

# ECONOMIC OUTCOMES OF URBAN FLOODPLAIN RESTORATION

IMPLICATIONS FOR PUGET SOUND

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## PREPARED BY

**BRANDON PARSONS**

*American Rivers*

**LAURA MARSHALL**

*ECONorthwest*

**MARK BUCKLEY**

*ECONorthwest*

**JONATHAN LOOS**

*Dartmouth College*

Lower Snoqualmie Valley near Duvall, WA,  
December 9, 2015 flood  
Source: King County, WA



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# Acknowledgments

For over 40 years ECONorthwest has helped its clients make sound decisions based on rigorous economic, planning, and financial analysis. For more information about ECONorthwest: [www.econw.com](http://www.econw.com).

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- Doug Osterman, WRIA 9 Salmon Recovery Manager
- Suzanna Smith, WRIA 9 Habitat Projects Coordinator
- Matt Goehring, WRIA 9 Planning and Technical Coordinator
- Jason Mulvihill-Kuntz, WRIA 8 Salmon Recovery Manager
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That assistance notwithstanding, ECONorthwest is responsible for the content of this report. The staff at ECONorthwest prepared this report based on their general knowledge of economic benefits of floodplain restoration, and on information derived from government agencies, private statistical services, the reports of others, interviews of individuals, and other sources believed to be reliable. ECONorthwest has not independently verified the accuracy of all such information, and makes no representation regarding its accuracy or completeness. Any statements nonfactual in nature constitute the authors' current opinions, which may change as more information becomes available.

## For more information about this report:

Laura Marshall,  
Project Manager, ECONorthwest  
503-222-6060 | [marshall@econw.com](mailto:marshall@econw.com)

Brandon Parsons, PLA  
Floodplain Restoration Lead, American Rivers  
512-517-4001 | [bparkers@americanrivers.org](mailto:bparkers@americanrivers.org)

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# Purpose of this Report

This report was developed in response to the immediate need to better understand and articulate the economic impacts of urban floodplain restoration on tax revenue. The purpose of this project is to investigate the direct financial outcomes of floodplain restoration on local budgets - some of which are often overlooked or have historically been poorly understood.

In urban communities of Puget Sound, river valleys and their historic floodplains are often the epicenter of competing interests. Decades of floodplain development has replaced complex habitat with industrial, commercial, and residential development. Although there have been ecological improvements implemented upstream that improve habitat and water quality, these urban rivers often have wide reaches where suitable habitat is not currently available for aquatic species. Meanwhile, due to recent budget cuts and economic uncertainty, communities must be increasingly strategic about how to invest their limited resources to provide the most benefit to their residents.

These dynamics between development, restoration, and local budgets are not in conflict – although they have often been viewed that way in the past. Instead, they present an opportunity for communities to achieve both financial and ecological outcomes through properly designed floodplain restoration projects. Other communities across the country have seen a substantial economic benefit when they invest in floodplain restoration, through:

- Reduced flood risk and lower flood insurance rates;
- Increased property values;
- Increased high value development outside of the floodplain;
- Increased jobs and economic activity;
- Increased business and employee attraction and retention; and
- Increased tax revenue.

Although the results of this project are meant to be regionally applicable and locally actionable, the momentum for this study grew out of a response to the Lower Green River Corridor Flood Hazard Management Plan. The flood control plan being developed by King County Flood Control District initially focused on flood reduction actions – without accounting for the hundreds of millions of dollars that have been spent on salmon recovery efforts. Initial proposals during the scoping of this plan would have undermined many water quality and salmon habitat investments. After hearing feedback from American Rivers, tribes, WRIA 9, and other stakeholders, the approximately \$1 billion project is now considering multiple benefits including habitat restoration and recreation opportunities, in addition to flood control. The example from the Lower Green River in general demonstrates the primary findings from our study, which are broadly applicable – **that holistic planning and multi-benefit projects can bring additional value to communities compared with single-purpose projects.** With integrated planning, projects can augment past investments and achieve multiple goals to best leverage scarce public funds.

Green-Duwamish River, WA



Source: Provided by Ned Ahrens

This report is meant to serve as a resource for communities on how to realize the highest and best use of their land in a way that balances healthy, functional rivers and economic growth. The audience for this report is state and local decision makers, those working in the floodplain restoration and management community, city planners, developers, and the general public. Although the geographic focus is the Puget Sound region of Washington, the findings of this report are broadly applicable to locations with similar perceived tensions between floodplain restoration and urban development.





Source: Provided by Brandon Parsons, American Rivers

## Executive Summary - Key Takeaways

- Floodplain restoration includes actions that reconnect floodplains to rivers, allow for variable flows, and restore natural habitat and structure at the appropriate scale. Floodplain restoration projects in urban areas will likely look different than floodplain restoration project in more rural, less developed areas. There are added pressures in urban areas for floodplain restoration because land is generally more expensive, project sizes can be limited, and local land use managers are under pressure to maintain a robust tax base. Urban floodplain projects will include things like flood reduction projects, park creation, or redevelopment opportunities that incorporate habitat features for fish and wildlife.
- The examples in this report demonstrate that there are income and benefit opportunities from urban floodplain restoration. **Floodplain restoration and promoting economic activity are not mutually exclusive – there are many pathways by which ecological improvements of floodplains can deliver value to residents, businesses, and local governments in urban areas.**
- The national literature review, conducted during this study, provides multiple examples of urban floodplain restoration projects that balance restoration with development and lead to a positive return on investment for communities. **Although floodplain restoration has a financial cost and land-scarcity implications, there is evidence that, when planned appropriately, benefits can outweigh the costs to yield positive net impacts.** Floodplain restoration can be another tool for city planners and developers as they make land-use decisions.
- The type and magnitude of benefits will depend on the site specific details of the project. **Successful urban floodplain restoration projects are designed for multiple benefits as part of a larger community vision.** Some of the largest benefits for urban projects occur when a community embraces a previously neglected river and the project incorporates flood reduction, increased recreational use, and/or adjacent development outside of the floodplain in tandem with restoration. Multi-benefit projects are advantageous because they can leverage multiple types of funding sources and garner broader stakeholder support.
- Previous research in the Puget Sound region has found large benefits of ecosystem services for rural projects, but studies that focus specifically on community revenue impacts from floodplain restoration are limited. Because there is evidence at the national level, it is likely that the community revenue benefits exist in Puget Sound but that the studies have not been done. Later phases of this project will identify the community revenue impacts from urban floodplain restoration projects in Puget Sound.



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Source: Provided by Jake Hochendoner

## Introduction

Ecosystem restoration within urban, developed landscapes is often perceived as being incompatible with local economic development objectives. This report provides another perspective – one where restoration is compatible with and even supportive of the long term economic viability of a community. The challenges of managing for both restoration and development is especially relevant in Puget Sound where ample development has occurred within the region's floodplains. Using examples from communities across the United States, this report provides evidence for and examples of the local financial benefits that can occur from urban floodplain restoration.

The goal of this study is to quantify and describe the economic impacts of floodplain restoration on local revenues and the fiscal strength of communities. We hope that these findings will result in an improved understanding of how to balance the natural and built environment along urban rivers. This additional information will provide local decision-makers with the tools needed to incorporate benefits from floodplain and river restoration into their land-use planning process. By fully considering all tradeoffs, communities will have more clarity on how to realize the highest and best use of their land in a way that balances restoration and development.

Floodplain restoration provides a suite of benefits to the environment as well as to the people who live in and visit the area. Prior studies on the benefits of floodplain

restoration have focused only on the environmental benefits, such as improved water quality and increased habitat for sensitive species of fish and wildlife. Because these environmental values are not realized through tangible revenues for communities or businesses, they are often overlooked despite having real and large value. In the Puget Sound, the examples of studies that have focused specifically on community revenue impacts from urban floodplain restoration are sparse. The evidence from the national literature suggests that these impacts can yield significant benefits in Puget Sound if urban floodplain restoration projects are designed to target those outcomes.

Floodplain restoration can also support financial benefits that communities and businesses can directly experience, such as increased economic activity or tax revenues. This report documents the specific types of financial benefits from floodplain restoration that have been realized by communities throughout the country. This information provides a better understanding of the type and magnitude of benefits that similar projects can deliver in Puget Sound.

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**“A fragmented approach to floodplain management is ineffective on the whole. A more integrated, multi-benefit approach gets people out of their silos, reduces conflicting actions and helps groups overcome political and financial obstacles.” – Bob Carey, Director of Strategic Partnerships, The Nature Conservancy**

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# Phase 1 of a Multi-Phase Project

This document represents the findings from Phase 1 of a multi-phase project. Phase 1 is a review of the literature on local community revenue impacts from floodplain restoration. This phase also includes the results of informational interviews with stakeholders and professionals working in floodplain restoration. The list of interviewees is detailed in Appendix C. Quotations from the informational interviews are included throughout the document.

Phases 2 and 3 will involve empirical case studies to analyze the impact of floodplain restoration on economic values and economic activity that contribute to local government and business revenue in selected jurisdictions in the Puget Sound region. These phases will include the development of materials and a tool for other communities to better understand the economic benefits of restoring and conserving their floodplains. More information about Phases 2 and 3 is at the end of this report.

## Definitions

The terms **floodplains** and **floodplain restoration** are used throughout this report. As used in this study, the definitions of these terms are as follows:

- A **floodplain** refers to the relatively flat area on either side of a river that becomes inundated during a flood. Floodplains are part of rivers and represent important aquatic and terrestrial habitat during changes in the water level.
- **Floodplain restoration** involves returning connectivity between the river channel and the floodplain so that water can access the floodplain at the right time, volume, and frequency to support ecological processes. It also includes converting land uses that are conducive to, or benefited by, regular inundation – transforming a unit of risk into a unit of natural capital. Examples of floodplain restoration includes projects such as levee setbacks or removals, repairing incised channels (regrading or excavation), removal of infrastructure from floodplain, and reforestation/revegetation.

A healthy floodplain provides many functions that benefit both people and nature, including:

### **STORING AND SLOWING FLOODWATERS:**

When a river floods, water spreads across the floodplain and slows down. Without floodplains, rivers would rise and move faster, just as water from a hose moves faster when you hold your finger over part of the opening.

### **IMPROVING WATER QUALITY:**

Floodplains act as natural filters, absorbing harmful chemicals and other pollution, making rivers healthier for drinking and swimming, and for plants and animals.

### **SAFEGUARDING PEOPLE AND PROPERTY:**

If floodplains are connected to rivers, they can hold water when floods cause a river's banks to overflow. This can help prevent floodwaters from reaching homes and businesses. They are our first and best defense against flood damage.

### **CREATING FERTILE SOIL FOR CROPS:**

Rivers deposit sediment and nutrients in floodplains, making them very productive areas for growing crops.

### **NURTURING LIFE:**

Floodplains are a productive environment for plants and wildlife and serve as nurseries for many species of fish. They provide vital habitat and are important for maintaining the web of life.

### **PROVIDING RECREATION:**

These are ideal places for hiking, paddling, fishing, exercising, and connecting with the beauty of nature.

### **RECHARGING GROUNDWATER:**

During floods, water can replenish groundwater supplies. Capturing flood water during wet years is one of the best ways to ensure adequate groundwater during droughts.

*Source: [www.americanrivers.org/threats-solutions/restoring-damaged-rivers/benefits-of-restoring-floodplains/](http://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/benefits-of-restoring-floodplains/)*





Source: Provided by Dennis Dixon, Pierce County

## History of Floodplain Development in Puget Sound

### Changes to Rivers and Floodplains

Historically, Puget Sound rivers were characterized by steep glacial and snow-fed headwaters, broad forested lowland valleys, and expansive estuaries.<sup>1</sup> In some basins, winter rains would swell the rivers beyond their banks, causing seasonal flooding so substantial that it often gave the impression of an inland sea to native peoples. These floods eroded parts of the landscape, while building up others over time. In this way, the rivers moved over the landscape, bringing with them trees and large amounts of sediment that formed the riffles, gravel bars, side channels, and deep pools that create the building blocks of a healthy ecosystem.

As Europeans arrived in Puget Sound in the early 1800s, they began to settle near the mouths of major rivers. They were drawn by the ample natural resources of this land, and trapping, mining, fishing, and logging were pervasive. At that time, the rivers looked much different. Downed trees were ubiquitous and formed snags and massive log jams, making navigation by river difficult. To accommodate the growing supply of timber, coal, and other raw materials being extracted from the landscape, heavy industry began

to replace the productive estuaries. Along with resource extraction, the landscape began to change as forests were cleared by settlers for farms and towns. By 1900, nearly all lowland riparian forests had been cleared (Plummer 1902).

Human-driven changes in the landscape also changed the structure and flow of river basins throughout Puget Sound. Dikes and levees were incrementally built to protect new agricultural land from flooding. Although this infrastructure reduced flood risk for some, it concentrated floodwaters and shifted the risk from one property to another causing a perpetual cycle of flood and repairs to levee systems. Frequent floods throughout the early 1900s repeatedly breached new levees and flooded new communities growing up in the floodplains. Flood-control dams were installed to reduce the damage, but the risk of flooding was never eliminated.

From 1970 to 1990 the region's population increased by over 1 million (OFM 2017), and businesses and industry incrementally replaced agriculture near urban centers—further increasing the need for larger and more extensive levee systems. As agricultural and urban development replaced floodplain habitat, 9 of the 31 historic salmon runs went extinct, and the wild Chinook salmon populations declined by 93 percent (Ford et al. 2011).

