Urban Forest Restoration and Park Design, A Study of Improvements in Habitat Conditions and Open Space Amenity in Kirkland, WA.

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Abstract

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Increasing development has contributed to the decreasing ecological health of our urban natural areas. Ecological restoration is one way to begin to reverse this trend and it is taking place in city parks throughout the Pacific Northwest. The Green Kirkland Partnership in Kirkland Washington is a city run program that realizes ecological restoration goals in its urban parks through the service of community volunteers. Restoration in urban parks brings new activities to parks with customary recreational uses. The focus of this research is the intersection of urban park design and natural area restoration. The belief that these two entities can become mutually beneficial is the founding principal for this exploration. Using case studies of four parks in the Green Kirkland Partnership this thesis aims to recognize patterns between existing park amenities, volunteer intervention, and changes in restoration site habitat based on the tree-iage matrix. The study finds three park features that could be beneficial to volunteer supported natural area restoration success: pedestrian paths through the site that connect to other pedestrian only routes, secluded benches, and educational signage. Natural areas in urban parks near to either one or all three of these features experienced a positive change in habitat composition.

Urban Forest Restoration and Park Design

A Study of Improvements in Habitat Conditions and Open Space Amenity in Kirkland, WA.

PREFACE

Green Kirkland steward BBQ 2016, Kirkland WA.
Picture: City of Kirkland 2018

PREFACE

This urban planning master's thesis draws on my experience working in the field of environmental restoration in urban parks. I first experienced pulling invasive Himalayan blackberry from the neighboring natural area to the Environmental and Adventure School in Kirkland, Washington. At the time, I was in middle school and did not always enjoy the experience, especially in the rain. A college internship with the City of Bellingham parks and recreation department renewed my interest in natural area restoration. I helped lead volunteer work parties in Bellingham's parks and began to draw connections in tangent with my urban planning studies. The experience in Bellingham qualified me for a seasonal laborer position with the City of Kirkland's Green Kirkland Partnership. Where I led community volunteer work parties, worked in the field, and experienced the full picture of how community connections to urban natural areas creates a sense of ownership and pride in people. I felt this sense of pride myself at Heronfield wetlands in Kirkland. Removing a wall of blackberry over my head tall was my task for the summer. Weeks of trimming this giant wall went by and by mid-august the blackberry had given way to reveal small alder trees, red elderberry, and other small native plants that had been stunted by the dominant invasive. I felt I had helped these plants, and given back to the parks. In the fall, I planted new plants based on the surviving native species I had uncovered. Occasionally I visit Heronfield Wetlands and check on "my plants" to see how they are growing. It brings me joy to visit the restoration site and see my thriving native plants.

My experience in urban park restoration is the inspiration throughout this research. My intent is to expand upon my observations as a participant and contribute to the body of knowledge that supports natural area restoration by engaging community.

I would like to thank Sharon Rodman, Jeremy Jones, Collins Klemm, Ina Penberthy, and Katie Cava at the Green Kirkland Partnership for lending knowledge and help all along this process. Thank you Lisa Ciecko with the Green Seattle Partnership. And a big thank you to the wonderful Green Kirkland Stewards who graciously offered their time to help me with this thesis; Bonnie Harpel and Helen Rasmussen at Josten Park, Marilee and Jeff Henry at McAuliffe Park nursery.

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INTRODUCTION

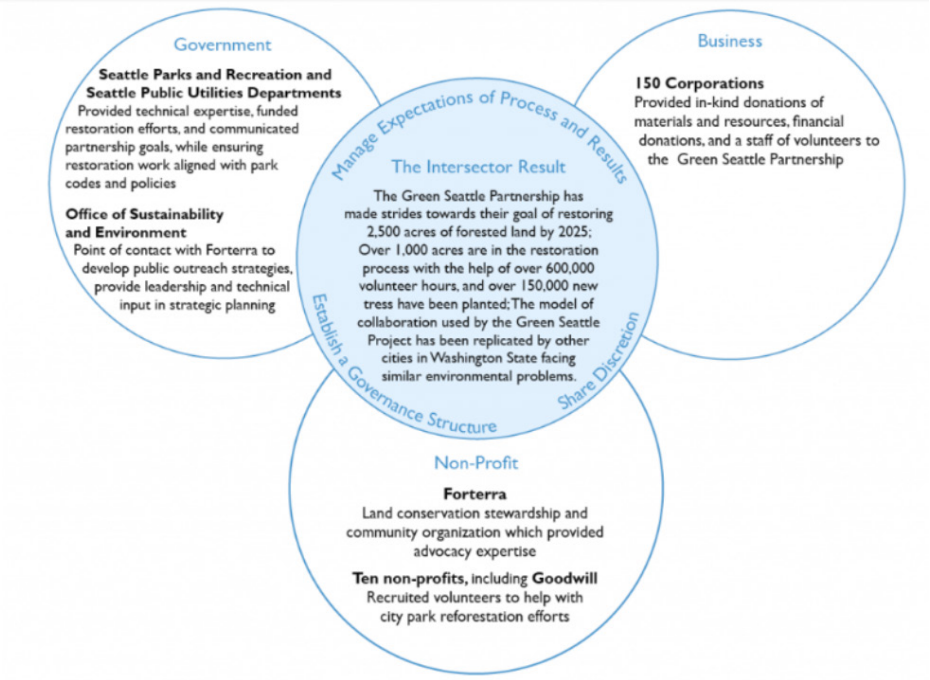

Figure 2: Roles of the three organizations that make up the Green Seattle Partnership. (Green Seattle 2006)

BACKGROUND

"Here is the means to end the great extinction spasm. The next century will, I believe, be the era of restoration in ecology." - E.O. Wilson the diversity of life 1992

Urban parks take various forms in 19th century street grids, elapsed military posts, and once forgotten places. Volunteer Park in the Capitol Hill neighborhood of Seattle fits nicely within the neighborhood blocks, Magnuson Park is the former Naval Air Station Sand Point in 1975, and Josten Park opens in Kirkland between abutting culs-de-sac in 2017 after being a neglected open space for four decades. Urban parks develop through unique circumstances, each park containing its own story, and preserving a part of human history. Parks range in size, shape, activities available, and natural flora and fauna. Urban parks offer more than the human eye can see. They offer psychological benefits, such as reducing stress through lowered blood pressure and uplifting perceived mood states (Stigsdotter et al. 2017) Parks have the potential to mitigate the negative consequences of climate change by sequestering carbon, filtering polluted stormwater runoff, and reducing temperatures by providing shade (Clewell 2000). With ever amassing benefits such as these, it becomes increasingly important to protect the natural functions of parks.

Parklands face numerous threats in urbanized areas, and specifically forests in the Puget Sound region. They are at risk of natural area fragmentation, invasive species dominance, and declining resources for maintenance and restoration (Green Kirkland, 2015). The Puget Sound region is experiencing large population growth. Growth

causes encroachment into undeveloped natural areas. The first step in combating the loss of natural systems is to conserve land. Public agencies and land trusts have been doing just that (Green Kirkland 2015). Forterra, a land conservation, stewardship, and community building organization based in Seattle Washington has been a leader in expanding sustainable land use since 1989. Forterra is active all over Washington State, conserving over 180,000 acres of forests, farms, and natural areas through property agreements and acquisition (Forterra, 2018). Forterra's website simply states, "Life takes place on land. How we use our land creates our future" (Forterra, 2018). However, with setting aside land for conservation comes the obligation to manage that land. Passive management strategies have proved ineffective in today's urban environment, human intervention in these areas is needed to maintain ecological health (Green Seattle 2006).

Numerous organizations have been working together on strategies to increase ecological health of natural areas. In 2004 Forterra (Then called The Cascade Land Conservancy) entered into a partnership with the City of Seattle (Figure 4) to accomplish the goal of restoring 2,500 acres of parklands by 2025 (Green Seattle 2006). The partnership involved two departments within the City of Seattle, Forterra, and private business ventures (Figure 2). The collective approach is the Green Seattle Partnership (GSP). As Figure 2 shows, each contributing entity provides their own expertise to the Partnership represented by the blue circle in the middle. The City of Seattle lends technical support and ensures restoration complies with park policies. The City also provides office and field staff to accomplish natural area restoration. Forterra provides restoration expertise through printed materials and plans, and provides staff and resources to lead volunteer restoration events in the community. Private businesses donate staff time and financial donations to help with restoration efforts. As of 2017, the Green Seattle Partnership has 1,520 acres enrolled in restoration (Forterra 2018)

The Green Kirkland Partnership (GKP) was formed in 2005 between the City of Kirkland and Forterra. Kirkland is a city located northeast of Seattle approximately 14.7 miles measured downtown-to-downtown (Figure 4). The City of Kirkland is smaller than Seattle is and does not have the same citywide investment level. GKP is in the Parks and Community Services Department and operates with a small budget with the help of grants from the King County Conservation District. In 2017, GKP has enrolled 95.7 acres into active restoration with an initial goal of 372 acres restored by 2028. The program has 30 dedicated volunteer park stewards, who combined hosted 1,707 work parties in 2017, to remove invasive species from the natural areas in Kirkland's parks (Rodman 2018). The restoration success of these public and private non-profit partnerships has led to the creation of nine more green cities partnerships around the Pacific Northwest.

Natural area restoration is a means of protecting and enhancing the ecological health of urban parks. Various academic fields define restoration in many different ways. "Ecological restoration is the conservation strategy that allows us to recover damaged ecosystems and augment the world's inventory of functional ecosystems." (Clewell, 2000, p.1) This study defines restoration through the framework of Green Cities Partnerships that use community volunteers to remove invasive vegetation, plant native species, and continue routine maintenance.

INTRODUCTION

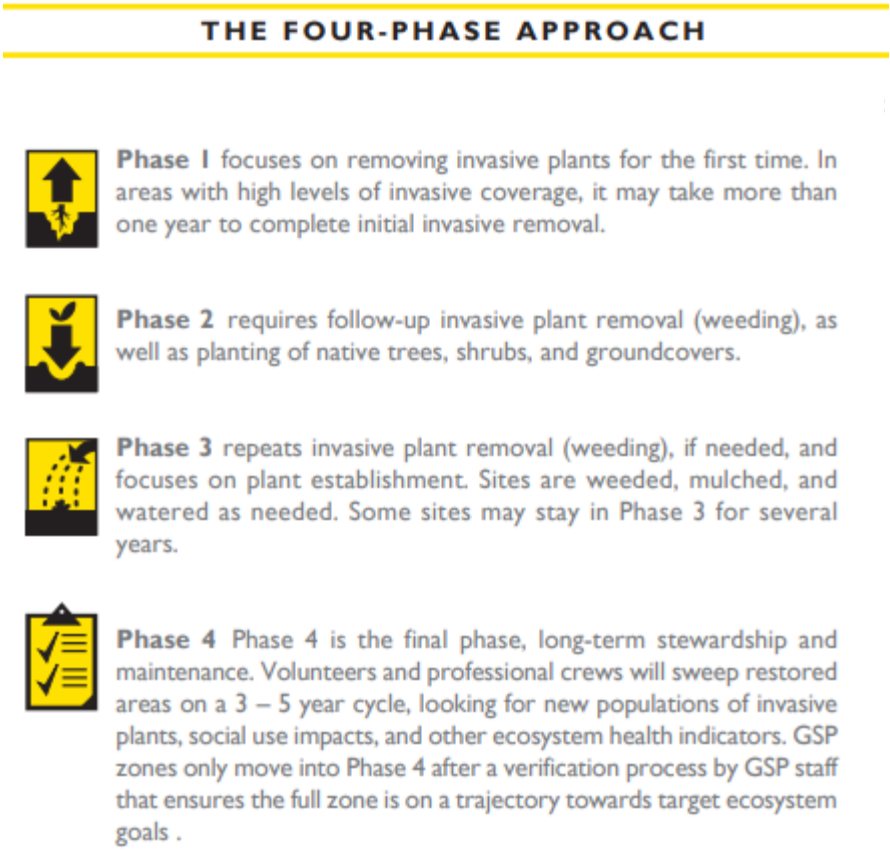

Figure 3 :The four - phase approach to restoration, City of Seattle and Forterra Forest Steward Field Guide 2016

The areas this work takes place in are natural areas within existing urban park boundaries and do not include man made environments like bioswales or rain gardens. Kathleen Wolf uses the term “metro nature” to describe urban areas where opportunities for human nature experiences occur (Wolf and Robbins 2015). Greenbelts, riparian corridors, parks, community gardens, and remnant urban forest parcels are types of “metro nature”. Wolf also includes green infrastructure facilities in her definition. The research focuses on restoration in “metro nature” but excludes green infrastructure in its definition.

The initial intent for this research originated from my work with the Green Kirkland Partnership from May 2015 to May 2016. Under the supervision of a senior grounds person, I received firsthand knowledge in manually removing invasive species from parks and leading volunteer restoration work parties. Through this lens, an understanding of the long-term maintenance of these natural areas arose. City’s natural areas in urban parks will not be able to maintain their ecological health without human intervention. Once restoration begins in an area, continual human intervention in the form of maintenance continues indefinably. The Green Seattle Partnership outlines the process of ecological restoration with four phases (Figure 3). Phase 1 is first time invasive species removal and phase four is the final phase in restoration where volunteers and professional crews maintain the area on a three to five year cycle (Green Cities Partnerships, 2014). Phase 4 is not the end of the restoration process, but the continuing long-term maintenance required to keep that natural area healthy. In the thirteen years Green Seattle Partnership has been active 301 acres of the 1,520 total enrolled acres are in

phase 4. While phase 4 is the final phase of restoration, human intervention is crucial to maintain on the healthy ecological trajectory.

Community involvement is included in the definition of natural area restoration for this research. A Large component of green cities partnerships are the volunteers. Varying degrees of involvement take place from being an official park Steward to volunteering at a four hour work event such as the United Way day of caring. All volunteer contribution is extremely valuable to Green City Partnerships due to the ever-increasing amount of restored land and the fixed staff budgets. Volunteer work parties vary in number of volunteers and frequency. Restoration professionals relate these differences to the size of the park; larger parks have more room for large restoration groups (Jones, 2018). Parks with high volunteer numbers tend to have healthier natural areas, meaning large parks with the carrying capacity for large volunteer work parties would have healthier restoration sites. However, my field observations reveal this explanation false. Watershed Park is a large park, but does not experience the same volunteer numbers that Juanita Beach Park gets, even though it is half the size. The inconsistency led to my questions related to park elements and restoration site success. What was the missing link? Are there aspects of a park's form and design that make its natural area restoration efforts easier than in other parks? Are there certain features in a park that make it easier for volunteer restoration activities? Could certain park amenities contribute to higher volunteer numbers or dedication? Where is the connection between successful restoration, strong community involvement and park amenities? This thesis provides me the opportunity to explore my interest where the natural world collides with the built environment in positive

Figure 4 - Seattle Kirkland Context Map. Image: Google Maps

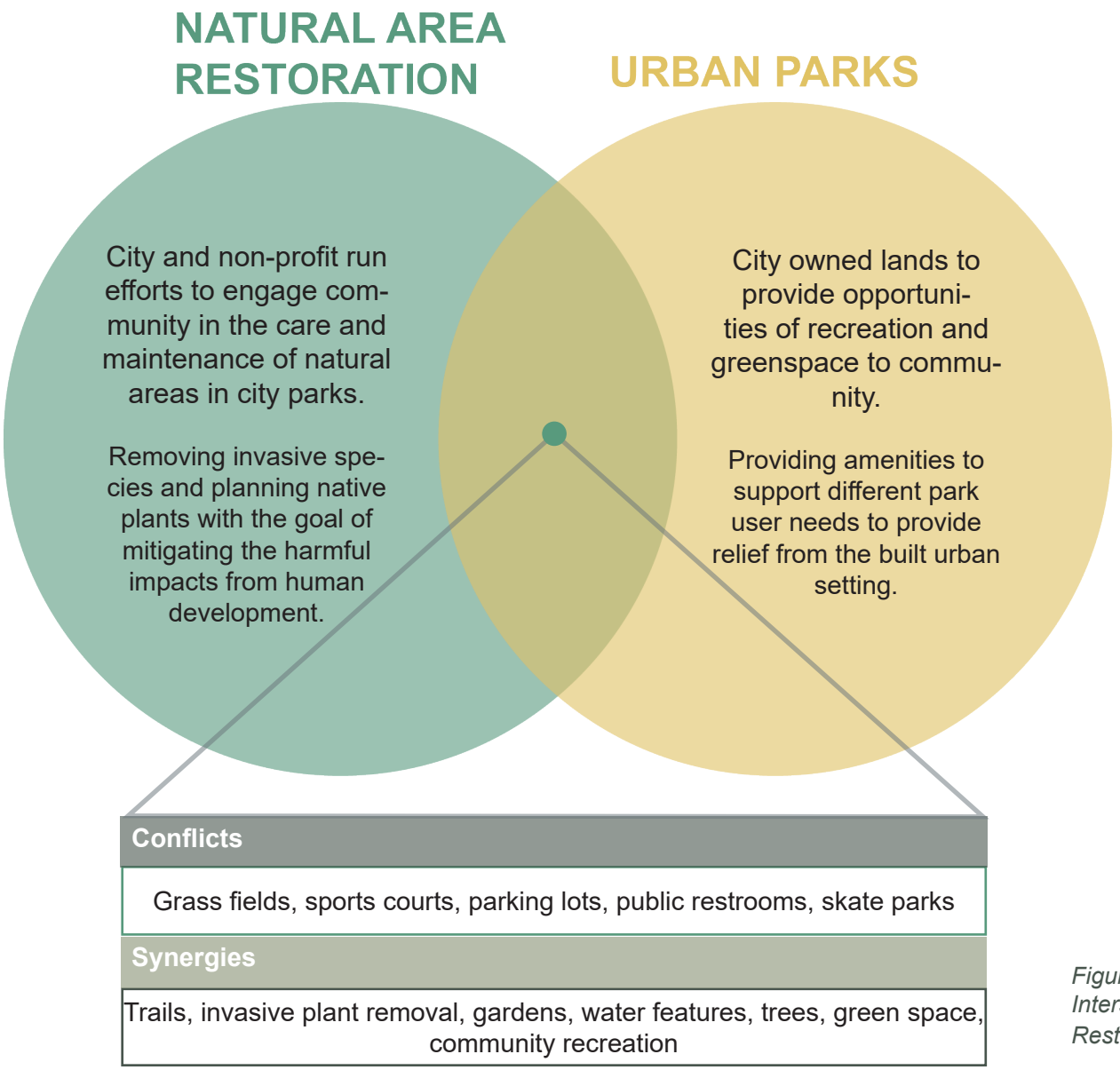

Figure 5 : Venn diagram of the Intersection of Natural Area Restoration and Urban Parks

and negative ways.

The Green Kirkland Partnerships 20 year plan from 2008 states “Maintained parks such as ball fields, playgrounds, beaches, orchards or open fields provide important open space benefits, but are not considered appropriate for forest restoration.” Figure 6 shows the elements in a park not considered when choosing a restoration project site. Currently park features are not included when selecting a restoration project site. The sentence “not included in the Green Kirkland Partnership project area” could change into two new categories: “beneficial to be located adjacent to site” and “not beneficial when adjacent to site”. The research aims to extend this sentence into a greater understanding about how these maintained parklands work with and fit into the parklands enrolled in the Green Kirkland Partnerships restoration efforts.

Research will be largely exploratory due to the relatively new history of Green City Partnerships. While this is not the first research to delve into volunteer forest restoration activities, it is the first to explore possible connections between the presence and locations of park amenities, and successful restoration sites within the Green Kirkland Partnership. Exploring patterns of a parks design elements with the adjacent natural area restoration effort will expand the understanding of how park features may correlate with volunteer interventions in natural environments. Figure 5 shows these two entities as circles and describes the purpose and benefit for each. The overlapping of these two circles is the area this research wants to expand. Where urban parks and natural area restoration merge, the call out box describes the conflicts and synergies between these two bodies. Synergies are potential opportunities were an increase in knowledge would be mutually beneficial to both parks, volunteer needs, and natural area restoration.

Volunteerism varies across the parks in the Green Kirkland Partnership. Stewards are community members who have volunteered to take the lead on restoring a specific park. They receive restoration training and support from the City of Kirkland, such as plant and tool drop offs for work parties. Some parks have multiple dedicated stewards who coordinate small weekly invasive removal sessions and large annual corporate groups. Other parks do not have a steward and experience inconsistent volunteer support. What makes a park attractive to volunteers so that a volunteer steward emerges and takes the lead on restoration? Exploring different park amenities and the habitat health of the adjacent restoration sites is an initial undertaking to find the answer to this question. It assumes that habitat health relates to dedicated volunteers and green Kirkland stewards actively working to increase the health of these natural areas.

The following document lays out a review of existing literature, followed by an explanation of the research approach and the development of the case studies. The four parks are grouped into two sections of case study based on the size, location, ecological makeup, and percentage of land in restoration of each park. These two sections will introduce each park, spatially examine the three categories of park features and adjacent restoration site change, and conclude with discussions and limitations. The thesis concludes with reflection on

Figure 6 :Defining the project area, areas where Green Kirkland prioritizes projects, 2015. City of Kirkland 20-year Forest Restoration Plan

Figure 6 shows which park features are not included (or considered) when selecting a restoration project site. The sentence “not included in the Green Kirkland Partnership project area” could change into two categories: beneficial to be located adjacent to site and not beneficial when adjacent to site.

combined findings and participant observations and finishes with areas for further study.

Main premises that form the basis of this research are:

1. Forests and natural areas play a vital role in the environmental, economic, and public health of our cities.
2. Urban parks are being impacted by decades of development and aggressive invasive plant species
3. Ecological restoration can help restore and maintain healthy forests and natural parklands.

RESEARCH QUESTION:

Are there locational patterns of park features that seem to correlate with the successful restoration of a natural area?

AUDIENCE

Understanding the interaction of a park's form and its natural area restoration through volunteers will contribute to restoration implementation strategies, and guide restoration prioritization. Outcomes from this research will benefit organizations that manage natural areas in urban parklands as well as those who consider themselves stewards of the environment. Green Cities Partnerships may use these findings in further research about the influences of park elements on the success of the restoration work.

On a larger scale, advancing the connection between parks, volunteers and the natural environment and could influence park design in the future. As the concept of the ecological park becomes more popular (Cranz 2003), discovering strategies to incorporate natural systems, community and park elements to be mutually beneficial will be essential. These initial findings may offer insight into future design guidelines for how natural areas and park features can best interact to protect the long-term health of the environment.

RESEARCH APPROACH

Two case studies will select parks based on specific criteria and examine features using themes uncovered from the existing literature. Visual observations compare the spatial locations of park features in relation to natural areas, further supplemented with my field observations on volunteer interventions. The concluding reflection discusses findings and possible next steps for future research. The focus is to explore the potential for a future research design to delve deeper into spatial connections deduced from restoration site success and adjacent park features.

A review of the existing literature on park design and natural area restoration reveals a set of park features commonly related to successful parks forms. The review compares books and peer-reviewed articles from the academic fields of landscape architecture, ecology, psychology, environmental planning, and urban design. These resources come from the University of Washington's library, online-article databases, and source organization webpages. Findings from the literature review guide the case studies and provide an understanding of how to classify elements in a park.

RELATING NATURAL AREA RESTORATION TO URBAN PARKS

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Figure 7: Heron Field Wetlands restoration site in Kirkland WA
Picture: Hallie O'Brien 2018

The following literature review follows a timeline of investigation undertaken by the author. An understanding of natural area restoration began this investigation. Once a firm definition for natural area restoration was developed, a framework for how organizations implement and use restoration formed. The concepts of park design features and restoration requires background in the topics; park design in a historical context, followed by research into the intersection of park design and natural systems function follow.

The literature review is broken down into the following four categories:

1. What is Natural Area Restoration?
2. How does Natural Area Restoration Benefit Cities?
3. Park Design
4. Intersection of ecology and the park

WHAT IS NATURAL AREA RESTORATION?

Ecological restoration is "a commitment to the re-creation of an entire community of plants and animals modeled strictly on one that occurs naturally" (Miles et al. 1998, p. 28). An important distinction to make is the type of ecological restoration this study is focusing on. The slight difference in terms are clearly explained in the following quote, "Ecological restoration is the practice of restoring ecosystems as performed by practitioners at specific project sites, whereas restoration ecology is the science upon which the practice is based" (Reid, Williams, & Paine, 2011, p. 19). This research is more concerned with the act of ecological restoration versus the academic field

of restoration ecology.

Researching the benefits of natural forests and areas reveals theories about the different ways to view the forest. Two dueling views are consuming nature for economic benefits versus not exhausting nature in order to preserve its value for future generations. The economist view of natural area restoration “natural area management goals need to sustain the long term persistence of animal and plant populations while also allowing private and public interests to profitably extract goods, services and energy” (Clewell, 2000, p.1). A powerful reason for preserving nature and ecological processes is to be able to continue to extract resources in order to keep the economy going and maintain the level of quality of life humans live today into the future (Blignaut et al. 2014). The economic viewpoint is similar to that of Conservationists. In environmental theory, there are two major philosophies: Conservationists and preservationists. Conservationists believe that ecosystem services are important in order to produce goods for humanity, while preservationists believe that natural systems are not be used for resource extraction (Beatley 1989).

