Building Watershed Narratives: Two Case Studies of Urban Streams in Seattle, Washington

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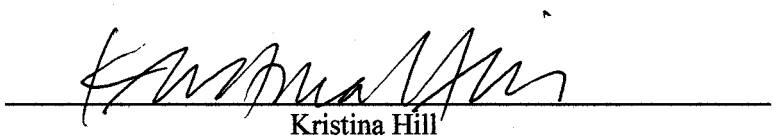

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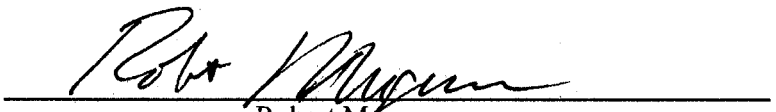

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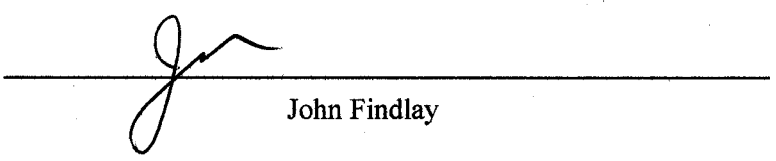

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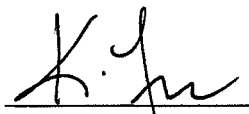
Signature 

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Abstract

Building Watershed Narratives: Two Case Studies of Urban Streams in Seattle, Washington

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My research responds to calls from both practitioners and theorists to broaden the approaches for identifying and addressing the problems inherent within urban streams and rivers by utilizing a narrative-based, case study approach for understanding the historical conditions of a watershed and for examining the values and perceptions that participants bring to the restoration process. Incorporating contemporary methods in spatial analysis, historical research, and participant interviews I have developed a model for restoration research that creates a chronotope for disentangling the multiple histories entwined in the physical, social, political and economic landscape of the contemporary urban environment. I use this model to develop case history narratives of two urban watersheds in Seattle, Washington that have recently been the focus of urban stream restoration practices. Although limited in scope, the problems, issues, and themes that emerge from these narratives are illustrative of the complex and often contentious processes that comprise any attempt to restore urban streams. The findings of this research highlight the need for urban stream restoration to be understood as a process more than from a project-based perspective. My research shows that this process can be more effective if it is scoped from a watershed perspective, historically and spatially grounded, clearly defined yet adaptive to changing social, political, and economic conditions, and inclusive of educational and participatory goals.

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ACKNOWLEDGEMENTS

As with most research endeavors of this scope there are many people that have played important roles in seeing this project through to completion. I would first and foremost like to thank my life partner Anna who continually supports my academic and professional interests, challenges my ideas, provides emotional grounding, and most importantly prods me to stay focused and keep working. Without her, I can confidently say that this project would still be far from done. I thank my parents Peter and Charlotte Yocom for their unconditional love and life-long support. I am forever indebted to my advisor, colleague, and friend Kristina Hill. Her continual support and guidance over the years has helped me to traverse the many intellectual peaks and valleys of a doctoral education. By continually demanding my best work, she has become a key figure to much of my personal and professional growth over the past several years. I thank my committee members Robert Mugerauer for embracing my often discombobulated thoughts, and John Findlay for the countless hours of focused conversation, and constantly asking the question, So what? I thank the many friends and colleagues in the University who have willingly shared their inspiration and passion for learning, understanding, and teaching. Specifically, I thank Jerry Watson, Adrienne Greve, and Daniele Spirandelli. To my Urban Ecology team members, Sarah Dooling and Gregory Simon, my gratitude is best expressed in our rally call, Bergen! I would also like to acknowledge the National Science Foundation's Integrated Graduate Education and Research Traineeship (IGERT) which funded much of this research, and provided an opportunity for me to explore innovative educational approaches to doctoral education. Last but not least, I would like to thank Kit O'Neill for showing me that careful consideration, determination, and perseverance can truly move mountains.

DEDICATION

I dedicate this dissertation to my grandmother,

Charlotte Louise Moor

May 18, 1907 to September 27, 2006

Chapter 1. Introduction

> 'The face of the water, in time, became a wonderful book—a book that was a dead language to the uneducated passenger, but which told its mind to me without reserve, delivering its most cherished secrets as clearly as if it uttered them with a voice. And it was not a book to be read once and thrown aside, for it had a new story to tell ever day.'
>
> —Mark Twain, *Life on the Mississippi*

Few ecosystems on the planet have escaped the impact of human actions (Lovelock 2006). That impact has been increasing substantially since 1700, as the human population has increased tenfold, from an estimated 600 million to roughly 6.3 billion (Cohen 2003). Much of the growth has occurred in the past eighty years, when the global population tripled. Changing patterns of human settlement have accompanied the increase in population, and the world has become increasingly urban. In 1900, about 12 percent of the human population lived in cities; today, it is nearly 50 percent (Cohen 2003). Although the largest concentration of urban population growth is occurring in developing regions of the world, countries such as the United States are also experiencing record growth in cities. The area of land occupied by urban areas in the United States is increasing rapidly, putting even greater stress on the ecosystems that provide services and support for human societies (McKinney 2002; Frick et al. 1998).

Human societies have always valued the essential services that ecosystems provide (Palmer et al. 2004; Curry and McGuire 2002; Bolund and Hunhammar 1999; Daily 1997). Accordingly, the impact of human actions on freshwater ecosystems, particularly in urban areas, is a matter of growing concern (McGranahan and Satterthwaite 2003; Jackson et al. 2001). Although water constitutes roughly 70 percent of the earth's surface, only 3 percent of that amount is freshwater, with most of it locked away in polar ice caps and glaciers. "Free-flowing" freshwater resources constitute less than 1 percent of the surface area of the Earth (Jackson et al. 2001; McAllister et al. 1997). The quality of freshwater ecosystems, which are estimated to be

only a fraction—one-hundredth of 1 percent—of all the Earth's water, is in rapid decline (Gleick 2003; Revenga et al. 2000; McAllister et al. 1997).

Self-sustaining and "healthy" freshwater systems are widely believed to be vital for rendering important ecological and social services of enormous global value, with some estimates putting that value at about several trillion U.S. dollars (Postel and Carpenter 1997). These services include water for municipal, industrial, and agricultural resources, as well as for providing aesthetic, spiritual, and recreational opportunities for human societies (Palmer et al. 2004; Postel and Richter 2003; Bolund and Hunhammar 1999; Wilson and Carpenter 1999). Concern about sustaining these services has motivated major efforts to restore and rehabilitate freshwater systems. Indeed, river and stream restoration has become a worldwide phenomenon and a thriving enterprise (Ormerod 2003; Boon et al. 2000; DeWaal et al. 1998; Holmes 1998; NRC 1992). Over the past several decades, billions of dollars have been spent on stream and river restoration in the United States, and predictions are for a noticeable increase in the number of projects, especially in and around urban areas (Palmer et al. 2004; Malakoff 2004; Cunningham 2002).

Despite major federal and local governmental efforts to improve and restore the quality of stream and river systems in the United States over the past thirty years, since the passing of the Clean Water Act in 1972, however, nearly 40 percent of the nation's waters are still categorized as impaired (ASCE 2003). Specifically in the U.S. Pacific Northwest region, a century of "benign neglect and denial" (Frissel and Ralph 1998, 599) in water resource management has altered the natural composition and processes of local river and stream function. This has been most visible in the well-publicized documentation of decreasing fish populations (particularly salmonids) in urban areas and across the region (Taylor 1999; Lichatowich 1999; Czech et al. 1997; NRC 1996).

The National Marine Fisheries Service's March 1999 listing of the Puget Sound population of Chinook salmon (*Oncorhynchus tshawytscha*) as "threatened" under the Endangered Species

Act (ESA) of 1973 has played a vital role in the initiation of a more sustainable water resource management approach for urban areas by means of toughened requirements for water quality compliance and habitat conservation in open waters and channels (Miller and Hobbs 2002; Weitkamp and Ruggerone 2000). In the Seattle area, marine and freshwater ecosystems, including urban streams, have been listed as critical habitat for these fish. This action is the first of its kind directly affecting the management of natural systems within urban centers, and it may represent the most substantial public action ever undertaken in order to save a species (Gorman and Sears 1999).

Although mandates of the ESA call for the conservation and in some cases the restoration of habitat for listed species, many scientists and professionals have argued that the focus on a single species is limiting, and that a broader, system-scale, process-based approach to management is more appropriate (Booth 2005; Walsh et al. 2005; Angermeir 1997). New legislative measures at federal, state, and local levels are being adopted that utilize systems-scale approaches and prioritization frameworks for setting limits and restrictions on development while further promoting the restoration of aquatic habitat and fish communities (Frissel and Ralph 1998). These laws provide state and local jurisdictions with the ability to manage their lands from a larger, systems approach and to evaluate recovery processes across forestry-managed and urban watersheds.

For example, on March 27, 2006, Seattle City Council ratified Ordinance 122050 updating the 1992 Environmentally Critical Areas ordinance (ECA), which was developed in response to the mandate of the Washington State Growth Management Act of 1990 (City of Seattle 2006). The ECA is designed to protect and preserve areas important to wildlife and people, as well as to deter development in areas that represent particular challenges, such as steep slopes, flood prone locations, and abandoned landfills. In the update, the city extended the spatial buffer requirement for new development along streams and shorelines. Along stream corridors, the buffers have been extended for salmon-bearing streams such as Longfellow from 50 feet to 75 feet while further

requiring the pesticide-free management of a 100-foot riparian corridor from the stream channel.[1] Although the ordinance is designed to protect remaining habitat while further enabling development rights along shorelines, neither stakeholder group—the environmental groups or real estate and development interests—are happy with the result. The environmental stakeholders feel that more should be done to preserve the already denuded shorelines and streams in the city, while the development factions argue that although the already existing development will be grandfathered into the new requirements, restrictions on new development will dramatically decrease property values along shorelines (Langston and Stiffler 2006). Under the mandates of these legislative measures and others created to protect valuable aquatic species, state and local expenditures for river and stream enhancement have risen dramatically across the U.S. Pacific Northwest and Puget Sound Region, reflecting increased social and political interest (NMFS 2004; WDFW 2004).

The Urban Streams of Seattle

Extensive and increasing urban development represents a primary threat to stream health and integrity in North America and around the world (Allan 2004; Paul and Meyer 2001; Riley 1998). In the Pacific Northwest, the Puget lowlands contain the region's largest concentration of people, with more than 3 million residing in and around major metropolitan areas (PSRC 2000). Since 1990, the population in the region has increased by 20 percent, with some projecting a million more by 2025 (MSRC 2003; PSRC 2004). This rate of population increase is reflective of the past 150 years of growth within the region. Over that period, urban development of the Puget lowlands has been extensive, especially around metropolitan centers such as Seattle, with dramatically negative physical, biological, and water quality impacts on water resources. These impacts have influenced the perceptions of urban streams for many, instilling images of flooding and derelict, neglected areas that must be controlled for the safety of people, as well as for protection of property. Summarizing the attitudes of past generations of Seattleites toward urban

streams, journalist William Dietrich (2000) writes, "The ravines were logged, the city grew, and the creeks were piped, paved and plugged with small dams. They became open storm sewers, garbage-dumping grounds [. . .]." Many of Seattle's streams, viewed as safety and health hazards and impediments to progress over the early and middle decades of the twentieth century, were lost.

Although the piping, ditching, and filling of streams in Seattle has mostly ceased because of increasing concerns about the environmental quality and health of the region since the late 1960s and early 1970s, streams are now being "lost" for other, more insidious reasons, such as pollution from urban, industrial, and residential development and activities and the removal of remnant forest stands along the stream channel. For example, in May of 1977, gasoline from a leaking underground tank at a neighboring service station leached into Thornton Creek in North Seattle. The buildup of gasoline fumes became so intense that a short section of the stream literally "exploded," scorching surrounding trees and partially burning several homes and sheds. Nobody was injured, but the local fish population suffered heavy damage, including cutthroat trout and juvenile Coho salmon, among them 50,000 fry that had just been released by a local chapter of Trout Unlimited (City of Seattle 2003). Although this is an extreme example, and the degradation and decline in the quality of streams is not always readily apparent, the list of threatened and endangered fish and wildlife species that depend upon streams for their existence is growing in the Pacific Northwest. The capability of the streams to produce and support a diverse and abundant range of organisms has been severely constrained, a phenomenon that reflects the manner in which society has planned and built communities.

The ability to assess the condition of urban streams and implement restorative measures has improved immensely over the past several decades, however, with a large volume of scientific literature examining the impacts of urban development on streams and rivers (Walsh et al. 2005; Allan 2004; Paul and Meyer 2001). Researchers have long agreed that the condition of streams and rivers reflects the character of the basins they drain (Montgomery et al. 2003; Naiman and

Bilby 1998; Vannote et al. 1980; Hynes 1975). These systems constantly adjust to physical changes in their surroundings. Disturbances, whether natural or produced by human activities, often influence the morphological structure and habitat diversity of streams across multiple spatial and temporal scales (Fausch et al. 2002; Schlosser 1991).

The Urban Stream Syndrome

Recently, researchers have coined the term "urban stream syndrome" to describe the consistent indicators of ecological degradation in watersheds that drain urban and urbanizing landscapes (Meyer et al. 2005). These indicators can be grouped into five classes: habitat, flow regime, water quality, energy, and biotic interactions (see Figure 1) (Booth 2005; Karr and Yoder 2003; Karr 1991; Karr et al. 1986). The classification of indicators provides a framework for analyzing the conditions of a stream or river as it responds to changes urbanization has brought about in the watershed.

As urban development in a watershed intensifies, the hydrologic patterns of the drainage basin are altered because of the introduction and spread of impervious areas such as rooftops and roads, coupled with the installation of drainage infrastructure designed to capture and convey to streams and receiving water bodies the runoff created by these impervious areas (Allan 2004; Paul and Meyer 2001; May 1996; Booth 1991; Leopold 1968). The representative hydrograph in Figure 2 shows the two primary differences in comparing developed and undeveloped watersheds: (1) flow magnitude and (2) timing. Developed watersheds have much higher "peak" flows in comparison to undeveloped ones (Booth and Jackson 1997; Horner et al. 1994; Dunne and Leopold 1978). Higher peak flows require the stream channel to transport larger amounts of water, increasing rates of bank erosion and streambed degradation (Seaburn 1969). This amplification in the amount of water further increases the number and magnitude of flooding events (Hirsch et al. 1990). Floods incur tremendous public and private economic costs as the high-water events overwhelm drainage infrastructure and erode private property (Riley 1998). The high peak

flows and subsequent flooding also have deleterious impacts on the channel structure of streams and surrounding ecological conditions (Roy et al. 2005; Walsh et al. 2005).

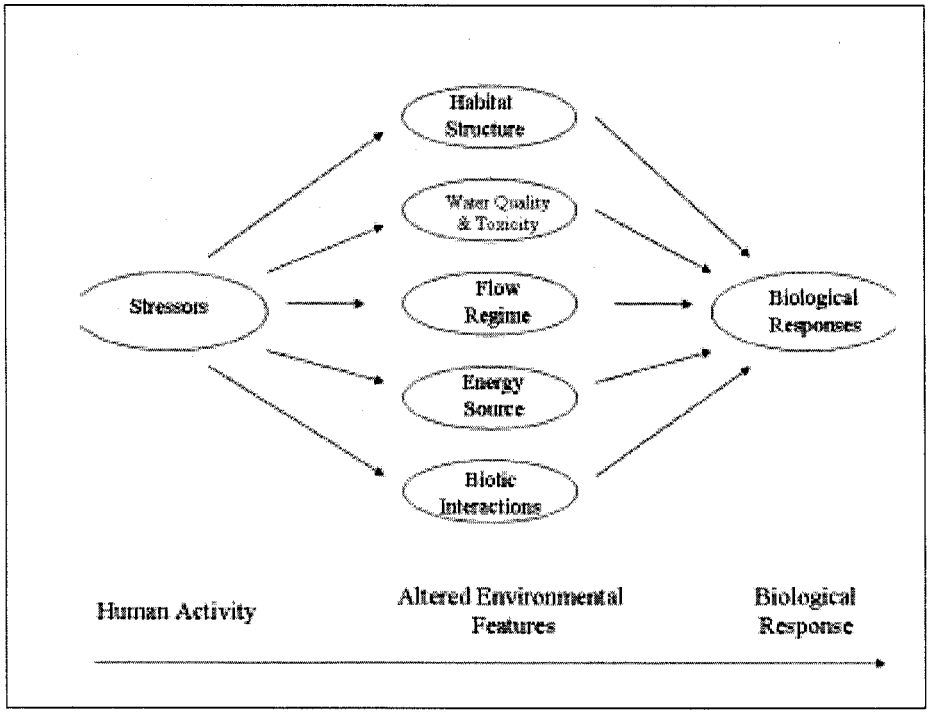

Figure 1: Indicators of Ecological Degradation in Urban Watersheds (Adapted from Karr and Yoder 2003)

Urban development in the watershed further alters the timing of watershed hydrology. As the figure shows, the limbs of the hydrograph both ascend and descend at a quicker rate in the urbanized watershed (Horner et al. 1994). The increased stormwater runoff reduces the water yield of the basin, meaning a larger proportion of water leaves the watershed instead of percolating into soils and recharging groundwater levels (Roy et al. 2005; Konrad and Booth 2002; Seaburn 1969). The inability for precipitation to percolate to the groundwater table also causes issues on a longer time scale. Reduced rates of groundwater recharge result in a reduction in the base flow of streams during dry periods, critically affecting many aquatic organisms and communities (May 1996; Barringer et al. 1994).

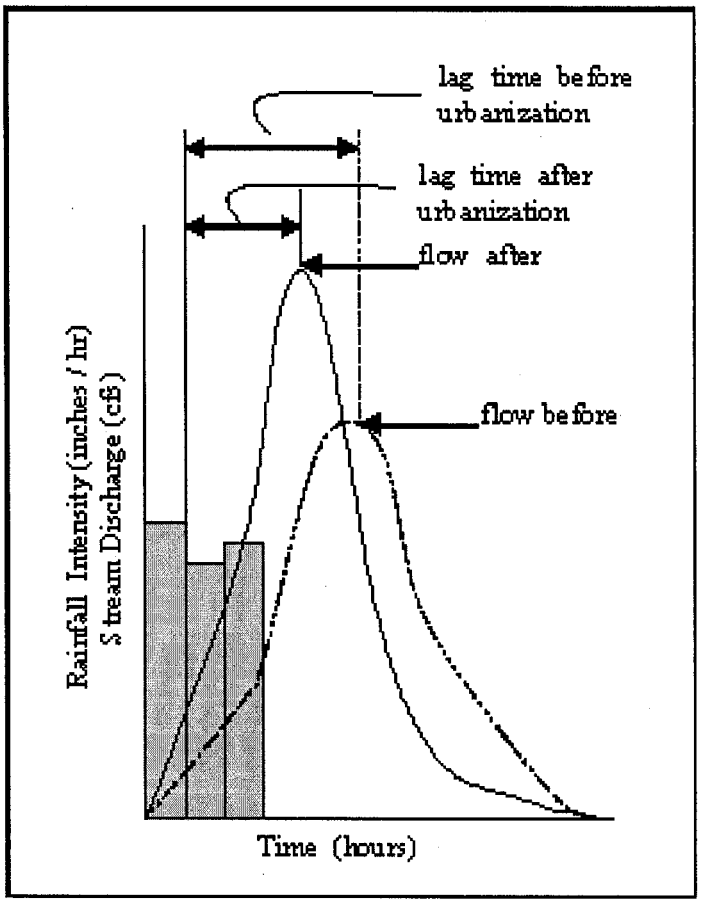

Figure 2: Effects of urbanization on timing and quantity of peak storm flows (Adapted from: FISRWG 1998)

The physical patterns of a watershed's stream network as well as the structure of the stream channel are also affected by urbanization. The density of natural stream channels often decreases dramatically in urban watersheds as small streams are filled, rerouted into the formal drainage system, or paved over (Meyer et al. 2005; Dunne and Leopold 1978). For example, prior to extensive urban development across the present extent of the City of Seattle, it is estimated that there were nearly 200 perennial streams with basins ranging in size from twelve square miles to less than a quarter-mile (City of Seattle 2005b). Today, only forty-two perennial and seasonal streams with at least some portion of open channel remain. The rest have been lost, either filled or culverted, and many have been incorporated into the sewage and drainage systems of the city.

Of the remaining systems, only four provide accessible habitat for migrating salmonids. Because of blockages of fish passage by culverts and dams, however, only one-fourth of the total remaining stream length in the city is accessible to migrating fish (City of Seattle 2005b).

Many of the streams that remain have been channelized or straightened, either in response to the changes in hydrology or by more active means to protect public and private properties and infrastructure from flooding and to expedite stormwater drainage to receiving bodies of water. Channelization reduces the dynamic capabilities and resilience of a stream to adapt to changing hydrologic conditions (Pizzuto et al. 2000; Arnold et al. 1982). Along with channelization, it is common for the instream structure of the streams to also be removed. Large woody debris, such as fallen trees and rootwads, are commonly removed from the waterway to further facilitate the drainage and reduce the severity of flooding events (Booth et al. 2001; Frissel and Ralph 1998).

Channelization brings a morphological shift away from the characteristic pool-riffle (slow water-fast water) habitat to a glide-dominant, less complex channel form. Generally, a balance between pool and riffle habitat is considered optimal (May 1996; Gregory et al. 1994). The loss of pool and riffle structure in urban streams significantly reduces the quantity, quality, and diversity of instream habitat. This loss has had grave consequences for the populations of coho salmon and other salmonids in urban streams in the Puget Lowlands and across the Pacific Northwest (Scott et al. 1986; Steward 1983; Richards 1982). Coho salmon have a strong preference for structurally complex cover and low-flow microhabitats associated with instream structure, such as large woody debris and boulders (McMahon and Hartman 1989). Research has found that as urbanization in a Puget Lowland watersheds increases, the composition of the fish community shifts from a more coho-dominated population to systems dominated by the more resilient cutthroat trout (May 1996). Overall, channelization leads to a simplification of habitat structure by reducing the amount and quality of habitat available for fish and other aquatic organisms.

Water quality has become a primary concern for urban streams (Riley 1998; May 1996). In general, water quality conditions in streams decrease as development within the watershed increases. These effects, however, are far more variable than the hydrologic and physical effects of urbanization, depending on the type and extent of urbanization, as well as climate and geology in the watershed (Walsh et al. 2005; Paul and Meyer 2001; May et al. 1997). Regardless, it is known that both water temperature and chemical composition are typically altered in urban watersheds. Stream temperature is important for many aquatic organisms such as invertebrates (Sweeney 1984) and fish (May 1996). Overall, urban streams in the Puget Sound lowlands are found to have warmer water temperatures and larger daily fluctuations in the temperature regime as a result of lower levels of canopy cover to shade the stream and runoff from heated impervious surfaces (May 1996).

Increased concentrations of several nutrients and chemical pollutants—including phosphorous, nitrogen, and heavy metals—have also been identified in urban streams (Hatt et al. 2004; Horner et al. 1997). Analysis of the water quality of Seattle's urban streams has identified several common elements that reduce water quality, and as a result, several of Seattle's watersheds have been listed by the Washington State Department of Ecology as having poor water quality conditions (DOE 2006). Some of these elements include high concentrations of fecal coliform introduced into the stream from animal waste and leaking sewer pipes and high concentrations of hydrocarbons and heavy metals as byproducts of automobile use that collect in stormwater runoff (City of Seattle 2005b). Although the poor water quality can rarely be seen with the naked eye, the effects of high concentrations of metals, pesticides, and hydrocarbons, coupled with increased water temperatures, create a toxic environment for aquatic organisms and reduce the overall biological productivity of the system. It is suspected that these water quality conditions are the primary cause of massive prespawn mortality rates for returning salmon, particularly Coho, in Seattle's urban streams. Although fish are entering the stream systems to spawn, only a small proportion, often less than 5 percent annually, are surviving long enough to do so (City of Seattle 2005b; Stiffler and McClure 2003).

Urbanization also alters the energy cycles established within stream environments, primarily through the reduction and loss of riparian forests and habitat. Riparian habitat represents the transition between aquatic (stream) and terrestrial (basin) zones (Naiman and DeCamps 1997). Composed of the active stream channel, floodplain area, and the surrounding hillslope forest, riparian corridors are crucial elements in maintaining the natural functions of a stream ecosystem (Naiman 1992). Well-established and connected riparian corridors are important, as the literature shows, for not only increasing the stability of channels, but also creating and maintaining habitat for fish (Yocom 2002; Chen et al. 1995; Gregory et al. 1991; Beschta 1991). The functions of riparian vegetation are numerous, including stabilization of stream banks and the reduction of erosion; filtration of stormwater pollutants, nutrients, and sediments; supply of large woody debris (LWD) for in-channel structure and hydraulic diversity; development and maintenance of a stream ecosystem microclimate; and as habitat for fish and wildlife (May 1996). Like all other aspects of stream ecology, riparian zones are greatly affected by urbanization and development within the watershed. May (1996) reports a decrease in riparian forest conditions and connectivity associated with an increase in development in the watershed. In developed watersheds, urbanization often places constraints on the function and connectivity of riparian corridors, clearly limiting the extent and characteristics (e.g., width, height, and community composition) of the riparian habitat (Sweeney et al. 2004; Naiman and DeCamps 1997).

The net result of these changes caused by urbanization is a simplification of stream channel conditions and aquatic habitat, resulting in further alterations to the biological communities utilizing the stream systems. The framework for classifying indicators of ecological degradation in streams and rivers allows researchers to systematically and thoroughly explore the interactions between urban development and its impacts on aquatic environments (Meyer et al. 2005; Allan 2004). This understanding provides a scientific basis for examining how and why the modification of these environments is needed to improve the overall "health" of communities through rehabilitation and restoration.

Yet, understanding the ecology of urban streams represents only one facet of the restoration process. Cities are human-dominated environments, developed and controlled by physical patterns of the environment that are conceived and maintained through socioeconomic and political forces. Attempting to understand the processes of urban stream restoration requires a broadening of the research agenda to incorporate not only the ecological conditions of the watershed, but also studies that increase understanding of how these urban forces generate and support the concept of restoration in the urban environment.

The Restoration Dialogue

The concept of ecological restoration conjures a myriad of mental images. For some, it draws on a romantic, idealized vision of a return to the past conditions of a landscape by righting perceived past wrongs and improving ecological conditions (Pinkham 1998). Others view ecological restoration as an opportunity to further modify conditions in ways that benefit both the quality of such conditions and the quality of life for society at large (Platt 2006; Riley 1998). Still others see ecological restoration as an opportunity to foster community development through a vision of cooperation and participation among neighbors and local government (Webler and Tuler 2001). From this perspective, restoration is inherently connected to ideas of participation, of developing community, and of righting the perceived wrongs that society has imposed on the surrounding environment through development and subsequent actions.

Filtering through these foundational concepts of restoration in an ecological and environmental context requires an integrative approach that blurs theoretical and methodological boundaries of traditional disciplines in the natural and social sciences and humanities. Eric Higgs states, "Restoration pushes the limits of our understanding of nature and reality [. . . .] Restorationists are tugged in all directions and operate from a wide variety of ideological positions, so much so that it is unclear generally and specifically what counts as restoration" (Higgs 2003, 63).

The fundamental meaning of the verb "restore" is to return to some past condition. In the field of ecological restoration, a call to bring back historical conditions forms the foundation and provides the fuel for much of the ethical, scientific, and pragmatic debates both for and against ecological restoration (Gobster and Hull 2000; Bradshaw 1983).

In 1988, the practice of ecological restoration became a professional field with the founding of the Society for Ecological Restoration (SER). Six years later, SER published the first issue of its flagship journal *Restoration Ecology*. Believing that the ecological sciences provide the foundation for restoration, many of the ecologists supporting SER have argued that the goals and objectives of restoration must be scientifically based and grounded in ecological theory (Jackson et al. 1995; Bradshaw 1993; Scherer 1992). SER contends that successful restoration unites both historical and scientific approaches, writing that "restoration attempts to return an ecosystem to its historic[al] trajectory. Historic[al] conditions are therefore the ideal starting point for restoration design." Further, "The general direction and boundaries of that trajectory can be established through a combination of knowledge of the damaged ecosystem's preexisting structure, composition and functioning, studies on comparable intact ecosystems, information about regional environmental conditions, and analysis of other ecological, cultural, and historical reference information" (SER 2004, 1).

Analyzing the history of a landscape as part of the restoration process allows for a more in-depth understanding of the practical issues a project faces. Questions such as what the major changes to the ecological system have been over time, what the timing of these events was, and how the system originally developed are important for understanding not only the historical trajectory of a system, but also how that trajectory has been altered because of changing conditions over time (Foster and Aber 2004; Marcucci 2000). In most restoration projects, however, little is done to understand the history of a system. The reasons are many, from restricted budgets to time constraints (Palmer et al. 2005). Yet, if the historical trajectories form the foundation for understanding the functioning of a contemporary system, those excuses are insufficient, and as

the SER (2004) reports, the historical trajectory is the ideal starting point for restoration activities.

Others argue, however, that explicitly establishing the historical trajectories as the starting point of the restoration process inherently implies a preference for historical environmental conditions over the contemporary. This argument has fueled an ethical debate that is relevant not only to the definition of ecological restoration, but also to a much larger discourse about the dialectical relationship between people and nature.

Environmental philosophers Robert Elliot and Eric Katz argue that restoration activities construct environmental artifacts, a product of human science and technology (Elliot 1997; Katz 1996). In this way, although the ecological processes of a restoration site may be reproduced, the site and its status are inherently different, changed from the previous condition in time and place. Katz states that "the practice of ecological restoration can only represent a misguided faith in the hegemony and infallibility of the human power to control the natural world." He argues that it would be more appropriate to focus attention inwardly in an attempt to "understand the limits and meaning of our power over the natural world" (Katz 1996, 224).

In rebuttal, philosopher Andrew Light argues that Katz's claims are exactly what participants promoting ecological restoration are attempting to move away from. Light notes that by definition, restoration inserts a component of human manipulation within the process. However, it is the intention of "restoring a culture of nature if not nature itself" (Light 2000, 108) that lends value to the concept of ecological restoration. In this sense, restoration allows development of a better understanding of the environment while providing for the opportunity for certain conditions to be reestablished where they have been lost.

Although ethical and theoretical arguments have made the understanding of theoretical concepts in restoration more complex, the practice of restoration activities is often viewed as an important contributor to the growth of ecological knowledge. Ecologist A. D. Bradshaw main-

tains that "the acid test of our understanding of ecosystems is not whether we can take systems to bits on pieces of paper, however scientifically, but whether we can put them back together in practice and make them work" (Bradshaw 1983). Bradshaw's statement objectively straddles the conceptual line between Katz's and Elliot's argument of restoration as an anthropocentric artifact of science and technology, and Light's stance of restoration as a mediating action for both improving environmental understanding and ecological conditions.

Restoring Streams in Cities

Attempts to enhance the ecological quality of streams and rivers in the United States can be traced to the activism of sport fishing associations, formed as early as the mid- to late-1800s (Riley 1998). Intent on restoring decimated fish populations, these groups organized land purchases to conserve river resources and promote fish habitat. Government involvement began in 1871 when Congress established the U.S. Fish Commission, the precursor to the U.S. Fish and Wildlife Service, in response to growing public concern about plummeting fish populations, caused by pollution, the damming of rivers, and overfishing (Stroud 1966). Yet it wasn't until the 1930s that fisheries biologists began proposing actual instream efforts to improve fish habitat (Reeves et al. 1998).

The 1930s are referred to in the literature as the "historic debut" of instream restoration efforts (Riley 1998). In the administration of Franklin D. Roosevelt (1933–1945), a natural resource inventory was conducted on all public lands within the United States in an attempt to initiate conservation measures for natural resources while providing much-needed employment opportunities (Owen 1975). In 1934, the Civilian Conservation Corps implemented possibly the first major attempt to improve fish habitat in rivers by creating nearly 2,000 pools over 46 linear miles of stream in New York through the construction of log and boulder dams and flow deflectors (Greeley 1935). Supported by the passing of the Wildlife Restoration Act of 1937, restoration projects were implemented across the country to improve terrestrial, aquatic, and wetland habitat.

Since that time, the knowledge of river systems and the techniques of restoration have advanced considerably. Yet most of the research and restoration projects have historically occurred outside urban areas. Applying the methods from these approaches to urban waterways has had mixed success. For example, it is generally accepted that restoration and management plans should be developed from a landscape scale or watershed perspective that focuses on reestablishing the physical processes and addressing root causes of degraded ecological conditions. Roni and colleagues argue for a conceptually based, hierarchically ordered framework for waterway restoration (Roni et al. 2002). They state that initially restoration and management plans should focus first on preserving areas with intact physical processes and high quality habitat. The next course of action is to work on connecting these areas at site-specific scales, for example attempting to reconnect the hydrologic processes between a separated oxbow and the channel. Once the connectivity between high-quality habitats is restored, efforts then should focus on reestablishing the physical and hydrologic processes in the watershed. Only then should managers attempt to develop in- and near-stream projects designed to enhance habitat conditions.

Although this may be a sound course of action in theory, such an ordered approach is difficult to accomplish, especially in an urban environment. For example, reestablishing the complex physical and hydrologic processes in an urban watershed is nearly impossible. Urban areas are subject to many physical and political infrastructure constraints. Once urban infrastructure in a watershed has been established, it is unlikely that major changes will be economically or politically viable. Moreover, land cover changes often are dramatic as the intensity of land uses increases, and in some cases, the connections among processes that supported the previous conditions of the system can even be permanently severed (Platt 2006; Allan 2004). To be successful, stream restoration in urban environments requires a conceptual shift from narrowly defined ecological and process-based measures of success to an inclusive framework linking human actions with changing river conditions (Palmer et al. 2005). This necessitates an integrative attempt to diagnose the principal limiting factors in stream health and a coordinated manage-

ment approach to apply the perceived remedies at both watershed and site-specific scales (Booth et al. 2001).

Attempts to restore urban streams need to be placed within the sociopolitical and economic context of the urban environment. Over the past several decades many cities, from Boston to Chicago to Berkeley, have been attempting to restore their urban waterway environments.[2] Seattle is also on this list. Since 1999, Seattle has spent upwards of $30 million, roughly $4 million annually, in an attempt to restore and enhance its urban stream systems for both public and ecological benefit (City of Seattle 2005a). Although many of these projects are funded and implemented with the implication that improving ecological and water quality conditions are the primary focus, Palmer et al. (2005) argue that restoration activities also provide other benefits, including meeting stakeholder needs and opportunities for learning both as an educational opportunity for citizens and for advancements in the science and practice of restoration (see Figure 3). In an ideal situation, the most successful restoration projects meet all three program goals: addressing stakeholder needs, improving ecological performance, and facilitating learning.

Many of the projects associated with the urban stream restoration movement are conceived and generate support from "grassroots," citizen-based initiatives. These projects inspire residents to educate themselves about their surroundings and to become more engaged with their community (Groffman et al. 2003; Gobster and Hull 2000; Riley 1998). Across Seattle, citizen watershed groups and councils have been established, offering thousands of volunteer hours annually for cleanup, restoration, and educational activities to increase public awareness and to further protect healthy remnants of already degraded streams (City of Seattle 2005a). The city now works to partner with these groups, developing priorities and action plans for determining the most appropriate approach to care for and restore valuable ecosystems.

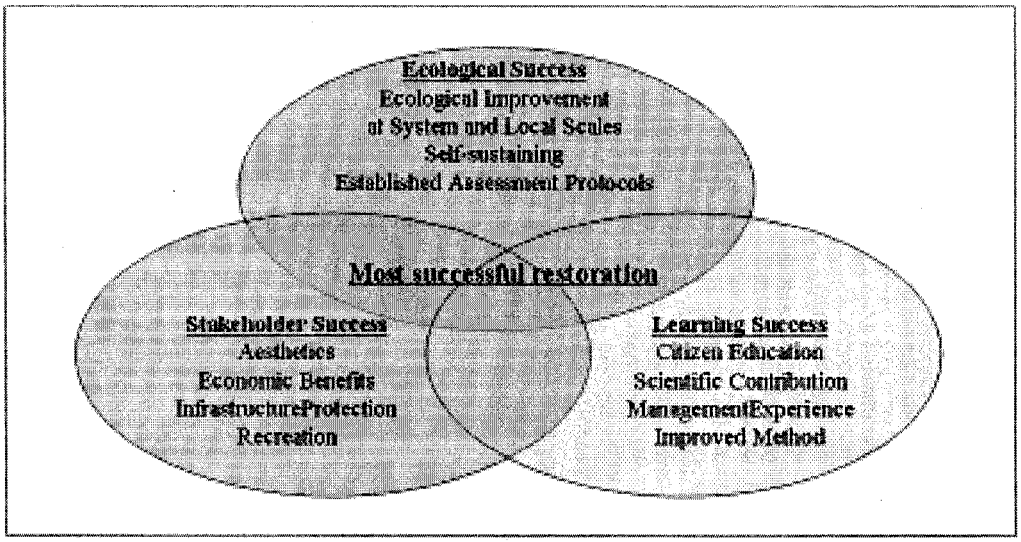

Figure 3: The most effective urban stream restoration projects lie at the intersection of the three primary criteria for success. (Adapted from Palmer et al. 2005:209)

Restoration projects also offer opportunities to learn on both personal and professional levels. Research has found that one of the greatest rewards for citizens volunteering their time to help with restoration and cleanup efforts is in developing deeper and more personal connections to the places in which they live (Groffman et al. 2003; Gobster and Hull 2000). Moreover, these opportunities educate citizens about ecological systems, helping them to understand how their efforts are working to improve the conditions of the system on which they are working (Gobster and Hull 2000).

