Community Values and Restoration on the Lower Duwamish River

University of Washington
School of Marine and Environmental Affairs
submitted in partial fulfillment of the
requirements for the degree of
Master of Marine Affairs

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Acknowledgements

The focus of this project is the Duwamish River. This river and the surrounding land was taken from the Coast Salish people and has been altered over centuries of colonization such that traditional practices are difficult or impossible for tribes to engage in. We acknowledge this history of violence that is an inextricable part of the story about this river, as well as the vital ongoing tribal commitments to clean and steward the lands and waters that are their home.

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Positionality Statement

The three authors of this report are graduate students in the School of Marine and Environmental Affairs at the University of Washington. Kat Husiak, Caitie Sheban, and Hannah Tennent's undergraduate degrees are from Eckerd College, Ohio State University, and Bowdoin College respectively. We each have

different identities and personal histories but a privilege we share is the experience of receiving the benefits of higher education and access to its resources. Additionally, while we are all Seattle residents, none of us live in the Duwamish Valley and do not bring that lived experience to this research project. One of our main goals was to approach our work with humility and respect for those who work, play, and live on the Duwamish River and to be aware of both the historical and present systematic injustices some Duwamish Valley residents navigate daily.

Introduction

Habitat restoration specialists and environmental economists from the National Oceanic and Atmospheric Administration's (NOAA) Northwest Fisheries Science Center approached the School for Marine and Environmental Affairs (SMEA) to propose a capstone project to learn about community preferences on the Lower Duwamish River (LDR) in Seattle, Washington. This project summarizes select literature over the span of multiple decades that contain community concerns, preferences and hopes about the LDR and seeks to contextualize the social realities that affect restoration application and success. We believe it is important to understand resource inequities and impacts of government actions that most directly affect minority and low-income communities. We assert that restoration decisions can address social and ecological needs simultaneously to achieve fundamental goals.

Ecological Restoration and Environmental Justice

Ecological restoration is the practice of restoring degraded ecosystems, guided by scientific processes, predictive models and theory (Palmer, 2006). Thus restoration requires a combination of science, human judgements, social actions and physical changes. There are longstanding debates over definitions of nature, wilderness, and the ethics of restoration, but the scope, goals, timeline, historical reference points and constraints are critical to define for a shared understanding of what a project is and aims to do.

Conceptual debates about what restoration is and what it should do are not inconsequential. Urban environments are especially challenging places for ecological restoration in part because the dominant ecological science approaches treat restoration primarily as a practical and scientific problem, not a social one (Eden and Tunstall, 2006). There can be disconnects between the expectations of scientists, policy makers and the public that breed poor communication and distrust.

Due to a growing public awareness of climate change and extreme natural events, public participation in environmental decision making, particularly related to restoration, has also increased. Conflicts arise when the social implications of restoration projects are not addressed. Questions about which stakeholders should be involved in decision-making and appropriate public engagement strategies are common (Junker, 2007).

A nationwide social movement for Environmental Justice (EJ) has raised awareness about the disproportionate burdens of environmental hazard to marginalized groups. Legacies of systemic racism and political redlining have resulted in minority groups living in places with higher exposures to toxins, poor air quality, and a lack of access to economic and recreational opportunities.

President Clinton signed Executive Order 12898 in 1994 to direct federal agencies to identify and address the disproportionately high adverse human health and environmental effects on minority and low-income populations (EPA, 2022). Recognition of EJ issues has become central to government policy at all levels, but there are challenges to create accountability measures and implementation standards when intervening with marginalized communities.

Social science can play an important role in describing public realities to inform policy changes. There is no one size fits all rule for dealing with place-based issues, but addressing environmental justice concerns is an entry point to address broader concerns about access to social and economic opportunities (Pastor, 2007).

The Duwamish River

The Green-Duwamish River flows out of the Cascade Mountains just north of Mount Rainier through the cities of Auburn, Kent and Tukwila. The Green River turns into the Duwamish at Tukwila, where the Cedar and Black rivers once joined. Historically, the White, Green, Black and Cedar Rivers, Lakes Washington and Samammish all drained through the Duwamish River, through the mudflats of Elliot Bay and into Puget Sound. The final 11 mile stretch of the Duwamish River drains into Puget Sound and is influenced by ocean tides (King County, 2023).

Since colonial settlement in the 1850s, this watershed has been diverted and channelized, replacing the Dkhw'Duw'Absh peoples with colonial development. The Treaty of Point Elliott in 1855 outlined government to government relationships between the US and Indigenous nations of the Duwamish reserving hunting and fishing rights in exchange for thousands of acres of their homelands, though many promises to tribes have never been upheld (Duwamish Tribal Services, 2018). Local and global industries that make up what is now the City of Seattle prospered from transforming the flow and economy of the river (Wilma, 2001). This industrial growth and the resulting pollution has been in conflict with Indigenous peoples, immigrant residents and salmon runs who primarily bear the costs of the transformed landscape (Cummings, 2020).

In the early 1900s, industries responding to demands of World War I included shipyards, airplane manufacturing, cement manufacturing, food processing, cold storage, lumber milling, metal fabrication, and equipment assembly. At the mouth of the river, Harbor Island, one of the world's largest artificial islands, was built on top of what used to be almost 1,500 acres of unvegetated intertidal estuary mudflats. Residential areas of Georgetown and South Park (established in 1851 and 1902, respectively) grew to house workers and Seattle's growing population. Continuing through the 20th century and during World War II, additional industries such as lead smelters, slaughterhouses, canneries and construction companies thrived up and down the riverbanks (Elliot Bay Trustees, 2019).

Originally, the Black, Cedar, White and Green Rivers as well as waters from Lakes Washington and Sammamish all drained into Puget Sound through the Duwamish River. Due to major modifications in the watershed, the White River was diverted, the Green and Black Rivers have dried up, and Lake Washington has dropped nine feet. The lower nine miles of the river is tidally influenced and what used to be grassy islands and eelgrass beds were home to oysters, clams, shorebirds, salmon and herring (WA

DOE, 2022). Ultimately, 97% of the original habitat of the LDR was destroyed by industrial transformations (NOAA, 2023), but 53 species of fish, 87 species of birds and six species of mammals have been recorded in the LDR between 2004-2007, including nine salmonid species (Windward Environmental LLC, 2010).