<sup>1</sup> An estuary is an area where a freshwater river meets an ocean or sea. Puget Sound has many estuaries along the perimeter of the Salish Sea. Many of the region's population centers, including Bellingham, Everett, Seattle, Tacoma, and Olympia are located in and around estuaries.

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“We have to raise the public consciousness that historical river management has created tremendous loss of floodplain function and value.”

– Mike Kline, Former Vermont State River Program Manager, River Ecologist/Geomorphologist, Fluvial Matters

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## IMPACTS TO NATIVE PEOPLE

Native people realized and appreciated the abundance rivers and floodplains provided. Many rivers in Puget Sound draw their name from the tribes that have occupied them since time immemorial. Much like the salmon themselves, the native people of this area evolved and adapted with the landscape and the resources it provided. They understood the seasonal changes of floodplains and closely aligned their activities with the environment to harvest an array of plants and animals at different times throughout the year. Prior to European settlement, only about 10,000 people lived in Western Washington and salmon outnumbered people at least a thousand to one (Montgomery 2005).

Today, hunting, fishing and gathering still play a critical role in native communities and is a hard-won legal right. Fishing in particular is central to tribal economies and cultural traditions. Native people and the rivers of Puget Sound have been interconnected for thousands of years and remain so today - despite pervasive alterations to the land and their fundamental way of life.

## Recognition of Environmental Problems

The impacts of human activities on Puget Sound's environment and regionally important species became more apparent over time, eliciting policy responses by state and federal governments. In 1999, Puget Sound Chinook salmon were listed as threatened under the Endangered Species Act, prompting the Puget Sound Chinook Recovery Plan.<sup>2</sup> Shortly after, in 2005, the Southern Resident orcas, that depend on Chinook as their primary food source, were listed as endangered.<sup>3</sup> In 2007 Puget Sound steelhead were listed as threatened as well.

In 1991, the Growth Management Act (GMA) was passed, which requires Washington state communities to develop comprehensive land-use plans, future land-use projections, and development regulations. The goals are to concentrate urban growth, reduce sprawl, and increase regional transportation and affordable housing, while encouraging economic development and the protection of “critical areas”, such as floodplains. The act has been amended many times and takes a bottom-up approach that rolls local plans up into county policies and ultimately regional land-use plans (Puget Sound Partnership 2010). Although the GMA has had significant positive impacts to economic development and natural resource protection, much of the damage to floodplains had already been done.

In 2008, the National Marine Fisheries Service, a division of NOAA, issued a Biological Opinion that concluded that FEMA's National Flood Insurance Program (NFIP) jeopardized most salmon, steelhead, and Southern Resident orcas in Puget Sound, as well as adversely modified their designated critical habitat (Lohn 2008). The filling of floodplains and construction of levees lead to increased stormwater runoff, carrying large amounts of contaminants directly into rivers and streams, further degrading habitat. The opinion recommended fundamental revisions to the NFIP to better protect and restore endangered species habitats and anticipate future land-use and climate change regulations.

In 2013, The Nature Conservancy, Puget Sound Partnership, and the Department of Ecology launched Floodplains by Design to promote integrated floodplain management in Washington state. The innovative program encourages integrated floodplain management through education, programs, projects and policy change. Floodplains by Design brought unlikely partners together to address the overlapping issues of flood, fish, and farm. Over the course of this program, they have raised over \$150 million, initiated 36 projects in 15 counties, restored 25 miles of river, reconnected 2,500 acres of floodplain habitat and protected 500 acres of agricultural land.

Even with regulations and programs in place, land-use changes in the Puget Sound continue to degrade floodplain habitat and undermine restoration efforts. Approximately 52 percent of Puget Sound's historic floodplains have been disconnected from the river and/or no longer have natural land cover (ESA 2018). Modeling by the U.S. Geological Survey shows that, under the status quo, regulatory environmental wetlands could be reduced by an additional 7 to 12 percent in urban and semi-urban areas by 2060 (Villarreal et al. 2017).

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<sup>2</sup> The Puget Sound Recovery Plan is available at: [www.archive.fisheries.noaa.gov/wcr/publications/recovery\\_planning/salmon\\_steelhead/domains/puget\\_sound/chinook/pugetsoundchinookrecoveryplan\\_wo\\_exec\\_summary.pdf](http://www.archive.fisheries.noaa.gov/wcr/publications/recovery_planning/salmon_steelhead/domains/puget_sound/chinook/pugetsoundchinookrecoveryplan_wo_exec_summary.pdf)

<sup>3</sup> More information about the Southern Resident orca listing is available at: [www.endangered.org/campaigns/southern-resident-orcas/](http://www.endangered.org/campaigns/southern-resident-orcas/)



## Current Conditions and Future Trends

Floodplain development has increased, resulting in economic prosperity, despite the risk and impact on floodplain health. Today, approximately 52 percent of Puget Sound floodplains have been lost (ESA 2018) and 71 percent of the remaining floodplains are in poor condition (Puget Sound Partnership 2010). Despite over 390-miles of Army Corps levees, flood damage has been increasing with 15 major flood events happening between 1990 and 2012 resulting in \$1.3 billion in damages. Washington State county assessors estimate there are 105,332 structures located on parcels within the regulatory floodplain and only 22 percent of residential structures have a flood insurance policy.

Puget Sound's lowland river valleys have commercial, residential, and industrial development valued at over \$18 billion (Floodplains by Design 2014). King County alone has approximately 65,000 jobs located in floodplains that generate nearly 7 percent (\$3.7 billion) of the county's total

annual wage and salary income (ECONorthwest 2007). These developments are often the economic centers for communities and provide substantial tax revenue - historically forcing decision makers to choose between maintaining their tax base and investing in environmental restoration. This tradeoff is based on the idea that healthy ecosystems and a healthy economy are mutually exclusive - they are not.

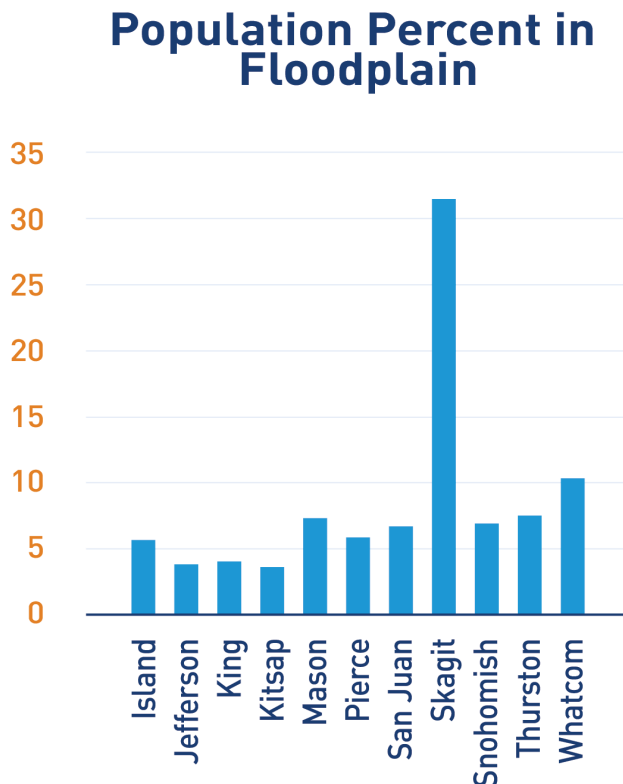
Historical trends and recent conservation efforts demonstrate that Puget Sound residents are willing to invest in floodplains. Since 1980, more than \$500 billion has been spent to restore, repair, and prevent negative impacts on floodplains in Washington (Washington Department of Ecology 2016). Increased population growth, climate change risks, and recreation trends further perpetuate the need for large-scale and long-term watershed restoration planning to maintain quality of life and a thriving economy in the Puget Sound region.

The population of Puget Sound has grown by approximately 1.2 percent annually since 2000 (OFM 2017), and a significant portion of the population lives in a floodplain. In Skagit County, over 30 percent of people live in a floodplain (Exhibit 1). Similar conditions exist in other areas of Washington State. For example, in Grays Harbor, Lewis, Grant, and Whatcom counties, over 10 percent of the population lives in a floodplain.

The value of functioning floodplains is becoming more apparent due to the effects of climate change. Research suggests that flooding will become more frequent in Puget Sound from increases in the frequency and intensity of heavy rain events caused by climate change (Mauger et al. 2005). Increased flooding would also increase urban and agricultural runoff, leading to more pollutants in rivers and bays and threatening aquatic species like salmon.<sup>4</sup> The habitat and functions that floodplains provide will make them even more important to species in the future due to climate change.

Demand for recreation has also increased in recent years both in Puget Sound and nationally as a result of population increases and changing preferences (Cordell 2012). Residents are seeking equitable access to nature in their own backyards, evidenced by community plans that support increased open-space development. The combined effects of a larger population and future growth in outdoor recreation (Bowker & Askew 2012) mean that demand for healthy environments is at an all-time high.

Exhibit 1. Percent of Population living in Puget Sound Floodplains (2015)



Source: Adapted from Washington State Department of Ecology (2016)

<sup>4</sup> Per Mauger et al. (2005) climate change will negative affect salmon from "Warmer streams, ocean acidification, lower summer streamflows, and higher winter streamflows... The persistence of cold water "refugia" within rivers and the diversity among salmon populations will be critical in helping salmon populations adapt to future climate conditions." (p.ES-4)

# Floodplain Restoration Outcomes

The outcomes that floodplain restoration can achieve in a community will vary depending on the location and extent of the project, as well as the goals of the community. Not every desirable outcome will be possible for every project. Exhibit 2 displays the wheel of potential benefits from floodplain restoration discussed in the literature. These benefits represent the range of possible outcomes from floodplain restoration projects – some of which are more well-known and understood than others.

Using a watershed-scale approach, communities can collaborate to understand which outcomes are most important for their area. This, in turn, will inform the types of projects that are best suited for that watershed and project design. Projects in urban areas present opportunities to restore floodplains in locations with some of the highest potential for public use—and in areas of historic water and habitat degradation.

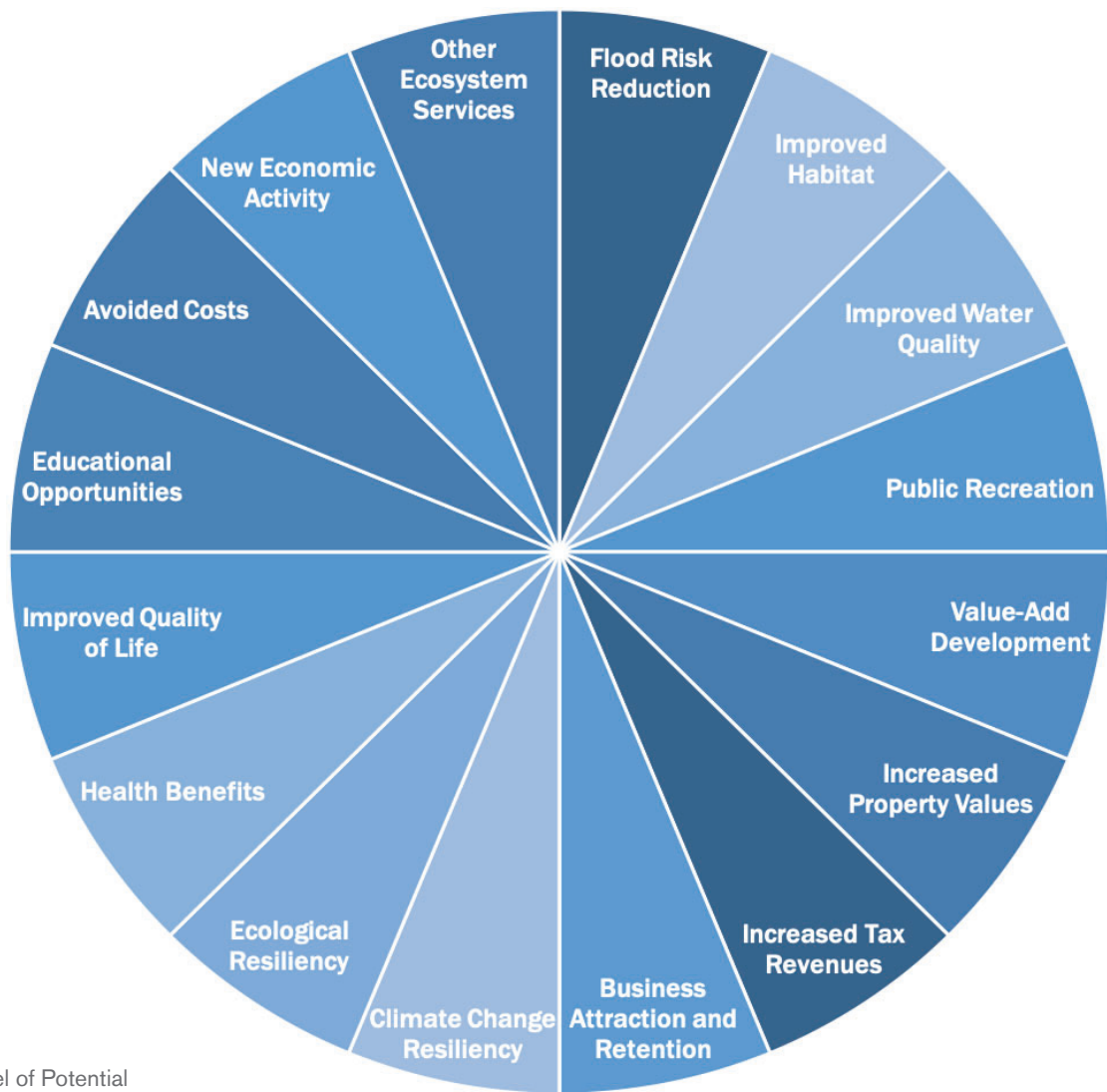


Exhibit 2. Wheel of Potential Benefits from Floodplain Restoration  
Source: Created by ECONorthwest

Does this graphic look familiar? These outcomes also align with Puget Sound Partnership’s “Vital Signs” measures of ecosystem health of abundant water, healthy water quality, healthy human population, vibrant human quality of life, thriving species and food web, and protected and restored habitat.<sup>5</sup>

<sup>5</sup> More information about Puget Sound Vital Signs is available at: [www.psp.wa.gov/evaluating-vital-signs.php](http://www.psp.wa.gov/evaluating-vital-signs.php)



Many of the potential benefits from floodplain restoration in the Puget Sound are described at length in other studies. **The purpose of this report is to describe the outcomes that are less commonly associated with floodplain restoration – the financial benefits to communities.**

### Floodplain Restoration Outcomes Studied Elsewhere

Because floodplain restoration can provide a suite of different benefits, the reasons to implement it are similarly varied. A general reason to implement floodplain restoration is that the public values and is willing to pay to protect environmental resources.<sup>6</sup> Similarly, there are abundant studies highlighting how much Pacific Northwesterners value fishing and water recreation experiences that are improved by floodplain restoration.<sup>7</sup> The benefits to people from floodplain restoration are commonly synthesized and referred to as “ecosystem services”.

