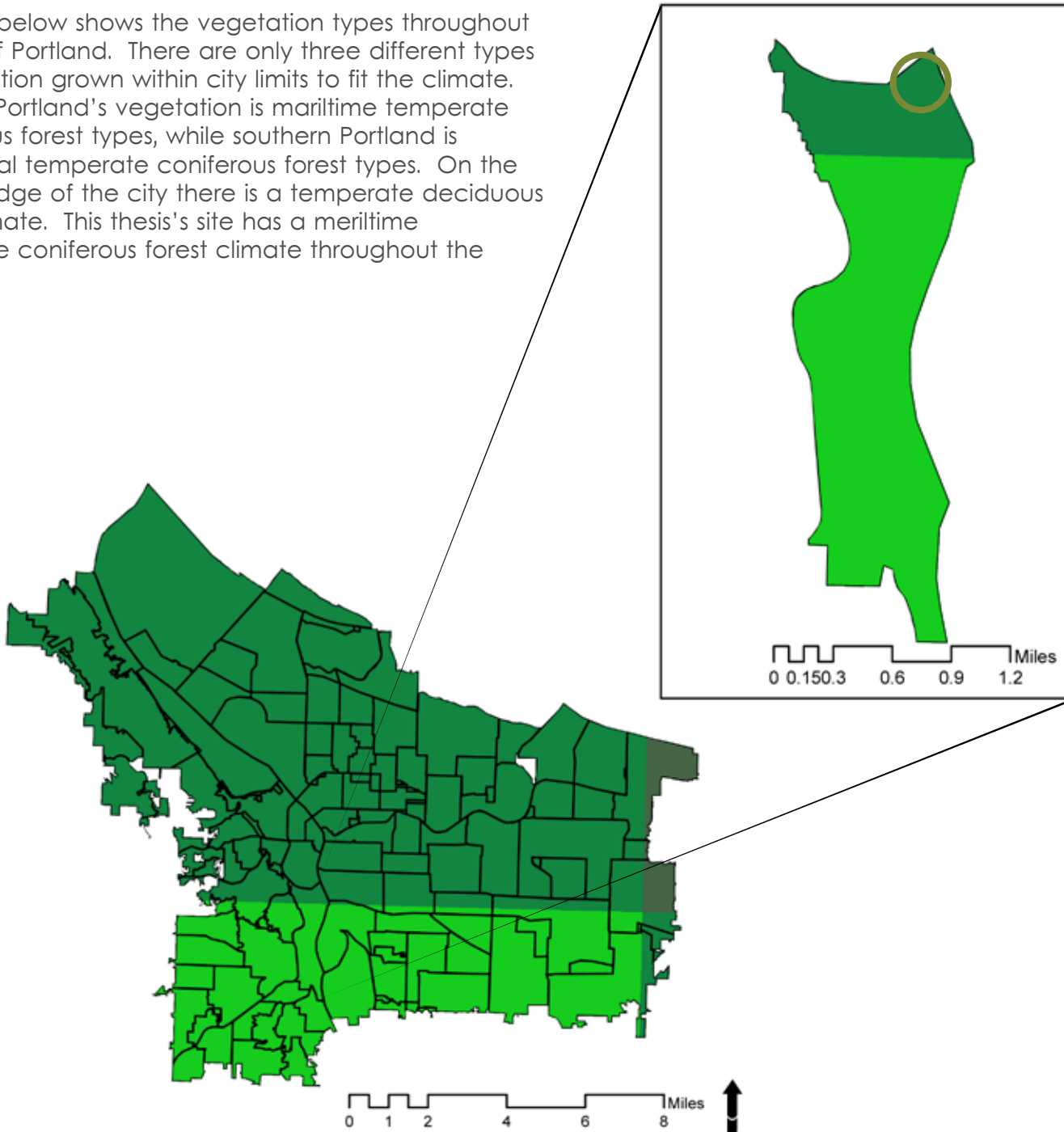
# Temperature

The temperature in Portland on average stays between 50 and 55 ° year round. In the winter time temperatures drop minimally as they increase minimally in the summertime. To the western edge of the city where Forest Park is located, temperature averages are less than in the developed, urban environment.



# Vegetation

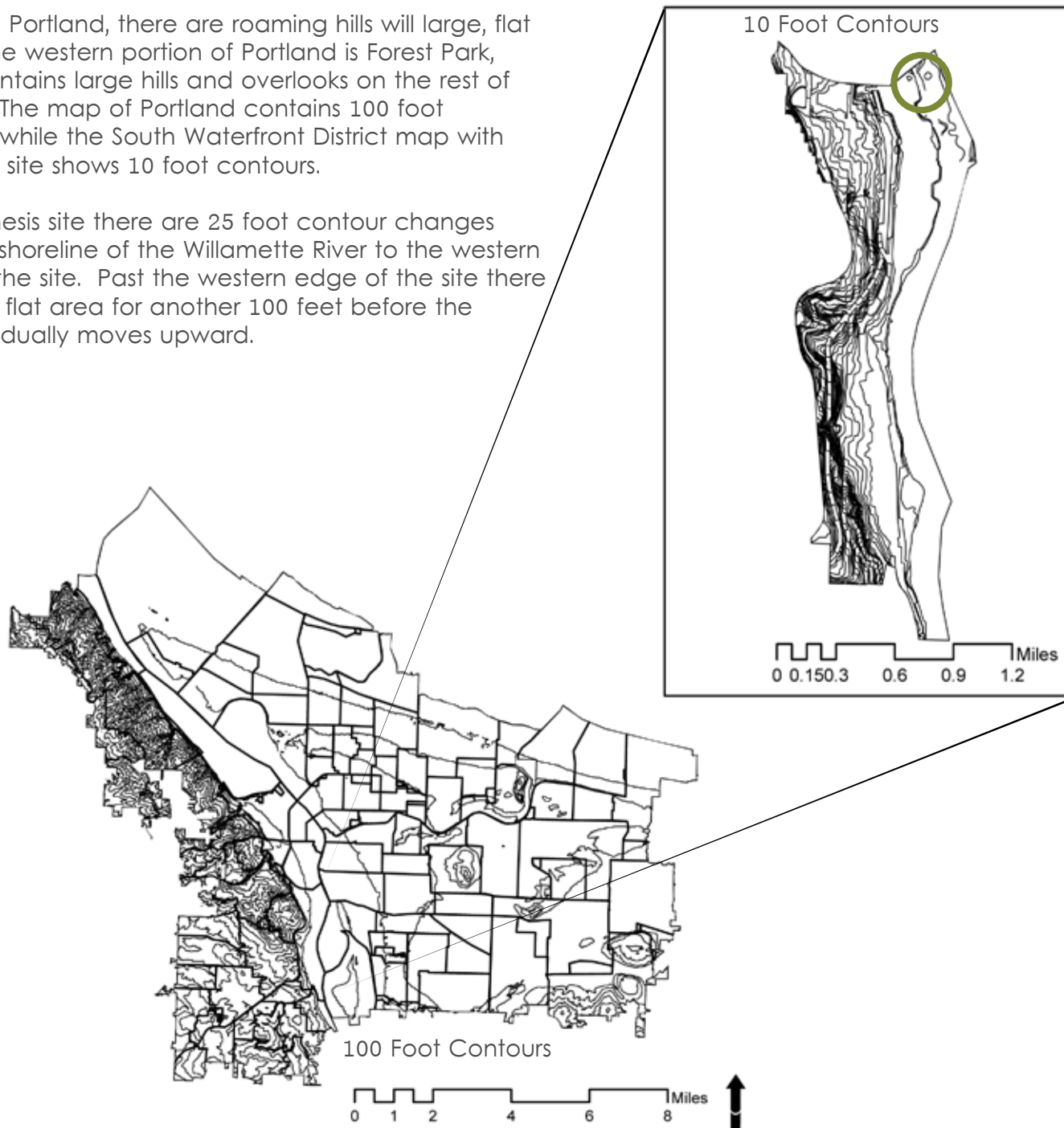
The map below shows the vegetation types throughout the city of Portland. There are only three different types of vegetation grown within city limits to fit the climate. Northern Portland's vegetation is maritime temperate coniferous forest types, while southern Portland is continental temperate coniferous forest types. On the eastern edge of the city there is a temperate deciduous forest climate. This thesis's site has a maritime temperate coniferous forest climate throughout the entire site.



# Topography

Overall in Portland, there are roaming hills with large, flat areas. The western portion of Portland is Forest Park, which contains large hills and overlooks on the rest of the city. The map of Portland contains 100 foot contours while the South Waterfront District map with the thesis site shows 10 foot contours.

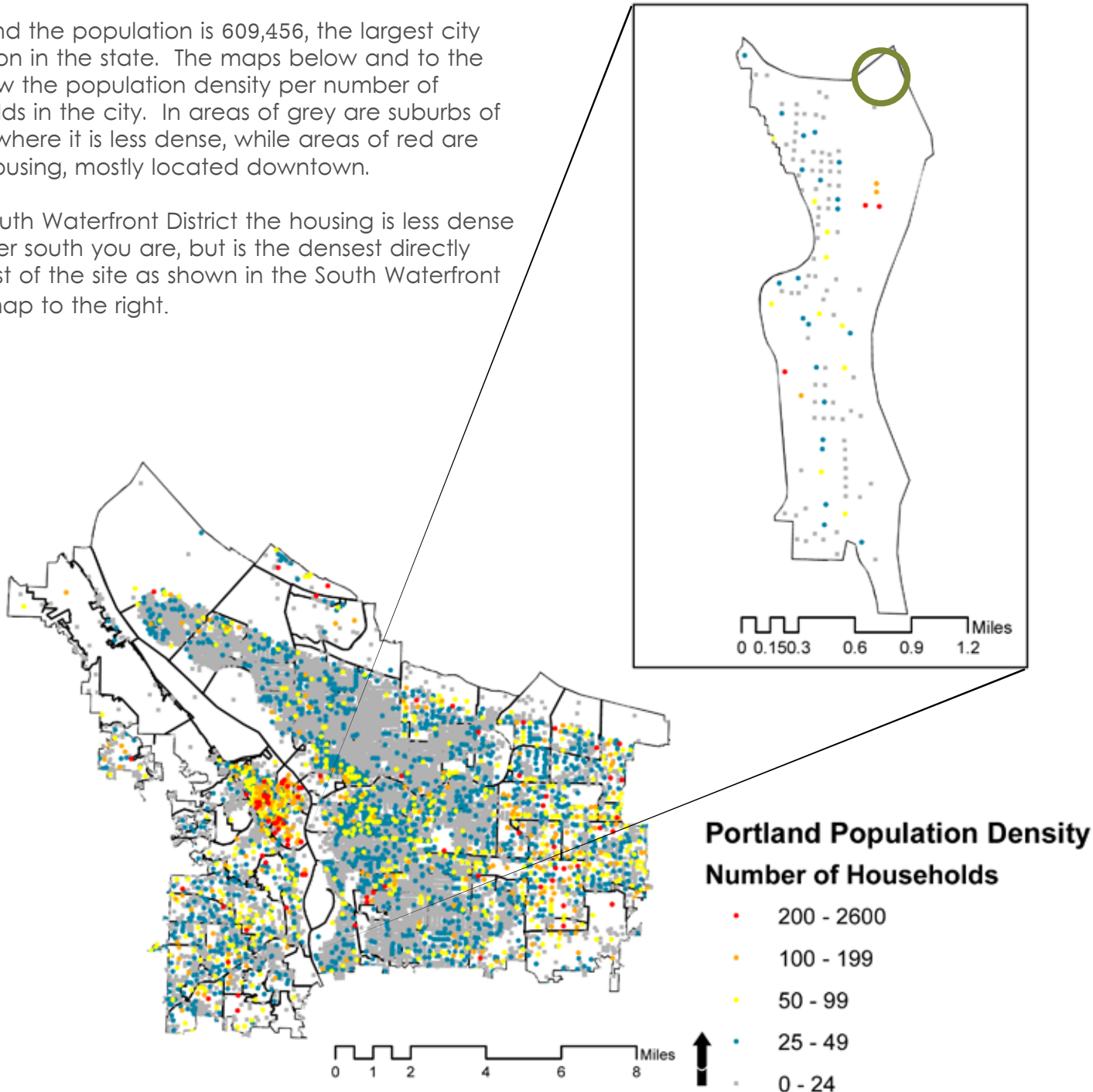
On this thesis site there are 25 foot contour changes from the shoreline of the Willamette River to the western edge of the site. Past the western edge of the site there is a large flat area for another 100 feet before the slope gradually moves upward.