From a professional standpoint, assessing the ecological and social impacts of stream restoration projects is critical for advancing both the science and practice of restoration ecology. Many argue that because of the absence of agreed-upon criteria and the lack of available funding offered for monitoring and evaluating projects postconstruction, much is being lost that is crucial for advancing the field (SER 2004; Hobbs and Harris 2001; Lake 2001; Brown 2000; Hobbs and Norton 1996; Bradshaw 1993). Establishing a monitoring program, which evaluates the ecologi-

cal conditions of a site, both prior to and post restoration, enables evaluations of success based on project objectives and goals (Dahm et al. 1995). Results from these evaluations can then be shared with other scientists and practitioners so they may learn from both the successes and failures of restoration strategies, ultimately advancing the knowledge of the field while reducing costs (Roni et al. 2003).

Examining the relationships between socioeconomic and ecological structures and processes can offer insight into the complexity of the cultural, social, and physical linkages between societies and the physical world around them (Alberti et al. 2003; Grimm et al. 2000; Berkowitz et al. 1999). Understanding these linkages between the nonhuman world and the built environment may enable practitioners to improve not only the conditions of freshwater ecosystems such as urban streams, but also to strive for improving the conditions of the urban environment as a whole (Booth et al. 2001; Riley 1998; Bradshaw 1993).

Research Summary and Outline

My research responds to calls from both practitioners and theorists to broaden the approaches for identifying and addressing the problems inherent within urban streams and rivers by utilizing a narrative analysis approach for understanding the historical conditions of the system and for examining the values and perceptions that participants bring to the restoration process. The restoration of urban streams is a complex endeavor that requires unique approaches because human activities associated with urban development alter stream geomorphology, hydrology, water quality, and ecology. Instead of examining a wide scope of urban and urbanizing basins and attempting to isolate a few variables to quantify distinct relationships between stream processes and disturbances, I take a more qualitative approach examining the history of physical disturbances in two heavily urbanized and altered watersheds within the city of Seattle. Taking this approach a step further, I interviewed people who are or have been active participants in visioning and facilitating the restoration process within these watersheds.

In stream restoration, the definition of the action or process of restoration is to "bring something back" or "to return" refers to returning to some previous set of physical or ecological conditions. Yet defining the logic that identifies preferred conditions is not an easy feat, and it is even more difficult to attain them by design. It is well understood that the return of an urban stream system to some idealized or pristine condition is not likely or even possible. However, I contend that although restoring a system to these preferred conditions may be beyond what is feasible, understanding the changing conditions specific to each system over the course of time gives insight into how to best design and manage the watershed to the extent possible for restoring some of the functional characteristics of these desired conditions.

To do this, I have developed a model that allows a researcher to establish a framework for examining the multiple histories of a watershed. The intent of this model is to account for physical and biological changes as well as the changing sociopolitical, cultural, and economic changes that influence the conditions of an urban system over time (Chapter 2). I use three distinct methods for collecting and analyzing data within this model (Chapter 3). The first is a spatial analysis over multiple time periods that examines not only the morphology of the watershed, but also the processes and patterns of urban development that impact the functions and conditions of the stream system, such as its hydrology, geomorphology, water quality, and ecology.

The second method is a historical analysis of the watershed that is guided by the findings of the spatial research. This section of the analysis gives additional depth to the spatial studies by examining more specifically the human actions that have caused change within the watershed. The historical analysis examines the context in which decisions were made and actions were implemented, and also examines the response to the outcomes of these actions.

The final method involves conducting a series of oral history interviews. Each of the watersheds examined in this study has already been affected by attempts to improve the quality of these stream systems. The oral history interviews invite people who are or have been actively

involved in these actions to provide their own narrative of events and of their intentions. I contend that going to the source and interviewing those who have been responsible for initiating and implementing restorative measures within these stream systems, a researcher can gain a more complete understanding of the motivations and values that are inherent in their designs and actions. These interviews also serve as an opportunity to triangulate among two analyses in search of consistent findings and omissions.

The results of my analyses of the spatial and socio-cultural histories is synthesized and presented in two narratives that describe the unique and changing set of conditions within these watersheds over time (Chapters 5 and 6). The narratives are structured so that the primary events or catalysts as well as long-term changes within the watershed that have affected the stream system are examined in specific detail. The narratives also examine the set of circumstances that created the motivations for initiating restorative measures within these watersheds and present the documented process of restoration and its outcomes.

The research model concludes by identifying themes within the analyses of the specific information that is produced through each method: spatial analysis over time, historical analysis, and oral history interviews. It also examines the themes that emerge from this approach and reviews the ways in which those themes inform and strengthen the information generated from more empirically based research methods. It concludes by reviewing the most important components and products of each method (Chapter 7).

Notes to Chapter 1

[1] See www.seattle.gov/dpd/planning/ECAupdate for information on the ECA update.

[2] For more information on the restoration efforts referred to in the cities, see Platt (2006) for a case history of Boston's Charles River; Gobster and Westphal (2004) and Hill (2000) for a thorough historical analysis of the Chicago River and associated restoration efforts; and Charbonneau and Resh (1992) for a case history and thorough historical analysis of Strawberry Creek in Berkeley, California.

Chapter 2. Grounding Knowledge: A Model for Narrative Research

> 'To explain is not to present a set of finished reasons, but to tell a story . . . . [This] is an unfinished story, told from various angles, sketchy in some parts, complete with gaps and question and unrealized characters. But it is a story, nonetheless, not a wholly determinate set of facts.'
>
> —David Abram, *The Spell of the Sensuous*

Introduction

Grounded within the emerging traditions of the postmodern movement for both generating and legitimatizing knowledge, my work attempts to embrace theoretical concepts exploring plurality in method, the power of narrative, and a belief in multiple parallel truths that may be irreducible, rather than striving to identify specific causal mechanisms or make singular truth claims about urban stream restoration. As the case study narratives in chapters 5 and 6 reveal, the processes that support the development and implementation of urban stream restoration plans can be understood as context dependent and localized. In this approach, knowledge claims for urban stream restoration emerge from a complex interaction among cultural structures, social values, individual actions, and observations of the material arrangements and processes of the physical environment (Preston 2003; Melnick 2000; Macnaghten and Urry 1998; Mugerauer 1995).

In my view, the process of achieving social, political, and environmental change is furthered by identifying and exploring the processes and frameworks of urban stream restoration through multiple theoretical views constructed across the boundaries of science, history, and design. As Richard Rorty states, "instead of seeing progress as a matter of getting closer to something specifiable in advance, we see it as a matter of solving more problems" (1998, 28). This work is about understanding how the current intellectual claims on ecological restoration "are created, legitimated, and contested" (Hannigan 1995, 3). Borrowing a metaphor from critical

theorist Bruno Latour, my research attempts to pry the lid from the "black box" of urban stream restoration by clarifying and more thoroughly exploring the objectives and values that lie inside its making (Latour 1987, 129-31)[1].

A Narrative Approach

A narrative can be simply defined as a story, historically and culturally grounded and shaped by human perspective (Wanner 1994). Presented through "narration," stories contain symbolic actions or words that have both sequence and meaning for those who interpret them (Potteiger and Purinton 1988; Fischer 1984). Postmodern theorists argue that theories of science have created what Jean-Francois Lyotard defined as "metanarratives," or grand narratives (Lyotard 1984). Understood as a descriptive representation of culture that organizes and explains knowledge and experience as a grand, all-encompassing story, a metanarratives is typified by some form of transcendent or collective truth. In his book *The Postmodern Condition* (1984), Lyotard argues that postmodernism is characterized by a distrust and skepticism toward metanarratives because they give little regard to the heterogeneity and diversity of human values and cultures. Such narratives are also perceived as historically deterministic in terms of human progress and often contain utopian views of a topic (Preston 2003). In the postmodern tradition, these grand narratives have given way to "petit recits," or small narratives, that are modestly constructed from localized structures and values that have a limited validity in place and time (Lyotard 1984). While the grand narratives depend on a solid and rigid structure, the petit narratives are less absolute, possessing an adaptive and changing construction that meets the criteria established by conditions surrounding each example of performance. These narratives produce multiple meanings and perspectives for a single action or event and are often accompanied by a wide range of possible interpretations.

Petit narratives are antithetical to the universalizing tendency of traditional approaches toward science. According to the petit narrative perspective, conditions include unique structures

and actors that cannot be generalized. Often described as located in the philosophical category of poststructuralism, this epistemological perspective argues for a multiplicity of localized interpretations and historical narratives that provide the stories for understanding the history of an action or event from the varying perspectives of the engaged participant groups and individuals (Polkinghorne 1984). Further, it argues that there is no single truth but many truths, and to truly comprehend an event or action, a researcher must at least attempt to understand all of the versions available. Insight emerges from this comparison, not from privileging one version a priori.

As anthropologist Clifford Geertz suggests, "The shapes of knowledge are always ineluctably local, indivisible from their instruments and their encasements" (1993, 4). He argues that to gain more insight into the complex relationship between knowledge, action and local culture requires replacing "thin descriptions," which focus on the narrowly empirical approach for deriving knowledge, with "thick descriptions," explorations and explanations of local contexts that look across a "multiplicity of complex conceptual stories, many of them superimposed upon or knotted into one another, which are at once strange, irregular, inexplicit" (10).

Similar to Geertz in approach, Donna Haraway (1995) uses the term "situated knowledges" to describe the ways in which people engage an action or event from particular vantage points. Although a group of people participating in an event may have similar intentions, each individual engages the action from his or her own particular vantage point that is shaped by individual values and experiences. Thus, participants provide their own perspective for how the action or event was developed, proceeded, and came to conclusion.

The approach taken in this dissertation research is complementary to those proposed by Geertz and Haraway. To borrow from Geertz's phrase, the intent of this research is to explore the "strange, irregular, inexplicit" ways in which people both interpret, make, and inhabit their surroundings. Also, it examines how these competing actions reflect the cultures of the people who are engaged and involved in attempts to restore urban streams. Although I am interested in

understanding why attempts to restore urban streams are occurring in Seattle, I am more concerned with understanding how these projects are conceived, developed, and implemented. I ask: What are the social and political motivations for conceiving these projects? What are the perceived benefits and outcomes? And mostly, what is the confluence of perceptions and actions that sometimes result in physical changes? By exploring and understanding the process of stream restoration from a pluralist perspective, incorporating competing interpretations, I argue that we can begin to approach future projects with an open mindset that utilizes historical, place-based, local knowledge into our future designs and plans.

Building Bridges

In 1998, biologist E. O. Wilson wrote, "The greatest enterprise of the mind has always been, and always will be, the attempted linkage of the sciences and humanities. The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world but artifacts of scholarship" (8). Although known for his positivist approach to science and knowledge derivation, Wilson's statement is often quoted as the intellectual impetus for engaging in interdisciplinary research endeavors.[2] He argued that the transfer of knowledge across disciplinary bounds is seldom realized because a common approach working to bridge these gaps between disciplines is missing. From this theoretical perspective, my research works to bridge this gap in regard to ecological restoration by taking a pluralist approach to "real world" knowledge derivation and development.

Landscapes and the systems that operate within them are dynamic, constantly changing both ecologically and culturally, with these vectors of change occurring over many spatial and temporal scales (Foster and Aber 2004; Kettle et al. 2000; Patterson 1994). Because of the lasting imprint of past uses of the landscape, it is essential that restoration studies utilize models that evaluate projects across this wide range of temporal and spatial scales (Tress and Tress 2001). Understanding the historical context is critical for comprehending the contemporary processes

and patterns of the landscape (Foster and Aber 2004). Yet, this understanding is complicated by the impact of human management and actions on these systems. As Bart Johnson and colleagues state, "Knowing how humans have modified natural processes and their motivation in doing so is a key step to understanding current conditions as well as potential responses to them" (2001, 318).

As part of this research, I have developed a model for historical, spatial, and narrative analysis that synthesizes Lyotard's 'petit narratives' into landscape and restoration studies. I contend that research focused on ecological restoration needs to consider within the historical context under which ecological and cultural communities of the landscape have emerged and developed.

In both theory and practice, the concept of ecological restoration is an interdisciplinary endeavor that extends across disciplinary and intellectual boundaries. To broach this issue of incorporating a narrative approach and analysis into plans for ecological restoration, I have synthesized three distinct models for interdisciplinary and landscape history research. The first model was developed by Pawson and Dovers (2003) to provide an overall framework for conducting general interdisciplinary research. The second and third models were developed in environmental history (Worster 1988) and in landscape studies (Marcucci 2000). Although similarities exist between the models in both structure and approach, I have worked to meld the distinct categories from each to effectively develop a model for narrative research that is integrated with the methods of historical analysis.

This model is distinct from the other models examined because it incorporates spatial and temporal scales of analysis as well as forms of environment, human agency, and process that alter landscape structure and function. While each of these categories is examined individually, they are not independent. They constitute a single dynamic inquiry in which the biophysical, social, and economic organization of the landscape is treated as a whole. As Worster states, "This whole

changes as nature changes, as people change, forming a dialectic that runs through all of the past down to the present" (1998, 293).

This integrated model (Figure 4) is structured upon an interactive and hierarchical framework developed from three categorical structures for analysis: composite holism, place histories, and agency and process. The first and most expansive category is composite holism. The category is formed from an appreciation and acceptance of a holistic approach for understanding the landscape and utilizes information, perspectives, and methods generated in multiple disciplines. The model is based on understanding that landscapes are holistic manifestations of physical, biotic, social, and cultural change over time and to understand these manifestations a researcher must incorporate a diversity of evidence, analysis, and representations from a wide range of expertise.

Holism is a philosophical concept that is diametrically contrary to the epistemological perspectives developed in reductionist science (Polkinghorne 1984). In this sense, where the reductionist or positivist works to identify, organize, and explain specific components of a relationship into generalizable, well-defined patterns and processes, work in holism views systems as composites, in the aggregate, and argues that to understand a system as a whole, it must be viewed as greater than the sum of its individual parts (White 2002). For the purposes of this model, the holistic perspective offers a complementary approach to reductionist frameworks by including forms of evidence and explanation that are idiographic while also working to accommodate explanations and descriptions, intentions and unanticipated outcomes with place-based and generalizable findings (Polkinghorne 1984; White 2002).

The second category is 'place histories. By definition, all landscapes are local, products of the both endogenous and exogenous physical and social interactions across time (Jackson 1980). Place history provides the spatial and temporal orientation of the landscape to the project. Developing a methodical narrative approach to understanding the landscape, requires understand-

ing the interaction of the cultural and ecological elements progressively, as a whole, across time (Marcucci 2000). Understanding the relationship in this spatial-temporal continuum enables research to identify and recreate the ecologic stages of the environment along a wide temporal scale, sometimes reaching as far back as 10,000 years (Foster and Aber 2004).

The spatial-material dimension of landscape is manifested in three subcategories: the abiotic, biotic, and "artifactual" spheres (Tress and Tress 2001). The abiotic sphere describes the geomorphic composition of the region or area in question. This primarily includes understanding how the physical conditions of the landscape were formed through, for example, volcanic or glacial activity. The biotic is primarily a description of the flora and fauna, including people, and depicts the composition and patterns of dispersal across the landscape.

An important component for understanding urban landscapes from a spatial perspective is the patterns of urban development that shape the contemporary environment, often altering the processes and functions of a specific landscape so that physical and ecological systems operate in a manner that is distinct from historical conditions (Tress and Tress 2001; Marcucci 2000; Worster 1988).This is known as the artifactual sphere. In some cases the most important aspect for understanding the patterns and processes of urban environments, this sphere describes the built components of the landscape in question, including infrastructure and buildings. Conducting research in urban ecological restoration studies requires an understanding of each of these subcategories and how they interact to influence and develop the processes and patterns of the contemporary landscape.

The time-change dimension is characterized by variable time frames and dynamic change. The processes of the abiotic sphere form the physical foundation of the landscape and tend to occur over long periods of time, from thousands to even millions of years. The biotic processes are more moderate on the temporal continuum, ranging from decades to centuries (Forman and Gordon 1986). Last, the artifactual processes of colonization and development may

occur over short and moderate periods of time and include impacts on the landscape and its processes caused by human actions.

The temporal dynamics of landscape processes and patterns are expressed in all dimensions and scales. As stated earlier, landscapes are not static, but intrinsically linked to change over time. In the time-change dimension, the interaction of both human and nonhuman action is considered in order to more fully understand the trajectory of ecosystem development and function. Along the time-change continuum, the contemporary processes and patterns of the landscape reveal legacies of past action that when examined closely provide a better understanding of the emerging and successive values projected by people toward the landscape (Foster and Aber 2004). From a holist perspective, there is no division between actions that are human induced and those that are initiated through traditionally understood "natural" processes. Nassauer (1995) notes that while culture works to structure the landscape, the structure of the landscape further influences the development and evolution of culture over time. Thus, there is an ongoing and interactive dialogue between people and the environment that cannot be differentiated.

A subcategory that unites the time-change and spatial-material dimensions of this model is disturbance regime. Disturbances are both difficult to predict and may occur over short or long time periods. They may also represent stochastic events or result from intentional action. Although events of disturbance may affect the landscape in many ways, not all disturbance events are of the magnitude to alter the physical or biological trajectory of the overall landscape. Further complicating the role of disturbances are the actions of people that have forced unprecedented change over short periods of time and remain unpredictable with respect to their long-term implications (Marcucci 2000). For example, logging and development on steep slopes may cause slumping or landslides, a disturbance that ultimately alters both biotic and abiotic processes. Disturbances such as landslides may have an immediate impact on these processes or have more

long-term implications as the soil exposed from a landslide event slowly makes its way into the surface water systems of a watershed.

This leads to the third category of the model, agency and process. This interactive category of landscape-forming processes examines the development and evolution of the contemporary landscape through cultural structures and perceptions of the landscape. For as long as the human species has existed, it has been influencing and changing the landscape (Foster and Aber 2004; Tress and Tress 2001; Marcucci 2000). The subcategory for agency and process is cultural systems. From this subcategory rises the strength of the petit-narrative, by an inherent attempt to examine the values, perspectives, and actions of individuals and groups toward the landscape. Utilizing Harroway's concept of "situated knowledges," what each person has to offer an action or event is dependent upon his or her perceptions and values that are developed through personal values and experience as well as cultural structures.

The cultural systems subcategory specifically integrates the relationship between human society and the nonhuman environment and includes the changing values and perceptions of individuals and society influenced by political and legal foundations of governance and settlement pattern, as well as technological advances and socio-economic activity. Tress and Tress write, "People are part of the landscape by means of their actions and thoughts. Through human thought, landscape becomes part of people" (2001, 150). Understanding how perceptions and values that both individuals and society have toward the landscape emerge and evolve over time can aid in understanding and describing the influence of cultural systems on the landscape.

For example, the dramatic shift from Native American influence to Euro-American control was an important period of societal and cultural transition in the Pacific Northwest. It is well understood that the native tribes of the region managed much of the area through the use of fire and stream control structures to increase the productivity of the landscape for their purposes. The concept of land ownership, as we know it today, however, was not a component of their

cultural system (Thrush 2002). As Euro-Americans arrived in the region in large numbers during the latter half of the nineteenth century, they viewed and managed the landscape from a much different perspective, as an economic resource. By 1900, much of the land in and around Seattle had been claimed under the auspices of the Homestead Act of 1862 that ostensibly gave 160 acres of land to settlers, with few restrictions. The pattern of settlement changed dramatically in the region and became the foundation for contemporary perspectives of landscape ownership and management.

The categories described above for constructing narrative histories in ecological restoration are not entirely distinct; their influences and structures have ways of seeping through the porous categorical boundaries developed in this model. Nonetheless, I hold that "petit-narratives" in combination with the experiential "metanarratives" provide reliable empirical insight into the localized social and cultural context of urban stream restoration. Although the categories employed in the historical narratives are not as precise or determinant as a mathematical equation, for example, it is this flexibility that enables the understanding of the multiple perspectives and narrative histories within a localized context. After all, there are always dominant and subdominant narratives in any discourse that attract, mobilize, and engage people (Guy and Moore 2005; Nye 2003). As John Dryzek suggests, it is these narratives that "help to constitute and reconstitute the world just as surely as do formal institutions or material economic forces" (1997, 201). In the context of this research, the narrative discourse is contingent on how citizens, government officials, and restoration scientists perceive their interests at any given time and how those perceptions change or are altered over the course of a project. The model proposed in this chapter is not meant to finalize the longstanding debate on the foundations and structure of knowledge, but is instead designed to offer opportunities to explore what the contemporary issues in urban stream restoration are and to reveal their forms.

As D.W. Meinig writes, '[L]andscape is composed not only of what lies before our eyes but what lies within our heads.' The landscape analysis model for constructing historical narra-

tives I develop in this research helps us to more fully comprehend the distinctions and similarities between what is perceived and experienced in the landscape. By understanding the dialogue that joins evolving perceptions and the dynamic physical and biological landscape, I argue that a researcher can gain insights that link the past and present, with an eye toward the future. Exploring the many histories that emerge from specific analysis of the physical, biotic, artifactual, and cultural spheres reveals changes that could represent ecological stages, cultural periods, and formative processes. This model proposes an approach to understanding the landscape as an integration of social, cultural, and physical layers. By conducting thorough historical research on a landscape we can improve description, prediction, and prescription in planning for our future (Marcucci 2000; Worster 1988).

Composite Holism

Holistic approach that views systems as irreducible composites and includes forms of evidence that are generalizable (metanarratives) and idiographic (petit narratives)

Place Histories (metanarratives)

Provides a spatial and temporal orientation for examining landscapes that incorporates the interaction between cultural and ecological spheres of influence

Spatial – Material

Contemporary processes and patterns of the landscape are influenced by past conditions and disturbances

Abiotic

Geomorphic composition of the landscape

Biotic

Distributive patterns of flora and fauna (including humans) across the landscape

Artifactual

Built composition of the landscape including infrastructure and buildings

Time – Change

Contemporary processes and patterns of the landscape reveal legacies of past disturbances and actions

Abiotic

Foundation variables that tend to occur over long periods of time, thousands to millions of years

Biotic

Processes and patterns that occur over moderate periods of time, decades to centuries

Artifactual

Built structures that arise over short to moderate periods of times, years to centuries

Disturbance

Stochastic events or persistent occurrences that can alter the physical, biological, and artifactual trajectory of a landscape

Agency & Process (petit narratives)

Examines the development and evolution of the landscape through cultural structures and social perceptions across time and space

Cultural Systems

Integrates the relationship between human society and the nonhuman environment by examining the perceptions, values, life experiences, and tropes of both individuals and groups toward the landscape

Figure 4: Integrated model for a narrative approach to landscape analysis

Notes to Chapter 2

[1] The phrase "black box" comes from Royal Air Force slang for a navigational instrument in an airplane; later the meaning was extended to denote any automatic apparatus performing intricate functions (Oxford Online 2006). Latour uses the phrase in the latter context, arguing that modern approaches to science and technology have packaged understanding and distilled knowledge into a format that inhibits comprehension of complex actions, events, or artifacts.

[2] Polkinghorne (1984) equates the positivist tradition with the deductive, single-method tradition in science. He argues, "Its primary themes can be summed up in three statements: (1) All metaphysics should be rejected and knowledge confined to what has or can be experienced. [. . .] (2) The adequacy of knowledge increases as it approximates the forms of explanation which have been achieved by the most advanced sciences. (3) Scientific explanation is limited to only functional and directional laws or to only mathematically functional laws (18-19).

Chapter 3. Methods

> 'The generalist, lacking the security and guidance of disciplinary boundaries, must simply follow where the topic dictates.'
>
> —Neile Evernden, *The Social Creation of Nature*

Introduction

My research is an interdisciplinary endeavor. It blurs boundaries, works the edges, and delves into the cracks of disciplinary structures to make history more applicable, to bring place to science, and to improve and inform restoration design. Using urban waterway restoration as an example, this research explores the historical, geographical, material, social, and cultural continuity that bridges traditionally distinct disciplines. Accepting the restoration process as a multi-faceted and complex endeavor, I have utilized a qualitative case study approach that incorporates not only factors of empirical and scientific interest, but also allows for a more in-depth analysis of the breadth of changing and emerging societal values.

Robson defines case study research as "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context, using multiple sources of evidence" (1993, 5). This approach examines an individual case in its own context, not as a sample from a population of similar events (Creswell 1994; Yin 1994). The use of "multiple sources of evidence" commonly produces data both quantitative and qualitative in nature (Robson 1993; Yin 1994). The interpretive landscape history model and multiple methods of inquiry utilized in this research are integrated in an effort to develop a spatial and temporal understanding of the changing physical conditions and emerging social values in the watersheds examined.

I take an interpretive and qualitative stance utilizing methods in history to identify, collect, and analyze data for understanding the motivations and perceptions that drive the urban stream restoration movement (Arnold 1996; Shafer 1974). This enables me to account for the fundamental and often radical historical shifts and variations in the values, meanings, and perceptions that society imbues onto its surroundings. The validity of the project is strengthened through disciplined generalization and thorough reflection on the principles and theory behind urban stream ecology, coupled with rigorous interpretation of the evolving societal values and judgments of people regarding nature (Schwandt 2003; Polkinghorne 1983).

I use three distinct yet interacting methods for constructing the landscape and restoration narratives of the Ravenna and Longfellow Creek watersheds. These methods consist of, first, an empirically based spatial analysis of the changing physical conditions of each watershed, examining both land cover alterations and changes to the flow of water across the landscape. Second, I conduct a historically focused text and image analysis of each watershed within the context of the surrounding city and region. Providing depth to the spatial analysis, this method examines the evolving perceptions and values that communities displayed toward these small streams over time. Last, I have conducted oral history interviews of people who are or have recently been active in the restoration process for either or both Ravenna and Longfellow creeks. These methods are used to develop the case narratives of the two small urban watersheds, looking explicitly at the environmental history and what may be the physical and socioeconomic drivers and processes associated with urban stream restoration. The methods are also applied to each case to more fully understand the evolving perceptions and subsequent interactions that people have with their surroundings.

The two case history projects on the Ravenna and Longfellow watersheds were chosen for this analysis based on several factors. First, and most important, both stream systems have been modified in recent years through restorative and rehabilitative practices. Roughly 650 feet of Ravenna Creek has been returned to the surface after being placed within a pipe more than half a

century ago and nearly one quarter of the open channel stream in Longfellow has been actively restored to increase viable fish habitat while further increasing the ability of the system to accommodate high-flow events. Second, both watersheds are located within Seattle, with Ravenna Creek draining to Lake Washington and Longfellow draining to the Puget Sound. Third, both watersheds have well developed and active community groups that have been engaged in attempts to restore the stream systems from the beginning. And finally, both Ravenna and Longfellow creeks have interesting, rich, diverse, and layered local histories that strongly reflect the physical and social transformations of Seattle as the city emerged from a small, frontier outpost in the Pacific Northwest to a major, globally influential city.

Spatial Analysis

To physically characterize each of the basins, I conducted a spatial analysis utilizing both contemporary geographic information and historical maps. I employed federal land survey records for the Puget Lowlands collected by the General Land Office (GLO) between the 1860s and 1890s to construct a picture of the early settlement landscape for both of these watersheds. The maps and descriptions produced by these surveys have become an invaluable resource for many historians, ecologists, and botanists attempting to reconstruct early landscape conditions (Shulte 2001; Whitney and DeCant 2001; Collins et al. 2003; Larson 2005). I also used early maps produced by the U.S. Geological Survey (USGS) around the turn of the twentieth century that provide more detail for understanding the historical conditions of these small watersheds (USGS 1897; USGS 1908).

I digitized (converted to a digital format from hard copy) each of the historical maps using Geographic Information Systems (GIS) and overlaid them with contemporary spatial information on land use, infrastructure, and topography made publicly available from King County and the City of Seattle. Each of the maps (layers) represents a different period in the watershed, and by overlaying the layers, I was able to discern trends and patterns of development over the past

century to attain a more detailed understanding of the extent and distribution of human influence within the basin. For example, today's Longfellow Creek watershed is dominated by urban development; however, this transition from a predominantly undeveloped community of "wild character" into the industrial, residential, and business districts of the contemporary conditions did not happen overnight (LCWMCa 1992). Most of the development occurred in discrete sections of the watershed at different times over the past 150 years. By identifying the extent and rate of physical transformation in the watersheds, I was able to draw a clearer picture for understanding the hydrologic changes that have occurred.

I further utilized the geographic information to discern changes to the morphometric (birdseye view) pattern of the stream to determine periods in which the stream channel was altered through channelization or piping. Coupled with spatial data of the extent and distribution of drainage infrastructure in the basin, I was able to determine locations of high stormwater inputs to the stream, as well as to show how the spatial extents or boundaries of the watersheds have been altered.

Conducting a watershed scale analysis over time increases the capability for understanding the changing physical and hydrological structure of these basins; however there are definite limitations to the use of such a methodology. As Collins and colleagues state, "Our knowledge of historical environments, especially those greatly changed by anthropogenic forces, is inherently uncertain" (2002, 82). Maps are representations of the landscape, and early cartographers were not afforded the technological benefits used today (Reithmaier 2001). Thus, early spatial representations of the landscape (hand-drawn maps) are often geographically askew or out of scale, and the small stream systems, like the ones analyzed in this research, are only generally located. My reconstruction of the historical landscape in these watersheds was thus limited by the completeness and reliability of the available data, and I could only deduce relatively broad, less detailed descriptions about physical patterns and hydrological processes. The following method-

ological approach, what I call "applied history," filled gaps and provided depth to the spatial analysis.

Applied History

Guided by the explicit findings of the spatial analysis, such as watershed boundaries, landcover changes, and stream alterations, the next methodological stage examined the social, political, and economic contexts for the emerging patterns of development within the watersheds. I conducted extensive research of historical texts, images, and periodicals within the context of the surrounding city and region, yet with a focus on each watershed. This approach provided detail to the general spatial framework or timeline developed in the spatial analysis to move beyond the question, What changed? and to begin to more fully understand why these watersheds were altered in the ways that they were across the course of development history within the region. My interest was in developing an understanding of the perceptions that the communities have had in relation to these creeks and how those perceptions may have changed over time.

For this analysis, descriptive information was gathered from many sources found in public and university libraries and museums, including journals and accounts of the first explorations and settlement of the area, records of Hudson Bay Company employees, field notes from surveyors of the General Land Office, and newspapers. I also relied on the published works of many anthropologists, ethnographers, and historians whose focus ranged from covering the entire Puget Sound Region to local histories of the neighborhoods within and surrounding each watershed. Contemporary reports with a historical component were also consulted, as were reports of fishery investigations and stocking records from state, federal, tribal, and local management sources.

Moreover, I utilized the extensive database of historical photographs available from various institutions around the Seattle area, including the University of Washington and the Museum of History and Industry (MOHAI). Historical photographs are a potent tool for examin-

ing and understanding the processes of biological and physical change and distribution on the timescale of decades and centuries. The images are particularly valuable for understanding the interactions between humans and the landscape (Bierman et al. 2005; Rogers et al. 1984). Examining physical features and change over time enables inferring how societal changes have shaped landscapes, as well as how landscapes have shaped societies (Hart et al 1996).

Even with the geographic similarity, the sources of information for each watershed varied greatly. For much of the historical analysis in the Ravenna watershed, I relied on historic maps, newspaper articles, park reports, early land surveys, brochures, and photographs. In contrast, a number of oral history projects have been conducted within the Delridge neighborhood as part of the Delridge Neighborhoods Development Association (DNDA) mandate to preserve the local history of the area. These oral histories have provided a wealth of information on the Longfellow watershed and offered insight that I would not have been able to gain otherwise.

It is rarely stated explicitly in historical work, but as an interpreter of the past, a historian takes on the responsibility of providing an accurate record of events and actions. Inherent in historical studies, however, is often a lack of available data from which the researcher must make his or her best interpolations (Gaddis 2002; Cronon 1983). In other words, an entirely accurate account of history is rarely possible. Therefore, it is incumbent upon the researcher to make the most honest interpretation of the data available using multiple sources of information that support the record of other sources. I have attempted to do this to the best of my ability, noting areas where little or incomplete information exists.

Oral History Interviews

Following the spatial and historical analysis of each watershed, I conducted the oral history interviews with individuals who were or are actively engaged in the restoration process of these watersheds. The purpose of the interviews was to more fully comprehend the intricacies, tribula-

tions, and perceived benefits of these restoration projects. The interview participants consisted of individuals from three distinct stakeholder groups: community volunteers (3), public agencies (8), and environmental consultants (2). The eight public agency employees were split evenly between employees of the Seattle Parks and Recreation Department (SPRD) and Seattle Public Utilities (SPU). These interviews provided a first-hand account of how the restoration process evolved, from both group and individual perspectives.

Philosopher Wilhelm Dilthey has argued that understanding the meaning of a person's actions requires grasping the intent of the person from his or her perspective (Dilthey 1958). The interviews were structured so that the participants could reflect and expound on their perceptions of and actions within the restoration process. Organized into two sections, the interviews were designed to have the participants speak about their engagement with the projects and to expound on how their perceptions and motivations of and toward the project evolved over the course of their involvement. The information collected from the first section was used to triangulate and give depth to the data collected through the more formal historical and spatial analysis, as well as to provide context for understanding the objectives of the overall projects from multiple interpretations. The second section of questions was posed to elicit more general comments from the interview participants about their perceptions and attitudes toward urban stream restoration. Each of the questions in this section was carefully crafted in an attempt to guide the practitioners of restoration (the interview participants) to address the more philosophical and theoretical issues of restoration derived from the literature. The responses were analyzed using general methods in discourse analysis, focusing on thematic trends in the responses of participants, both as individuals and as representatives of a particular stakeholder group (Bernard 1995). The themes, both common and inconsistent, provide grounding for understanding the root objectives and the values each of the participants holds for these projects.

These findings, gathered from the interviews with engaged citizens, environmental consultants, and city agency employees, have highlighted a number of important themes about the

pragmatics of stream restoration within the urban environment. Although I have analyzed the transcripts of these interviews for trends, I would like to note the limitations of such analysis here. The primary limitation to this component of my research is that the interviewees were few in number (13). There have been and are many more participants involved in the urban stream restoration process who would bring further richness to the complexity of issues, objectives, and values that participants in urban stream restoration projects bring to a larger narrative. The interviewees were selected because of their intimate involvement in the projects, such as in the case of the citizens and city agency employees interviewed, or by their expertise and involvement in the issues and processes associated with urban stream restoration.

Because of the limited number of interviews completed, I make no sweeping claims as to the value of these findings to urban stream restoration in general. Instead, the interviews have been utilized as a single component of the "thick" descriptions I have developed for the two case studies in this work. These interviews by no means represent all of the views and perspectives about these specific projects or for urban stream restoration in general.

Chapter 4. A Landscape in Context

The Physical Landscape

The City of Seattle is the geographic and economic center of the Puget Sound region of Western Washington. Noted by some as a historically "bad place to build a city," it resides along the junction between land and sea (Thrush 2006, 89). The region is embraced by the Cascade Mountains to the east and the Olympics to the west, while locally, Puget Sound and Lake Washington bound the city on each side. This combination of mountains, steep lowland terrain, and water provides the ingredients for a city set within a dramatic landscape filled with spectacular vistas. The climate is maritime and mild, with average annual temperatures ranging from approximately thirty-three to forty-four degrees Fahrenheit during the winter months, and fifty-two to seventy-five degrees Fahrenheit in the summer. Nearly three-quarters of its annual rainfall (~thirty-eight inches) falls in the autumn and winter seasons (NWS 2006).

Formed during the Fraser glaciation ending roughly 10,000 years ago the lowlands region of the Puget Sound Region was shaped by the slow advance of the Vashon glacier, which is estimated to have been some 3,000 feet thick near Seattle's location, extending south some sixty miles (Franklin and Dyrness 1988). As the glacier melted and the ice retreated, the water produced from the melt further carved the valleys of the land below. The valleys and ravines through which today's rivers and streams flow owe their existence to that long vanished glacier (Kruckeberg 1991).