Ecosystem services are the benefits that the environment provides that humans do not have to pay for.<sup>8</sup> Many previous evaluations of the benefits of floodplain restoration in the Puget Sound have focused on ecosystem services. Ecosystem services are generally categorized as provisioning, regulating, cultural, and supporting services. See Exhibit 3 for descriptions of the ecosystem services that can be provided by floodplains.

Although ecosystem service benefits are important and can yield large benefits to communities, they are not the focus of this study because they have been discussed at length in other research. Although ecosystem service values like avoided costs from flood reduction are often used in land use planning decisions, they can be overshadowed by development and other economic drivers. Local jurisdictions

“There is a whole slate of potential benefits including improved fish habitat, agricultural productivity, flood risk reduction, parks and open space, economic development, etc. Not all projects in all watersheds will have all benefits. Each watershed will convene people together to understand which cards are the right hand for that community.” – Bob Carey, Director of Strategic Partnerships, The Nature Conservancy

can face challenges justifying floodplain restoration investments if they do not result in a return on the investment in terms of tangible funds flowing back to the community.

The purpose of this project is to investigate the direct financial outcomes of floodplain restoration on local budgets—some of which are often overlooked or have historically been poorly understood. **The financial benefits from floodplain restoration include flood risk reduction, increases to property values, value-add development, increased tax revenues, new jobs and economic activity, and business and employee attraction and retention.**

Each of these benefits is introduced in the sections below. Following that, the literature review expands upon these initial introductions to provide specific examples of how these benefits have been realized in communities across the country and the implications for Puget Sound.

Exhibit 3. Ecosystem Services from Floodplains

PROVISIONING SERVICES	REGULATING SERVICES	CULTURAL SERVICES
The “products” obtained from ecosystems	Benefits obtained from the regulation of ecosystem processes	Nonmaterial benefits obtained from ecosystems
Food	Flood Regulation	Recreational
Habitat	Climate Regulation	Aesthetic & Artistic
Fresh Water	Water Purification	Spiritual
Raw Materials		Educational & Heritage
SUPPORTING SERVICES		
Services necessary for the production of all other ecosystem services		
	Nutrient Cycling	
	Biodiversity	
	Soil Formation	
	Primary Production	

Source: Created by ECONorthwest based on Millennium Ecosystem Assessment

<sup>6</sup> For example, in a national survey Wallmo and Lew (2012) found that a households across the U.S. are willing to pay \$40 per year (2011 dollars) to protect Puget Sound Chinook salmon.

<sup>7</sup> For the Washington region, Rosenberger et al. (2017) estimate that the consumer surplus (i.e., additional value that people receive beyond what they pay) of recreation in national forests for fishing is \$71.52 and for nonmotorized boating is \$108.93 (2016 dollars).

<sup>8</sup> A discussion of ecosystem service benefits from natural capital in Puget Sound is available in Batker et al. (2008).

## 1. Reduced Flood Risk

Many areas in Washington experience persistent flooding, at both the small, local and devastating large scales. Planning by the King County Flood Control District (2016) identified that a 500-year flood event in the Green River Valley could cause damages and losses of over \$47.1 million per year. Losses could be even larger if businesses relocate out of the region as a result.

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“Mitigating flood hazards is the most compelling reason why municipalities have worked with the agencies to pursue floodplain restoration work. When the river has room to move and connect with its floodplain, especially upstream or even within the urban area, it results in far less damage.” – Mike Kline, Former Vermont State River Program Manager, River Ecologist/Geomorphologist, Fluvial Matters

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Between 1990 and 2012, over \$1.37 billion in flood damages have occurred in Washington state (Exhibit 4). As of April 15, 2020, the National Flood Insurance Program had paid \$18 million in total between 2010 and 2020 in all cities and counties within the area covered by the Puget Sound Biological Opinion (Van Hoff 2020). Allowing rivers room to meander and absorb high flows reduces flooding risks, while also improving water quality and available habitat.

Flood risk reduction is likely to become more valuable in the future due to the increased flood risk posed by climate change (Mauger et al. 2005). For property owners, reducing the risk of flooding not only improves their physical and financial security, but it can also result in lower flood insurance costs. For example, because Pierce County participates in the Federal Emergency Management Agency (FEMA) Community Rating Service<sup>9</sup> and engages in activities beyond FEMA's minimum requirements (such as open space preservation and higher regulatory standards), the unincorporated areas receive a 40 percent discount on federal insurance premiums (Pierce County Public Works 2016).

Other research demonstrates the economic effectiveness of preparatory strategies to reduce future costs. The National Institute of Building Sciences estimates that every \$1 invested in pre-disaster mitigation saves \$6 in damages (Multi-Hazard Mitigation Council 2019).

Exhibit 4. Flood Costs by the Numbers in Puget Sound

### FLOOD COSTS BY THE NUMBERS

*Between 1990-2012:*

**15** flood disaster declarations in Puget Sound

**58** deaths during flood disasters

**\$71 million** in repeat insurance claims

**900** cattle and farm animals drowned

**10** of the **15** flood disasters caused **levee damage, overtopping or failure**

**\$125 million** in levee repairs

**4** times that Interstate 5 closed due to flooding

**\$1.37 billion** in flood damage statewide

**833:** Homes damaged multiple times by floods since 1978

**105,332:** Total structures in Puget Sound regulatory floodplains

**\$28.7 billion:** Value of structures at high risk of flood damage in Puget Sound

**36:** Total federally declared flood disasters in Washington State (through Dec 2012)

Source: National Wildlife Federation (2013)

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“We have talked a lot about what happens if we don’t manage flood protection. What does that mean for homes and businesses in the floodplain? There are risks of costly flood insurance and risks of development restrictions. If we’re not getting flood protection put in place then there are adverse economic consequences.” – Dave Upthegrove, King County Council Member

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<sup>9</sup> More information about the Community Rating System program is available at: [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system)



## 2. Increased Property Values

The value of properties, particularly residential homes, reflects the suite of amenities available on site or nearby. Like an extra bedroom or being on a corner lot, nearby floodplain restoration can increase property values for adjacent or nearby properties through amenities like improved water quality, access to open space, recreation opportunities, and reduced flood risk. The added value from increased local amenities can also encourage new development and land-use change that yield local revenues. For floodplain restoration projects that motivate development, property values can increase from additional investment, access to services, and other amenities.

In an evaluation of homes in California, Streiner and Loomis (1995) found that residential homes near restored streams can experience up to a 13 percent increase in property value compared with those near non-restored streams, depending on the restoration effort implemented. The researchers imposed California property tax rates to the increased property values to demonstrate the potential increase in property tax revenues from the increased property value.

Nicholls and Crompton (2017) performed a meta review of the literature on the effects of views of and proximity to rivers, streams, and canals on surrounding residential

property values. The increased value is most pronounced in urban areas, where the property value premium associated with river views is typically between 10 and 30 percent.

South Platte River, Denver, CO



Source: Rendering of the new River Mile development and river centric activity. [www.rivermiledenver.com](http://www.rivermiledenver.com)

There are many examples of floodplain restoration used in waterfront park redevelopment projects.<sup>10</sup> The concept for Harold Simmons Park in Dallas, Texas, along the Trinity River provides an example of how a large urban park and associated development opportunities have incorporated floodplain restoration.<sup>11</sup> In addition to revegetation and widening of the river, Harold Simmons Park is designed to allow flooding during storm events. The \$150 million investment in Harold Simmons Park is expected to stimulate additional real estate development by \$3.5 billion and generate property taxes of \$1.2 billion by 2050 (ECONorthwest 2019a). This large development impact estimate for a signature urban park is consistent with prior studies of New York City's High Line Park, Millennium Park in Chicago, Discovery Green Park in Houston, and others.

These riverfront development projects demonstrate how communities that had previously turned their backs on their rivers are now embracing them. Denver's South Platte River provides an example of how cleaning up the river initially allowed residents and developers to see the value of the river as an amenity. With that momentum, new development came in and demanded increased healthy habitat and river improvements as a component of the overall revitalization. The Auraria District in Denver, centered around the South Platte River, is an example of how rivers can play a key part in creating a "prosperous, walkable, distinctive, diverse, and green downtown" and contribute to City revenue.<sup>12</sup>

<sup>10</sup> The Rock Island Bridge Project Slideshow details how riverfront parks with river restoration are being used as a catalyst for development across the country, including in Nashville, Milwaukee, Chicago, Oklahoma City, and New York City. The Rock Island Bridge Project Slideshow is available at [www.rockislandbridgeproject.org/](http://www.rockislandbridgeproject.org/)

<sup>11</sup> The design can be viewed at: [www.trinityparkconservancy.org/wp-content/uploads/2018/12/2018.11.30\\_Large-Section-NTS\\_with-text.pdf](http://www.trinityparkconservancy.org/wp-content/uploads/2018/12/2018.11.30_Large-Section-NTS_with-text.pdf)

<sup>12</sup> The 2018 Denver Downtown Area Plan Amendment is available at: [www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/Plans/Downtown\\_Area\\_Plan\\_Amendment.pdf](http://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/Plans/Downtown_Area_Plan_Amendment.pdf)

### 3. Value-Add Development

Revitalization of riverfronts is happening across the country, often along rivers with histories of environmental degradation. This development often includes aspects of floodplain restoration, such as increased riparian planting, levee setbacks, emergent wetlands, and other strategies to improve habitat and water quality, while also increasing accessibility.

Adjacent zoning and overlay districts are tools used in some of the most successful floodplain restoration projects observed in the literature review. Similarly, land acquisition buyout programs across the country have been successful at maintaining tax revenues within taxing jurisdictions to prevent fiscal revenue losses by keeping residents in their jurisdictions. These planning and development tools offer flexibility to prevent potential losses of community revenue while encouraging restoration on parcels with high environmental value. In many cases, increased development is not compatible with floodplain restoration. Development within floodplains increases flood risk and destroys habitat. However, increased development in adjacent areas outside of the floodplain can provide an economic benefit to the community and increase habitat. **Benefits can be realized through restoration in urban areas where the majority of land has already been developed and through preservation of healthy floodplains in areas facing increased pressure from development.**

Waypoint Park Bellingham Waterfront, Bellingham, WA



Source: Provided by Brandon Parsons, American Rivers

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“There are ways to incorporate natural beauty while allowing development to occur around it... For Vulcan, investing in sustainable development is just the right thing to do. We aren't being incentivized other than increasing the marketability of our projects due to how residents and tenants perceive the environment.” – Lori Mason Curran, Real Estate Investment Strategy Director, Vulcan Real Estate

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Although riverfront development is widespread and communities have invested heavily in their riverfronts, projects are not always explicitly designed with floodplain restoration in mind. For example, the Spokane River Centennial State Park is a nearly 40-mile trail along the Spokane River. Tourism generates over \$1.7 million in economic activity for Spokane County and property value premiums near the trail have increased approximately two percent (\$23.7 million) as a result (ECONorthwest 2019b). A development example is the Waterfront District development in Garden City, Idaho, which will provide a mix of single-family, condo, townhouse, live/work residential-type opportunities with amenities like a community clubhouse, private beach, pool, and access to the Boise River, the Greenbelt, and the whitewater park.<sup>13</sup> Although it is unclear whether these developments included investments in floodplain restoration, they both are centered around a river and demonstrate the desire people have to live, work, and recreate near healthy rivers.