# Population Density

In Portland the population is 609,456, the largest city population in the state. The maps below and to the right show the population density per number of households in the city. In areas of grey are suburbs of the city where it is less dense, while areas of red are dense housing, mostly located downtown.

In the South Waterfront District the housing is less dense the further south you are, but is the densest directly southwest of the site as shown in the South Waterfront District map to the right.



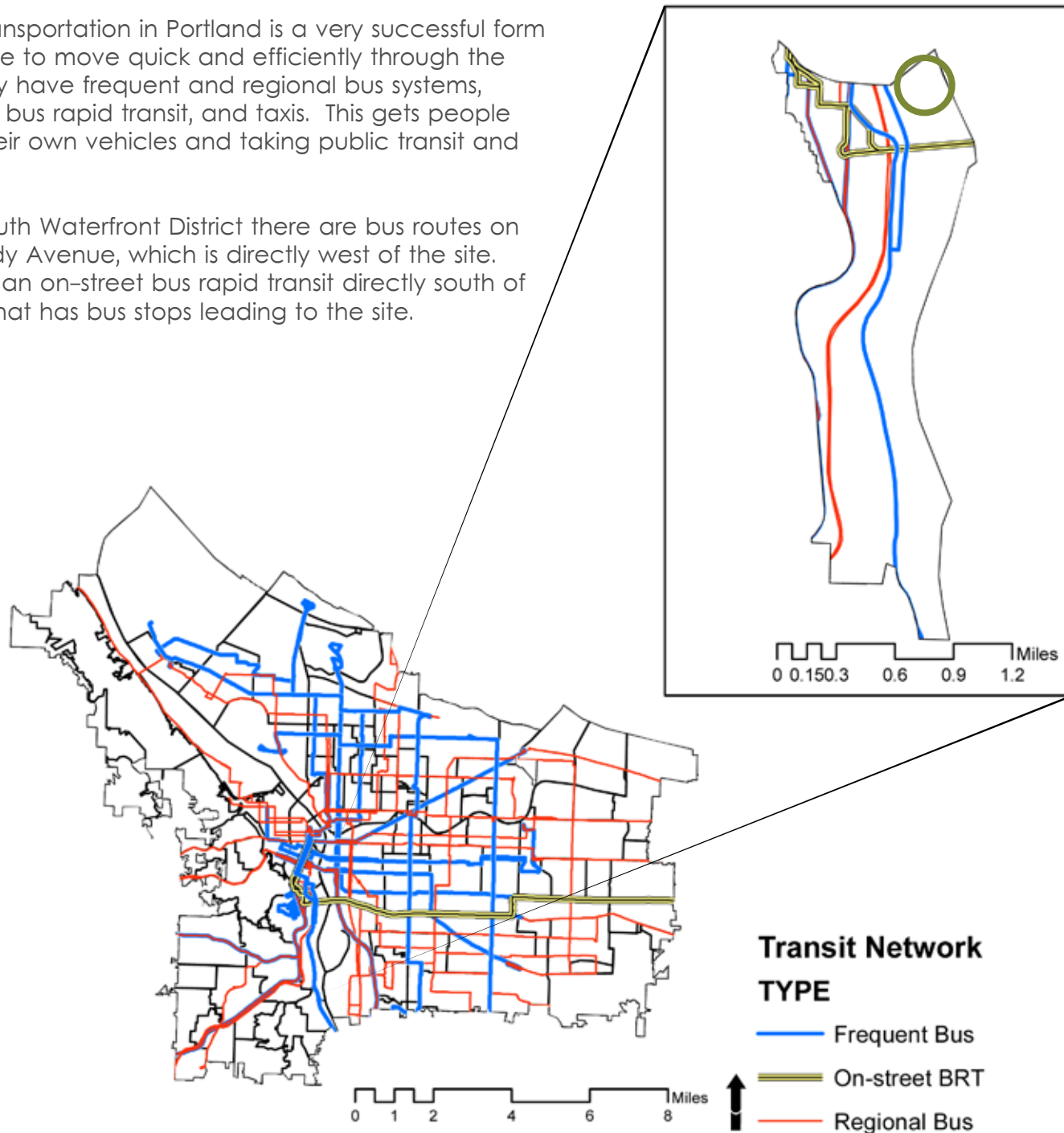


# Transit Network

Public transportation in Portland is a very successful form for people to move quick and efficiently through the city. They have frequent and regional bus systems, on-street bus rapid transit, and taxis. This gets people out of their own vehicles and taking public transit and walking.

In the South Waterfront District there are bus routes on SW Moody Avenue, which is directly west of the site.

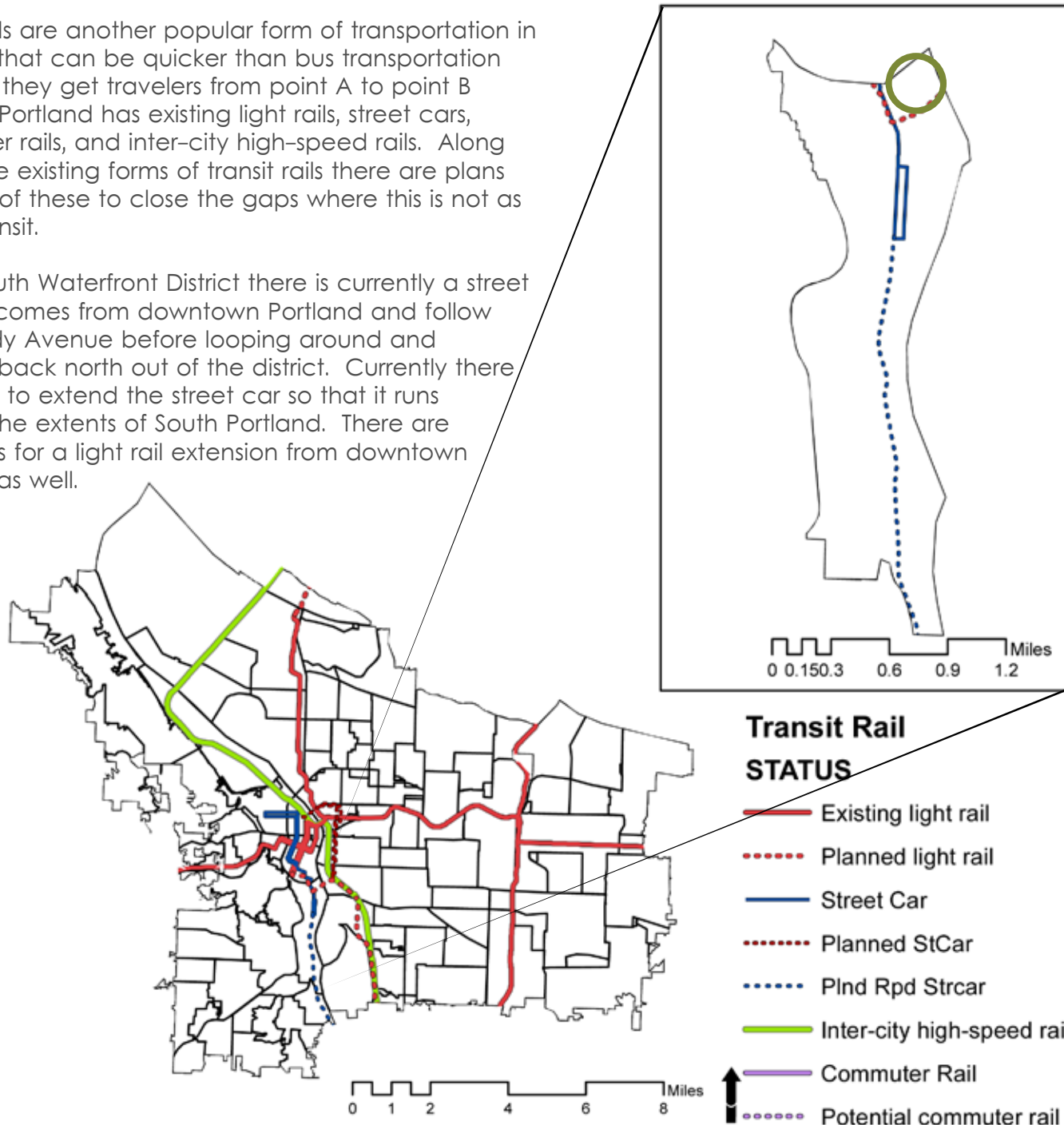
There is an on-street bus rapid transit directly south of the site that has bus stops leading to the site.