The soil structure of the lowlands region is composed primarily of glacial till mixed with shallow accumulations of organic material along ridgelines and hilltops, with more fertile and deeper organic accumulations typically found in lower-lying areas and river valleys (Larson 2005; Kruckeberg 1991; Franklin and Dyrness 1988). This organic soil structure, known as forest duff, both supports and is supplied by the dense, primarily coniferous, forests that historically

blanketed the region (Omernik and Gallant 1986; Franklin and Dyrness 1988). The forest duff is estimated to have ranged in depth from twelve to eighteen inches across the low-lying hills and valleys in and around the present location of Seattle. These organic soils have high moisture retention thresholds that worked to detain precipitation and allow for absorption into the ground-water table. As human activities such as logging, agriculture, and urban development spread across the region, this duff layer was removed, dramatically changing surface hydrology conditions and creating runoff.

Although these coniferous stands dominated the larger forest matrix of the landscape for several thousand years, other ecosystems—deciduous forest stands, wetlands, peat bogs, and open meadows—also existed, depending on local conditions (Kruckeberg 1991; Franklin and Dyrness 1988; Rigg 1958). Recent research examining the character of forests in and near Seattle around the time of Euro-American settlement reveals a heavily forested landscape of dynamic conditions (Larson 2005). Most of the steep hill slopes and valley bottoms were covered in coniferous stands of complex, multi-aged forest that were the products of localized disturbances such as tree falls, landslides, and floods. While the forests are largely characterized in this research as old growth (more than 200 years), very few exceeded 300 years in age (Larson 2005). Most of the forested areas displayed legacies of past disturbances (Larson 2005; Kruckeberg 1991). Older forest stands tended to contain stands of younger trees in areas where the forest canopy had been thinned by wind and fire (Larson 2005).

The Social Landscape

Although many historians of the Seattle area have in the past begun their narratives with the arrival of the Denny party in November of 1851, it was not a region without prior history. For thousands of years before the arrival of Euro-Americans, tribes and loose-knit communities of native peoples inhabited the region, subsisting from and managing the available bounty of land and water with established settlements and advanced methods of hunting, fishing, and even

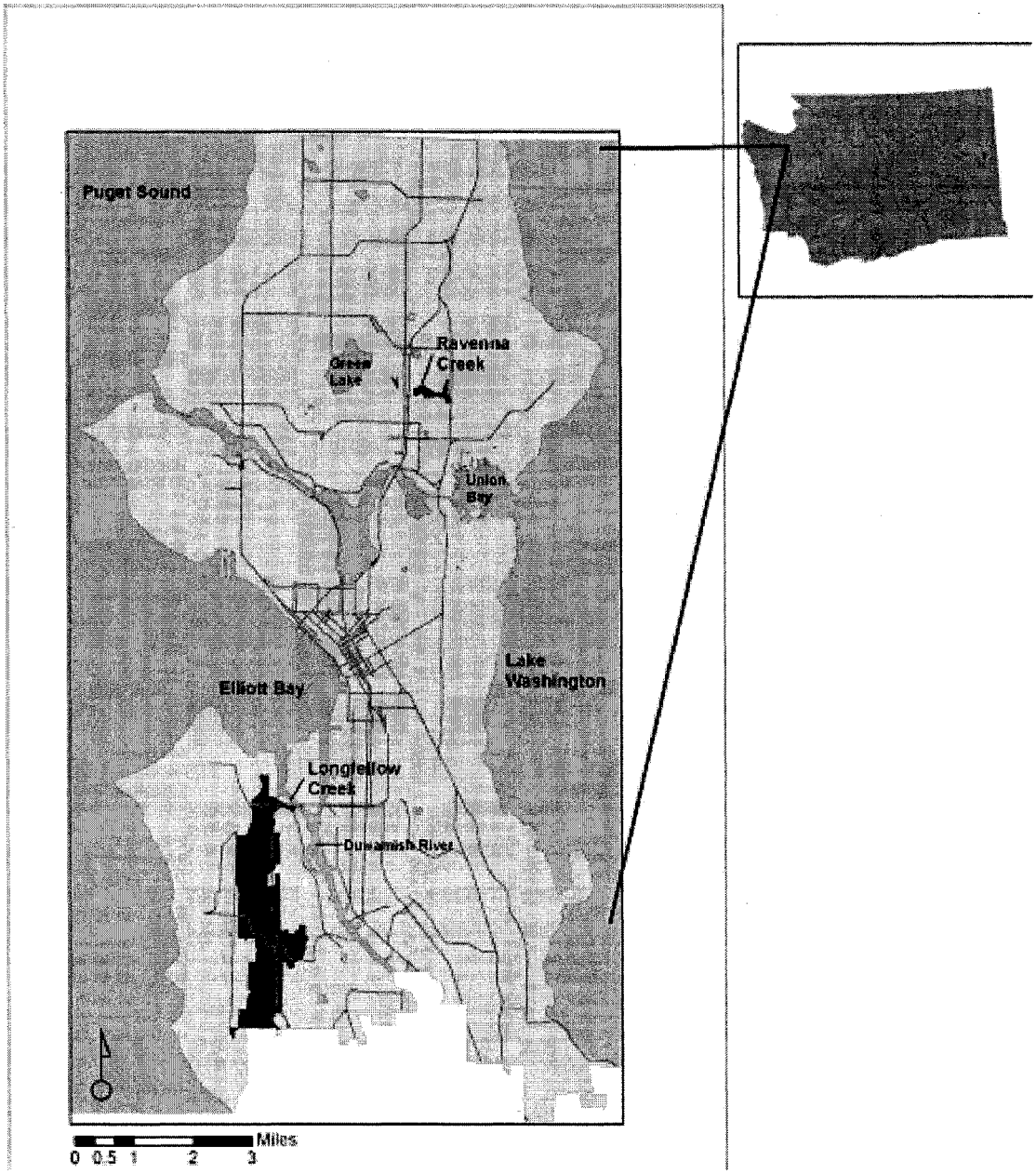

Figure 5: Case study watersheds; Ravenna and Longfellow Creeks.

agriculture. Many of the tribes actively managed fires to burn the dense forest undergrowth in an effort to maintain open areas and manage for wildlife and subsistence plants such as berries (Duwamish et al. 1927).

People first began migrating to the region after the last glacial retreat (Boyd 1999). Over thousands of years, communities grew in number and evolved cultural practices for creating the rich and diverse cultures that early Euro-American settlers first experienced when sailing into the region. Conservative estimates for the mid-1700s gauge the overall population of native people in the Puget Sound Region to have been greater than 30,000. Accurate estimates are difficult, however, because unlike the Euro-Americans who resided in relatively permanent settlements, the native people of the Puget region led a transitory life dependent upon seasonal changes, climatic conditions, and the distribution and availability of food resources (Boyd 1999).

Over the centuries, loosely organized communities developed a socially complex and distinctive culture, physically and spiritually intertwined with the mountains, forests, and waters of the region (Thrush 2002). Most of the native people of the Puget Lowlands subsisted on a diet of salmon and other freshwater and saltwater fishes, shellfish, a large variety of edible berries, some roots and bulbs such as camas, and larger animals, such as deer, elk, and bear (Thrush 2002; Larson 2005).

By the early nineteenth century, widespread disease had begun to decimate the populations of native people. Few if any of the native encampments and villages were spared the rampant spread of disease. In some cases, whole tribes had been lost, and most represented mere shadows of their former existence. It is estimated that with the first wave of smallpox, some 30 percent of the central Puget Sound population of native peoples were killed (Boyd 1999). Many early explorers and settlers in the region described the area as seemingly abandoned, with past village sites and wooden structures defunct and decaying (Grant 1891; Buerge 1992). George Vancouver noted this decrease in population in his voyage into Puget Sound in 1792: "Not many years since,

each of these places might have been allotted to the inhabitants of different societies, and the variation observed in their extent might have been conformable to the size of each village; on the scite [sic] of which, since their abdication, or extermination, nothing but smaller shrubs and plants had yet been able to rear their heads" (Meany 1949).

When Euro-American settlers began arriving in substantial numbers during the latter half of the nineteenth century, they entered a region undergoing cultural upheaval. From the pre-contact population estimates of nearly 31,000, only about 11,000 native people remained in the Puget region. Epidemics of smallpox and measles swept through the region in waves arriving along three fronts: from the Pacific Coast to the west, the Columbia plateau to the south, and across the Cascade Mountain range to the east (Boyd 1999). After more than two generations of widespread pestilence, native cultures were shattered and populations decimated. When the early settlers arrived, "they intruded upon a world already in the midst of profound changes. New networks of trade, imperial reconnaissance, and most important of all, epidemic disease" served as the historic prelude to the founding of Seattle (Thrush 2002). Such dramatic mortality rates transformed the culture of the native people, drastically reconfiguring the cultural and societal practices established over thousands of years.

Three relatively distinct communities of native peoples were part of the Puget Salish tribes in the immediate Seattle area: the Duwamish that resided predominantly along the lower reaches of the Duwamish River; the People of the Entering and Emerging Place, living on the tidal inlet of Salmon Bay; and the Lake People of Lake Washington. Forming a loose conglomeration of localized communities, these relatively distinct groups were inherently connected through cultural traditions and social practices. They were also connected to the much larger spatial and social network of communities that resided in the region (Thrush 2002). Between 1778 and 1848, outbreaks of smallpox and measles reduced the estimated population of the immediate area from roughly 11,000 to less than 5,000 inhabitants, with a mortality rate of 60 percent (Boyd 1999).

Many of the histories of the establishment and rise of Seattle as the major socioeconomic metropolitan area in the Pacific Northwest begin with the arrival of the Denny party in 1851 or the arrival one year earlier of the Van Asselt party, which established homesteads farther up the Duwamish River valley. It is important to understand, however, that as historian Coll Thrush stresses, the already well established culture of the region had been shattered. "[I]f [George] Vancouver and other Europeans tended to see indigenous North Americans as "people without a history," the evidence of that history, in the forms of fallen-in roofs and silent prairies turning to forest, was everywhere" (Thrush 2003). When the early Euro-American settlers arrived, the region was in the midst of a societal transformation that would even more dramatically and rapidly evolve over the next 150 years to the present day.

Urban Transformations

Euro-Americans who began to settle in the region between the 1860s and 1890s established and ensconced themselves onto the landscape in ways that the native cultures of the region had never done. A primary difference was the ways in which they viewed and valued the land and its resources. A good example for describing this difference is proffered by historian Linda Nash (2000) in her analysis of the changing societal perceptions of the Skagit River, roughly thirty miles to the north of Seattle, between 1870 and 1930. Using the journals of early cartographers employed by the U.S. government to map the region, Nash juxtaposes the methods of the Euro-American for measuring and quantifying the landscape with the maps created by their Native American guides. She writes that Native American "maps reflected the relative significance of specific features, rather than precise physical distances. They mapped what was useful to them, and large areas remained outside the realm of their interest and expertise (1607). For the native people, knowledge of the landscape was situated in their experiences, travel, and use; a geographically precise conception and depiction of the landscape was of little importance.

Accurate cartographic representation was important for the Euro-Americans, however, both because they had little experience with the region's landscape and because the motivations of many were grounded in the capitalist traditions of Western culture (Berner 1991). The landscape and its resources came to be viewed as a commodity that would form the economic foundation for supporting settlement and growth within the region. Between 1851 and 1890, Euro-American settlers, initially supported by land claims given to settlers by the U.S. government under the Donation Land Act of 1851, which allowed claim to 160-acre parcels of land, quickly divided the region along parcel lines (Buerge 1986). No longer were the boundaries and features of the landscape understood through experience and use; the land became divided on the basis of seemingly arbitrary ownership lines that eventually formed the basic physical pattern on which the City of Seattle developed.

Between the latter decades of the nineteenth century and the early decades of the twentieth, efforts were undertaken to transform the land and waterways in and around the growing city (LeWarne 2002). The most prominent example of this land transformation was the undertaking of nearly sixty regrading projects between 1898 and 1931, in an effort to create a more efficient landscape upon which to build the city (Klingle 2001). Altogether, city engineers changed the topography of the landscape to accommodate more than twenty major roads in and around the city and entirely removed the 250-foot Denny Hill perched along the shores of the Puget Sound. Named for one of the original founders of the city, the hill was viewed as an impediment to its progress (Klingle 2001; Sale 1976). The spoils generated in these regrading efforts were used elsewhere around the city, most prominently as fill material for the intertidal marsh near the mouth of the Duwamish River on the south side of Elliott Bay.

Viewed as progressive attempts to create a more efficient and orderly landscape on which the city would grow, the major land transformations were occurring at the same time that city engineers were also transforming the major waterways that surrounded the city. In the Puget Lowlands, people have utilized these extensive waterways that frame the region for most of the

past 10,000 years (Buerge 1984). Around Seattle, native people built seasonal and permanent encampments on large bodies of water—such as Lake Washington, Puget Sound, and the Duwamish River—because these dynamic and biologically rich places provided sustenance for survival (Buerge 1984). It is well recorded that native peoples used these waterways as transportation corridors, as well as food sources, building fish weirs and basket traps to capture the fish and aquatic organisms that resided in the watery environment (Thrush 2002; Klingle 2001). Upon the arrival and settlement of Euro-Americans in the region, the waterways were utilized more extensively as transportation corridors for moving from community to community and for transporting natural resources such as timber to faraway places, such as San Francisco in the early years and Asia more recently (Schwantes 1989; Booth 1991; Collins et al. 2003).

Most of the rivers in the Puget Sound region underwent extensive change as Euro-Americans began to settle the region. In an attempt to facilitate river navigation and to alleviate flooding events, much of the physical structure in the streams, such as fallen trees and woody debris, was removed, and levees and dikes were built to drain the wetlands (Collins et al. 2003). During the early- to mid-1900s, dams were built to harness the hydrologic power of the rivers in the region to supply the energy needed to support the growing human population, while extensive urban development distorted the hydrologic cycle, thus altering the functional characteristics of local waterways to an even greater extent (Booth, 1991).

The greatest transformation of the waterways surrounding Seattle occurred with the opening of the Montlake Cut in 1916, creating a new outlet for Lake Washington and essentially replumbing the hydrology of the entire watershed (Chrzatowski 1983; Ajwani 1956). Deemed by many within the city as an action necessary to more efficiently connect the lake to the sound for transportation and commerce, this action lowered the lake by more than fifteen feet. Historian Matthew Klingle writes, "It was as if a plug had been pulled and a giant sink emptied" (2001, 71). Land and waterway transformations wreaked havoc on many of the functional physical and biological characteristics of the region. By the 1930s, many of the major physical changes that

were to occur to the landscape were coming to end. The hills had been removed and waterways realigned, all in an attempt to create a more efficient landscape for urban development.

Over the next several decades, alterations and degradation of the land and waters occurred in less obvious, more insidious ways (Chrzastowski 1983). As the population of the city grew and the intensity of development increased, pollution levels in the surrounding waterways also increased. Few sections of the city were supported by wastewater treatment facilities, and the growing population that lived within the Lake Washington watershed dumped effluent directly into its waters. During this time, the residents of Seattle were experiencing first-hand the impact that people were having on the local environment. Over the decades, Lake Washington became so polluted that large algal blooms occurred across the lake. Residents quickly responded, and in 1958 voted to form the Municipality of Metropolitan Seattle – Metro. A regional agency, Metro quickly took on the task of cleaning the lake and ended the pumping of raw sewage into its waters. The water quality of Lake Washington was largely improved by these actions. In 1950, an eight-inch disk was visible from the surface of Lake Washington at a depth of twelve feet, but by 1966, the lake had become so polluted that the disk could not be seen more than two feet below the surface. After nearly three decades, in 1993 the disk was visible at a depth of twenty-five feet (Lane 1995).

On the metaphorical coattails of Metro's efforts to clean up Lake Washington, concerns over the environmental health and quality of the region began to spread from the larger water-ways to the smaller streams and channels that permeated the landscape and flowed through residential backyards. As early as the 1970s and 1980s, residents of Seattle were forming groups dedicated to protecting streams that ran through their neighborhoods and backyards (Buerge 1997). Nancy Malmgren, for example, has worked for decades to conserve the conditions of Piper's Creek, a small drainage in Northwest Seattle that flows mostly through Carkeek Park before emptying into the Puget Sound. Returning salmon had disappeared from Piper's Creek in 1926, but after decades of work by local residents, including Nancy Malmgren, to support the

creek, salmon returned in 1987 and have utilized the system annually for spawning ever since (City of Seattle 2005b).

This fight has not been easy, with success stories few and far between during the early years. Cheryl Klinker, citizen activist and past president of the Thornton Creek Alliance, said that trying to get city officials to come and look at the creek "was like pulling teeth. Habitat conservation was not even in their scope. Got a flooding problem, put it in a pipe. They've come a long way" (Dietrich and Schneider 2000). In 2003, Yes for Seattle, a non-profit group, collected 22,000 signatures for a ballot measure that would have required the "daylighting" of once open segments of stream that have been put in a pipe (Mulady 2003). Following attacks by real estate interests, developers, and the Port of Seattle, a court ruled that such a land-use matter could not be decided by initiative, and it was kept off of the ballot. Several locally based environmental and stream support groups are continuing to argue for the streams. Knoll Lowney, an attorney and community activist, said, "We want to preserve the option to daylight in the future by ensuring that a developer cannot place a building on top of a creek, whether that creek is temporarily in a culvert or not" (Stiffler 2006).

For many in the region, salmon, a "charismatic megafauna," has become a metaphorical measuring stick of environmental health, but restoring waterways for salmon is no easy feat in and around urbanizing areas. Much of the effort in the Puget Sound Lowland region so far has focused only on the site specific benefits of restoration, and although there are coordinated efforts to unite, prioritize, and guide these projects, the challenges are daunting (Gustav et al. 1994). As former Seattle Mayor Paul Schell said in 1999, "In the Puget Sound area a single salmon can migrate through 28 different jurisdictions during its life cycle" (Schell 1999). The coordination of waterway restoration efforts among jurisdictions is critical and has become a primary focus for many examining the reestablishment and stabilization of fish species currently listed under the ESA.

At the turn of the twenty-first century, Paul Schell sponsored a set of initiatives called the "Light, Water, and Woods Millennium Project" that focused on building a lasting environmental legacy in the city (Seattle Arts Commission 2000). Referring to the project's intention to reflect the commitment of Seattle to its nonhuman environment, Schell said, "This is an important transition. It is a time of commitment and renewal" (Phuong 1999).

The two narrative case histories on the processes of urban stream restoration that follow examine conditions and multiple narratives on both a local and regional scale that set the stage for this "time of commitment and renewal." Examining the multiple histories of each watershed, the case histories combine the metanarratives of the physical and social histories of these places with the petit narratives of local perceptions and values in order to explore the changing physical conditions of the watersheds and the actions undertaken to restore them.

Chapter 5. Ravenna Creek

On Mothers Day, May 14, 2006, community activist and President of Ravenna Creek Alliance (RCA), Kit O'Neill stood on the banks of Ravenna Creek clutching the edges of a temporary podium. Smiling broadly, she addressed a large crowd of onlookers there to celebrate and commemorate this small urban stream.

In her speech she stated, "I've been an advocate for this invisible creek for the past 15 years. Many people have been part of the project that you see here today. Our original vision was a very bold one, to take Ravenna Creek on the surface from the south end of this park all the way down to Union Bay. That route was more than 4,000 feet long. We believed that it could be done...we still do. But we learned that in the real world you have to juggle competing issues, status quo versus change, and political will versus political reality." She went on to say, "My efforts have been to keep the idea alive, to make sure it got judged on its merits, to work to get the community to embrace the idea....This is and always has been a grassroots project, native grassroots. I am proud today of what has been accomplished. It's not the full vision we started with, but it is an extraordinary and beautiful and ecologically valuable thing."

This day marked in both time and space the beginning to an end. Although the final design and construction of the "daylighting" project was to some a disappointment, others took the action as a success, no matter how small.[1] The early visions of a tumbling stream, 'teeming with fish,' flowing through neighborhood and shopping mall, from park to lake, are gone. The political and economic realities of Seattle had long since dimmed the light for the Ravenna Creek project. While initially supported by local politics and public agencies, changing land ownership and shifting political priorities nearly shelved the project altogether.

Today, the daylighting of Ravenna Creek has extended the open channel length of the stream by nearly 650 ft. Located entirely on publicly owned park land the daylighted section is designed to mimic the the patterns of less disturbed streams in the region. Perhaps the most

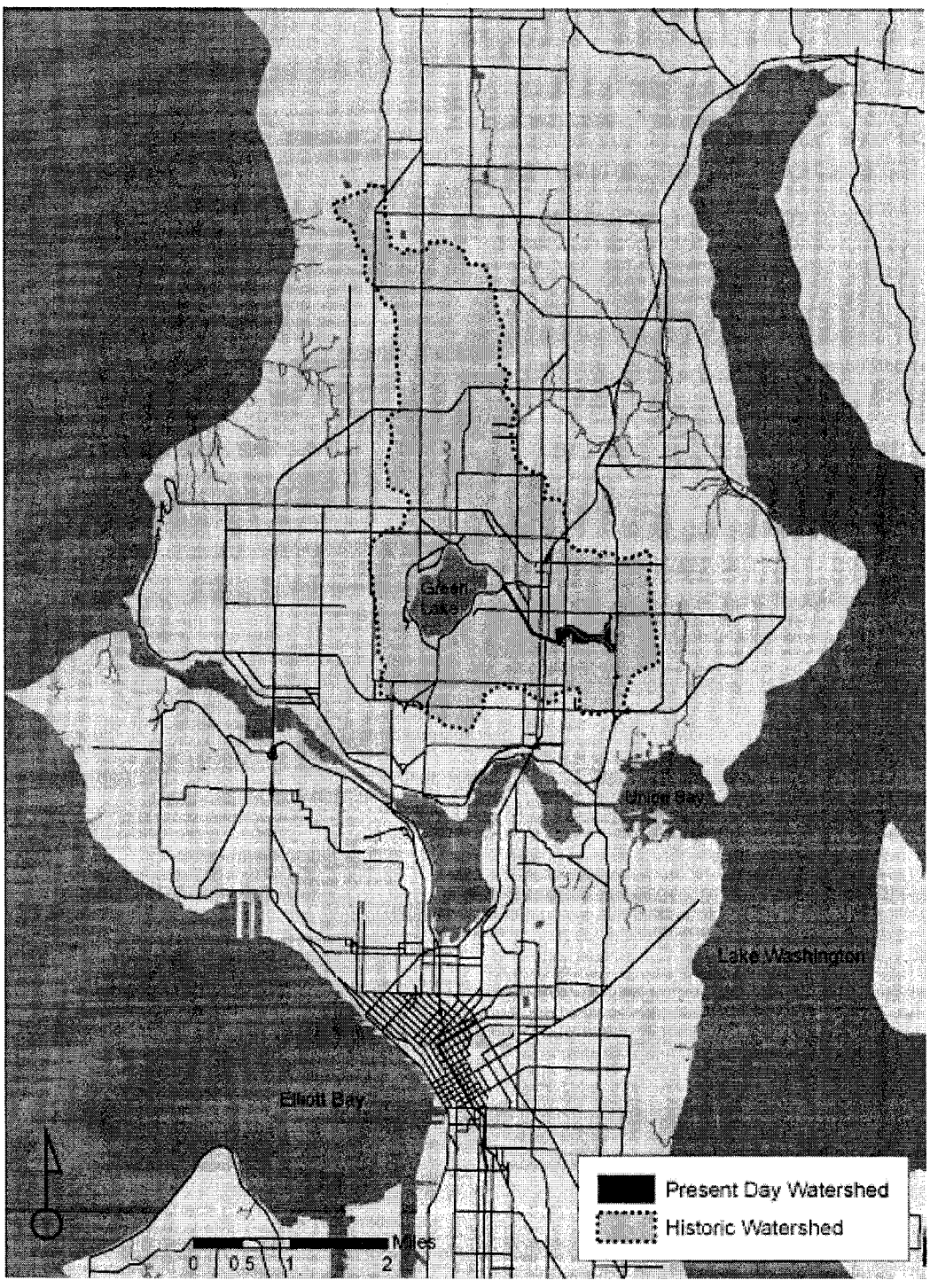

Figure 6. Ravenna watershed map.

successful outcome of the entire process is that after more than half-a-century, the water from Ravenna Creek is no longer diverted to a sewer trunk line that whisked it off to the Westpoint Treatment facility before releasing it nearly a half mile offshore in Puget Sound. Ravenna Creek is once again connected to its past receiving waters, Lake Washington, albeit mostly through an underground pipe.

As a culminating ceremony for more than a decade of work, this Mothers Day event was charged with a powerful sense of pride in the local community. Among the several hundred people who gathered to take part in the celebration was a mixture of local and state politicians, business owners from the surrounding neighborhood, and community members, many of whom had played an active role in one way or another in the development of the Ravenna Creek 'daylighting' project. This event also marked a contemporary example of a community-based attempt at ecological restoration that, although original in its detail, is becoming increasinglycommon across the United States.

In the story of the community's fight to restore Ravenna Creek as an urban surface water system, new definitions emerged as to what it means to 'restore' a stream system within a politically, economically, and socially driven urban environment. It must be understood that the community's fight took place in this charged environment, where the desires for and values of the creek were at odds. In this way, Ravenna Creek's contemporary history blends intention and subsequent actions for the creation of a modified stream, inherently tied to the processes, events, and actions of a much longer, very rich and diverse past.

A Changing Landscape

The history of the Ravenna Creek watershed extends back before the time of the Euro-American pioneers and settlers (see Figure 5). The watershed is but a small reflection of the much larger processes that shaped the features of the Puget Lowlands which were formed some 14,000

years ago as the Fraser Glaciation of the Pleistocene Era receded. Prior to this period, the Puget Lowlands were covered with nearly 3,000 feet of ice known today as the Vashon Glacier. As the glacier made its slow advance southward, it's scouring and rasping of the land created the terrain and topography we know today. Several thousand years later, the glacial retreat deposited hundreds of feet of sand and glacial till across the region. Over time, flowing waters slowly carved the topographic drainage patterns of valleys and ravines through the till. Vegetation took root and emerged on the surfaces of the landscape, transforming the region west of the Cascades into a dense coniferous forest. Ravenna Creek, a small piece of this much larger story, is a product of that erosion and growth, part of a dynamic landscape that owes its form to the interactions of people, land, and water.

After the glacial retreat, it is believed that migrating bands of people began to inhabit the region, sustaining themselves primarily through hunting and gathering activities. When Euro-Americans first began to arrive in the last decade of the 18th century, the landscape revealed legacies of long interaction with the loose conglomeration of tribes that resided in the region (Thrush 2003). A group named HLuwi'Labh (hloo-weelh-AHBSH) took its name from the SLuwi'L (s-hloo-WEEHL), the narrow passages that intersected the Union Bay marsh.[2] This group, commanding the eastern terminus of the short portage between what is now Lake Union and the Puget Sound was the largest and one of the most influential of any group living on the lake (McDonald 1979). The area of this low divide between the lakes was called 'the Portage', and was frequently used by natives and early Euro-American settlers (Chrzastowski 1983). Five longhouses were located on the northern margin of Union Bay near the present University of Washington steam plant, another near the south end of Lake Union, and yet another that may have been used as a potlatch house was located near what is now Edgewater Park. These longhouse settlements marked the permanent residences of the tribe in winter. However, the village dispersed in family groups during the summer to move into the heavily forested hillsides nearby to fish, hunt, and gather supplies for the coming winter (HistoryLink 2005a).

Historical records reveal that the people of the HLuwi'Labh tribe called the creek Tclaa'Lqo, roughly translated to mean channel or watercourse, and built a weir near its mouth of to harvest salmon during annual migrations (Buerge 1980). They also constructed and operated a number of basket weirs along the shores of Green Lake (DutLe'c), the historic headwaters of Ravenna Creek, to catch suckers and perch (Waterman 1922). During the winter months the HLuwi'Labh hunted waterfowl such as ducks and geese in the marshy area now called Union Bay where the stream met Lake Washington (Buerge 1980).

By the time that Euro-American settlers began to lay claim to the lands around Lake Washington in the 1860s and 1870s they found the area largely deserted. The HLuwi'Labh tribe had all but disappeared. Although it is not known exactly what happened to the people of this tribe, it can be assumed that many in the population had succumbed to the same diseases as those that impacted the rest of the Native American tribes in the region.

The first known Euro-American to lay claim to the lands surrounding what remains of Ravenna Creek was a man by the name of William N. Bell in the mid-1870s. His claim included the steep, heavily forested ravine that would later become Ravenna Park. He subsequently logged much of the accessible land in his claim and sold the property by 1880. The land changed hands several times during the 1880s, and the claim increased in value with the opening of the Lake Shore & Eastern Railroad that extended from Seattle up the western shore of Lake Washington. By 1887, George and Oltilde Dorffel held title to the property and in that year platted the ravine as a park (HistoryLink 2005b). Saved from Bell's axe due to its steep terrain, the ravine still contained old growth trees and was locally renowned for its natural beauty (HistoryLink 2005b).

The following year 300 acres of the land including the ravine changed hands again. This time it was Presbyterian minister Reverend William Beck and his wife Louise fresh from Kentucky that purchased the area. It has been said that Beck looked upon this land as a place of new and prosperous beginnings despite its already long and established history (Dorpat 1984). Rever

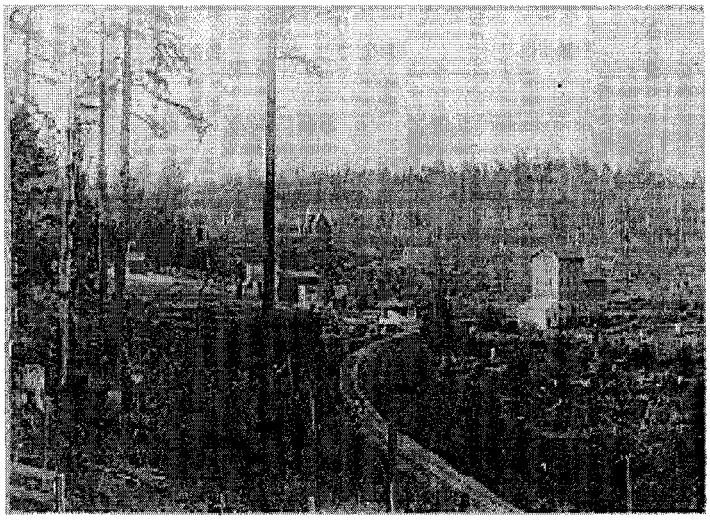

Figure 7. Ravenna neighborhood, Seattle, ca.1893. Northwest Railway Museum Image Collection, L107

end Beck promptly named the newly purchased lands "Ravenna" after the region in Italy.[3] Beck quickly set his sights on 'improving' the land with the idea of establishing a mercantile outpost and town as an intermediary point between the emerging city of Seattle and the logging camps along the western and northern shores of Lake Washington. Within two years, Beck had logged what remained of the trees on the land but, like those before him, had left the roughly 60 acres of the ravine untouched and preserved as a private park. Less than a mile in length and roughly 400 feet at its widest point, the steep slopes and valley bottom of the ravine were blanketed by mature coniferous trees, between which a small stream meandered. The stream, later given the newly acquired name of the area, Ravenna, originated from Green Lake, a roughly 300-acre lake little more than a mile to the northwest. Its flow was, and still is, supplemented by a number of seeps and mineral springs that emerged from the walls of the ravine (Dorpat 1984b).

After some rudimentary improvements to the park, including the building of trails and rest kiosks, Beck opened the ravine to the public, charging a quarter for visitors to walk the park with its ravine of giant trees and babbling brook. From the beginning, the park was enjoyed by

many who lived in the region as one of the few remaining areas around the city that had yet to be transformed by Euro-American settlement. In 1890, *Seattle Illustrated*, a local Seattle newspaper, vociferously promoted Ravenna Park as both unique in nature and in location. It declared: 'Nowhere in this country or in Europe can one find a retreat of this size which so harmoniously combines the rugged and the picturesque with the quiet, peaceful, and lovely. The whole effect is startling...as if nature had specially exerted itself to make this a park' (Seattle Chamber of Commerce 1890). The park was so enjoyed by its visitors that local community groups and citizens took to naming and sponsoring the larger trees in the ravine. Mrs. Beck named one of the giants, Paderweski, after the famous Polish pianist Ignace Paderweski (Dorpat 1984).

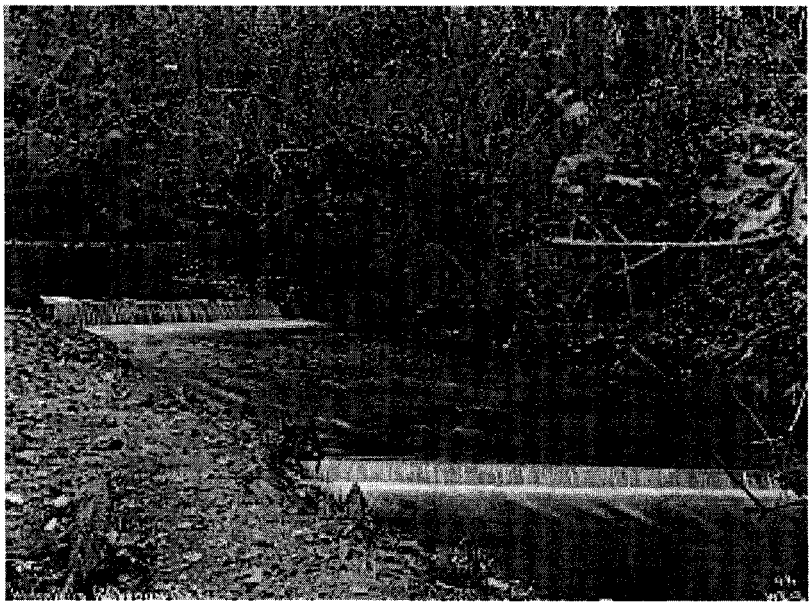

Figure 8. Waterfalls in Ravenna Park, Seattle, ca. 1911. Museum of History & Industry Photograph Collection, 1983.10.6551

Several mineral springs within the Park were cherished by the community because 'people would bring cups for drinks to the sulphur/spring water for tonic and medicinal purposes' (Towne 1970). However, conflicting reports over the years concerning the quality of the water emerging

from the springs caused their eventual capping later in the century. A 1928 report from the City Department of Health and Sanitation declared, 'The various springs in [the] park to be unsafe for potable or drinking purposes'(Hanley 1928). However, in a 1939 letter from the State Department of Health to Mr. Umlauff, the President of the Board Park Commissioners, expressed the desire for the springs to be captured in 'sanitary drinking fountains' to 'benefit the public even more than it has in the past'(Umlauff 1939).

In 1909, Seattle hosted a World's Fair highlighting the city's establishment and emergence from the wilderness of the Pacific Northwest. The world's fair was held at the University of Washington, in close proximity to Ravenna Park. Large numbers of visitors from across the country and around the world descended on Ravenna Park to view and experience the natural beauty of the region. A pamphlet promoting the park was published during this period stated, 'Ravenna Park, with its standing or fallen giant trees; moss and fern-clothed canyons; dashing trout streams, preserves in quaint uniqueness every beauty of the wonderful Puget Sound forest, and is Seattle's only forest unshorn by axe and fire of original beauty of noblest and grandest characteristics'(Brochure 1909). These years marked an early peak of appreciation for Ravenna's ravine, forest, and creek.

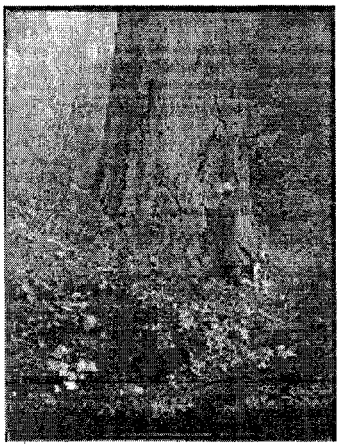

Figure 9. Man with large tree in Ravenna Park, Seattle, ca. 1911; Museum of History & Industry Photograph Collection, 1983.10.7952.1

Although inherently tied to the history of Ravenna Park, Ravenna Creek was not as nostalgically linked and valued by the people of Seattle at the time. Two major events over the past 100 years drastically altered the historical processes of the Ravenna Creek watershed. These events were the lowering of Green Lake in 1911, thereby disconnecting Ravenna Creek from its headwaters, and the lowering of Lake Washington in 1917, exposing the shoreline for future development.

By the 1860s, the watershed that drained to Green Lake had already been drastically transformed from its pre-Euro-American conditions. By 1879, the four square miles of land encapsulating Green Lake were in the hands of speculators and a few homesteaders. As early as the 1880s two lumber mills had been established and were rapidly consuming the 'Timber fir, cedar, Hemlock-Maple, Alder' forest with axe and saw. Guy Phinney built a mill on Green Lake in 1884 that produced 10,000 board feet of cut lumber per day. In 1888, mills in Seattle processed 160 million board feet of lumber (Bagley 1916). The forests in the region were giving way rapidly to the ax and saw, but these numbers also reflect the thickness of the forests in the area.

Figure 10. Sawmill on site of Green Lake fieldhouse, Seattle, 1890. Theodore E. Peiser Photograph Collection; University of Washington Libraries, Special Collections Division, no. 282

The population was in the hundreds, and with the arrival of the electric trolley in 1890, growth of the area began in earnest, especially along Green Lake's eastern shoreline. By 1910, most of the Green Lake and the Ravenna Creek watershed had long been logged, and the area was now being transformed into smaller agricultural plots and early suburban development.