<sup>13</sup> More information about the Waterfront District is available at: [www.buildidaho.com/idaho\\_subdivisions/ada\\_county/garden\\_city\\_new\\_subdivisions/waterfront\\_district/](http://www.buildidaho.com/idaho_subdivisions/ada_county/garden_city_new_subdivisions/waterfront_district/)



## 4. Increased Tax Revenues

Increased tax revenues can come from a variety of sources and depend on the state and local tax revenue structures. Floodplain restoration can result in increased sales and use tax from the purchase of supplies for a project. For example, project plans for the Lower Russell Road Levee Setback project along the Green River suggest that sales tax revenues from construction alone would be \$2.3 million (HDR 2016). Further sales and use tax can occur from visitor spending, particularly if recreation features or adjacent development motivates visitation. Projects that increase property values can also increase property tax revenue.

Washington State has taxing districts at the state, county, and city levels. Because of this structure, there are multiple pathways by which tax revenues can change as a result of floodplain restoration projects. The largest share of tax revenue for the state and local governments is the sales and use tax and property tax.

- **Sales and Use Tax:** The statewide sales tax rate is 6.5 percent. Local jurisdictions can also assess a local retail sales and use tax. Purchases of materials for floodplain restoration projects generates short-term sales and use tax revenue - but the largest sales and use tax revenue benefits accrue when the project motivates development or land use changes to higher and better use, such as a shift from warehouses to a riverfront development with new retail, restaurant, and business opportunities.

In 2008, Washington switched to a “destination-based sales tax” model so that sales tax is collected based on where goods are shipped to rather than delivered from.<sup>14</sup> For manufacturing hubs in Puget Sound, this means that the local jurisdiction that produces the good is no longer receiving the tax revenue if it is shipped elsewhere. Bringing economic activity back to historical manufacturing areas through ecologically focused redevelopment could replace some of that lost tax revenue while also yielding environmental benefits.

- **Property Taxes:** Local governments administer property taxes in Washington based on assessed values. Property tax rates vary by county, but usually comprise approximately half of the total tax revenues for a county. Floodplain restoration can increase property values by motivating development in adjacent areas outside of the floodplain and through property value increases and increasing the total tax base.

Local property tax in Washington state is budget-based. Rather than property tax revenue based on a fixed share of property value (e.g. \$10 per \$100,000 of assessed value), it is based on a share of revenue necessary to meet a particular taxing jurisdiction's budget needs.<sup>16</sup> The distribution is based on assessed value, so an increase in assessed value would shift a larger proportion of the tax burden onto the properties with improved value, but not necessarily increase tax revenue. Furthermore, there is a constitutional limit of \$10 per \$1,000 assessed value. Local districts are limited to \$5.90 of this \$10 limit. However, many local districts are not up to that limit, and could experience property tax revenues increase. Taxes cannot increase more than 1 percent per year.

Tax revenues generated can be used to fund a variety of services, including additional restoration. Communities across the country rely on these tax revenues to fund their infrastructure and environmental programs.<sup>15</sup>

- The Iowa state Flood Mitigation Board relies, in part, on an incremental increase in the state sales tax to fund flood mitigation projects. As of 2015, the program has raised nearly \$600 million for flood reduction projects.
- Through ballot measure AA, the nine counties around San Francisco Bay have established a \$1/ month parcel tax to fund restoration projects to increase resilience to climate change and sea level rise. This measure will create \$25 million a year for restoration and approximately \$500 million over the next 20 years.
- In 1998 five towns on the east end of Long Island, implemented the Peconic Bay Community Preservation Fund. This 2 percent tax on real estate transactions is now directed over \$1 billion towards open space, water quality improvements, and overall coastal resilience.

<sup>14</sup> More information about the destination-based sales tax can be found at: [www.mrsc.org/Home/Explore-Topics/Finance/Revenues/The-Property-Tax-in-Washington-State.aspx](http://www.mrsc.org/Home/Explore-Topics/Finance/Revenues/The-Property-Tax-in-Washington-State.aspx)

<sup>15</sup> More information about community funding can be found at: [www.nrcsolutions.org/funding/](http://www.nrcsolutions.org/funding/)

<sup>16</sup> Created using the Washington statewide IMPLAN software for 2018 for industry “463 Environmental and technical consulting services”.

5. New Jobs and Economic Activity

Floodplain restoration projects can create both short-term and long-term economic impacts. Jobs and spending are required for the initial project construction. Project spending supports additional economic activity through the “multiplier effect,” which leads to additional jobs, income, and spending in the economy. Exhibit 5 shows the pathways for this type of development.

An example of how the multiplier effect works is how the wages paid to construction workers on the project are represented in the economy at restaurants and other local businesses. Similarly, the materials used for the project are often sourced locally, which supports local businesses and their employees.

For the state of Washington, the jobs multiplier from the “environmental and technical consulting services”, an industry commonly involved with floodplain restoration, is 1.6, meaning that for every 1 job created another 0.6 jobs is supported in the state from multiplier impacts. The multiplier for output for that industry is 2.0, meaning that every \$1 million spent in that industry supports an additional \$1 million in economic activity in the state for a total impact of \$2 million.<sup>16</sup> The Thea Foss Waterway project, discussed in Puget Sound case studies later in this document, saw a multiplier from construction and operations spending between 1.55 and 1.7, meaning that for every job created from spending, an additional 0.5 to 0.7 jobs are supported in the local economy.

After construction, further economic impacts can occur from operations and maintenance, recreation opportunities, as well as retail and other development. Like construction spending, there are multiplier effects from this spending. The economic impacts after construction sustain long-term economic activity into the future.

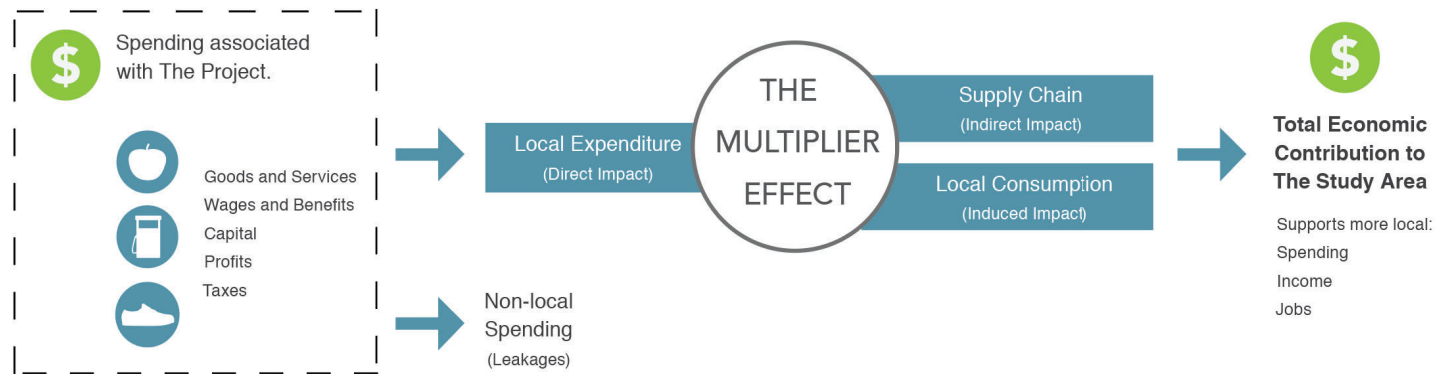
“Quality of life attracts business and jobs. Healthy habitats connect people to the river in a way that allows them opportunity and access to the quality of life they value.” – Dave Upthegrove, King County Council Member

Rendering of proposed Foss Waterway Park



Source: Metro Parks Tacoma, Washington - [www.metroparkstacoma.org/project/foss-waterway-parks/](http://www.metroparkstacoma.org/project/foss-waterway-parks/)

Exhibit 5. Pathway for Multiplier Impacts from Project Spending



Source: Created by ECONorthwest



## 6. Business and Employee Attraction and Retention

Natural amenities like floodplains, water views, and recreation amenities add both general livability as well as site specific amenities. Talented employees and certain businesses want to live and work in a place with amenities. These amenities can be general to the community, such as having access to open space and clean water, or site specific, like having a riverfront trail near their place of work.

A local example of how businesses interact with their floodplains occurred at the North Winds Weir on the Duwamish River in Tukwila. Boeing had an office located across the street from North Winds Weir. The employees at this site donated both time and resources to the restoration project and continued to serve as stewards and visitors to the site after the project was completed.<sup>17</sup> This example demonstrates how improving environmental amenities through floodplains can attract and benefit employers and employees.

Evidence from Bend, Oregon, provides information about the attributes of businesses that choose to relocate to an area that has invested in its natural amenities (ECONorthwest 2017). The businesses that relocated to Bend, including professional, scientific, and technical services, as well as businesses in the recreation and tourism industries, experienced higher wage growth

and were less likely to lay off workers during the 2008 recession. Similar evidence from Utah demonstrates how outdoor recreation opportunities attract talented employees and bolster industries like their burgeoning tech sector (Harrison 2019).

Technology and specialized service firms rank environmental quality as one of the primary drivers of business location decision-making (Gottlieb 1995). Technology companies, research and development facilities, corporate headquarters, finance, and professional services are more likely than manufacturing operations to prioritize quality of life in location decisions (Reilly and Renski 2008). Smaller companies that want their location to reflect their corporate culture also place a higher value on quality of life.

In Puget Sound, there is recognition that quality of life from environmental amenities is critical to attracting new businesses and retaining a talented workforce. A regional economic development strategy developed for the Puget Sound Regional Council acknowledges that “the prosperity of the Puget Sound depends on providing a high quality of life for the region’s businesses, workforce and families” (Prosperity Partnership 2012, p.53). To maintain quality of life the report recommends **balancing growth with enhancing the environment and recognizing the environment as a key economic asset.**

Deschutes River, Bend, OR



Source: Provided by Brandon Parsons, American Rivers

<sup>17</sup> More information about the Boeing employees and other volunteers for the North Wind's Weir project can be found at: [www.govlink.org/watersheds/9/plan-implementation/SRFB-northwinds.aspx](http://www.govlink.org/watersheds/9/plan-implementation/SRFB-northwinds.aspx).

## Barriers to Urban Floodplain Restoration

This report is specifically focused on improving the understanding of the type and magnitude of benefits from urban floodplain restoration. However, there are also potential costs that need to be considered as part of the land use decision making process. As with any investment, there are tradeoffs that should be vetted in the design and planning process.

The most obvious cost associated with a project is the capital cost of project construction. Because land use values are generally higher in urban areas compared with properties outside city limits, the cost of urban floodplain restoration can be higher than for similar restoration in rural areas. Urban floodplain restoration occurs when the potential benefits are also larger in urban areas, such as environmental improvements, flood risk reduction, increased tax revenue potential, increased recreational opportunities, and others. Tradeoffs between floodplain restoration project locations is part of the watershed scale planning process of viewing a river holistically to determine where the smallest costs and largest benefits of a project could occur. Since a river flows through both urban and rural areas, healthy ecosystems are needed in both.

Another concern is one of the purposes of this project – the concern that urban floodplain restoration displaces businesses or residents. Although open space does prevent development from occurring on that specific parcel of land, it does not need to prevent adjacent development. Because we are focused on urban areas which are essentially completely built, the assumption is that areas are already developed adjacent to the floodplain. This report demonstrates how the benefits of floodplain restoration with redevelopment can motivate higher-value or denser development, depending on the appropriateness of development for that site. Depending on the project, adjacent properties can also experience benefits from reduced flooding and increased open space.

If property values go up, then the potential for displacement of marginalized groups does as well. People can be priced out of where they live when increased development occurs. This change can result in losses of the culture of a community and economic hardship, particularly for renters. There are many policy levers to prevent displacement discussed in the literature on equitable development planning. King County has an Equity and Social Justice Strategic Plan and Seattle has an Equitable Development Initiative,<sup>18, 19</sup> which contain strategies to minimize equity and social justice concerns like displacement and others.

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“Some sites should also consider how the public could use the site, for example having places to sit, viewing areas or trails for recreation purposes. In the past we have missed opportunities to make places more meaningful to the community. If you don’t love it you aren’t going to take care of it.” – Marie Walkiewicz, Portland Bureau of Environmental Services

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Importantly, higher property values is not necessarily desirable in many parts of Puget Sound, such as around Seattle where property values are already very high. Because increased property value does not necessarily lead to increased property tax revenue in Washington, the incentives are even lower. However, increased property values in areas that have not experienced economic development reflects the increased value that the community has for the area as a place to live and work, which would be valuable for many communities in Puget Sound.

Related to displacement of people, another common concern about urban floodplain restoration projects is the potential for the site to be used for encampments and by people experiencing homelessness. Often, restoration projects actually reduce encampments because of increased use and visibility. Use of facilities by people experiencing homelessness is also not specific to green infrastructure and can be experienced by grey infrastructure projects as well.

Many of the potential costs and tradeoffs associated with urban floodplain restoration can be addressed in design and planning. Resources like Floodplains by Design offer assistance for watershed-based planning that is necessary to balance restoration with other community priorities.

The examples provided in the next section represent the potential benefits from urban floodplain restoration that can occur with proper design. We recognize that there have also been projects that have created costs and the types of benefits we discuss are not always positive for every floodplain restoration project. For example, there are instances when adjacent property values actually decline if increased vegetation blocks river views or if increased use of the adjacent site creates a nuisance for neighbors. The distribution of benefits and costs are site specific and will vary with every project. However, the examples provided in the next section describe the types and magnitudes of potential benefits that can occur with proper design.