# Transit Network

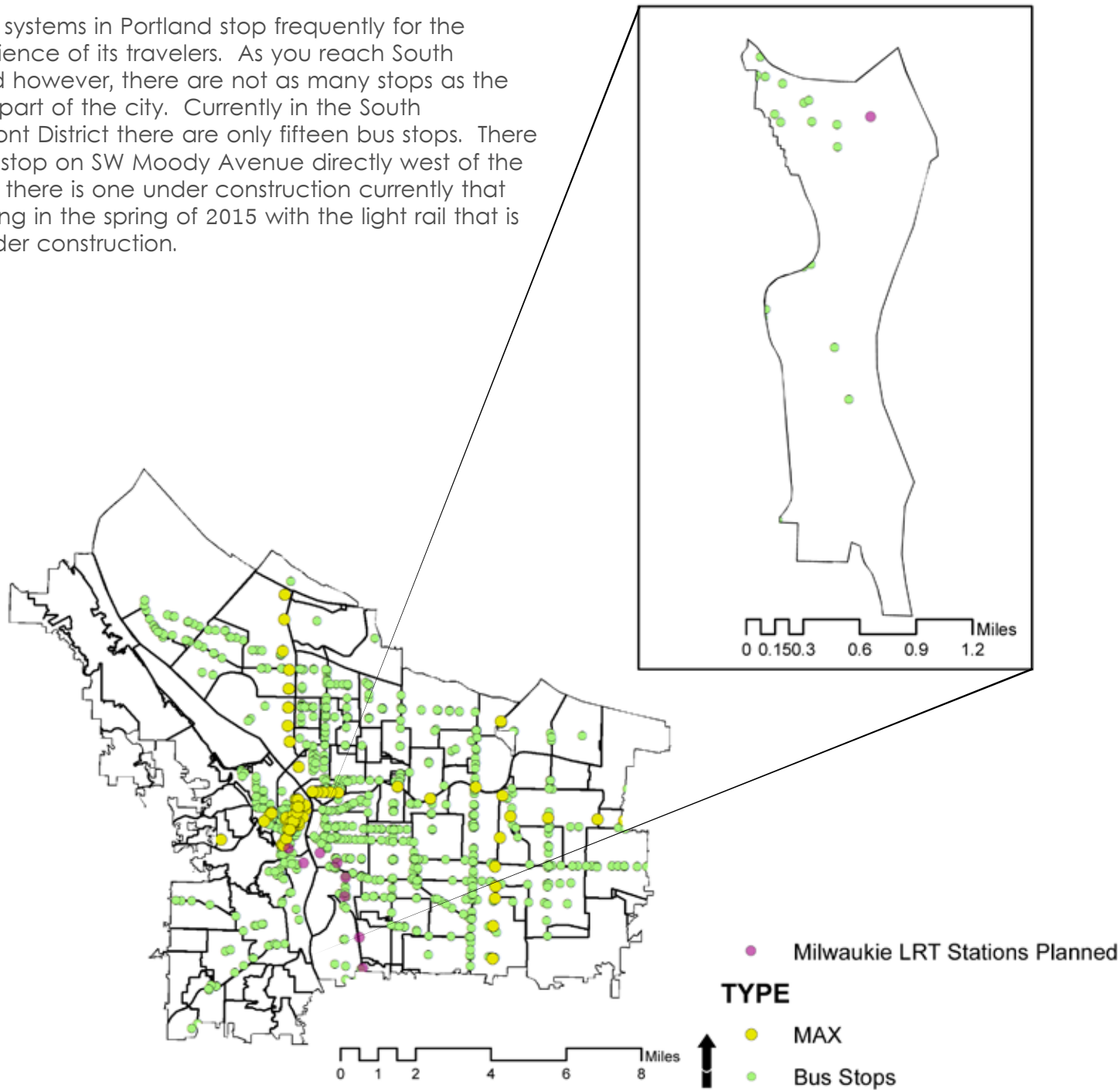
Transit rails are another popular form of transportation in Portland that can be quicker than bus transportation because they get travelers from point A to point B quicker. Portland has existing light rails, street cars, commuter rails, and inter-city high-speed rails. Along with these existing forms of transit rails there are plans for more of these to close the gaps where this is not as much transit.

In the South Waterfront District there is currently a street car that comes from downtown Portland and follow SW Moody Avenue before looping around and heading back north out of the district. Currently there are plans to extend the street car so that it runs through the extents of South Portland. There are also plans for a light rail extension from downtown Portland as well.



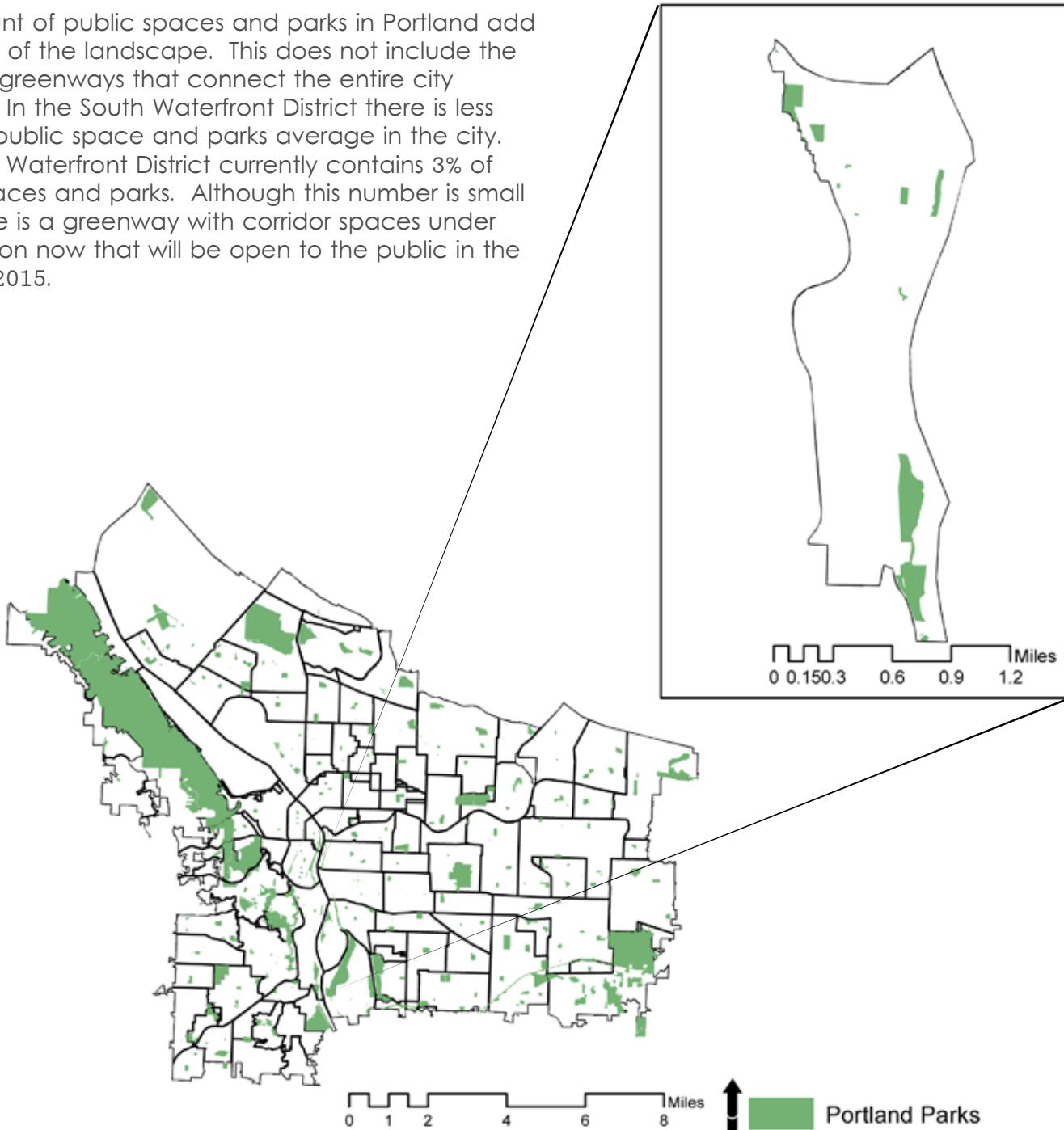
# Transit Network

The bus systems in Portland stop frequently for the convenience of its travelers. As you reach South Portland however, there are not as many stops as the central part of the city. Currently in the South Waterfront District there are only fifteen bus stops. There is not a stop on SW Moody Avenue directly west of the site, but there is one under construction currently that is opening in the spring of 2015 with the light rail that is also under construction.



# Parks & Green Spaces

The amount of public spaces and parks in Portland add up to 15% of the landscape. This does not include the trails and greenways that connect the entire city together. In the South Waterfront District there is less than the public space and parks average in the city. The South Waterfront District currently contains 3% of public spaces and parks. Although this number is small now, there is a greenway with corridor spaces under construction now that will be open to the public in the spring of 2015.