Superfund Sites and the NRDA Process

After 150 years of colonial exploitation and multiple species on the brink of extinction, the federal government finally designated the river one of the most toxic hazardous waste sites in the country on the National Priority List in 2001 and 2007 (EPA, 2023). In 2020, the number of active sites on the national list reached 1,335, and 424 have been completed and delisted (DEOHS, 2023). There are three Superfund sites within the lower five miles of the Duwamish River: The Lower Duwamish Waterway Site designated in 2001, the Harbor Island Site and Lockheed West Superfund Site both designated in 2007 (Elliot Bay Trustees, 2019). Figure 1 shows the adjacent site locations and proximity to downtown Seattle, Lake Washington and Puget Sound.

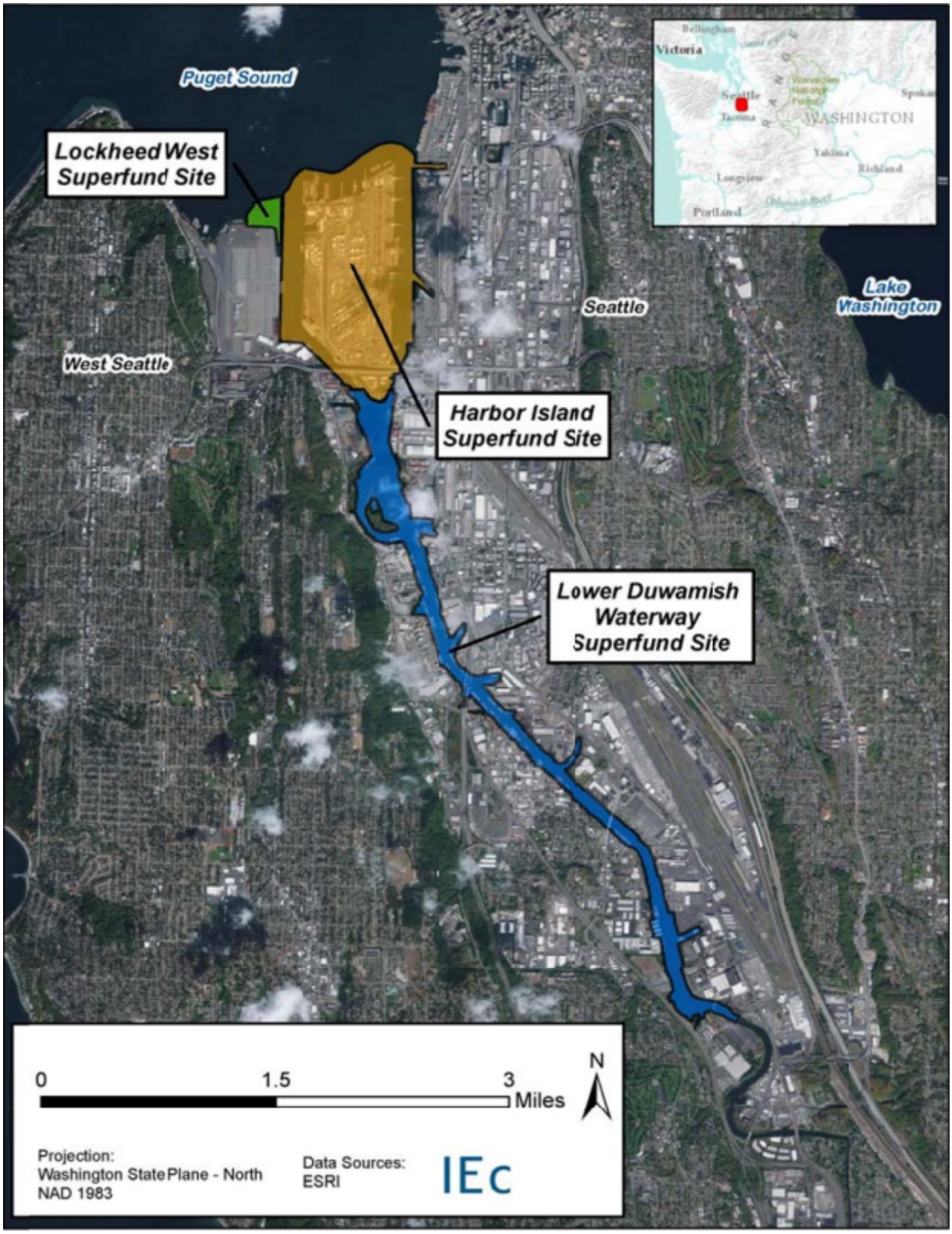

Figure 1: Superfund boundaries of the Lockheed West, Harbor Island and Lower Duwamish Waterway Sites (Industrial Economics Inc., pg. 5, 2019).

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the Superfund Law, was enacted by Congress in 1980. Under CERCLA, the Environmental Protection Agency (EPA) leads the federal cleanup of contamination. The lead agency for restoration can be variable under CERCLA, but NOAA holds this role for all three LDR sites. Additionally, the Washington Department of Ecology (Ecology), controls additional point and nonpoint pollution from entering the river, and the City of Seattle and King County Public Health Departments lead the *Fun to Catch, Toxic to Eat* program that promotes safe fish consumption.

The Superfund Law designates the U.S. Department of the Interior, WA State, U.S. Department of Commerce, NOAA, the Suquamish Tribe, and the Muckleshoot Indian Tribe to act unanimously as the Elliot Bay Trustee Council to 1) assess injuries to natural resources, 2) plan, design, implement, maintain and monitor actions to restore, replace or acquire the equivalent of those resources, and 3) coordinate any prosecution or settlements associated with the area on behalf of the American public using a Natural Resource Damage Assessment process (NRDA) (MOA for Elliot Bay, 2005).

The NRDA process defines an injury as “a measurable adverse change, either long- or short-term, in the chemical or physical quality or the viability of a natural resource resulting in either directly or indirectly from exposure to a discharge of oil or release of a hazardous substance (CERCLA Title 43 CFR §11.14(v)), and damages refer to the amount of money sought by the trustees as compensation for injury, destruction, or loss of natural resources (43 CFR §11.14(l)).There are a number of damages that are excluded under CERCLA (43 CFR Part 11.24(b)) including damages that occurred before the enactment of the law on December 11, 1980.