All of these varying viewpoints merge on the topic of forest restoration. “Conservation Programs have been established with a core mission of protecting and enhancing specific physical regions or biological phenomena (Groves, 2003 p. 53). While preservationists do not want humans interrupting natural systems, they do agree that restoration of natural areas is a key piece to preserving land for the future (Beatley, 1989). A new understanding in the preservation community that natural systems subject to human pressures cannot self-sustain and need human intervention in order to prosper (Green Seattle, 2006). Conservationists know that in order to continue economic markets, natural systems need to be healthy and able to endure into the future. “The adverse impacts of humans can be mitigated by positive actions such as planning, planting, and management; all occurring with common commitment and shared vision.” (Clark, 1997, p.112) Forest restoration is a solution to restoring habitat health and natural systems function. Restoration returns the health of the earth’s forests directly while simultaneously restoring human health through improving air quality, water quality, and reducing the impact of global warming.

In order to understand forest restoration, an individual needs to understand the many provisions forest ecosystem services provide. In Washington State, benefits provided by the forest fall into many categories, such as water and air pollution mitigation, human health, and combating climate change (Littell et al. 2010). Seattle receives a fair amount of rain. Rain falls on asphalt that contains many contaminants such as copper from the brake pads of cars and oil from these same engines. Rainwater wash these pollutants into nearby storm drains moving these materials into the streams and lakes that provide drinking water for the City. However, if these polluted waters move through a forest, it filters and absorbs toxins by microorganisms in the soil or taken in by trees and stored in the woody tissues (Osborne and Kovacic 1993). Healthy forests can mitigate the impacts of climate change by reducing energy use due to the tall trees providing shade and lowering the air temperatures to reduce the use of air-conditioning (Park and Evans 2016) .Trees also sequester carbon dioxide, decreasing amounts of greenhouse gases in the atmosphere (Littell et al. 2010).

RELATING NATURAL AREA RESTORATION TO URBAN PARKS

Figure 8: If forested parklands are not restored vs if they are restored
Top: If Forested Parklands are Not Restored. Forterra 2015
Bottom: If Forested Parklands are Restored. Forterra 2015

In addition to environmental benefits, there is also increasing research on the positive impacts natural environments have on human health through physical activity, community strengthening, and psychological restoration. The term “Forest Bathing” describes the Japanese tradition of taking in the forest atmosphere, usually by walking through a natural environment (Stigsdotter et al. 2017). Studies find positive psychological benefits in terms of decrease in blood pressure and enhancement of parasympathetic nervous system activity (rest and digestive functions) and positive mood change (Stigsdotter et al. 2017). Even a small act, such as having a window looking over a park can provide immense health benefits, as illustrated by this quote; “Further studies demonstrate that long term and short term physical and emotional stress associated with urban living are reduced by access to views of nature (Wolf and Robbins 2015, p.394).

The urbanization of the Puget Sound region has fragmented and destroyed the natural forests and resulted in loss of habitat and healthy natural systems (Green Kirkland 2015). Cities are in general, destructive to the natural environments in which they are situated. Fragmentation of the forest occurs when roads and homes disrupt a connected dense forest causing clearing of native plants and animals and creates divisions that natural systems cannot cross. The addition of invasive species such as English Ivy and Himalayan blackberry, have made it impossible for forests to regenerate themselves as these plant species choke out new native seedlings (MacDougall and Turkington 2005). Human development has changed forest composition such as canopy cover and structure. The services these forests provide are diminishing (Clark and Matheny 1998). (Figure 8) In 2004, the City of Seattle realized that if no

action is taken in its urban parks, 70% of all parklands be degraded within twenty years (Green Seattle 2006).

Invasive species are a recognized nuisance. Washington State requires the management of what they consider “noxious weeds”. ““Noxious weed” means a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices” (RCW 17.10.010) “Statute requires counties to form weed management districts and requires county commissioners to appoint a district weed board to administer a noxious weed management program” (Montana 1997, p.5). In Washington State, King County operates a noxious weed program. King County defines Himalayan blackberry and English ivy (the two most commonly found noxious weeds in forest parklands) as Non-regulated Class C noxious weeds, meaning that control is recommended but not required. The county offers classes on noxious weed best management practices and assists other agencies and non-profits with weed survey, suppression, and eradication (king county, 1994).

HOW DOES NATURAL AREA RESTORATION BENEFIT CITIES?

Urban parks are becoming popular for restoration due to the many benefits urban green spaces provide for residents in a city. Trails through these areas offer a wide range of reliefs from urban life, and allow for cultural and recreational benefits as well (Green Seattle 2006). In 2002, Seattle mayor Greg Nickels made a pledge to preserve and enhance Seattle’s green infrastructure, putting in motion a goal to restore all forests within the city to a functionally sustainable state within twenty years (Green Seattle 2006). The initiative sparked a new strategy that required all land managing entities to work together and share resources in order to achieve this objective. Before the Green Seattle Initiative, the many departments in the City and organizations that dealt in natural area management had different visions of nature. For example, the Parks Department focused on the wishes of volunteers while Public Utilities cared about protecting riparian zones in the City’s watershed (Hellier 2012). In order to achieve restoration goals a uniting vision needs unite these different groups. Two years later in 2004 the green cities program began, it recognized that uniting with municipalities and communities to coordinate a volunteer and steward based restoration effort would expand the capacity of both entities. The program is economically viable in that staff share work between each program, and community volunteers donate their time and build relationships with their forests and natural areas to sustain long-term management (Travaline and Hunold 2010).

Partnerships such as the Green Cities Program use “Collective Impact”, which was the theme for the 2018 Urban Forest Symposium and annual event at the University of Washington’s Center for Urban Horticulture (McCann et al. 2017). David Cohen, the Director of Portland’s Intertwine Alliance, defines collective impact as the commitment of a group of players from different sectors to develop a common agenda and shared action plan for solving complex community-driven challenges. Collective impact allows for accessing more community members through arts and culture. Nalini Nadkarni, a professor in the biology department at the University of Utah, uses creative partnerships with prisons and urban youths to bring environmental education and research to

Figure 9: TreeTop Barbie concept by Nalini Nadkarni 2018

those with limited access to natural environments. She also collaborates with rap singers, fashion designers, and toy makers to extend urban forest values into new avenues for increased exposure, which she called “bridging science and society”.

In 2005 the City of Kirkland, following in the footsteps of the City of Seattle, partnered with Forterra and founded the Green Kirkland Partnership. The partnership maintains a mission of restoring the city’s natural parklands through training volunteer stewards on forests in urban environments and engaging the public through active work in the field (Green Kirkland 2015). In the Puget Sound region, there are currently nine green city partnerships (Rodman 2018). These partnerships between city and non-profit allow for a greater impact on restoration by combining resources and knowledge. Using volunteer stewards is an economical way to restore parklands while also building long term relationships between a community and its natural areas (Fisk 1995) Working in a local park to enhance its natural systems instills a sense of pride and ownership within a volunteer (Hellier 2012). A community that takes pride in their natural areas is committed to the long-term maintenance that is required for a healthy urban forest. “We cannot separate sustainable urban forests from the people who live in and around them” (Clark 1997). Authors Irene Miles, William Sullivan, and Frances Kuo, repeat this sentiment in the paper Ecological Restoration Volunteers: Benefits of Participation. “Restoration is a group effort to repair natural communities. Thus it seems possible that in the act of restoring, volunteers may experience a sense of community with each other, as well as a sense of connection with nature.” (Miles et al. 1998, p. 40)

Similar to varying views on nature, there are different views about the orientation of forest restoration. In an interview with Sharon Rodman, the Green Kirkland Partnership Supervisor, she discusses two lenses of urban forest restoration. One lens is oriented towards community, building relationships with stewards, renewing relationships between people and nature, and increasing the number of return volunteers to park restoration sites. The other lens is one focusing on ecological habitat success, motivated on the scientific aspect of restoration, such as diversity of native species present and amount of regenerating native trees (Rodman, 2018). These goals do not have to be separate; these viewpoints of restoration work together in the Green Kirkland Partnership. More volunteers' means more restoration work, which means more parklands are free of invasive cover, which means more native seedlings sprout.

The location of restoration activities is important to consider. The Green Kirkland Partnership focuses its restoration work into the City owned parks, because these natural areas are accessible to the public and contribute to the common good of the surrounding community. While all land is important to restoration efforts, parks are good places to start and build momentum due to the community building nature of people recreating together (Green Kirkland 2015).

PARK DESIGN

A parks design changes over the years through improvements and remodels. These remodels reflect the wishes of community, design trends in landscape architecture, and social attitudes of the time (Cranz 2003). In 1982, Galen Cranz published The politics of park design: A history of urban parks in America. Her research lays out four historical park types: The pleasure ground 1850 – 1900, the reform park 1900 – 1930, the recreation facility 1930-1965, and the open-space system 1965 – after WWII. Through these four time periods Cranz muses that the complex political and social context led to the design elements within the parks. The pleasure ground was an escape for urban dwellers using natural curves and large landscape to differentiate between the straight lines of the urban form. The reform park was smaller and sought to offer play for children and a more organized space for specific kinds of recreation, which turned into the recreation facility where large buildings and sport fields were dominant. The last park type, the open-space system, requires various types of parks, large, small, natural, and recreational, to bring open space into urban areas. A couple decades after The Politics of Park Design, Cranz published a new emerging park type, that of the ecological park. An ecological park design aims for parks to mitigate ecological problems and incorporate natural systems into a parks design. She states that these parks include native plants, recycling, and community-based stewardship and restoration of wildlife habitat and native plant communities (Cranz 2003).

Another prominent professional in park design is Frederick Law Olmsted, who is credited with being the founder of "public parks". Olmstead's park designs fit into Cranz's pleasure ground typology, where winding paths take pedestrians through open space. (Olmsted and Twombly 2010) Some of Olmsted's key design features are water, mixed topography, using native plants, and tall trees as buffers around the park boundary. Additionally Olmsted believes that a park needs to balance active and passive recreation in order to be successful. Allowing for

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Figure 10: The boardwalk at Yesler Swamp allows people to view the wetland restoration projects. Seattle WA.
Picture: Hallie O'Brien 2018

exertive recreation such as sports, and receptive recreation such as birdwatching and community gathering, is central to as successful park (Olmsted, 1970).

Olmsted's idea of balancing user's recreation needs relates to Marc Francis's book Urban Open Space, Designing for User Needs. Successful parks are designed around the needs of users will be popular. These needs are comfort, relaxation, passive engagement, active engagement, and discovery (Francis 2003). Comfort features include benches, places to get food and drink, and relief from the elements such as shade or sun. Relaxation features include water features and natural landscapes. Passive engagement features are areas for observing sports events or areas to sit and read. Active engagement features designed for physical activity such as baseball fields or walking paths, and lastly discovery features are elements that promote learning such as viewing public art or reading an interpretive sign (Francis 2003). The Municipal Research and Services Center discuss recent research about park features essential to success in the article 9 Elements of Successful Small Parks and Plazas by Steve Butler. These nine successful elements are; location, seating, natural landscaping, lighting, water features, public art, play equipment, entertainment, and food and drink. Butler goes on to say that parks do not need all of these elements to be successful, but main elements of seating and lighting are important features for a park to be popular (Butler 2016). These features fit within Francis's user needs categories and further emphasize the emerging importance of park design features in the success of a park with the community.

INTERSECTION OF ECOLOGY AND THE PARK

An interesting intersection of ecology and park design in Urban Open Spaces is in the chapter Why Some Work and Others Don't. Francis mentions a perceived conflict between human use and ecology. He goes on to explain that environmental scientists believe that human use and wildlife areas need to be separate and protected from one another. The case of New York City's Prospect Park is an example where a section of woodlands was fenced off in order to restore the natural habitat. Scientific evidence supports protecting habitat, but there is a conflicting concern that movements like this reduce the public's access to nature. Recent research suggest ways to balance people's needs without damaging the habitat (Gobster 2001). Ecologist Joan Ehrenfeld suggests that public support for wetland conservation heightens when the public has access to recreation by the use of trails through wetlands, and that this action is more important to conserving a natural area then it is disturbing to the wetlands integrity (Ehrenfeld 2005). The writings of Paul Gobster echo this notion by explaining that if carefully designed an area can both support the ecological functions and provide for human recreation without detriment to either (Gobster 2001). He goes on to explain that the presence of natural habitats in urban settings provide urban residents the opportunity to connect with nature.

Ecological citizenry is a term developed by philosopher Andrew Light. He states that in order to restore people's relationship to the land, they need to understand the land. In his book Nature by Design, Eric Higgs explains that ecological restoration is the action that links a person's connection to their understanding of land. He states, "To restore something means to consider what that thing was and what it means", this is the primary value of restoration, a way of deeply reflecting on appropriate action (Higgs 2003, p.41).

This literature-based research brings to light an emergence of connection of nature for human enjoyment and need. The most recent park type identified by Galen Cranz, the ecological park, displays the strengthening relationship between the built and natural environments. A direct connection between design features in a park and their interaction with natural systems function in terms of volunteer restoration does not exist. Main research on ecological design focuses on a larger planning scheme, and discusses topics such as financing, neighbor opposition, construction processes, and long-term management plans. There is a connection missing in the research between the spatial locations of the restoration site within a park. No guidelines speak to the perils or success of specific natural site locations in relation to the larger park. While features of a park identified as positively influencing a parks popularity with the surrounding community, there is little to no research of design features and their relation to ecological systems.

The exploratory nature of this report aims to begin to fill this gap in understanding. The research aims to look at these specific design elements attributed to successful parks and further apply them to link the success in habitat restoration seen in adjacent natural areas. The success of a park by providing for park users needs is connected to the success of volunteer ecological restoration through the following study.

CASE STUDY FRAMEWORK

Figure 11: Rose Hill Meadows Park pre - restoration work party
Picture: City of Kirkland

CASE STUDY FRAMEWORK

The framework for the following case studies uses Mark Francis's criterion that "successful parks respond to the needs to their users" as a base metric for classifying park features (Francis 2003). The research uses three of his "use" divisions to evaluate corresponding park features to restoration site changes. Looking at the use features of a park will help draw connections between volunteer needs and the benefitting natural areas. These divisions are comfort features, passive features, and active features. Comfort features provide a park user with places to sit and relax. Benches, trashcans, drinking fountains and bathrooms are comfort features. The comfort category also includes space where a park user can warm up in the sun, or cool down in shade. Passive features are psychological elements in a park involving views of nature and tuning out from others around you. Elements that encompass this passive use are areas to view water or birds, and open space. Active features are those that involve physical activity, such as walking paths or sports fields. Active features can also be educational opportunities like signs or interpretive centers.

Each park will have a separate corresponding map for these three identified feature classifications, and a fourth map that combines all features. The following features will be included in the comfort features exploration: Benches, garbage can, picnic table, open lawns, and bathrooms. In the passive evaluation, open space, views of the water, streams, and places to view wildlife are the features. Active features are as signs, playgrounds, sports fields, paths, walkways over water, and Joboxes. Joboxes are included in this study because they are storage boxes

Figure 12: Rose Hill Meadows Park post - restoration work party
Picture: City of Kirkland

that hold restoration supplies for volunteer work parties. This feature is specific to restoration activities and is included in the active features classification maps. The last evaluation for each park will incorporate all features on one map to identify patterns; this section will also include fences because this feature does not fit into a park use category. The literature review identified fences as being an important park feature that separates park visitors from interacting with nature.

Participant observations from my experience working with volunteers and corporate groups in the field add to the background on restoration sites and provide insight into why certain park features could contribute to their volunteer success. Conversations with Greek Kirkland Partnership coworkers and other natural area restoration professionals contribute to the discussions following each case study.

The tree-iage classification metric determined by the Green Kirkland Partnership in 2008 and 2015 is a means of evaluating restoration site success. In 2007, a Master in Urban planning student Peter James Noonan finished a professional project for the City of Seattle's Parks and Recreation Department Green Seattle Initiative. The research applies the medical triage approach as a means to achieve forest restoration goals. Triage in the medical industry is used when large numbers of people need care and decisions have to me made regarding who receives attention first (Hobbs and Kristjanson, 2003) The medical triage uses the type of injury, the amount of treatment needed, and the probability that the patient will recover. The method of prioritizing restoration in order to achieve the greatest benefit is important due to the lack of funding,

CASE STUDY FRAMEWORK

Probability of long-term persistence or system recovery	Low	Medium	High
High	C – Threat minimization and prevention	F – Prompt protection or restoration	I – Urgent protection or restoration
Medium	B – Low-level management of threats	E – Active threat reduction	H – Fast-tracked management intervention
Low	A – No immediate management action	D – Long-term low-level management	G – Transition to different system

Level of Need/Threat

Figure 13: Triage model from Hobbs and Kristjanson, 2003. Landscape management intervention grid.

rapid deterioration of forest health, and large amount of green space (Green Cities Partnerships, 2014).

Using this nine category framework (Figure 14) a prioritization method was established using habitat composition and invasive plant cover as the two parameter to prioritize restoration in management units in parks (Ciecko, 2016) Taking this framework and building upon it with the Forest Landscape Assessment Tool (FLAT) creates a finer detailed assessment of a natural areas conditions. FLAT allows for site-specific analysis and characterizes habitat further based on the age and size of trees, the native understory species composition, and tree seedling establishment (Ciecko, 2016). The Green Kirkland Partnership uses both of these tools to assign natural areas in a park into a prioritization class. Categories range from one to nine and represent a broad picture of the natural conditions in the management units of a park.

For the above row categories, specific ranges of habitat composition were broken down into three levels, Low, Medium, and High. High habitat composition is the management unit with more than 25% native tree canopy cover, where evergreen and madrone species make up more than 50% of the total canopy (Green Kirkland Partnership 2015). Management units placed in the medium habitat composition class have 25% native tree canopy cover, where evergreen and madrone species make up 1% - 50% of the total canopy cover. In order to assign a low habitat composition, management units have less than 25% native tree canopy cover and evergreen and madrones are not present.

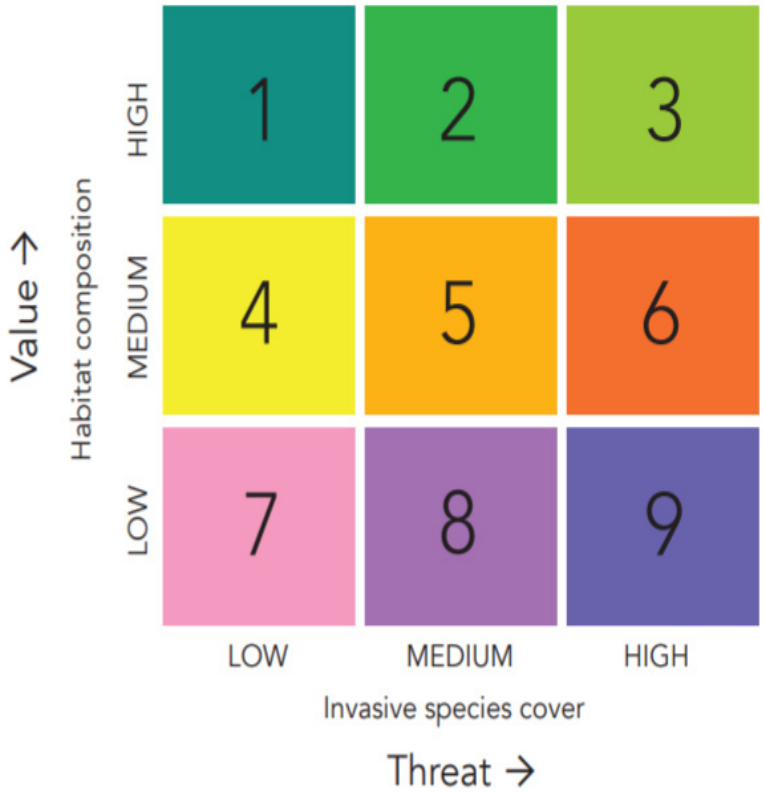


Figure 14 Tree-iage legend, Green Kirkland Partnership 2015

To asses invasive species cover three levels of low, medium, and high are distinguished using a percentage derived from amount of invasive species over the total land area. Management units with more than 50% invasive species cover are in the high class, between 5% and 50% invasive cover are considered medium, and low invasive cover was determined to represent management units with less than 4% invasive cover.

All Green City Partnerships in the Pacific Northwest use this method for classifying natural areas in order to better plan restoration strategies. Using maps of Green Kirkland Partnerships active restoration management units, maps from 2008 and 2015 allow for a comparison on habitat improvement. Tree-iage classification helps to visually assess the variance in natural area restoration within a park and begin to recognize patterns in relation to park features.

The research first looks at every park in the Green Kirkland Partnership with active restoration sites. Table 1 organizes information about each park to allow for comparison. The table assesses each park based on the themes identified through the literature and my observations working in the field. The park features creates the first row, (table 1), each feature of a park adds 1 point to a total amenity amount. A Park with a higher total amenity number means the park has more of these listed amenities. A park with a low number does not have many amenities. Figure 16 shows the results of this amenity comparison. A similar total amount of amenities, or an amenity amount within two units, is important to selecting the parks.

CASE STUDY FRAMEWORK

Park Name:	Size of Park (acres)	Size of Restoration site	Percentage of park	Playfields	bathrooms	Picnic Table	benches	Play structure	Waterfront	Open Space	trail through site	fence around site	School nearby	Parking lot	Wetlands	Steep Slope	TOTAL
Josten Park	0.8	0.8	100%			1	1	1		1	1		1				6
Brookhaven Park	0.95	0.4	42%			1	1			1		1	1				5
South Rose Hill Park	2.2	0.3	14%	1	1	1	1	1			1		1	1			8
Kiwanis Park	2.57	1.8	70%			1	1		1		1					-1	3
Rose Hill Meadows	4.25	0.04	1%			1	1	1		1		1	1	1			7
Cotton Hill Park	4.4	4.3	98%								1	1	1		1		4
Juanita Heights Park	6.2	4.2	68%								1			1		-1	1
Mark Twain Park	6.64	0.1	2%	1		1	1	1		1	1		1				7
Carillon Woods Park	9.3	7.4	80%				1	1			1	1	1			-1	4
McAuliffe Park	11.65	0.9	8%		1	1	1	1		1	1		1	1			8
North Rose Hill Woodlar	21.2	1.6	8%			1	1	1		1	1		1				6
Everest Park	21.5	3.7	17%	1	1	1	1	1		1	1		1	1	1		10
Crestwoods park	26.63	11.3	42%	1	1	1	1	1		1	1		1	1			9
Juanita Beach Park	26.91	3.3	12%	1	1	1	1	1	1	1	1	1		1	1		11
Heronfield Wetlands	29.5	0.3	1%			1	1			1		1		1	1		6
O.O. Denny Park	45.47	10.8	24%		1	1	1	1	1	1	1			1	1	-1	8
Watershed park	73.37	29.3	40%				1			1	1		1			-1	3
Juanita Bay Park	124.45	15.2	12%		1	1	1		1	1	1	1		1	1		9

Table 1 Park feature comparison table for all parks in Green Kirkland Partnership.

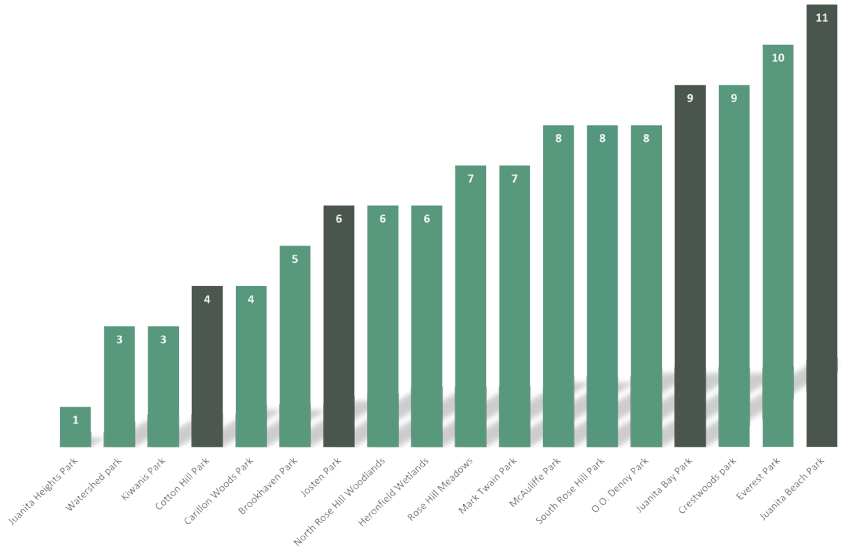


Figure 16: Green Kirkland Partnership parks and and their park amenities. The graphic shows the variation of features among parks. The darker bars are the parks compared in this study. Cotton Hill Park and Josten Park have a comparable amount of feature differing by 2, Juanita Bay Park and Juanita Beach Park offer many amenities and also differ by 2.

Four selection criteria based on common themes within the parks:

- The park is located within the City of Kirkland
- There are similar ecological systems present in the parks
- The classification of the park based on size.
- Restoration area as a percentage of total park area

CRITERIA EXPLAINED

The parks for this research are located within the City of Kirkland limits (Figure 15), an important criterion because this ensures each park operates under the same guidelines set forth by the City of Kirkland's Park Maintenance Department. Park maintenance varies across the Pacific Northwest in terms of best management practices such as type of pesticides used, lawn mowing frequency, and plant species used in flowerbeds. Parks departments also prioritize park maintenance based on community needs and sentiment. For example, during the summer of 2015, the parks department conducted a trial run of discontinuing mowing the expansive lawn at Juanita Bay Park. A similar practice at the City of Seattle's park Genesee Park and Playfield, where the meadows have been returned to a natural state and are no longer mowed by staff. The city of Kirkland received many complaints from neighbors about the tall lawn at Juanita bay. The meadow did not last through the summer. Locational restrictions also maintains each park is in the same bioregion so weather patterns, watershed boundaries, soil composition, and native species are constant.