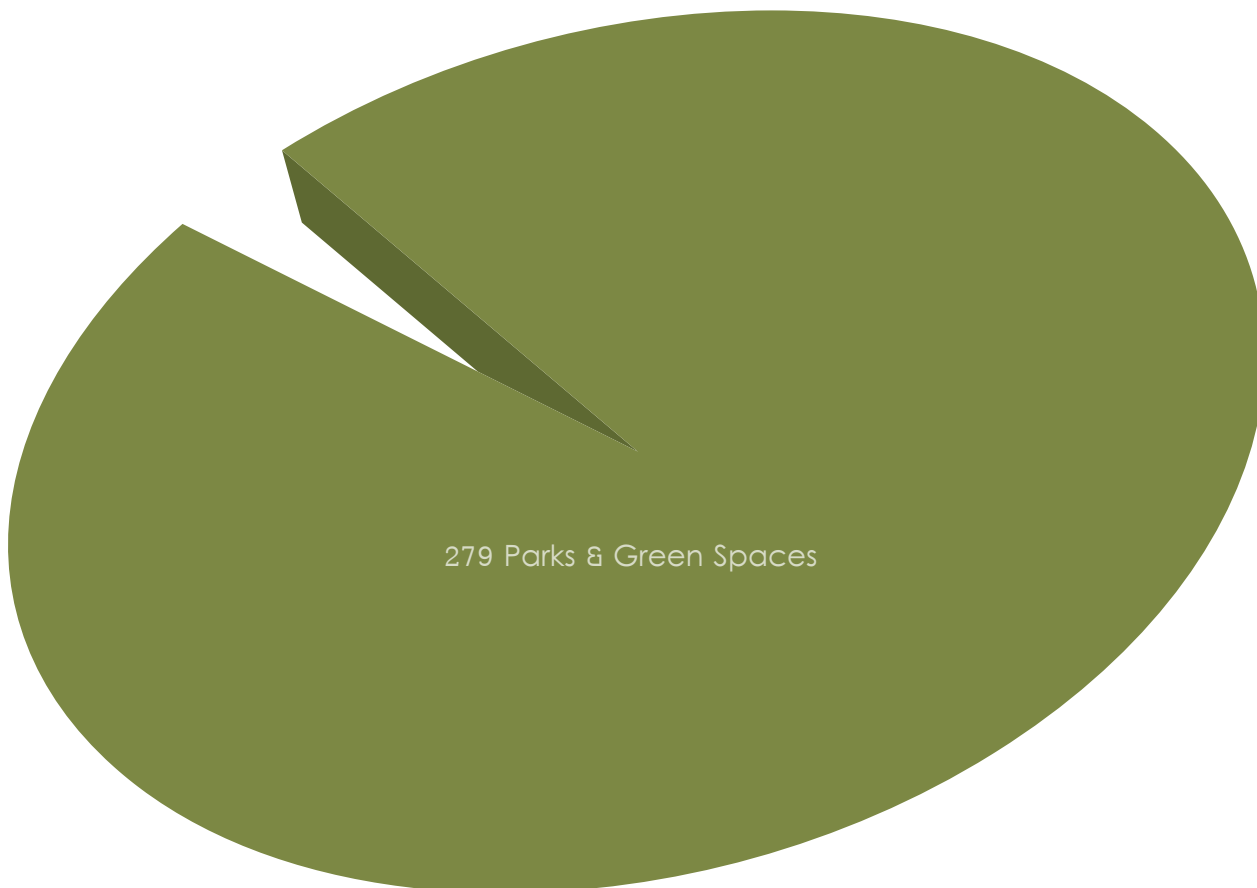


# Parks & Green Spaces

South Waterfront District Parks: 9



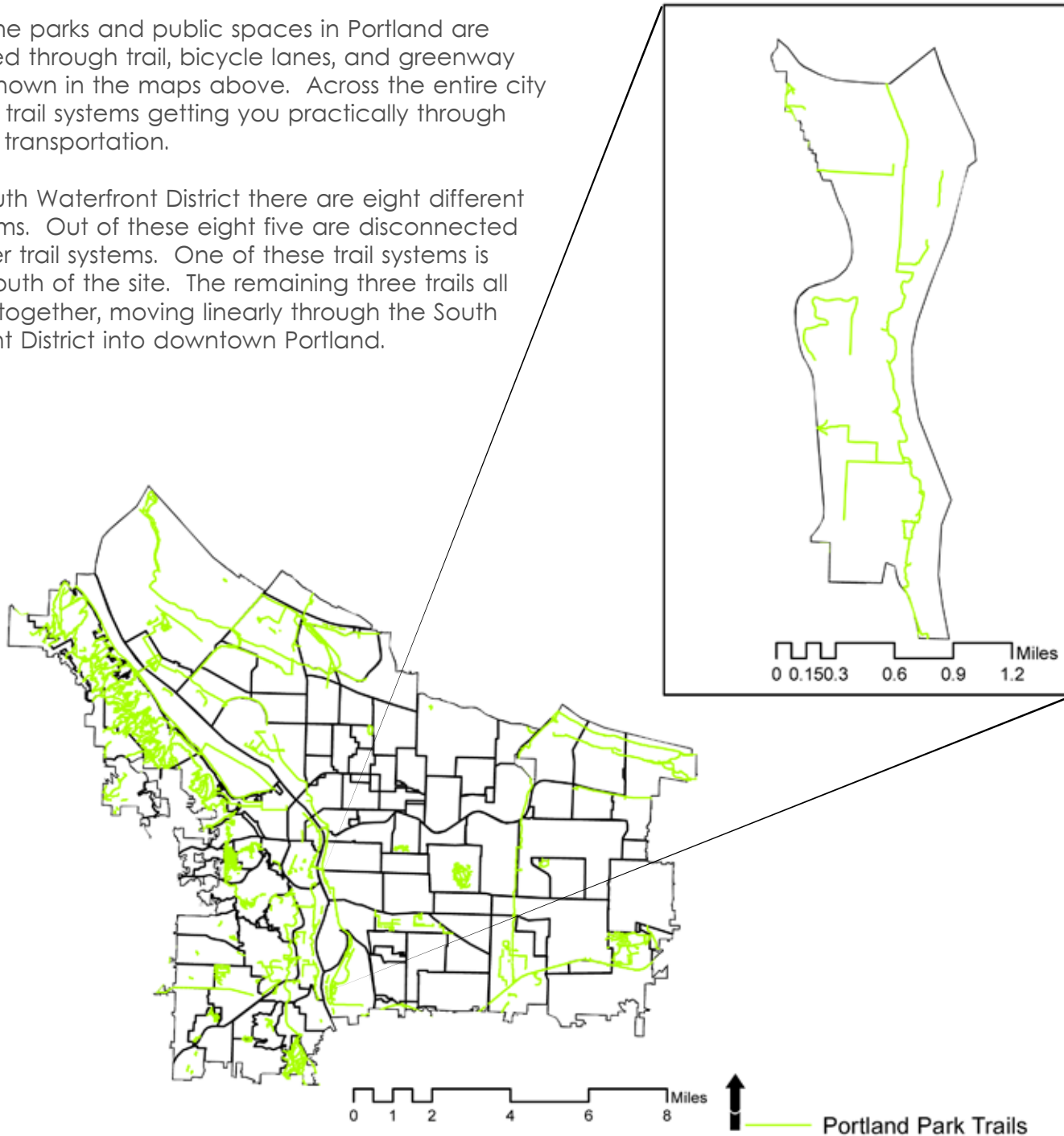
Portland, Oregon Parks: 279



# Trail Systems

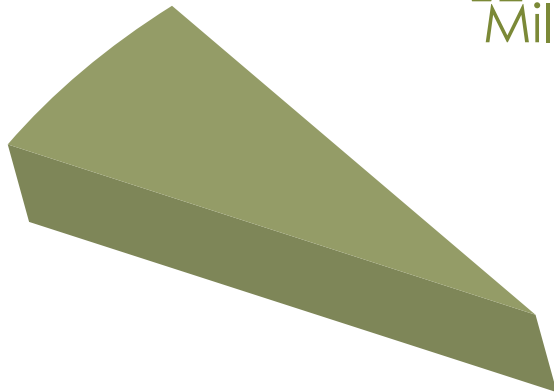
Most of the parks and public spaces in Portland are connected through trail, bicycle lanes, and greenway systems shown in the maps above. Across the entire city there are trail systems getting you practically through alternate transportation.

In the South Waterfront District there are eight different trail systems. Out of these eight five are disconnected from other trail systems. One of these trail systems is directly south of the site. The remaining three trails all connect together, moving linearly through the South Waterfront District into downtown Portland.



# Trail Systems

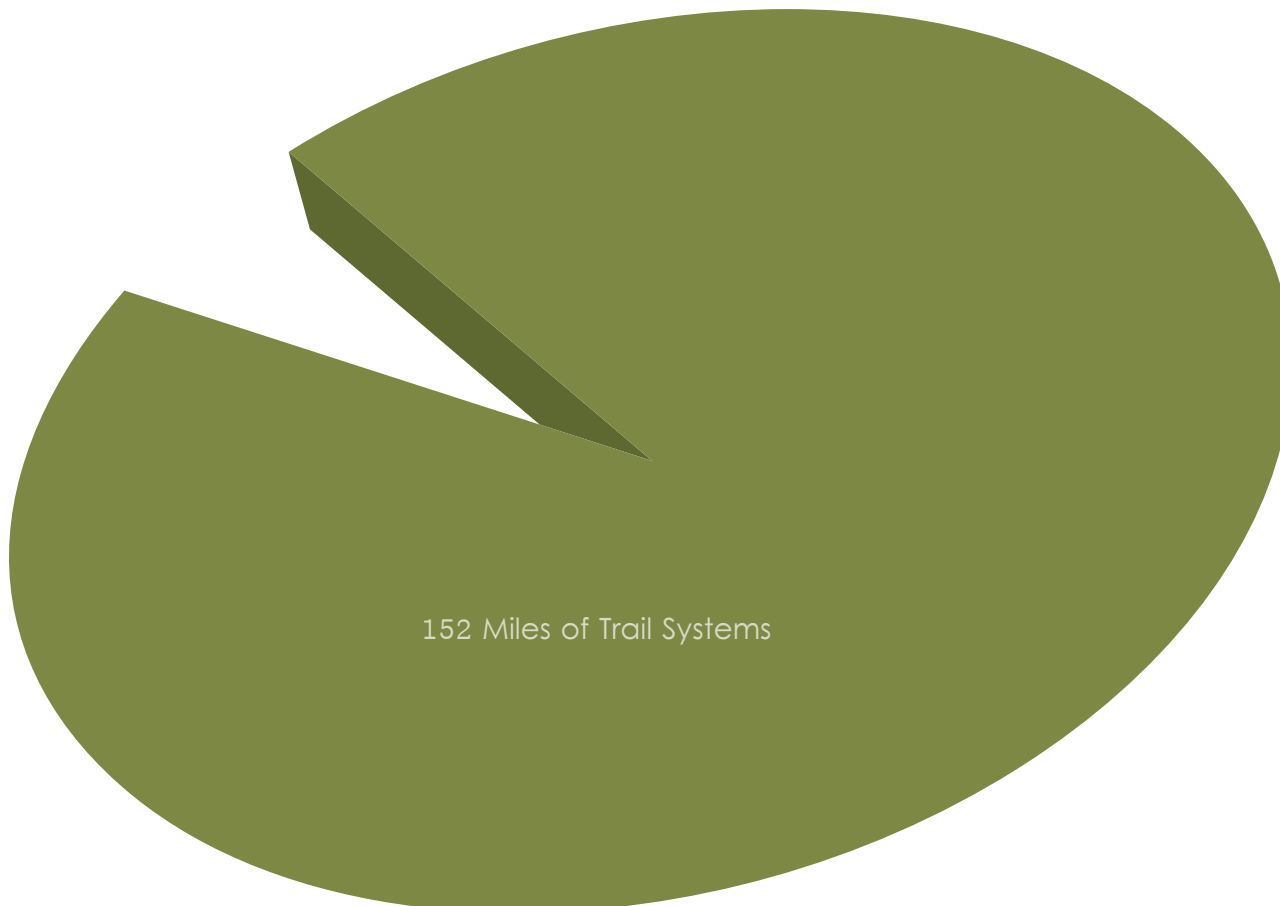
South Waterfront District Trails: 12 Miles



South Waterfront District contains only 7.8% of the city limit's parks.