The Final Injury Assessment Plan was released by the Trustees in 2019, which summarized their understanding of the river resources and the nature of contamination on natural resources (Industrial Economics Inc., 2019). As part of the NRDA process, the Trustees prioritize restoration areas, design restoration plans, and either make agreements with or litigate responsible parties to pay for the projects (DOI, 2012).

Some restoration projects were constructed before the NRDA settlement was complete such as the $360,000 Boeing Company restoration project in 2014 that restored almost five acres of marshland and riparian vegetation. In 2021, a settlement with the City of Seattle for $3.9 million was completed, as well as a $48.8 million settlement with Vigor Industrial, LLC and Exxon Mobil Corp. In January 2023, a $550,000 settlement with Lynden will pay for restoration plans that the Trustees designed in 2013 (DARRP, 2023).

Public Participation

The standards, settlement tools, and cleanup technologies defined under CERCLA have changed since 1980 to increase state and local involvement, and increase public participation in deciding how Superfund sites should be cleaned up (EPA, 2023).

The EPA is the lead agency providing opportunities for public input such as providing technical assistance and establishing a library of information (EPA, 2023). In regards to the LDR, the Duwamish River Community Coalition (DRCC) is a technical advisory group (TAG) that was established in direct response to the Superfund destination in 2001 and is involved in all aspects of the cleanup process as a

liaison for community communication. The DRCC hosts community events and meetings, produces multilingual factsheets and river tours, submits comments during public comment periods, and advocates for high cleanup standards (DRCC, 2023).

The DRCC is the primary organization involved in public communication with the government, but there are also many other organizations working to clean and restore habitat and public access to the river, such as Dirt Corps, the Environmental Coalition of South Seattle (ECOSS), the Duwamish Alive Coalition and Puget Sound Partnership.

The EPA released a Final Cleanup Plan also known as the Record of Decision in 2014, which is a document for the public outlining the design and construction phase of cleanup including a responsiveness summary showing how public comments were incorporated. Using formal and informal interviews, drop-in informational sessions and online surveys, the EPA established a Community Involvement Plan in 2016 that outlines the EPA's commitment to EJ and gives an overview of the outreach tools they plan to use to communicate with communities throughout the multi-decade cleanup process (EPA, 2016).

In February of 2021, the EPA proposed a revision of this Record of Decision, citing updated health risk information that would lessen the amount of contaminant removal needed by seven times, arguing this change could also save $1 million in cleanup costs (EPA, 2021). As with any federal decision proposing an Explanation of Significant Differences (ESD), a public comment period was opened, and due to DRCC requests, the EPA presented information and answered questions in a community meeting in English, Spanish, Vietnamese and Khmer and extended the public comment period.

Due to public feedback, the EPA reversed this proposal of lowering cleanup standards reflected in the April 2023 Harbor Island Superfund Site Proposed Plan (EPA, 2023). Public news coverage cited this change as a huge success for the DRCC and EJ advocates, though calls for increased trust building and effective communication are still strong (Pailthorp, 2023).

Communities of the LDR

The LDR is dominated by industrial zoning around the two residential neighborhoods of South Park and Georgetown. Roughly 53,000 people live in the two neighborhoods combined, and is home to some of the lowest income and most ethnically diverse communities in Seattle. South Park is almost 40% Latino, 14% Asian, 8% African American and 34% identify as "non-white" or multiracial. Residents who identify as "white" comprise 44% of South Park, compared to the 70% Seattle average (DRCC, 2009). Residents also have a lifespan 13 years shorter compared to the Seattle average (Gould & Cummings, 2013). Both South Park and Georgetown have been labeled as "environmental justice communities" by local governments due to the legacies of concentrated environmental degradation, which most directly affects Tribes, subsistence fishers, and low-income people of color (EPA Community Involvement Plan, 2016).

The federally recognized Muckleshoot and Suquamish Tribes and non-federally recognized Duwamish Tribe maintain and use reserved fishing rights along the Duwamish River. The lower section of the LDR is primarily fished by Muckleshoot commercial operations, and the Suquamish Tribe manages a fish hatchery just north of the LDR boundaries. Tribal seafood consumption surveys of the Tulalip and

Suquamish Tribes found rates much higher than the EPA's recommended amount (EPA EJ Analysis, 2013).

Both South Park and Georgetown used to be located right on the river's original meanders, but now have limited access due to privatized industrial properties built up when the river was straightened (Seattle Parks Foundation, 2017). People continue to fish and recreate on the river despite the lack of public access and known health concerns. The communities along the LDR have voiced their concerns and visions for improvements along the river which have been recorded in numerous reports, websites and news articles, but continue to struggle with burnout from lack of tangible improvements as a result of their efforts.

Community organizations play an important role in mediating highly technical legal processes that are repeated at each level of government, but generally speaking, people living on and around the LDR feel disenfranchised and believe the government and industries should be held accountable for the injustices on the river. Even though many efforts are working toward similar goals, calls for better government coordination highlight the diffused sense of responsibility and efficacy.

Project Purpose and Research Contribution

This project aims to synthesize existing documentation of community preferences and values about the LDR so that future restoration efforts can be better informed about the desires of the public. The original capstone project proposal stated that "(a) number of underserved populations (e.g. immigrants, non-English speakers, tribes, or economically disadvantaged) live along the lower Duwamish River in Seattle and their use of the river is not well understood….Without this understanding, decisions about how public access is managed as well as decisions guiding restoration of the river by agencies such as NOAA may not fully reflect community interests".