In 1903, the city of Seattle hired the esteemed Olmsted Brothers firm of Brookline, Massachusetts to develop a comprehensive park plan for the city and surrounding area. Arriving in April of that year, John C. Olmsted, stepson to landscape architect and urban visionary Fredrick Law Olmsted, Sr., traveled the area on horseback, foot, and canoe, identifying lands that were well suited for park development (City of Seattle 1903). In June 1903, Olmsted presented to the city council of Seattle a visionary, 100-year plan titled *Parks, Playgrounds, and Boulevards* that devised a spatial schematic for developing a 'green necklace' of parklands that would unite the future cityscape of Seattle (Olmsted 1903).

Within this plan, he set recommendations for the city to acquire and extend the boundaries of the then well established, but privately owned Ravenna Park, describing the area as 'remarkable... wholly covered by native forest' (Olmsted 1903: 98). He also recommended the city acquire a 'liberal stretch of land' along the stream corridor between Ravenna Park and Green Lake' (Olmsted 1903: 99). Olmsted envisioned a tree-lined boulevard, with paved roads bounding the stream to either side, linking the forest ravine of Ravenna Park with the open water of Green Lake.

Unknown to Olmsted however, his final recommendation for the immediate area surrounding Ravenna Creek and Green Lake would alter the hydrology of the watershed. He proposed that the city of Seattle acquire all land under water and along the existing shoreline of Green Lake. With this accomplished, the city would increase the usable area around the lake for recreation purposes by "lowering the water level' (Olmsted 1903; 143). In October of 1903, the city council adopted Olmsted's comprehensive park plan with wide public support and set forth integrating his recommendations into the fabric of the growing city.

In 1911, after acquiring the required properties, the Seattle Parks Department commenced with Olmsted's plans to lower Green Lake by seven feet, indelibly changing the future of Ravenna Creek. This action severed Ravenna Creek from its headwaters, leaving the streambed at a higher elevation than the surrounding lake. Little water remained in the channel and in the following years, the streambed between Green Lake and Ravenna Park was unceremoniously filled to provide level ground for the building of houses and the expansion of Ravenna Boulevard (Sherwood 1973). The only water remaining in the stream's channel was collected from the hillside seeps and springs within Cowen and Ravenna Parks.

Concurrently, in 1911 the Becks sold the 60 acres of Ravenna Park to the city of Seattle through condemnation for the price of $122,000 (Dorpat 1984). This transfer of ownership marked the end of the Ravenna ravine's term as a private park reserve. With the sale of the roughly 60 acres came a change in the approach and commitment to maintaining the trails, kiosks, and forest within the park. With public funds for park management spread thin across the entire city, little was done to enhance or maintain the park over the next several decades.[4] A mere 18 years following the purchase of park by the city, Seattle historian Clarence Bagley (1929) described Ravenna Park as a 'dark, damp, dismal hole in the ground for which the city paid an outrageous price.' It was also during this period that the last of the old growth trees disappeared from the park. There is speculation as to the cause of their disappearance, however, as some accuse the parks department of felling the trees to sell for profit while the parks department claims a windstorm in 1924 brought down the last of the trees.[5] Regardless, the outcome was the same, and the trees were removed, further altering the conditions of the park and stream. Although no longer considered a regional treasure, the residents surrounding the ravine supported the park in their neighborhood, often arguing to be included in the management and plans for the park (Burnett 1931).

Another major event in Seattle's development history that affected Ravenna Creek was the opening of the Montlake Cut in Union Bay, to connect Lake Washington to the Puget Sound.[6]

A major public works expansion for the city of Seattle the Montlake Cut project was completed to facilitate shipping traffic between the Puget Sound and the timber-rich areas and communities along Lake Washington's shoreline. The opening of the cut in 1917 ultimately lowered the elevation of Lake Washington by nine feet, exposing mud flats and drying peat in Union Bay where open water and marsh lands used to be (Higman and Larrison 1951) . The creek that once flowed into the area that is today University Village, a regional shopping center, carved a channel roughly 4000 feet through the of the mudflats, forming a new delta in Lake Washington to the east of the current location of the University of Washington stadium. With the lowering of Lake Washington, the exposed mudflats provided a broad expanse of land that was previously under water. This land was then made viable for development; land values in the area increased as well as did development pressures. The future of the stream from Ravenna Park to its newly formed outlet was now in jeopardy.

As the decades of the twentieth century progressed, little attention was given to the creek or the park through which it flowed. Since its purchase from the Becks in 1911, the park was largely neglected by a Parks Department that struggled to gain funds for managing the system of parks across the city. However, in 1931, the southeast corner of Ravenna Park, where the 'daylighted' section of stream is located, was filled to provide room for a playground and ballfield. As part of this work, the federally funded Works Progress Administration (WPA) built a large, 'scenic,' wading pool that was fed by Ravenna Creek. The wading pool was abandoned in 1950 after water quality issues were raised due to stagnation caused by drainage failure. The pool was later filled in 1964 (Sherwood 1973).

During the 1940s, development pressures increased on the lands that were once under Lake Washington, and concerns of degrading water quality conditions in the stream surfaced (Cooper 1948b). The city directed the remaining Ravenna Creek stream flow into pipes and culverts in several places as roads were built and parcels developed. Finally, in 1948, in an attempt to provide a more efficient drainage system for the area, the city diverted, under intense

public scrutiny, the water of Ravenna Creek into the North Trunk Sewer line, directing its flow through the public sewer system and treatment facilities before being discharged into Puget Sound (Cooper 1948a). The diversion occurred near the southeast corner of the park, by the wading pond. This action summarily ended the Ravenna Creek's connection with the larger basin of the Lake Washington watershed. The remaining channel, the only physical remnant of the stream, between Ravenna Park and Union Bay, was quickly filled, and the stream of the past was seemingly forgotten.

Figure 11. Ravenna Creek draining into the North Trunk Sewer.

Then, on November 11, 1957, the North Trunk Sewer collapsed not far from Ravenna Park. Within a few hours, a rapidly growing sinkhole appeared in the street above. Residents on the street were quickly evacuated as the sinkhole expanded. The chasm eventually grew to 175 feet wide, 200 feet long and 50 feet deep (Phelps 1978). Within days a diversion pipeline was built to funnel water and waste into Ravenna Creek. For two weeks the waste of the 43,000 residents whose homes were connected to the North Trunk Sewer was pumped directly into the

stream system. One of the most costly infrastructure repairs in U.S. history at the time gave little regard to the impact the sewage diversion had on Ravenna Creek (Phelps 1978). Although a subsequent set of tests conducted early in 1960 revealed little contamination of water quality, the Sanitation Department cautioned that Ravenna Creek 'should not be considered as a suitable source of water used for human consumption' (Bright 1960).

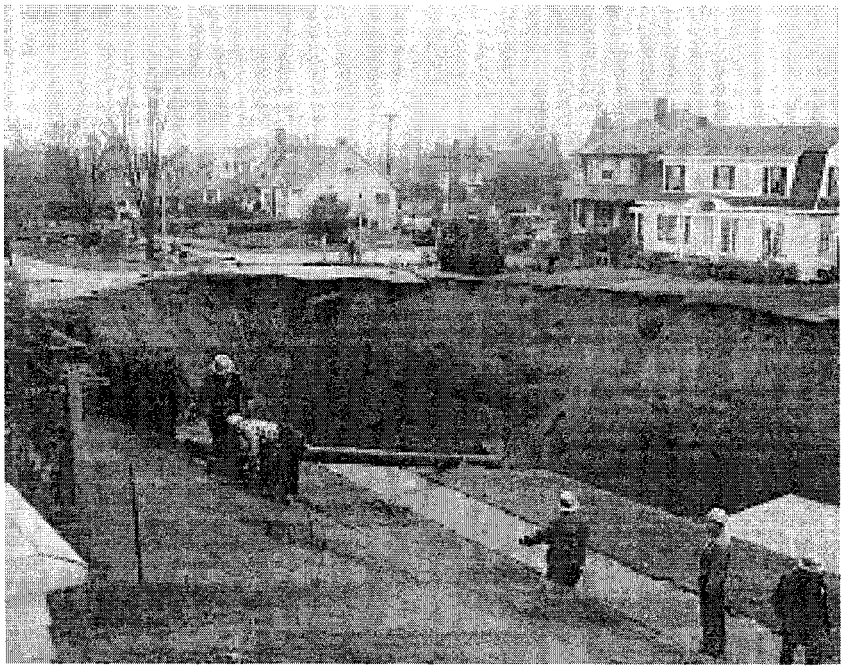

Figure 12. Sink hole caused by North Trunk sewer line break, Seattle, ca 1957. Museum of History & Industry Photograph Collection, PI24322

The development of the Ravenna area also had profound impacts on the patterns and processes of the original watershed. As biologist Tom Ostrom writes, 'Examining the changes to Ravenna Creek over the past hundred years is a window into the history of human disturbance' (Ostrom 1995: 2). With the ultimate diversion of the outflow of the creek into a sanitary sewer line, the creek was severed from both its source and its outfall. Ravenna Creek became a remnant of what it once was. The drainage basin for the creek became roughly twenty times smaller than the original watershed that spanned from Phinney Ridge on the west to View Ridge on the east.

One branch of Ravenna Creek emerged as a wetland in Cowen Park, adjacent to Ravenna Park, just below the park entrance at 62nd and Brooklyn. A second branch began near NE 65th Street and 23rd Ave NE. The branches joined in Ravenna Park. The creek was fed solely by several springs and hillside seeps along the steep slopes. Near the lower end of Ravenna Park, the creek was diverted into King County's trunk sewer system. The total length of the creek, approximately 3500 feet, stretched from the wetland in Cowen Park to the intake grate for the sewer system at the southeastern end of Ravenna Park.

Re-visioning Ravenna

The decades following the diversion of Ravenna Creek into the North Trunk sewer represented a time of distinct changes for the city of Seattle. Following World War II the population of the region expanded rapidly spurring an intense period of suburban development to meet housing needs. During this period the city of Seattle experienced its first decline in population since its establishment more than a century before. The decline in population represented a decline in the tax base at a period when the infrastructure of the now one-hundred year old city was in disrepair. By the mid-1960s, community dissent was on the rise as citizens voiced concerns ranging from racial inequality to declining educational standards to the overall decay of the physical city (Sale 1976). Many of the individual dissents were united under a single initiative known as Forward Thrust. Developed as a collective action to improve the urban situation in Seattle and the surrounding King County area, Forward Thrust was a citizen-based initiative comprised of twelve propositions addressing issues ranging from transportation to low income housing to the establishment of youth service centers. In a speech to the Seattle Rotary Club on January 10, 1968, Forward Thrust proponent James R. Ellis described the initiative as 'a partnership of people from every section of the County, every viewpoint and walk of life. This was not a citizen front for a program pre-determined by government.' The program gave voice to the citizens of the city and county, ensuring residents a seat at the negotiating table from which to

address urban issues in Seattle. This program not only united socially disparate communities in the city and county, but developed a partnership between residents and public officials. In retrospect, there was little recognition of the impact such a partnership would have on the future of the Ravenna neighborhood and its relationship to the creek.

In 1988, King County Metro, a county-wide agency responsible for managing the drainage and wastewater utilities across the county, began to develop plans that would separate stormwater drainage from the wastewater sewer systems in the northern sectors of the city. Originally developed as a combined system, all sewage and stormwater runoff was flushed through the same pipe system and cleaned at treatment facilities before being pumped into the Puget Sound. As the city expanded over time, the capacity for treatment of the combined system was reached and subsequently surpassed. To address this problem, Metro and the city of Seattle proposed several alternatives. One of these alternatives involved placing a system of two pipes underneath the streambed of Ravenna Creek. One pipe would pump water from Green Lake to Union Bay in an effort to provide the lake with greater circulation, and the other would direct the stormwater drainage from the surrounding area to Union Bay. As part of this proposal, portions of the stream channel would be engineered and redesigned to reflect the size and character of the stream as it was prior to the lowering of Green Lake in 1909. Initially, the plan was seen as beneficial to both lake and stream, but the proposal soon faced a disgruntled community as further investigation revealed the extent of disturbance to the park that would be created by the construction of this system. The project was soon shelved due to community dissension and its projected cost (Lin & Associates, Inc. 1991).

After further study, Metro submitted a new series of proposals to the community in the winter of 1991. The preferred alternative for this new plan was to remove the flow of Ravenna Creek from the trunk sewer line and place it into a new pipe system with an outfall (the confluence of pipe and open water system) in University Slough before entering Union Bay. This would ultimately return the flow of the disconnected stream system back into Union Bay. It was

estimated that flow generated by Ravenna Creek on an annual basis equaled the amount of wastewater generated by approximately 20,000 people which cost the utility roughly $2 million over a 20-year period to both clean and chlorinate (McCreary 1991). According to Metro's manager for the project, Doug Houck, the cost for building the preferred alternative, this design to return the flow of the creek to the bay, would be recovered within two decades. Houck presented the plan to several community groups in January, 1991. The community responded with an idea for daylighting the stream instead of placing it in a pipe. An ambitious plan, the concept was to recreate the stream channel, returning the creek to the surface and reestablishing an historical connection of the stream to Union Bay. Many in the community enthusiastically embraced the daylighting concept, and began to develop an alternative to the proposed pipe system. A working group was formed, composed of community leaders and University of Washington faculty in both Landscape Architecture and Fisheries.

In July of that same year, Kit O'Neill, a local resident and community activist presented a preliminary feasibility report for the daylighting of Ravenna Creek, based on the groundwork done by the working group. The intent of the report was to provide 'a basis for discussion and determination of a general course of action to be pursued' (O'Neill 2004) Conceptual in scope, the report mixed preliminary studies of technical feasibility with the neighborhood perception of viewing this project as an amenity to the overall community. (O'Neill 1991). More importantly, the report provided both cohesion to address the diversity of community interests and direction. In the beginning the concepts and perceptions promoted by the citizens supporting the project took on a utopian feel, with idealized visions of how the project would integrate the needs of the community with the needs of the stream system. Beyond restoring access to fish and creating habitat within the stream system, the report looked to forge community bonds within the neighborhood between residents and businesses. The daylighting of Ravenna Creek was also viewed as an opportunity to bring the business and residential communities together through a series of design interventions that promoted pedestrian connections between surrounding neighborhoods, Ravenna Park, and University Village, a commercial hub for local shoppers. Each of these early

ideas represented an idealized version of the possibilities for how such a project could impact the community. However as the economic and political realities that are inevitably incorporated into such an urban project of renovation and restoration would soon reveal, the visions were in some instances just short of naïve.

The feasibility report also plotted several alternative routes for the daylighting of Ravenna Creek from Ravenna Park to Union Bay. The scope of the project promptly emphasized the understanding that the newly reformed creek would pass through a heavily developed area of residential streets, arterial roads, and privately owned commercial properties. In order to be successful, support for the plan needed to come not only from local residents but also from businesses and local government.

In the spring of 1992, Kit O'Neill, the future president of the Ravenna Creek Alliance (RCA), organized a design charette in collaboration with the University of Washington's Department of Landscape Architecture to thoroughly explore the conceptual designs for the proposal. Students partnered with local professionals including engineers, biologists, and landscape architects, to form charette teams to develop design alternatives that would address possible routes for the newly formed creek. The designs focused on incorporating the new channel within the already established fabric of the developed community. The design alternatives generated by the charette were then compiled and presented to city staff, community members, and businesses that would be affected by the stream design.

Support for the plan was strong and immediate, both locally and across the region. A letter from Seattle Mayor Norm Rice to the Executive Director of METRO, Richard Sandaas, pronounced the city's support for the project stating, 'I understand that Metro will play a lead role in the proposed project…[and] I am happy to pledge my support to the concept of restoring Ravenna Creek to an open channel.' Further, The Seattle Times published an article on the Ravenna daylighting plan noting, 'It's an ambitious one-of-a-kind restoration that would mean

digging a creek bed through the shopping mall's parking lot and down one side of a Ravenna-area street, making the street one-way. And it would mean raising lots of money' (Whitely 1991) The article, which was picked up by the AP network and published widely, brought to light the difficulties that lay ahead for the project, not only in the feasibility of physically implementing the plan, but also of the costs that would be incurred for re-creating the stream corridor. Despite these difficulties, the concerned citizens and local activists from surrounding neighborhoods formed the Ravenna Creek Alliance (RCA), a nonprofit organization incorporated to spearhead the daylighting efforts. The creation of the alliance allowed the community to lobby for both federal and state funds that would support the overall costs of the project. The RCA organized signature drives and published a local newsletter entitled *Ravenna Matters*, to inform the community about the process. In an attempt to garner further support for the daylighting project, the RCA hosted annual Ravenna Creek festivals between 1993 and 1996. A vehicle for fundraising as well as communicating, the festivals provided food, music, and storytelling, which centered on the history of the neighborhood and long time residents' interactions with the creek. The RCA also collaborated with schools from around the city in 'service learning projects,' aimed at having children interact with and learn from their surroundings (Hollister 1996). Projects for the children included planting native vegetation along the stream banks and water quality testing. By the end of its first year in existence, the RCA had over 400 active members.

Between the end of 1993 and the early months of 1994, both King County and the City of Seattle passed council resolutions in support of the 'daylighting of Ravenna Creek from Ravenna Park to Union Bay' (City of Seattle 1994). This represented a great leap forward in the attempt by the RCA to gain political support for the daylighting project. The King County Resolution stated, '...we support the efforts of the Ravenna Creek Alliance in daylighting Ravenna Creek and we encourage them to continue their efforts to demonstrate that errors of the past can be corrected in the present' (King County 1993). Further, and possibly more fundamentally important to the project, both resolutions encouraged federal and state governments to provide funding assistance.

During this period, the Ravenna Creek Standing Committee was created by Metro to provide oversight, coordination, and review of the daylighting process for Ravenna Creek. The committee, an advisory board body, was comprised of representatives from public agencies and private property owners with a vested interest in the project, including the RCA, Metro, the Seattle Parks and Engineering Departments, both the City of Seattle and King County Council, and University Village management. The creation of this committee marked the commitment of all stakeholders involved in the process to develop a realistic and cogent agenda for daylighting the southern reaches of Ravenna Creek. In the context of an urban landscape dominated by political and economic agendas, such a wide array of stakeholder support for the daylighting of Ravenna Creek was unusual, and allowed the priorities of the RCA to shift from focusing on economic and physical constraints of the project to assessing possibilities for implementing a restoration plan that would benefit the community, the stream, and the returning salmon that would use the stream.

Following the formation of the Standing Committee, the RCA developed a master plan which clearly defined a consolidated framework for daylighting Ravenna Creek. The plan represented a conglomeration of local perceptions towards the watershed, and highlighted the impacts that daylighting would have on restoring fish habitat within the stream channel. It also provided a forum that supported community participation and cohesion. Many design professionals and engineers combined their expertise in a concerted effort to develop a daylighting plan that was both technically feasible and agreeable to the diverse stakeholders of residents, local governments, and businesses that would be impacted by the project.

The primary focus of this enterprise was to re-create some of the historical processes of the watershed by re-establishing the connection of Ravenna Creek to Lake Washington and enable the opportunity for fish and other wildlife species to utilize the stream corridor. The proposed master plan sought to expose patterns of nature as an integral part of the city, to restore the physical function of the stream, and reveal the myriad legacies of past land use actions. The

RCA (1994: 3) wrote, 'Seattle is a city of hikers and in the mountains when you find a valley you also find the water that made it. Daylighting the creek would restore the natural integrity of the watershed.' The RCA also argued that revealing the past patterns of the watershed would provide greater understanding and appreciation not only for the built aspects of the modern city but also for the biophysical processes that shaped the landscape on which the city is sited. Promoting the historical conditions of the watershed, the RCA indelibly identified the daylighting of Ravenna Creek as a critical element for restoring the ecological processes.

The proposed design of the streambed mimicked the patterns of more undeveloped stream systems within the region, providing structure to support changes in grade while enhancing fish habitat. In an attempt to dissipate both the velocity and the quantity of water moving through the system, the design created off-channel floodplain areas allowing higher flows to breach the banks of the stream channel. At every stage of the proposed channel, the design elements provided opportunities for people, whether living in the neighborhood or passing by on the Burke-Gilman Trail, to engage with the stream, to explore its dynamics, and to associate the stream processes with the larger context of the landscape surrounding them. The proposal was a plan for restoration that incorporated biophysical processes found in undeveloped watersheds in the region within the contemporary, heavily urbanized environment.

Estimated to cost $2.3 million, the plan the RCA developed represented a significant refinement of the previous proposals. In common with earlier proposals, this alternative called for the stream to run through University Village from north to south before outfalling into University Slough (the south side of N.E. 45th St), an arm of Union Bay in Lake Washington. The plan identified several sections of the route that posed difficulties for the design process and offered a series of conceptual resolutions. Of greatest concern was the route the stream would take through University Village. At that time, the proposed route for the daylighted stream transected an area designated for parking at University Village. The RCA's alternative resolved to redesign the parking area to accommodate a greater number of vehicles in exchange for the daylighted stream

corridor. University Village, however, had changed ownership since the standing committee was formed. Whereas the previous owners had been supportive of the daylighting concept, the new owners became concerned about introducing a design element to the Village that was beyond their control (Sloan 1995). University Village was sold by the Oregon-based holding company Tektronix, Inc. to local developers Stuart Sloan and Matt Griffin (Wieland-Nogaki 1993). Openly surpportive of the daylighting concept, representatives from Tektronix brought the new owners up to speed on the daylighting project. Soon to become evident to the RCA and community stake-holders, however, was the fact that this sale was going to have a negative impact on the feasibility of daylighting the channel through the University Village property. The new owners had plans for transforming the small neighborhood shopping village into a regional shopping center. These plans did not permit incorporation of the stream into the redevelopment.

In a letter to RCA President Kit O'Neill dated April 6, 1995, Stuart Sloan wrote, 'While we are supportive of the concept of daylighting the creek, there are several environmental, safety and other issues to be resolved.' These concerns included water flow and environmental quality, public safety, construction and maintenance, and finally, funding. Sloan's primary concern was the legal restrictions daylighting Ravenna Creek would place on future development on the property. He wrote, 'Daylighting of Ravenna Creek is an exciting and positive concept, but there are many, many questions that must be addressed before that dream can become a reality' (Sloan 1995).

One primary concern was the danger of flood events due to storm flows. The flows for Ravenna are relatively consistent in comparison to other streams of similar characteristics within the region, ranging from 1 to 2 cubic feet per second (cfs) (Ostrom 1995). This is primarily due to the constricted size of the watershed. Since being cut off from its source at Green Lake, the stream comes entirely from the seeps and springs within Ravenna Park. Further, drainage from surrounding streets and parking lots, the primary cause of flow fluctuation during storm events

would not be placed within the new channel. Thus, the RCA assured the new owners that flooding concerns about the creek were unfounded.

In 1995, biologist Tom Ostrom conducted a habitat assessment of Ravenna Creek to determine the feasibility of the remaining stream channel to support a fish population and other aquatic communities. Ostrom concluded the stream system had a relatively poor habitat structure in comparison to other watersheds of similar size in the region (Ostrom 1995). However, another study conducted by Metro six years prior had found that the creek supported self-sustaining populations of two salmonid species: rainbow and cutthroat trout (KCM 1989). The most limiting factor for habitat viability within the stream was found to be a lack of diversity in the flow regime that leads to a low quality of in-channel substrate and a homogeneous distribution of habitat character. Ostrom claimed that Ravenna Creek displayed characteristics that make it an anomaly in comparison to other urban stream basins. He felt that typical instream 'fixes' to promote habitat would do little unless some of the larger scale watershed processes controlling fluctuation within the flow regime were addressed.

In December of 1997, King County released a technical feasibility study about daylighting Ravenna Creek. Examining three separate routes for the stream channel from the south end of Ravenna Park to the University Slough, the report determined that although the stream conditions would be able to support a cutthroat trout population, the designed channel would not provide enough of a gradient or variation in flow to support migrating coho salmon. Thus, the lack of flow diversity the RCA claimed would drastically reduce the likelihood of flooding in the shopping center became a constraint to the viability for the newly designed Ravenna Creek to sustain fish populations.

The feasibility study further estimated the cost for the project to range from $6.5 million to $9.8 million (SvR Design 1997).These estimates were substantially more than the $2.3 million estimated by the RCA in 1994. Further, the new owners of University Village demanded a

parking garage be built at a cost of $1 million to accommodate for lost parking stalls with the introduction of the creek on to the property (O'Neill 2004) The high cost for the structure was prohibitive for the RCA and ended any possibility for the alignment of the creek to be placed through University Village.

Although it had been determined that the technical difficulties could be overcome, support from government for the full daylighting project began to wane. The costs for the single project were seen as too high by both the city and county governments. Even after King County Councilmember Cynthia Sullivan spearheaded a county allocation of $3 million to be used before 1999 for the daylighting project, the estimated costs were more than could be raised by the RCA from private sources in the two-year period without support from the City Council (O'Neill 2004).

By the summer of 1998, both city and county officials began withdrawing support for the full implementation of the daylighting project from Ravenna Park to the University Slough. A letter from City Hall stated, 'Though we have been intrigued with the vision of completing the whole daylighting project, we feel that we can only support that part of the project that daylights the creek within Ravenna Park' (Schell et al. 1997) The letter lists a series of concerns but most noticeably a concern for the appropriate use of limited public funds under the priorities set by the city. With the listing of the Puget Sound Chinook population as threatened under the Endangered Species Act in 1997, the city was now required to mitigate for the spawning and migration of salmon within its existing, open channel creek systems. This requirement placed pressure on the city to work with what was already available in terms of viable habitat and drop Ravenna Creek daylighting project to the bottom of the list. 'The needs of existing creeks are substantial. There are other projects that more effectively respond to the Endangered Species Act. The cost of maintaining the full stretch of the creek, even with the community's commitment of volunteer resources, would take money away from higher priority programs' (Schell et al. 1997). Instead of supporting the entire length of the daylighting project, the city offered its support for daylighting

a small (roughly 650 linear feet) section of the creek at the southern end of Ravenna Park. 'As part of this agreement, the city will accept all future maintenance responsibilities for the park segment' (Schell et al. 1997).

In an e-mail message in January of 1999 from Kit O'Neill to newly elected Seattle Mayor Paul Schell, she asked that if RCA could produce a check for the remaining needed funds to cover the cost of development and maintenance for the daylighting, 'would you say – Yes, it's time to daylight Ravenna Creek. Let's do it. Or would you say – I do not believe in the use of public funds for daylighting Ravenna' (O'Neill 1999). Schell responded in a formal letter one month later, stating, Although, 'I am impressed with the level of community commitment to Ravenna Creek…even if the Ravenna Creek daylighting proposal was constructed with other funds, the likely impacts on the city are substantial and continue to make it difficult for me to support the project.' He listed impacts to 'abutting property owners and the traveling public' and 'more expensive utility access' as the primary concern for withdrawing his and the city's support for the project. O'Neill responded in the local press, 'I am for the first time discouraged. It's slowed me down. I'm not saying [the project] is dead, but there sure is somebody out there trying to kill it' (Holly-Gottleib 1999: 1).

A series of letters between King County and City of Seattle government officials in 2000 effectively ended the decade-long attempt of the Ravenna Creek Alliance to daylight the entire southern portion of the watershed. An April 2000 letter from the Seattle City Council (2000) stated, 'After reviewing several options for daylighting the Creek, the city regretfully concluded that daylighting the entire length of the creek was not feasible. It is our understanding that the county agrees that pursuing daylighting of the entire course of the Creek is not a possible option at this time, and that the Ravenna Creek Alliance acquiesces in this decision.'

The scope of the daylighting project within the Ravenna Creek watershed was drastically reduced to 650 linear feet, a segment of the overall plan. As with the original plan proposed by

Metro in 1991, the water from the stream was to be removed from the sewer line and placed in a pipe system to Union Bay, reconnecting the Ravenna Creek to Lake Washington. The reduced scope of the project was entirely contained within the bounds of publicly owned lands, serving as an extension of the remnant stream. The minimal scope of the daylighting served as an amenity to the community surrounding the park, providing in a small way for an increase in available habitat for species other than humans within the city.

The agreement to daylight the shorter section within Ravenna Park sparked further debate, dividing the community and park users. The proposed design required the restructuring of the lower area of the park that was used as a sports field for both little league baseball and soccer. A designer for the project described the entire design process as "very contentious [...] primarily revolving around the ball field issues [...]. [T]here were a lot of factions in the community and people were fighting over every piece of the park. You had the ball field folks, the soccer people, the people who just didn't want to do anything, and then you had the creek people. There were some who saw the creek and natural area not as a park, but as wasted space. Then there were others... that were passionate about this type of space" (OHI 2006)

Several public meetings were sponsored by the Seattle Parks & Recreation Department (SPRD) to bring the contentious parties to the table to discuss alternatives. One project manager from SPRD stated, "The meetings often started out very abrasive, with neither group listening to what the other had to say. Concluding each meeting, we would have some sort of consensus, but by the next time we got together again, no one would agree" (OHI 2006). In the end, the community groups found common ground, and it was agreed that although the soccer practice field would be lost to allow for the daylighting of the channel, the baseball field would remain. Another park manager for the site stated that "restoration in the urban arena is a process of negotiating, a bit of give and take. Not everyone is going to get everything they want" (OHI 2006).

Thin Blue Line

As part of the final agreement among the City of Seattle, King County, and the RCA, the city provided funds under its 1% for Arts Program to include a series of art projects that highlight Ravenna Creek as an integral piece of the natural history of the neighborhood and community. In 2002, a Seattle Arts Commission panel selected the San Francisco-based environmental artist Mark Brest Van Kempen to develop a public art plan for the Ravenna Creek watershed (Brest van Kempen 2002). The original art plan was to trace the lost streambed of Ravenna Creek from its source at Green Lake to its delta in Union Bay. Combining the physical history of the watershed with the current development patterns, the plan would create a metaphorical corridor, bridging the past and the present. Individual elements within the corridor focus on the physical connections between the natural environment and the city that has emerged within it. Although this plan, too, was cut due to budget constraints, several elements have been installed in the lower portion of the watershed. One of the art pieces along the piped system from Ravenna Park to University Slough is a thin blue line embedded in the concrete above. As a physical metaphor for the flow of water, the blue line represents the contemporary pattern of Ravenna Creek in its reconnected lower watershed.

The Ravenna Creek daylighting project took 15 years to complete, yet in many ways it is just beginning. In her dedication speech Kit O'Neill (2006) said, 'The job is not over, it has turned from one of advocacy to one of stewardship.' What the minimal extent of daylighting has accomplished is to once again restore the processes of the creek. The two acres of riparian plants that have been installed may eventually establish and transform the once barren soccer field into a diverse and dynamic extension of the densely forested ravine of Ravenna Park with the help of an interested and active group of citizens.

Notes to Chapter 5

[1] 'Daylighting' refers to the process of returning a stream to the surface after it has been placed in a pipe.

[2] The word originally referred to the tiny hole bored into the side of the canoe by its maker during the final stages of construction to measure its thickness (Waterman 1922).

[3] There is a discrepancy in the sources about the naming of the Ravenna area. All agree that the name is in reference to the region in Italy known as Ravenna, but different sources refer to a number of different landowners as the persons who named the site. Refer to: Paul Dorpat Seattle, Now & Then Vol. 1 (Tartu Publications: Seattle, 1984) and HistoryLink.org, "City of Seattle Annexes Town of Ravenna," Ibid.; (Accessed March 06, 2005).

[4] Analysis of the Seattle Parks Department Annual Reports between 1920 and 1935 supports this statement. As the 1920s progressed, the Parks Department received smaller and smaller allotments from the City's annual budget. With a newly expanded park system, the Parks Department spread its insufficient annual allotment for management between all of the parks within the city.

[5] There are conflicting historical accounts for when and why the trees in Ravenna Park were removed. Dorpat (1984) states both sides of the argument, however, a letter from J.W. Thompson, Superintendent of the Board of Park Commissioners; dated January 30, 1913 confirms the sale of cedar within Ravenna Park. He writes, 'Some time ago I made verbal agreement with your Mr. Ryan (timber harvester) for what cedar we could supply from Ravenna Park at a price of $1.00 per cord measured on the ground, payment to be made as per measurement to the cutters.'

[6] Only a brief account of the Lake Washington Ship Canal project is described here. The history is rich, spanning 63 years with six alternative routes, and involving private enterprise, county, state, and federal governments. Several authors have documented this project: Klingle (2001); Sale (1976); Larson (1975); and Bagley (1916).

Chapter 6. Longfellow Creek

On the first and third Saturday of every month, Jay Mirro, a resident of the Delridge Neighborhood, can be found along the banks of Longfellow Creek, just north of SW Brandon Street, working with a small but growing group of volunteers pulling ivy, clipping blackberry bushes, nurturing native plants, and spreading mulch. Since they began on this site in November of 2004, Mirro and his friends have managed to clear the invasive plants from nearly an acre of urban forest along the stream to help reestablish native forest conditions.

Mirro views their planting efforts as providing for the forest of tomorrow. "Longfellow Creek and the open areas around it are gems of the Emerald City," he says. His vision for the future is of the Longfellow Creek watershed as a regional example of an urban landscape with a functionally healthy ecosystem. By continuing the work the city and community have begun, "we can foster a sense of pride in the neighborhood [...]. Other neighborhoods in urbanizing areas will be able to learn from our mistakes and take advantage of our successes." He adds: "We must be realistic; we are never going to return this landscape to what it was 150 years ago before [Euro-Americans] arrived. There are too many factors now that play into the equation. What we need to set are realistic, long-term goals and seize opportunities when they arise." Mirro's words are an extension of the vision and key strategies promoted by the Delridge Neighborhoods Development Association (DNDA) for the further development and enhancement of the diverse, working class, immigrant community that has resided there for more than a century.

In March 1999, a draft of the Delridge Neighborhood Plan was released to the public and presented to the City of Seattle for review and adoption. A culmination of nearly three years of work managed by the Delridge Planning Committee (DPC), the document represents a diverse array of community interests that includes input from neighborhood and environmental groups, businesses, educational institutions, art organizations, and individual residents. In addition to revealing the heritage of the community, the document presents two key strategies designed to

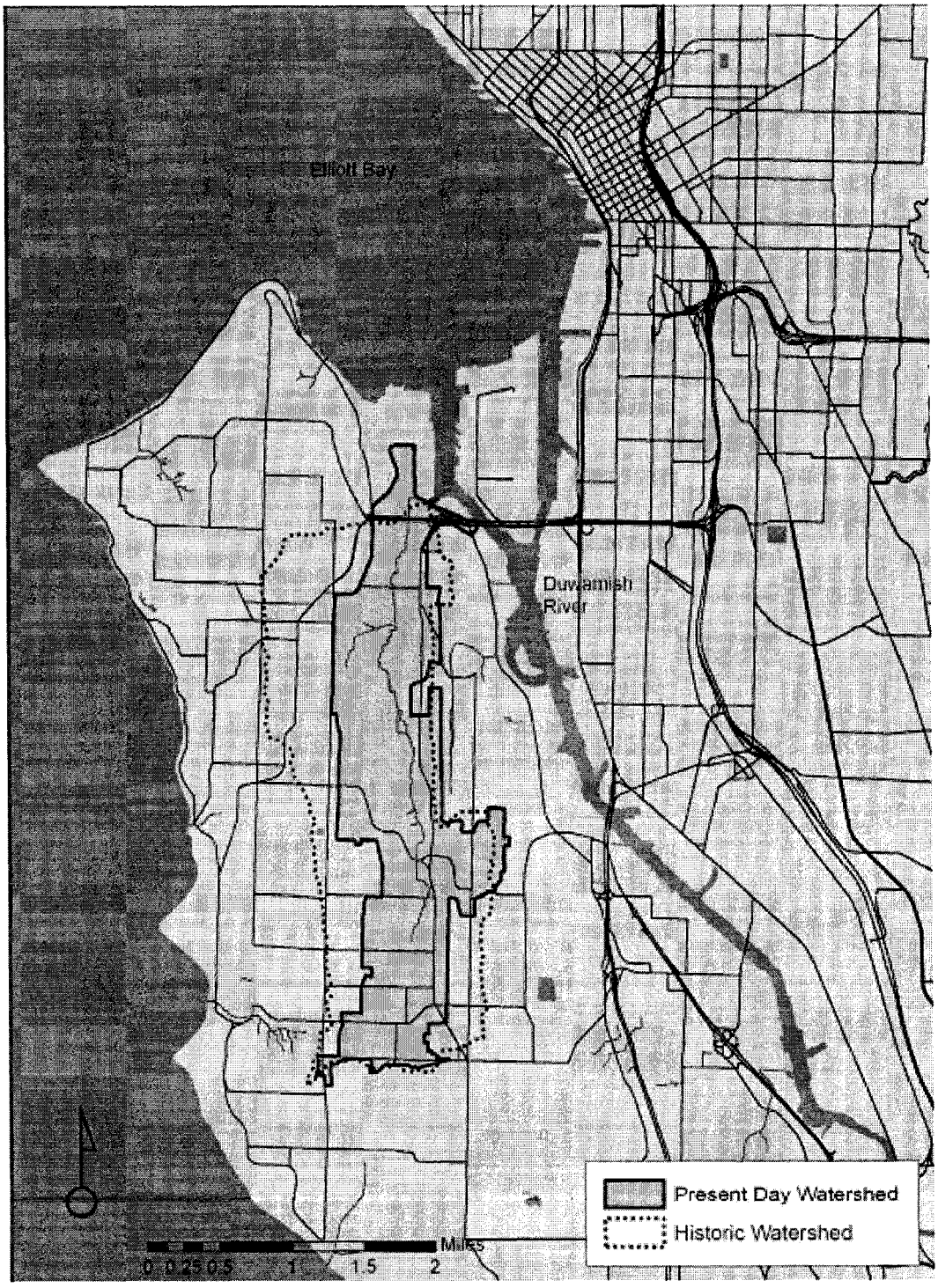

Figure 13. Longfellow watershed map.

implement the overall vision and objectives of the community. While one is to create concentrated and connected nodes of activity designed to unite the residential and business community within the neighborhoods of Delridge, the other is to integrate, conserve, and restore natural processes in the development plans of the community. As part of the vision for this strategy, the DPC document states: "Delridge is a place where the community and natural environment are integrated. Our open space and natural areas are preserved, interconnected, well maintained, and safe—for wildlife, residents, and children and students who use these spaces as 'natural classrooms.' We, in partnership with the city, take pride in and provide the stewardship needed to help maintain this natural environment" (DPC 1999, 13). As a key part of the strategy for defining the future of the Delridge community, this vision embraces and promotes the concept of community and ecological integration supported through education and stewardship.