Common ecological systems needed to be cohesive between the two comparison parks. For example, Juanita Bay Park and Watershed Park have a similar mix of tree-iage classifications represented and overall size of the park; however, the ecological functions of each park varied greatly. Juanita Bay Park is located on Lake Washington and has a large majority of wetland area whereas Watershed Park is mostly conifer forest and it is landlocked. These systems function differently from each other in terms of plant species, ecological benefits provided, and invasive species threats, to name a few. It is important to have ecological systems similar in a park case study comparison so that the restoration best management practices are the same. Restoration strategies vary by invasive threat. Some strategies are more successful in terms of maintenance and invasive species regeneration. Restoration strategies change on a park-by-park basis. Each park needs a unique plan to rid it of invasive species dominance. The removal of Himalayan blackberry from a wetland is different from the removal of the same plant from a forest.

The City of Kirkland has a park classification system based on size. The Parks and Community Services Department identifies four kinds of parks. The two comparison studies in this paper delve into two of these four classifications, Community Parks and Neighborhood Parks. Community parks are large park sites ranging 15 to 30 acres in size. These parks offer a wide variety of both active and passive recreational facilities and focus on serving those within a 1-mile drive, walk, or bike distance from the park. Neighborhood parks are smaller parks ranging from three to five acres in size with limited active and passive recreational facilities; these parks focus on the need of those residents that are in ¼-mile walking

CASE STUDY FRAMEWORK

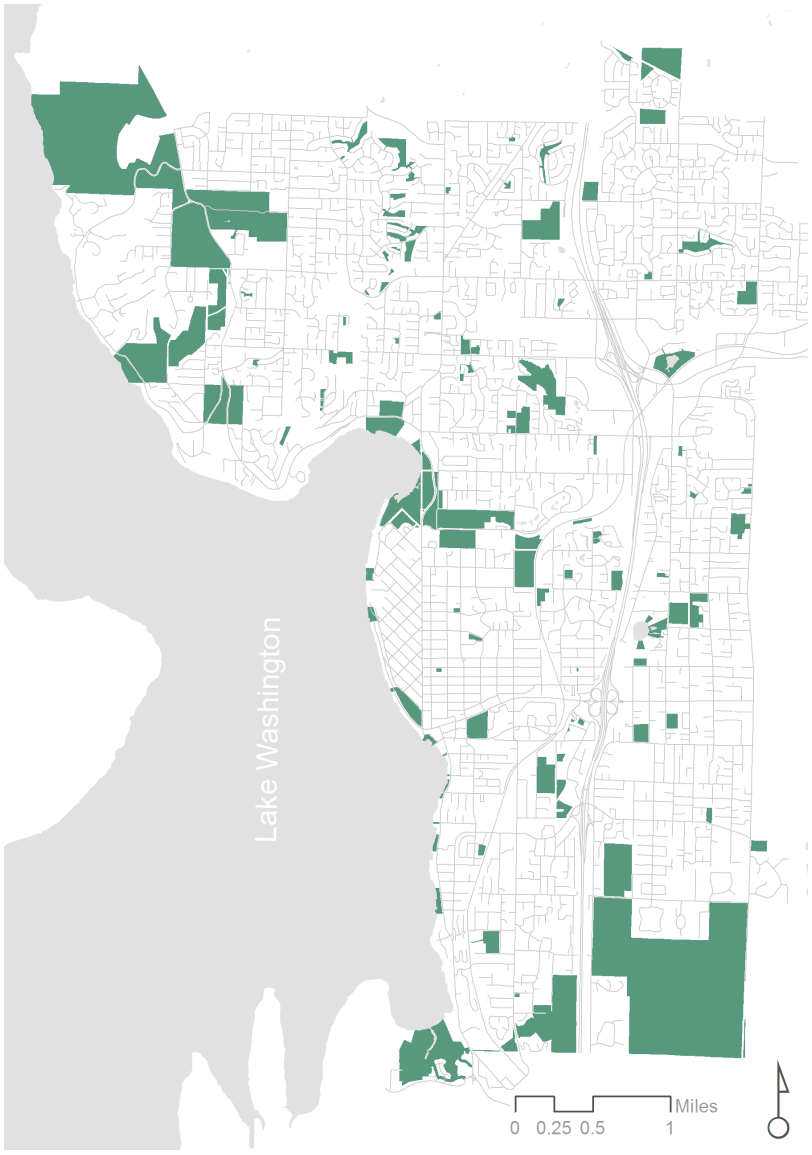


Figure 15: All parks in the City of Kirkland

distance. It is important to include this element in the park selection criteria because the community uses of a park vary by the size of the park.

The fourth metric in this selection criterion is the percentage of land the park has in ecological restoration. In order to equally asses' parks each park needs to have a similar percentage of land in restoration. It would not make sense to compare a park where 100% of its parklands are in ecological restoration with a park where only 10% of the lands are in restoration. This element is central to exploring the design of the park and the success of restoration sites by establishing the equal distribution of parklands in restoration allowing for the insight into the variances of use in the remaining acres of the park.

Figure 17 shows the four parks are Cotton Hill Park, Josten Park, Juanita Bay Park, and Juanita Beach Park. Spatially looking at the natural area restoration sites using aerial imagery maps with 2008 and 2015 tree-iage assessments will explore potential patterns in the built landscape. Figure 22 illustrates this approach. The 2008 tree-iage map shows the habitat condition of restoration sites in that year. The 2015 tree-iage map shows the habitat condition of the restoration sites. Noting changes between these two years and the proximity of park features is the basis for the pattern recognition process.

Lastly, from my experience these four parks are similar in volunteer presence. Juanita Bay Park and Juanita Beach Park has multiple dedicated stewards and host a variety of large corporate service work events. Josten Park and Cotton Hill Park are similar in the smaller nature of the volunteer work parties while having a dedicated park

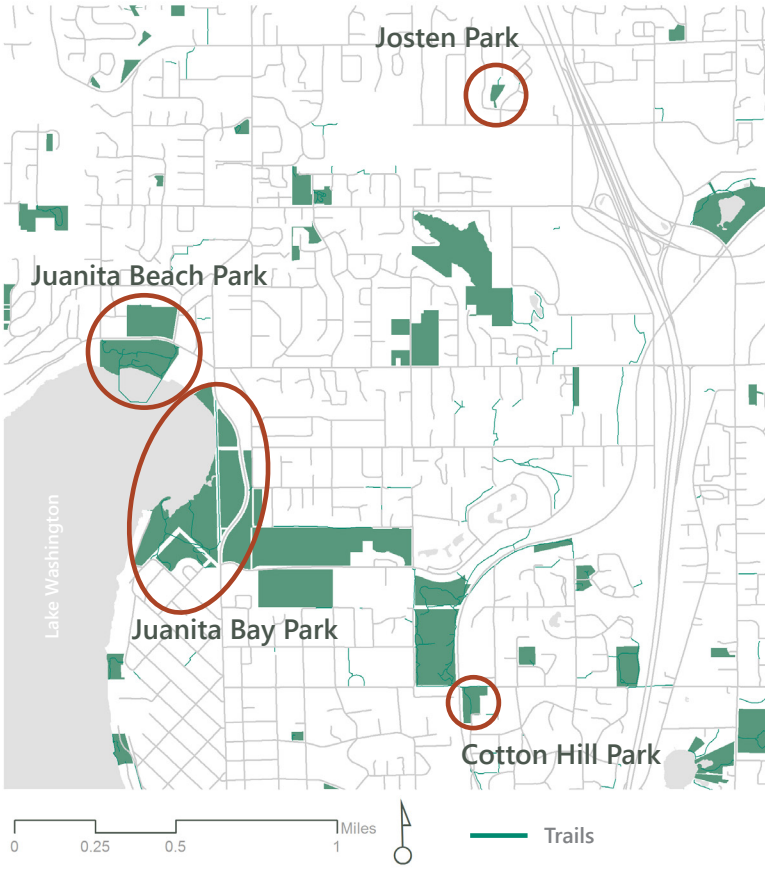


Figure 17: City of Kirkland Parks selected for this study based on selection criteria

steward who lives close by.

Two goals for understanding park design features and their relation to forest restoration sites:

1. Uncover a set of characteristics related to park design that contribute to the health of natural environments, human environments, and civic engagement.
2. Consider how the specific feature might interact with restoration.

PROPOSITIONS:

Parks that experience a higher number of users due to having a larger number of park features will have more natural areas in a lower triage category than a park with fewer amenities.

A Park that has benches and other comfort features close to or overlooking restoration sites will experience more success in habitat restoration than a park with no benches, or benches far removed from the natural area.

Parks that have paths or trails through natural areas will have lower triage category numbers then a park with fenced off natural areas.

Parks that have educational signage next to the restoration site on a trail will have more success in habitat restoration than parks that do not have signage or signage that is not close or relatable to the actual natural area.

COTTON HILL PARK & JOSTEN PARK

COTTON HILL PARK & JOSTEN PARK

INTRODUCTION

Figure 18: Park amenities comparison matrix results. Josten Park has six features (picnic table, bench, play structure, open space, trail through site, and a school nearby) Cotton Hill has 4 of these park features (trail through site, fence around site, school nearby, and wetland)

COMPARISON

In this comparative case study Josten Park and Cotton Hill Park (Figure 19) will be compared because they are both characterized as neighborhood parks (Green Kirkland, 2015), both have close to 100% of their natural areas in active restoration (Figure 20), both are located in Kirkland Washington (Figure 15), and both have similar ecological systems. In addition when compared to the number of park amenities/features each park has (Figure 18), they scored two intervals away, meaning each park has a similar number of user needs met through these amenities.

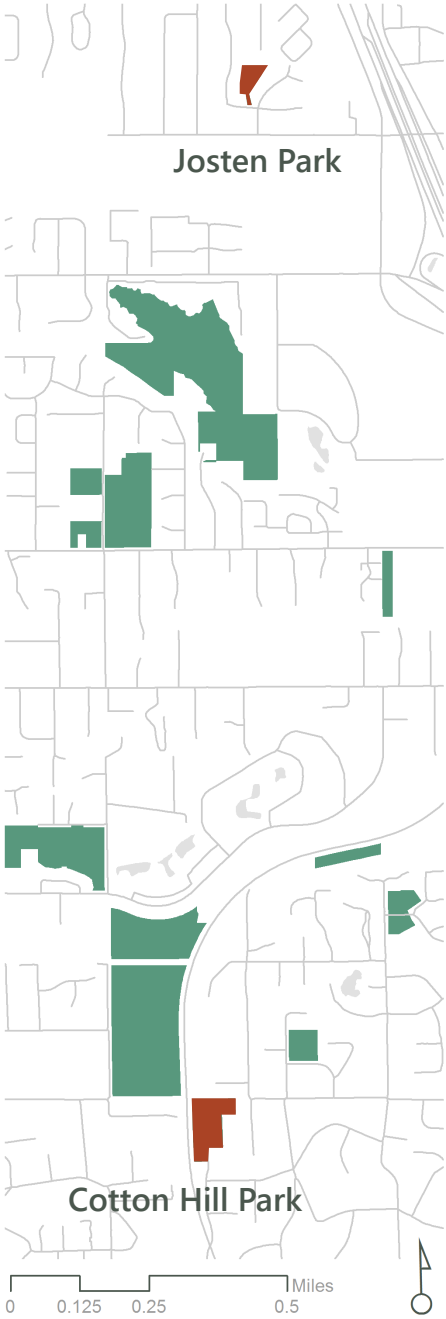


Figure 19: Location comparison map. Josten Park is 2 miles directly north of Cotton Hill Park (not using roads). Other parks not included in the study are shown in green, while the parks included have been shown in red.

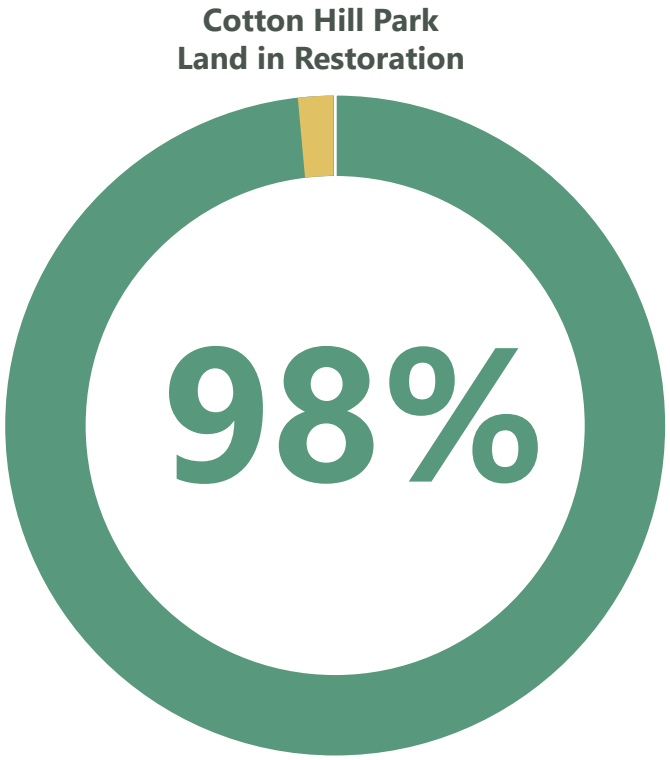


Figure 20: A visual representation of the amount of each parks land is enrolled in active restoration with the Green Kirkland Partnership. Both Josten Park and Cotton Hill Park have almost all of their parklands in forest restoration.

Spatially analysis for patterns of park features based on the three categories: Comfort features, Passive features, and Active features each contains. In order to begin the process, the following pages will provide a brief overview of each parks restoration history, the status of current restoration, and the changes that have occurred in each park from 2008 through to 2015. Discussing the different use of park features in relation to the volunteer restoration effort will illuminate connections of park amenity, volunteer commitment, and ecological health.

COTTON HILL PARK & JOSTEN PARK

COTTON HILL PARK

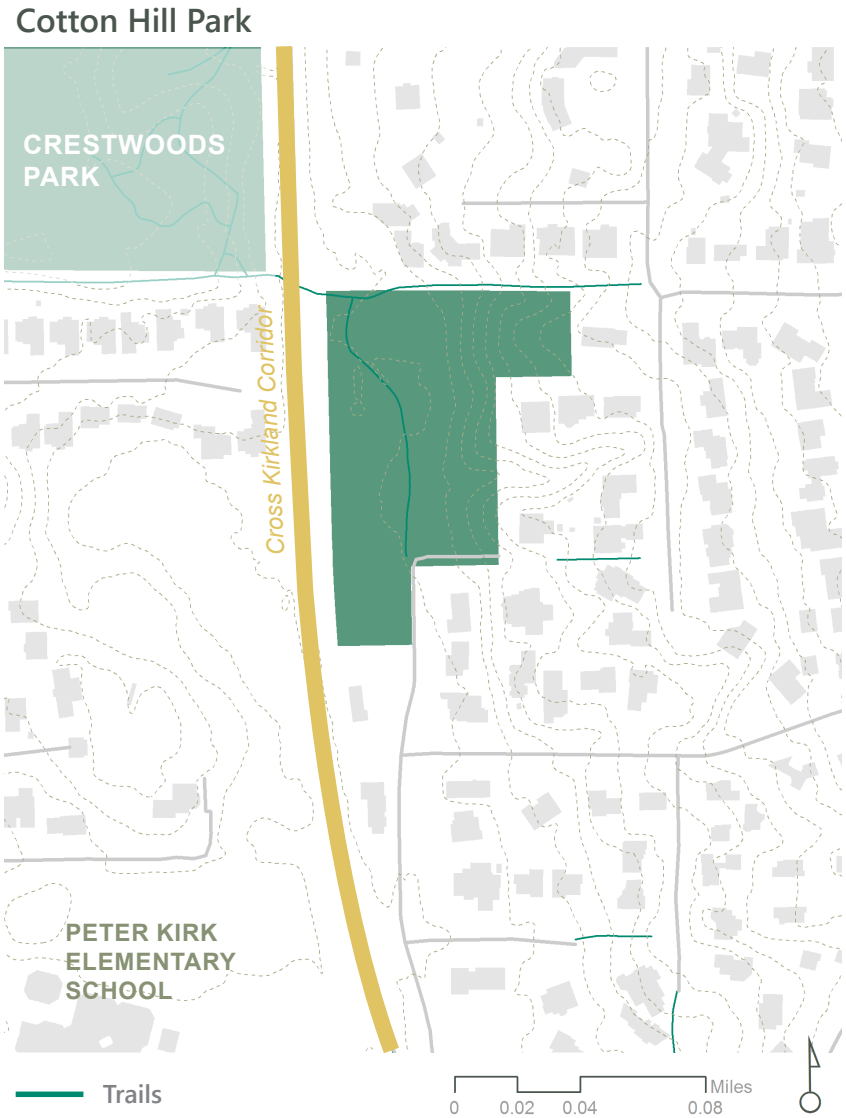


Figure 21: Cotton Hill Park map

PARK DESCRIPTION

Located in Kirkland Washington, Cotton Hill Park is in the Highlands Neighborhood on the dead end corner of 110th Ave NE and NE 98th Street (Figure 21). Low-density residential land use surrounds the 4.4 acres park. Peter Kirk Elementary school is located to the south west of the park; Crestwoods Park is directly North West and connected to Cotton Hill Park with a gravel trail. The Cross Kirkland Corridor (CKC) runs between Cotton Hill Park and Crestwoods Park, on the West side of Cotton Hill Park. The CKC is a 5.75-mile trail that runs along an old railway corridor.

Cotton Hill Park is mostly forest with a mix of Conifer and Deciduous trees. A steep west-facing slope begins at the east edge of the park. A staircase on the northeast boarder creates a through connect for elementary students walking to school. The park has a main gravel train that runs north south through the middle of the park and connects to a trail that runs East West along the north boarder of the park. There is a small stream that runs east to south west through the park.

A history of logging and single family home development has significantly degraded the ecosystem in this park. Logging changed the forest composition from a conifer dominant forest to one dominated by deciduous trees. The clearing created open areas for non-native invasive species to move in, Himalayan Blackberry, English Ivy, and Reed canary grass. The development in this area forever altered the topography and changed the ecology of the park by culverting the stream before it

Figure 22: 2017 aerial of Cotton Hill Park and tree-iage areas by year
Above: 2017 Aerial of Cotton Hill Park. Below: tree-iage areas by year

enters the east side of the park. The stream's sources are storm water and groundwater from the neighborhood to the north.

The restoration approach for this park is initial invasive plant removal followed by planting site-specific native plant species, and maintenance invasive plant removal. Cotton Hill Park has a very dedicated Steward who lives close by and leads small monthly work parties with regular volunteers who also live in the neighborhood. There are large work parties with corporate groups that occur about once a year ranging from 30 to 60 volunteers.

Cotton Hill Park's restoration began in 2008 and a rapid assessment of habitat composition and invasive species cover determined the initial status of the forest's health. The 2008 map shows the tree-iage category of each assed unit (Figure 22). The next assessment from 2015 is adjacent for comparison. Restoration expanded into new areas encompassing almost all of the parkland. The north end of the park has seen the most success in habitat restoration, improving from a classification of 9 to 6 and 5. While the area in the south of the park remains

Figure 10: Tree-iage legend Green Kirkland Partnership 2015

COTTON HILL PARK & JOSTEN PARK

COTTON HILL PARK

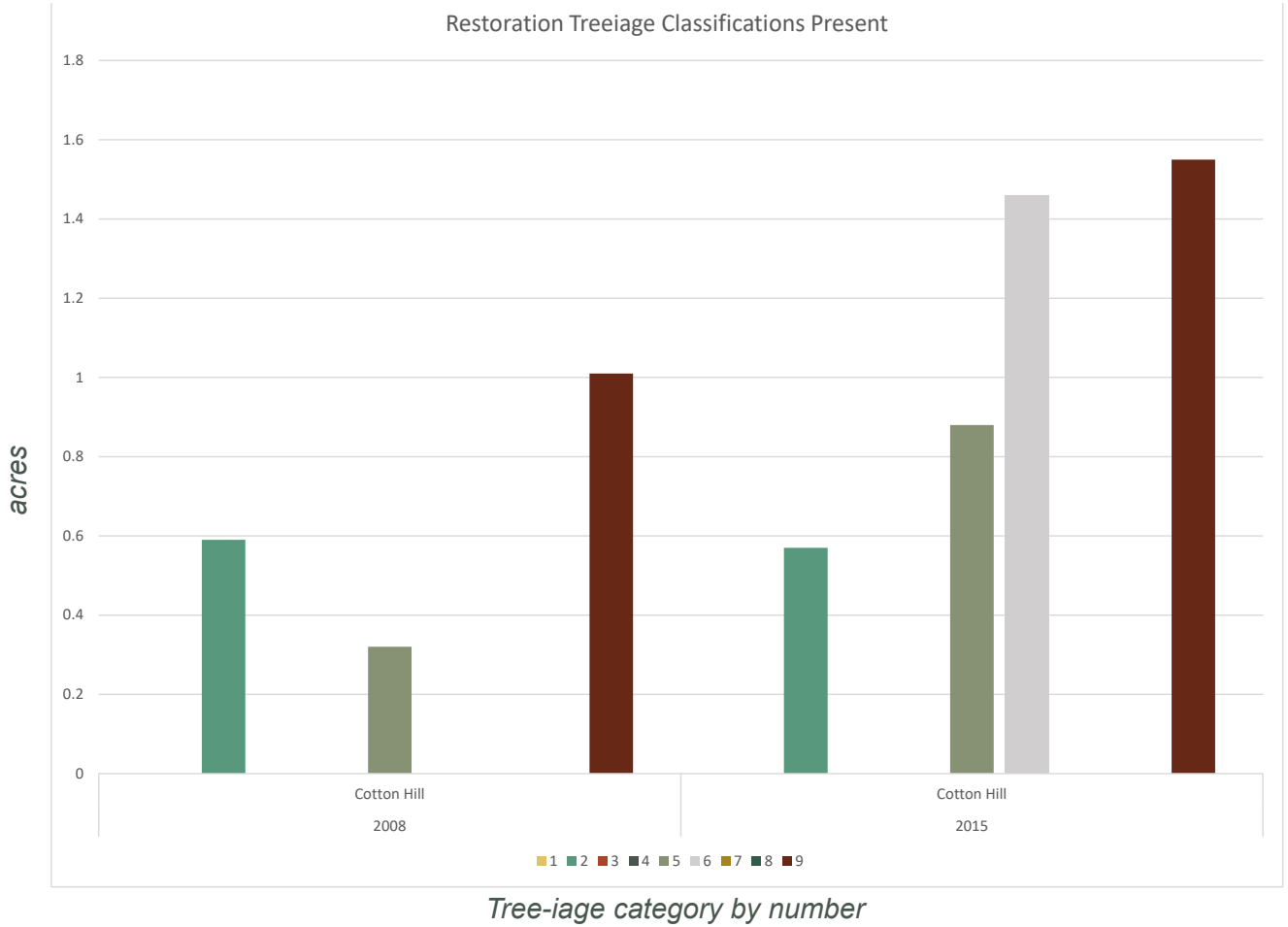


Figure 23: Cotton Hill Park Tree-iage Classifications Present in 2008 and 2015

Figure 23 shows the increase in restoration acreage per tree-iage category. The graph represents the two years the habitat assessment is available for 2008 and 2015. The increase in category 9 areas explains the expansion of parkland area in restoration. There is an increase in acreage category 5, and an appearance of category 6. Overall, this is an improvement in habitat quality, and while a snapshot in time, tells the continuing restoration effort to be positive for the park.

Figure 24:
Above: Entrance to Cotton Hill Park. Photo: Hallie O'Brien
Below left: Main trail through middle of Cotton Hill Park. Photo: Hallie O'Brien
Below right: Staircase on North border of Cotton Hill Park. Photo: Hallie O'Brien

at a 9 the park as a whole has seen an improvement in species composition.

In 2008, the University of Washington collaborated with Green Kirkland in a Restoration Ecology Network program. The UW-REN is a program that partners community and the university in ecological restoration knowledge and practice. The project involved a group of UW students defining a site within Cotton Hill Park where they would assess the current habitat composition, leave restoration efforts, monitor ecological process, and plant natives throughout three academic quarters. The students chose a site in the northern section of the park and contributed to restoring the habitat from a 9 to a 6. The students also designed interpretive and educational signs that later influenced the final designs installed in the park. These signs called out native plant species and identification details along with the history of the restoration of the park.

Cotton Hill Park has the Certificate of Exceptional Merit awarded by the National Wildlife Federation's Community Wildlife Habitat Program. Certification under this program means a park provides food, water, cover, place to raise young, and use sustainable practices in removing/controlling invasive plants. The certification plaque is at the entrance to Cotton Hill Park (Figure 24).

JOSTEN PARK

Figure 25: JostenPark map

PARK DESCRIPTION:

Located in Kirkland Washington, Josten Park is in the North Juanita Neighborhood with a main entrance on NE 129th St (Figure 25), and a pedestrian oriented entrance on 112th Ave NE. Low-density residential land use surrounds the 0.8 acres of park. Juanita High School is located 0.37 miles to the west of the park. Interstate 405 is located 1,300 feet to the East, and Evergreen Hospital is 0.6 miles east.

Josten Park is a small area with a couple large established conifers. When soliciting names for the park in 2015 a neighbor submitted the name Red Cedar Park, due to the defining characteristic this tree provides. There is no significant change in elevation in the park. The park has a main gravel train that runs north south along the western edge through the park. There is a significant grass covered open space in the middle of the park. In the north section of the park there is a swing set and two bounce toys in a wood-chipped rectangle with a picnic table adjacent.