There are numerous individuals and organizations conducting outreach on the LDR, and while many reports reference each other, we did not find any that summarize findings holistically. The decision to synthesize existing documentation of community preferences was based on a previous finding that communities who live along the river suffer from research fatigue (Windward Environmental LLC, 2016). Research fatigue is described as burnout, refusal to participate, potential misleading results and a deterioration of relationships between communities and the institutions of power employing the research (Clark, 2008). Additionally, there have been no published efforts to synthesize the myriad of individual reports that exist about the LDR. Finally, engaging in extensive outreach can also harm researchers' and practitioners' goals. Gregory (2017) identifies a list of problems with the extensive 'inclusive approach' including, "long lists of undifferentiated concerns, facts tainted by stakeholders' perspectives and worldviews, little access to clarifying dialogue or tests of expertise, few opportunities to scrutinize knowledge quality, avoidance of controversial issues, and an overwhelming abundance of information".

Sample Design

To identify existing community preferences we compiled 32 relevant documents and two relevant videos (collectively referred to as the subsample) and analyzed the text of the subsample using qualitative methods including content and thematic analyses. The subsample we identified were the result of a literature search focused on publicly available content containing value statements from community members about the Duwamish River. From this broader search, which revealed 600 results, we narrowed down a subsample of documents published both by government agencies and community organizations using three inclusion/exclusion criteria. The first criterion was that the document had to contain primary data. Community preferences could either be directly quoted or summarized by researchers but could not come from another study, book, etc. The second criterion was that the research questions or the purpose behind each document had to be about preferences or values on the LDR or in the Duwamish Valley. Finally, the document could not be a book. There were six relevant books found in the literature search but the length and depth of information found in books made them unrealistic to include in this study. Qualitative coding is a time-intensive process.

Our analysis was driven by the following research questions:

1. What has been documented about community preferences and values in regards to the LDR?
2. What has been documented about who uses the LDR, how they use the river, and where?

Report Structure

The remainder of this report will outline our methodological choices including a description of our document subsample, an overview of our content analysis process, and example codes we applied across documents. The results and discussion section describes a list of values coded in our data, seven themes that we identified in the analysis, specific activities people are recorded as engaging in, and locations where activities take place.

Methods

Content and Thematic Analysis Overview

Qualitative content analysis is a method for analyzing written materials and interpreting the data within them to find themes, patterns, and meanings. To perform a content analysis on the subsample, words, sentences, and paragraphs in the documents were assigned codes in a systematic protocol for each document. The project team met regularly to corroborate code definitions and standardize the process. Codes can be created in a bottom-up fashion from the data itself, known as inductive codes, or created ahead of time and assigned to the data where appropriate, called deductive codes. Our analysis included both inductive and deductive codes, the definitions of which were shared through the use of a codebook (see Appendix B). The coded chunks of text (referred to in this report as coded statements) served as our dataset. We coded a total of 8264 subcodes to 1753 statements from the 34 documents.. To surface themes, subsets of the data were categorized and analyzed for patterns and connections between concepts.

Literature Search and Sampling Design

Our literature search took place between 10/8/22 - 11/16/22 and consisted of three combinations of search words: “Duwamish and interview”, “Duwamish and community”, and “Duwamish and vision” in three search engines: Google Scholar, the UW library catalog, and Newsbank, a database of media articles. Our methods included looking through the first 200 search results by reading the title and abstract to determine if the document was potentially relevant. Relevant documents were defined as containing primary data (direct comments or summaries of direct comments) about how people use the Duwamish river or what values community members have about it. Out of the 600 search results, this method resulted in 44 relevant documents.

Additional documents we were aware of prior to the literature review were added to our document pool due to their high relevancy. These documents didn’t surface in library catalog searches; they seemed to be available only through previous Google searches or knowing that certain government sites host catalogs of their work. This purposive sampling allowed us to include six data rich documents (Bernard et al., 2017; Palinkas et al.2015), described in Table 1.

Finally, we used a backward snowballing method, which involved looking at each citation in our sample to determine if they could be relevant (Ong et al., 2020), which surfaced another 14 relevant documents, resulting in a sample of 64 documents.

Source	**Method**
• Lower Duwamish Waterway Fishers Study Data Report Final by the Lower Duwamish Working Group	Mentioned by NOAA clients in early project meetings.
• A River for All website (http://www.riverforall.org/)	Shared with us by UW librarian Maureen Nolan during literature search.
• Part 3 Responsiveness Survey • Lower Duwamish Waterway Superfund Site Community Involvement Plan • Re: Comments on ESD for Lower Duwamish Waterway Superfund Site • Explanation of significant differences by the EPA	Found on EPA website that hosts publicly available documents and data about the Lower Duwamish Waterway Superfund Sites: https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.docdata&id=1002020

Table 1. A summary of sources included in literature search through purposive sampling design.

Out of the 64 documents found in the literature search, we chose a subsample of 34 using an intensity sampling method which includes “...selecting studies that are excellent or rich examples of the phenomenon of interest, but not highly unusual cases” (Patton, 2002). Specifically, we created the following three criteria required for inclusion:

1. The document must contain primary data. This could be either quotes from interviewees or community statements about values that were subsequently summarized by researchers and/or document authors but it had to be information collected by the document authors. It could not be

secondary data nor could it be general value statements from an organization that didn't clearly come from community members.

2. The research question that inspired the document must be about preferences or values on the Duwamish River or in the Duwamish Valley community.

3. The document must not be a book. While our search of the literature revealed 6 relevant books, we determined books to be outside of the scope of the analysis.

Of this high intensity subsample, there are 17 documents that were published by local and federal government agencies; many of these were plans. There were 13 by non-profits and 4 that we designated as "other" (UW theses, a compilation of interviews from UW, and a newspaper article). This process is summarized in Figure 2 below. The two videos included in the subsample were translated where necessary using YouTube's closed caption translation services and then transcripted for coding. A full list of documents in our subsample can be found in Appendix A.