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<sup>18</sup> More information about King County's Equity and Social Justice Strategic Plan is available at: [www.kingcounty.gov/elected/executive/equity-social-justice/strategic-plan.aspx](http://www.kingcounty.gov/elected/executive/equity-social-justice/strategic-plan.aspx)

<sup>19</sup> More information about Seattle's Equitable Development Initiative is available at: [www.seattle.gov/opcd/ongoing-initiatives/equitable-development-initiativewatersheds/9/plan-implementation/SRFB-northwinds.aspx](http://www.seattle.gov/opcd/ongoing-initiatives/equitable-development-initiativewatersheds/9/plan-implementation/SRFB-northwinds.aspx)



## Evidence from the Literature Outside of Puget Sound

River and floodplain restoration projects from outside the region help inform the scale and magnitude of benefits that could be realized in Puget Sound. Although original studies are preferable to evaluate the benefits of floodplain restoration for a particular area, values from elsewhere can be more cost effective and yield similar results. Applying values from elsewhere should be used with caution, however, and only if appropriate guidelines are followed to prevent benefits from being grossly overstated or understated relative to the local context.

### Methodology

With assistance from ECONorthwest, Jonathan Loos, Dartmouth University, performed the systematic literature review of the national literature (the literature review for the Puget Sound region was analyzed separately). The literature review was focused on the property value and community revenue benefits from floodplain restoration. Community welfare and avoided cost benefits were also documented, but were not the primary focus of the review. Filtering criteria was collaboratively developed with the Steering Committee and used to focus the search results on urban floodplain and river restoration projects with these types of benefits. Literature included in the review must include all of the following criteria:

- Located within inland floodplains adjacent to a stream or river channel (i.e., not a lake or ocean);
- Project outcomes impact human communities in urban or semi-urban settings;
- Located on a site that provides public access;
- Quantified metrics of project parameters and outcomes (with an exception for regional projects that may only have qualitatively described outcomes)
- Some level of economic analysis of outcomes; and
- Project-specific analysis of outcomes.

*The full methodology for the literature review is detailed in Appendix A and the full results are available in Appendix B.*

Sixteen case studies of floodplain restoration are included that met our project definition criteria. Projects span most of the United States, except the Southeastern and Gulf States, and include one project from Europe and one from Canada. From the literature review results, we describe below the examples that best exemplify the potential benefits of urban floodplain restoration applicable to Puget Sound based on our predetermined criteria.

The type of floodplain restoration described in the case studies may not be viewed by all as traditional floodplain restoration in Puget Sound because it incorporates elements like adjacent development and recreational use. These examples represent options for restoration in urban developed areas. Some of the examples may be more appropriately characterized as redevelopment with ecological benefits rather than traditional floodplain restoration. We recognize that this type of restoration may not be the type of strategy to maximize habitat benefits and aquatic functions, but they do represent feasible strategies that balance restoration, improve ecological function, and allow for compatible redevelopment in urban areas where options for process-based restoration are limited or non-existent.

Don River Naturalization and Port Lands Flood Protection Project  
Toronto, ON



Source: Michael Van Valkenburgh Associates/Waterfront Toronto  
[www.waterfronttoronto.ca](http://www.waterfronttoronto.ca)



Type of Floodplain Restoration:  
Stream channel repair, floodplain  
reconnection, riparian restoration

Source: Provided by Brandon Parsons, American Rivers

## South Platte River and Cherry Creek, Denver, Colorado

Historically, Denver's South Platte River and Cherry Creek were heavily polluted rivers due to dumping and industrial activity. Over \$130 million has been invested in floodplain restoration in this region since 1970. Instream, riparian, and floodplain restoration projects have improved water quality levels in the South Platte River and Cheery Creek.<sup>20</sup> Restoration projects and their associated environmental improvements have led to urban revitalization all along the South Platte and Cherry Creek waterways through Denver. As a result, the neighborhoods along the waterfront are desirable locations for people to live, work, and recreate.

Summit Economics (2017) evaluated the economic outcomes of multiple decades of restoration in the South Platte and Cherry Creek watersheds within Denver's urban areas. The researchers find that **properties within a half mile of the water and greenways are valued 36 percent higher than properties in other areas of the city, on average.** Fifty years ago, when the river was severely degraded, those same properties were valued 17 percent less than similar properties in Denver. This increased value also raised property tax revenues. In 2017, Denver collected \$64 million in additional property taxes due to improved river conditions, including \$100 million for Denver schools. Ecosystem services from the river provide an additional \$1.4 billion in annual benefits.

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**"The river polls very highly, whenever voters are asked to pay for something the river is one of their top choices." – Jolon Clark, Denver City Council President, on the passage of Ballot Measure 2A for a Parks and Open Spaces Sales Tax**

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Denver continues to invest in its river. A partnership between The Greenway Foundation, developer Revesco Properties, and the city of Denver, is resulting in a massive riverfront redevelopment project coined "The River Mile" along the South Platte River. The development, located in downtown Denver, will include improvements to the watershed for increased and healthier habitat, while also supporting over 27 acres of parks and open space, as well as new commercial, retail, residential, education facilities, arts, cultural, and transportation resources.<sup>21</sup> The vision for the River Mile is long term and will take approximately 25 years to complete. Funding for the project is coming from multiple sources, including metro districts that allow bonding from higher tax rates within the project area.<sup>22</sup>

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**"The river used to be something the community turned its back on. The planning department had to get the river classified as a street because planning wouldn't let you do activation at that time. Now everyone wants to live and work by the river." – Jolon Clark, Denver City Council President**

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<sup>20</sup> More information about the water quality improvements can be found at: [www.thegreenwayfoundation.org/projects.html](http://www.thegreenwayfoundation.org/projects.html)

<sup>21</sup> More information about The River Mile can be found at: [www.rivermiledenver.com/](http://www.rivermiledenver.com/)

<sup>22</sup> More information about funding sources can be found at: [www.denverite.com/2018/07/23/denver-river-mile-bridges-roads/](http://www.denverite.com/2018/07/23/denver-river-mile-bridges-roads/)



An example of the Johnson Creek Willing Seller Program's success is the Foster Floodplain Natural Area project. Working for over 15 years through the Willing Seller Acquisition Program, the City of Portland purchased the land from 60 families and helped them move out of the 100-year floodplain.



Type of Floodplain Restoration:  
Willing seller program, land acquisition,  
floodplain reconnection, riparian restoration

Source: [www.hiddenhydrology.org/category/city/portland/page/2/](http://www.hiddenhydrology.org/category/city/portland/page/2/)

## Johnson Creek, Portland and Surrounding Area, Oregon

The Johnson Creek watershed is a 52-square-mile area of varied landscapes that drains the cities of Milwaukie, Portland, Gresham, and Happy Valley in Oregon. For more than 70 years, various local, regional, state, and federal agencies have worked toward understanding the dynamics of the Johnson Creek watershed and have attempted to resolve recurring flooding, water quality, and other environmental problems.

After severe flooding in 1996 and Endangered Species Act listings of local salmon species, the city of Portland's Bureau of Environmental Services (BES) developed the Johnson Creek Willing Seller Land Acquisition Program. The goal of this program is to help move people and property out of areas that frequently flood and to restore the land acquired through the program to increase flood storage, improve fish and wildlife habitat, restore wetlands and create passive recreational activities for city residents. BES is a sewer and sanitary agency, which creates unique opportunities for the land acquisition program due to access to capital, ability to bond, and the agency's ability to be patient to wait until willing sellers are ready to participate.

A study by Jarrad et al. (2015) evaluated the impact to single-family residential property values from \$363 million in river restoration investments in two voter approved bonds. The researchers applied a repeat-sales method to ascertain the changes in property values attributable to restoration interventions in the Johnson Watershed.

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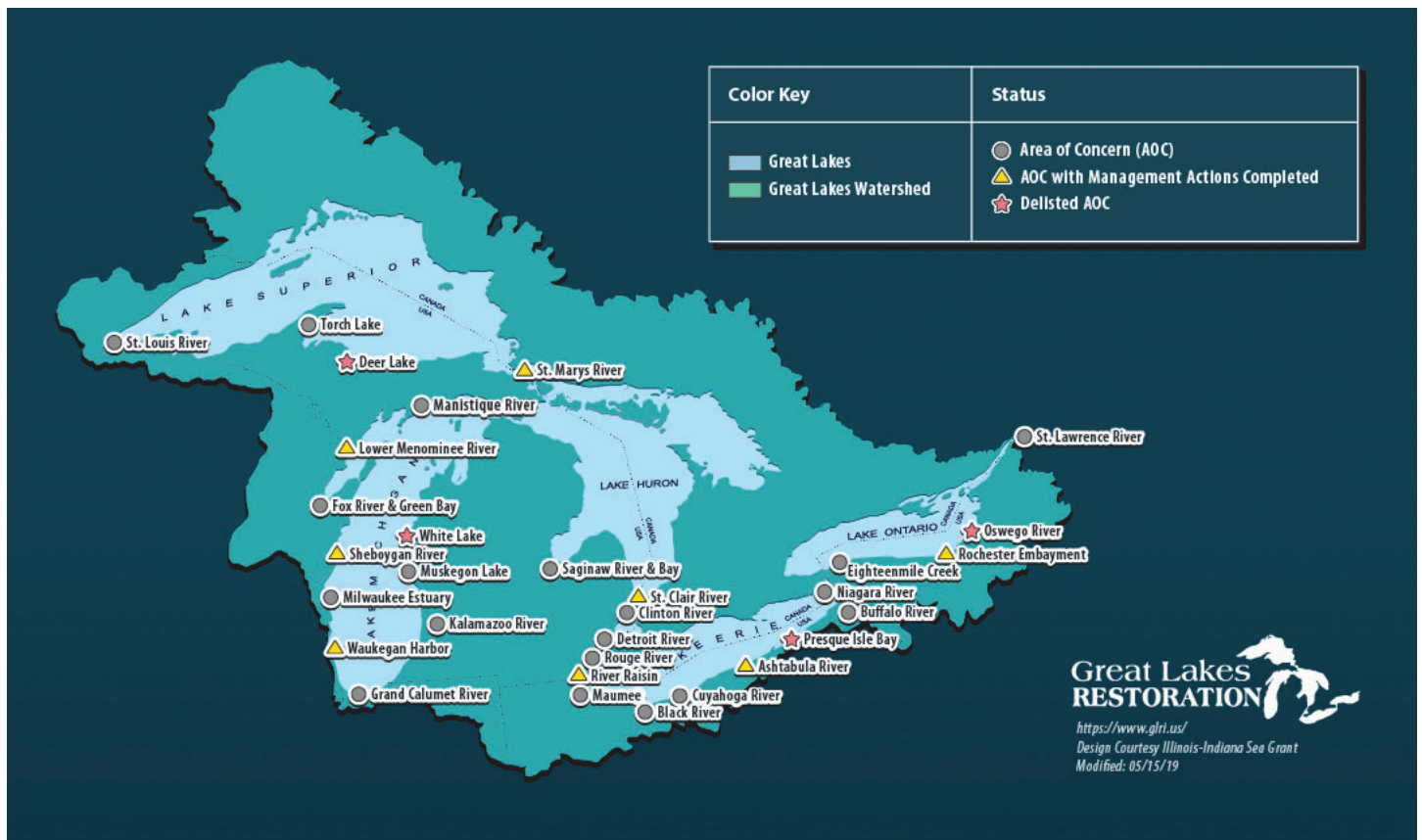
"Until recently, most stormwater planning and land use planning happened independently from each other. Now, the different bureaus are figuring out how to work together to maximize benefits and meet the objectives of multiple organizations". – Marie Walkiewicz, Portland Bureau of Environmental Services

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Their findings highlight how property value impacts vary based on type of project, distance, and time since project completion. They found that **floodplain restoration projects had a positive impact of 10.79 percent on property values in the closest buffer range (0.25 km)** during the later mature stage of project completion (6 years after implementation). The positive value to nearby home prices for later phases of projects is likely due to the adverse impacts of construction noise and traffic during the construction period, as well as the time needed for riparian plantings to mature in the intermediate period. Impacts to nearby properties are also positive for stormwater projects (7.15 percent) during the project phase when public outreach about these projects is greatest.

Similar work in the Johnson Creek watershed by Netusil et al. (2019) also found that estimated effects vary by attribute, distance, and project phase. **Projects with recreation that are within 0.25 kilometers (0.16 miles) of the project site, are estimated to have positive effect on property values of 3.99 percent (pre-project), 5.49 percent (project), and 6.99 percent (post-project).**

Exhibit 6. Great Lakes Areas of Concern (AOC)



Source: U.S. Environmental Protection Agency. Retrieved from [www.epa.gov/sites/production/files/2019-06/documents/aoc\\_map\\_b3\\_text\\_002.pdf](http://www.epa.gov/sites/production/files/2019-06/documents/aoc_map_b3_text_002.pdf)

## Great Lakes Region

Other examples of successful urban rivers restoration projects that yield both ecological and economic benefits are from the Great Lakes region. This region has taken a large-scale approach, that spans two countries and seven U.S. states. Efforts began in 1985 with the designation of the EPA's "Areas of Concern" (Exhibit 6). Since then, these communities have invested in their formally polluted rivers to improve both water quality and quality of life.

The International Association for Great Lakes Research, a collaboration between researchers and agencies from Canada and the United States, documented the benefits they have seen in "Great Lakes Revival: How Restoring Polluted Waters Leads to Rebirth of Great Lakes Communities." This document includes 10 case studies from around the Great Lakes that "illustrate the benefits of water reclamation in catalyzing community revival" (p.ix). The three case studies below were informed by this collaborative report.