12 Miles of Trail Systems

Portland, Oregon Trails: 152 Miles



152 Miles of Trail Systems

# Site Views



A ←



B ←



C ←



D ←



E ←



## Urban Habitat

Wildlife in this environment include even the most developed areas of the city by using back yards, street trees, bridges, building roofs and ledges, utility poles, gardens, parks, trails, and greenways. Some of the urban wildlife includes:

- Bald Eagles
- Great Blue Herons
- Peregrine Falcon
- Coyote
- Little Brown Bat
- Pacific Chorus Frog
- Vaux's Swift
- Western Bumblebee
- Anna's Hummingbird
- Western Screech Owl

## Forest Habitat

On the western edge of the city is Forest Park, the largest urban forest in the United States at 5,157 acres. Some of the city's most beautiful birds live in the park as well as some of their most exciting wildlife. Some of the forest wildlife includes:

- Bobcat
- Roosevelt Elk
- Cougar
- Black Bear
- Satyr Anglewing Butterfly
- Northern Flying Squirrel
- Varied Thrush
- Pacific Giant Salamander
- Pileated Woodpecker
- Northern Pygmy Owl
- Townsend's Warbler

# Wildlife

## Grassland Habitat

Grassland habitats are the rarest of habitats in Portland, Oregon. This habitat supports Oregon's state bird, as well as many other animals in nest areas and platforms, bat boxes, and rock or brush piles in your yard. Some of the grassland wildlife includes:

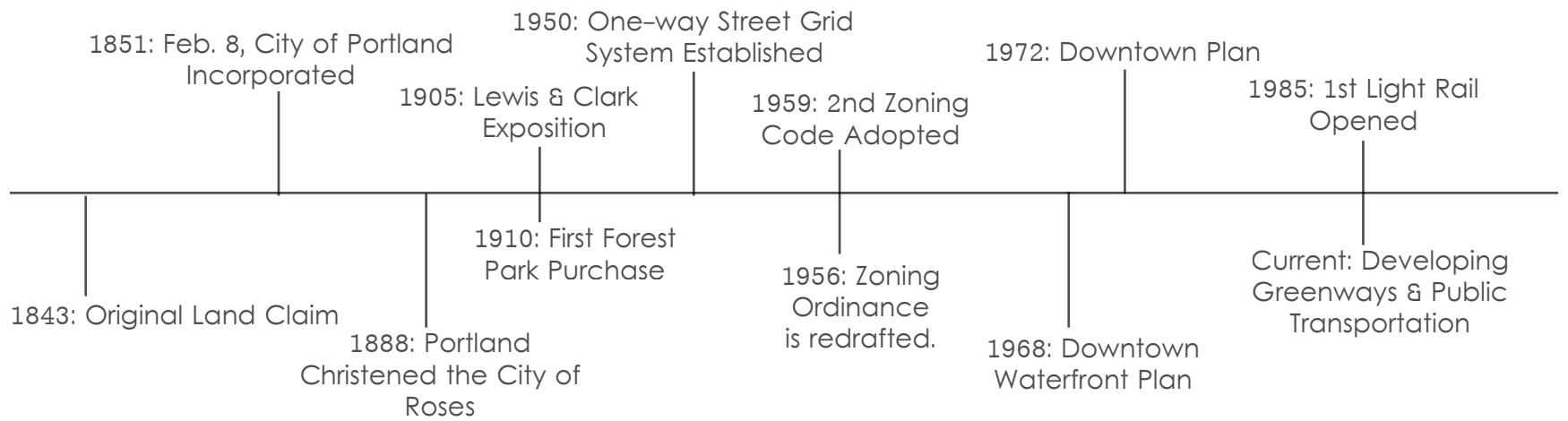
- American kestrel
- Western Meadowlark (Oregon's state bird)
- Horned Lark
- Black-Tailed Deer
- Northern Harrier
- Streaked Horned Lark
- Red-Spotted Garter Snake
- Common Yellowthroat
- Vagrant Shrew
- Lazuli Bunting

## Aquatic Habitat

There are two main rivers in Portland, Oregon, the Columbia River, and the Willamette River. Both of these rivers are home to various birds, fish, salamanders, and frogs. Some of the aquatic wildlife includes:

- Western Painted Turtle
- Oregon Floater Mussel
- Chinook Salmon
- Northern Red-Legged Frog
- Pacific Forktail Damselfly
- River Otter
- Green Heron
- Bald Eagle

# History



# Culture & Recreation

## Culture/Arts:

Portland was inhabited for centuries by two bands of Upper Chinook Indians. The Multnomah people settled on and around the Sauvie Island while the Cascades Indians settled along the Columbia Gorge. Later on the city was known to American, Canadian, and British traders, trappers, and settlers for the Willamette River and being a small stopping place while traveling through.

## Recreation:

Portland has hundreds of things to do whether you live in or are visiting. Whether on the river, in the city, or in Forest Park you can:

- Hike
- Canoe
- Kayak
- Fish
- Swim
- Theatres
- Farmers Markets
- Plays
- Food Trucks
- Festivals





# Chapter Six:

Discussion

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# Discussion

The goal of the research completed was to learn how to optimize the design of greenways to fit pedestrians of all ages and demographics. To successfully optimize this greenway for all potential users, many different surveys and observations had to be taken into consideration. These surveys include the observation of multiple greenway and public park sites throughout the Portland area that are near the same size as Cully Park. Each survey recorded the number of visitors on site in a given hour; their form of transportation, time on site, movement patterns, as well as site amenities, and materials. The main elements of research provided interesting results regarding visitors length of stay on site, form of transportation in regards to site materials, amenities and access points in regards to length of stay on site, and movement patterns with different lengths of stay, paths and materials. Each of these elements results directly correlates to the final design and overall goal of this research to optimize the design of greenways to fit pedestrians of all ages and demographics. Research on current successful greenways and waterfront parks have demonstrated how various materials and pathways can direct and attract site visitors, lengthen the stay of visitors, and create a popular destination for alternate transportation. Currently on this thesis site there are no amenities, nor paths to work off of as the entire site is closed off to the public. This gives the opportunity for creative, unique design based off of all the results from surveys and research. In conclusion, incorporating various amenities, small and large corridor spaces, lighting, pathways with different materials and multiple access points for greenway entry and exits will optimize this thesis to fit pedestrians of all ages and demographics.







# Chapter Seven:

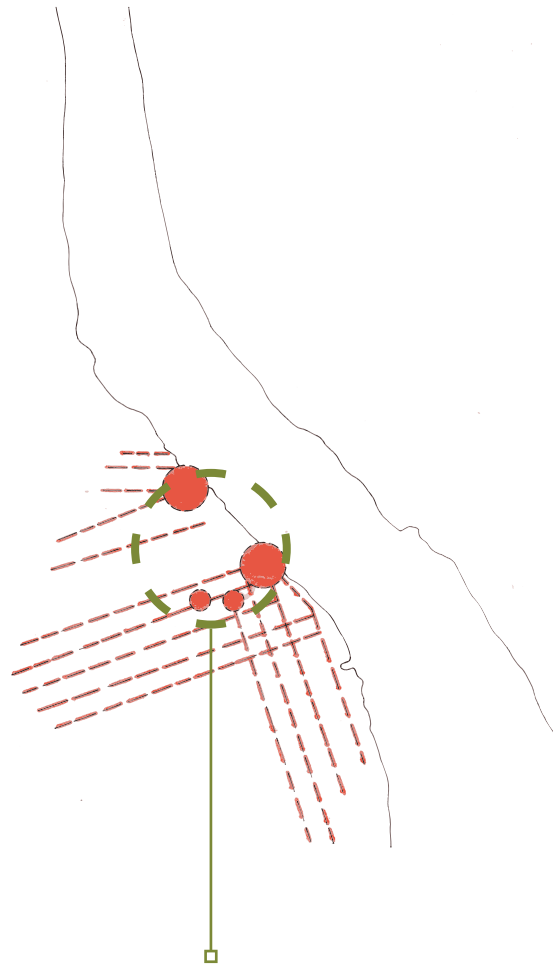
Design / Development

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# Analysis



Portland's bus systems, and light rails have two stops directly west and south of this thesis site. These transportation systems take up to thirty minutes to arrive during certain hours of the day. This leaves pedestrians with nothing to do but sit and wait. Creating connections from Cully Park to these bus stops is extremely important so that pedestrians can enjoy their time while they wait for their bus stop and think of their route as an after thought while they are meandering through the gardens.



Portland is designed off of a grid system, everywhere that is except for the three block radius around the thesis site. Because of this layout change, all blocks are pointed towards Cully Park. While they are all pushing people towards this site, there is a large disconnect between people and the park. Creating connections and bringing these blocks through to the site will establish a destination for the community of the South Waterfront District as well as Downtown Portland.



Portland's riverfront is aimed to create public trail systems and river access for the entire community to enjoy. There are existing greenways surrounding the entire river as well as public docking spots and fishing locations. Along the Willamette River are industrial docking points that are privately owned. In the South Waterfront District the public access and trail systems are lacking. Creating a trail system to connect the existing ones would extend the public riverfront that the city of Portland has created.



**Big Idea One:**  
Creating connections between existing trail systems.

Designing connections to existing greenways brings existing and new pedestrians further through the trail instead of creating a small loop. It also connects downtown Portland with the South Waterfront District.

**Big Idea Two:**  
Creating bus stop connections to Cully Park.

The existing transit systems surround the west and south ends of Cully Park and have bus stops at both ends of the site. Extending walking paths from the park to the bus stops will give pedestrians spaces to wait for their bus.

**Big Idea Three:**  
Extending surrounding blocks and grid systems to Cully Park.

The grid system in Portland extends from downtown through the South Waterfront District but comes to an abrupt stop straight north and west of the park. Extending these block systems will direct pedestrians to Cully Park and the Willamette riverfront.