Over the past seven years since the Delridge Neighborhood Plan was released, volunteers have contributed countless hours of labor, and local and state public agencies have poured millions of dollars into the watershed, all for the enhancement of the stream corridor and the development of a trail system that works to internally link the neighborhoods of Delridge, while providing for connections to surrounding communities. Since 1999, nearly 40 percent of the open channel length has been reconstructed as part of the Urban Creeks Legacy project initiated by then Mayor Paul Schell and later supported by Mayor Greg Nickel's initiative, Restore Our Waters. The reconstruction projects were developed with the explicit goal to improve water quality and drainage conditions while preventing erosion and flooding, restoring habitat, and expanding community open spaces and trails. Another project, the Longfellow Creek Legacy Trail, funded mostly through the city-wide ProParks levy passed in 2000 and Department of Neighborhood Matching grants, is a 4.2-mile trail that roughly parallels the creek, beginning at the Roxhill Bog headwaters and ending where the stream drops into the pipe under the Nucor Steel Plant near SW Yancy Street. For many in the Delridge community, the trail and creek reconstruction projects represent opportunities for revitalization.

Walking the Line: A Narrative Map

Like Ravenna and the rest of the Puget Lowlands, the physical history of the Longfellow Creek basin can be traced to the advance of the final stade of the Fraser Glaciation some 15,000 years ago (Franklin and Dyrness 1988). Following the glacial retreat 5,000 to 6,000 years later, the landscape revealed a low-lying valley between two parallel ridges oriented north to south. Just to the east, on the shores of the Duwamish River, is Herring House, the longest standing continuously occupied human encampment in the Pacific Northwest, dating back to the sixth century (Thrush 2002; LCWMCa 1992). Although relatively few records exist about early human life in the region, it is understood that by the 1850s several thousand native people lived a semi-nomadic life in and around the Duwamish watershed, including along Longfellow Creek (Thrush 2002). It was named by the Duwamish native tribe "to-AH-wee," meaning "trout place," and historical records describe a series of fish weirs just up from the confluence with the Duwamish River, revealing seasonal use of the stream to capture migrating salmon and resident trout (City of Seattle 2003). The Longfellow headwaters, located in what is now known as Roxhill Bog, some five miles to the south of the confluence, were also used seasonally for gathering the numerous species of wild berries that grew in the low, open environment of the bog area (Morse and Brown 1989).

Today, Longfellow Creek flows through the valley, both above and below ground, through a diverse area of mixed commercial, residential, and open space. The headwaters are located in Roxhill Park near the southern limits of the city. Supplied by underground springs, the once extensive wetland and peat bog covered an area of roughly one square mile. Much of the bog area has been lost to filling, with land uses in the early twentieth century consisting primarily of Japanese truck farms and more recently of the commercial area for the Westwood neighborhood and surrounding communities. So vast was the bog that when Westwood Village, a local shopping center, was developed in the 1960s, more than 1,000 pilings had to be drilled into the ground to a depth of up to forty feet to support the structures (LCWMCa 1992). Now, all that exists of the

bog is located in a small one-acre area of Roxhill Park. As the beneficiary of ongoing restoration efforts, this small section of bog has been transformed in recent years from a vacant parcel, inaccessible because of the dense growth of blackberries, to a thriving wetland area supporting a great diversity of native wetland plants and shrubs.

Flow generated in the headwaters is carried through an underground pipe for more than 4,000 feet below the Westwood Village shopping center and another commercial area now occupied by Home Depot. The stream reappears above ground between 24th and 25th streets, just upstream of SW Thistle Street. The stream meanders through a mixture of public and private property for nearly a mile before dumping into the Webster detention pond, which was built in 1982 and designed to capture and detain the high flows created by extensive development in the upper or southern portion of the watershed.

Below the Webster detention pond, the stream is again piped for roughly a third of a mile before daylighting just to the north of SW Myrtle Street. There, the gradient of the stream decreases to less than 1 percent from the 2 to 3 percent upstream (City of Seattle 2005b). Historically, the stream meandered along this reach across the valley bottom, creating a series of oxbow wetlands. Today, however, the stream has been channelized with boulder and wood armoring to protect the stream banks from erosion and reduce the severity and frequency of flooding along private properties and roadways. Along publicly owned lands in this reach, the stream channel and riparian areas have been subjected to extensive restoration efforts designed to increase the overall diversity of aquatic and riparian habitat and to reconnect the degraded stream to its historic floodplain during high flows, in a further attempt to reduce the severity and frequency of flooding. Although one restoration ecologist familiar with the project was not optimistic about the overall success of the design, he did note that the area has been recently recolonized by a family of beaver working to turn sections of the project into a series of ponds that will ultimately ensure the reduction of high storm flows downstream while increasing the amount and quality of habitat in this section of stream.

Downstream of this reach, the gradient again increases to 2 to 4 percent as it enters the southern end of the West Seattle Golf Course (City of Seattle 2005b). Upon entering the golf course, the stream flows through a steep-walled canyon with an established riparian canopy that has helped to create some the most diverse habitat conditions for fish within the entire system. Ironically, at the downstream or southern end of the golf course is a barrier to fish movement up the system. A fourteen-foot dam of large boulders was built by the Works Progress Administration in the 1930s when the land was reformed and the golf course constructed (WSH 1988).

Below the golf course, between SW Genessee and SW Andover streets, is another section of stream that has undergone extensive restoration efforts, primarily to provide flow and habitat conditions suitable for fish and other aquatic organisms. Although the design does not allow the frequent high flows access to much of the adjacent floodplain along this reach, the structures used to stabilize the streambed work to pond water to reduce flow velocities during storm events and to keep fish from being washed into the roughly 3,500-foot pipe located at SW Andover Street. This pipe carries the flow of Longfellow Creek underneath the Nucor Steel Plant and into the west channel of the Duwamish waterway.

Because it is a relatively small drainage for the Puget Lowlands, it is unlikely that Longfellow Creek ever supported great numbers of fish. Historical accounts, however, reveal a diverse array of fish species with high returns of sea-run cutthroat (Morse and Brown 1989; Hartman and Gill 1968). Salmon also utilized the system; with noted steelhead returns and limited use of the system by Coho and Chinook, as well (Morse and Brown 1989). There is no historical record of Chum use within the system, but it is likely that this species spawned in the lower reaches of the creek. (City of Seattle 2003) A recent survey of fish presence in Longfellow Creek, conducted during low flow conditions in summer months, found relatively few fish utilizing the system. Most of the fish captured were sculpin and stickleback; however, both rainbow trout and young Coho were also found (Lantz et al. 2006).

In the fall of 1997, several adult salmon swam from the West Duwamish waterway, up nearly two-thirds of a mile of drainage pipe, and into Longfellow Creek. Not since 1935 had salmon been seen in the system (City of Seattle 2003). A few years later, the City of Seattle began to conduct spawning surveys during the fall and early winter months, as well as smolt[1] trapping in the spring to assess the use of the system by salmon. The surveys found up to 300 adult Coho salmon entering the stream annually to spawn. Spring trapping of young Coho, however, found few of the young able to survive in the heavily urbanized system of large flow volumes, high velocities, and degraded water quality conditions (City of Seattle 2005b).

Spawning surveyors also found in Longfellow and other Seattle stream systems a disturbing trend of adult salmon dying prior to spawning. After further study, it is now estimated that the adult mortality rate prior to spawning in Longfellow Creek is approximately 90 percent. The causes of these early and untimely deaths, known as prespawn mortality, have yet to be identified; however, an expansive, region-wide study conducted by federal, state, and city agencies has been developed to identify the causes. Initial findings point to degraded water quality conditions in the urban and urbanizing environments that are worsened during storm events (Booth 2005).

The Urban Context

Longfellow Creek is named for John Enoch Longfellow, an early settler who established a farm and lumber mill near the mouth of the creek on the shores of Young's Cove. The creek is located in the Delridge Valley of Southwest Seattle, only a mile from the original landing spot of the Denny party from the schooner *Exact* in February of 1851. Originally, the watershed drained an area mostly of a low-lying, north to south valley, 200 to 500 yards in width and nearly five miles in length. Although the size of the Longfellow drainage basin has shrunk to 2.7 square miles with the development of a formal drainage system, it is still the second largest basin in Seattle with a predominantly open channel stream and one of only four stream systems in the city

that host an annual return of salmon, predominantly Coho (Lantz et. al 2006; City of Seattle 2005b).

Unlike other stream watersheds in the Puget Lowlands that have a dendritic or branching pattern with numerous steep tributaries, Longfellow Creek consists of a single main channel with few tributaries. Prior to development within the watershed, the stream was fed primarily from the high groundwater table in the low-lying area of the valley, with only a few identified tributaries that carried year-round flow. Today, only three tributaries remain, the most prominent of which is located in a steep, yet shallow ravine in the West Seattle Golf Course. The development within the watershed over the past 150 years has altered the hydrologic patterns of the basin dramatically (LCWMCb 1992). The stream conditions now reflect the altered processes of a "typical" urban watershed, with high and flashy storm flows, extraordinarily low base flows, poor water quality, and simplified habitat conditions for fish and other aquatic organisms (LCWMCa 1992).

Since the early years of the twentieth century, Longfellow Creek has been used and managed as the primary spine of the drainage network in the valley for channeling stormwater runoff caused by the development of roads and buildings. The hydrology of the creek is predominantly controlled by an extensive drainage infrastructure system of pipes and ditches. The flow within the stream is governed by numerous outfalls from the formalized drainage system located along the stream length, as well as the Webster Street detention pond. In 1989, a bypass structure between SW Juneau Street and SW Findlay Street was built. Put into operation the following year, the bypass is designed to divert high storm flows and reduce flooding in a low-lying and relatively flat section of the valley bottom where the stream channel has been encroached by residential development. As noted in chapter 2, these changes in hydrologic process and pattern within the watershed have had tremendous impact on the physical structure of the stream channel and the composition of flora and fauna communities.

Figure 14. Longfellow Creek near Barton Street and 25th Avenue S.W., Seattle, ca 1934. Federal Emergency Relief Administration Photographs; FER0112

Longfellow Creek is also integrated into the local combined sewer system, serving approximately 40 percent of the watershed, with four combined sewer outfalls located along the stream that channel a mixture of raw sewage and runoff into the stream during heavy storms. Although municipal efforts to decrease the frequency and amount of sewage entering the stream have continued for several decades, overflow events still occur on an annual basis. The water quality of Longfellow Creek is related to these events. Early sampling conducted in the 1970s and 1980s revealed relatively clean water conditions during dry periods, but—typical of most urban streams—the water quality plummeted during storm events (Brown and Caldwell 1984.) Problems associated with erosion and sedimentation created by the large volumes and high velocities of stormwater runoff generated by development in the watershed were of primary concern. This prompted the listing of the Longfellow Creek basin as "degraded" under the guidelines of the U.S. Clean Water Act of 1972. Concern for water quality conditions in the creek increased during the 1990s and led the Puget Sound Water Quality Authority to express a primary concern that Puget Sound waters were being polluted from nonpoint sources in urban areas (City of Seattle

1988). Nonpoint pollutants are difficult to pinpoint but are often generated by improperly and excessively applied fertilizers and pesticides on lawns in residential neighborhoods and the golf course; excessive erosion; and oil, gas, and heavy metal residue from streets. During storm events, the contaminants are captured in stormwater runoff and deposited in Longfellow Creek, which then transports them to the Puget Sound.

Longfellow Creek is truly an urban waterway. Both the watershed and the stream have been dramatically transformed over the past 150 years. From a heavily forested dell and series of ridges, from which the neighborhood gets its name, to a densely populated set of urban neighborhoods, Delridge has emerged as a community intrinsically tied to its physical environment.

An Industrial Foundation

Located one ridge to the east of Longfellow Creek is Seattle's largest river. The relatively low gradient and meandering channel of the lower Duwamish River made it ideal for transporting timber harvested upstream and produce grown along its fertile floodplains. The location of the Duwamish Valley was also ideal for industrial development, as it was situated in close proximity to railway lines that connected Seattle to the surrounding region and other growing urban areas, such as Tacoma, Olympia, and Portland to the south and Vancouver to the north (Carlson 1950). In 1893, the Washington State legislature passed the Tidelands Reclamation Act, which allowed for the dredging of the lower reaches of the Duwamish River and the filling of state-owned tidelands to facilitate and expand industrial development along its shores. The dredging created a deepwater port that allowed access into the bay of larger shipping vessels for transporting goods along the Pacific Coast of the United States and across the Pacific Rim. Many in the area viewed the industrial development of the Duwamish Delta as the best way for Seattle to obtain cheap and accessible sites to diversify the industrial economy of the city (Carlson 1950). The following year, the Seattle and Lake Washington Waterway Company was incorporated. Dredging of the Duwamish River began shortly thereafter. Eventually, two section of waterway were dug: one for

a distance of 2.5 miles, fifty to sixty feet deep and 1,000 feet wide; the other, for two miles ,500 feet wide (Buerge 1992). The dredge spoil, combined with what was washed from the steep Seattle hills bordering Elliot Bay during the regrading effort from 1900 to the 1930s, reclaimed 1,400 acres of tideland and produced Harbor Island at the mouth of the Duwamish, then the largest artificial island in the world (Carlson 1950). As dredges worked to straighten the river channel, meandering segments were filled, the new land was platted, and streets were surveyed. As part of these changes, Young's Cove, into which Longfellow Creek historically discharged, was filled between 1905 and 1916 with the dredged material to provide for the expansion of the newly established steel mill located adjacent to the creek (Ith 2004). During this period, the lower reach of the creek was unceremoniously placed within a pipe and filled (LCWMCa 1992). The rising tide of urban development quickly swept across the transformed bay and its surrounding land.

In May of 1905, two entrepreneurs, Judge E. M. Wilson and William Pigott, both from Youngstown, Ohio, began operating the steel mills of the newly formed Seattle Steel Company on the shores of Young's Cove. Now under the name Nucor Steel Seattle, Inc., the steel mill has been in continuous operation since that time (Nucor 2005). When the steel mill opened, it was hailed as the industrial foundation on which the City of Seattle would be established. An article titled "Seattle's Little Pittsburgh" in the *Seattle Sunday Times* in September of that year applauded the opening of the mill stating, "the iron mills of the Seattle Steel Company . . . will become the nucleus around which a great and powerful industry will be built up—an industry which, in the East, is regarded in a strictly commercial sense as the foundation of the industrial progress and prosperous development of any community in which it is located" (*Seattle Times* 1905).

Although the potential the steel mill had for transforming Seattle into the industrial metropolis of the West Coast was never fully realized, its location has since played an important role in local history and the development of the Longfellow Creek watershed. In 1910, five years after their arrival, Wilson and Pigott proposed and adopted the name Youngstown for the small settle

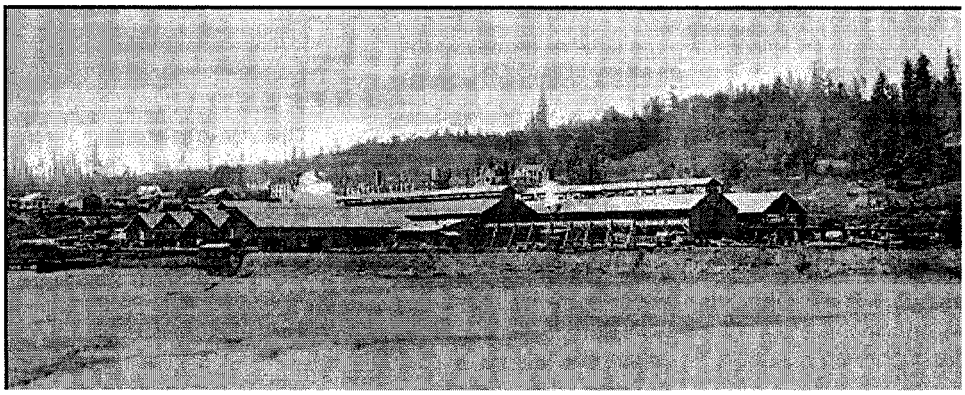

Figure 15. Steel mill located on Youngs Cove, Seattle, ca. 1910.

ment, in honor of their hometown in Ohio. With the establishment of the steel mill, the lower or northern sections of the watershed became the center of development in the area.

A small town began to develop around the steel mill along what is now 16th Avenue SW. Then, a plank road built atop the rapidly disappearing tidal flats made Youngstown a crossroads of sorts, connecting downtown Seattle with the newly annexed community of West Seattle and smaller settlements such as Riverside and South Park to the south. Direct connection from the West Seattle peninsula to the rest of Seattle had long been a problem (Dubrow and Berlow 1994). Early access was provided by a small bridge that spanned the tidelands. Whenever ships passed through the mouth of the river, the bridge spun on a large wheel, thereby denying access between the two areas. In 1890, another bridge was built across the tidelands, increasing access from downtown to West Seattle. In all, five bridges has been built over the past century, the most recent constructed in 1984 (Bidwell 2003).

The Creek and Its People: Social Transitions and Development Patterns

Like the Ravenna watershed—and the entire Puget Lowlands, for that matter—the Longfellow Creek basin has a rich and unique local history that extends well beyond the arrival and settlement of Euro-Americans in the region. Longfellow Creek flows into the western-most

waterway of the Duwamish River. It was described to historian T. T. Waterman by native peoples as being an old river channel of the Duwamish that was given a name that when translated from the local Lushootseed language, meant "abandoned" (Hilbert et al. 2001). The northern end of the abandoned channel near Pigeon Point, the northern terminus of the ridge that separates the Longfellow watershed from the Duwamish, was known as "Where There Is Something Overhead Across the Path." Waterman wrote that this was "a place where there were a lot of tree trunks and dead timber" that likely had been deposited there by the river when the abandoned channel had been active (Hilbert et al. 2001).

The native peoples of the immediate area, known as the Duwamish tribe or k-ul-KAH-koob-yu, meaning "a proud or confident people," were a distinctly river people in comparison to the "lake people" who lived around Lake Washington and Ravenna Creek. Inherently tied in tradition and culture to the other tribes of the Puget Lowlands, the Duwamish tribe had been living in the area around the delta of the Duwamish for many millennia. In fact, archeological evidence dates to the sixth century a settlement on the western shores of the Duwamish River, roughly half a mile from the present confluence with the Puget Sound (Buerge 1992). A relatively large settlement of regional importance for many native people and tribes within the region, the site is translated from the local Lushootseed language as "Herring House" because of the tremendous runs of herring that were present in the Duwamish delta (Hilbert et al. 2001). Early accounts describe a settlement composed of no less than seven longhouses measuring some 60 by 120 feet that were located along the shoreline of the river and centered on a larger potlatch house measuring roughly 60 by 360 feet (DPC 1999). The site was used by tribal nobility to host great seasonal feasts and celebrations that drew natives from around the region. Tribal shamans also used the site to conduct lively competitions and for mock battles in an attempt to establish tribal importance and supremacy (Thrush 2002).

As with other native tribes in the region, the Duwamish people were a loose-knit, semi-nomadic group that moved seasonally based on available harvest of flora and fauna (Boyd 1999;

Thrush 2002). The Duwamish divided themselves among upstream and downstream village groups that developed territorial agreements on the river for the harvesting of fish (Thrush 2002). Evidence of encampments and seasonal use along Longfellow Creek has been found both in the lower reaches of the stream and near the headwaters (Morse and Brown 1989; WSH 1980). Known today as Roxhill Bog and to early Euro-American settlers simply as "the cranberry place," the headwaters of Longfellow Creek produced many species of edible berries that were harvested by the Duwamish people during the summer months (Morse and Brown 1989). The vast coniferous forests that blanketed the region could not be physically supported in this immediate area because of the lack of soil structure and integrity provided by the peat of the bog. Thus, low-growing, fruit-producing species flourished in the rich, moist environment with its direct exposure to the sun.

The Lushootseed name for Longfellow Creek, "tow-AH-hee," or "trout place," is a prime indicator of the use of the stream to harvest resident trout as well as migrating sea-run cutthroat that would enter the system to spawn each spring. Early historical accounts describe a seasonal encampment, fish drying racks, and a series of fish weirs located in the lower reaches of the creek (Morse and Brown 1989).

Shortly after the arrival of Euro-American settlers in the region in 1851, William Heebner settled near the mouth of Longfellow Creek on the shores of Young's Cove. Several years later, Captain John R. Williamson settled into the same cove as Heebner and quickly cleared ground and established a sawmill. Within a few years, the mill had burned down, not once but twice, and another was not built until John Enoch Longfellow arrived in 1868 (Bass 1947). After first moving to Port Gamble, on the Kitsap Peninsula, where the Puget Mill Company, the region's first logging company, was headquartered, Longfellow quickly relocated to Young's Cove, which was by then named "Humphreys" settlement and consisted of a small cluster of dwellings and dilapidated buildings (Dubrow and Berlow 1994). . The Puget Mill Company, which owned thousands of forested acres around the Puget Sound, also owned several hundred acres along the

ridges above the cove. Longfellow promptly went to work establishing a farm and opening the Longfellow Logging Company and mill at the base of the eastern ridge of the valley (DCA 1999). Although the mill was destroyed by fire in 1892, Longfellow had already established himself within the community of West Seattle by that time, serving as treasurer of the new city and later as a councilman. His political stature and prominence within the community were enough to memorialize his name on Longfellow Creek. A land classification map of the Seattle area created by the U.S. Geological Survey in 1894 was the first evidence in print of the small stream, labeled Longfellow Creek, just to the west of the Duwamish River.

In the early years of the twentieth century, the small community of Youngstown consisted of a post office, grocer, meat market, small vegetable stand, and drug store, as well as a one-room schoolhouse built in 1906 by the steel mill for the families of mill workers (LCWMCa 1992; DCA 1999). There also were several boarding houses, a hotel, and four saloons that had been hastily erected to provide housing and entertainment for the mill workers. Because of the rowdiness and overall debauchery of many of the mill employees, the annexation of the small but burgeoning community that was developing in the valley surrounding the creek was bitterly contested by the people of West Seattle. Petitioners against the annexation described the community as "rough, uneven and unfit for municipal advantages . . . some of the sections [of the valley] contain no inhabitants, and others only five or six people . . . it is wild country" (LCWMCa 1992, 9). Despite these concerns, the residents of West Seattle overwhelmingly approved annexation in 1902, voting 325 to 8 for the small city and surrounding communities to become part of the larger, burgeoning metropolis of Seattle (Dorpat 1984a). The community's rowdy and wild reputation, however, persisted in the minds of many in Seattle well into the middle decades of the twentieth century.

In some regards, the stigma of the area as "wild country" was well founded. Even into the 1970s and 1980s, the valley south of Youngstown was noted for its rural character (LCWMCa 1992). The poet Richard Hugo grew up a short distance to the south of Youngstown in a commu-

nity known as White Center during the 1930s and 1940s. Highly prolific, Hugo wrote extensively about his childhood experiences in and around the Duwamish River and nearby neighborhoods. In his autobiography published in 1986, he described the area as "a world outside the mainstream of city life, isolated and ignored. . . . [It was] in those days, a curious combination of the industrial and rural. A brickyard, a saw mill or a sand and gravel company operated here and there. More often they were idle, abandoned . . . ." (Hugo 1976, 14). Much of this had to do with the slow rate of urban development along the valley bottom. In the early twentieth century, as the community of Youngstown continued to grow, streetcar lines were established on the east and west slopes of the valley, and residential development followed. The ridges within the Longfellow Creek watershed had long since been logged by the Puget Mill Company and the Longfellow Logging Company. The valley bottom and steeper hillsides remained densely forested, however, because of the soft ground and high groundwater table that made retrieving felled trees nearly impossible. It was not until the 1930s that most of the valley bottom had been logged, and residential development and agricultural uses began to encroach upon the banks of Longfellow Creek (City of Seattle 2003).

Erma Schwartz, a longtime resident of Delridge, recalls Youngstown in the early decades of the twentieth century as a small town, where "everybody knew everybody else" (DNDA 1992). Most of the people who lived in the neighborhood worked at the steel mill or other industries along the Duwamish. It also became the preferred settling spot for many immigrants coming into the region, with English, German, Swedish, Italian, and Yugoslavian families all congregating into and around the northern end of the valley. Just upstream of the steel mill and along the banks of Longfellow Creek, a cluster of houses was built by newly arrived Italian immigrants. This area came to be known as "garlic gulch" because of the Italians living there, and the kids who grew up there were known as "gulch rats" (Dubrow and Berlow 1994; DNDA 1992). In the distinctly blue-collar, working class neighborhood, many of the families tended extensive vegetable gardens of onions, peas, tomatoes, spinach, and carrots and raised goats and chickens (Dubrow and Berlow 1994).

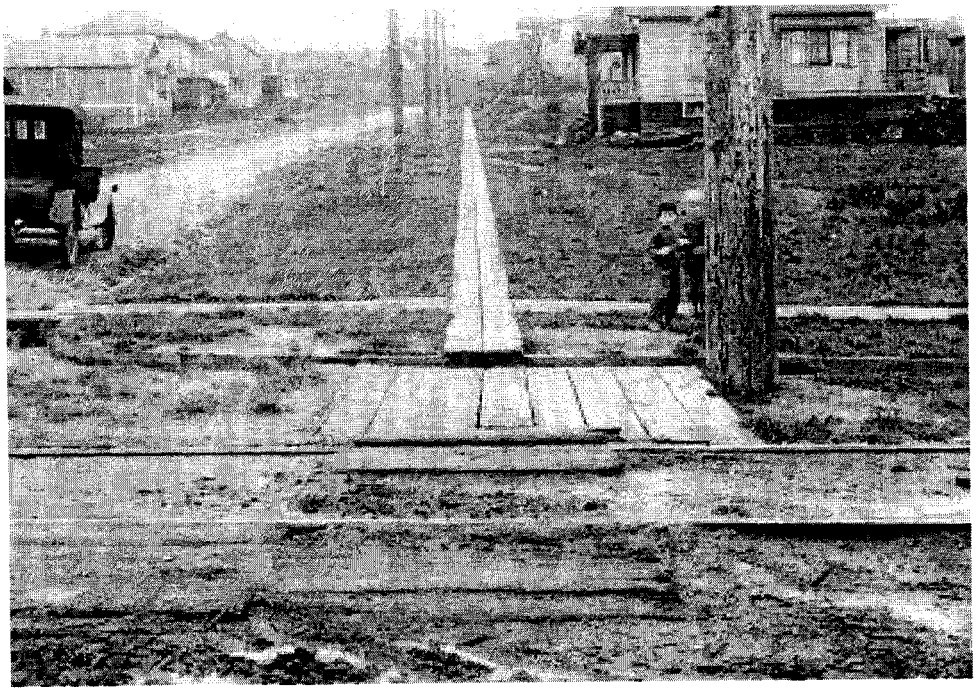

Figure 16. The Youngstown neighborhood, Seattle, ca. 1920.
University of Washington, Special Collections Unit, SMR1

Nearly everyone who lived in the valley and along the ridges in the Delridge community was working class poor. Hugo and others who grew up in the surrounding neighborhoods viewed West Seattle as a "middle class paradise" (Hugo 1976, 8). Longtime resident Mary Alice Willi described West Seattle "as an ideal. To be accepted there meant one had become a better person. It was everybody's dream . . . to eventually get to West Seattle" (DNDA 1992). For the children growing up in the Delridge valley, West Seattle "towered over the sources of felt debasement, the filthy, loud belching steel mill, the oily slow river, the immigrants hanging on to their odd ways, Indians getting drunk in the unswept taverns, the commercial fisherman, tugboat workers and mill workers with their coarse manners" (Hugo 1976, 8).

In 1935, the narrow valley between the Duwamish Ridge and West Seattle Ridge became home to Seattle's third golf course, known today as the West Seattle Golf Course. The 208-acre parcel of land was purchased from the Puget Mill Company for $36,000 on the condition that the

site be developed for use as a municipal golf course (Sherwood 1979). Over the course of the following five years and at a cost of more than $1 million provided by the WPA as part of an "unemployment relief project," the sloping hillside and valley bottom were graded, an old refuse dump was covered, and nearly 15,000 stumps were removed for the development of the golf course, which opened in May of 1940 (WSH 1987, 200). Although much of Longfellow Creek was left untouched during this development, several sections of the stream were placed in a pipe, and a fourteen-foot high dam was built near the northern end of the golf course to control flows and reduce flooding.

Figure 17. Building the West Seattle golf course, Seattle, ca. 1938. Seattle Municipal Archives, 30630

The golf course and creek came to be a favorite spot for children and teens growing up in the valley. One longtime resident in the valley recalls sneaking onto the golf course at night and flying kites. During the day, children played along the creek and collected golf balls that they then sold to golfers. "We could make up to $20 a week . . . and we would use that money to buy ice cream" (DNDA 1992).

During the middle decades of the twentieth century, development began to spread up the valley. Near the headwaters of Longfellow Creek in the 1930s, several Japanese families moved into the area and established farms in the rich, moist soil of the valley bottom. The produce they raised was trucked to area markets in Youngstown, Riverside, West Seattle, and even over into Seattle. With the onset of war in the Pacific, these Japanese families were taken from their homes and interned in several camps throughout the American West. Most of the families from the Seattle area were sent to Minidoka Internment camp just to the north of Twin Falls, Idaho (Tamura 2004). The lands vacated by the Japanese later became the location of extensive development and the building of the Westwood shopping center in the upper watershed with the filling of headwater wetlands and bog areas of Longellow Creek in the 1950s and 1960s.

During World War II, much of the land owned by the Puget Mill Company in the Longfellow Creek watershed was transferred to the local and federal government (Dubrow and Berlow 1994; WSH 1987). After the Japanese air strikes on Pearl Harbor and the Aleutian Islands, nearly 200 soldiers were stationed in and around West Seattle to defend the industrial infrastructure of Seattle, including the steel mill (then named Bethlehem Steel Inc.) and Boeing. The federal government established several military communications and anti-aircraft gunnery posts along the ridges to the east and west of the watershed, and a barrage balloon battalion was camped in a local playfield near the creek. Many of these soldiers, mostly from New York, stayed following the war, becoming part of a growing population boom within the Delridge community and West Seattle.

As was true of many communities in Seattle following World War II, the population in the Longfellow Creek basin and Delridge neighborhoods grew rapidly, and single-family residential development increased across the region (Sale 1976). Development penetrated the lower portions of the valley along Longfellow Creek, and the stream channel was straightened and armored to facilitate the urban growth. Although slumps in the rate of residential development have occurred within the watershed since then, especially during the 1970s, more recent development in the

basin from the 1980s on has shifted the dominant residential land use in the community from single-family homes to multi-family units. Despite this shift, the Delridge neighborhoods remained an ethnically diverse, working class area within Seattle.

Development in the headwaters area also intensified. Westwood Village shopping center was built during the early to mid-1960s. It was designed as a regional shopping center that would serve the needs of communities in West and South Seattle, with three department stores, a grocery store, a post office, and more than nineteen specialty shops, together with a vast parking lot, built over the extensive headwaters of Longfellow Creek (WSH 1987). As part of the development, a 7.5-acre tract of land now named Roxhill Park was donated to the city by the owners of the shopping center. The park now contains the last remnant of Longfellow Creek's wetland headwaters.

As development increased within the watershed, so did the problems associated with a decline in water quality and the frequency and intensity of flooding within the creek. The increased stormwater runoff and associated inputs of hydrocarbons and sediment into the stream were extensive enough that by 1949, Longfellow Creek was declared a health hazard (City of Seattle 2003).

From "Wild Country" to Open Space

Although residential, industrial, and commercial land uses dominate the Longfellow Creek watershed, the Delridge community has a larger percentage of open space and vacant land than any other neighborhood in Seattle. Over the past century, nearly 5 percent of the overall area has been purchased or condemned by the Seattle Parks and Recreation Department and preserved as open space. Much of the land is located along the Longfellow Creek corridor and includes the West Seattle Golf Course. Although typically lands that are inappropriate to development because

of their proximity to the creek and the high groundwater table in the valley, these areas have long been viewed by the city as a valuable asset to the community.

When John C. Olmsted returned to Seattle to draw up a supplemental report to his original park plan, he included many of the areas newly annexed by the city. In the plan, he recommended a large swath of land adjacent to Longfellow Creek be preserved as a linear park that would connect tree-lined boulevards that he proposed running east to west at both the northern and southern boundaries of the watershed. Olmsted's vision for Longfellow Park was to be a "narrow long park or wide parkway . . . designed to preserve the wooded valley of Longfellow Creek south of Youngstown between Duwamish Hill and Lincoln Hill and from West Seattle Parkway to South Bourne Parkway" (Olmsted Brothers 1905, 131). Over the decades, the city has acquired much of the land proposed by Olmsted in his supplemental plan—in part to fulfill his recommendations, but also to utilize the low-lying areas along the creek to manage flows within the stream and to look for opportunities to reduce flooding and damage to surrounding properties.

Since 1989, with the passing of the King County Open Space and Trails Bond Issue and coupled with the state Interagency for Outdoor Recreation/Washington Wildlife and Recreation Program, the Seattle Open Space Program, a local agency formed to acquire portions of the remaining open space within the city, has been successful in receiving supplemental grants to buy and preserve land along Longfellow Creek. The program has negotiated the acquisition of more than thirty acres of property along the creek. One of the earlier purchases, completed in 1996, included the area in the northern end of the watershed, just above the steel mill, once known as Garlic Gulch. In 2000, another section of open space along the creek located across from Sealth High School was purchased and preserved as open space for the community. Both of the areas have been the focus of extensive restoration activities within the stream and along the riparian corridor. They also accommodate portions of the Legacy Trail that extends from the headwaters of the creek down to the point it disappears into a pipe underneath the steel plant.

Building "Community Pride"

From the founding of Youngstown, the growing areas located within the low-lying Delridge valley through which Longfellow Creek drains struggled both economically and socially to be viewed as a valuable community within the city of Seattle. Throughout the middle decades of the twentieth century, "community spirit" was the primary rallying cry for bringing the community of Delridge together (LCWMCa 1992). However, the diverse ethnic demographics and multiple languages spoken within the area made it difficult for the larger community to coalesce under a common banner to promote the Delridge neighborhoods.

By the middle to latter decades of the twentieth century, however, many in the community began to realize that Longfellow Creek was severely degraded and represented a liability for the community and safety concern for local residents (O'Conner 1958). In 1974, King County's Housing and Community Development Block Grants were made available for local communities as matching funds. Coupled with grants from Seattle's urban reform program known as Forward Thrust, these funds enabled the community to begin planning and developing projects that were focused on open space and recreational activities. In 1980, the grants paid for the construction of a new community center along Delridge Way, followed a few years later by a neighborhood sign welcoming people to the community of Delridge. These projects not only encouraged residents in the surrounding neighborhoods to participate in community events, but they also helped to clearly set a precedent that recognized Delridge as a distinct community within West Seattle (Dubrow and Berlow 1994).

In 1987, a partnership comprising city employees from the Department of Community Development and members of the Delridge Community Association was created to cooperatively prepare an Action Plan for identifying and prioritizing development issues within the community. Drainage issues were identified as the "highest priority need within the community" (DCA 1990, 13). With the community still reeling from the effects of a major flood in January 1986 that

inundated many of the low-lying homes and businesses located along the valley bottom, as well as undermining and destroying a portion of SW Nevada Street, the plan stressed the need for improving drainage flow, infrastructure capacity, and water quality conditions. For decades, Longfellow Creek had been overflowing its banks on at least an annual basis, flooding backyards and basements. Removal of groundcover vegetation for development had also caused slumping and landslides to occur along the steep valley walls, where development pressure in the watershed has been most intense since the late 1800s and early decades of the twentieth century.