## Buffalo River, Buffalo, New York

### Type of Floodplain Restoration: Shoreline and riparian restoration, floodplain reconnection

The revitalization of the Buffalo River in Buffalo, New York, began in the 1980s after passage of the Clean Water Act, the U.S.-Canada Great Lakes Water Quality Agreement, and the Endangered Species Act. In 2002, the Great Lakes Legacy Act<sup>23</sup> and in 2010 the Great Lakes Restoration Initiative (GLRI)<sup>24</sup> were passed. These acts provide federal funding for projects that advance the goals of fishable and swimmable waters. As a result of this increased funding and the resulting investments, fish have returned to the Buffalo River and public access to the river has expanded. Waterfront revitalization, too, has begun to occur. Since 2012, over \$428 million has been invested along the Buffalo River (p.9). The historic business district "Canalside" is a prime example of this success story. Since revitalization in 2008, the site now hosts over 1.5 million visitors and more than 1,000 annual events per year. **This visitation drives economic activity as people travel to the area and frequent local businesses.**

<sup>23</sup> More information about the Great Lakes Legacy Act is available at: [www.epa.gov/great-lakes-aocs/great-lakes-legacy-act](http://www.epa.gov/great-lakes-aocs/great-lakes-legacy-act)

<sup>24</sup> More information about the GLRI is available at: [www.glri.us/node/256](http://www.glri.us/node/256)



## Cuyahoga River, Cleveland, Ohio

**Type of Floodplain Restoration:** Floodplain reconnection and wetland, shoreline, and riparian restoration

The Cuyahoga River famously caught fire in 1969 due to rampant pollution, becoming a national symbol of the environmental costs of river degradation. The Great Lakes Legacy Act, the GLRI, the U.S. EPA, and the Ohio EPA have financed wetland restoration, shoreline restoration, headwater habitat restoration, invasive species removal, contaminated sediment removal, and dam removal. As a result, fish, osprey, peregrine falcons, bald eagles, and blue and green herons have returned to the Cuyahoga River. Like the other case studies, when the river is clean, recreation and development follow. **The waterfront area of Cleveland Flats has experienced \$750 million in economic development since 2012 and another \$270 million is planned.** Visitation to the flats was over 500,000 in 2016 and the area now offers festivals, community events, walking tours, and watersport rentals.

## Muskegon River, Muskegon, Michigan

**Type of Floodplain Restoration:** Floodplain reconnection, wetland, riparian, shoreline restoration

Muskegon, Michigan, was historically a timber town. Sawmills and other industry on the shoreline of Muskegon Lake resulted in contaminated sediments, habitat loss, and environmental degradation. From the 2009 American Reinvestment and Recovery Act, \$10 million in grant funding was awarded to restore wetlands and stabilize shoreline along the south shore of Muskegon Lake. Using a travel-cost survey to estimate the value to recreationists from the improvements and a hedonic analysis to calculate impacts to residential properties, Isely et al. (2018) calculate a **6 to 1 return on investment from restoration at Muskegon Lake, from property value increases and recreation value alone.** Specifically, for property values, the researchers estimate restoration on the south shore led to an increase in property values of between \$11.9 million and \$15.5 million. **For the \$10 million spent in project costs, the property value benefits alone have a positive return on investment.** Additionally, the property value increase results in over \$600,000 per year in additional property tax for the region (Hartig et al. 2019). When including recreation, Muskegon Lake contributes an additional \$3.2 million per year in direct travel cost spending. The 6 to 1 return on investment does not consider other benefits from the restoration project, and therefore is likely underestimated.

“As a result of water quality and fish habitat improvements the Milwaukee and Menomonee Rivers have become a destination . People are now coming from all over to fish the harbor and lower stretches of the rivers near the downtown. The Milwaukee Riverwalk has people docking along the river, walking up to bars and restaurants. Bars and restaurants have tables and food on the river, but in years past there were dumpsters there.” – Dave Fowler, Certified Floodplain Manager, former Franklin, WI, Planning Commissioner and retired Senior Project Manager with the Milwaukee Metropolitan Sewerage District

Cleveland Airport



Source: [www.clevelandairport.com/airport/cle-art-program/temporary-exhibits/crooked-river-contrasts](http://www.clevelandairport.com/airport/cle-art-program/temporary-exhibits/crooked-river-contrasts)

Veteran's Memorial Park After Habitat restoration, Muskegon, Michigan



Source: West Michigan Shoreline Regional Development Commission. Retrieved from: [www.wmsrdc.org/project/muskegon-river-habitat-restoration-at-veterans-memorial-park/](http://www.wmsrdc.org/project/muskegon-river-habitat-restoration-at-veterans-memorial-park/)



Source: Provided by Mike Kline, Fluvial Matters

## Vermont

Recent research in Vermont highlights the potential value of flood reduction costs from floodplain restoration. Schiff et al. (2014) evaluated both the avoiding damages from flooding as well as the reduced flood insurance costs from floodplain restoration in Waterbury, Vermont. The proposed floodplain restoration in Waterbury decreases existing annual building damages from \$51,000 to \$41,000, a reduction of approximately 20 percent. This research also modeled avoided damages from Tropical Storm Irene and estimated \$2.6 million in damages due to proposed floodplain restoration. The researchers conclude that “the current and future cost of living in the floodplain is lowered with floodplain restoration” (p.4). The cost is clearly lower from both homeowners as well as the cities and towns that maintain infrastructure in the floodplain due to the reduced flooding risk. Reduced risk may also lead to increased property values or lower insurance premiums, although those benefits were not evaluated by the researchers specifically.

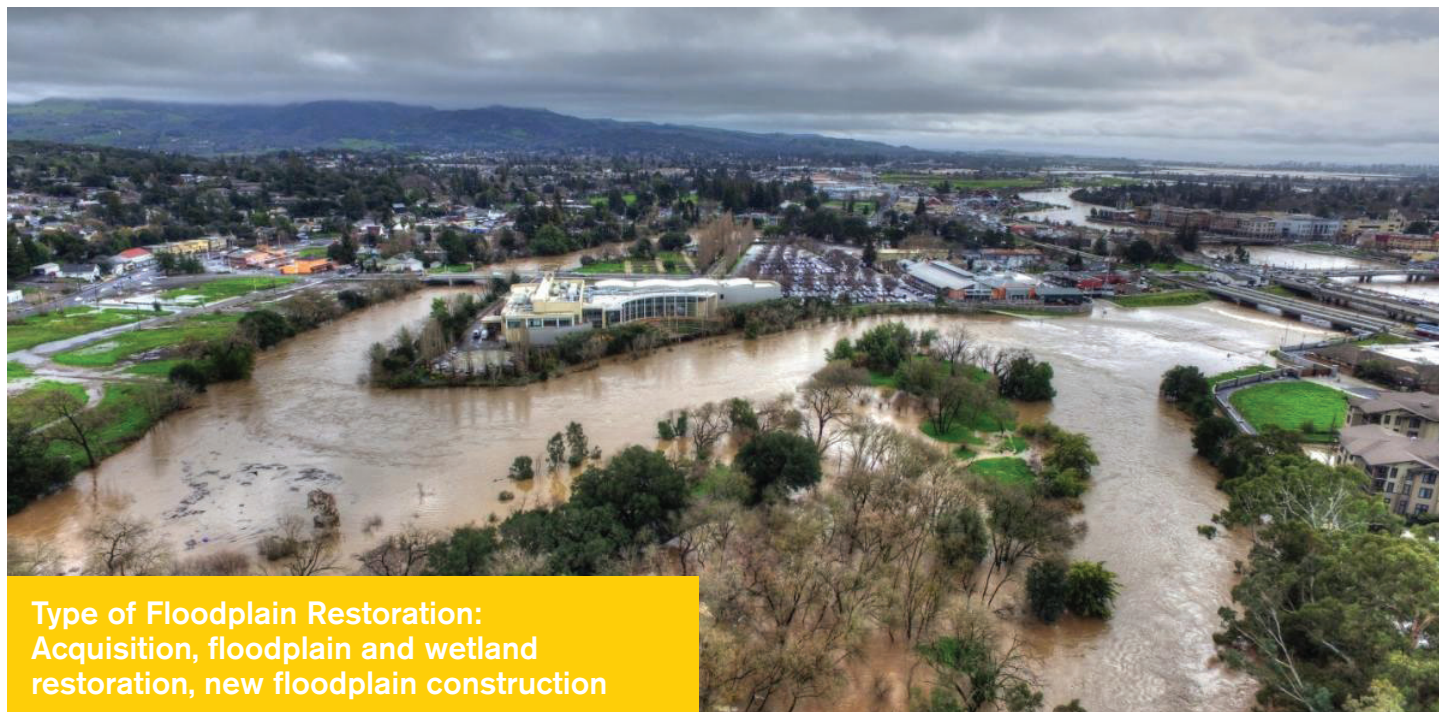
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“Even small floodplains can make a huge difference. Creating a functioning floodplain on a 5 acre parcel in Vermont is designed to drop inundation levels by 3 feet in an adjacent downtown area which would create millions of dollars in savings from avoided damages.” – Mike Kline, Former Vermont State River Program Manager, River Ecologist/Geomorphologist, Fluvial Matters

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Otter Creek flows through Middlebury, Vermont, a town of approximately 8,500. The average annual value of ecosystem services from Otter Creek range from \$126,000 to \$450,000 per year (Watson et al. 2016). The researchers also modelled potential cost savings of flood mitigation for an event like Tropical Storm Irene. In this modelling scenario, the existing wetlands in Otter Creek provide between \$627,000 and \$2 million in avoided damages. The researchers did not measure the impact to property values or lower flood insurance premiums resulting from the reduced flood damages, so it is unclear if those benefits resulted from the risk reduction.





Type of Floodplain Restoration:  
Acquisition, floodplain and wetland  
restoration, new floodplain construction

Source: California State Association of Counties. Retrieved from [www.counties.org/county-voice/napa-county-flood-control-2017](http://www.counties.org/county-voice/napa-county-flood-control-2017)

## Napa River, Napa, California

Napa County residents passed the Napa River Flood Protection Program (NRFPP) in 1998 with the goal of reducing flooding and reconnecting the Napa River to its historic floodplain. As of 2015, the NRFPP has restored over 1,000 acres of wetland and riparian habitats. The \$550 million in project funding also supported the new half-acre Veterans Memorial Park in downtown Napa, which is designed to flood when needed (Kershner & Gregg 2015). As a result of the NRFPP, 3,000 properties were protected from the 100-year flood event. Property damage from flooding in Napa County is now approximately \$25 million lower per year resulting in \$1 billion in flood damage savings over the life of the project.

Since 1999, approximately nine developments have been constructed outside of the 100-year floodplain in Napa that would have been at high risk of flooding without the NRFPP. New Downtown Riverfront Development and Design Guidelines ensured high-quality, river-oriented design and architectural components were incorporated in the new developments. The Riverfront now supports 30,000 square feet of Class A office space, 44,000 square feet of retail, and hotel structures that together support 1,248 permanent retail and administrative jobs (Kondolf et al. 2015). Based on the construction value of these projects, an estimated 1,373 temporary construction jobs were created because those developments could move forward (Kondolf et al. 2015). These job estimates do not

consider multiplier impacts or the economic contribution of spending on construction of floodplain restoration projects, so total jobs supported by this work are likely even higher. However, these job estimates do not consider if developments could have been located elsewhere and would have occurred regardless of the NRFPP.

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“When you buy a person out that is the best way to do flood mitigation because they never have the risk of flooding again.” – Dave Fowler, Certified Floodplain Manager, former Franklin, WI, Planning Commissioner and retired Senior Project Manager with the Milwaukee Metropolitan Sewerage District

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# Floodplain Restoration in Puget Sound

Puget Sound's lowland river valleys have commercial, residential, and industrial development valued at over \$18 billion (Floodplains by Design 2014). The region is interconnected with its floodplains, but historically has tried to steer floodplains away from development rather than allowing the natural merging of the two in urban areas. From the national literature review, there is abundant evidence that modern planning that integrates floodplain restoration efforts can maximize benefits from both natural and built environments.

This section presents the findings from the review of the literature on benefits of floodplains for Puget Sound and identifies key projects as success stories to emulate and expand upon. These projects and others uncovered in this work also represent potential case studies that could be evaluated in Phase 2 of this project.

## Findings for Puget Sound

The literature review on the community and fiscal benefits of urban floodplain restoration in Puget Sound yielded limited examples of property value, development, or tax revenue impacts from these projects. As evidenced by the national literature review, the lack of examples does not mean that these benefits do not exist, but rather that there have not been sufficient studies in the region to make a determination.

The literature review in this report is not the first effort to document the values of floodplain restoration. For Puget Sound Partnership, Northern Economics (2019) evaluated the benefits and costs of marine water quality improvements in Puget Sound. That research identified literature on the benefits to commercial fisheries, recreation, property owners, and non-use.

We begin this section with a discussion of projects that did not fit our search criteria, but nonetheless demonstrate the beneficial outcomes that are possible from urban floodplain restoration. We then discuss the examples from the regional case study and the relevant benefits that have been found.