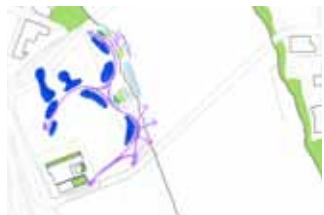
# Design Concept



Early February



Mid February



Late February



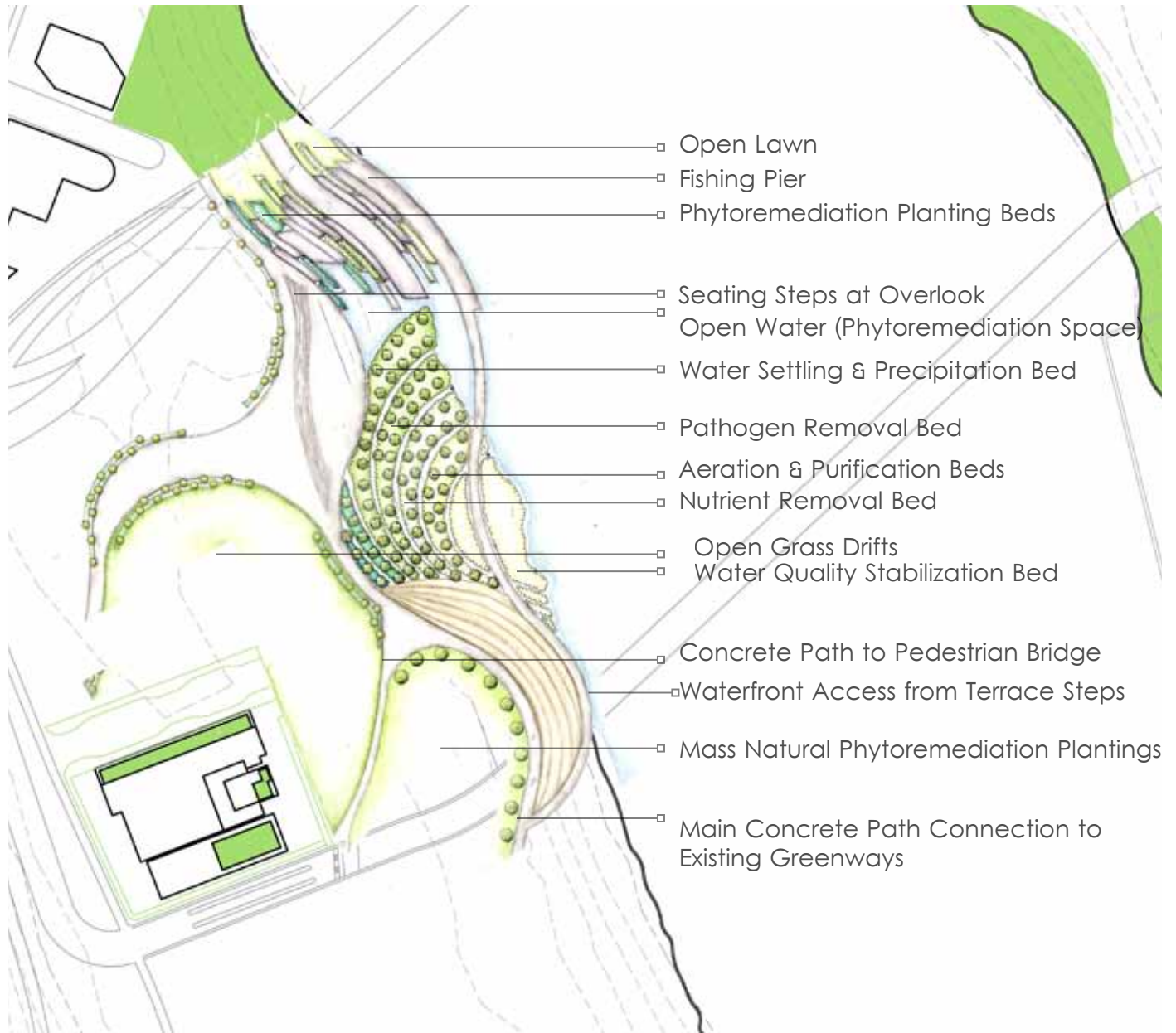
Early March



Mid March



Mid March



# Program Elements & Design Goals

## Program Elements:

- Greenway Connections
- Transit Connections
- Waterfront Access
- Oregon State University Extension Buildings
- Kayak Docking
- Fishing Pier
- Harvest Gardens
- Remediation Lighting
- Intimate Seating Spaces
- Native Planting Beds
- Harvest Access Points
- Willamette River Overlook
- Major & Minor Walking Paths
- Material Changes to Attract Pedestrians

## Ecological Movement: Water

Stormwater flows off buildings, vehicles and streets following Portland's contours until they reach the Willamette River. The movement of this water plays a huge role in the remediation of it's contaminants before it enters the river.

## Educating People on Remediation Practices

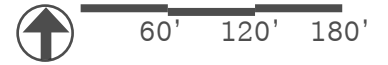
Through lighting indicators and harvesting gardens, educating people on phytoremediation practices creates a possible future standard for the city of Portland.

## Linking Transportation Systems to the Thesis Site

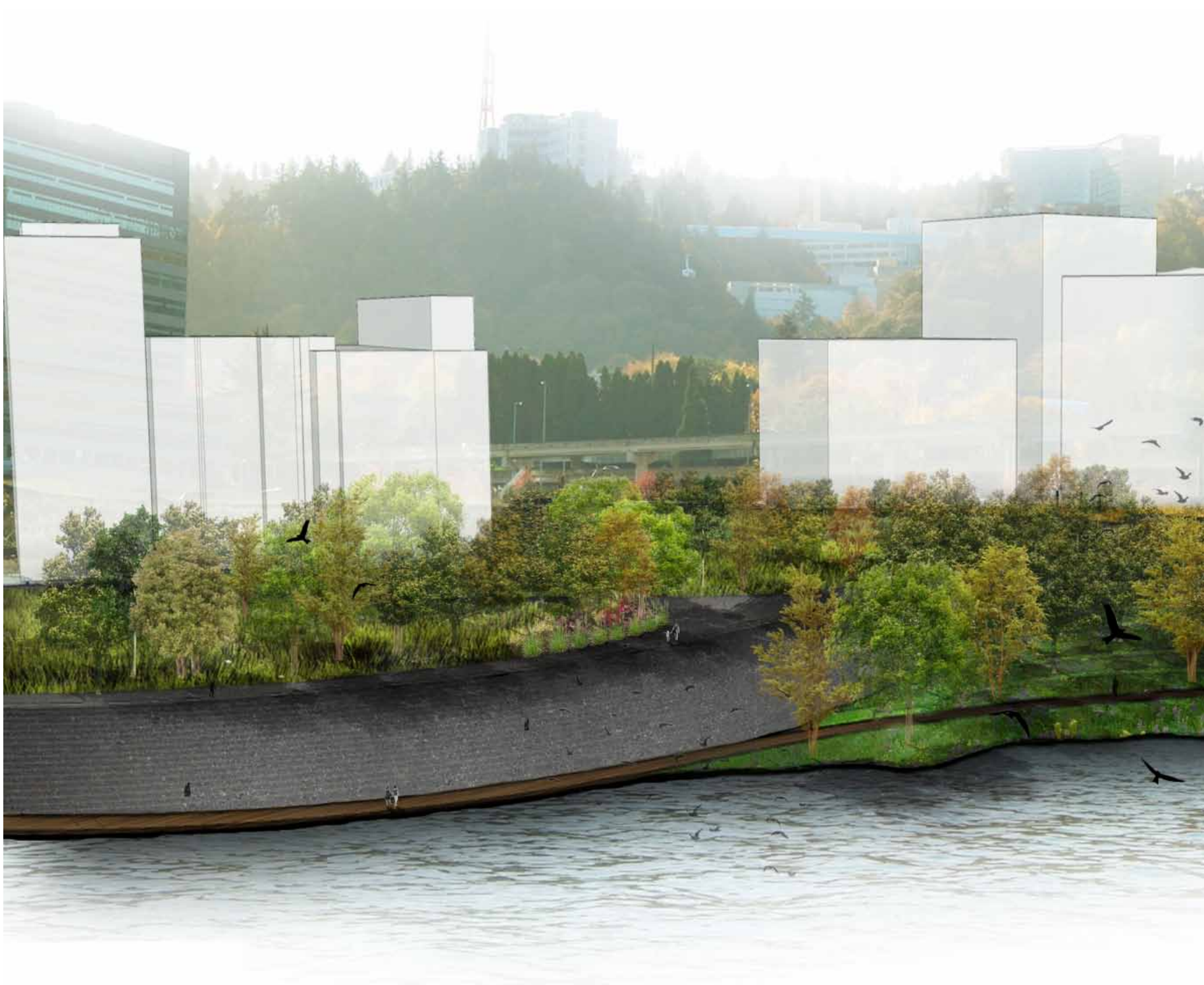
Portland's transit systems have stops surrounding Cully Park, but there are no spaces for pedestrians to wait for their following bus or walk to their destination on trail systems.







- Existing Oregon State University Multi-Use Building
- Intimate Boardwalk with Remediation Demonstration Planting Beds and Mixed Seating Spaces
- Western Red Cedar Boardwalk Waterfront Access & Fishing Pier in Willamette River
- Boardwalk Site Plan Bounding Box
- Western Red Cedar Boardwalk/Dock along Willamette River; Provides Kayak Tie-up Docking
- Proposed Multi-Use Building. Three Stories: First Floor Commercial use; Second & Third Floor Offices.
- Main Walk, Stamped Concrete with Viewing Space and Overlook to Willamette River and Step Seating for Long Term Stay
- Proposed Multi-Use Building
- Remediation Demonstration Terrace Garden Plantings
- Proposed High Rise Housing Building for OSU
- Harvest Gardens Bounding Box
- Phytoremediation Harvesting Gardens with Mass Plantings
- Proposed High Rise Housing Building for OSU
- Remediation Demonstration Planting Beds
- Poured Concrete Terrace Steps. Five Foot Width and One Foot Depth
- Western Red Cedar Boardwalk Ramp Leading Down to Waterfont Access
- Existing Oregon State University School of Dentistry Building



Overall view of Cully Park, shows the rising contours of the hills in Portland, as well as the surrounding metropolitan area and road networks.

# Master Plan Birds-Eye Perspective



# Boardwalk Site Plan



10' 20' 40'

## Ornamental Grass Plantings Staggering Into Western Red Cedar Boardwalk

The boardwalk consists of main walking spaces that break off into smaller boardwalk and seating areas at each level. Each smaller space is then separated out by mass plantings of ornamental grasses, perennials, and shrubs. These plantings have a teared affect and get larger as they move back. Low lighting in each smaller space illuminates the boardwalk and plantings from the ground up for night time use.

## Western Red Cedar Main Boardwalk

The main boardwalks meander from the main poured concrete walking path down to the waterfront boardwalk. These boardwalks range from six feet wide to twenty feet wide for interesting variations at each separate level.

These main boardwalk paths have various bench sizes as well as trash cans for site visitors as well as stainless steel post railings with a six inch wide cedar railing tops. These railings have lighting installed to shine down at the boardwalk to help light the walking paths for site visitors.

## Boardwalk Views to Willamette River

The southern side of the boardwalks contain open views to the Willamette River as well as the remediation demonstration terrace gardens.

The boardwalks meet the main poured concrete path at a contour level of twenty five feet and drop various amounts for each level ranging from two feet to eight feet. The drop off viewing distance from the boardwalk to the river starts at twenty five feet until meeting the waterfront access boardwalk that is level with the river.