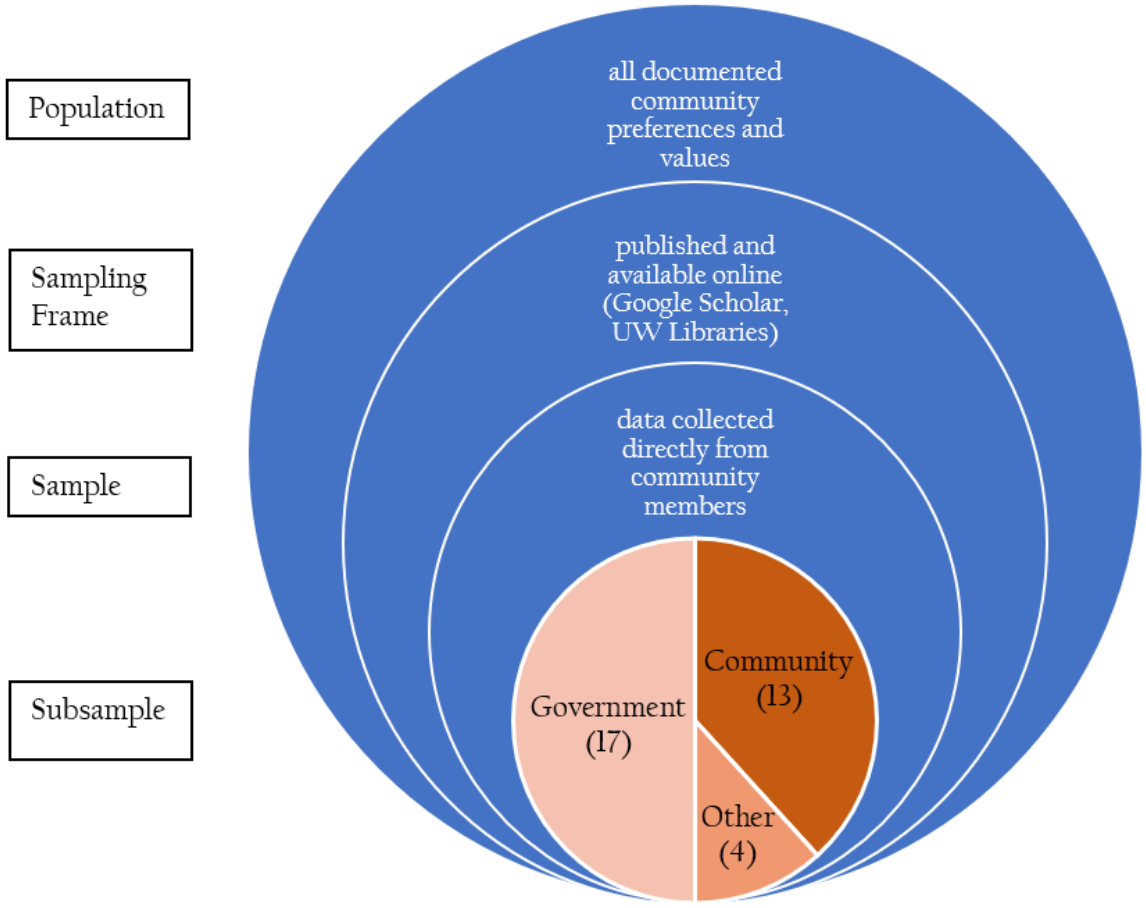

Figure 2. Sampling strategy from population of documented community preferences and values to a subsample for content analysis.

Coding and Content Analysis

Using both inductive and deductive processes (Schreier, 2012; Bernard et al. 2017) implemented in the ATLAS.ti 22 software, we identified 9 parent categories of code to address research questions. Deductive and inductive codes are detailed in Table 2. The full codebook is available in Appendix B.

	Parent Category	Definition of parent code	Example subcodes within the parent category	Total number of subcodes
Deductive	Activity	An activity people are currently engaged in on the river	● boating ● exercise ● playing	20, used 397 unique times
	Demographic	Any identity information (racial, age, employment type, nationality) provided by a community member quoted in a document	● Cambodian ● Demo: DRCC volunteer ● Demo: Georgetown resident ● Demo: Mienh ● Demo: not stated	42, used 1,387 unique times
	Location	Used to record any statement from people about places they like to recreate, places they avoid, and places where they desire improvements.	● Location: place people go ● Location: place people avoid	2, used 76 unique times
	Quotation	Used to mark any quote that was a direct statement from a participant, as opposed to a statement summarized by researchers.	● N/A	Used 555 unique times
Inductive	Accomplishment	Something that the community highlights as a success	● A: Community education ● A: Gov't/community collaboration ● A: Language accessibility	5, used 16 unique times
	Concern	Issues or problems that people state, related to the river	● Concern: Access	20, used 437 unique times

			• Concern: Clean up • Concern: Impact to industry • Concern: Uncertainty	
	Desire	Things people like that already exist on the river and/or something they want related to the river that doesn't currently exist	• Desire: Appropriate language materials • Desire: Boat launches • Desire: Community involvement • Desire: Safety	40, used 1114 unique times
	Solution	Actions that the community views as active or potential solutions	• Solution: Good communication • Solution: Minimize impacts • Solution: Support DRCC	20, used 193 unique times
	Value	Values are the reasons why someone might have the concerns or desires they do. It's a broader statement.	• Value: Community health • Value: Equity • Value: Pride	13, used 251 unique times

Table 2. Deductive and inductive parent code

Note on Demographics

Because the client was particularly interested in who is being heard from in previous outreach and who hasn't been listened to, identifying as many demographics as possible was an initial goal. As shown in Table 2, this included racial demographics, residential information, and employment status, among others. As the content analysis continued it became clear that, in many cases, authors did not ask and/or identify participant identities. This is demonstrated by the fact that the "Demographic: Not stated" code was used 556 times, while the next most common demographic code was "Georgetown Community Member" used 149 times. The most frequent racial demographic code was "Vietnamese", used only a total 66 times. While the number of times a code was used does not represent the number of people, comments or strength behind the code (i.e. an interview, focus group or report summary would all be coded the same way), we can interpret that specific demographic identifiers are not often published in reports. Many of the outreach methods outlined for each report were sensitive to protect the privacy of community members in this way.

Thematic Analysis

In qualitative methods, themes are referred to by many names (categories, motifs, concepts), but generally are defined by patterns in behaviors, activities or prohibition of activities (Opler, 1945). We synthesized our data and grouped codes to describe major conceptual themes.

The importance of a theme is related to how often it appears, how pervasive it is across differing cultural ideas and practices, how people react when a theme is violated, and the degree that a theme's expression is controlled by specific contexts (Bernard et al., 2017). We created our themes based on both the quality and quantity of the codes; themes were created from codes that showed up frequently across multiple documents and the strength of the sentiments within the coded statements.