The development and subsequent implementation of the action plan became a catalyst for community action and participation within the basin. Bolstered by financial support from city-sponsored matching funds, residents began forming volunteer groups to work on improving the stream corridor by cleaning up garbage, removing invasives, and planting native species. Kate Stannard of DNDA said that over the past fifteen years, "there has been a tremendous outpouring from the community" (True 2005). Hundreds of people of all ages from schools, nonprofits, neighborhood groups, government, and businesses all over Seattle have come to Longfellow Creek to pull weeds, build bridges, and plant. One local resident remarked that "these efforts were bringing life back to Delridge and the creek" (True 2005).

Legacy and Wayfinding: From Past to Future

In 2000, several residents applied for and received a matching fund grant from the city to build a trail along Longfellow Creek. After approaching the DNDA for assistance, the community embarked on a partnership with several city agencies, including Seattle Public Utilities, Seattle Parks and Recreation Department, and Seattle Department of Transportation, to plan, design, and construct the trail. With more than $100,000 from the ProParks Levy of 2000 passed by the people of Seattle and Neighborhood Matching funds, the 4.2-mile trail system was opened within four years. The Legacy Trail roughly parallels the creek, adjacent to publicly owned areas and weaving its way along sidewalks and neighborhood streets in other sections. It has been described

as an "exercise in contrasts" (True 2005). From the soft edges of the stream to the curbs, asphalt, and rushing traffic of Delridge Way, the community trail weaves together the diversity of the built and forested areas of the Longfellow Creek watershed.

The original idea of the trail captured the imagination of many who lived in the watershed. Longfellow resident Mary Quackenbush was quoted in a local newspaper as saying, "We really want to capitalize on the ability of the creek to connect us as a community and remind us of our natural history" (Le 2001). There was much speculation from both the community and the agencies working to develop the trail as to whether there would be a positive community return on the investment of public monies. The process for developing the trail was often highly contentious, with the several factions involved disagreeing about what should be done and where the trail should be placed within the neighborhood. Numerous public meetings occurred during the planning and design phase of the trail project. Average attendance at the meetings ranged from thirty to fifty people and always included several people who were adamantly opposing the development of the trail. But several project managers from the city interviewed as part of this research, along with local residents who worked on the trail project, viewed it as a "true accomplishment" and deemed it a "great success."

A dominant feature of the Delridge neighborhoods, Longfellow Creek flows across both public and private lands. Some in the watershed, especially those who live along the stream, resisted the development of the trail, arguing that it would destroy the natural character of the greenspace and could increase crime rates in the area by providing for vagrants easier access into the sheltered areas along the creek. Attending to these arguments, the DNDA, with the help of community members and city officials, devised a plan for the trail to connect segments already completed as part of several Capital Improvement Projects (CIP) funded by Seattle Public Utilities. These projects also addressed rebuilding the stream channel to enhance fish habitat while further accommodating the increased stream flows caused by urbanization.

Artwork has been incorporated into the overall design of the trail and creek restoration projects to serve as both an educational tool and physical metaphor of the creek that flows through the community, much like what has occurred in the Ravenna Creek area. As the trail diverges from the stream, "wayfinding" signs have been installed to help in guiding residents along the trail, and in several locations, "gateways" have been built at entrances to publicly owned open space to reveal these areas to residents and visitors of the watershed.

City employee Sheryl Shapiro views Longfellow Creek as a "ribbon of connection," a physical reminder of the basin's past, present, and future (True 2000). Although the trail now provides a walking path from its headwaters to near the mouth, and nearly 40 percent of the open channel of Longfellow Creek has been enhanced to provide habitat for fish, there is still much to be done. Current projects within the community are looking at how best to connect to the east and west with the trail and to educate residents who live in the watershed about the benefits of the creek, while helping them realize their actions have an impact on the community as a whole.

In a recent newspaper article, journalist Karen Sykes wrote, "The story of Longfellow Creek is still being written . . ." (2005, 1). Recent actions sponsored by community involvement and supported by city initiatives and funding opportunities, have revealed that attempts to improve the conditions of both the physical and social community in the Delridge neighborhoods under the banner of "restoration" is strengthened through the partnerships developed between city agencies and community residents. As Jay Mirro has observed, the future of Longfellow Creek lies in the hands of those now involved in the restoration projects and of those who will be involved in the future. Although Longfellow Creek will never be restored to what it was in the past, its conditions can be improved for the benefit of both the people residing in the surrounding neighborhoods and the fish and wildlife that use the stream corridor. "The creek," Mirro says, "makes a wonderful neighbor.'

Notes to Chapter 6

[1] The term "smolt" is used to describe a life stage of young salmon. At this stage, the salmon becomes covered with silvery scales and first migrates from fresh water to the sea.

Chapter 7. Narrative Analysis and Discussion

> 'In the beginning was the story. Or rather: many stories, of many places, in many voices, pointing toward many ends.'
>
> — William Cronon, *A Place for Stories: Nature, History, and Narrative*

Introduction

The two case history narratives presented in chapters 5 and 6 do not comprehensively represent nor definitively articulate all the efforts currently underway in the city of Seattle to restore urban streams. However, the issues and problems that are enunciated in these narratives are illustrative of the complex and often contentious processes that comprise any attempt to restore urban streams.

Clearly, there is no single solution to solving the complex issues of degradation and neglect associated with urban streams. No watershed or stream has the same characteristics; each is a product of its unique physical conditions and processes. Geographer Rutherford Platt writes, '...urban watersheds are complex geographic mosaics of physical, ecological, political, and socioeconomic diversity...Each watershed is sui generis in terms of physical setting, history, political culture, state and local laws...'(2006, 40-41). Thus, evaluating priorities, setting objectives, and understanding limits for restorative or rehabilitative work in urban watersheds should be assessed on a case by case basis.

The contemporary conditions of cities are physical and symbolic products of their design, structure, and environment. They are repositories of human communities, political and economic institutions, and cultural artifacts. However, they are also physical places, subject to the same variables of climate, geomorphic, and hydrologic processes as hinterland areas. Throughout much of modern urban history the ecological processes associated with these variables have been

neglected and relegated to the margins of social concern and consciousness. This is especially pronounced in regards to rivers and streams that flow within and through cities. The functional processes of these systems and watersheds which they drain have been dramatically altered by urban development.

Since the mid-19th century in the Puget Sound region large rivers have been straightened, channelized, and drained to facilitate commerce, protect infrastructure, and control flooding (Collins et al. 2002; Booth 1991). The lower reaches of the Duwamish River are a prime example of where such treatment has been implemented (Buerge 1992; Carlson 1950). Smaller stream systems have mostly been lost, placed in pipes, covered, and forgotten. Those that have remained on the surface such as parts of Longfellow and Ravenna Creeks have suffered similar fates as the larger rivers. Degraded by large scale development and heavily managed by state and local mandates, many of these smaller stream systems are relegated to simply function as an efficient system for stormwater control and flood abatement.

The proliferation of urban stream restoration projects within Seattle represents a cultural shift in the perceptions of people and government for how to manage the hydrologic systems in urban environments. It is a transition from an operational perspective that primarily valued efficiency to an incorporation of broader environmental concerns and a greater realization of the opportunities that such environments may provide more for both people and wildlife. One of the interview participants in this study poignantly explained that over time, "Past generations [have] viewed [the non-human environment] much differently than we do today, and we have to remember and appreciate that."

These historical shifts in views and environmental values at both local and regional scales present opportunities for researchers and practitioners interested in urban restoration efforts to more fully comprehend both the contemporary and historical conditions of the watershed. Current methods in urban stream restoration have focused almost entirely on re-creating or

re-establishing the functional characteristics of a system from a contemporary perspective, and have viewed the physical and perceptional constraints of urban environments as an impediment to the successful attainment of ecologically based goals. In calls from both practitioners and researchers to expand the methodological approaches used in stream restoration practice and research, this explicit lack of historical understanding provides opportunities for interpretive methods in narrative analysis to be applied to the restoration process.

This research shows that utilizing a narrative case history approach which uses multiple methods of analysis can provide a profound understanding of the interaction between landscape and cultural processes at local and regional scales. This approach explicates not only the physical and ecological changes that have occurred within these watersheds, but also provides a more comprehensive understanding for how these systems have been viewed, understood, and managed in the past. Coupled with contemporary methods used in the design and implementation of restorative measures, the information derived from this approach can aid practitioners and researchers alike by informing them of management strategies that can address the patterns and processes, both human and non-human in origin, of the conditions and disturbances that affect streams and watersheds in the urban environment. This approach can also inform state and local municipalities of the role of streams in daily life by incorporating the petit-narratives of community members who's lived experiences accessed through oral history interviews, can assist in defining the overall restoration strategies for regulatory agencies.

It is my contention that conducting a historically-based analysis of the multiple narratives of urban watersheds will serve to inform researchers and practitioners of urban stream restoration efforts of how the functional conditions for which they are attempting to restore and manage have become degraded or lost, and how these conditions are linked to the societal perceptions and values that have created them. I do not mean to insinuate that utilizing this approach will provide the answers for the most appropriate or correct ways for planning and implementing attempts to restore urban streams. However, I do argue that a historically-based narrative approach adds to

and diversifies the current methods utilized in the practice of urban stream restoration, which are almost entirely focused on narrowly defined objectives such as reducing flooding or creating habitat for fish, by incorporating the values and perspectives of people that support this work.

The methods that support this narrative approach, the spatial and historical analyses, and interviews are each tactics that form the fundamental tenets of historically-based narratives. When utilized in a syncretic model, like the one described in chapter 2, these tactics provide a complementary method to contemporary approaches in urban stream restoration by revealing the multiple historical and contemporary narratives of local watersheds. In this way, the narrative approach serves as a chronotope, a materialization of time and space that incorporates human and non-human factors ultimately becoming the organizing core for understanding how the functional processes of the stream have been degraded or lost, and in turn, how they are being restored.

In this chapter, I examine how these methods can provide tacit information for the development of narratives. This narrative approach examines how these watersheds have been altered over time and why they are now the focus of restoration efforts. Although not intended to be an explicit comparison between the watersheds, I draw from the similarities and differences of these examples to explicate themes that I contend are important to both understand and incorporate in any urban stream restoration project.

Re-Visioning the Watershed

It is well accepted in stream ecology literature that to comprehend the complex processes of rivers and streams requires a panoptic understanding the dynamics of the watershed which it drains. Although I agree that a watershed perspective is vital, I would also argue that such an understanding is limited if it does not support the use of historical methods in conjunction with spatial analysis techniques. Conducting a historically grounded spatial analysis of watershed conditions provides a contextual perspective of the physical and ecological transformations of the

landscape through time. Such an approach highlights distinct periods of change that together have produced the spatial patterns and functional processes of the contemporary landscape. In the Ravenna and Longfellow Creek watersheds examined here, the aforementioned ecological transformation is exacerbated by the impact of urban expansion and development.

Recreating the watershed extents of Ravenna Creek using a digital elevation model (DEM) based on the topography of the basin and tools offered in Geographic Information Systems (GIS) shows that historically this stream was one of the largest within the contemporary boundaries of Seattle, draining an area of almost 9 square miles. At the time of Euro-American settlement, the headwaters of the Ravenna Creek watershed originated in the low-lying forested wetlands and bogs in the northern most sections of the present day extents of Seattle, and flowed south temporarily storing in Green Lake before draining through a small marshy outlet in the northeast corner of the lake. From this point, Ravenna Creek flowed in a southeasterly direction through a deep ravine before discharging into Union Bay on the western shores of Lake Washington. In all, the stream length of Ravenna Creek was roughly 2.5 miles from Green Lake to Union Bay. Today, the stream is only slightly more than 3,600 feet in length, 650 feet of which was uncovered in the recent daylighting project.

Two major events, the lowering of Green Lake and the rerouting of Ravenna Creek into the North trunk sewer line, isolated the creek from much of its original drainage basin. When Green Lake was lowered in 1909 to increase recreation opportunities along its shoreline, the Ravenna creek channel was left, quite literally, high and dry. Over the subsequent decades plat maps of the area reveal extensive residential development, and the channel was eventually filled and lost beneath what is today Ravenna Boulevard. Following World War II, maps of the area reveal similar development pressure occurring in the lower watershed, and much of the channel was already relocated in pipes to protect the urban municipal infrastructure and surrounding residential properties from flooding. In 1948, the flow of Ravenna Creek was diverted to the underground sewer mainline that collected waste for many of the communities in North Seattle.

These actions completely altered the conditions of the stream system, whereby an entirely new set of watershed dimensions operating under a new order of physical characteristics and functional processes emerged.

Today, the creek drains an area of less than one-tenth a square mile, primarily within the steep ravine below Green Lake. The majority of water that flows through the system is generated from groundwater seeps located primarily within Ravenna and Cowen Parks. Unlike many urban stream systems, Ravenna's flow is not supplemented by stormwater generated from surrounding neighborhoods. This has created a hydrologic regime that is relatively stable adjusting only seasonally to changes in groundwater densities and levels, but not responding greatly during major storm events. In this way, the hydrology of Ravenna Creek is similar to undeveloped watersheds that have only moderate fluctuations in flow during storms.

In contrast, the Longfellow Creek basin is considered a typical urban watershed with a 'flashy' hydrologic response to storm events (LCWMC 1992a). Stormwater infrastructure diagrams show Longfellow Creek as the functional backbone of the formal (piped) drainage system within the basin (Brown and Caldwell 1984). The urban characteristics of this watershed are created by an extensive system of pipes and constructed ditches that funnel runoff directly into the stream channel. Thus, Longfellow Creek now receives the majority of runoff from its basin at a greater rate than has historically been the case. This has dramatically increased degradation within the stream channel, loss of habitat, and the number and severity of floods that fill basements, erode backyards, and in one instance undermined the supports of the Nevada Street Bridge that spanned the ravine in the lower reach of the stream (LCWMC 1992a). More closely examining the distribution pattern of the stormwater infrastructure system within the watershed shows that the majority of runoff discharges into Longfellow Creek in the upper third of the stream system (City of Seattle 2005b). This exacerbates the spatial extent of the scouring and erosion in the stream channel caused by higher water volumes and the increased velocity of water along the entire stream system.

Interestingly, even though the magnitude of flows in Longfellow has increased dramatically, the actual drainage area of the watershed has been reduced by nearly 1/3 from 4.2 to 2.7 square miles and the open channel stream length has been reduced from more than 5 miles to fewer than 4. As urban development spread through out the watershed, drainage infrastructure was installed to capture the increased runoff and portions of this flow were diverted to other systems. In one instance the drainage from an area along the eastern slopes of the valley is pumped over the ridge and outside of Longfellow's topographic basin, ultimately discharging into the Duwamish River, nearly a mile from its confluence with Elliott Bay (City of Seattle 2005b).

The original maps created by the General Land Office (GLO) in the 1860s of the landscape in and around the Longfellow Creek watershed show a linear stream channel (i.e. one with few tributaries) that originates in a low-lying bog and wetland system in the upper valley and discharges nearly five miles to the north in a complex intertidal and estuary zone near the mouth of the Duwamish River. By overlaying a contemporary map on the historical GLO map the changes to the conditions of the watershed are evident and dramatic. The intertidal estuary is now filled with the spoils from decades of leveling the surrounding hills to facilitate urban development. The lower 3,260 feet of Longfellow Creek is contained within a 96-inch diameter pipe, flowing under the Nucor steel mill and the acres of asphalt that make up the west terminal of the Seattle port. The creek now discharges into the highly industrial and regularly dredged West Duwamish waterway.

The headwater area for Longfellow reveals a similar transformation. All that is left of the extensive bog and wetland system, which at one time encompassed 2.5 square miles of the upper valley in the watershed, is now a small 1.5-acre park. The rest of the area is heavily developed with commercial and residential land uses. Like the lower sections of Longfellow, the upper 4,000 feet of stream is encased within a pipe located beneath the surface of the ground.

Today, the character of the Longfellow Creek basin shows little resemblance to the landscape that was extant prior to Euro-American settlement in the region. Early plat maps and

subsequent aerial photos from the 1930s to present used in the spatial analysis of the watershed show initial concentrations of development built along the lower reaches of the stream and along the shoreline of what once was Youngs Cove. Over subsequent decades development rapidly expanded in this area as well as along the ridges and steep hillsides that bordered the valley. Roads were cut into the lower slopes of these ridges and eventually trolley car lines ran along them connecting the growing center of Youngstown with surrounding communities. This served as a catalyst to further commercial and residential development along their routes. During this time several small farms were established in the upper watershed taking advantage of the relatively treeless expanse of bog and wetland habitat as well as the rich soil conditions. Aerial photographs (1952) show that it was not until the end of World War II that development really began to intensify in the valley bottom, quickly transforming the conditions of the stream.

Recreating the physical characteristics of watersheds provides the spatial context for understanding the processes that dominated the historical conditions of the drainage basin. This re-creation further provides insight for understanding the differences between historical and contemporary conditions. Both of the watersheds examined in this research became smaller and the stream length became shorter due to human actions. These changes have distinct impacts that influence the conditions and processes of the watershed, and also provide the researcher and restoration practitioner with process-based information for developing and prioritizing a watershed approach for stream restoration.

Linking Meaning to Action

While the spatial analysis provides context to the changing physical conditions of the watersheds over time, a focused place history traces in greater detail the material and social transformations of the landscape. The watersheds examined in this research offer rich and colorful histories that reveal the distinctiveness of these places. The information generated from an analysis of their histories contributes both to the depth and breadth of the historical interpretation

of these watersheds by examining how the perceptions and values inherent in the cultural systems and subsequent actions have shaped the physical environment of these places.

In a brochure published in 1909 advertising Ravenna Park as a destination in Seattle for visitors and residents alike, the character of the park was eloquently described, 'No pen and no picture can do justice to tree and moss and bird and flower, and their settings, their colorings and their music as they are found in Ravenna Park.' The park represented a forested environment that was rapidly disappearing in the growing city. In the early part of the 20th century, much of the area within and around the city had been logged, and the once forested landscape was by then stark and denuded in comparison to earlier years. Confirmed by the city's efforts to develop a plan for parks and open spaces that would rival the cities of the eastern seaboard, the citizens of Seattle felt drawn to places such as Ravenna Park for the calming respite the ravine offered that was so different from their everyday lives. The ravine and its forest and stream offered shelter from the ruckus of the burgeoning city. However, a mere 14 years after its sale from private to public ownership in 1911, the perceptions of and values for the park and stream had changed dramatically. At this time, Seattle historian Clarence Bagley described the ravine as a 'dark, damp, dismal hole in the ground ...' (Bagley 1929: 17). The reasons behind this shift in perception and appreciation are largely due to the transition from private to public ownership. When the park was a private holding a $0.25 entrance fee was required, and the funds in turn helped pay to maintain the park amenities. When it was acquired by the city it became one property of many that had recently been purchased or condemned in accordance with Olmsted's plan for a connected system of parks across the Seattle isthmus. In fact, during a period between 1906 and 1916 the city acquired nearly 80 properties for park uses (Dooling et al. 2006). With all the public money available for open space earmarked for acquisitions there was little remaining to manage the land coming into the park system, and many of the newly acquired parks, such as Ravenna, descended to a state of neglect.

By the 1930s, much of the lower reaches of Ravenna Creek between the park and Union Bay had been channelized and piped to protect infrastructure and facilitate development within the area. A decade later, the stream was diverted into the North trunk sewer line at the lower end of the park, and the empty channel was quickly filled. While this reveals the city's intentions to manage stream systems in Seattle as efficiently and effectively as possible, local newspaper articles reveal a public outcry in response to merging the stream and sewer. Several decades later, backed by concerns over environmental health, the decline of salmon, and a general decline in the conditions of the urban communities of Seattle, the voices of many in the community again rose in favor of preserving the conditions of the creek, eventually coalescing into a grassroots sponsored and driven attempt to daylight the stream channel in the lower third of its watershed.

The narrative approach used in this research develops a more complete picture for understanding how the Ravenna Creek daylighting project was initially conceived, and how the project proceeded over the course of a decade and a half, battling against fluctuating public support changes in political backing and economic as well as ecological viability. It also enables a deeper understanding from multiple perspectives capturing the ideas and views of the perceived benefits of the daylighting as well as the negative aspects. For instance, many who supported the project, held a distinct and deep seated mistrust of the governance structures that set management priorities for Ravenna Creek, while from the governance perspective, the growing realization of the public costs and risks associated with such a large and extensive daylighting effort mandated a reassessment of priorities for how to manage not just Ravenna, but all the stream systems of Seattle.

Comparing the historical narratives of Longfellow and Ravenna highlights the similarities and distinctions between the watersheds. Although physically distinct in form and location from Ravenna, Longfellow Creek has in many ways had a similar social and urban development history. Although much of the hillsides bordering the lower valley through which Longfellow Creek flows were logged prior to the beginning of the 20th century, much of the lower valley was

preserved, but for very different reasons than Ravenna. The low lying valley of the Longfellow basin was primarily composed of wetlands and bogs due to high groundwater levels and topographically low gradients that made the removal of trees from the area difficult, since the stream was not large enough to transport the downed logs. With residential and commercial development concentrated in the upper and lower areas of the watershed the middle reaches of the stream retained a rural and wild character similar to that of Ravenna that was quickly disappearing from the surrounding urban areas.

During this time, Longfellow Creek became a natural playground for many of the youth that grew up in the area, and the stream was also used regularly by some in the community for domestic reasons such as a place to "cool ...milk and eggs" (DNDA interviews 2004) However, the perceptions and values of local residents toward the creek began to change by the middle decades of the century. As the rate of urban development increased within the watershed the quality of the stream began to degrade. One resident described experiencing the creek during this period "slick with oil" and often "colored by paint" (DNDA 1992). No longer was Longfellow Creek viewed as an amenity for the community. Frequently flooding and considered dirty, the stream and the area around it was understood as a "dangerous place" (DNDA 1992). It was not until the 1980s and early 1990s that people in the community really began to turn their attention to the creek, and look for ways to incorporate the stream and its surrounding lands into the larger plans for growth in the community. Ultimately described in the Delridge neighborhood plan released in 1992 as a community that would grow in concert with its natural surroundings the benefits of the creek were again perceived as a positive feature within the neighborhood. There are many reasons for this perceptual shift that range from the listing of local populations of salmon under the Endangered Species Act, to a growing societal concern for environmental conditions, to the purchase of the lands surrounding the creek to be preserved as publicly owned open space.

Distinct from Ravenna many of the early plans to restore the creek were sponsored by city initiatives established to enhance the stream conditions for fish use. Later, in partnership with the community the city of Seattle developed plans for a 4.2 mile community trail that today links the neighborhoods of Delridge from the headwaters to the lower reaches of the stream, providing for many experiential and educational opportunities for all people. In regards to Longfellow Creek, one agency employee stated, "[The creek] has and continues to both shape and change the nature of the community." With the work being done on the stream and surrounding areas to both increase access to the people within the community, as well as to increase the quality of stream habitat, it has for many, the agency employee continues, now become "a place of respite, a place to relax...it really improves the quality of life" for the community as a whole. "Now it is a welcoming area, and you may see your neighbors or someone walking their dog or with a stroller. So a lot of people now come [to Longfellow], because it is a safe place and a destination within the neighborhood."

Examining the evolving perceptions of society towards these systems over time gives insight into not only how the contemporary conditions of the stream were created, but further provides substantive depth for understanding the societal and cultural motivations for improving these systems. The goals and objectives for each attempt to restore urban streams are a product of these motivations, highlighting the need to include the participation of residents concerned with improving the conditions of their neighborhoods and the watershed in which they reside.

Learning from Stories

While both the spatial and historical analyses of the watersheds gives structure to the narratives developed in this research, the oral history interviews incorporate the lived experiences, the petit narratives, of those that have resided and worked within the basins. The oral history interviews conducted in this research are designed and analyzed to confirm the narrative structure of the histories of these basins, and also provide information regarding how the restora-

tion efforts for both watersheds were initiated, planned, and developed from multiple perspectives.

By interviewing the environmental consultants who are or have recently been engaged in the efforts to restore these systems the researcher gains a better understanding of why and how the projects were conceived and designed. For example, the designer for the Ravenna Creek daylighting stated that she had a lot of difficulty in initially attempting to gain permit approval from the regulatory agencies for her design, because she had incorporated several wide meanders in the design of the new stream channel to increase stream length and improve the overall quality of the habitat that would be made available by the daylighting. The regulatory agencies felt that based on their experiences of the often fluctuating flows in urban areas, the creek would jump the channel banks and eventually create a new channel that short circuited the meanders. However, the designer argued that her reasons for applying these design elements came from understanding the physical and ecological processes apparent in the contemporary system, and an appreciation for how these processes had changed over time. As stated earlier, Ravenna Creek is only fed by groundwater seeps located primarily within Ravenna and Cowen Parks resulting in a moderated flow regime with only modest flow fluctuations during storm events. In a 'typical' urban watershed high flow conditions would be flashy and unpredictable, and would short circuit the large meanders. However in a low gradient stream like Ravenna, the meanders mimic the patterns of less disturbed stream channels, and help to increase the overall stream length, ultimately providing for more available habitat. By using a historically grounded argument for defining the hydrologic conditions of the stream system the designer was able to convince the regulatory agencies that her meandering design was appropriate for the conditions of the stream.

In another example, a consultant familiar with the projects on Longfellow Creek felt that it was beneficial for the individual instream projects to be planned, designed, and constructed over a period of several years. "By doing it this way, the city [Seattle Public Utilities] was able to learn from some of their earlier mistakes." He felt that some of the earlier projects were too

narrowly focused on reducing flow velocities, and tried to force the issue of habitat. In this way the problems with the degraded stream channel were never addressed. He states, "I believe they have the wrong structures in the wrong places… [I]t was an expensive project, and now we have structures in a very narrow channel that are not functioning as desired." He feels that if the designers of the restoration projects had begun with a greater understanding of the past conditions of the stream channel they would have created a channel with lower stream banks to allow access to adjacent floodplains during periods of high water, and the amount of different instream structures to slow the water would not be as necessary. In the later projects, farther upstream, the designs were more focused on reconnecting the adjacent floodplain, reducing flow velocities and increasing the capacity of the stream to handle the high and flashy flows without excessive degradation and erosion along the stream channel.

However, for this consultant, the most beneficial aspect of the entire design happened several years after the projects were installed. In the fall of 2005, a family of beaver took up residence in one of the project areas in the upper part of the system, creating a series of dams and backwater ponds that forces the stream beyond its confined banks into the surrounding floodplain. He states, "Despite our best efforts to lock up a stream system, [these systems] change with time…. [H]opefully the beaver will turn it into something that is functional."

The interviews also provide insight into the development and evolution of goals and objectives as the projects progressed. For Ravenna Creek, the original goal of the community group was to re-create a stream channel from the southern end of Ravenna Park to Union Bay. Early proponents for the daylighting project viewed it as an opportunity to unite the diverse community of businesses and residents, enhancing the overall conditions of the neighborhood while also improving the environmental quality of the area. In hindsight, their early visions for creating a stream that would be 'teeming with fish' were relatively naïve considering the conditions of the watershed. However, over the 15 years that it took for the project to actually be built the goals and objectives changed many times as information regarding the ability of the system to

support a fish population was limited by size and hydrology, and support for the project waned with changing political and local business priorities. One long time supporter of the project stated during the construction of the daylighted section of stream channel, "What we are getting is not what we were originally working towards, but ... at least the flow of the creek is being reconnected and some of the channel is being daylighted."

For Longfellow Creek, the objectives for restoration are connected to the wider community goals for integrating the 'community with nature' as described in the 1992 Delridge Neighborhood Plan. As each of the restoration projects have been installed the objectives for restoring the system as a whole are becoming linked and the scale is expanding. One SPU employee stated, "Now that we have done a lot of the projects that were relatively easy to put together, we can focus on developing larger, system scale goals for reducing runoff, increasing water quality ... and making the upper sections of the stream more accessible to fish." A city agency employee that worked on establishing the Legacy Trail said that the objective for increasing connectivity within the community is also expanding. "Now that we have the trail along the creek, we want to look at opportunities for getting people to it from surrounding communities." In this way, the goals and objectives for the individual restoration projects have become integrated with the larger goals of planning for the future of the community in the watershed. A community activist commented, "The goals and objectives [for the restoration of Longfellow Creek] are constantly changing as [we begin] looking broader and broader."

In both of the examples of urban stream restoration in this study, the inclusion of public needs and objectives for the community were critical to the success of these projects. One SPRD employee stated, "[I]f you don't have community support the project [will] never be successful." In both cases, members of the local community were strong advocates for the urban stream projects. In Ravenna, local residents initiated and became the primary supporter for the daylighting of the creek within the neighborhood. It could realistically be argued, that if the community had not joined together for the sake of the project, no part of the daylighting would

have come to fruition. By forming the Ravenna Creek Alliance in 1992, the community members committed to daylighting were able to unite their intentions under a focused directive, while further enabling them to operate independently of city economic controls by tapping potential funding for the project from both public and private sources.

In Longfellow, although much of the instream and riparian objectives of the urban stream restoration process was defined by Seattle Public Utilities and the Parks and Recreation Department and funded by the ProParks Levy of 2000 as well as monies attained for Capital Improvement Projects, the community played an important role in the development, design, and now stewardship of the trail that mostly parallels the stream channel. The trail was originally envisioned by two community members that applied for and received a Neighborhood Matching Grant from the City of Seattle to design and build a small section of the trail near the headwaters of the stream. The concept of the trail was readily grasped by many in the community interested in making the large amount of open space in their neighborhood accessible to everyone. One employee of Delridge Neighborhoods Development Association (DNDA) that worked as a facilitator between the city agencies involved with the project and community members stated, "I was impressed when we held ... community meetings that there were at least 50 people at each meeting. That was a good indication [that the community was interested in the project]. Two or three people at each meeting would be really upset, but 99% of the people there were really excited, and wanted to see it happen." Since the projects began, DNDA reports that hundreds of volunteers have shown up for community organized and run volunteer projects to work on the trail and to clear invasive plants from the surrounding forest. One self described "forest steward" on Longfellow Creek feels that "volunteering and doing work for an urban stream is important because it allows us to share knowledge and enthusiasm with children and adults." In extension, "it helps us to become better neighbors."

Although the evidence generated from the case history narratives shows that establishing partnerships between government and community is beneficial for paving the road to successfully

implementing restoration projects in urban streams the planning is rarely a smooth process and contention can easily emerge between various stakeholders about the design and intention of the project. The restoration project in Ravenna Creek provides a good example. Although many in the community were supportive of the restoration efforts conceptually, when it came to designing the daylighted channel through the park playfields there were wide and divergent views about where the new stream channel would actually be located, and what alternative uses for these areas would remain. The lower field of Ravenna Park, through which the new channel would run was then divided into a practice field for soccer and a little league baseball field. A consultant for SPRD on the project stated, "[E]veryone was competing for this limited resource of available land. There are some people in the public that see a creek or natural area not as a park, but as wasted space. Then there are others in the city that are passionate about this type of space, and believe that they are necessary for a clean environment and air. It was very contentious public process." The primary opponents to this change were the ball park users. One advocate for the ball parks, felt that opening the stream channel would provide little benefit to the community, and instead create a "swamp" that would be unusable and undesirable by many in the area. One SPRD employee charged with facilitating the community meetings focused on developing alternatives for the design of the stream channel described the initial public meetings as "extremely frustrating." She goes on to state, "We would walk away from one meeting with some sort of agreement, but when we came back together again it would have all blown apart." Another SPRD employee that took on the project some months later stated, "The project really came together when each of the neighborhood groups [finally] decided that they could concede some of their issues so that all could benefit." She continues, "[Now] kids are playing ball in the park and that is great, although they should also understand that there is a creek and what a riparian corridor is. It is just a great chance to put all of those things together."

The oral history interviews additionally highlighted the importance of education as an integral component of the urban stream restoration process. Every participant in the oral history interviews regard the process of urban stream restoration as a prime opportunity for engaging and

educating members of the community of the natural environment in which they live. One environmental consultant stated, "I have always seen these creeks as a close up educational opportunity to build a greater environmental ethic in an attempt to inform and influence people's perceptions."

However, extending this concept of education, several of the participants regarded these projects as opportunities for professional education as well. One environmental consultant states, "[Urban stream restoration] is about learning what you did wrong the first time, and trying not to make the mistake again ... in other projects." A city agency employee describes the instream attempts to restore habitat and reduce flooding as a huge learning project for the city. "With some of the earlier projects we were at the bottom of the learning curve. There was a sense that you could fix the stream without fixing the riparian corridor. It wasn't about connecting floodplains; we didn't have a deep understanding of how the systems operated. We instead went for dramatic projects that were built quickly. But you learn along the way. I think if we designed those projects today, they would be very different. We would take a lot more care about floodplain connections ...We started out with spurts of mega-projects, but none of [the current projects] are glamorous; they are all modest projects representing a steady and consistent application of effort." As each of these responses make clear, taking the time to understand the complexity of ecological conditions and assess the many urban constraints allows practitioners the ability to more fully understand urban stream restoration as both an ecologically and socially beneficial endeavor that requires adaptive approaches that are informed from both the successes and failures of previous projects.

As these examples show the oral history interviews with consultants, agency employees, and citizens involved in the restoration projects for these watersheds provide pertinent information for understanding the intentions, motivations, and implementation behind these projects. They give insight into reasons why the projects were initially conceived, how they proceeded, and what they provide from an ecological as well as a social perspective. The information interpreted from interviews such as these enables the researcher and practitioner to understand the

distinctions and similarities that are inherent in these restoration schemes that they can then incorporate into the understanding and planning of future projects.

Using the multiple methods of spatial and historical analyses to structure the narrative histories as well as the oral history interviews that provide substance and personalized experiences in these watersheds illustrates how interpretive methods inherent in narrative development can provide the practitioner and researcher with effective tools for characterizing changing watershed conditions through time, and also establish physical and process objectives that are realistic and attainable. The following section reveals the themes that have emerged from this interpretive approach to examining urban stream restoration projects

The Meanings Hidden in Language

While narrative form gives structure to stories, stories in return supply substance to narratives (Wanner 1994). However language, and the intentions and meanings behind the words that build stories can often be subjective and as complex as the narrative it develops. It is important for the researcher to accurately clarify the meanings behind the use of subjective words such as nature, success, and restoration when conducting interviews on urban stream restoration. As part of the interviews I asked participants to define what they mean when they use the word restoration and their responses varied greatly, however a general trend in the definitions was the need for restoration to be defined as an adaptive process, as dynamic as the processes restoration projects are attempting to enhance.

As previously stated, the meaning of restoration has become intellectually contested terrain. While some, such as Katz and Elliot, argue the act of ecological restoration is a form of ecological mimicry, and the results are a poor reflection of the complexity which abounds in undisturbed settings, others such as Light and Higgs understand restoration in a more pragmatic and less stringent manner: as a way to mitigate for changes and degradation incurred by our

actions. From less an ethical and more a scientific perspective ecological restoration is about re-establishing physical and ecological processes either lost or degraded to create the conditions for a dynamic and adaptive stability within the ever-changing systems of rivers and streams. The meanings of ecological restoration are many. Each individual, discipline, and approach supplies credible perspectives for what ecological restoration is or possibly should be.

When asked to define restoration, the responses from the interview participants varied as much as those found in the literature. Each of the participants referred to the root definition of restoration, 'to return or bring back,' suggesting that in the context of urban stream restoration, part of the purpose is to reestablish the functional processes to some pre-existing set of conditions.

However, many of the participants did not believe that a stringent definition for restoration with an explicit intent on reestablishing past conditions is realistic in an urban setting. One SPRD employee argued that, "You are never going to be able to put it back to the way that it was before. You have to be realistic; you have to live in today." Another stated, "common sense guides restoration [projects]. In an urban area, restoration is going to be a balance between the built environment and what you can achieve to create connection and bring back the [pre-existing] processes." This balance requires a definition for restoration that is pragmatic and adaptable to the physical, biological, economic, political, and social context in which these projects are taking place.

Understanding restoration as a complex yet pragmatic endeavor, one local citizen engaged in restoration work on Longfellow argued that, "If we try to shoot for the moon [restore exactly to previous conditions] we would never [restore] more than the smallest of acreage. Restoration is ...[an attempt] to come to a fairly decent representation of what was here, but we need to understand that this is now a built environment, and there is going to constantly be disturbances...These are the things that we have to live with, and we can't exclude them."

From these perspectives, any definition of restoration in the urban environment must be adaptable to the individual conditions and objectives that drive the process to enhance these systems. For the practitioner and researcher alike, it is important to understand that there is no definitive definition of restoration. Each restoration project represents an original set of physical, ecological, political, social, and economic conditions and issues that should be understood and utilized for setting objectives and implementing plans.