# Boardwalk Birds-Eye Perspective

Overall look of the boardwalk and plantings facing south towards the main walking path and mass planting areas.



# Harvest Gardens Site Plan



10' 20' 40'

## Remediation Demonstration Lighting

Each light is connected to indicator pipes that lead under ground beneath the phytoremediation harvesting gardens. These indicator pipes have specific indicators spaced ten feet apart so they are site specific.

Each light is ten feet tall and built out of stainless steel. The bottom four feet are whole stainless steel while the top six feet are stainless steel framing and plexiglass wrapping for the lights. The LED lights have different colors for each intimate seating space. These different colors reflect the different contaminants that are being taken up by each harvesting section.



## Western Red Cedar Wood Flooring

Six inches wide, staggering into poured concrete to intrigue site visitors to the intimate seating space

## Poured, Stamped Concrete Eight Foot Walking Path

Small, intimate walking path carrying site visitors through the remediation demonstration gardens for quicker and quaint access to the waterfront and roadways.

## Remediation Demonstration Gardens

These gardens keep a distance of at least thirty feet of plantings between pedestrian walkways and the phytoremediation harvesting gardens. Using plants hardy to Portland, they provide vivid colors and textures.

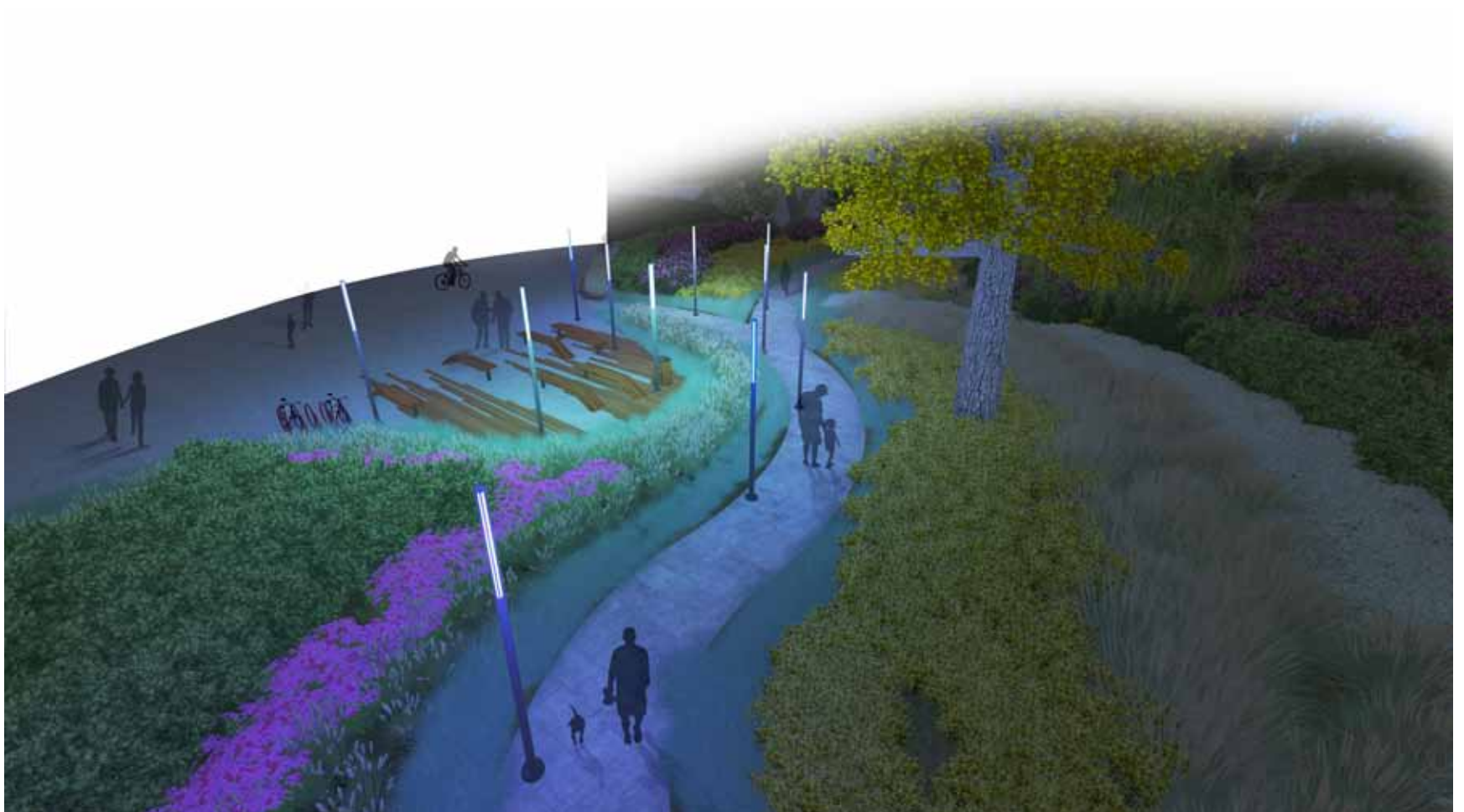
## Phytoremediation Harvesting Gardens

The harvesting gardens are separated into three sections that remediate the spaces of the selected heavy metals contaminants. These contaminants are as follows:

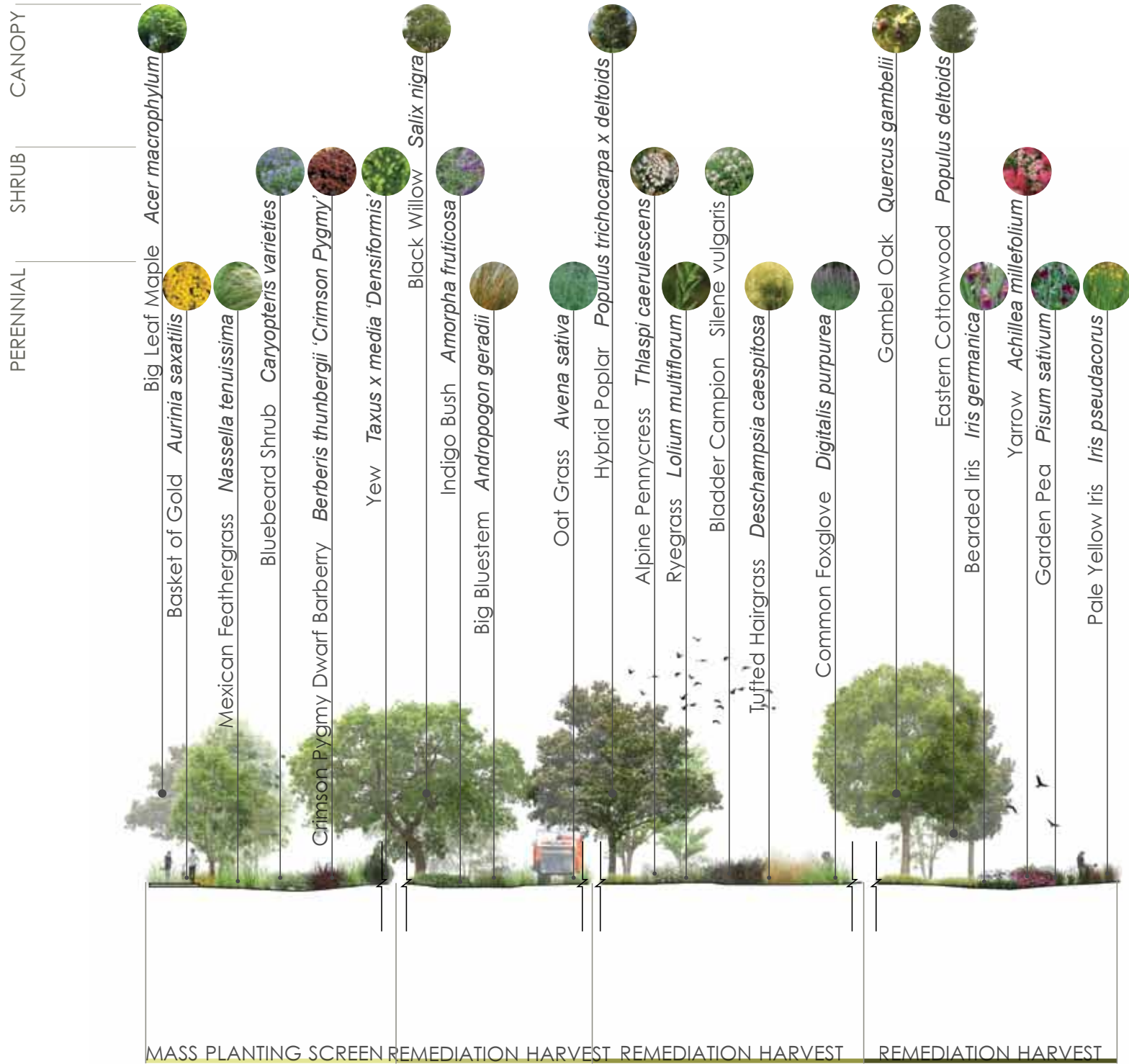
- Cadmium
- Copper
- Lead
- Nickel
- Zinc

# Harvest Gardens Birds-Eye Perspective

Night time view of educational lighting connected to harvest gardens within the minor walking path and seating area.