Josten Park is a very young park, officially opening in 2016; this area was set aside for open space in the original development of the neighborhood in 1972. In 2003, the City of Kirkland surveyed the greenspace as a possible location for a park. The process stopped due to property owners whose backyards encroached into the overgrown green space. In 2009, a new single-family housing development built near the northern corner of what would become the park advertised to homebuyers the new park. The developer paid the city in lieu of

Figure: 26
Above: 2017 Aerial of Josten Park. *Below: tree-iage areas by year*

sidewalks for the development of this space into a park. A large ecological restoration of the site began as part of the development of this park. Thus begins the actions of the Green Kirkland Partnership at what used to be the North Juanita Open Space.

The restoration approach for this park is involved a large-scale removal of Himalayan blackberry using goats and machinery, followed by native species plantings and maintenance. Josten Park has two dedicated Stewards who lives close by and lead small monthly work parties with regular volunteers who also live in the neighborhood. There are large work parties with corporate groups that occur about once a year ranging from 15 to 40 volunteers.

Josten Park is unique because its neighbors have played a role in the development. Recent knowledge of what used to be remains in the memories of the neighborhood kids who now swing on the swing set in an area they used to call the “brambly space”. There is a powerful sense of community felt at this park. Neighbors’ back yards meet the park boarder and windows overlook the space creating a sense of

JOSTEN PARK

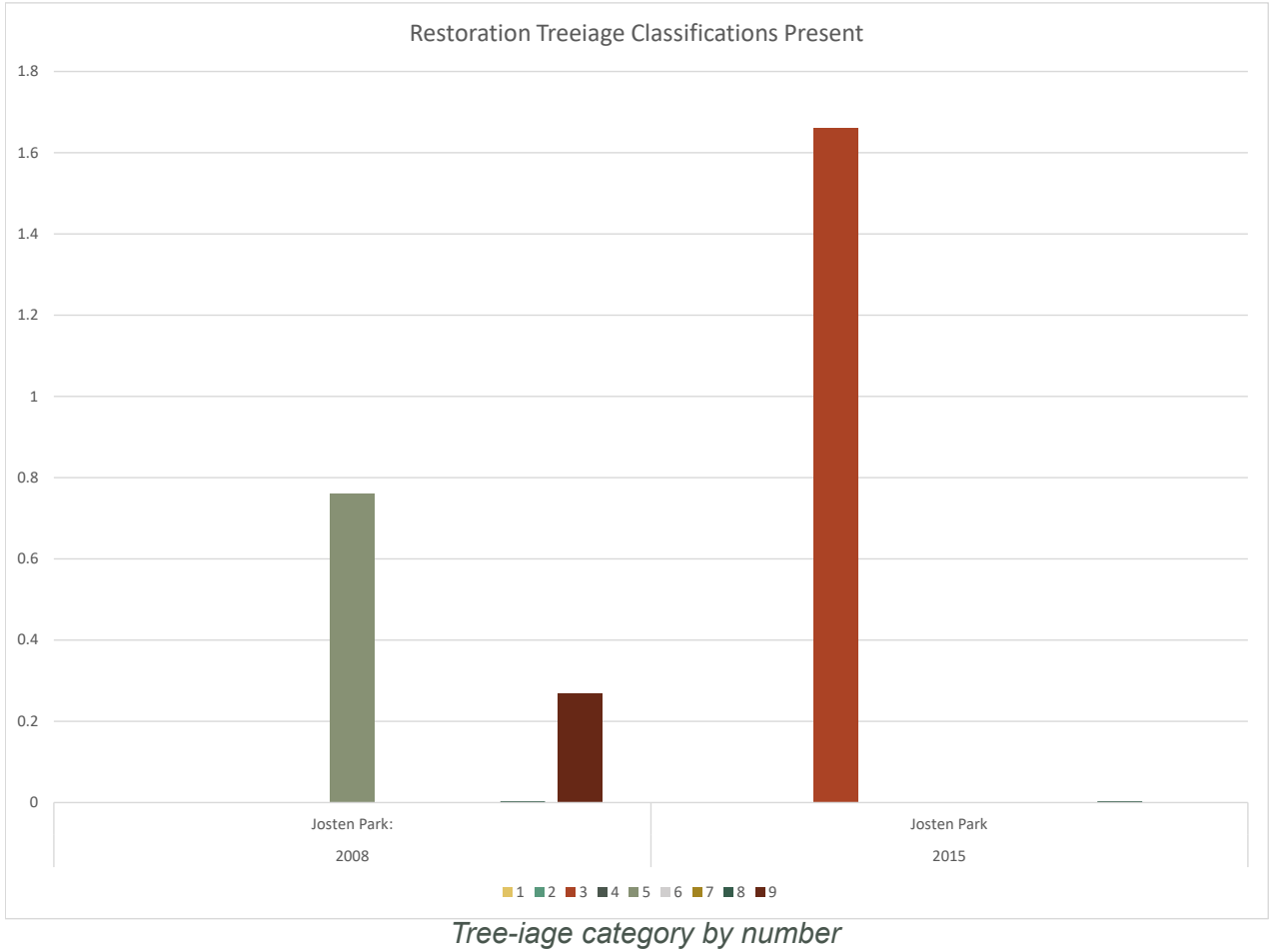


Figure 27: Josten Park Tree-iage Classifications Present in 2008 and 2015

Figure 27 shows the increase in restoration acreage per tree-iage category. The graph shows the two years the habitat assessment is available for 2008 and 2015. The change from 2008 to 2015 shows the elimination of category 9, and the replacement of majority category 5 with category 3 habitat composition/invasive cover. Overall, the increase in habitat quality and the decrease in invasive species cover shows a positive trend for Josten Park's restoration outcomes.

Figure 28:
Above: Entrance to Josten Park. Photo: Hallie O'Brien
Below: Playground, grass field, picnic bench at Josten Park. Photo: Hallie O'Brien

security. There was initial concern that High School kids would find the hidden park a great place to party, but this worry never materialized. The path through the park allows an inter-block connection in a neighborhood with a stick and lollipop street system, where dead ends limit walking connections. As a result, the park is seeing more and more foot traffic from families.

Josten Park is a great example of where ecological restoration fits into urban design and planning. An area that was ecologically suffering met restoration and not only benefited the environment but also benefitted the community health of this neighborhood.

COTTON HILL PARK & JOSTEN PARK

COMFORT FEATURES COTTON HILL

Figure 29: Comfort Features Cotton Hill Park

LEGEND

- Sign - interpretive/educational
- Jobox
- Bench
- Garbage can
- Picnic table
- Bathroom
- Playground
- Open field
- Sports field/court
- Path/walkway
- Fence
- Stream
- Walkway over water

Cotton Hill shade offers park users escape from hot sunny days, and a garbage can provides a preferred dog-walking route. The garbage can at the entrance of the park is in front of the healthiest restoration unit shown in green. The shade offered by trees is in the majority of the park. Comparing the park features and change in habitat category from 2008 to 2015, shows the garbage can is near a healthy habitat that has remained healthy (Figure 29). This shade

COMFORT FEATURES JOSTEN

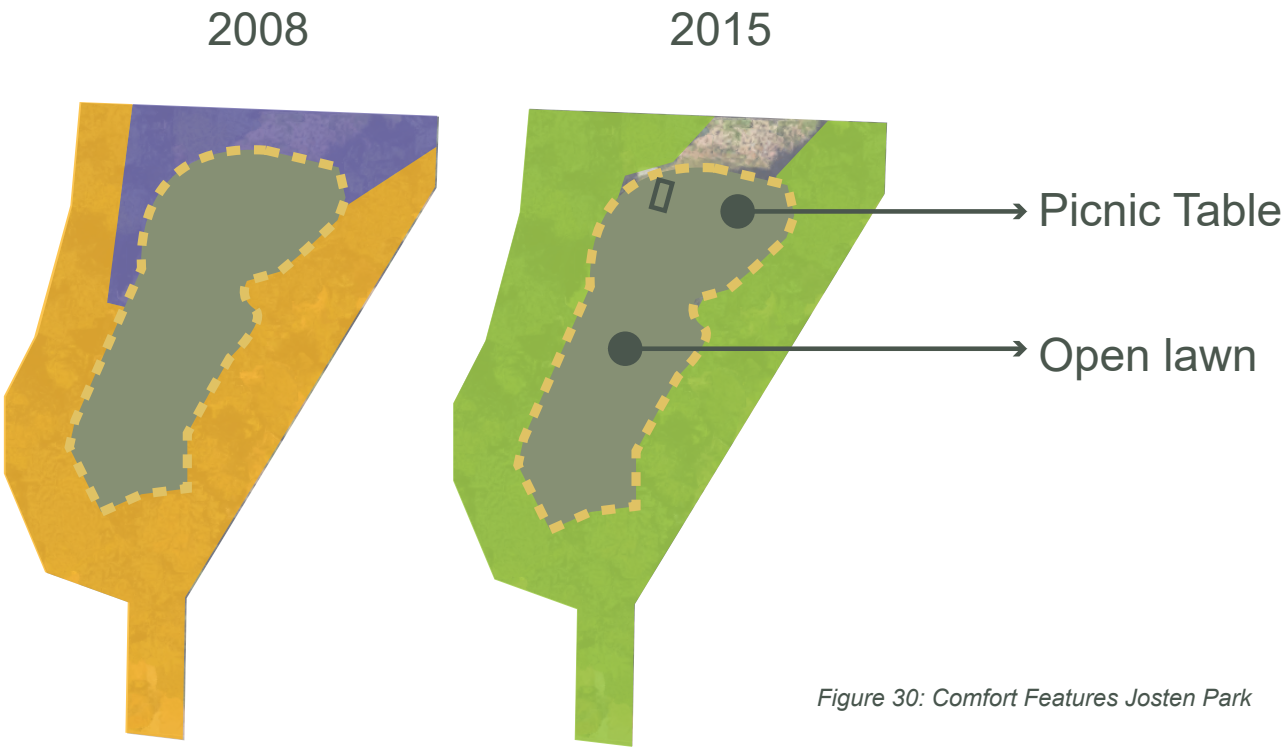


Figure 30: Comfort Features Josten Park

could draw restoration volunteers during warmer months, but deter during colder months when most restoration occurs.

Josten Park has an open lawn allowing park users to warm up in the sun and provides shade around the perimeter. The space allows park goers to relax on the grass and spend more time in the park. The picnic table situated at the north of the park is a couple feet away from a newly planted restoration site allowing people to sit and view the plants and animals as well as children playing in the playground. The habitat change from 2008 to 2015 shows that next to the picnic table the category changed from 9 to 3, and where the open field is the category has changed from 5 to 3 (Figure 30).

COTTON HILL PARK & JOSTEN PARK

PASSIVE FEATURES COTTON HILL

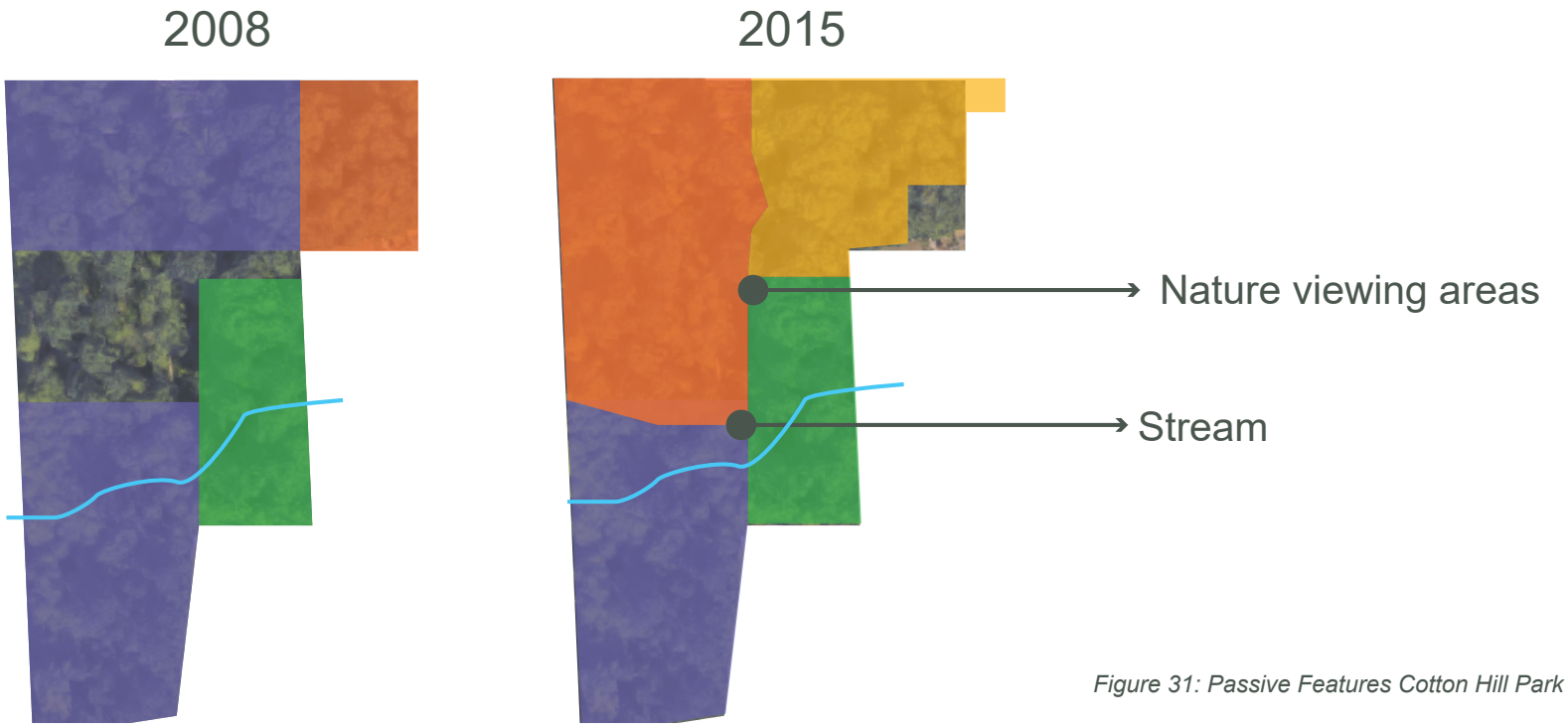


Figure 31: Passive Features Cotton Hill Park

LEGEND

- Sign - interpretive/educational
- Jobox
- Bench
- Garbage can
- Picnic table
- Bathroom
- Playground
- Open field
- Sports field/court
- Path/walkway
- Fence
- Stream
- Walkway over water

Cotton Hill Park has a small stream that runs west through the southeast and west sections of the parkland. From 2008 to 2015, there was no change in tree-iage category in relation to the stream. There are opportunities to view nature throughout the park, especially while walking along the path. However, there are no areas specifically designated for this passive feature (Figure 31). Restoration

PASSIVE FEATURES JOSTEN

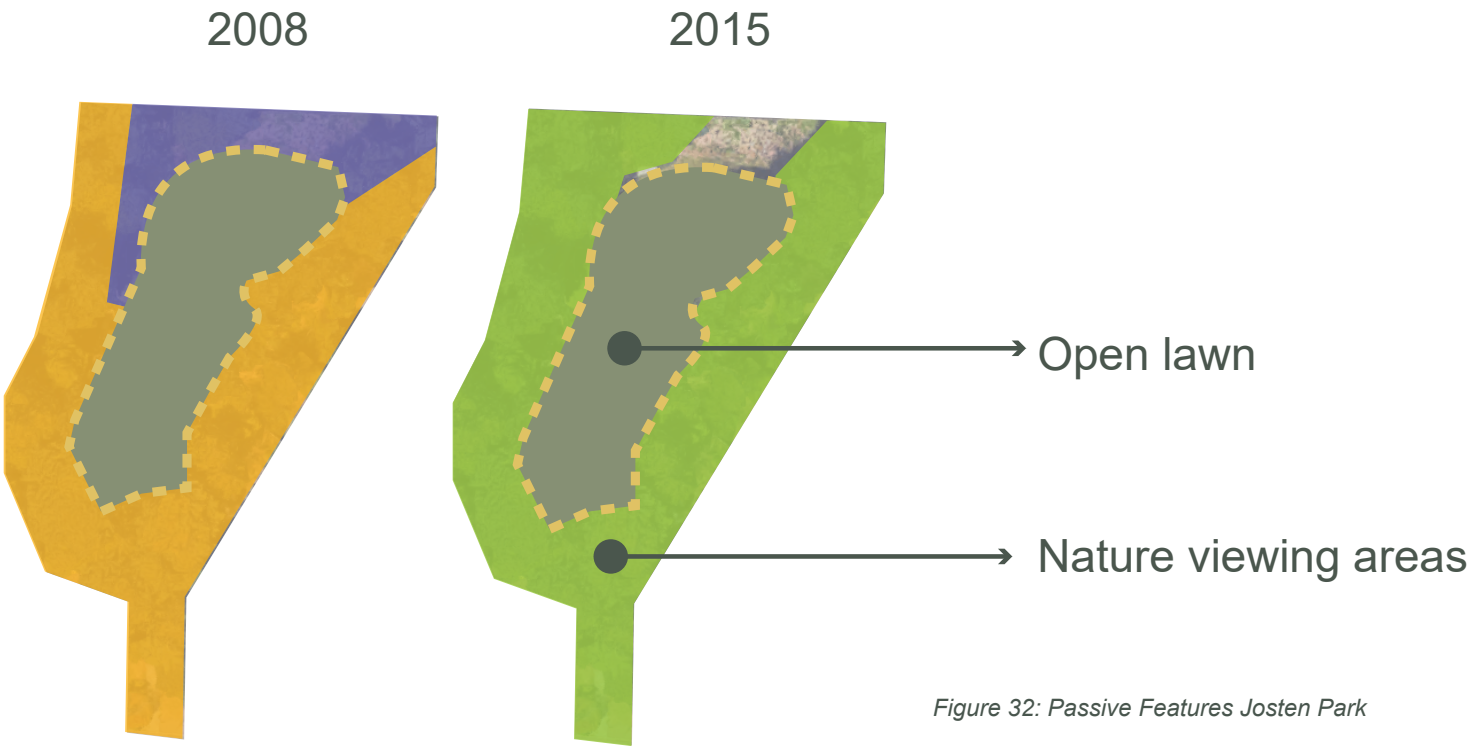


Figure 32: Passive Features Josten Park

volunteers benefit by connecting with the diverse nature the stream brings to the park.

Josten Park has an open lawn for users to sit and watch the surrounding nature as well as passersby on the path. People can lay out in the lawn and read a book. There are new native plantings close to the lawn. There has been a tree-iage change from 5 to 3 in the restoration site around the open lawn (Figure 32). The close proximity of new native plantings could entice more volunteers to join the restoration effort by making the effort more visible.

COTTON HILL PARK & JOSTEN PARK

ACTIVE FEATURES COTTON HILL

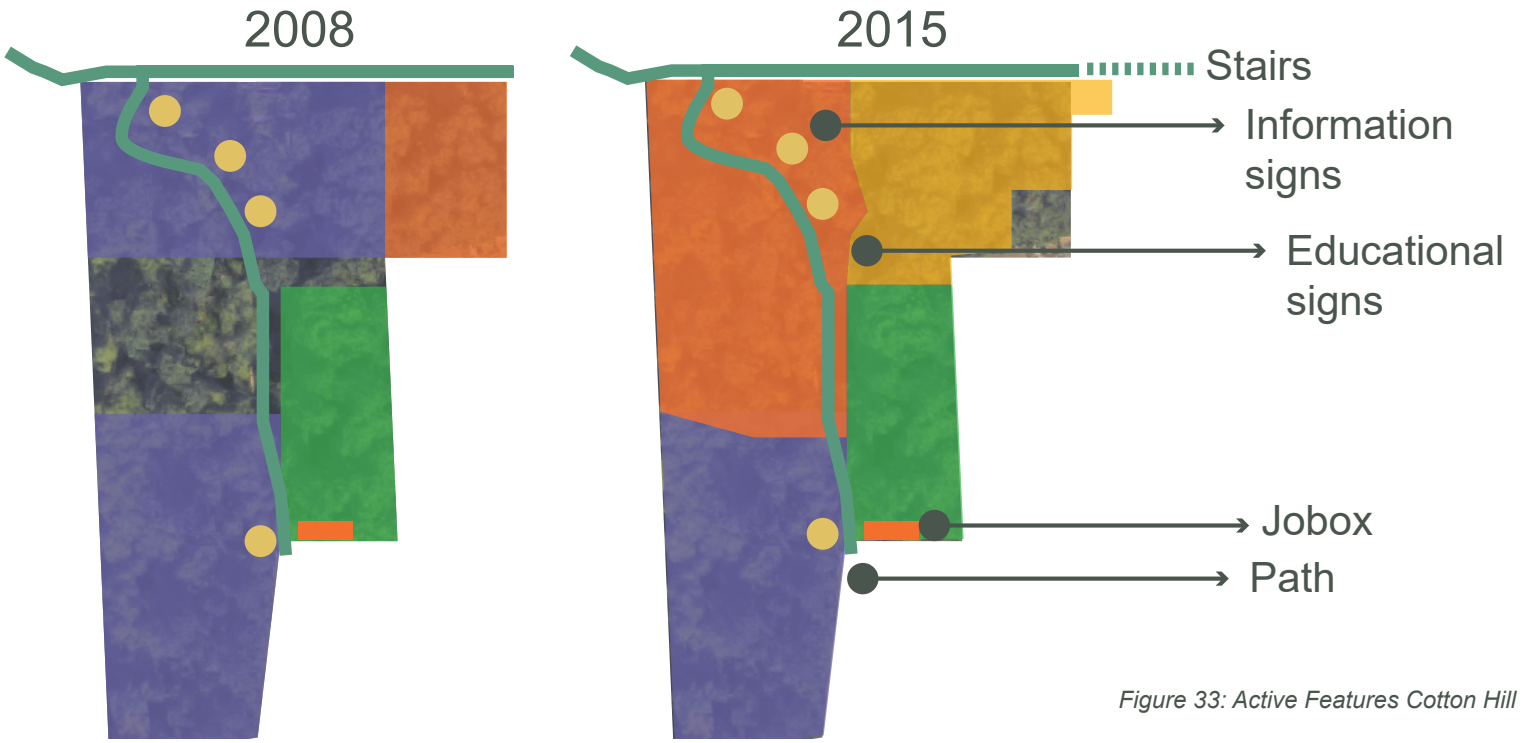


Figure 33: Active Features Cotton Hill Park

Cotton Hill Park has four educational signs in the park. The two signs in the northern section of the park are native plant identifying signs that allow the public to learn about the native species they see. The tree-iage category change in this area improved from 9 to 6. One informational sign at the intersection of the two paths in the northern section of the park explains the history of the restoration projects in the park; here the habitat improvement is the same. The path

LEGEND

- Sign - interpretive/educational
- Jobox
- Bench
- Garbage can
- Picnic table
- Bathroom
- Playground
- Open field
- Sports field/court
- Path/walkway
- Fence
- Stream
- Walkway over water

ACTIVE FEATURES JOSTEN

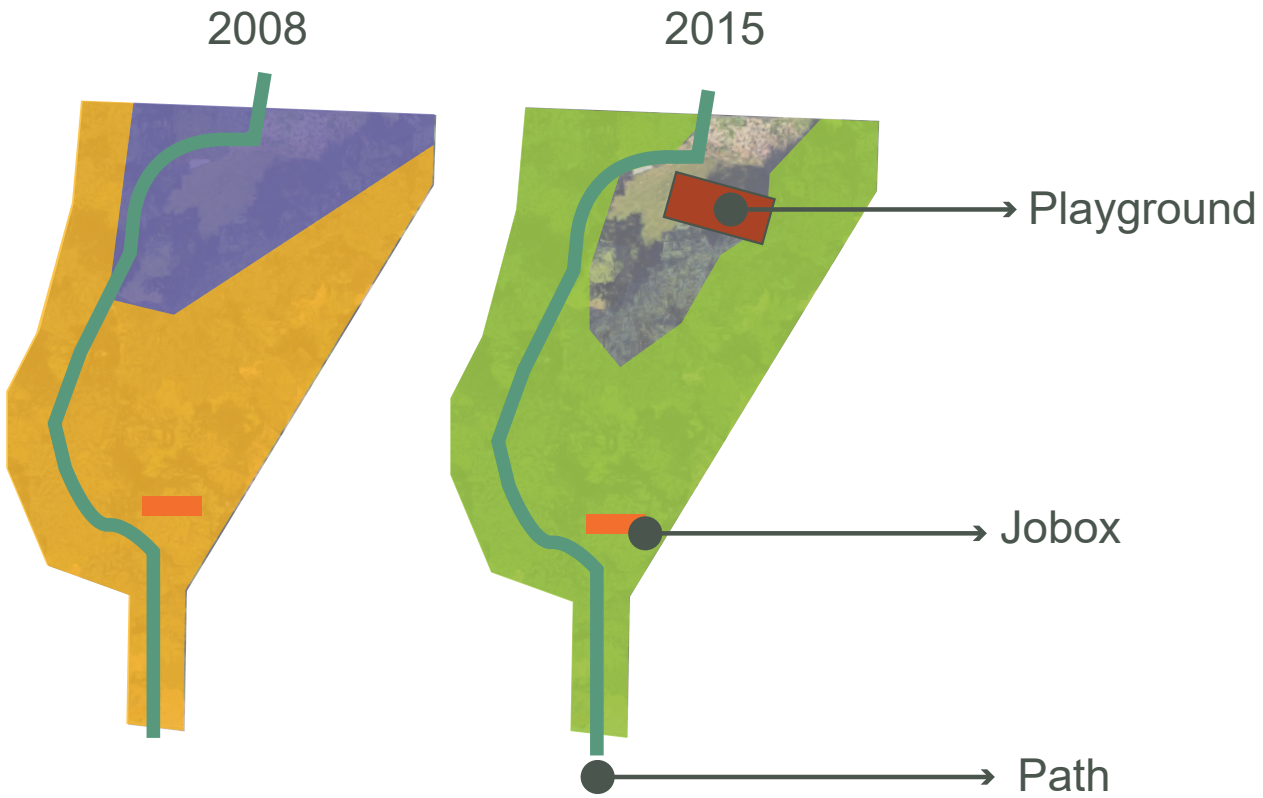


Figure 34: Active Features Josten Park

sees tree-iage category improvement along the edges of the norther and middle of the park, from 9 to 6. The category change next to the stairs shows improvement from 6 to 5. The Jobox and entrance sign show no change in tree-iage category (Figure 33).