Reaching for Success

Inherently related to the goals and objectives of a particular restoration project, defining success can be equally as problematic as defining restoration. As described in Chapter 1, the most successful attempts at restoration reside at the intersection between achieving ecological goals, meeting stakeholder needs, and learning from the process (Palmer et al. 2005). The narrative approach to restoration applied in this research supports these three components of success, however it is the scale of success that becomes the point of contention.

Taking a watershed scale approach to restoration insinuates that success should be measured from a landscape perspective. The argument is based on the concept that ecological systems are linked and complex, and if restoration projects are to be both successful and sustainable then the goals and objectives of the project must be structured so that the scope of the project addresses the issues of the watershed. However attaining such a high functional and spatial scale of success is not realistic, especially in urban watersheds. For example in urban stream restoration, projects are typically completed based not on an assessment of the needs of the watershed as a whole, but on other issues such as specific site conditions, cost, and access. The projects that have been designed and constructed within the city of Seattle are examples of restoration attempts that have been constrained by these urban realities. For example, all of the urban stream restoration projects addressed in this research are located on publicly owned lands in park and open space settings that are easily accessible. Also the projects have been prioritized

not based on an objective analysis of watershed conditions, but on the economic realities and value of perceived benefits from the project.

The economic constraints and political motivations for such an approach are readily apparent in the Ravenna Creek example. As the perceived costs of the project rose the city felt that it could no longer support the plans for the entire extent of the daylighted channel from Ravenna Park to Union Bay. As stated in the letter from Mayor Paul Schell (1999) to RCA president Kit O'Neill, '...the likely impacts on the city are substantial and continue to make it difficult for me to support the project.' Thus, the overall plan to daylight the lower reaches of Ravenna Creek was downsized, and the smaller scale project that was eventually built was located entirely within the boundaries of the publicly owned Ravenna Park. Arguably, this project will provide only localized ecological benefits, and may not provide sustainable solutions for improving the conditions of the system at the scale of the watershed.

For the researcher and practitioner this narrative analysis shows that measures of success for urban streams restoration projects are constrained not only by physical parameters, but also by the political, economic, and social realities of the contemporary urban environment. It is highly unlikely that in the near future attempts to restore urban streams will be successful from the watershed perspective. Measurements of success should relate to the scale of the project and the attainment of the specific goals and objectives set from the project such as a reduction in overall flooding events, an increase in returning migratory salmon, or an engaged and active community of stream stewards. Attaining these small scale measures of success is important to gain support scientifically, politically, monetarily, or from the community for future projects. As one environmental consultant who worked on the Ravenna Creek project feels, success in urban stream restoration "is the balance between the positive affect on people and also seeing it physically succeed as habitat." She goes on to state, "these successes do not need be large or dramatic, they just need to be meaningful."

The Historical Imperative in Restoration

John Lewis Gaddis (2002, 11) writes, "As we look toward the future, there is no better guide than the past." I have argued throughout this research that understanding the history of a landscape from multiple perspectives more fully enables the researcher to comprehend and understand the complexity of the present-day conditions of that place. So often there is a stark physical and social difference between contemporary urban landscapes and the conditions of the past, yet a fundamental component of the restoration dialogue examines the possibilities and constraints for restoring functional systems to some ill-defined and often vague set of historical conditions.

When asked if they felt that understanding the history of a system or place is important in urban stream restoration, 12 of the 13 participants resoundingly responded "yes." One environmental consultant stated, "You have got to understand where things have been to get your head around shaping what it can be in the future. If you don't understand all of the mistakes that have been made you really won't have a very good basis for thinking about how to mitigate contemporary conditions." Put another way, one SPRD employee responded, "The history of a site is absolutely important...If you don't know how it used to operate, and then you put the layers of time and development on top of that, you don't know how the system changed, and you will never be able to go back and figure out what the compromise position is." In this sense, understanding the past and changing conditions of the landscape provides a baseline from which restoration can proceed (Jordan et al. 1987).

Although many of the participants argued that understanding the history of a site or watershed is important in restoration, recreating those historical conditions is not the goal. Several of the participants argued that the objective of stream restoration, especially in the urban environment, should not be to reconstruct the ecological and physical patterns of the past, but to understand and work with the basic processes of the system for today and the future. One city

employee stated, "[H]istory gives context that is necessary. [It] shapes the actions that we currently see and experience." However, she also feels that understanding and utilizing historical reconstructions is only part of the process, and must be taken in context. "Sometimes we get stuck trying to make something what it was, but we need to understand that things have changed…somehow [the restoration process] needs to be more dynamic between past, present, and future."

A single interview participant felt that understanding the history both physical and social is unnecessary for planning and implementing urban stream restoration projects. An agency employee, this respondent felt that "our systems are so altered and the options so limited, that it doesn't really matter what it used to be. It can't be that again… It is more important to manage [the system] for what it can be." Dependent upon the contemporary conditions of the watershed and the stream channel, this employee felt that it is more important to deal with the altered and degraded conditions that we have today. The employee continues, "In my view, the restoration [of urban streams] is not about going back, but moving forward. In many cases these systems are trashed and what we are trying to do… is [to] create local gems that are not for what happened yesterday, but for what will happen tomorrow."

For the researcher and the practitioner, the narrative approach to urban stream restoration studies shows that for most understanding the history of changing physical, ecological, and cultural processes in the system is important for comprehending the ecological and social parameters within which restoration practices should proceed. In this way, using a historically based approach in attempts to restore urban streams is as much about understanding and defining conditions as it is for projecting what the impacts of these projects will have on the stream system in the future.

Artistic Tropes in Restoration

An unexpected theme that emerged in the narrative analysis of Ravenna and Longfellow Creeks was the role that art plays, and the worth that is has as a heuristic tool for both revealing and educating the public on the beneficial values of urban stream restoration. In many ways, urban stream restoration is as much art as it is science. It requires not only a scientific understanding of the system it is attempting to enhance, but also a creative touch. The examples of art used in both the Ravenna and Longfellow Creek examples examined in this research extend this artistic and creative component of restoration.

In each of the case studies artistic representations are used as a metaphorical extension of the restoration projects. One city agency employee that worked with the Ravenna Creek daylighting project said that the idea "... was that artwork would highlight [the restoration work], and ... teach residents about the watershed." In Ravenna, the artistic representations are designed to depict processes and reveal the patterns of the stream system beyond the physical bounds of the daylighting project. Borrowing from cartographic representation techniques, the underground pipe is traced on the surface through concrete and asphalt with an embedded blue line. Along one segment of the line, stretching nearly 100 feet, the words Ravenna Creek are embossed in the sidewalk in 12-inch cast bronze. Influenced by physical representation and maps of the watershed, the thin blue line and spelling of Ravenna Creek above the pipe represent a life size portrayal of a map of the watershed. The design also incorporates 'windows' into the pipe to reveal the flow of Ravenna Creek from park to slough. As pedestrians walk along the sidewalk they are offered glimpses into the pipe in an explicit design attempt to reveal the hydrologic processes of the stream, encased within the confines of the pipe. Time capsules have also been cast within the sidewalk containing seeds of native trees and shrubs.

The art projects within the Longfellow Creek watershed serve a slightly different purpose. The individual pieces are designed to draw people into the sites and to guide them along the

trail. The most prominent features of these projects are four 'gateways' located at the entrance of several open space areas along the stream corridor. Designed and constructed by volunteers the gateways are a reflection of the distinct character of those that worked to enhance the conditions of the stream and open space surrounding it. By doing this, the gateways serve as a portal into the open space areas along the stream corridor creating a more intimate experience between visitors and the creek that could not be gained by peering into these areas from the street.

As part of the trail project, 'wayfinding' signs have been created, designed with a consistent motif using photographs of several native plant species found along the stream corridor. The purpose of these signs is to draw people along the trail through the neighborhoods surrounding the creek, and guide them to the open space areas that are spread along the stream corridor from the headwaters to the open space area near the mouth of the creek. One city agency employee familiar with the Longfellow Creek project stated, "...to me the wayfinding [signs] became the major objective of the trail. They provide a way for people walking in the neighborhood to orient them to the creek, and to experience what the creek and the surrounding forested spaces have to offer."

For the practitioner and researcher, these art projects establish a focused narrative for further understanding these systems beyond the physical boundaries of the restoration projects. The thin blue line of Ravenna and the gateways and wayfinding signs of Longfellow all represent an attempt to reveal the stream systems and processes in the context of the larger landscape. As a designer for the Ravenna Creek daylighting states, the art projects work "to educate the community and integrate the creek into their daily lives." As an agency employee said, "Urban stream restoration [is] as much social restoration as it is ecological." These art projects aid in metaphorically extending the influence of urban stream restoration projects to the larger community, educating and possibly expanding their perceptions to understand and appreciate the stream systems as an integral part of the community in which they live.

Conclusion

Five decades ago, urban historian Lewis Mumford (1956, 386) wrote, "[The modern city tends] to loosen the bonds that connect [its] inhabitants with nature and to transform, eliminate, or replace its earth-bound aspects, covering the natural site with an artificial environment that enhances the dominance of man and encourages an illusion of complete independence from nature...." Although Mumford's statement is descriptive of the many lost, displaced, or degraded stream systems in urban environments, the processes of restoration offer a metaphorical bridge reestablishing the link between urban inhabitants and the city's 'earth-bound aspects.' The many attempts initiated to restore urban streams reveal opportunities for understanding the urban landscape as an amalgamation of both human and non-human significance.

However the knowledge and methods used to support urban stream restoration efforts are still maturing. As revealed in this research, the concepts and theory that drive the wider view of restoration have emerged as contested intellectual terrain; the values, ethics, and the very definition of restoration are subject to wide debate. The term restoration implies the returning of something (in this context, streams) to some previous condition, but there is often little agreement about what conditions are preferred, and further the relationship between functional processes and landscape patterns has yet to be thoroughly explored. Many practicing restoration ecologists and theorists acknowledge the lack of a definitive theoretical base in restoration studies, yet remain wedded to a narrow scientific perspective viewing species-specific improvements as the single measure of success in restoration. However, as I have attempted to show in this research the narratives derived from examining urban stream restoration efforts on Ravenna and Longfellow Creeks reveal a tightly woven cultural bundle of complex social and physical issues. Understanding how and why urban stream restoration projects are conceived, developed, and implemented requires disentangling the multiple narratives entwined in the physical, social, political, and economic landscape of our contemporary cities. These narratives reveal a complex set of relationships that is best understood through clarification rather than simplification. A

canned approach to developing and implementing restoration projects is not realistic; the individual circumstances and opportunities defining each watershed are as contingent on past as well as present circumstances. Analyzing specific case studies of urban stream restoration affords flexibility to interactively identify and disclose past mistakes, recent foibles, and the future of opportunities. As Potteiger and Purinton (1998, 214) succinctly state, '[R]estoration has emerged as one of the more compelling stories being worked out in the contemporary landscape.'

To more fully understand these compelling stories, I believe that it is essential to utilize a research program that formulates a re-visioning of the watershed perspective. Using a historically-grounded approach to spatial analysis addresses not only how the watershed conditions have changed over time, but further articulates how the impacts of these changes have formed the contemporary conditions and processes of the landscape. This perspective incorporates a multidimensional approach that utilizes spatial analysis methods in conjunction with historical and contemporary narratives. The results of this combination creates a chronotope for characterizing the changing conditions and processes of these basins and offers the opportunity to make recommendations for how to best situate these changing conditions within the cultural narratives of the urban environment. Understanding the landscape features of a watershed, establishes both physical and perceptional boundaries of the abiotic, biotic, and artifactual spheres of the narrative. However, also understanding the processes of physical and cultural change focuses the structural form of the narrative, and provides the restoration researcher and practitioner with specific information regarding the social and cultural structures that manage the stream system.

I believe that investigating both the physical and cultural histories of urban watersheds in an iterative format strengthens the researcher's ability to coherently expound on the multiple historical narratives generated in the urban environment. These narratives give meaning to the physical actions that have impacted the conditions and processes of the landscape, while also providing insight into the emerging relationships and interactions between functional processes and cultural practices.

While these remarks bring this dissertation to close, it is prudent for me to acknowledge that this research represents a narrow example of what narrative research has to offer. There are many more avenues for exploring how narrative understanding can inform restoration practices that may yet reveal new directions in restoration research, and in an even larger context new approaches for how people both intellectually and physically experience their surroundings. Potential avenues for expanding interpretive modes of research in restoration are to: (1) more critically examine the rhetoric of restoration practitioners in efforts to objectively characterize initial and post-project perceptions of what ecological restoration in the urban environment has to offer; (2) to more thoroughly explore the changing relationship between people and the landscape over time as new political and economic structures are developed and implemented. For, example returning to the conversation of defining restoration, and the inherent perception of returning a landscape to some past set of conditions, how do the political and economic structures of contemporary society influence perceptions and create an often utopian view of past conditions; and, (3) to utilize a narrative approach that incorporates knowledge of the past into spatial understanding of landscape processes from the beginning of the restoration process, to analyze the influence of such an approach not only on the outcomes, but from the initial development of goals and objectives.

Surrounding the isolated scenes of Longfellow and Ravenna Creeks is the panorama of Seattle and the larger challenge of developing effective urban restoration narratives. There is no clear picture of the history of these watersheds from beginning to end. After more than a hundred years of change it is not possible to recreate past conditions. Rather than carefully contriving images of what should have been, the undertaking for restoration is becoming one of experimentation, of negotiating a future dialogue that is grounded in the particular social, cultural, and environmental realities of the urban environment. It is precisely because urban streams, like Ravenna and Longfellow, have historically been perceived at the conscious margins of the built environment that restoration offers the opportunity to diversify perceptions and experiment in the construction of narratives that in a small way work to refold the common allegory that distin-

guishes between humans and the non-human environment. Here, in this metaphorical lacuna, attempts to restore urban streams engender a range of possible narratives for re-visioning, re-telling, re-sequencing, and re-prioritizing society's relationship to the urban landscape.

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Appendix A: Interview Introduction and Questions

Name
Street Address
City, State Zip Code

Date, 2006

Dear Interviewee {Name}:

I was referred to you by {Name}, and it is my understanding that they have already contacted you let you know that I would be approaching you about participating in an oral history project for Ravenna/ Longfellow Creeks.

I am writing to you to request an oral history interview based on your experience(s) as an active participant in the restoration process for one or both of the watersheds in question.

I am a doctoral candidate in the PhD in the Built Environment Program at the University of Washington. I am researching several urban stream restoration projects within the City of Seattle for my dissertation project. These include the 'daylighting' of Ravenna Creek and the development of the Legacy Trail along Longfellow Creek.

When finished with my dissertation work, and with your permission, your interview and the story of these watersheds will be donated to the Museum of History and Industry, MOHAI. In 2008, the museum plans to open a major exhibition, Urban by Nature that will explore and interpret the history of our local environment; one portion of the exhibition will focus on rivers and lakes in and around Seattle during the 20th century.

Your oral history interview will be a tape-recorded conversation. For this reason, I will ask you to sign an agreement, which allows me and the Museum to use the information on these tapes for educational purposes, and to make your interview available to the public. I encourage you to be frank and comprehensive – this is an opportunity to be reflective about your life and times, and for the distant future. You may, if you wish, "seal" parts of your interview from public access for a period, so that controversial topics can be explored for future research but be unavailable in the near term. Please feel free to discuss this agreement with me.

The oral history interview will last about 45 minutes. I want to be clear that this is an entirely voluntary interview process. Please feel free to decline if you wish. If you agree, your interview will be transcribed in its entirety and returned to you for review and edit. I will only use the information from the interviews that you approve following review.

I will arrange to meet or at least speak with you over the phone prior to the interview to discuss any concerns, suggestions, or questions you might have, and to preliminarily map our conversation together. I will also be sending you the questions I would like to ask before our planned meeting.

Your experience is unique, and offers insight and understanding that I could gain in no other way. Without *your* memories and reflections, my project would be incomplete. I very much hope that you will be willing to share your experience and accomplishments with me.

Please fell free to contact me by phone (---) or email[1] (---) if you have any questions concerning the interview process.

Very truly yours,

Kenneth Yocom
Doctoral Candidate
Ph.D. in the Built Environment
College of Architecture & Urban Planning
University of Washington

Building Watershed Narratives: Two Case Studies of Urban Streams in Seattle, Washington

Kenneth Yocom
Doctoral Candidate
Program in the Built Environment
College of Architecture & Urban Planning
University of Washington

Thank you for agreeing to participate in this interview. While developing the foundations of this research, I have found it imperative to involve the people that have actively participated in developing and/or implementing the restoration/rehabilitation plans for Ravenna Creek. I have listed a series of questions that I will be asking you during the interview. Please review them prior to our scheduled interview time. Following the interview, I will transcribe your responses, and return them to you for review, comment, and approval.

Part 1: Project-specific Questions

1. How did you first become involved in the development and/ or implementation of the 'daylighting' (restoration) plans for Ravenna Creek?

2. How do you view your role in the process to 'daylight' the stream? Has this changed since you first became involved with the project?

3. What were your goals and objectives for this project when you first became involved? Have your goals and objectives changed since your initial involvement? If so, in what ways?

4. What has been the most enjoyable experience you have had while participating in this project? Conversely, what has been the most frustrating or contentious experience?

5. What do you think is the most important thing that you have learned from your involvement with this 'daylighting' project?

6. Do you feel that the outcome of this project is a success? If yes, how so? If no, why not?

7. What do you think are the most important issues pertaining to this project, or for the Ravenna watershed as a whole, that still need to be addressed?

8. What would you like to see happen in the future on/for Ravenna Creek?

Part 2: General questions on urban stream restoration

1. Do you feel that urban stream restoration is important in general? If yes, why? If no, why not?

2. How do you define restoration?

3. Does understanding the history of the site or watershed play a role in developing and implementing restoration plans? If so, how? Can you provide an example?

4. What do you consider is needed for an urban stream restoration project to be successful?

Note: Confidentiality cannot be ensured with email contact.

Appendix B: Place-based Urban Ecology: A century of park planning in Seattle

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Place-based urban ecology: A century of park planning in Seattle

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Abstract This research responds to calls from within the field of urban ecology to explicitly incorporate humanities-based research in order to achieve robust interdisciplinarity. Our research provides an example of a place-based urban ecological analysis. We use this framework to analyze over a century of park planning and development within the city of Seattle. We identify four eras of park planning that are linked by a comprehensive 100-year park plan. This case study examines how the political, cultural, and economic aspects of park planning have produced and been influenced by long-term trends and historical contingencies. This research also offers practical insights for effective contemporary urban planning, emphasizing the need for flexible and adaptive long-term plans when confronted with unpredictable events, emerging political arrangements, changing cultural priorities, and shifting fiscal climates.

Keywords Urban ecology · Seattle · Urban parks · Place-based · Humanities · Interdisciplinary · Long-term planning · Olmsted firm

Introduction

Seattle is a city of over half a million residents with approximately 9% of its total area designated as park or open space (US Census 2000). There are currently more than 400 city-owned and maintained parks, including forested areas, boulevards, playfields, playgrounds, and golf courses. Guided by a vision and comprehensive plan for parks developed in

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1903 by John C. Olmsted, Seattle has woven an extensive system of park spaces into the fabric of the city. This commitment to parks and open space has persisted throughout the development history of the city. Although the contemporary park landscape is a physical legacy of the 1903 Olmsted plan, shifting political processes, fluctuating economic conditions and evolving cultural ideologies have influenced the implementation of the plan over the past 100 years. More than a century after its initial implementation, the plan continues to be interpreted and applied within the context of a densely settled urban system, where the converging interactions between politics, economics, and park planning culture are in some ways similar, yet inherently distinct from the earliest period of park planning in Seattle.

Our research explores the development and influence of park planning in Seattle from 1884 to 2004 within an analytic framework of urban ecology (see Alberti et al. 2003). Within natural science research, urban ecology promotes the re-integration of humans into researching the ecology of urban systems (May 2004; Alberti et al. 2003; Pickett et al. 2001; Grimm et al. 2000). Much of the natural science research has defined urban areas as "ecosystems" without explicitly acknowledging the influence of humans on the biophysical landscape (McIntyre et al. 2000). However, as the understanding of ecological processes in urban and urbanizing environments expands, natural scientists are becoming more motivated to perceive urban areas as human dominated systems which function in distinct ways from non-human dominated systems. The growing appreciation among natural scientists for the role of urban social systems in driving urban ecological change facilitated the construction of an urban ecological framework that perceives urban systems as co-evolving human and natural systems (Alberti et al. 2003).

The application of an urban ecological framework allows for the detailed study of interactions between human (including political, economic, and cultural) and biophysical (including hydrological, climatological, and terrestrial) conditions as well as resulting patterns of environmental and social change. Urban ecology has been positioned between the humanities and science, with some urban ecologists proposing that humanities become the backbone of rigorous urban ecology research (Alberti et al. 2003). Although, most urban scholars acknowledge the importance of history and culture, few recognize the influence of historical contingencies on the social and ecological patterns that emerge in urban systems. May (2004) explicitly incorporates a humanistic approach into an urban ecological framework, and articulates the influence of historical conditions and cultural practices in the development of an urban area. Building upon her work, we expand this urban ecological framework to incorporate methods of historical analysis for exploring how the interactions between politics, economics, and ideologies have influenced park planning and development over time.

Our framework embraces a place-based, historically grounded approach focusing on the relationship between patterns of park development, shifting political arrangements, changing cultural conditions, and fluctuating fiscal resources within park planning. We ask three questions:

1. What major political, economic, and cultural processes have influenced park planning in Seattle over the past century;
2. How have these processes interacted to produce significant and distinct periods of park planning (including acquisition and development) activity; and
3. How has the 1903 Olmsted plan persisted and adapted to the shifting processes of park planning during this same time.

We define the politics of park planning as the relationship between the Seattle Parks and Recreation Department (SPRD), Seattle city elite and local community members engaged in

the process of park planning. The economics of park planning refers to private, city, regional, and federal fiscal resources used to acquire, develop, and maintain parks. Park planning culture is viewed as the influence of citywide agendas concerning park acquisition, maintenance and development. Primarily driven by local factors, these three components of park planning are further influenced by scalar economic, political, and cultural conditions. We explore each component individually, while also paying attention to their interactions in order to describe and situate the application of the 1903 Olmsted plan. By incorporating a historic analytic method to Alberti et al's framework of urban ecology, we are able to identify fluctuations in long-term processes and drivers, which lead to a rich understanding of the evolution of urban systems.

Our description of the process of urban park planning and development over 100 years motivates an understanding of cities as ecological systems, where the historical interrelationship between social, economic and political processes has influenced park development in Seattle. We are therefore most concerned with examining the ecological relationships, or network of factors, *influencing* park acquisition and development over time. By focusing on the drivers, processes and patterns of urban change in relation to parks, we utilize three of the four aspects of Alberti et al's conceptual framework. The fourth dimension, addressing effects—such as the ecological function of parks and park use patterns—is not part of this historical study.

The inseparability of politics from the park planning process has been well established by previous scholars (Rothman 2003; Cranz 1982). Park historian, Galen Cranz (1982) documents the emergence of new cultural ideologies and forms of public engagement, specifically addressing changing demands from citizens on the creation of new park designs and models. She acknowledges the impact of economics on urban park development, claiming parks have received increasingly smaller portions of city revenues, resulting in an increased dependence on federal funds for acquisition and maintenance. Our research builds upon Cranz's work. Where Cranz identifies large, nation-wide patterns based on three cities, we explore the single case study of Seattle, a city known both for its initial commitment to cultivate a park system and for its contemporary participatory approach to urban park planning. Cranz (1982) contends that the history of urban parks is relatively homogenous, however our research suggests that although Seattle shares some similarities with other urban centers (i.e., fiscal challenges, use of parks for social reform and public health agendas) it also possesses unique interactions between the politics, economics, and culture of park planning (i.e., the influence of a 100-year park plan, a progressive participatory park planning model and a natural endowment of hilly forested terrain, mountain views and scenic waterways). We situate our research within this expanded framework of urban ecology, using the history of park development as a focal point to highlight the contributions of historical analysis for understanding complex urban environments.

For the purposes of this study, we define historical analysis simply as the expansion of the sampling time frame. In this effort, we are attempting to capture contingencies and the variation associated with long-term and accumulative changes in the development of urban systems. Tracing the development, dormancy and resurgence of the Olmsted plan over 100 years illustrates the challenges and adaptive approaches that accompany long-term planning efforts. May (2004) emphasizes the influential power of ideology espoused by elites in high society on city development while Rozenzweig (1983) emphasizes the necessity of acknowledging citizen influence on the design and development of urban landscapes. Our research incorporates both of these perspectives. We demonstrate that park planning, including the process of implementing and adapting the Olmsted plan in Seattle, is a product

of efforts undertaken by political and economic elites as well as local neighborhood groups. We further argue that the constellation of institutional, elite, and local citizen participants, as well as the influence of regional and national park planning trends, has impacted both the process of park planning and the kinds of parks produced in Seattle.

This paper makes three significant scholarly contributions:

1. We respond to calls from within the field of urban ecology to utilize methods and epistemologies prevalent in the humanities. Scholarship commonly found in historical and cultural studies should be rigorously incorporated into the field of urban ecology to achieve robust interdisciplinarity. To this end, we have developed a *place-based, historical analysis* to understand urban ecosystems. We position our research analytically and epistemologically within the fields of urban studies and history by exploring the place-based, cultural and historical dimensions of landscape change—including the link between shifting planning cultures, evolving citizen participation in park planning efforts, and institutional park planning decisions. Instead of generating a set of generalizable findings, we seek to understand the evolution of park planning in Seattle through a case study that draws explanatory power from an assemblage of unique historical and contemporary actors, events and processes. Through this analytical approach, our research offers an epistemological orientation and set of methods commonly identified with research in humanities. Although, we recognize that our research is limited primarily to historical methodologies, we maintain substantive interdisciplinarity by addressing the cultural, economic, political, and physical dimensions of park development and landscape change in Seattle.
2. Our findings illustrate that incorporating humanities into the field of urban ecology broadens our understanding of urban ecosystems. Incorporating a humanities orientation allows us to explore the cultural, political, and economic aspects of an urban system, the uniqueness of the social and physical environment and the unpredictable outcomes of a place's history. We develop an in-depth, place-based analysis that integrates the cultural, economic and political aspects of park planning in Seattle. This analysis highlights how relationships between these three aspects of park planning have both produced and been influenced by long-term trends and historical contingencies. In Seattle, 100 years of park planning has been influenced by: stochastic financial resource availability across federal, regional, state, and city scales; an evolving park planning culture that included shifts in institutional ideologies and priorities; and an ever changing political fabric that resulted in emergent arrangements of political representation and power. By incorporating an extended time frame and the cultural aspects of urban systems we are providing an interpretation that is typically not provided by urban ecological research projects developed within dominant natural sciences epistemologies. We argue that a humanities-based understanding of urban systems contributes a rich, multi-faceted understanding to the interpretations generated by natural science-based research.
3. Our research shows how a place-based, historically grounded urban ecology can offer practical insights for effective contemporary urban planning. A historical analysis of the 100-year Olmsted plan in Seattle reveals important lessons for successful long-term urban planning. Specifically, our study illustrates the need to implement and maintain flexible and adaptive long-term plans that can remain viable in the face of unpredictable events, emerging political arrangements, changing cultural priorities, and shifting fiscal climates.

Methods

By conducting historical analysis within an urban ecological framework, we developed a mixed methodological approach for determining the relationships and nuances between the ideological, economic, and political components of park planning within Seattle.

We first constructed a database containing: the date of acquisition; method of acquisition (purchase, condemnation, donation); purchase amount; source of funding for acquisition (i.e., park bonds, levies); location of park; type of park (park, boulevard, playfield, playground, golf courses and community centers); and size of park. The database included parks acquired in Seattle between 1884 and 2003. We identified all designated park parcels excluding those less than 0.25 acres that functioned as medians, places, and triangles. Although owned by SPRD, these parcels are typically managed by local residents. The database accounts for 93% of all park properties. A histogram of the data representing the numbers of parks acquired through donations, direct purchase, condemnation, and transfer of ownership reveals four discrete park eras, including three periods of intense park acquisition activity and one period of relative inactivity (Fig. 1).

We then conducted a content analysis of primary sources such as the Seattle Parks and Recreation Department (SPRD) annual reports and park history files, as well as local newspaper accounts, and official correspondence between SPRD, the Engineering Department, and Seattle City Council. Information regarding the SPRD and other stakeholder agendas regarding park acquisitions, changing organizational structure within SPRD, and shifts in civil society participation were recorded. We concentrated our data collection on the periods of park acquisition activity; however the period of inactivity was also examined to identify shifts in management and acquisition strategies for parkland that constrained acquisitions and development efforts.

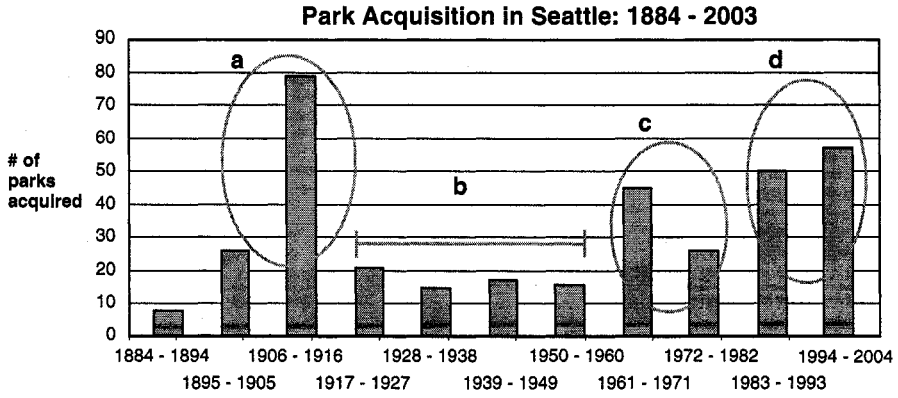

Fig. 1 Eras of park planning in Seattle between 1884 and 2004. The three periods with high rates of park acquisition are: (a) the Olmsted vision (1884–1913), (c)Urban Challenges (1968–1982), and (d) Pocket Parks for a Global City (1990–2003). The phase of inactivity is referred to as the period of (b) competition and constraints (1915–1966)

Eras of park planning

In the following sections we present the eras of park planning in Seattle, while keeping in mind the political, economic, and cultural trends, and their collective influence on the process of park development and the types of parks produced. These periods of activity are named 'the Olmsted Vision', 'Urban Challenges', and 'Pocket Parks for a Global City; and the time of inactivity is named the period of 'Competition and Constraints'. We present a narrative history of each period and then discuss in more detail the major organizing themes that dominate Seattle's history of park planning. We conclude with lessons we have learned from conducting our historical analysis within the framework of urban ecology, by focusing on the contribution of historic analytics and the challenges and opportunities of multiple epistemologies in urban ecology research.

The Olmsted vision (1884–1913)

In 1884, Denny Park was obtained by the city of Seattle, marking the official beginning of Seattle's park system. Nearly 20 years later, the park acquisition and planning process was dominated by the development of the 1903 Olmsted plan, a document that reflected the commitment on the part of influential city elites, politicians, and local citizens to the design and creation of a comprehensive parks system. An interweaving set of political, economic, and cultural conditions greatly influenced the adoption and actualization of an Olmsted-based park planning agenda. This first era of park acquisition was heavily influenced by institutional and city elite interests who viewed parks as a means of refining and beautifying the urban landscape. They also imagined Seattle as the economically prosperous hub of the Northwest and parks as a necessary feature of this elite city status. Driving much of the early parks development activity was a fear of current and future fiscal constraints and land scarcity. As the city population and demand for urban infrastructure grew, the city of Seattle acted quickly to secure parkland.

Fluctuating economic conditions greatly facilitated urban development including the creation of parks in Seattle. From its founding in 1856, and through several tenuous decades of early development, the small port town of Seattle was known as an isolated frontier outpost in the far northwest corner of the nation; yet by the turn of the century, the city was steeped in economic competition with Tacoma, a smaller town 30 miles to the south. The growing population of political and economic elite within the city wanted to establish Seattle as the center of Pacific Northwest commerce while providing the city with an aura of civic growth, sophistication, and most importantly material wealth.

Much of the economic prosperity of this period can be attributed to the Alaska-Yukon gold rush between 1896 and 1898 (Berton 1965). The port town of Seattle served as the last major port for supplies as perspective miners made their way north. Local merchants reaped the economic benefits. This prosperity brought with it opportunities, attracting investors, speculators, and future residents. Between 1890 and 1900, the resident population of Seattle increased from 63,000 to 80,000. A decade later, the city's population had increased nearly 300%, reaching 240,000 residents.

As the population and physical city grew, so did the local economy. Such growth was intrinsically linked to the transformation of the biophysical landscape and the waterways surrounding the region. Local hydrologic, timber, tideland and soil resources were harnessed to develop the nascent urban landscape and to develop the required infrastructure

for its rapidly increasing population (Klingle 2001). The city also began to refashion its landscape through an extensive grading process designed to level the steep landscape of the Puget Sound shoreline in order to increase the buildable area of the city. The biophysical environment provided both opportunities and limitations for the diversity of urban projects in the emerging city, including the development of a citywide parks system. The drive for economic competition, coupled with population growth and city expansion, were important factors that led to the commission and subsequent adoption of a comprehensive park plan developed by John C. Olmsted in 1903. Seattle, and its future park system, was to be carved out of, and built into, the surrounding physical environment as a result of this early economic prosperity.

Early on, Seattle Park Commissioners recognized that in order to foster a refined citizenry and powerful local and regional economy that was attractive to merchants and investors, the city needed to take full advantage of its environmental setting. Consistent with romantic ideals of urban society in the United States during this period the Seattle Park Commissioners stated,

> Nature has blessed Seattle with a magnificent setting for a beautiful park system. With the placid waters of the Puget Sound...Lake Washington...the lofty Olympic Mountains...the Cascades...with two large lakes within the city itself, what more could one conceive in the way of scenic environment (Park Board Commissioners 1912, p. 9).

City boosters hoped that harnessing these environmental aesthetics would help to acculturate a sense of high-class identities (Fig. 2). As the park commissioners wrote in their 1893 Annual Report to the City Council, "Proper provision should be made for a system of parks and avenues as an agent of humanizing and refining the community" (Park Board Commissioners 1893, p. 3).

A decade later, Seattle's Board of Park Commissioners hired the renowned Olmsted Brothers landscape firm from Brookline, Massachusetts to design a connected system of parklands across the city (Fig. 3). The Park Commissioners wrote, "Our citizens were quick to realize that with nature's endowment we had before us a wonderful opportunity to develop a park system which would attract the eyes of the nation." (Park Board

Fig. 2 This 1920 image of Mt Baker Park portrays the aesthetic, sophisticating ideals of the Olmsted plan as experienced by park visitors (Source: Seattle Municipal Archives)

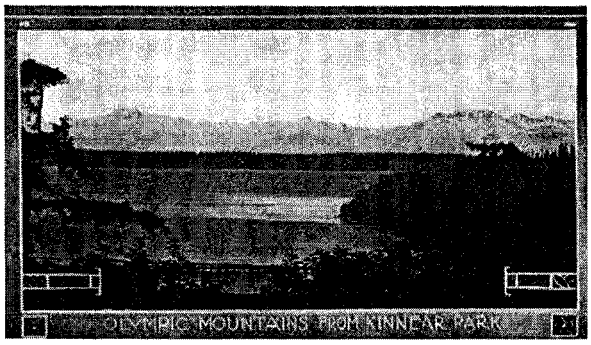

Fig. 3 Report from Parks Department shows view from Kinnear Park. During the early 1900s, Seattle parks provided aesthetic getaways or 'portals' into the surrounding (Park Board Commissioners Report 1913, p. 8)

Commissioners 1912, p. 9). Urban parks of this period were viewed as civilizing features of the congested and polluted cities; these parks represented the social refinement, civic health, and aesthetic beauty necessary for creating a modern, elite and nationally recognized city (Cranz 1982; Olmsted 1971).

The Olmsted firm presented a 100-year plan for the implementation and development of a citywide park system. The hundred-year time frame allowed the city to implement the plan gradually. A key strategy, recommended by John C. Olmsted, was the condemnation and acquisition of large tracts of land. However, a rising population brought about both supply and demand side pressures, which actively influenced the timing and rate of park acquisition. The Park Commissioners acknowledged the threat of increasing land prices and increasing human population for the development of a comprehensive park system (Park Board Commissioners 1904, p. 43; 1909, p. 11). In the early stages of park development, the notion of scarcity was prevalent, and embedded in the fundamental ideology of the Olmsted plan and in institutional strategies for park acquisition and development.

A major goal of the 1903 Olmsted plan titled *Parks, Playgrounds, and Boulevards for Seattle* was to produce an opportunity to commune with nature within the city. Such an experience was already perceived to be threatened by rapid urbanization. Between 1908 and 1912, Schmitz Park Preserve was donated to the city to bring the urban citizenry "close to nature" while simultaneously protecting some of the last stands of old growth Douglas fir in the city (Park Board Commissioners 1913, p. 38). After its donation, Schmitz Park Preserve was maintained as a forested ravine because the owner perceived a scarcity of old growth forest due to extensive logging practices in Seattle's early history.