# Harvest Gardens Planting Plan



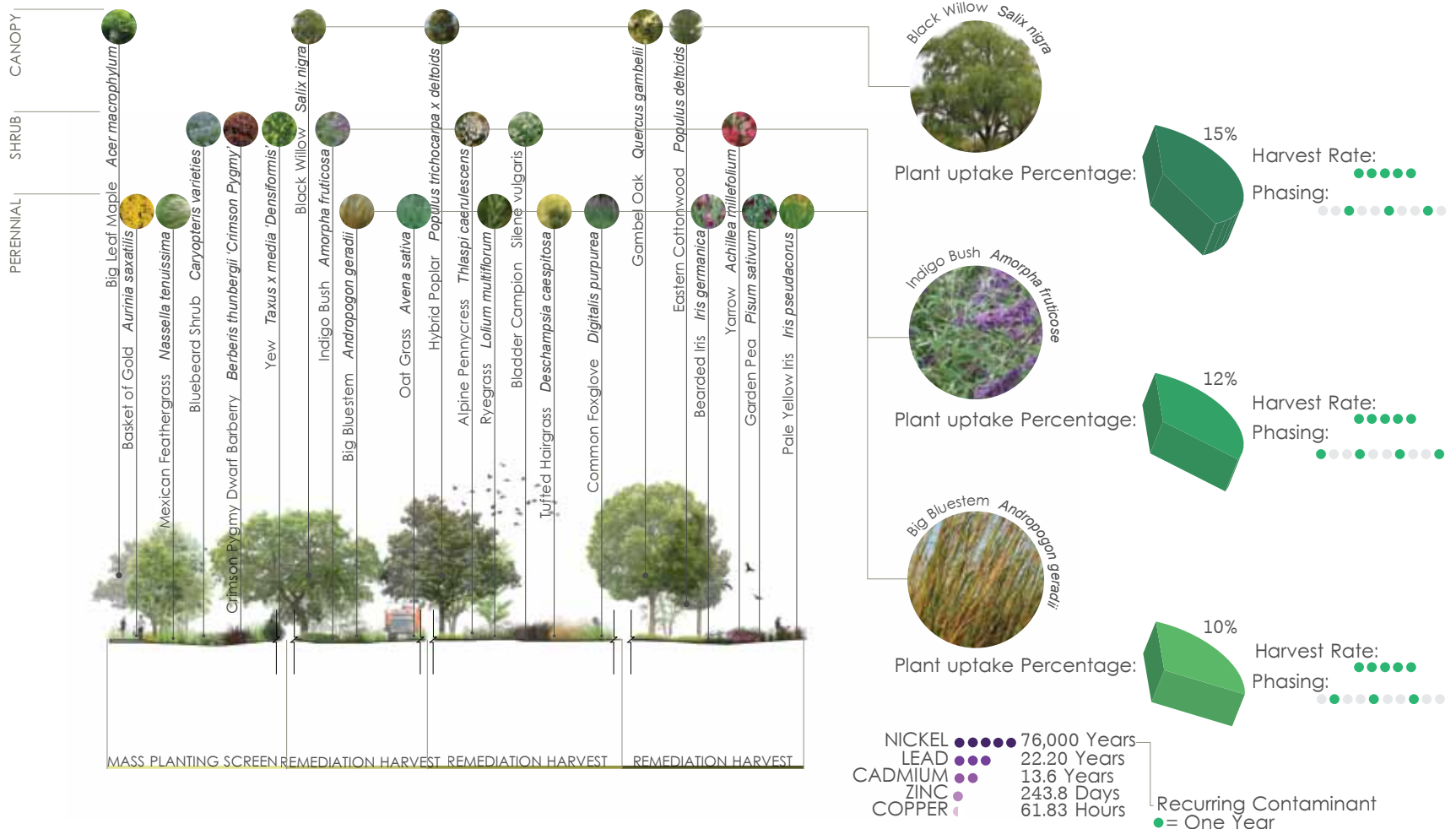


# Phytoremediation Contaminant Graphic

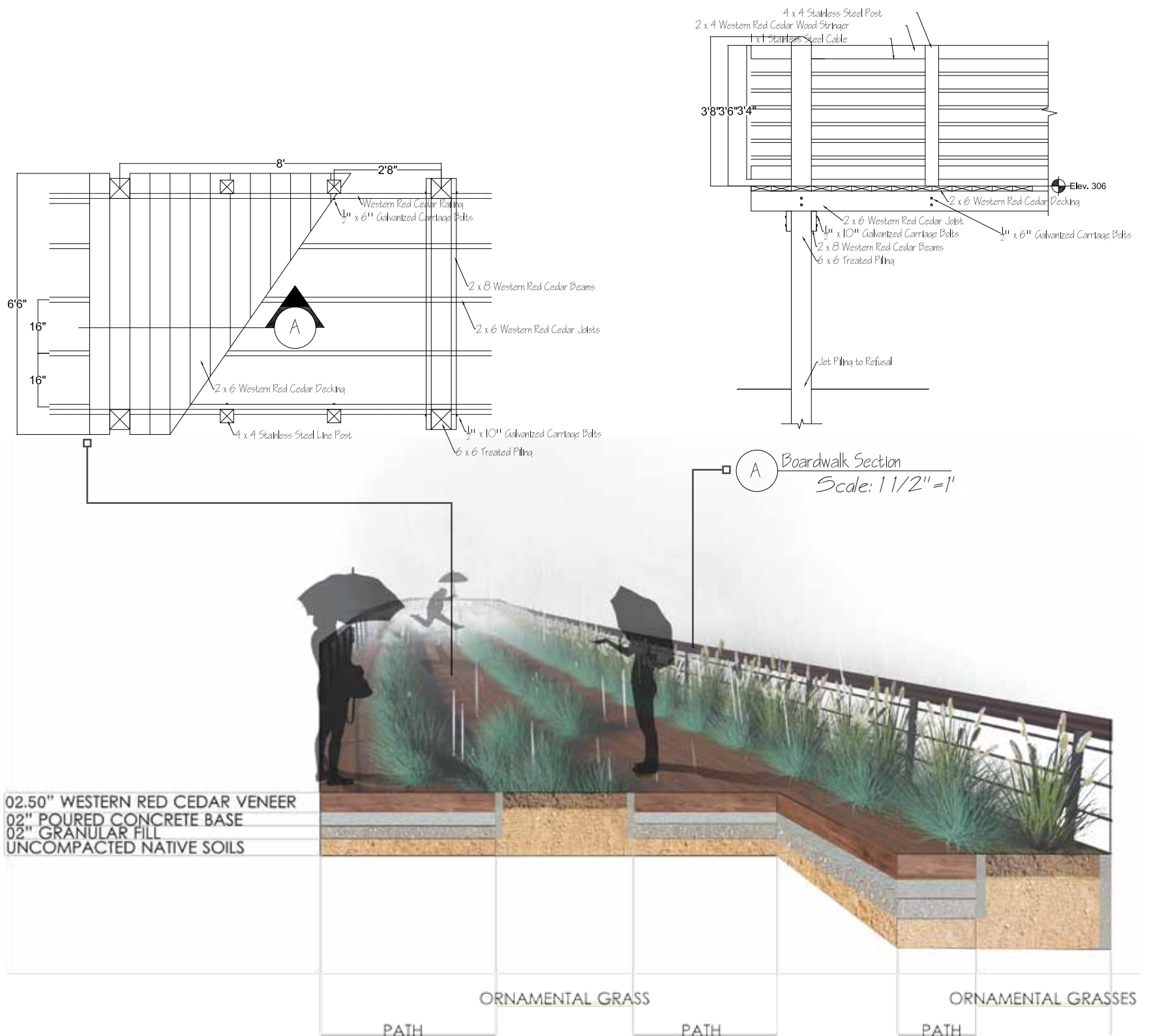
The graphic below displays the phytoremediation plantings as well as their contaminant uptake percentage, harvest rate, and their plant phasing. The graphic extended to the right shows these things specifically for one canopy tree, one shrub, and one perennial.

Plants typically can only uptake between 10–15% of contaminants before they are at capacity; because of this the harvest rate and time takes five years (for Cully Park specifically). To ensure the optimum growth of all plants during this process they are phased so that only one is harvested each year.

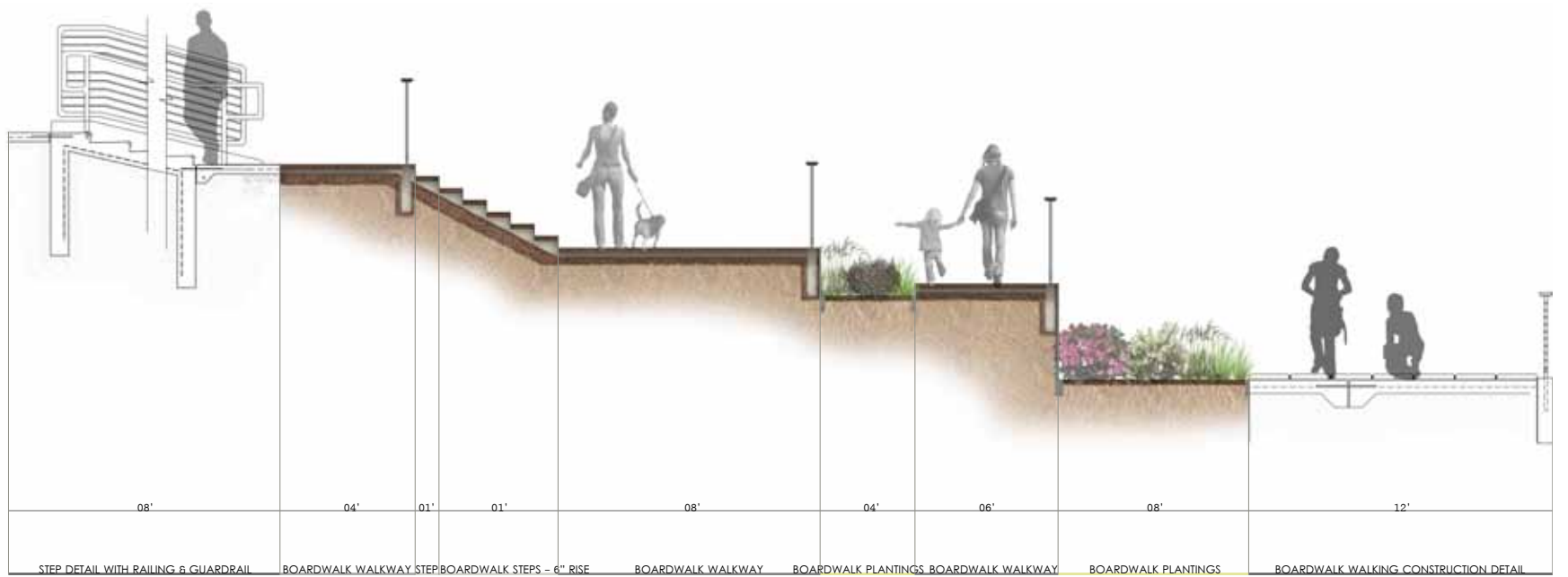
The plants will not reach full maturity for up to thirty years after the harvesting process is complete and the park is fully remediated. This is also a process that must take place before this design may be installed due do the heavy amount of contaminants existing currently on site.



# Boardwalk Site Plan Detail



# Boardwalk Site Plan Section Cut



4" 8" 12"

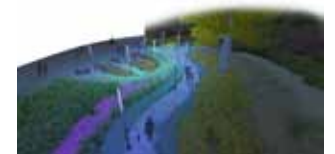
# Harvest Gardens Site Plan Night Detail





# Harvest Gardens Site Plan Perspective





## Conclusion

Through evaluating Portland's trails and park systems, as well as pollutant levels along the Willamette Waterfront, designing a remediation greenway closes the gap between the South Waterfront District and Downtown Portland to establish a destination for People to go to and relax while being educated on phytoremediation practices.

## THANK YOU

*Kelsey M. Wicker*





# Chapter Eight:

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