Josten Park has three active features, the path, Jobox and Playground. The area in relation to the playground has experienced a positive change in tree-iage category from 9 to 3. In the northern section of the park were the path runs through changed from 9 to 3, while the southern section changed from 5 to 3. The area around the Jobox also has a tree-iage category change of 5 to 3 (Figure 34). The Jobox is the meeting location for volunteers. Maybe the standing and waiting of volunteers prior to an event explains the Tree-iage change.

COTTON HILL PARK & JOSTEN PARK

ALL FEATURES COTTON HILL

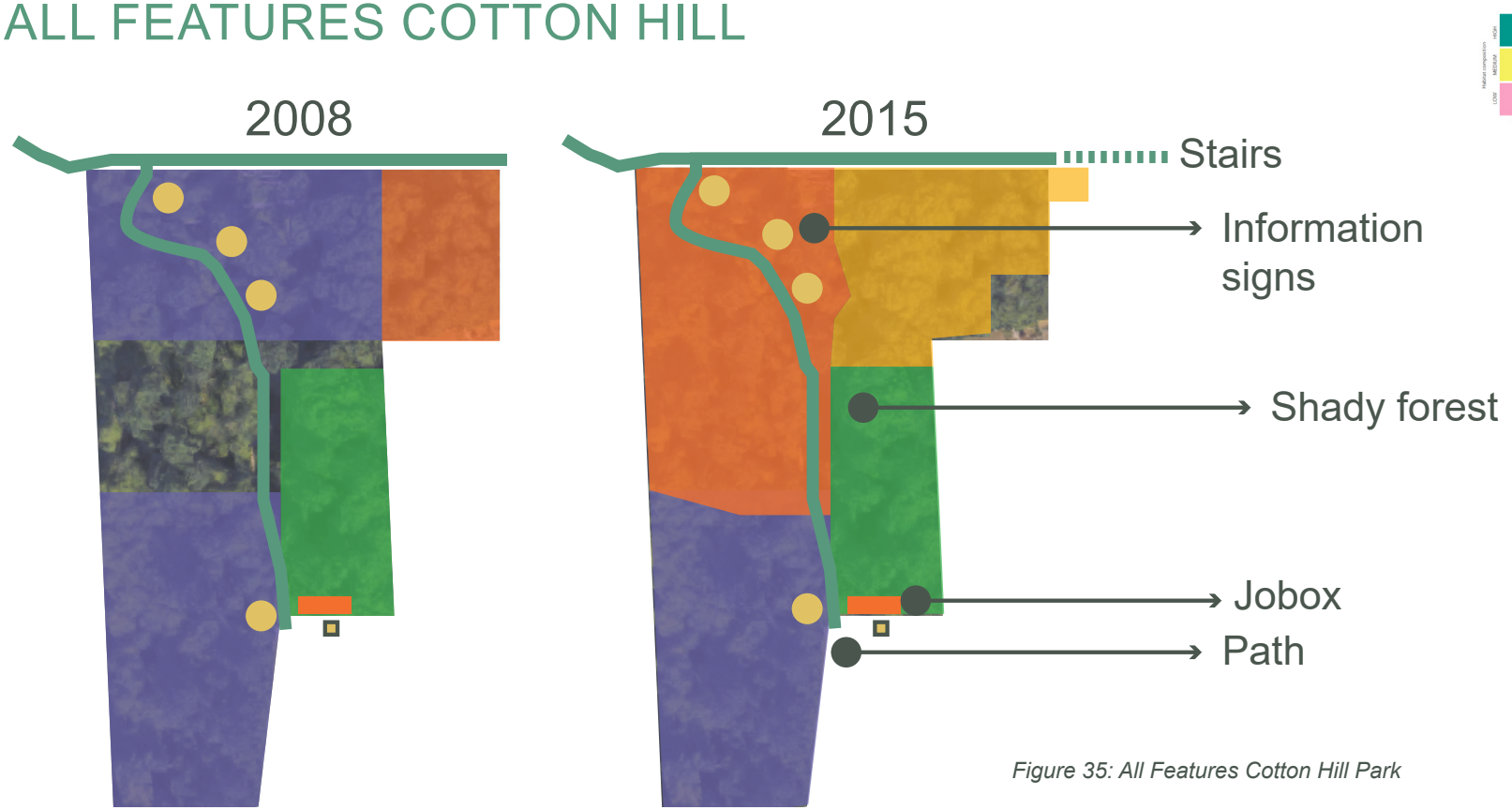


Figure 35: All Features Cotton Hill Park

In Cotton Hill Park, the sites in the northern section of the park saw more of an improvement in habitat health. The entrance of the park did not see a change in tree-iage category. The northern section of the park has two pedestrian paths that intersect and connects to additional parks and the larger Cross Kirkland Corridor trail. People walking on these paths see the volunteer work parties and sometimes stop to learn about the event. The middle of the park does not have many park features except the main trail, but sees a tree-iage improvement from 9 to 6 (Figure 35).

LEGEND

- Sign - interpretive/educational
- Jobox
- Bench
- Garbage can
- Picnic table
- Bathroom
- Playground
- Open field
- Sports field/court
- Path/walkway
- Fence
- Stream
- Walkway over water

ALL FEATURES JOSTEN

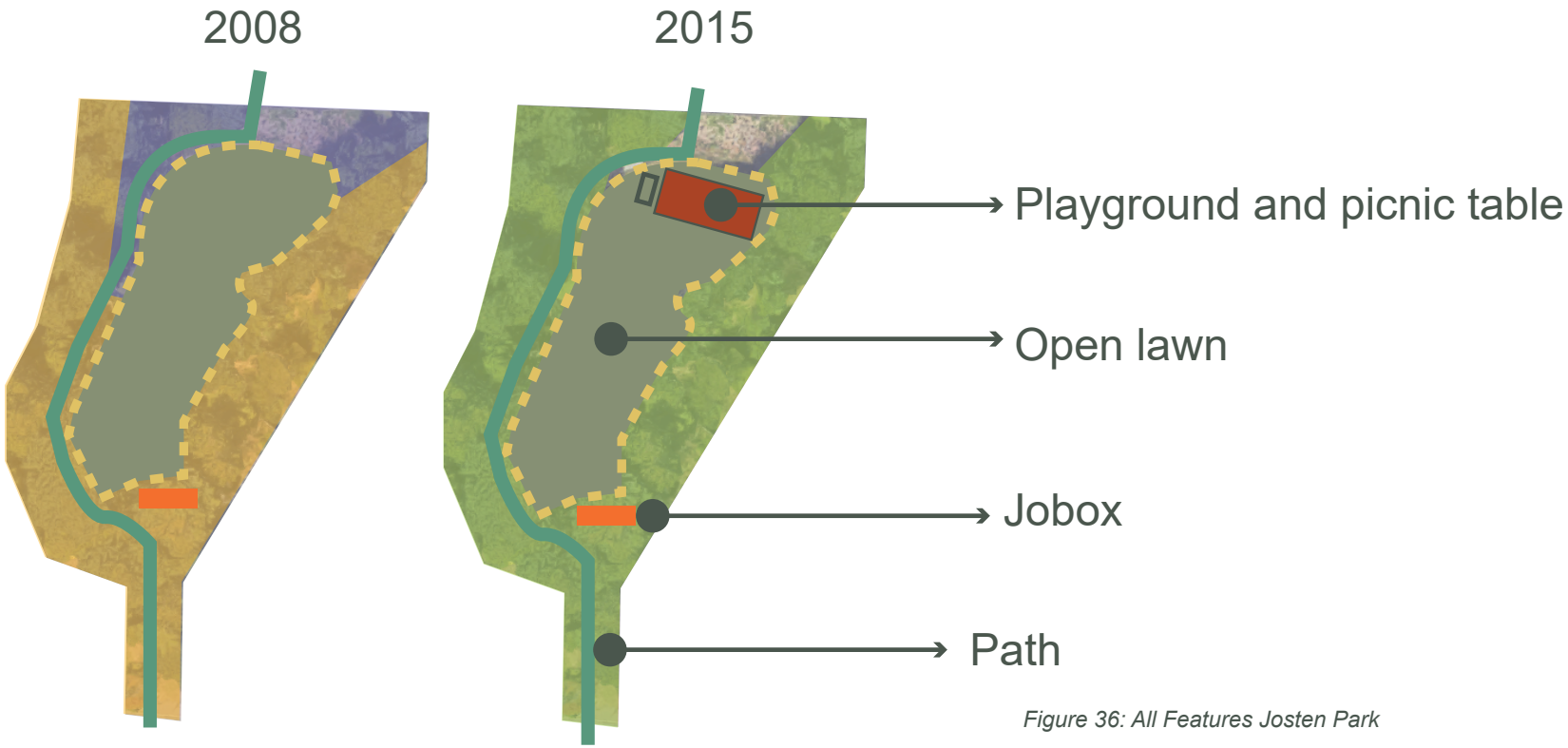


Figure 36: All Features Josten Park

Josten Park experiences a tree-iage category improvement in each restoration site from 2008 to 2015; the entire park is now in category 3. The area in the northern section of the park experienced a change from 9 to 3 near the playground, picnic table, and northern park entrance. Park features cluster in the northern section of the park, with the southern section being more restoration oriented (Figure 36).

COTTON HILL PARK & JOSTEN PARK

DISCUSSION

The case study looks at the comfort, passive, and active features of the parks, as well as combining all three of these categories at the end in “All Features” (Figure 35, 36) to discover potential patterns. Between these two parks, the one with better pedestrian-oriented trail connections also has the most improved tree-iage category, suggesting that areas where a walking trail connects to another pedestrian trial could benefit ecological restoration efforts in some way. In the northern section of Josten Park, where the tree-iage index is highest, the northern entrance trail is a pedestrian-only connection to the neighborhood, where as in the less successfully restored southern section the trail connects to a neighborhood street with no sidewalks. The pattern is similar in Cotton Hill Park, where the northern section of the park sees improved habitat and a better tree-iage category. In this section, a pedestrian only path runs from the neighborhood down to the Cross Kirkland Corridor (Figure 21), and then to another trail into Crestwoods Park, the main trail through Cotton Hill Park intersects with this path. In the southern section of the park where there is no advancement in tree-iage category, the pedestrian trail of the park ends at a dead end neighborhood street with no sidewalks. These pedestrian-to-pedestrian connections could spur run-ins between people traveling along the paths and spark conversations related to the improvements seen in the natural environment of the park.

Another pattern seen is in areas with educational signs that describe native species, but offer the real life plant adjacent to the sign. Cotton Hill Park’s educational signs (Figure 37) are next to native trees and bushes and the restoration site saw a tree-iage category change from 9 to 6. Whereas the informational sign positioned at the southern entrance to the park displaying the Certificate of Exceptional Merit from the Community Wildlife Habitat program, shows no improvement in the adjacent restoration site. Volunteers in the park feel a sense of ownership and pride in these signs. Without the dedicated work of stewards, these signs would not exist. Custom-made signs, such as Cotton Hill Park’s history of restoration sign, showing pictures of the volunteers working, add to this connection.

In comparing the three park features grouped by park user need, it appears that features defined by the research as active provide more potential influences on restoration sites. The active features of paths, signs, stairs, and playgrounds could have more connections to the restoration success of their adjacent natural areas then passive features and comfort features. This could be because restoration itself is an active feature, and requires further activation to help it thrive and gain momentum. Volunteers working in the site are seen by those passing by on trails, who then join in the work or stop and talk with neighbors. Could more active features mean more active opportunities for restoration volunteers to recruit more volunteers?

It was surprising no patterns emerged around the Jobox locations in the parks. These storage boxes hold the restoration tools, such as shovels, gloves, loppers, and sometimes granola bars. These are important focal points for restoration volunteer work parties. However, another focal point could be overriding the Jobox as the meeting place for volunteers to congregate around. In Josten Park, the playground and picnic table could become the new meeting location, and in Cotton Hill volunteers congregate on the asphalt street in front of the main trail. It is interesting that no

LIMITATIONS

substantial ecological improvement is near these restoration icons. Joboxes are not useful to park users, as they do not make good benches. The use of these storage devices is only during volunteer restoration work parties, the rest of the time these features are not active.

LIMITATIONS

Nature is a complex web of relationships. The patterns described above may relate to factors not explored in this study. The connection between restoration success, volunteers meeting and pedestrian paths could be unrelated to the pedestrian nature of these features and more related to the positioning of these areas further away from development and more connected to larger forested areas. The small area of these parks could misrepresent the ecology by closing off the study area to the parks boarder. The larger areas surrounding the park could play more of a role. For example, Cotton Hill Park is part of a larger park network that expands north into Crestwoods Park; a future study could include land beyond a parks boundary and the forest area on Peter Kirk Elementary schools campus when examining park features (Figure 21).

The varying restoration activities in these parks could also be determining successes not related to park features. For example, Josten Park underwent a park-wide mass restoration effort where goats ate away the blackberry and after the City of Kirkland Staff bulldozed sections of the land, where the open field now is. Cotton Hill did not have this kind of coordinated park-wide effort, however special attention brought from a partnership with the University of Washington could contribute to the ongoing dedicated volunteer efforts in the park that encourage more maintenance in the north section of the park where the initial UW study site is located.

The years the tree-iage classification assessment is available could also be a detriment to validity, as only two years are available, 2008 and 2015. These years do not relate to the parks history. In 2008, Josten Park did not have a playground or picnic bench, and Cotton Hill did not have the educational signage that now exists. In order to perform a more accurate assessment, all these features would need to exist in the park during the first assessment and later assessment.

While these graphics allow for an initial visual pattern identification, there is no specific distance measurement preformed to further support and relate findings to park features positioning. This is a good starting point for a later study that goes more in-depth into these observations.

Figure 37: Educational sign in Cotton Hill Park. Photo: Hallie O'Brien

JUANITA BAY PARK & JUANITA BEACH PARK

JUANITA BAY PARK & JUANITA BEACH PARK

INTRODUCTION

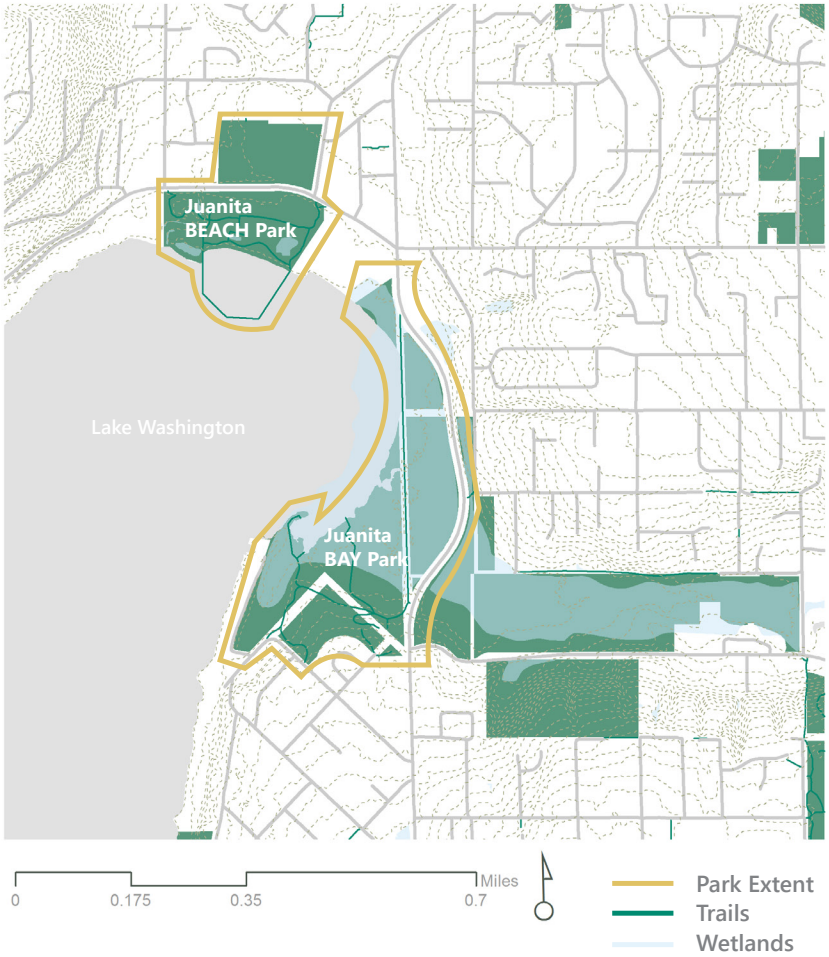
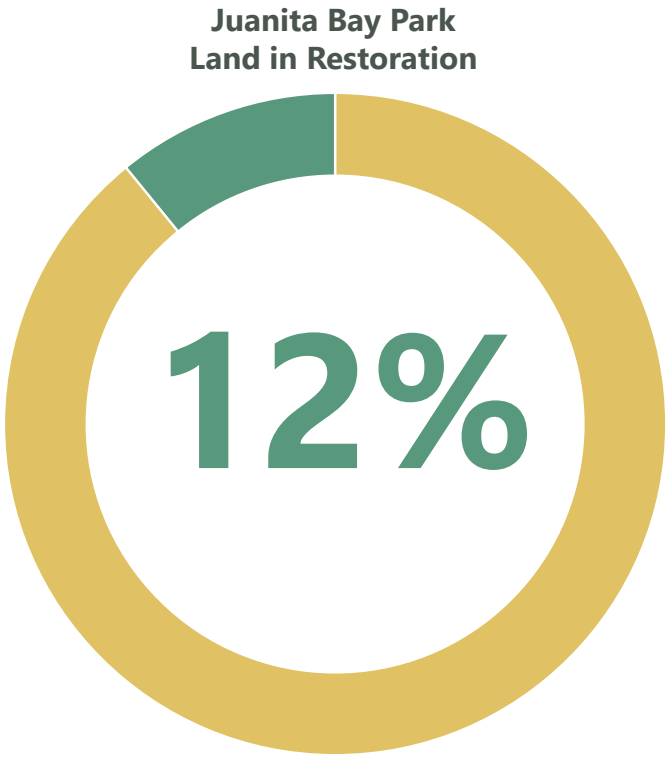


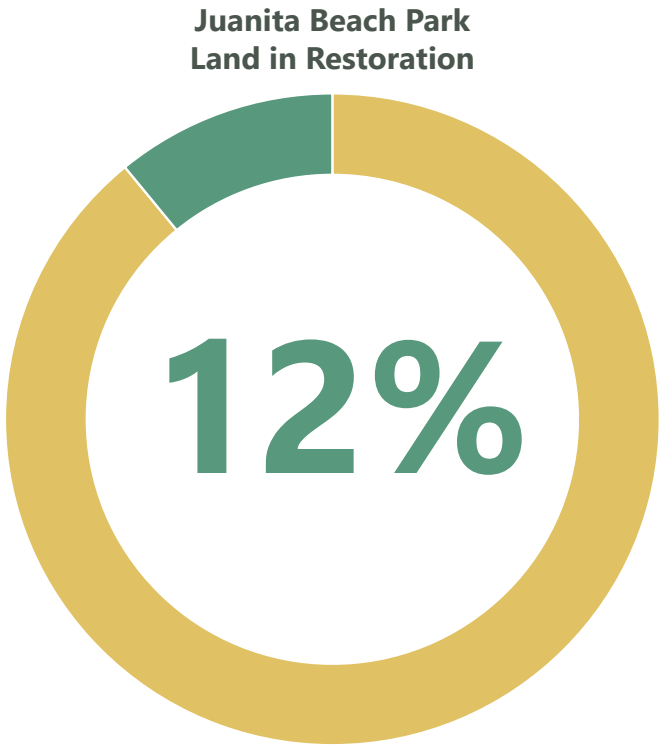
Figure 38: Location comparison map. Juanita Bay Park and Juanita Beach Park are very close to each other, Juanita Beach Park is about 700 feet North West of Juanita Bay Park. These two parks show with a yellow outline and parks not included show without this line.

Figure 39: Park amenities comparison matrix results. Juanita Bay Park has nine features and Juanita Beach Park has eleven features. .

COMPARISON

In this comparative case study, Juanita Bay Park and Juanita Beach Park (Figure 38) will be compared because they are both characterized as Community parks (Green Kirkland, 2015), both have 12% of their natural areas in active restoration (Figure 40), both are located in Kirkland Washington, and both have similar ecological systems. In addition when compared to the number of park amenities/ features each park has, they scored two intervals away, meaning each park has a similar number of user needs met through these amenities (Figure 39).





Spatial analysis will look for patterns of park features based on the three categories: Comfort features, Passive features, and Active features each contain. In order to begin the process, the following pages will provide a brief overview of each parks restoration history, the status of current restoration, and the changes that have occurred in each park from 2008 through to 2015. Discussing the different use of park features in relation to the volunteer restoration effort will illuminate connections of park amenity, volunteer commitment, and ecological health.

Figure 40: These charts visually represent the amount of each parks land is in active restoration with the Green Kirkland Partnership. Both Juanita Bay Park and Juanita Beach Park have 12% of their parklands in restoration.

JUANITA BAY PARK & JUANITA BEACH PARK

JUANITA BAY PARK

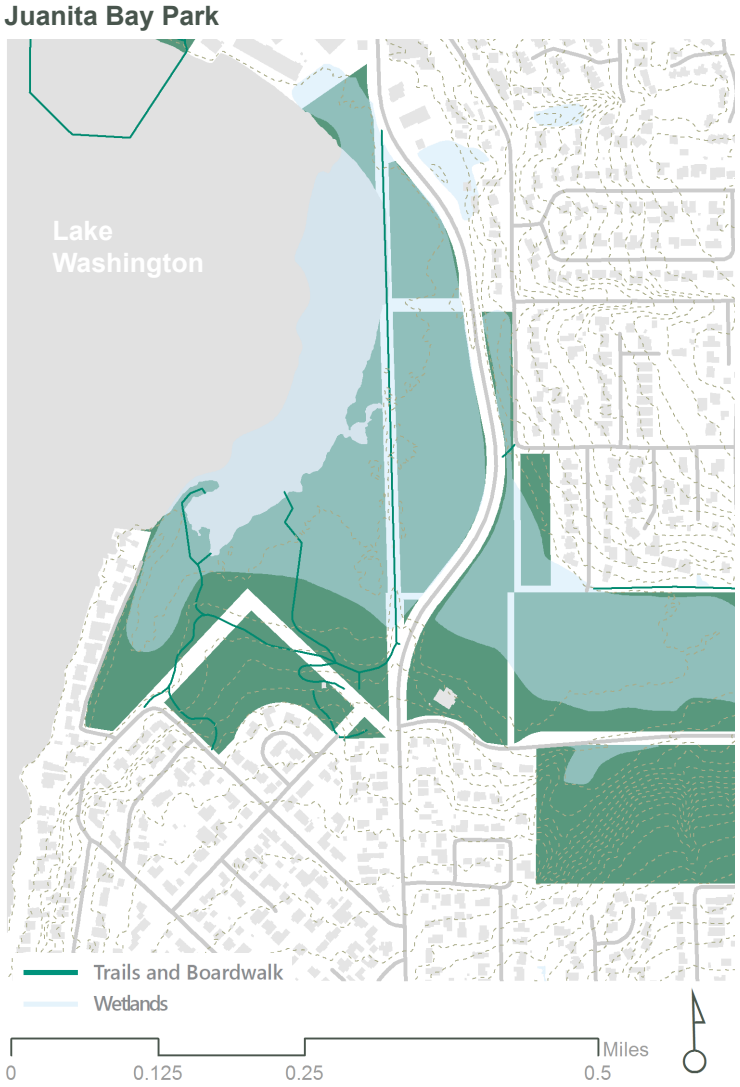


Figure 41: Juanita Bay Park map

PARK DESCRIPTION

Located in Kirkland Washington, Juanita Bay Park is in the Market and South Juanita Neighborhoods at 2201 Market St. (Figure 41) The Park is 124.4 acres large with low-density residential land use to the south, commercial in the north, and Lake Washington on the west. Juanita Beach Park is located 700 feet to the north west and Kiwanis Park is .3 miles south west. 98th Ave NE boarders the east side of the park and is a main arterial connecting the Juanita downtown-to-downtown Kirkland. There is a fire station located across 98th Ave NE at 9816 Forbes Creek Dr. near the main entrance to the park.

Juanita Bay Park is a waterfront park with mostly wetland and a mix of meadow and small forested patches. The park is on Lake Washington and has slight elevation gain in the southern edge of the park; a north-facing slope descends from the south edge of the park and meets the water's edge. A historic boardwalk runs north south along the eastern shore of the park. The park has a diverse bird population and is home to beavers, turtles, herons, and hawks.