The creation and equitable distribution of playgrounds was another goal of the 1903 plan (Sheridan 2004). Echoing Olmsted's concern over the equity of park distribution, and responding to the Board of Commissioners concerns over diminishing opportunities for securing new parklands, the 1903 Report of the Park Commissioners (p. 50) indicated the need to acquire playgrounds. Playgrounds were intended to provide opportunities for active recreation. The 1922 Report of Park Board Commissioners measured desired access to playgrounds as within half a mile of every residence. Achieving spatial equity of park distribution across the city was an important benchmark if the Olmsted plan was to be considered successful (Fig. 4).

In 1904, despite resistance from the City Council, the Board of Park Commissioners was granted administrative authority over the parks and boulevards. It was argued that this administrative shift would take decision-making power out of bureaucratic hands and better

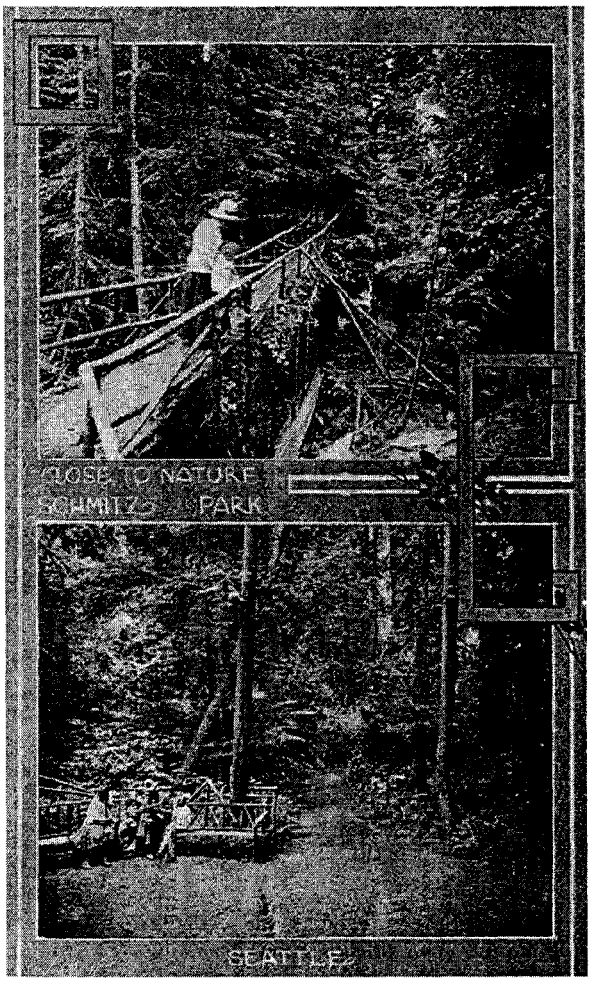

Fig. 4 Schmitz Park is presented by the Parks Department as an urban refuge where the public may get "close to nature" and leave the stresses of urban life behind (Source: 1913 Park Board Commissioner Report, p. 38)

serve the needs of the public (Seattle Mail and Herald 1905). With this transition came a series of park bonds put forth by the city. Every 2 years, between 1907 and 1912, city residents approved bonds totaling over $5 million (approximately $20 million in 2005 dollars) for the acquisition, development, and management of parklands within the city (Bagley 1916). While park bonds and parcel condemnation were important mechanisms for acquiring and maintaining early parklands, donations of private land by wealthy, land holding citizens were equally significant. From 1884 to 1913, 13 private parcels were donated to the city for park use, including Seattle's first park, Denny Park, donated in 1884. During this period the majority of decision making power and fiscal authority over park creation resided within the prominent land holding sectors of Seattle's citizenry. This form of centralized governance, despite necessitating public approval, reflected the goals and objectives of the economic and political elite, and supported the implementation of their ideological agendas.

Although ultimate public support for the park bonds was evident in the bonds' approval, there was also a strong dissenting voice among the citizenry at large. Opponents argued that government officials were acting out of self-interest by strategically locating the majority of parks in areas that improved the personal real estate value of the politicians (Seattle Mail and Herald 1905). These instances of civic response foreshadowed a future decentralized public participation approach, which was institutionalized within SPRD in later years.

From 1884 to 1914, a total of 109 parks were incorporated into the cultural and biophysical fabric of Seattle (see Fig. 1). The majority of parks acquired during this period were large open tracts; however nearly a quarter of parks were developed as playgrounds, playfields and boulevards. In the rapidly urbanizing cityscape, new parks served as tools for economic development and social refinement. They also served as sites for preserving and experiencing the natural amenities of the city. The process of achieving the Olmsted vision for an Emerald City was dominated by institutional and city elite decision makers. Underlying their desire for an economically prosperous, beautiful and refined urban environment was a perceived scarcity of money and land. As future developments unfolded, these concerns and prognostications were proven sage.

Period of competition and constraints (1915–1966)

Relatively little park acquisition activity occurred between the Olmsted vision period and the period of Urban Challenges. Two World Wars and the Great Depression, coupled with a citywide emphasis on other forms of infrastructure, such as highway development, left few resources for park planning within Seattle. The scarce city funds allotted to the SPRD during this period were used almost entirely to develop and maintain the properties acquired during the Olmsted vision period.

During and after World War I the economic and population boom of Seattle's early decades began to wane with a relatively stable local population of roughly 315,000 residents (Berner 1992). From 1915 to 1922, no new parks were acquired. The Seattle park system fared slightly better under the New Deal Programs implemented during the Great Depression of the 1930s. The Depression resulted in the merging of national and local political efforts to deal with the unemployed and relief efforts. With assistance from federal programs such as the Work Projects Administration and the Civilian Conservation Corps, the Seattle park system slowly expanded with the modest acquisition of 38 park properties between 1923 and 1944 (Berner 1992).

Although the wartime economy created by World War II caused a temporary economic upsurge for Seattle, the city and region returned to its economic slump following the war's end in 1945 (Sale 1978). Available fiscal resources were prioritized for the construction of a major north-south highway, which bisected the center of Seattle, requiring the intentional sacrifice of parks, boulevards, and neighborhoods.

The citizenry also demonstrated little support for the park system. Between 1952 and 1958, four bond measures slated to provide Seattle's park system with nearly $12 million for acquisition, development, and management were defeated by popular vote. The superintendent of parks lamented, "... this was an era of disappointments and failures" (SPRD Annual Report 1956). With little fiscal capacity to address the maintenance of Seattle's urban infrastructure, many parks fell into decay. From 1946 to 1965, only 45 park properties were acquired. During this period, there were inadequate fiscal opportunities and little public support to continue implementing the guidelines set forth by the Olmsted plan.

Urban challenges (1968–1983)

The period of Urban Challenges is characterized by a resurgence in public park acquisition driven by an increase in citizen and neighborhood-based participation in the park planning process. Concerned by the decaying condition of Seattle's urban infrastructure and predictions on the magnitude of future growth in Seattle these groups demanded more attention and money be provided for acquiring areas of remaining open space. The growing scarcity and increasing cost of available land began to exert pressures on park development, motivating creative approaches for re-developing land previously occupied by industries, municipal partnerships and other economically productive uses. These pressures resulted in the development of a diversity of park types across the city that reflected the character of the community they served (King County 1980).

During this period, the guidance for acquiring parks by the Olmsted plan was not explicitly utilized. Rather, the Olmsted plan was replaced with a focus on the city's decaying urban infrastructure. The city of Seattle also emphasized the integration of citizen needs in the overall planning process for park development.

Mired in an economic recession, Seattle experienced its first decline in population since the city was established more than a century earlier. Early profits gained from Seattle's entrance into the US and global economic markets following WWII soon waned. Seattle developed into a blue-collar city economically controlled by labor union politics, reliant on the abundant timber and hydrological resources of the region (Berner 1992). During these financially lean times, little attention was given to the development and maintenance of physical infrastructure and urban amenities.

By the mid-1960s an uneasy tension between Seattle's citizenry and government institutions increased as residents voiced concerns ranging from racial inequality to the overall physical decay of the city. Included in these concerns was the amount, quality, and distribution of parks within the city (Sale 1978). Many of these dissenting voices united under the community-driven initiative termed, Forward Thrust, which focused on assessing the impacts of future urban growth within the region (Forward Thrust Committee 1970). The community-based planning process supported by the Forward Thrust program led to the establishment of formal partnerships between residents and city departments, including the Parks Department. In 1968, Forward Thrust proponent James R. Ellis described the initiative as "...a partnership of people from every section of the County, every viewpoint and walk of life. This was not a citizen front for a program pre-determined by government" (Forward Thrust Committee 1968). A basic component of the Forward Thrust program was to empower the citizenry and provide them with an outlet to voice their concerns about the condition of the city in which they lived.

As part of the Forward Thrust movement in Seattle, a 'Committee of 200', that included city, county and local business leaders, spent 2 years determining the direction of development in King County. The committee emerged with an expensive 12-year capital improvement program package of 13 city and county propositions totaling an estimated appropriation of more than half a billion dollars, much of which would be used to secure matching federal funds offered for urban renewal projects (Vandenbosch 1974). The package included a proposed $385 million mass transit rail system, some $68 million for roads, $68 million for flood and wastewater control, $40 million for a sports stadium, and $118 million to be used to acquire, develop, and maintain parks across King County (Sieverling 1968; King County 1968). At the time, the Forward Thrust program was the nation's largest, per capita, public infrastructure improvement package (Sale 1978).

On February 13, 1968, six of the Forward Thrust propositions were approved by a public vote, including the parks proposition included (Conant 1968). Over the 12-year program, $44 million from existing state and federal sources further supplemented the $118 million bond for parks. From 1968 to 1982 over $41 million of related Forward Thrust funds were spent within Seattle for the acquisition of new parks and the maintenance and improvement of existing park properties. A decision to focus the acquisition of parklands early proved fortuitous as real estate prices escalated during the middle years of the 1970s. A total of 64 parks equaling more than 1,050 acres within the city were acquired during this 14-year period.

The majority of this land, over 700 acres, was acquired from the federal government in a 'Lands to Parks' program that transferred ownership of surplus federal land and decommissioned military bases to local and state governments around the country. Two facilities, now known as Discovery Park and Magnuson Park, were acquired by SPRD during this period and have become the largest contiguous tracts of parkland within Seattle. These large parks provide multiple open space functions including improved public access to shoreline areas and the creation of open spaces for informal play and sports fields. In addition, many of the decommissioned buildings on the site are used for arts, education, and cultural programs while several areas within these parks are being transformed through community-based attempts to restore the wetland and forest conditions. Other parks acquired during the Forward Thrust period range in size from roughly 140 acres of Puget Sound tidelands to small "vest pocket" parks of less than half an acre.

As development pressures and real estate values within and around the city increased, vacant city land was quickly becoming a scarce commodity, and condemnation no longer was a simple strategy of transference for development rights and ownership from private land into park management. Instead, the expansion of the park system required the creative development and conversion of already built lands into parks. An example of this conversion is Gas Works Park a former gas manufacturing plant located in a prominent location near downtown. Originally built in 1906 the plant became technologically obsolete and subsequently closed by the 1950s (Sherwood 1973–1981). The city of Seattle purchased the land in 1962, and by 1975 the conversion of the area from a previously industrial land use to dedicated park and recreation use was completed. Today the park retains the five-story high towers from the smoke-belching days of industrial use and remains one of the city's most popular urban recreational areas (Fig. 5).

Another example of this innovative creation of parklands includes Freeway Park. Built atop Interstate 5 using interstate air rights, the 5.2-acre park reconnects the financial center of downtown with the residential and business neighborhoods to the east (Sherwood 1973–1981). Completed in 1976, the project was supported through an array of sources including Forward Thrust bonds and state and federal highway funds. School properties presented yet another creative opportunity to convert lands for park use. SPRD, in partnership with the Seattle School Districts since 1948, implemented the "Grey to Green Initiative," a program that mandated SPRD to convert publicly owned asphalt surfaces to green surfaces for park use at selected school sites throughout the city. In this agreement, the newly formed parks were utilized by school children during the day and open to public use after school hours (Fig. 6).

The implementation of the Forward Thrust bond measures further altered the approach and management of the city's urban park system. As a countywide measure, emphasis for connecting the system of open spaces moved beyond Olmsted's vision of a locally interconnected urban park system to a broader regional context. For example, the Burke–Gilman Trail, which was converted from abandoned railroad tracks into a bike and

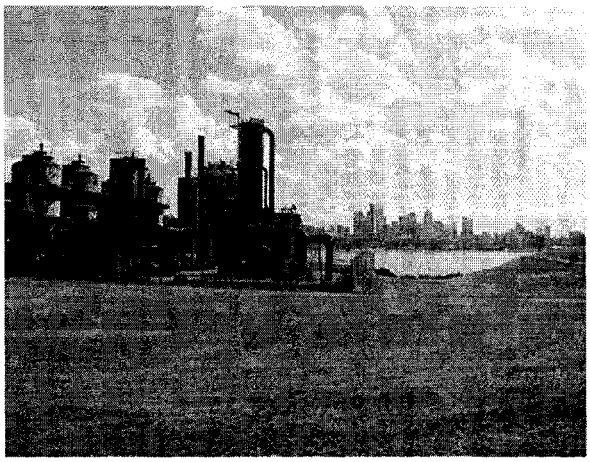

Fig. 5 Gasworks Park stands on an old Brownfield site. As developable land became increasingly scarce throughout the city, Seattle began reclaiming former urban wastelands and turning them into viable public park spaces (Source: Seattle Parks and Recreation)

pedestrian route bordering 35 miles of the western shore of Lake Washington, reflected the Forward Thrust agenda (Sherwood 1973–1981). Although the responsibility for the acquisition, development, and management of Seattle's park system still resided with SPRD, the objectives and priorities of the designed system were to be more inclusive of wide-ranging efforts to connect open spaces across the county.

The shift in park planning culture during this era included a stronger role for civil society in articulating their needs and desires for park spaces. And while the types and location of proposed parks differed by neighborhood, the ideology was similar: local participation was important in easing the tension between city government and local residents. The convergence of the politics of participation and the ideologies of park planning was further supported by the locally generated Forward Thrust bonds. In many ways, this era marked Seattle as a city with a park system driven by local needs, and guided by efforts of participatory, community-based planning.

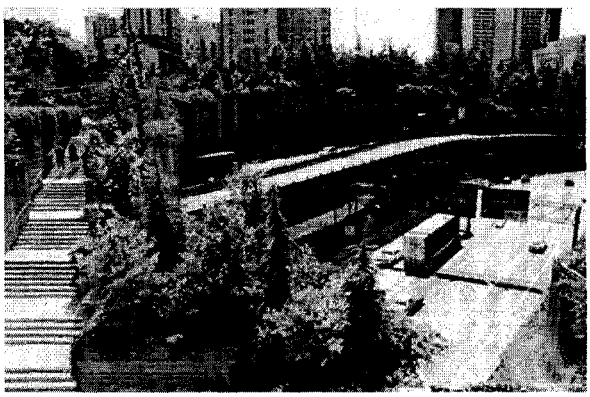

Fig. 6 Representative of efforts to mitigate the negative impacts of urban infrastructure development, Freeway Park was built directly above Interstate 5 connecting the financial center of Seattle with surrounding neighborhoods (Source: Seattle Parks and Recreation)

Pocket parks in a global city (1995–2003)

This era is characterized by expanding ideologies within SPRD regarding the role of parks in the urban landscape of Seattle. Whereas the Olmsted vision promoted a sense of nature based on aesthetic value, the Pocket Parks in a Global City period promotes a functioning of nature based on a scientific understanding of ecological systems. The 1903 Olmsted plan is revisited, revised and expanded to reflect its application in a more densely settled urban area. While serving the recreational needs of Seattle's citizenry remains an important goal, a conservationist approach also infuses park management (Fig. 7).

The year 2003 marked the hundredth year of the comprehensive Olmsted park system plan for Seattle. Although the importance of the Olmsted plan in managing the park system was not apparent in the middle decades of the twentieth century, the plan and its guidelines experienced a revival in the mid 1990s and served as a critical element of SPRD's mission.

Patterns of globalization profoundly influenced how Seattle city boosters framed the function of parks as symbolizing the city's 'emerald' quality. Seattle now competed for mobile capital from transnational corporations with other cities in the Pacific Rim and elsewhere around the world (Gibson 2004). The marketing of Seattle's distinctly high quality of life emphasized the natural beauty and recreational opportunities provided by the region's environment, including parks. As in the Olmsted vision period, parks were utilized as an economic development tool to attract economic resources and investments.

Trends in globalization also influenced the fiscal capacity of the city and the funding mechanisms used to acquire parkland (Gibson 2004). During the Olmsted vision period, park acquisition was funded by locally generated tax money and through parcel condemnation and land donations. During Forward Thrust, local funds were supplemented by state and federal support. During the Olmsted Revisited period local funds were generated when Seattle residents approved the 2000 Pro-Parks Levy, worth $198.2 million, to acquire the land for more than 30 new parks, and to continue the development, improvement, and management of more than 95 already established parks. Then Deputy Mayor Tom Byers characterized the passage of the Parks Levy as the most substantial reflection of public support since the 1903 Olmsted plan. Once again, citizens of Seattle supported the financing of park development, reflecting how parks are valued.

The requirements and guidelines of the Pro-Parks Levy signaled important shifts in the priorities of park management agendas and acquisition decisions for SPRD. Broadening their environmental agenda, SPRD embraced a more ecologically oriented management strategy for parks. During this time S PRD created its first Wildlife Habitat Management Plan for the parks system in response to the desire expressed by the citizens of Seattle "to have wildlife as an integral part of the city, despite the pressures of human population and

Fig. 7 During the most recent period of park acquisition, a distinct environmental consciousness informs the park planning process (Source: Seattle Parks and Recreation)

development" (SPRD 2000a). Park users wanted not only passive and active recreation opportunities, but they also wanted opportunities for observing urban wildlife species and experiencing "natural" settings, as well as the preservation of contiguous forested and green areas. SPRD's Urban Wildlife and Habitat Management Plan expanded the management goals of the agency "toward more natural and ecological resource management of parks than has taken place in the past" (SPRD 2000a). This management plan was consistent with the city's Environmental Critical Areas Policies and the Environmental Action Agenda, which called for the incorporation of environmental stewardship into all city actions.

The local desire for more wildlife and habitat oriented management efforts within SPRD was emblematic of the larger national conservationist and sustainability environmental movements which increasingly emphasized tree plantings, utilizing native plant species, and wildlife habitat protection efforts in the urban core. The influence of the environmental movement impacted the types of parklands that were purchased during this period. Land, which was previously considered useless and negligible, including steep slopes along forested ravines, was acquired to preserve the remaining open spaces within the city for wildlife use and habitat protection (Fig. 8).

The shift from a primarily human-centric management effort during the Olmsted and Forward Thrust periods, to a combined human and natural resource management focus was also reflected in the types of park improvement projects implemented by SPRD. For example, in the early 1990s the management for Schmitz Preserve Park shifted to a larger ecological agenda, which included daylighting a small stream flowing through the preserve. The original intention of the preserve—the protection of the oldest growth in the city—has been maintained over time through the incorporation of new ecologically oriented management tools.

In 1990, the Washington State legislature found that "uncoordinated and unplanned growth, together with a lack of common goals. ... pose a threat to the environment, sustainable economic development, and the health, safety, and high quality of life enjoyed by residents of this state. It is in the public interest that citizens, communities, local governments, and the private sector cooperate and coordinate with one another in comprehensive land use planning" (RCW 36.70A.010). The 1990 enacted GMA represented a revolution in Washington State land use planning. The key substantive element to the 1990 GMA was a financial and political commitment to support "urban growth areas into which all urban and suburban like growth will be directed and outside of which none will be allowed" (Smith 1993). Washington was one of the first states to direct counties and cities to work out the details of an urban growth boundary. The key procedural

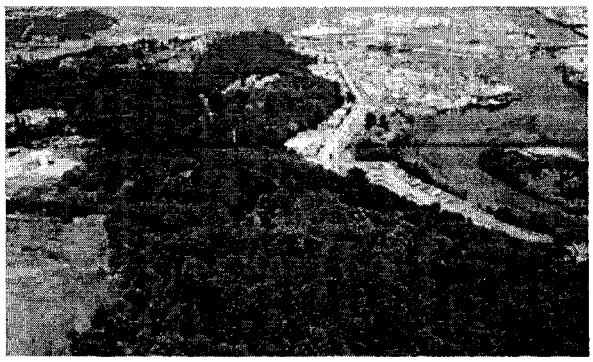

Fig. 8 The Duwamish Greenbelt is indicative of many recent park purchases and acquisitions. Steep ravines and corridors have been integrated into the citywide mosaic of parklands. These parcels are not specifically designed for human use and access. Instead they are intended to serve as important wildlife habitat areas and industrial buffers (Source: Seattle Parks and Recreation)

element in this new planning system was the mandate that each county experiencing growth problems create a comprehensive plan through a cooperative process with each of the cities and towns within the county.

Thus, the political context in which parks in Seattle were acquired, developed, and improved, changed in response to an increasingly urban and densely populated landscape. With the legal mandate to intensify development within the UGB boundary, the goals of the SPRD shifted to prioritize the purchase of small neighborhood, pocket parcels to maintain and provide additional open space within the UGB, and to maintain existing larger urban parks. SPRD acknowledged that the "partnerships in the community are critical to identifying priority properties, potential uses of acquired sites, and additional resources" (SPRD July 25, 2005, p. 8). The first cycle of the Levy's $10 million Opportunity Fund included 16 citizen-initiated park acquisition and development projects. As of 2003, the Levy purchased six neighborhood sites for pocket parks. In many ways, the GMA facilitated the institutionalization of citizen participation in the process of park planning.

Park development was placed in direct conflict with the need for other forms of urban amenities and infrastructure. In 1997, the mayor decided to sell part of a playfield to developers for middle-income, single-family homes (Seattle Times 1996). In response, citizens supported Initiative 42, preventing the sale of parkland for non-park use, unless equal or better replacement was provided. The mayor's pre-empted actions signified the city's persistent fiscal struggle to provide for multiple and oftentimes competing forms of urban infrastructures, including affordable housing and park space.

Citizen involvement regarding proposed park use continued to evolve. In 1985, SPRD created an advisory board for concession related grievances when a local neighborhood opposed the selling of alcohol by a park concessionaire (Seattle Times 1985). During Forward Thrust, SPRD used a neighborhood-based planning approach to define the location and type of future park development. SPRD worked with these neighborhood groups as consultants, not as park planning experts. By the 1990s, SPRD established 24 neighborhood advisory councils that provided a forum for testing new program ideas; and by 1991, this local, decentralized planning process for parks was the norm. In 1993, SPRD restructured its management to reflect the decentralized planning approach by programs and park planning efforts under the management of three geographic divisions of the city (Seattle Post-Intelligencer 1993). SPRD no longer provided, and citizens no longer desired nor expected, the top-down, expert driven model of park development. This period of citizen participation was marked by increased leverage of citizen groups to promote specific agendas. "Friends of Parks" groups mobilized around park-specific issues, and used their collective bargaining power to demand certain amenities for parks from SPRD. In the 2000 update to 1993 Department of Parks and Recreation comprehensive plan (COMPLAN), SPRD defined its primary fundamental responsibility as "listening to the citizens ... and involve them from the beginning in decisions affecting the future of their parks and recreation system, especially in their neighborhoods. Implementing recommendations from neighborhood planning activities and the community initiated efforts to improve the Seattle park system" (SPRD 2000b).

During this period 95 parks were acquired and developed, only 14 fewer than during the Olmsted vision period. The 1903 Olmsted plan was integrated into a re-visioning of recreational park spaces in the city and region. Instead of treating the Olmsted plan as a static historic plan without relevancy for contemporary Seattle, SPRD strategically incorporated aspects of the Olmsted plan that best fit the unique political, cultural, and economic context of each time period. Such a flexible, opportunistic attitude towards the

implementation of the Olmsted plan was necessary for its persistent, if discontinuous, influence on park development in Seattle. Importantly, city politicians and citizens continued to give high priority to parks, reflecting the initial valuation of green and open spaces articulated in the 1903 Olmsted plan. Seattle's 2000 COMPLAN update states: "Planning for parks and recreation must be sensitive to the stresses and complexities of urban life, flexible to changing conditions, and be a part of the city's overall growth strategy" (SPRD 2000b).

The parks themselves are the physical legacy of the history of park planning in Seattle. Through the lens of politics, economics, and culture, the presentation of these historical narratives reveals trends and contingencies that influence the production of a citywide park system.

Discussion

The organization of Seattle's park history around three themes—the economics, politics, and culture of park planning—allows us to understand planning approaches, various funding strategies, and city development agendas during the four eras of park planning. Furthermore, we can identify emerging trends and the influence of historical contingencies. Through this analysis we recognize the interrelatedness of these three themes and their collective explanatory power for understanding the process of park development in Seattle. These themes shed light on important factors influencing the rate and type of parks acquired in Seattle. Urban ecologists can utilize historical insights in order to better appreciate contemporary and future urban landscape change in the context of shifting economic, political and cultural conditions.

Politics of park planning: From Frederick to friends

The history of park development in Seattle has been marked by changes in how city residents and SPRD engage in the process of park acquisition, development, and maintenance. The changes in the relationship between SPRD and city residents reflect an overall national trend toward decentralized planning, with contemporary citizen groups influencing management action priorities. Today, the Seattle city government is renowned for its model of participatory planning protocols. The theme of accessibility effectively captures these shifts. Accessibility, as we view it, occurs along two lines: access to the political process of park planning and the creation of accessible park use (accommodating diverse park uses and users).

Planning for accessibility evolved from a top down policy model with limited public access to a more accessible and participatory civic engagement process. During the Olmsted vision period, the Board of Park Commissioners and the early Parks Department consisted of a collection of city and technical elites; largely members of upper echelon urbanites held park planning decisions. Likewise, the Olmsted Brothers firm planning model espoused an elite driven, expert dominated approach. Although this top-down planning process was framed as serving the public good, the primary opportunities for city residents to participate in park development was limited to voting on proposed park bond issues and through the donations of private property for park use.

In contrast, the Urban Challenges period was marked by an intense degree of public participation in identifying the location and type of future parks. During Forward Thrust, citizens organized around an infusion of state and federal money into the local and regional planning process, with SPRD functioning as experts to the neighborhood planning effort. As public participation persisted and demand for such participation grew, SPRD institutionalized this new form of citizen engagement with the establishment of committees and guidelines. This shift in the relationship between SPRD and city residents reflected the overall trend in municipal governance towards decentralized planning.

During the Olmsted vision period the Seattle citizenry experienced an increase in accessibility to the park planning process. Formal community participation institutionalized during the early 1970s created a more open and inclusive planning process. Citizens established 'Friends of Parks' groups that operated external to institutional planning efforts and organized around specific parks in the city. As a decentralized model for participatory park management, 'Friends of' groups have leveraged their collective resources to advocate for specific amenities and management actions.

Accessible park use (accommodating diverse park uses and users) increased as the city's ideological hold on acceptable park use expanded. By the end of the Olmsted vision period, there were numerous small and well-dispersed parks. Parks and playgrounds were perceived as spaces for tacit forms of social control, designed to refine and humanize the population and provide a limited diversity of uses (Cranz 1982; Olmsted 1971; Sutton 1971). With the participatory planning forum in place during the Urban Challenges period, an increased diversity of park types were produced which, in turn, created a more accessible park-planning approach. Consequently there was an emphasis on social equity of park access, with greater attention given to neglected communities by strategically identifying park space and park uses for underserved neighborhood communities. This led to an increase of not only a diversity of park uses in the city but also to a diversity of park users.

Multiple scales of economy: Encountering scarcity and opportunity

Perhaps no other factor contributed more to the acquisition of parks, and to the formation of acquisition periods, than the availability of financial resources. The history of Seattle's park development is largely influenced by a series of fiscal restraints and opportunities. As Seattle's park planning history reveals, any assessment of the ongoing struggle to secure fiscal resources must examine economic interactions across local, regional, and global contexts and the impacts of these multi-scalar economies on the financing of parks. In the early 1900s, the park planning process mostly depended on a local economy that supported park acquisition and maintenance through the donations of local landholders and city funds. Although this money was generated locally, the city's wealth arrived only a few years earlier as part of the post-gold rush regional resource market expansion. A direct intra-regional economic competition between Tacoma and Seattle fueled Seattle's efforts to attract money and investors. This regional economic competition influenced the approval of local bonds that provided the bulk of the money for Olmsted plan's recommended purchases and designs.

During the Urban Challenges period, an infusion of matching state and federal funds into regional and local planning projects was necessary to overcome escalating land values and local fiscal restraints. Beginning in the mid-1990s, when the Olmsted plan was revived, the city of Seattle still faced budgetary fiscal constraints similar to previous periods. The Pro-Parks Levy was approved in 2000 and once again citizens allocated

monies for park purchase and maintenance. The Pocket Parks in a Global City period can be seen, in large part, as a return to a dependence on locally generated funding streams. However, instead of being derived primarily from urban elites and major landholders, as was the case in the early period, this purchasing power was derived from the public at large, through a complex set of city tax arrangements.

The establishment of Seattle as a regional economic power, which was the goal of urban residents and boosters during the early Olmsted vision period, expanded during the Pocket Parks in a Global City period. While parks had always been used as an economic development tool by the city and private developers, the link between Seattle and international markets generated new opportunities for park development. Public and private interests around the city viewed parks as a valuable tool to effectively market desirable qualities of Seattle to transnational corporations and an international labor pool.

Park planning culture: Getaways, lungs, and global markets

Dominant ideologies of park planning influenced the allocation of fiscal resources and, to a great extent, the vision of parks functioning within the city. The ideologies of park planning in the earliest period were characterized by the initiation of the 100-year, comprehensive Olmsted plan and the influence of Seattle's regional economic agenda to become the economic center of the Pacific Northwest. Parks in the city were viewed as places for humanizing, sophisticating and refining the urban citizenry. Parks as sites of refinement required harnessing and utilizing aesthetics of the natural environments. Ravenna and Schmitz parks were designed as urban 'getaways' while others like Volunteer Park were established in part to serve as aesthetic 'portals' to the surrounding water, mountain and wilderness areas. These ideologies of park planning emphasized the progressive pursuit of social health and refinement simultaneously with the beautification of the city and romantic notions of nature.

Park planning efforts during the Urban Challenges period were couched within a broader context of urban infrastructural decay. Parks were thought to contribute to the salubriousness of the city. As part of an urban regeneration project, parks infused new spaces of vitality throughout the city neighborhoods and were viewed by many residents and politicians as the "lungs of the city." The planning culture of the Pocket Parks in a Global City and Olmsted vision periods both viewed city parks as tools for economic development. In the Olmsted vision period, parks were used to attract potential residents to Seattle and to newly developed neighborhoods. To the national and international audience, parks were used to market Seattle as a unique and livable urban area within the global market.

With the revival of the Olmsted plan, many original Olmstedian principles, including connectivity of green spaces, access to park spaces, and a public health focus for parks, are still of concern to SPRD and city residents. However, the ideologies of SPRD have expanded the early Olmstedian vision for connected green spaces and sophisticating recreational use with the incorporation of an explicit ecological agenda, which operates in concert with social programs.

The persistence of the Olmsted plan in the shifting cultural ideologies of park planning reflects the capacity of SPRD to embrace the Olmstedian principles and goals while recognizing the context of an evolving urban system where constraints and opportunities for securing funding and initiating park development vary over time.

Conclusion

Integrating analytical approaches and epistemologies from the humanities into urban ecology

We take seriously the call for a "unity of sciences and humanities" as the "backbone" of urban ecology (Alberti et al. 2003). We operationalize these notions and articulate advancements within the field of urban ecology along two tracks: an integration of historical place-based analytics and a practice of interdisciplinary research. The field of urban ecology provides a rich and diverse platform from which to ask a multitude of research questions. Urban ecology's inherent interdisciplinarity or "integrated approach" is outlined by numerous scholars (Pickett et al. 2004; Alberti et al. 2003; Collins et al. 2000; Grimm et al. 2000; Zimmerer 1994). This convergence of multiple disciplines has led to a flurry of literature by these scholars on how to combine the research agendas of the social and natural sciences to address a more holistic consideration of the ecology "of cities" (Grimm et al. 2000).

We recognize that the majority of research questions asked by urban ecologists seek to organize and explain variables in ways that reduce them to a series of generalizable, well-defined patterns and processes. While these approaches are highly valuable and contribute to a robust understanding of urban systems, we offer a complimentary approach by including forms of evidence and explanation that are idiographic. We suggest that there are benefits to an urban ecology that accommodates explanations and descriptions, intentions and unanticipated outcomes, place-based and generalizable findings. After all, if the field of urban ecology is to be profoundly interdisciplinary, it necessitates an integration of different methods, theories, and epistemologies.

Improving our understanding of cities: Place-based historical analysis

Utilizing an explicitly historical and place-based approach we extend an integrated study of human and ecological systems over 120 years of park planning in Seattle. In doing so, we build upon the model put forth by Alberti et al. (2003) which integrates humans and ecosystem science by linking "human and biophysical drivers, patterns, processes and effects" (p. 1174). This approach to urban ecology reveals both the spatial changes in land development from non-park to parkland, and the rich tapestry of influential political, economic and cultural processes.

While a place-based approach to urban ecology can lead to a profound understanding of the nexus between city culture, politics and economic processes, a historically grounded approach elucidates the relationship between these processes as they change over time and interact through various citywide developments (see Table 1). Indeed, two recent ideas promoted in urban ecology, 'cities as systems of resilience' (Pickett et al. 2004) and 'cities as emergent phenomenon' (Alberti et al. 2003) can be more effectively revealed within a research agenda that incorporates long-term changes within urban systems. Our study illustrates how a historical and place-based analysis reveals changing governance structures and ideologies, while also allowing for a more precise documentation of how these structures and ideologies function as emergent and variable sources of political influence. Moreover, examining a 120-year time period enables important scalar economic relationships between city, regional, and federal programs to be revealed.

From the early sophisticating aesthetics of the Olmsted firm to the locally derived multi-use and ecologically oriented park plans found today, changing structures of political

Table 1 The economic, political, and cultural aspects of park planning for each era of park planning in Seattle, WA, and the specific outcomes associated with each era of park planning

	Olmsted vision (1884–1913)	Competition and constraints (1916–1966)	Urban challenges (1968–1983)	Pocket parks in a global city (1990–2003)
Economics				
+	Parks are acquired by SPRD through land donations, condemnation, and locally generated funds totaling $5 million	Despite a regional economic surge during WWII, the economy of Seattle slumped, and fiscal resources for park acquisition were scarce	Matching state and federal funds bolsters locally generated monies from the approved parks proposition of the Forward Thrust program	Locally generated money from the approved Pro Parks Levy. Competition between forms of urban infrastructure. Citizens pass Initiative 42, preventing the sale of parkland for non park uses
Politics				
+	The process for planning for the parks system is dominated by city government and economic elites	Other forms of urban infrastructure development such as highway construction are prioritized over the park planning process	The parks planning process shifts towards a more community-oriented participatory planning approach	SPRD institutionalized participatory planning process and adopted a decentralized organizational structure
Culture				
+	Urban parks are viewed as both economic attractors to speculative investors as well as a social refinement tool	Little public support was afforded to the park system as much of the public open space, including parks, fell into decay	The diversity in types and use of parks in the city increases to accommodate multiple perspectives and community desires	Maintenance of pre-existing parks and development of pocket parks in high-density residential neighborhoods. Parks are managed for social and ecological uses. Parks viewed as a tool for economic development in the global economy
Outcomes				
=	SPRD accepts and implements a 100-year plan for Seattle's park system developed by John C. Olmsted in 1903. Parks are incorporated into the urban form of the city	The public defeated four bond measures between 1952 and 1958 that would have provided nearly $12 million in park-specific funds	Seattle and King residents approve a major urban renewal program known as Forward Thrust in 1968	Seattle residents approve 2000 Pro Parks Levy. Centennial celebration of Olmsted Plan

representation have influenced the process and outcome of park planning. Moreover, the city of Seattle has overcome fiscal and land scarcity in creative ways and has utilized park space strategically to elevate its image and competitive position within broader economic agendas. Under a place-based historical analysis the park landscape within Seattle can be viewed as a legacy of these shifting strategies and conditions.

Practical benefits

By implementing a historical approach to urban ecological research this study reveals the influence of a 100-year comprehensive plan as it evolves through long periods of absence and periods of renewed interest. Accounting for long-term trends, cyclical patterns, and historical contingencies enables us to reveal practical insights that are useful for urban planners and practitioners. We illustrate that the viability of long-term plans requires flexible and adaptive application in the face of unpredictable events, changing political arrangements, and shifting cultural priorities and fiscal climates. Understanding dynamics that support and challenge long-term planning efforts is typically not provided in temporally truncated studies.

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