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**"Getting these types of projects done at a larger scale will take more work with local leadership to educate them on the benefits, rather than simply telling them these projects are good." - Marc Daily, Executive Director, Thurston Regional Planning Council**

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**"Some people have become too hung up on quantifying ecosystem services benefits down to the penny. Of course, you can do that but you are assigning values that are subjective. How much is a fish worth? How much is a vista worth? People don't hold that same standard for road improvements or other projects in which we invest orders of magnitude more public funds." – David Lewis, Executive Director, Save The Bay**

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## Ecosystem Service Approaches

There is abundant literature on the value of ecosystem-service benefits, including reduced flood costs, in Puget Sound. Ecosystem service approaches to valuing floodplain restoration are notable, but not the purpose of this project.<sup>25</sup> The purpose of this project is to supplement the known benefits from ecosystem services with more specific community revenue implications for projects in urban areas. Of the projects in Puget Sound that have evaluated ecosystem service benefits, most of those have been in rural areas.

Earth Economics, an economic consulting firm based out of Tacoma, has a history of evaluating ecosystem benefits of floodplain and river restoration projects in Puget Sound and beyond. For example, it has recommended a holistic benefit-cost framework as part of the evaluation of a rural floodplain restoration site on the Skykomish River in Snohomish County (Earth Economics 2017).

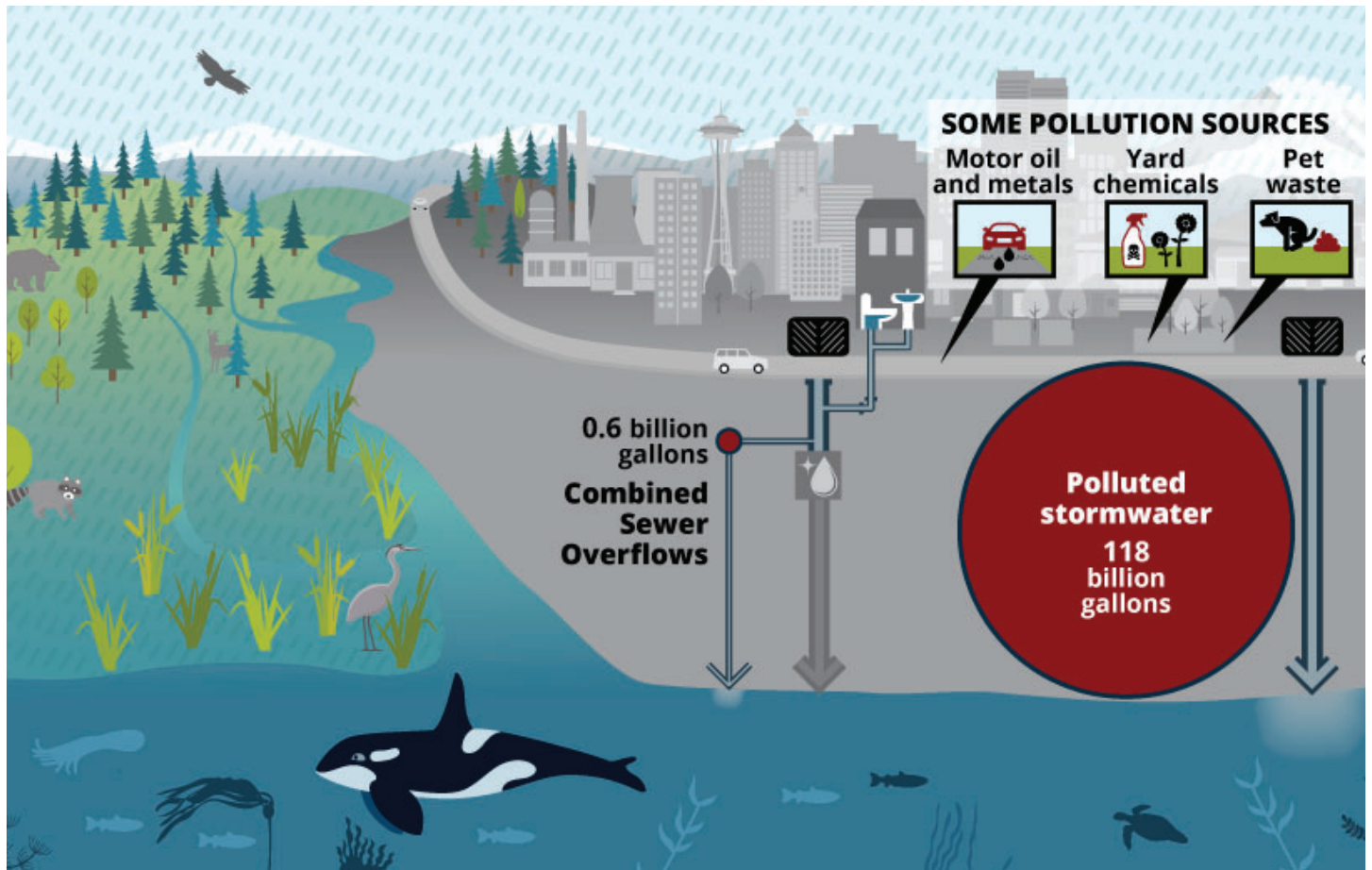
A large-scale rural floodplain restoration project is the Fisher Slough Tidal Marsh Restoration Project, completed in the fall of 2011 within the Skagit River delta in northwestern Washington. This project restored about 60 acres of tidal wetlands, expanded fish passage, and improved flood storage capacity. ECONorthwest (2012) evaluated the socioeconomic benefits of the \$7.7 million investment in the project. The socioeconomic benefits include avoided costs and increased benefits to farmers, but the evaluation does not perform a full accounting of ecosystem service benefits. The results of that evaluation suggest that \$9.1 million to \$20.6 million in benefits are expected from the project over the next 50 years, demonstrating a return on the investment even without a full consideration of ecosystem service benefits.

Projects that have National Environmental Policy Act (NEPA) or State Environmental Protection Act requirements can also provide benefits. Many of these projects are in rural areas and may involve only minimal

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<sup>25</sup> See Exhibit 3 of this report for an overview of ecosystem services.





Source: [www.kingcounty.gov/elected/executive/constantine/initiatives/clean-water-healthy-habitat/stormwater.aspx](http://www.kingcounty.gov/elected/executive/constantine/initiatives/clean-water-healthy-habitat/stormwater.aspx)

floodplain restoration. For example, the U.S. Army Corps of Engineers, through the NEPA Environmental Impact Statement process, evaluated the benefits and costs of levee setbacks along the Puyallup, White, and Carbon rivers (USACE 2016). The benefits considered include reduced flooding risks and associated reductions in damages, and reduced disruption of economic activity. The benefit-cost ratio for that project was estimated to be 2.4, meaning that every \$1 of costs yields approximately \$2.40 of benefits.

## Stormwater Efforts

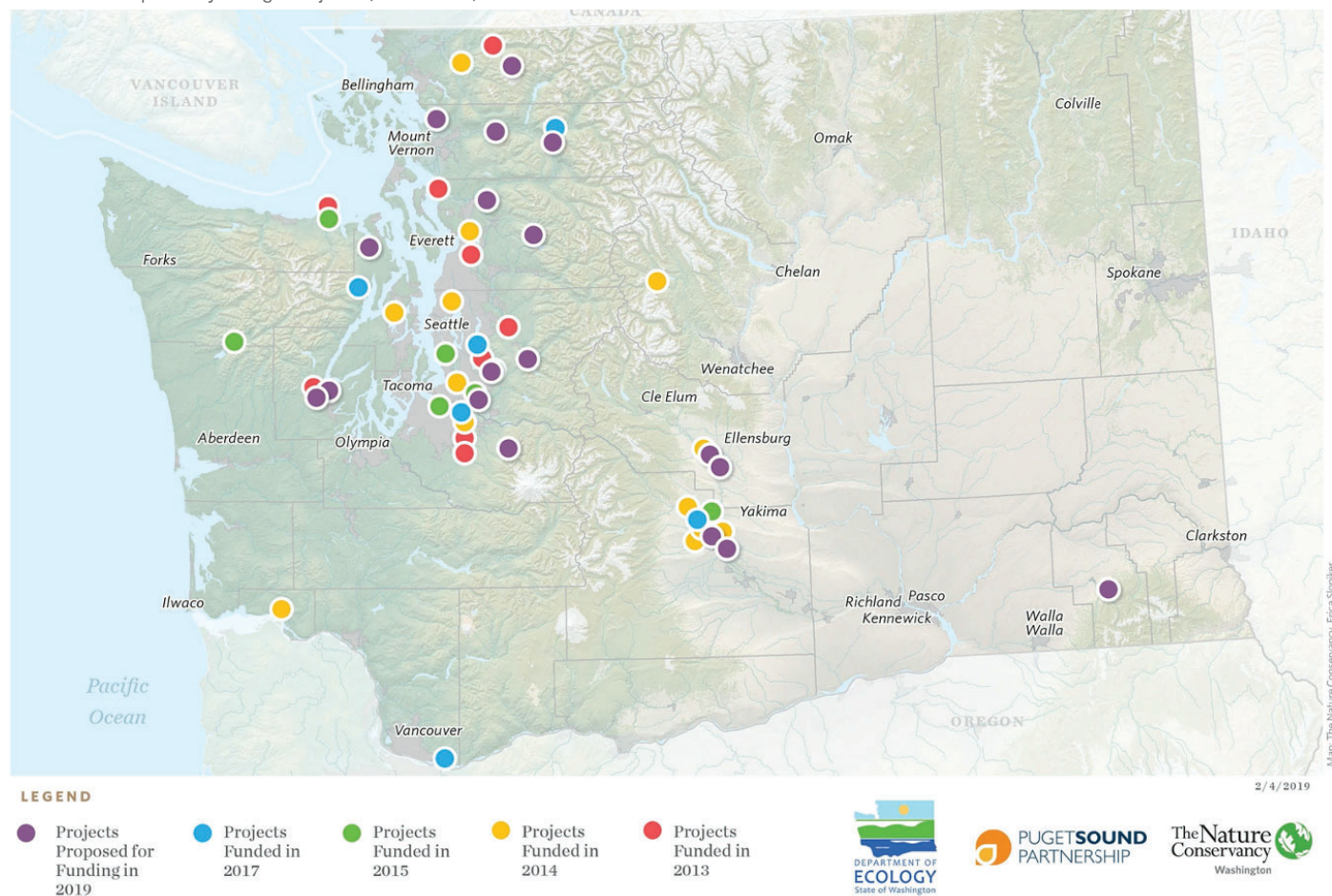
Pollution from stormwater runoff is a well-documented issue in Puget Sound (Exhibit 7). Impervious cover from development has resulted in increased stormwater runoff, contributing to increased urban flooding and poor water quality. Now, there are more than 357,000 acres of impervious cover, producing an average 370 billion gallons of stormwater runoff each year (Milesi 2015). With no riparian buffer to filter it, the majority of this stormwater washes directly into streams and rivers. In King County alone, 118 billion gallons flow untreated into natural waterways annually (Constantine, No Date). Over 500

streams, rivers, lakes and marine water bodies are now impaired, and untreated stormwater is the largest source of pollution in Puget Sound (Puget Sound Action Team 2005).

Governments throughout the region have been working for years to improve the approach to stormwater management. Although this problem might include floodplain restoration as one of the solutions, other smaller-scale solutions, like green stormwater infrastructure, are more commonly implemented. For example, Exhibit 7 displays an infographic created by King County created as part of their efforts to reduce stormwater pollution.

USEPA et al. (2017) evaluated the economic value of green stormwater infrastructure for Seattle Public Utilities. The benefits from bioretention facilities, which could be designed within a floodplain restoration project, include stormwater treatment, increased hydrological function, and resilience to climate change, as well as mental health benefits from exposure to green space for nearby residents.

Exhibit 8. Floodplains by Design Projects (2013-2019)



Source: Provided by Floodplains by Design

## Coastal and Marine Projects

Other literature that was not the focus of this study but is relevant for Puget Sound includes coastal and marine projects, rather than projects that affect urban inland rivers and streams. Because many of Puget Sound's largest urban areas are located on saltwater, there are examples of marine restoration projects in the region. Many, but not all, of the benefits from marine waterfronts could be extended to inland projects. For example, the 23-acre Edmonds Marsh wetland is maintained by the city of Edmonds on the waterfront and provides commercial as well as recreational opportunities that deliver community and economic value, including tax revenues, to the city. Using ecosystem service benefits, the value of the Edmonds Marsh is approximately \$2.7 million (Gamblewood et al. 2016).

The Port of Bellingham's Waterfront District and the Seattle Waterfront similarly show how marine waterfront revitalizations can stimulate development in previously degraded areas. Bellingham's waterfront is working on two

new recreation features, the Heritage Trail<sup>26</sup> and Waypoint Park<sup>27</sup> as part of redevelopment projects that include water restoration designs. For the Seattle Waterfront, research shows that even in heavily industrial areas there is opportunity for design that enhances habitat incorporated into development projects (Munsch et al. 2017).

## Floodplains by Design

Floodplains by Design was started in 2013 as a public-private partnership between The Nature Conservancy, Washington Department of Ecology, and Puget Sound Partnership. The goal of Floodplains by Design is "to improve the resiliency of floodplains for the protection of human communities and the health of the ecosystem, while supporting values important in the state such as agriculture, clean water, a vibrant economy and outdoor recreation." (Floodplains by Design 2018a, p.2).