From 1932 to 1975 what is now Juanita Bay Park was the nine-hole Juanita Golf Corse. The land use comes after a lowering of lake Washington that shrunk the size of Juanita bay by 9 feet (Johnston 2011). The lowering degraded the ecosystem by drying sensitive wetland environments and removing native forest to plant the expansive grass lawn. The lowering of the lake also eliminated the Duwamish tribe's use of the land, where they used to dig wapato bulbs no longer supported the

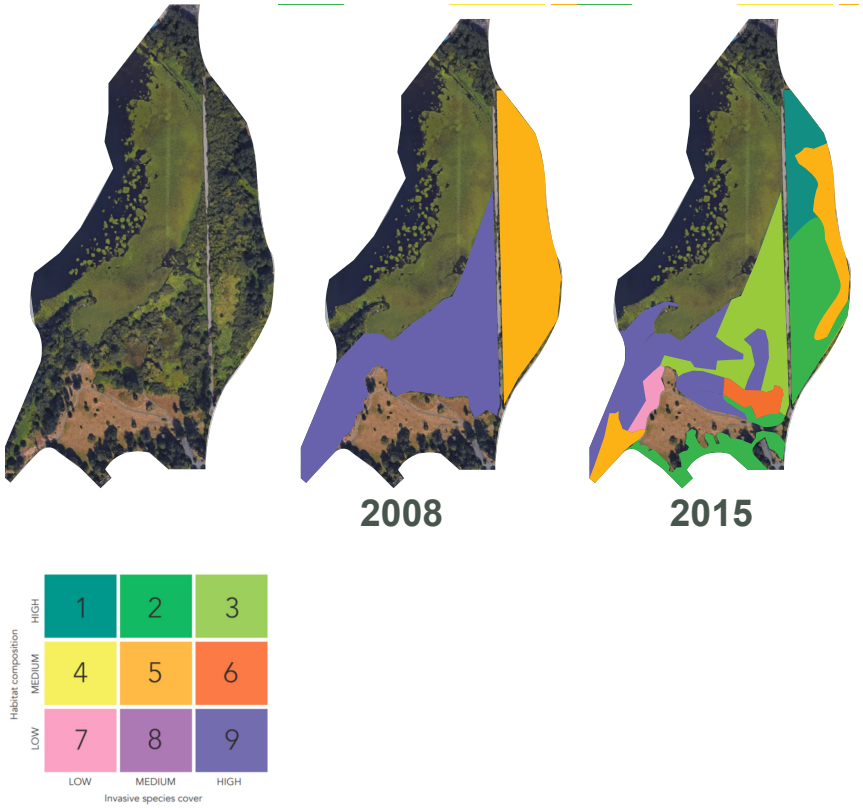


Figure 42: above: 2017 Aerial of Juanita Bay Park. right: tree-iage areas by year

plant (Johnston 2011). When the golf course closed in 1975, the City of Kirkland purchased the land and turned it into a park after residents rallied against a proposed housing development. For two decades, no restoration work took place at the park and invasive species took over, large blackberry brambles established themselves in the open lawn and reed canary grass dominated the shoreline.

JUANITA BAY PARK

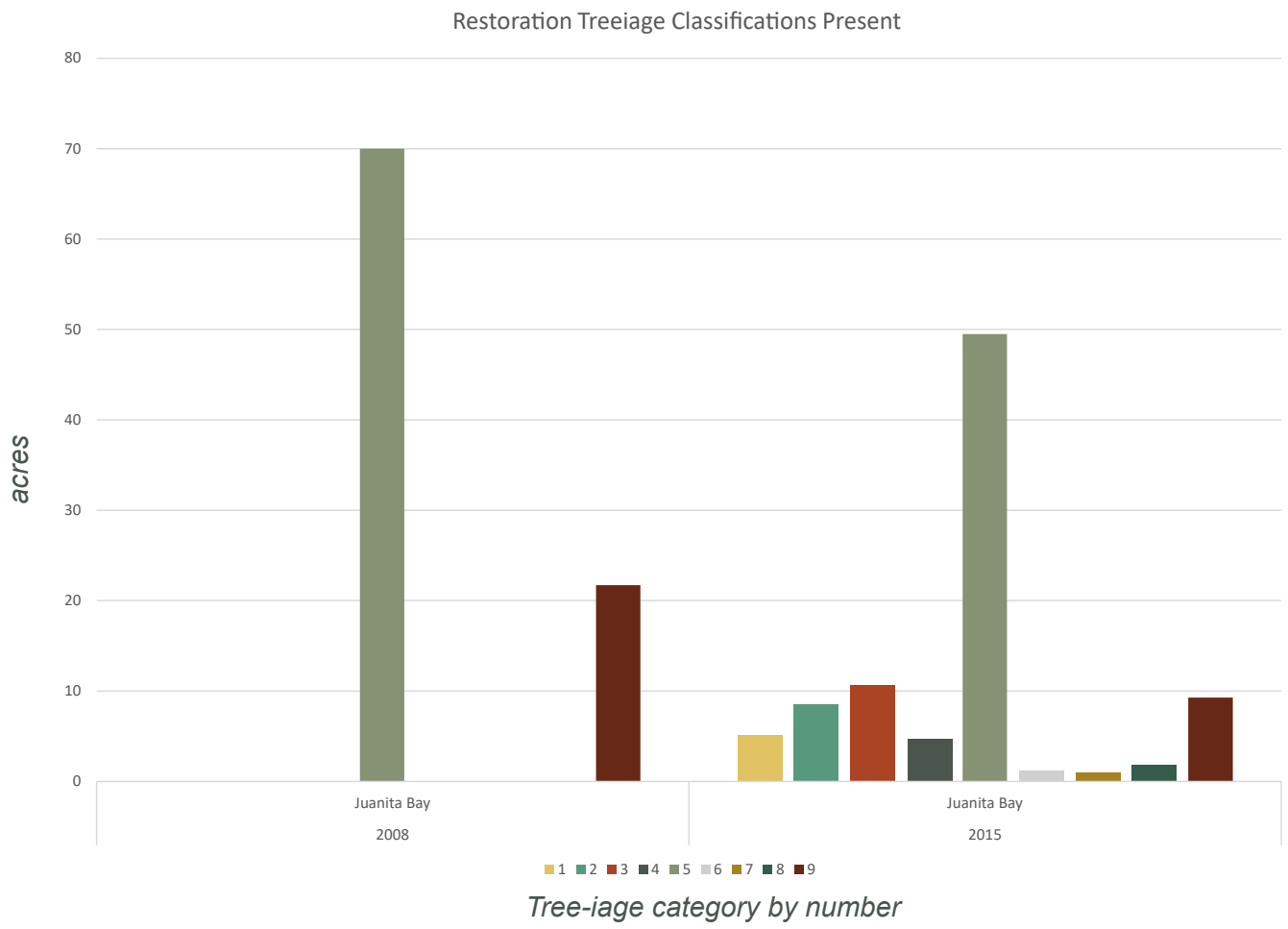


Figure 43: Juanita Bay Park Tree-iage Classifications Present in 2008 and 2015

Figure 43 shows the increase in restoration acreage per tree-iage category. The graph shows the two years the habitat assessment is available for, 2008 and 2015. The increase in tree-iage categories from 2008 to 2015 shows the improvement in diversity of habitat quality. Acres in category 9 decreased by more than half, and the appearance of category 1 in 2015 is a sign that restoration is reaching healthy levels.

Figure 44:
Above: Interpretive center at Juanita Bay Park. Photo: Gabe Teotonio
Below: Benches in the grass lawn in the southern section of Juanita Bay Park. Photo: Gabe Teotonio

The restoration approach for this park is initial invasive plant removal followed by planting site-specific native plant species, and maintenance invasive plant removal. Juanita Bay Park has six dedicated Stewards who lead a range of work parties from small to large, weekly to annually. The park is popular for large volunteer groups because of its size, bathrooms, and parking lot. The amount of stewards and the size of the park results in frequent restoration events. Juanita Bay also has restoration performed by professional crews due to the sensitive wetland areas.

Juanita Bay is an active park. The Eastside Audubon Society leads programed bird walks twice a month and displays program materials at an interpretive center at the entrance to the park. Field trips bring local students to the park for lessons in ranging from wildlife identification to landscape architecture. Juanita Bay Park is similar to Josten Park in terms of the community involvement during the conception and development of the park. The park also qualifies for the Certificate of Exceptional Merit by the National Wildlife Federation's Community Wildlife Habitat program (Figure 44).

JUANITA BEACH PARK

Figure 45: Juanita Beach Park map

PARK DESCRIPTION

Located in Kirkland Washington, Juanita Beach Park is in the Juanita Neighborhood at 9703 NE Juanita Dr. (Figure 45) The park is 26.9 acres large with multifamily residential land use on the east, west, and north, Lake Washington borders the south, and commercial land use to the north east. NE Juanita Dr. divides the park in half east to west. In the northern half of the park are baseball fields, tennis courts, the historic Forbes home, and parking. In the southern half of the park is beach access, sand volleyball, parking, and a building hosting restrooms, showers, and concessions.

Juanita Beach Park is located on lake Washington and is the estuary for Juanita Creek. The park does not have any extreme topography, and is flat throughout. There are wetlands on the east side of the park that surround Juanita Creek, which runs north south along the eastern edge of the park. There is a small forested area with conifers and deciduous trees in the north east corner surrounding the upper section of Juanita creek. The restoration areas are limited to the east side of the parklands due to the landscaping design of the remainder of the park

Juanita Beach Park has a long history of human development from tribal settlement to roaring 1920's beach resort. Since the 1950s, the swimming area closes intermittently due to pollution. Water quality is a reoccurring issue in this area due to pollution from development, human uses like pesticides and road runoff, and an overpopulation of geese. Invasive species

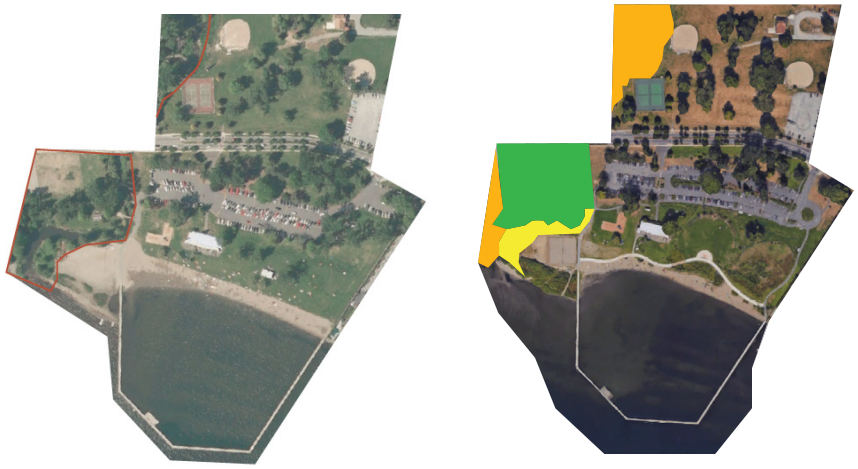


Figure 46: Above: 2017 Aerial of Juanita Bay Park. Below: tree-iage areas by year

established during the 1990's during a period of scarce maintenance funding.

The restoration approach for this park began with a Juanita Creek Restoration project in 2007 the involved removing culverts and daylighting sections of the creek and a larger storm water management project in 2011. The riparian work initiated the habitat restoration of the area involving invasive removal by professional crews and a re-design of the channelization. Volunteer work parties continue maintenance throughout the site and plant native species every fall. The park has large and frequent volunteer work parties. This could be due to the amount of amenities the park provides and the regional draw of the park. When speaking with stewards of other parks, many cited Juanita Beach Park as an example of successful

JUANITA BEACH PARK

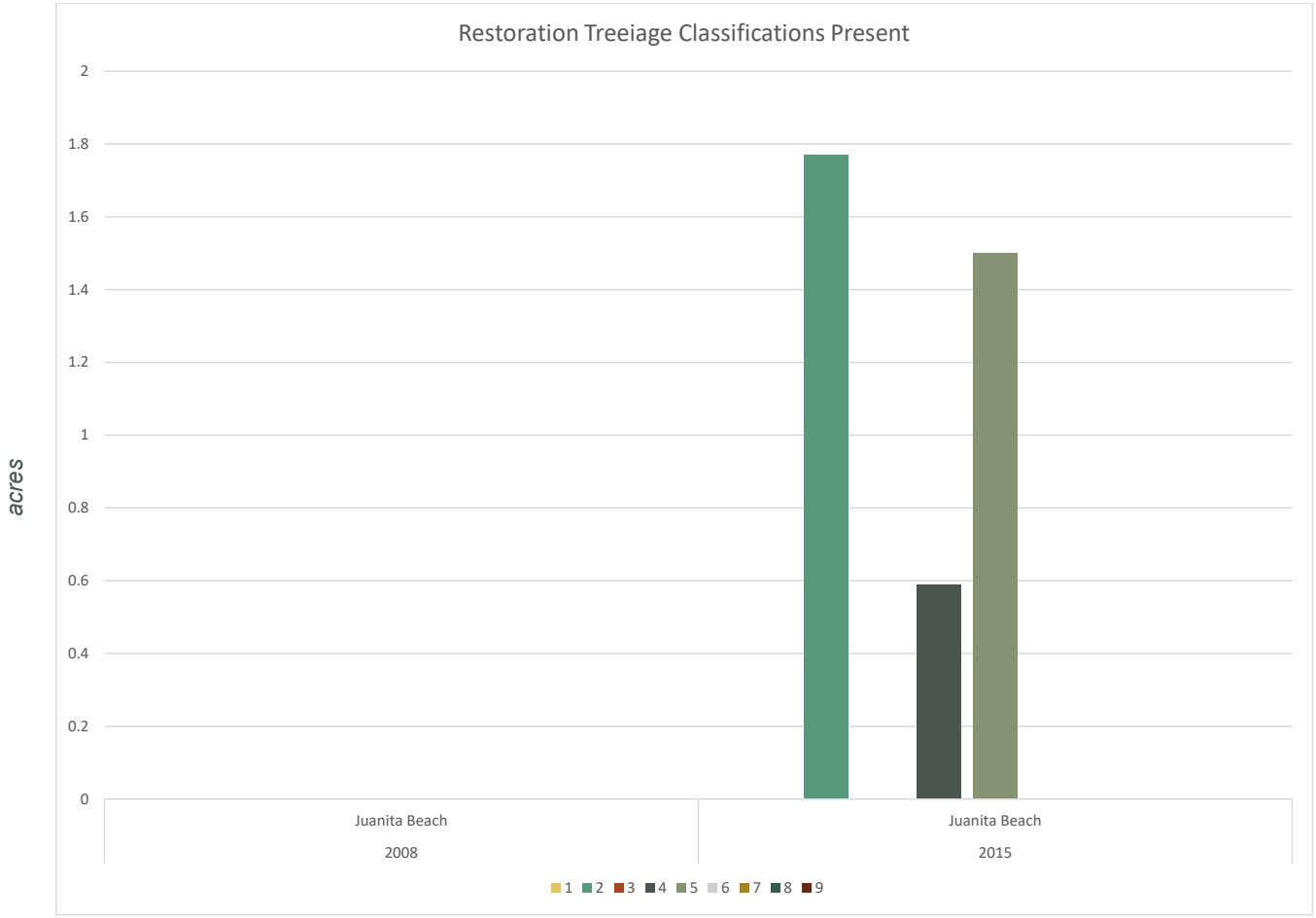


Figure 47: Juanita Beach Park Tree-iage Classifications Present in 2008 and 2015

Figure 47 shows the restoration acreage per tree-iage category. To keep format with the other studies the graph shows the two years the habitat assessment is available for; 2008 and 2015, even though no habitat assessment was done for 2008. There is no category 9 present in this park, and the most acreage is in category 2 of tree-iage, and category 5. No bottom level tree-iage categories are present in this park.

Figure 48:
Above: Path through wetland at Juanita Beach Park Photo: Gabe Teotonio
Below: Restoration site fence and background tennis courts at Juanita Beach Park. Photo: Gabe Teotonio

volunteer restoration. Many of the stewards wish to have similar volunteer numbers Juanita Beach draws.

This park underwent a large remodel in 2011, which would have conflicted with the 2008 data as a starting point for comparison. Figure 46 shows the new remodel of the park and provides a clear picture of the restoration sites. The tree-iage assessment from 2015 is adjacent. Restoration is limited to these two sites in the park, even though there are bioswales and wetland above the beach; they are man-made and will not be included in this study. The majority of the site is in category 2, with the northern site in 5, and the area closest to the water in category 4.

Juanita Beach is a historical site in Kirkland. The original 1905 home of the Forbes family that owned the land and ran the Beach Resort during the 1920s-50 is located in the north section of the property. The Forbes sold the property to King County in 1956, who then transferred ownership to the City of Kirkland in 2002 (King County, 2011). This historical importance could be the reason for the continued amount of volunteer support at the park. In the late 1990's Juanita Beach Park was run down. The city of Kirkland has been investing in the continuing renovations of this park, and the improvements seen could be a catalyst for community members to volunteer at the park.

JUANITA BAY PARK & JUANITA BEACH PARK

COMFORT FEATURES

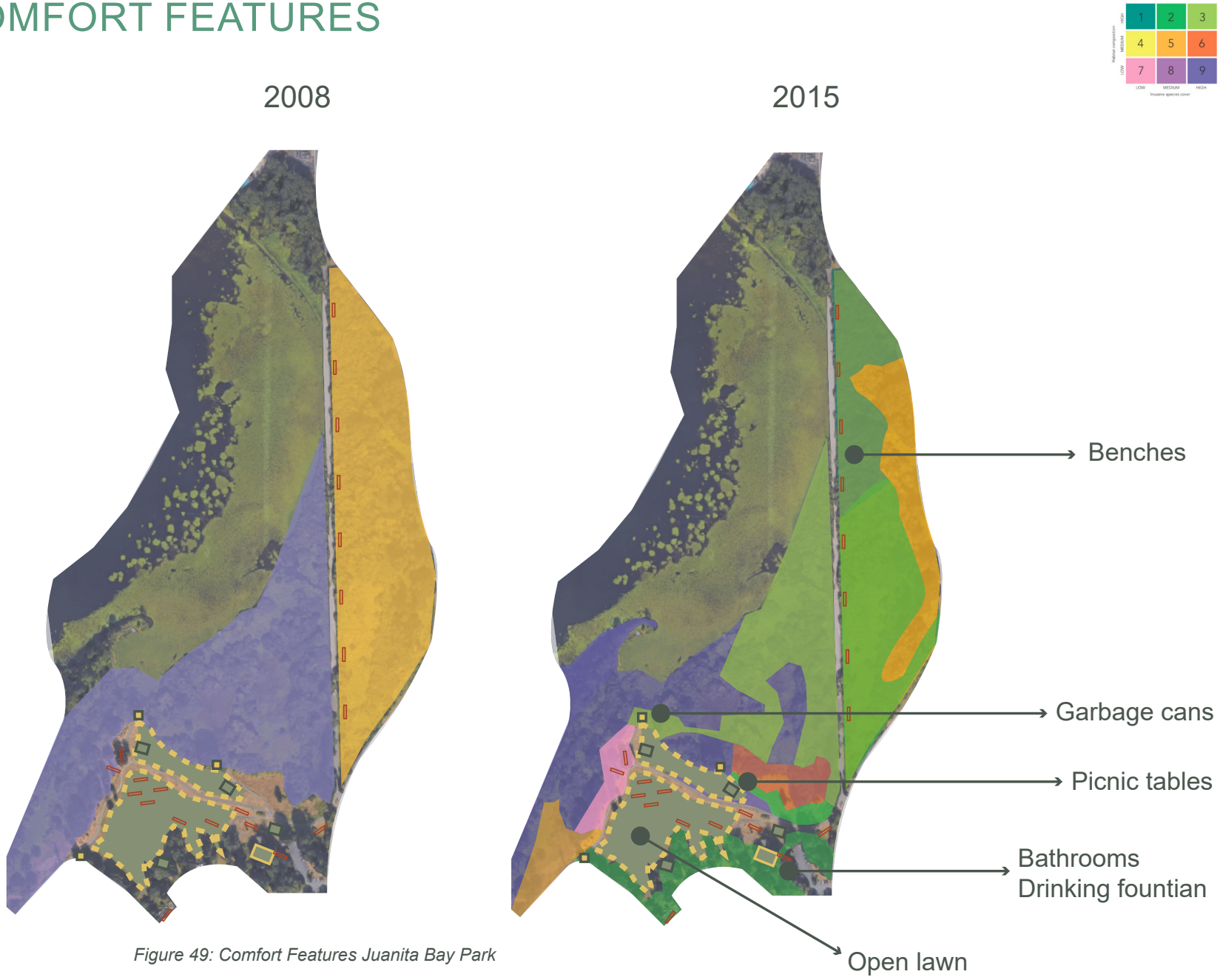


Figure 49: Comfort Features Juanita Bay Park

JUANITA BAY PARK

LEGEND

Juanita Bay Park offers park users the comfort of benches placed away from paths and other benches to provide peace and quiet reflection. These benches are oriented to face the water. The park has lots of open space and does not provide relief from sun exposure. The restoration sites close to the edge of this open grass field range in tree-iage category from 9 to 2. In the southwest section sites improved to level 5 and 7 from 9. The restoration area at the south edge bordered by the open field and the bathrooms is in category 2. This could be because the area is close to the parking lot for Juanita Bay Park and restoration volunteers are highly visible from this location. The amenity of the restroom could draw more volunteers for longer periods of time by eliminating the concern of bathroom access that comes with outdoor activities. The benches along the historic boardwalk experience category 1, 2, and 3, in the top level of the tree-iage matrix (Figure 49). The frequency of these benches provides a reliable place for a volunteer to take a break from working, and are located under branches that provide shade. The benches are elevated above the main walkway on a raised wooden platform creating a sense of separation from the moving foot traffic on the boardwalk.

The restoration site that changed from a category 9 to 7 (pink) has a cluster of picnic tables and benches close by, as well as a garbage can and shares a border with the grass field. This natural area is off the main walking path loop and is farther away from the restrooms at the entrance to the park. Here is also a large piece of woody debris that deters access to the site and blocks views of the native plants.

JUANITA BAY PARK & JUANITA BEACH PARK

COMFORT FEATURES

2009

2015

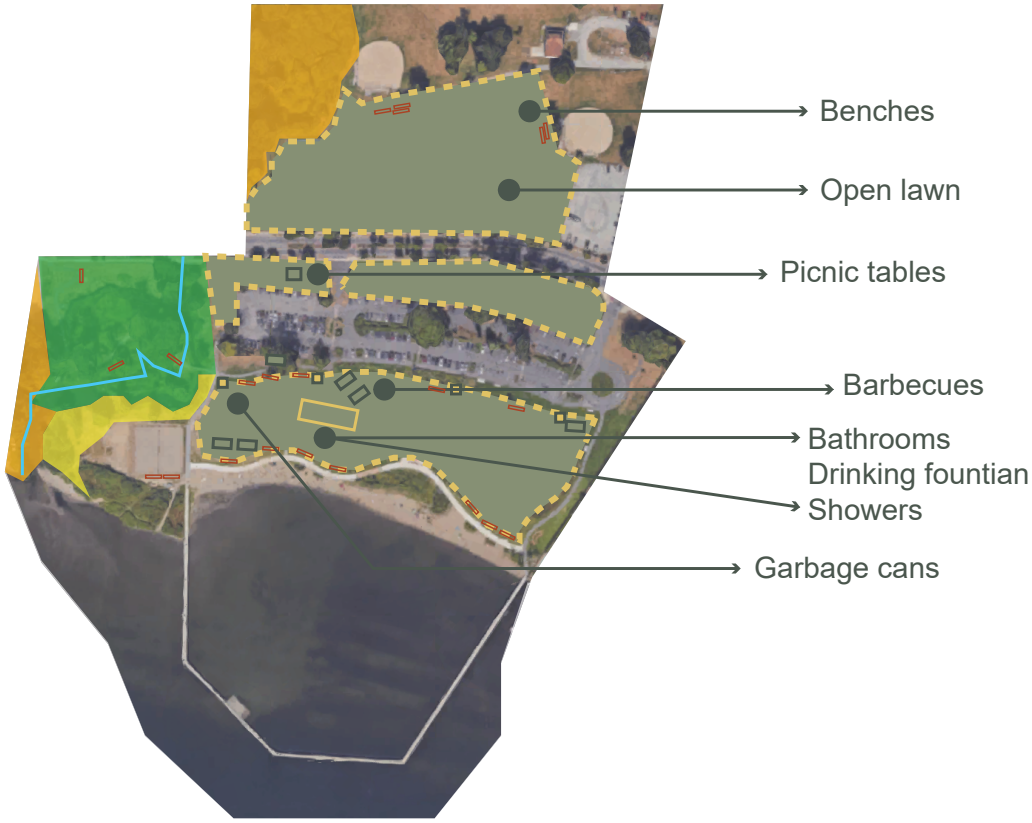


Figure 50: Comfort Features Juanita Beach Park

JUANITA BEACH PARK

LEGEND

Juanita Beach Park has many comfort features that cater to both hosting large groups and the relaxation of an individual. Comfort features placed near the beach provide for easy access for swimmers and beachgoers. The bleachers for sand volleyball are located near the southern section of the restoration site where the tree-iage category is four. However, the bleachers face away from the natural area and focus on the court. There is limited shade in this area and volunteers working on a warm day seek shade in the neighboring restoration site in category 2.