Identifying themes took place over the entire coding process from first glance at the title, to multiple rounds of reading through and coding pieces of text. Repetitions of words, ideas, metaphors, activities, and certain linguistic connectors that help explain motivations were marked in the initial coding process and themes that emerged later in the process were then coded for again in subsequent readings. Themes were created by the entire project team, comparing what issues came up frequently in the text, how people discussed them, and how the topics were connected.

Locations

A data set of locations and activities was created from the location code. Locations of where people access or use the river were often described in the text and the coordinates were found via Google maps. If a location could not be identified, it was not used. Using this data set, the maps were created using ArcGIS software.

Limitations

We do not claim that this is an exhaustive list of activities that occur in or along the Lower Duwamish River, nor that all people belonging to one or more racial demographic groups speak for the entire group as far as activities practiced or values shared.

Each document had its own method of gathering community comments and opinions, which limited our ability to extrapolate from our analyses in certain ways. Community engagement methods noted in the document subsample include the following:

- Mail-in questionnaires; including open- and close-ended questions
- Focus group conversations
- Public comments; including prompted and self-written statements
- Interviews; including semi-structured, structured, and intercept
- Open letters to public officials
- Community-based participatory research methods; including collaborative map-making and brainstorming activities

Some reports recorded comments from an individual person as a single statement, such as the Duwamish River Community Coalition's collection of comments for the EPA (DRCC TAG, 2021). Other reports summarized feedback from a group in a single statement, like the summary sections of the Georgetown Open Space Vision Framework (Seattle Parks Foundation, 2017). Considering the diversity of outreach methods employed by the document subsample, we cannot state the relative importance of a certain activity or how frequently each activity occurs.

The second limitation was a result of the greater context of these documents and the motivations behind their production. Some documents focused specifically on fishing due to the health concerns of fish consumption from the LDR, while other reports addressed concerns about broader topics of recreation, employment and education. For example, the frequency of our codes relating to fishing were much higher than other activities. Thus, the goals of the original documents have shaped our findings, potentially yielding only a subset of the environmental values held by communities in the LDR.

A third limitation encountered was generated by the fact that many community-generated advocacy efforts to help increase public participation provide scripts or guided responses. While these accessibility efforts are important, this structure also amplified the frequency of some of our codes.

The fourth limitation is about connecting racial demographics to specific activities and values. We do not claim that the racial demographic data recorded in our document subsample is representative of entire groups of people. For example, almost all of our data from Vietnamese people is about fishing, but Vietnamese people in the Duwamish Valley area do more than fishing. We also want to clarify that the absence of a particular racial demographic group participating in an activity does not mean that individuals belonging to that group do not engage in the activity, it is just not published in these reports. This was a major limitation of our sampling design towards answering our client's original question about

the demographics of river use, but was the best option determined by the research team with the resources and timeline of the project.

Results and Discussion

Themes

Our thematic analysis resulted in seven high-level inductive themes. While these themes do not summarize all of the beliefs and values people hold about the Duwamish River, they do highlight the main concerns found in our subsample. Many individual statements may have been coded for multiple sentiments and therefore can support more than one theme.

Current Conditions	**Aspirational Conditions**

1. Fishing
  a. Recreational
  b. Commercial
  c. Subsistence
2. Shellfish harvesting
3. Boating
4. Cultural gathering on river banks
5. Tribal rights: access, heritage, sacred areas
6. Tribal events on river
7. Employment
8. Encampments
9. Exercise
10. Relaxation
11. Pet access
12. Playing
13. Restoration
14. Swimming
15. Wildlife viewing
16. Social gathering
17. Increased vegetation and green space
18. Beach access
19. Individual human health
20. Community health
21. Ecological health for sake of wildlife
22. Stormwater management/green infrastructure
23. Water and sediment quality
24. Community involvement in cleanup and restoration
	1. Polluter accountability
	2. Community education about health risks
	3. Duwamish Tribe recognition
	4. Righting environmental injustices
	5. Government building trust with residents
	6. Youth engagement
	7. Healthy ecosystem
	8. Maintenance/long-term stewardship
	9. Improvements for future generations

Table 3. Comprehensive list of values.

Table 3 shows a comprehensive list of unique values about the river. The column on the left shows codes applied to information about how people engage in/on the river. The column on the right includes aspirations people hold about the future state of the river. Values from both columns were used to create themes. Table 4 shows the theme titles, descriptions and example coded statements.