Floodplains by Design implements a broad approach to river restoration that includes a collaborative planning

<sup>26</sup> More information about the Heritage trail can be found at: [www.portofbellinham.com/DocumentCenter/View/7683/Bellingham\\_Heritage-Trail-Concept-Plan\\_20180430](http://www.portofbellinham.com/DocumentCenter/View/7683/Bellingham_Heritage-Trail-Concept-Plan_20180430)

<sup>27</sup> More information about Waypoint Park can be found at: [www.cob.org/gov/projects/Completed/Public%20Works/Waypoint-Park.pdf](http://www.cob.org/gov/projects/Completed/Public%20Works/Waypoint-Park.pdf)



process at the watershed or reach scale. The initiative seeks to change the floodplain restoration paradigm by planning at a watershed or reach scale, rather than with piecemeal projects. Using this strategy, Floodplains by Design serves as a funder, convener, and organizer to improve long-range planning through a “collaborative model that maximizes benefits and reduces costs to people and nature” (Floodplains by Design 2018a, p.2).

As of 2018, Floodplains by Design's grant program has allocated \$115 million in support of large-scale, multi-benefit projects in Washington (Floodplains by Design 2018b). With those funds, over 2,500 acres of floodplain have been reconnected, and planning has identified a further 3,000 acres for future projects. Thirty-eight communities have experienced flood risk reduction because of Floodplain by Design projects, and 700 residences have been removed from high-risk floodplain areas. Floodplain by Design projects are located throughout the state, including in the Puget Sound region (Exhibit 8). The multi-benefit requirement of Floodplain by Design projects makes them candidates for potential case studies in Phase 2 of this project.

## Knickerbocker Floodplain Restoration, City of Shoreline

### Type of Floodplain Restoration: New floodplain construction, riparian restoration

The Thornton Creek Confluence and Knickerbocker restoration projects in North Seattle were implemented Seattle Public Utilities in 2014 to reduce flooding of both private and public resources. For Thornton Creek Confluence, periodic flooding affected nearby homes, Nathan Hale High School, the Meadowbrook Community Center, and occasionally closed 35th Avenue N.E. To increase the area available to floodwaters, Seattle Public Utilities added 2 acres of floodplain, installed a larger culvert, removed invasive plants, and planted riparian trees and shrubs.<sup>28</sup>

The Knickerbocker Floodplain Reconnection project was a result of the Thornton Creek Watershed Action Plan that the city of Shoreline developed in 2009. The project location is a suburban area in Shoreline, Washington, north of Seattle. Between 2001 and 2006, Seattle Parks and Seattle Public Utilities spent \$2.9 million to acquire six parcels of land.<sup>29</sup> The Knickerbocker Floodplain Reconnection project was completed in 2014 on this

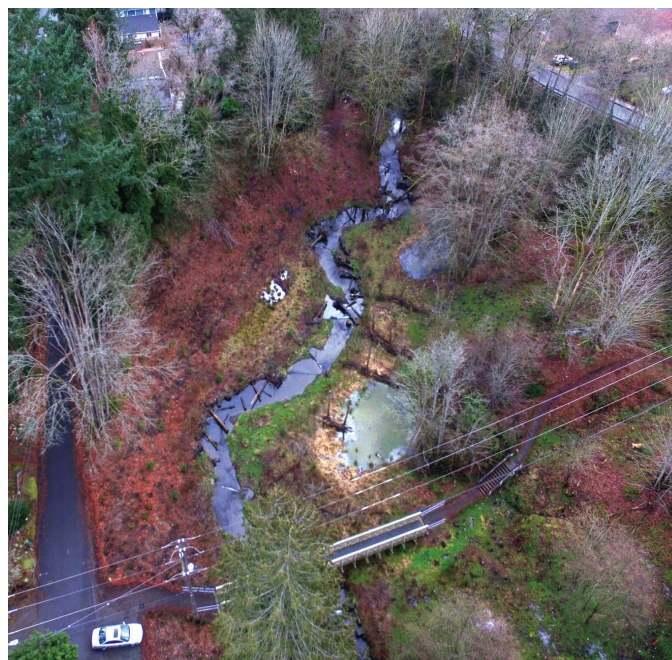
land. Elements of project design included increased flood storage by 1.5 acres, slowed stream velocities, improved riparian habitat, and improved water quality.<sup>30</sup>

The 2011 project plan submitted to Seattle Public Utilities for the Knickerbocker project estimated the project cost as \$1.25 million and included estimates of the ecosystem service benefits from the project (Seattle Public Utilities 2011). The quantified benefits of the project range from \$166,000 to \$1.46 million for ecosystem services and \$48,000 for flood reduction (present value over 100 years). In addition to reduction in the risk of flooding, the ecosystem service benefits considered include increased habitat, improved sediment storage and transport, and improved flow conditions. Other benefits not monetized in this project include:

- Benefits to adjacent properties from land acquisition and project implementation;
- Benefits specific to increased habitat for salmon;
- Benefits from outdoor classroom opportunities; and
- New recreation opportunities for local residents.

“Healthy rivers and floodplains are central to having a healthy environment as a whole – that’s central to economic prosperity and wellbeing.” – Dave Upthegrove, King County Council Member

Thornton Creek Restoration



Source: Natural Systems Design

<sup>28</sup> More information about the Thornton Creek Confluence Project is available at: [www.seattle.gov/util/cs/groups/public/@spu/@drainsew/documents/webcontent/01\\_029734.pdf](http://www.seattle.gov/util/cs/groups/public/@spu/@drainsew/documents/webcontent/01_029734.pdf)

<sup>29</sup> To date, no study has been conducted to estimate impacts to property values for adjacent properties for the Knickerbocker Floodplain Reconnection project.

<sup>30</sup> [www.parkways.seattle.gov/2014/11/24/knickerbocker-floodplain-restoration-project-complete/](http://www.parkways.seattle.gov/2014/11/24/knickerbocker-floodplain-restoration-project-complete/)

## North Wind Weir, South King County

### Type of Floodplain Restoration: Levee setback, riparian restoration

North Wind's Weir estuary habitat restoration project is located on the Duwamish River a few miles upstream of where it feeds into Elliott Bay. The intertidal habitat enhanced by this project provides a feeding area and transitional zone for juvenile salmon. King County purchased 2.5 acres of industrial land for the project in 2001. The restoration project, which was finalized in 2011, included a large-scale levee setback, removal of contaminated soil, excavation and grading, and planting of native upland and emergent vegetation. Approximately \$5.6 million was spent on the project, including property acquisition (Christin & Kline 2017). The acquisition investment was funded by Puget Sound Acquisition and Restoration Fund, the Elliott Bay/ Duwamish Restoration Program, the Aquatic Lands Enhancement Account, the city of Seattle, King County, and the city of Tukwila (Christin 2014).

Christin (2014) evaluated the ecosystem service benefits as well as the economic contributions of the North Wind Weir project. Exhibit 9 displays the results of their analysis. Using the industry-standard modelling software IMPLAN, the research found that the expenditures on the North

Wind Weir project generate approximately 24 full-time jobs and \$3.5 million in economic output (2013 dollars). Combining the suite of benefits considered, the study estimates that return on investment for the North Wind's Weir estuary habitat restoration will occur after 25 years.

## Thea Foss Waterway, Tacoma

### Type of Floodplain Restoration: Not applicable for this project (see note below)

The Thea Foss Waterway in Tacoma, an inlet of Commencement Bay, is a former Superfund site due to its history of receiving industrial waste, sewage, and runoff. This project does not fit all aspects of our literature review filter criteria because it is a marine project with limited habitat improvements, other than removing contaminated soil. However, it does represent a waterfront project in Puget Sound where a previously degraded water resource in a historically industrial area was transformed and embraced as a community asset after environmental conditions improved.

The Thea Foss Waterway site is a federally designated Renewal Community and is allocated \$12 million in annual tax deductions as a result. To solicit development, the city issues a 10-year property tax exemption for new residential construction on the 27-acre site. Redevelopment of the Thea Foss Waterway now includes hotels, retail space, public access, parks, and restaurants — none of which would have been possible without cleaning the site.

Prior to remediation of the Thea Foss Waterway, Washington's Department of Ecology (2010) Toxics Cleanup Program estimated that the net present value of the project over 20 years is over \$120 million. For the state, the return on investment for tax revenues is approximately 2 to 1. The state would receive \$67.3 million in tax revenues after investing roughly \$30.4 million. In addition, tax revenues for the city of Tacoma would be approximately \$27 million. Job impacts from remediation and construction were also estimated in this Department of Ecology report. The multiplier impacts from construction and operations range from 1.55 to 1.7, meaning that for every job created from spending, an additional 0.5 to 0.7 jobs are supported in the local economy.

Exhibit 9. Benefits from the North Wind's Weir Restoration Project

Table 9. Benefits from the NWW Restoration Project	
NWW Benefits	Value (\$2013)
Annual Benefits (\$/year)	
Air Purification	\$610.48
Soil Erosion Prevention	\$2,991.86
Salmon Habitat	\$136.04 to \$12,377.97
Stormwater and Flood Mitigation	\$9,544.71 to \$11,800.25
Aesthetic Information	\$2,502.39 to \$3,767.13
Recreation	\$190.99 to \$9,718.90
Water Filtration	\$655.47
Carbon Sequestration	\$216.93 to \$530.07
<b>Total Annual Value</b>	<b>\$21,971 to \$41,983</b>
One-Time Benefits (\$)	
Volunteer Donation	\$98,890.72
Economic Impact	\$3,541,198
<b>Total One-Time Value</b>	<b>\$3,640,086</b>

Source: Christin (2014), p. 20





## Key Findings and Lessons Learned

There is a reason urban river and floodplain restoration projects are occurring throughout the United States and elsewhere. As evidenced by the literature and case studies highlighted in this research, such restoration projects can yield benefits and revenue to local communities that justify the investment. This literature review conducted in Phase 1 of this project demonstrates that **the benefits from urban floodplain restoration projects can be quite large, even if only some benefits are quantified.**

From decades of river restoration projects, we know the costs of polluted and degraded habitats—now we also know how to design projects to yield the highest value for local communities. A common theme from the literature review is that **as the rivers are cleaned, people want to use them to live, work, and play.** Public amenities are the clearest way to yield co-benefits from floodplain restoration projects. Projects that decrease flood risk while improving investments in water quality, habitat, open space, and recreation can increase development and adjacent property values, as well as tax revenues.

Despite the extensive development that has occurred in urban floodplain areas, there are many types of opportunities available to increase ecological functions while providing benefits to the community. Much of the Puget Sound region is facing land-use decisions that positions development and community revenue against ecological restoration. However, these two goals are not mutually exclusive. Planning that integrates ecological

restoration with new development has proven successful at stimulating economic growth in locations throughout the county. With this perspective, **floodplain restoration can be another tool for city planners and developers as they make land-use decisions.**

The types of multi-benefit projects that yield the highest community value also benefit from being able to leverage multiple funding sources – including funds from flood control districts, Washington's Recreation and Conservation Office, stormwater grants, national estuary program money from EPA, and others. There would also be opportunities for public-private partnership funding sources. **With a multi-faceted approach, urban floodplain restoration projects can be part of a larger community vision that meets multiple community objectives,** including salmon recovery and habitat benefits.

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**“We need to view projects holistically. For example, a multi-benefit significant setback program – can you partner with other governments and pull in the housing authority? We need to look for opportunities to take a floodplain project and fold it into a larger vision.”**  
– Dave Upthegrove, King County Council Member

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## Implications for Phases 2 and 3

Phases 2 and 3 of this project will expand upon the findings from Phase 1. In Phase 2, we will evaluate regional case studies to effectively quantify and communicate local floodplain benefits in terms that are compelling to local government and business leaders. The case studies will further contribute to development of a benefit calculator tool that can be applied to existing and proposed floodplain projects calibrated to local conditions for waterways in the Puget Sound basin. The specific sites for case studies are still under review and will be selected with approval by the project steering committee. The objective is to utilize representative cases that are relevant throughout the region, particularly in urban and mixed-use contexts.

The tool that will be developed in Phase 3 will give local communities a resource to better understand the specific fiscal and market impacts of floodplain restoration and conservation they do or could enjoy. The structure and format of this tool will be developed with the input of the steering committee and local government officials to determine the most helpful type of tool.

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**“Touting the benefits of salmon recovery and ecosystem services is necessary, but not always sufficient. You need to translate these discussions to a more traditional bottom line dollars and cents.”- Marc Daily, Executive Director, Thurston Regional Planning Council**

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Phase 3 will also include recommendations on funding mechanisms to support more widespread implementation of floodplain restoration across Puget Sound. From the informational interviews, we understand that the primary barriers to floodplain restoration in Puget Sound are a lack of funding and available land. Funding mechanisms have been successfully implemented elsewhere, such as Ballot Measure 2A in Denver, Colorado, Measure AA in the San Francisco Bay, and numerous flood-control district levies. Work on funding tools has been ongoing, led in part by Water Resource Inventory Area (WRIA) 9, which envisions a watershed investment district funding mechanism for restoration projects at a watershed scale (Earth Economics 2010) and Puget Sound Partnership, which has developed a comprehensive list of innovative financing tools to aid salmon recovery (Doherty and O’Neil 2019).

From Phase 1, we know that restoration of urban waterways can produce a substantial return on investment, increasing the value of adjacent property, enhanced investment in adjacent development, improved quality of life, and a variety of other social and environmental benefits. These benefits can also lead to increased economic activity and associated sales and property tax revenues. Phases 2 and 3 will allow for original research on the magnitude and types of benefits possible in Puget Sound.



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# Appendices

**Appendix A. Methodology**

**Appendix B. Literature Review**

**Appendix C. Interviewee List**

**Appendix D. History of Floodplain Restoration in the Puget Sound (American Rivers)**



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