There are secluded spaced out benches in the restoration site in category 2 facing toward the creek. These provide rest areas for volunteers and relaxation for park visitors. This site also provides a volunteer a short walk to the restroom, while the norther section is far away. In the northern section, there are benches oriented towards the baseball fields close to the restoration site in category 5. The metal benches are in direct sunlight at get hot on warm days, families watching baseball usually spread out blankets on the grass instead. The northern site shares a longer edge with a grass field and is in category 5, while the southern site in category 2 shares a shorter edge with a grass field. This line could be causing a visual “fence” between natural areas and groomed park features, stunting potential volunteers’ interest due to the perceived boundary.

JUANITA BAY PARK & JUANITA BEACH PARK

PASSIVE FEATURES

2008

2015

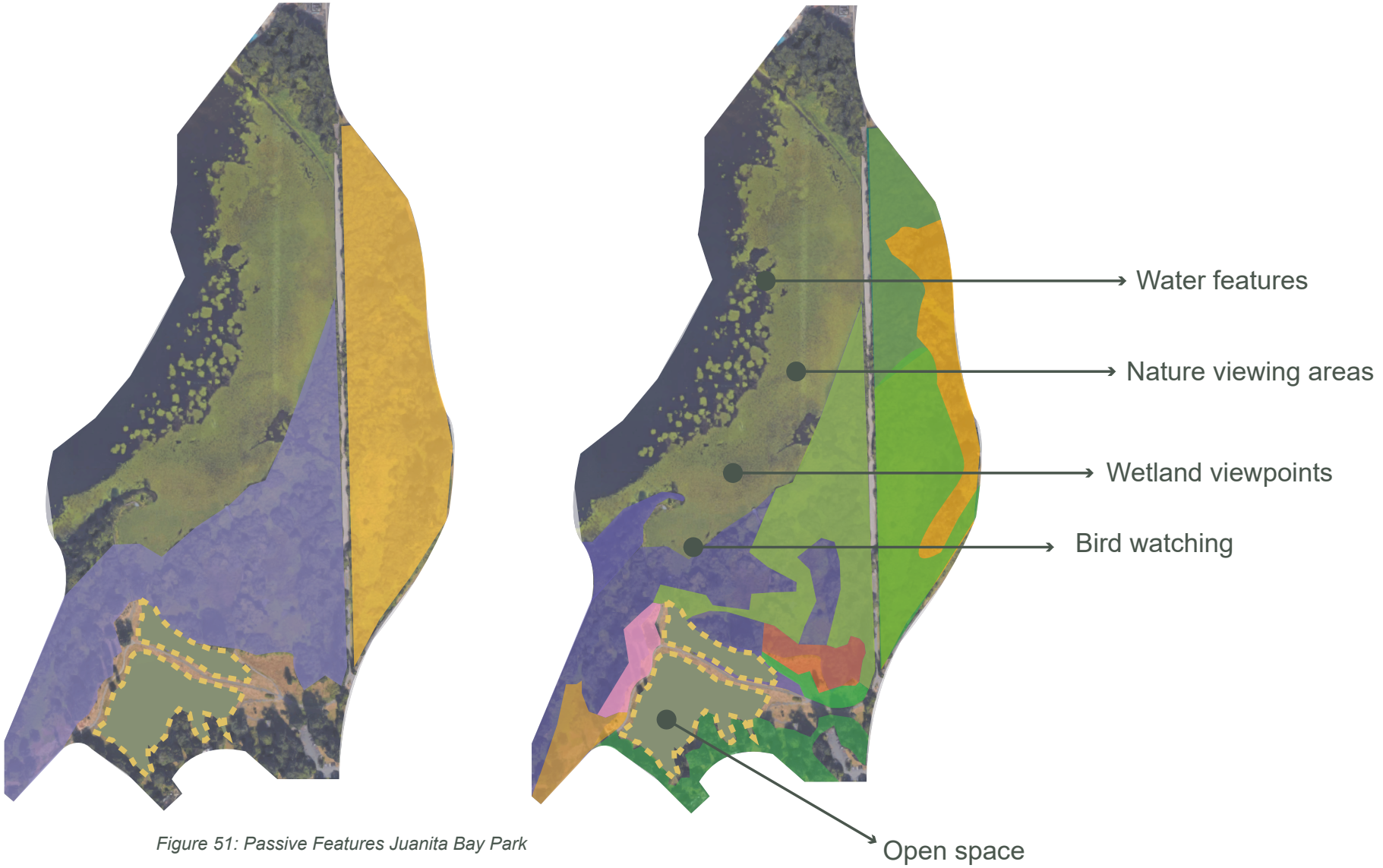


Figure 51: Passive Features Juanita Bay Park

JUANITA BAY PARK

LEGEND

Juanita Bay Park is a popular park for viewing wildlife. There are guided bird tours monthly open to the public free of charge. Areas where one can view the water are in the northern section of the park where restoration sites changed from 5 to 1, 5 to 2, and 9 to 3. Areas with views of the wetland are in the middle and south east sections of the park, where restoration sites have changed from 9 to 3 or remained at 9. Professional restoration crews only restore the wetland areas. This could explain a disinterest in volunteer efforts in these areas and the two extremes in habitat condition. Areas crews work in are in category 3, while sites not yet restored remain in 9 because stewards cannot work there.

Areas where people sit and watch the passing scene, such as the open grass field see a change in restoration sites form category 9 to 5, and 9 to 7, as well as 9 to 2 on the west side of the grass lawn. The most popular areas to view nature are long the historic boardwalk where the restoration site changed from a category 9 to 2, looking west towards Lake Washington. The trails that extend into the wetland from the south of the park are popular to view nature, but do not experience the same amount of restoration success.

JUANITA BAY PARK & JUANITA BEACH PARK

PASSIVE FEATURES

2009

2015

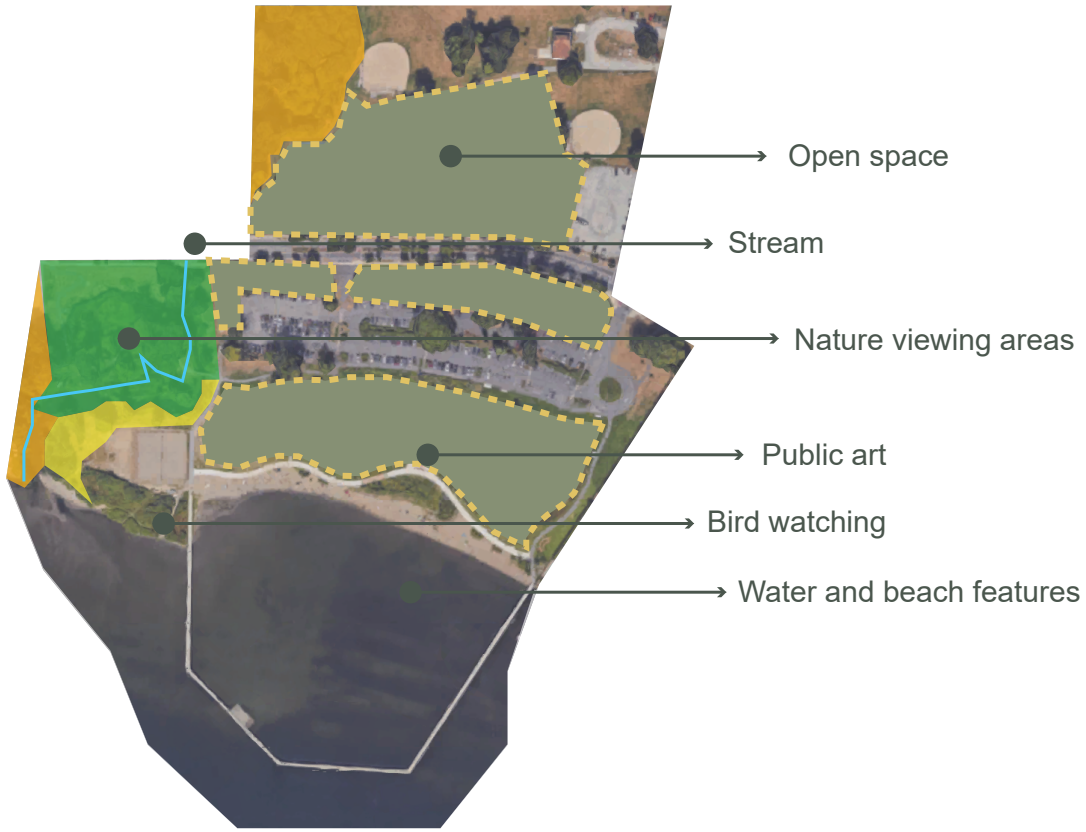


Figure 52: Passive Features Juanita Beach Park

JUANITA BEACH PARK

LEGEND

Juanita Beach Park offers many opportunities in the summer months to observe the scene of those barbequing, playing volleyball, tennis, or baseball. The best places to view birds in this park are located near the estuary of Juanita Creek. However, this environment is best observed from the long boardwalk that extends out from the beach. This disconnect between the viewpoint and the natural area could be a further disconnect between bird watchers and restoration volunteers (Figure 52).

The public art in this park is not located near the restoration sites, and does not have a connection to the environment originally in the park. This separation of art and ecological landscape divides those interested in the arts from natural areas and volunteer restoration. The open lawn where an observer of baseball or tennis would be is located near a restoration site in category 5. Orientation away from nature is a common theme with sports courts, and could be an explanation for habitat condition of the neighboring restoration site.

JUANITA BAY PARK & JUANITA BEACH PARK

ACTIVE FEATURES

2008

2015

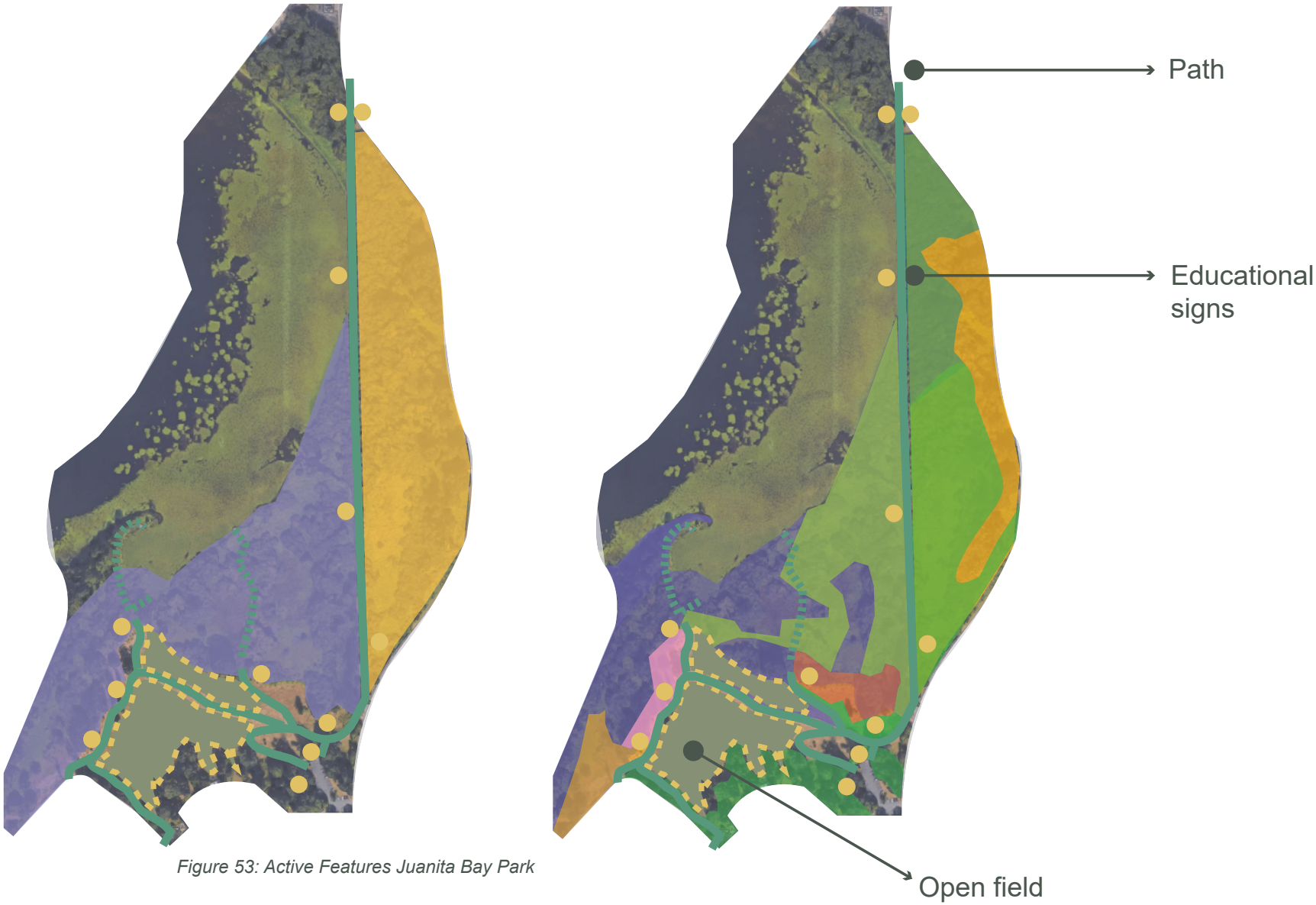


Figure 53: Active Features Juanita Bay Park

JUANITA BAY PARK

LEGEND

Juanita Bay Park features walking trails and interpretive signage. Two Small boardwalks extend out into the wetlands, and one large historic boardwalk extends north south on the western edge of the park. All of these paths are paved and accessible, but bicycles rarely travel on the smaller boardwalks. Restoration sites with the small boardwalks through saw a change from 9 to 2, or remained in category 9. As explained before, these areas are off limits to steward restoration efforts due to the wetland (Figure 53).

The restoration site next to the interpretive center is in tree-iage category 2. The signs along the historic boardwalk are on the west side, or waterside. These display historical information and information about the wildlife seen in the park. The restoration sites close to these signs sees restoration categories in the top level of the tree-iage matrix. The educational signs at the start of the small boardwalks are next to restoration sites that experienced a 9 to 7 and 9 to 6 category change. The two signs in the southern section of the park simply say “wetland”, and the sites adjacent improved from a category 9 to 7 on the tree-iage matrix. These signs do not offer the stewards the same sense of pride and accomplishment that the signs at Cotton Hill Park provide. This is because these signs are not in direct connection with the restoration story of Juanita Bay Park.

JUANITA BAY PARK & JUANITA BEACH PARK

ACTIVE FEATURES

2009

2015

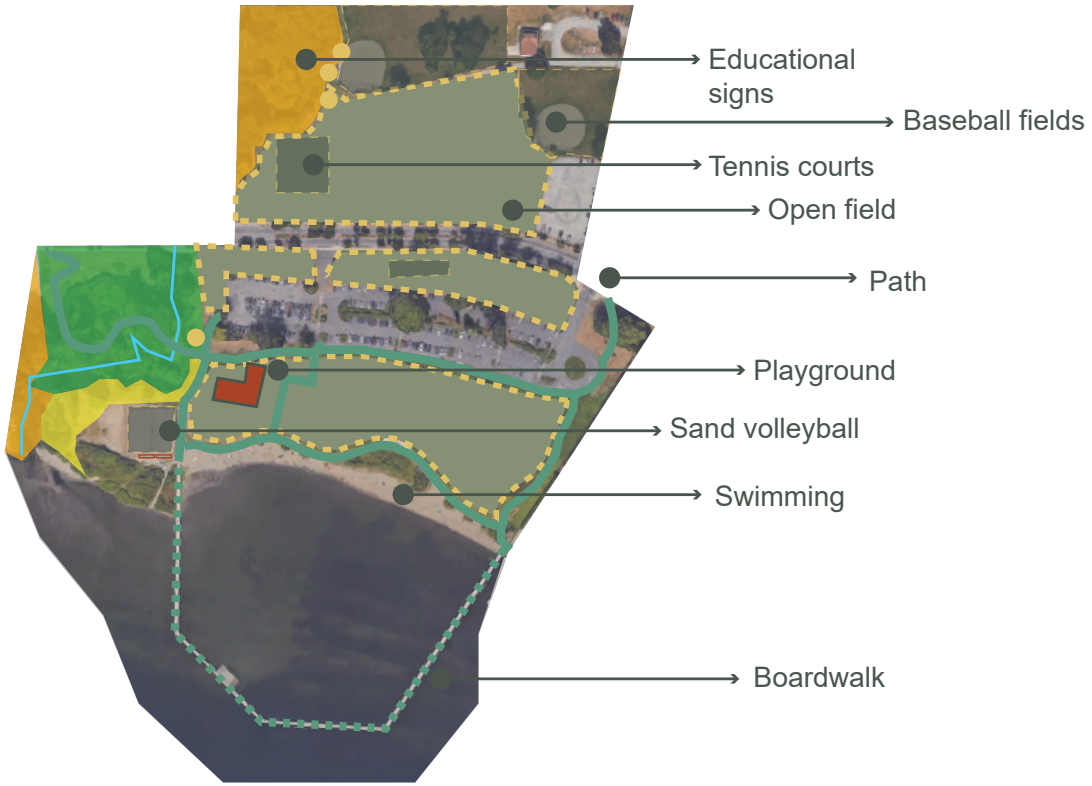


Figure 54: Active Features Juanita Beach Park

JUANITA BEACH PARK

LEGEND

Juanita Beach Park offers a wide range of active park features for users. In the northern section of the park, there are two baseball diamonds, and two tennis courts. The restoration site next to the tennis courts is in category 5 of the tree-iage matrix. The site also has three educational signs on its edge explaining the restoration of the area and native wildlife. These three signs are close to the adjacent baseball field, and not the tennis courts. It is interesting that these signs are not as indicative of the health of the restoration site, but do cover the history of volunteers efforts. One interpretive sign in the southern section of the park explains the history of the Juanita Creek restoration project and is next to a restoration site in category 2 of the tree-iage matrix (Figure 54).

In the southern section of the park, the path and boardwalk that wind through the creek are located in a category 2 restoration site. This path allows park visitors to see volunteers working. This acts as a kind of community advertising for restoration sites. The restoration site next to the playground is in category 4, this could be because of the separation of playground and natural area is similar to the separation of sports fields and natural areas. The two spaces are oriented away from each other and therefore confines the view of the people using these spaces.

JUANITA BAY PARK & JUANITA BEACH PARK

ALL FEATURES

2008

JUANITA BAY PARK

2015

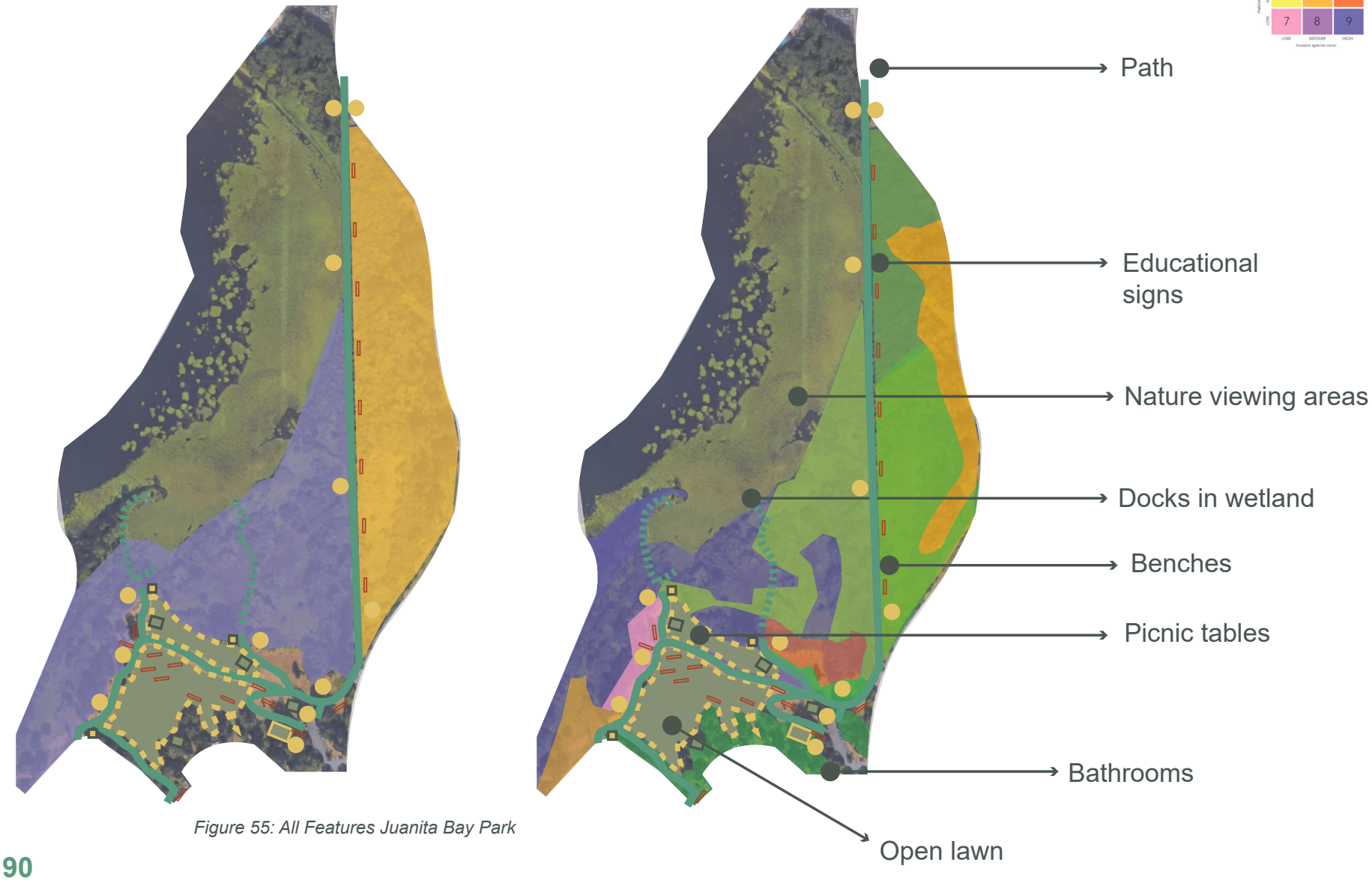


Figure 55: All Features Juanita Bay Park

ALL FEATURES

2009

LEGEND

- Sign - interpretive/educational
- Jobox
- Bench
- Garbage can
- Picnic table
- Bathroom
- Playground
- Open field
- Sports field/court
- Path/walkway
- Fence
- Stream
- Walkway over water

JUANITA BEACH PARK

2015

Figure 56: All Features Juanita Beach Park

See next page for written description of all features in the parks

JUANITA BAY PARK & JUANITA BEACH PARK

ALL FEATURES

Figure 57: Photos of Juanita Beach Park

Path entrance to Juanita Creek restoration area in Juanita Beach Park Photo: Hallie O'Brien

Fence around restoration site in northern section of Juanita Beach Park next to the baseball field. Photo: Hallie O'Brien

In Juanita Bay Park, the northern section of the park with the historic boardwalk and educational signs sees more improvement in habitat health. These restoration sites are all in top-level categories of the tree-iage Matrix, and provide relief from sun and crowds for stewards. The southern section experiences a mix of success in habitat health with more positive outcomes near the bathrooms and interpretive center at the entrance to the park. The areas in category 9 are located near the small boardwalks and are not adjacent to any walking paths, signs, garbage cans, or benches (Figure 55). This low habitat quality could be explained by the restriction of the restoration of these areas to professional crews only.

In Juanita Beach Park, restoration sites with a top-level tree-iage category are located in the southern section of the park. The site with a category 2 has a path with boardwalk over creek crossings and an interpretive sign at the beginning of the path into the site. This allows for the social mixing of restoration volunteers and park visitors. The restoration sites without a path adjacent are in mid-level tree-iage categories. The northern restoration site is next to the baseball diamond and tennis courts is in category 5 and does not have a path to or next to it, but does have three educational signs (Figure 56). This area has a wooden fence separating it from the field. This barrier could be causing a mental barrier for potential new volunteers.

JUANITA BAY PARK & JUANITA BEACH PARK

DISCUSSION

A similar pattern to Josten and Cotton Hill Park's exists in Juanita Bay and Juanita Beach Parks, the pattern of pedestrian paths connecting to other pedestrian paths. In Juanita Bay Park, the main historical boardwalk connects pedestrians to other paths within the park as well as to a path leading to downtown Juanita and eventually Juanita Beach Park. Restoration sites along this connected path experience lower tree-iage categories associated with healthier habitats. In Juanita Beach Park, the same pattern where a pedestrian path through the site also connects to two other pedestrian ways and experiences better habitat health then sites with no path or with a path that dead end. This could be because the intersection of these paths allows for greater pedestrian access creating social interaction that could spur conversation about adjacent restoration sites. These pathways also act as marketing agents during volunteer events, by actively showing work occurring. In Juanita Bay Park, a possible explanation for the category 9 seen in the southern area with the small boardwalk (Figure 55) is that this boardwalk does not connect to anything and dead ends at a viewing platform. The lack of access to these environments for volunteer stewards can also explain the lower habitat quality.

A new pattern seen in these two community parks is that restoration sites next to high use areas whether it be a cluster of comfort features or sports fields, does not experience top level categories of the tree-iage matrix. Clustered features appear in Juanita Bay in an area with many benches and picnic tables and signs, as well as in an area in Juanita Beach where multiple sport courts and activities bunch in the northern section. Traditional use dominated park amenities, such as sports courts and bleachers, do not feature access for restoration volunteers. The design of these features does not accommodate restoration events and thus the two are not mutually beneficial.