Clean river (26 codes, 512 coded statements)	**How people conceptualize a clean river, either symbolically or specifically, and how they relate to the idea of water without contamination currently and for future generations.**
	● "I hope that we can clean up the Duwamish so that people can have fun with their friends and family way of fishing." ((DRCC, 2010) ● "This potential reduction of clean up would violate tribal treaty rights and does not take into effect the cumulative nature of the toxic stew that is already in the Duwamish. We have an obligation to clean up the superfund site and make the river a healthy place for salmon, community's that depend on this river for subsistence and for all of us who live in this neighborhood that depend on a healthy watershed." (EPA, Explanation of Significant Differences, 2021b)
Access and amenities (30 codes, 467 coded statements)	**People want to be able to access the river for a variety of reasons and want to see more multi-use spaces that serve the public.**
	● "The data gathered during the first round of community input suggested that traditional open space and park destinations and local businesses were equally important as destinations for all community members." (Seattle Parks Foundation, 2017) ● "Improve fishing piers, including better access, longer hours, safety lighting, transportation/bus access, parking, and washing stations." (EPA, CIP, 2016) ● "Though there was not a lot of mention of habitat restoration, overall, people envisioned a greener Georgetown with increased access to the water. They wanted to see more open space, parks, trees, and more bike paths and walking trails along the river." (Simson et al., 2009)
Human health and safety (37 codes, 590 coded statements)	**Concerns about direct exposure to pollution and indirect compounding burdens affecting human health and community wellbeing.**
	● "Some emphasized the importance of cleaning up the beaches and stated that they are currently reluctant to allow their children to play on the beaches or in the Duwamish due to the contamination." (EPA, Part 3 Responsiveness Summary, 2014) ● "...some community members have expressed concern for the multiple exposures present near the site, due to the concentration of facilities and mobile sources (major roadways, areas of concentrated vehicle traffic) in the vicinity, and the relative vulnerability of the populations in the area. Some community members and tribal comments emphasized the need to protect the most vulnerable populations exposed to the contamination in the waterway." (EPA, EJ Analysis, 2013) ● "DRCC/TAG, the Suquamish Tribe, and many community members commented that the cleanup must achieve pollutant levels low enough to protect human health, with an ultimate goal of allowing safe consumption of resident fish and shellfish at tribal and subsistence consumption rates." (EPA, Part 3 Responsiveness Summary, 2014)
Polluter accountability & government - community relationship (35 codes, 518 coded statements)	**Peoples' perceptions of power dynamics and relationships between themselves and polluting companies, as well as between themselves and governments (local and state).**
	● "Hopefully this will not only get the river cleaned up but also hold the companies that pollute and city accountable." (DRCC TAG, 2021) ● "...lack of transparency of interactions between agency delegations, especially between EPA, Department of Ecology, and Puget Sound Clean Air Agency and lack of transparency in delegated decisions." (EPA, EJ Analysis, 2013) ● "Even if the proposed changes don't seem like a 'big deal' to EPA scientists (as stated in the Feb 16th webinar), any reduction in the strength of the cleanup is a blatant disregard for the community's lived experiences with and along the Duwamish River and is disrespectful for the multiple environmental burdens they have been enduring for decades." (EPA, Explanation of Significant Differences, 2021b) ● "Establishing consistent relationships with agencies involved in LDW cleanup activities (the Duwamish Tribe prefers to communicate with the same individuals over time)." (WA DOH, 2003)

Clean river (26 codes, 512 coded statements)	**How people conceptualize a clean river, either symbolically or specifically, and how they relate to the idea of water without contamination currently and for future generations.**
	● "I hope that we can clean up the Duwamish so that people can have fun with their friends and family way of fishing." ((DRCC, 2010) ● "This potential reduction of clean up would violate tribal treaty rights and does not take into effect the cumulative nature of the toxic stew that is already in the Duwamish. We have an obligation to clean up the superfund site and make the river a healthy place for salmon, community's that depend on this river for subsistence and for all of us who live in this neighborhood that depend on a healthy watershed." (EPA, Explanation of Significant Differences, 2021b)
Access and amenities (30 codes, 467 coded statements)	**People want to be able to access the river for a variety of reasons and want to see more multi-use spaces that serve the public.**
	● "The data gathered during the first round of community input suggested that traditional open space and park destinations and local businesses were equally important as destinations for all community members." (Seattle Parks Foundation, 2017) ● "Improve fishing piers, including better access, longer hours, safety lighting, transportation/bus access, parking, and washing stations." (EPA, CIP, 2016) ● "Though there was not a lot of mention of habitat restoration, overall, people envisioned a greener Georgetown with increased access to the water. They wanted to see more open space, parks, trees, and more bike paths and walking trails along the river." (Simson et al., 2009)
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Identity (21 codes, 255 coded statements)	**How people identify with the physical river, the symbology of the river, and how they relate to the river personally and communally.**
	● "For me, fishing is important … a way to enjoy time outdoor, able to watch the waterway and to ease stress after days of working." (Windward Environmental LLC, 2016) ● "In general, the fisher culture creates a social identity and influences social interactions such as sharing of catch, communal consumption of fish, and sharing of traditions, such as learning how to fish. Although some cultural details may differ by ethnicity, the broad aspects of Duwamish fisher culture are shared by fishers across the various ethnicities and result in more commonalities than differences (i.e., comments from fishers of different cultures are often hard to distinguish). Experiences in how the fishers learned to fish and how they compare fishing in their home countries to fishing in the United States help to explain why this shared Duwamish fisher culture exists, which could be important in providing health promotion (including outreach and education) to these communities." (Windward Environmental LLC, 2016)

Clean river (26 codes, 512 coded statements)	**How people conceptualize a clean river, either symbolically or specifically, and how they relate to the idea of water without contamination currently and for future generations.**
	● "I hope that we can clean up the Duwamish so that people can have fun with their friends and family way of fishing." ((DRCC, 2010) ● "This potential reduction of clean up would violate tribal treaty rights and does not take into effect the cumulative nature of the toxic stew that is already in the Duwamish. We have an obligation to clean up the superfund site and make the river a healthy place for salmon, community's that depend on this river for subsistence and for all of us who live in this neighborhood that depend on a healthy watershed." (EPA, Explanation of Significant Differences, 2021b)
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	● "The Duwamish River is a lifeline, representing change, survival, and community. Seattle's chapter of Environmental Professionals of Color (EPOC) live and work within the Duwamish watershed." (DRCC, 2014)
Ecological health (21 codes, 413 coded statements)	**Concerns about the health of the river for the ecosystem's sake.**
	● "It's important to keep the river clean because it sustains many forms of life including entire ecosystems of animal and plant life. Fish also depend on its purity as trash and other contaminants are deadly. Disrupting the ecosystem can cause irreversible damage to the plant/animal/fish population as well as the surrounding plant life and the people who depend on it." (EPA Explanation of Significant Differences, 2021b) ● "Participants felt that the restoration of the Duwamish River should be a prioritized as a gesture of responsibility to the Native community. Another idea was to improve the habitat of Kellogg Island and the surrounding shores and Longhouse area. There was also interest restoring original mudflats on the north side of the West Seattle Bridge." (Simson et al., 2009)

Clean river (26 codes, 512 coded statements)	**How people conceptualize a clean river, either symbolically or specifically, and how they relate to the idea of water without contamination currently and for future generations.**
	● "I hope that we can clean up the Duwamish so that people can have fun with their friends and family way of fishing." ((DRCC, 2010) ● "This potential reduction of clean up would violate tribal treaty rights and does not take into effect the cumulative nature of the toxic stew that is already in the Duwamish. We have an obligation to clean up the superfund site and make the river a healthy place for salmon, community's that depend on this river for subsistence and for all of us who live in this neighborhood that depend on a healthy watershed." (EPA, Explanation of Significant Differences, 2021b)
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Connections between human and ecological health (17 codes, 357 coded statements)	**Ecological and human health, as well as community well-being, are intertwined. They are dependent on each other.**
	● "We must bring safe fishing back. If fish are safe people are safe" (DRCC TAG, 2021) ● "Many of these commenters also acknowledged that cleanup of the Duwamish is needed and some noted that the cleanup of the LDW will have benefits for local business and workers, and the region's economy. They asked that the Duwamish workforce be an important voice in cleanup decisions." (EPA, Part 3 Responsiveness Summary, 2014) ● "I agree that cleanup is essential for the health of our river, the wildlife that depend on the river and our local and extended community in West Seattle and Seattle." (DRCC TAG, 2021)

Table 4. Conceptual theme definitions and examples of supporting statements.