The pattern identified with education signs in the first study appears again when looking at these two larger parks. Educational signs placed adjacent to the actual species habitat they describe are likely to have more successful restoration sites. This is a sign of dedicated volunteers who contribute to the materialization of these signs. In Juanita Bay Park, this pattern is near the entrance of the park where the restoration site is in category 2 and along the historic boardwalk where the sites are in categories 1, 2, and 3. Juanita Beach Park contradicts this pattern (Figure 57), where there is a successful restoration site with an educational sign in category 2, but also a restoration site in category 5 that has three educational signs calling out native plant species. The fence around this category 5 site could be the main deterrent for community involvement in this area as it divides park users from the natural area.

Secluded benches or benches where a person could sit and not be near to others could be beneficial to the success of a restoration site (Figure 48). These benches provide volunteers the opportunity to sit and admire their work and provides a space for relaxation during restoration work events. Looking at Juanita Bay Park (Figure 55), areas where benches are in places off the walking paths were near to restoration sites in category 2. The same pattern is in Juanita Beach Park (Figure 56), where secluded benches are located in a restoration site

in category 2 of the tree-iage matrix.

These two parks are unique in that they are both waterfront parks on the shore of Lake Washington. The water is accessible and active at Juanita Beach Park, but at Juanita Bay Park, the water is passively active and not as accessible. Looking at both parks Passive and Active Features, and then looking at the tree-iage category shoreline restoration sites experience; Juanita Beach Park has many active features (Figure 54) and its waterfront restoration sites fall into the middle tier of the tree-iage matrix. Juanita Bay Park has three active features (Figure 53) and waterfront restoration sites falling into category 2, but also 9. Volunteer restoration work on the waterfront is not common in either of these parks. Juanita Bay Park has many passive features and opportunities to view nature close to the shoreline, whereas Juanita Beach Park has nature-viewing areas up and away from the waterfront. In a future study, it would be interesting to see if waterfront parks that have mostly passive park features experience greater success in volunteer habitat restoration.

LIMITATIONS

The study of these two community parks highlights some differences in the initial park selection. One difference discovered through this process is that while the percentage of parklands in active restoration are the same for Juanita Bay and Juanita Beach Park (Figure 40), there is an important distinction realized in relation to the parklands not in restoration. Juanita Beach Park parklands undergo a lot of maintenance, and feature man made green infrastructure, green lawns, flowerbeds, and art. Juanita Bay Park parklands received maintenance historically, the change to a park left the land to be natural; there are no flowerbeds or defined garden beds. The difference in landscaping could have impacts on the habitat health of restoration sites, for example Juanita Beach park has a sprinkler system in the lawn to keep the grass green during the summer, this non-natural water availability could benefit or hurt restoration sites. This difference in vegetation could also change prioritization for volunteer stewards. Sites like Juanita Beach Park could be seen as not needing restoration volunteers because the landscaping portrays a healthy image of green grass and trimmed edges. Whereas, in Juanita Bay Park, the native vegetation and minimal landscaping allows volunteers to see the need.

A limitation with the Juanita Beach Park Study is the renovation of Juanita creek in 2011 and the missing 2008 tree-iage assessment. While the 2011 project would have disrupted the 2008 data and made it an inaccurate starting point, it would have allowed the Juanita Beach Park study to be congruous with the other three park studies. The 2011 Juanita Creek Restoration project altered the creeks channelization, removed a picnic shelter building, and removed grass lawn (Figure 58).

Figure 58:
Left: Juanita Creek 2009Right: Juanita Creek 2011 after restoration
Photos: Google Earth

Again these patterns are observational, the natural phenomena in each park is wildly different and complex. Secluded benches could not be beneficial to restoration sites or volunteers, but simply located in areas where people can view an existing healthy environment. A more accurate assessment would verify the benches location in the initial habitat assessment and defined unit of measurement around the bench. Volunteer numbers counted over a specified amount of time and be numerically compared to other volunteer efforts.

While Juanita Beach Park is similar in size, ecology, number of amenities, and operated by the City of Kirkland, its social use is very different from Juanita Beach Park. The social uses of a park will be interesting for a future study to include. For example, people spread blankets and have picnics and birthday parties in the lawn of Juanita Beach Park, but these activities do not occur in Juanita Bay's lawn. Two more selection criteria, similar social use and landscape maintenance, during the initial selection of study parks will increase the breadth of this research in the future.

REFLECTION

REFLECTION

DISCUSSION

The intent of this study aims to draw connections for the larger research question of how a parks design connects successful restoration and strong community involvement through park amenities. The restoration sites chosen are natural areas restored by volunteers in the Green Kirkland Partnership (Table 1). These restoration sites are not man made green infrastructure projects or professionally designed ecologically systems. Rather these sites previously exist within the parks natural amenities, and are overgrown with invasive species. These volunteer community restoration efforts have a healthy impact on the natural environment and social environment of a community. The research in this thesis hopes to increase the popularity of this method in urban planning as a field.

The research set out to begin to answer the question of what park amenities are present in parks with successful volunteer led restoration sites. Identifying park features commonly found in successful parks and comparing their location to restoration sites with varying categories of habitat health, is the research approach. The study finds four patterns involving specific park features, participant observations, and low tree-iage categories. Findings suggest walking paths, educational signs, benches, and high use areas could influence habitat health in a volunteer restoration site in positive and negative ways.

Walking trails and paths that provide pedestrian only connections are commonly near restoration sites with top-level tree-iage categories (1-3), or near the healthiest restoration site in the park. Further, pedestrian paths that connect to areas outside of the park boundary that are also pedestrian only are commonly next to sites with low tree-iage categories. The configuration is in the norther section of Cotton Hill Park, where the main trail through the park connects to another trail connecting the Cross Kirkland Corridor to Crestwoods Park (Figure 21). Again, the same pattern is in the northern section of Josten Park, the Northern section of Juanita Bay Park (Figure 41), and the southern section of Juanita Beach Park (Figure 45). Pedestrian connections allow more access for people walking to socialize and see volunteer work events in action. This action allows for community education on the need for ecological restoration, and recruits new volunteers.

The finding is similar to the work of ecologist Joan Ehrenfeld, who suggested that wetlands benefitted from the boardwalks through them because it gave access to users and led to the community support for further conservation efforts (Ehrenfeld 2005). Her claim does not hold when looking at the wetland boardwalks in Juanita Bay Park (Figure 55). The smaller boardwalks that dead-end into viewing platforms do not see as much improvement in habitat health compared to other wetland areas without boardwalks. The larger historic boardwalk in Juanita Bay Park supports Ehrenfeld's theory. The discrepancy explains the design where these smaller boardwalks dead-end, where the larger boardwalk connects to other routes. Low habitat quality in this area could be explained by the lack of volunteer stewards allowed in the sensitive wetland habitat. The areas where only professional crews work experience both ends of the Tree-iage spectrum, either top-level where crews have worked, or bottom-level where no one has worked.

Educational Signage when placed directly in front of

or near the phenomena it is displaying are frequently near restoration sites that have lower tree-iage classifications. The northern section of Juanita Bay Park (Figure 53), where signs explaining species habitat and historical context are positioned in front these phenomena, has adjacent restoration sites are in top-level tree-iage categories. In Cotton Hill Park where plant identification signs are directly in front of the native plant it is describing (Figure 37), and the restoration site these signs are in experienced a positive change in habitat health. The signs at Cotton Hill Park provide meaning for the steward who volunteers there. The design of the sign features pictures of the volunteers working in the park, names contributing neighbors, and displays the dedication the community has for this park. Juanita Beach Park challenges the pattern where educational signs fitting this description are located next to a successful restoration site (Figure 48). The two cases, Juanita Bay and Juanita Beach Park, generated another hint coupled to educational signs. The sign close to the healthiest habitat in the park was also on a pedestrian path, whereas the signs next to the site with a higher tree-iage category were not located on a path. The inconsistency further defines this finding by incorporating the educational signage not only needs to be next to the article it is describing, addressing volunteer contribution, but also positioned on a pedestrian path.

The placement of benches away from other benches, or secluded bench placement, commonly found near restoration sites that have experienced a positive change in habitat health. These benches provide volunteers the opportunity to sit and admire their hard work, and provide shaded areas to rest during warm volunteer events. The finding relates to similar findings from Paul Gobster, where these secluded benches are giving park users the opportunity to connect with nature by allowing space for contemplation and reflection (Gobster 2001). The connection to nature could further spur a park user to volunteer in the restoration work parties and contribute to the improving ecological health of an area. However, these secluded benches could be beneficial to restoration sites for another reason, which is discouraging non-use. No bench-user counts exist for this study, so these benches could be vacant due to their isolated locations and associated with less human disturbance to the adjacent natural area.

Areas where features are closely clustered together, either active or comfort features, are near to restoration sites that have not experienced as positive of change in habitat health compared to other sites within the park. Looking at Juanita Beach Park reveals a pattern of clustered active and comfort park features (Figure 56). Traditional park uses, such as baseball or soccer fields, are oriented away from natural areas and typically do not provide space for restoration volunteers. Potential volunteers are lost due to the edge these amenities create between adjacent natural areas. Fences reinforces this edge, but the visual line of short lawn and natural area is vivid enough to divide the two spheres. Fences not only block people from nature, they also add a challenge to restoration activities. Removing middle posts from fences allows access for volunteers to a natural site, and is commonly the case in Kirkland.

REFLECTION

LIMITATIONS AND FURTHER RESEARCH

The research approach is far from perfect but provides a starting point for exploring the intersection of park features and volunteer habitat restoration. Certain limitations in the areas of data availability, the area of research both geographically and biologically, as well as limits to the features assed, effect this study. Only using parks within the city limits of Kirkland Washington, and the amount of four parks is restrictive. These four parks (Figure 17), while meeting methodology criteria, limit the range of park types this research can apply. A future study could expand the number of parks and include other park in cities with green partnership programs. Looking at parks in their boarder context would also benefit a further study in this topic. Specifically looking at proximity to surrounding parks, and connections between them would allow for more insight into the idea of the park network and its benefits.

Defining restoration through the Green Kirkland Partnership only captures one unique type of volunteer restoration project, and limits the applicability to the wider field of ecological restoration. It would be interesting to take into account man-made green infrastructure projects in parks, such as bioswales and raingardens, and see how quality changes in relation to different park features. Using tree-iage as an assessment of habitat health does not always capture the real state of ecological wellbeing of a restoration site. In addition, the Green Kirkland Partnership changed the way areas classify using tree-iage from 2008 to 2015, so the picture of changes these graphics represent is not accurate. A future study could use the four-phase approach to compare restoration site success. The Green Seattle Partnership is currently using this approach and has a collection of geographical data available online for each Seattle Park. Using the four phases is more accurate because it uses volunteer restoration as a framework work. Areas not enrolled in restoration are not included on the maps, where as in Tree-iage areas not yet restored mix with active restoration sites. Phase 1-4 represents a volunteer based scale depicting the maintenance required for long-term sustainability. For the City of Kirkland, this would require assessing management units within each restoration site and generating maps showing units in phase 1 – 4. The work is a future wish for the Green Kirkland Partnership; a future study could have access to this data.

After running through this research approach a couple elements to include in a future research design emerged. The social elements in parks, such as the activities typically observed from users and the seasonality of these activities, for example barbeques in the summer vs morning joggers year round, developed. If a researcher understands the park uses, they can better interpret how amenities play into the neighboring restoration sites and the volunteer efforts restoring them. Focusing on volunteer efforts through interviews and neighborhood analysis is the next direction for this exploration (Appendix A). Questions aimed at volunteers could reveal patterns further connecting park amenities and volunteer numbers. Recently, locational data on where volunteers are coming from became available. Using zip codes, a scholar could compare restoration sites based on the neighborhoods volunteers are coming from. The question of where volunteers are originating from begins to connect the urban fabric of neighborhoods with occurrences of eco-citizenry through restoration volunteers.

CONCLUSION

Figure 59: Top: New Plants at Juanita Bay after invasive removal 2013 Pictures: City of Kirkland
Bottom: Goats at Juanita Bay Park in 2010.

Pedestrian oriented pathways, educational signage, and bench placement are park amenities that could play a role in the restoration success of an adjacent natural area. This study set out to provide a research design for a future study to begin to understand the interconnected web between successful natural area restoration, volunteer projects and urban park design. Restoring natural areas in urban parks is important for the ecological health of a city, as well as the psychological health of the people who live there. Sustainable programs such as the Green Kirkland Partnership and the larger Green Seattle Initiative embody the ecologically focused direction cities are moving in. New research such as Galen Cranz's ecological park type and older philosophies about the importance of the human connection with nature (Miles et at. 1998) show the importance of mechanisms to improve the environment and restore human to nature relationships. Volunteer restoration work in local urban parks is one mechanism that achieves both of these aims. The research adds to the base of knowledge to support community programs in environmental restoration by adding more insight into the human nature connection through our park amenities and their response to our parks health. The topic hopes to bring together the fields of urban planning, landscape architecture, and forest sciences through design, environment, and community. The interconnectedness of these fields mimics the interconnectedness of the natural world, when these bases of knowledge come together more resources come together leading to thoughtful sustainable solutions that will produce exponential benefits for the community.

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APPENDIX A

IRB AND INTERVIEW QUESTIONS

UNIVERSITY of WASHINGTON
HUMAN SUBJECTS DIVISION

DETERMINATION OF EXEMPT STATUS

April 20, 2018

Dear Hallie O'Brien:

On 4/20/2018, the University of Washington Human Subjects Division (HSD) reviewed the following application:

Type of Review:	Initial Study
Title of Study:	Restoration Site Location and Neighborhood Design, New Connections for Ecological and Community Well-Being
Investigator:	Hallie O'brien
IRB ID:	STUDY00004637
Funding:	None

Exempt Status

HSD determined that your proposed activity is human subjects research that qualifies for exempt status (Category 2).

- This determination is valid for the duration of your research.
- This means that your research is exempt from the federal human subjects regulations, including the requirement for IRB approval and continuing review.
- **Depending on the nature of your study, you may need to obtain other approvals or permissions to conduct your research. For example, you might need to apply for access to data (e.g., to obtain UW student data). Or, you might need to obtain permission from facilities managers to approach possible subjects or conduct research procedures in the facilities (e.g., Seattle School District; the Harborview Emergency Department).**

If you consider changes to the activities in the future and know that the changes will require IRB review (or you are not certain), you may request a review or new determination by submitting a Modification to this application. For information about what changes require a Modification, refer to the **GUIDANCE: Exempt Research**.

Thank you for your commitment to ethical and responsible research. We wish you great success!

Sincerely,

Leah M. Miller, PhD
Team Operations Lead, IRB-D and Team D
lemiller@uw.edu
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IRB AND INTERVIEW QUESTIONS

Sample Interview Questions for Future Research

Interview Questions: Name: Date:

1. What kind of neighborhood layout do you live in?

2. Is there an ecological restoration site in your neighborhood?

b. Do you volunteer at it?

c. How many of your neighbors volunteer at it?

d. Is there a common features among these neighbors? (kids, retired)

3. What is the general feeling of neighbors who live next to a restoration site? Are they supportive?

4. When you think of restoration sites, what are describing characteristics of the neighborhood around them? (dead-ends, lack of access)

5. Do you think the design of a neighborhood has a relationship to restoration sites? (lots of parks = lots of restorations, lots of cul-de-sac = no restoration?)

6. If you volunteer at a restoration site not in your neighborhood, what brings you to work there?

Park Design and Restoration site survey

How do you define a successful restoration site: (Check all that apply)

- ☐ Ecologically in Phase 4 (no maintenance)
- ☐ High numbers of volunteers
- ☐ High numbers of return volunteers
- ☐ Monthly work parties where I hang out with neighbors

What design features in a park contribute to the success of a restoration site? (Check all that apply)

- ☐ Lots of Parking
- ☐ Bathrooms at the park
- ☐ Open space
- ☐ Flexible space for many different active uses
- ☐ Defined Path through restoration site
- ☐ A focal point (playground, fountain, bench, bridge)
- ☐ Sports fields at the park
- ☐ Size of the park (larger park vs small park)
- ☐ Mostly Forest (natural park)
- ☐ Signage
- ☐ Fence around restoration site
- ☐ Views (water)
- ☐ Other: please write in

What benefits does parkland restoration have?

- ☐ Habitat preservation
- ☐ Environmental education
- ☐ Native Plant species propagation
- ☐ Community building
- ☐ Park Beautification
- ☐ Crime prevention
- ☐ Mindfulness, wellness
- ☐ Ecological function
- ☐ Other: please write in

Write in park with successful restoration site:

Write in park with challenge restoration site:

LEGEND

COMFORT

BENCHES, GARBAGE CAN, PICNIC TABLE, OPEN LAWNS, AND BATHROOMS

PASSIVE

OPEN SPACE, VIEWS OF THE WATER, STREAMS, AND PLACES TO VIEW WILDLIFE

ACTIVE

SIGNS, PLAYGROUNDS, SPORTS FIELDS, PATHS, WALKWAYS OVER WATER, AND JOBOXES

ALL

APPENDIX B

PRESENTATION GRAPHICS

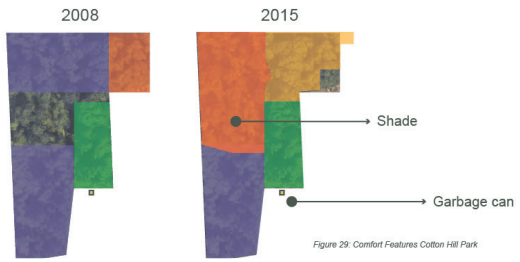


Figure 29: Comfort Features Cotton Hill Park

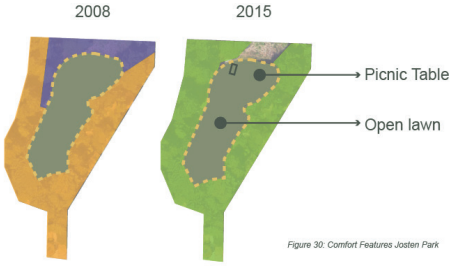


Figure 30: Comfort Features Josten Park

COMFORT

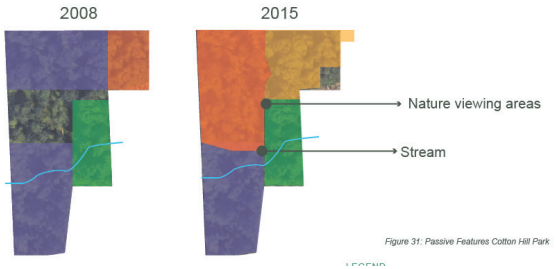


Figure 31: Passive Features Cotton Hill Park

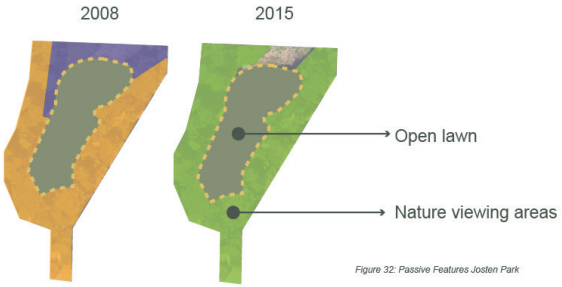


Figure 32: Passive Features Josten Park

PASSIVE

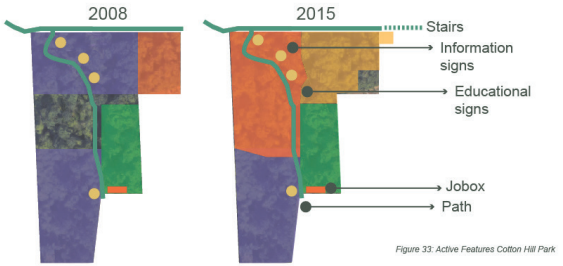
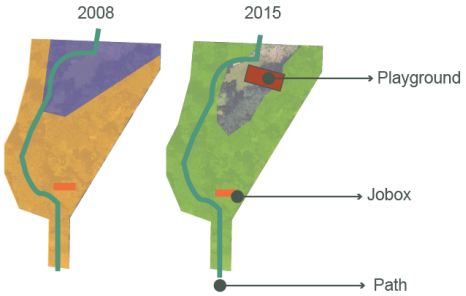


Figure 33: Active Features Cotton Hill Park



ACTIVE

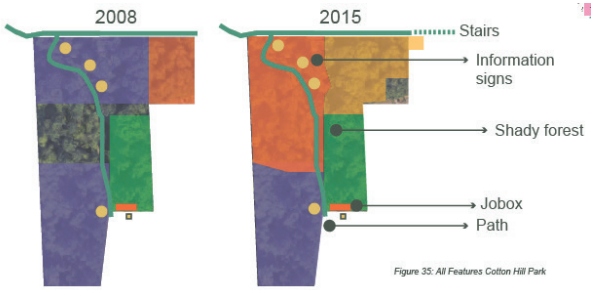


Figure 35: All Features Cotton Hill Park

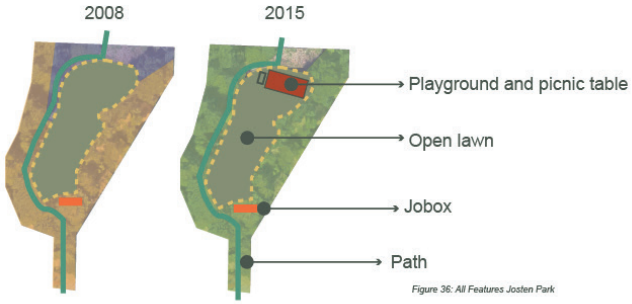
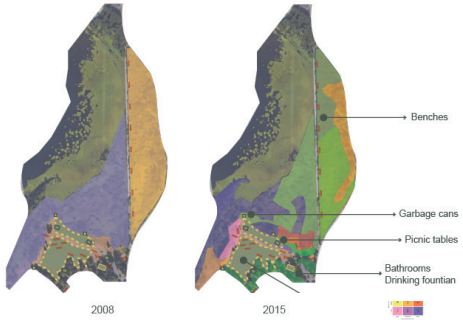
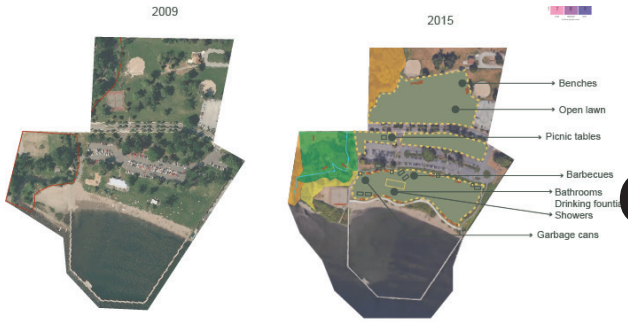


Figure 36: All Features Josten Park

ALL





COMFORT

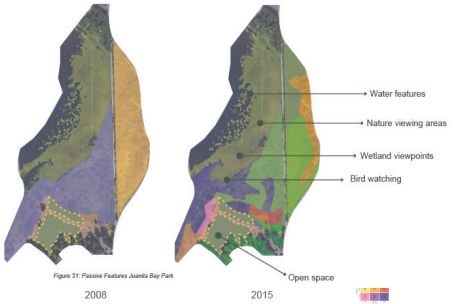


Figure 51: Passive Features Juanita Bay Park

PASSIVE

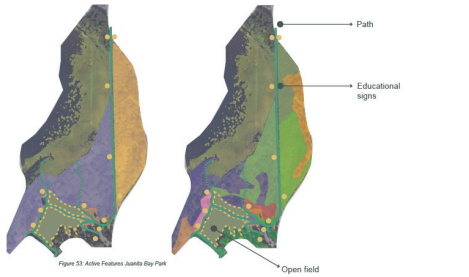
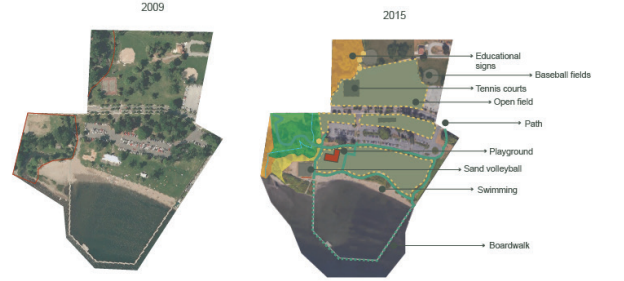


Figure 53: Active Features Juanita Bay Park



ACTIVE

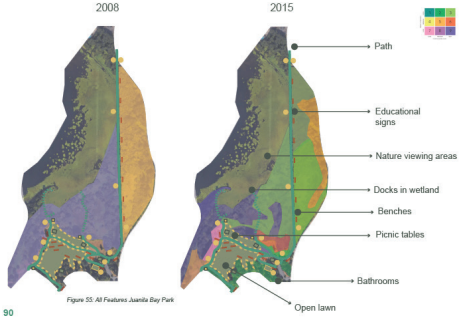


Figure 55: All Features Juanita Bay Park

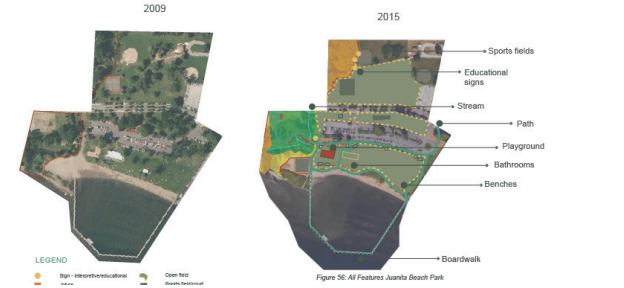


Figure 56: All Features Juanita Beach Park

ALL