Theme 1: Clean River

The pollution and resulting Superfund designation has catalyzed much of the outreach we analyzed. People frequently used the adjectives “clean” and “dirty” to describe the LDR. The concept of a clean river became a distinct theme that was mostly used symbolically (e.g. “I value a clean environment”). It was also mentioned more specifically (e.g. removing contaminated sediment or picking up visible trash on the shore). Due to this variability there was no obvious definition of what people think a clean river is. While this terminology was ubiquitous across the subsample, it clearly means different things to different people.

The top three codes applied in this theme were “concern: pollution exposure” (93 statements), “concern: clean up” (68 statements) and “desire: clean river” (72 statements). An additional 279 statements across 23 other codes supported the theme addressing sentiments about gathering, harvesting food, restoration incentives and community stewardship.

While this first theme is distinct, it is closely related to the other six themes. Sentiments about a clean river were frequently connected to the theme of human health impacts of pollution, particularly in regards to fishing.

> *“It is imperative that EPA fulfills its 2014 commitment to fully clean up the Duwamish River and Waterway to standards that are safe for human activities including subsistence fishing. Do not backtrack on this commitment that has been held in good faith for the past 7 years by all of the community stakeholders.”* (EPA, Explanation Of Significant Differences, 2021b)

A clean river also meant one in which flora and fauna thrived, which relates to the theme of ecological health.

> *“It’s important to keep the river clean because it sustains many forms of life including entire ecosystems of animal and plant life. Fish also depend on its purity as trash and other contaminants are deadly.”* (EPA, Explanation Of Significant Differences, 2021)

Another dynamic of the clean river theme is that the community feels it is owed cleanup, which relates to the theme of polluter accountability and government-community relationship. This coded statement portrays the thematic connection.

> *“Our children deserve a clean river to play.”* (DRCC TAG, 2021)

People discussed that they would like to engage in more recreational activities but cannot because the river is “dirty.” We found ten statements about what people avoid due to contamination in the river, including not letting children play on beaches, the inability to exercise tribal treaty rights, unsafe shellfish collection and consumption, unsafe fish collection and consumption, and unsafe swimming conditions. These statements are collected in Appendix E.

> *"I would like to swim in the river one day with my brothers. Now we only see it from the park because it is dirty and polluted. Please clean our river." (*DRCC TAG, 2021)

Theme 2: Access and Amenities

Access and use of the river is limited due to industrial zoning and institutional controls such as government warnings of high pollution levels. Desire for more safe public access surfaced frequently, with fishing being the most common desired use.

> *"The Duwamish was generally viewed by fishers as a good location for fishing both because it is a good spot to fish and because it is a close and convenient location."* (Windward Environmental LLC, 2016)

> *"It's hard to find a place to enjoy the river. This is the only place I can go with access [to the river]."* (Currier, 2019)

> *"[The] DRCC would like to see a high priority for projects that integrate habitat restoration and public access. Long term public access to the river ensures long term support for monitoring and stewardship."* (NOAA, 2013)

Many concerns about access are also related to connectivity between neighborhoods, parks and the river. The following four coded statements are from the Port of Seattle's 2009 Habitat Restoration Plan:

> *"Public access improves stewardship and creates connection to community."*

> *"Paths near shoreline should be integrated (e.g. downstream on Puget Sound Truck Lines site)"*

> *"Although Georgetown residential area is separated from the river by East Marginal Way South and industrial properties, the community values its proximity and existing opportunities to access the river."*

> *"Public access needs better signage, entrance and connectivity to community."*

One of the common solutions mentioned was to improve river access via improvements to street ends. We can infer that street ends are seen as achievable projects that already provide public access to the river and are already commonly used. Street ends are seen as both access to the river, and as a distinct amenity.

> *"Though South Park has a relatively small amount of open green space per resident when compared to other Seattle neighborhoods, the majority of the priority sites chosen through the surveys were about improving amenities at existing sites rather than creating new open spaces. The exception to this was the overwhelming desire to improve street ends in the neighborhood, which generally have very small footprints and are more about providing residents access to the Duwamish River."* (Seattle Parks Foundation, 2014)

Often, the desire for access co-occurred with the desire for more amenities. Most amenities described were for recreation including walking paths, parks, fishing infrastructure, public art, pedestrian bridges, pet access, multi-use spaces, improved signage, and boat launches. One example of this came from the Duwamish Tribe, who stated that they would love to see canoe landings at all restoration sites (King County Department of Metropolitan Services Panel, 1994).

Some amenities were desired with the intention to mitigate harm caused by pollution. In the DRCC Vision Report, one participant wanted

> *"...showers [in public parks] for kids to clean off after they play."* (Simson et al., 2009)

Desires for both recreational amenities, as well as public facilities support the common sentiment that people want to use the river more than they do.

In addition to revealing community sentiments for access and specific improvements, this theme begins to address our research question of "What has been documented about who uses the LDR, how they use the river, and where?". The following two sections expand upon this research question, addressing who uses the river, and where.

Theme 2 Detail: Activities and Demographics

Figure 3 provides insights into who uses the river and what activities they do. Of the 1753 coded statements in our dataset, 233 of them were about engaging in specific activities (13.3% of total data). An icon is present if one or more statements with the corresponding racial identity either was observed or self-reported engaging in the activity. We discovered 17 activity categories. The definitions of each activity category can be found in Appendix B.

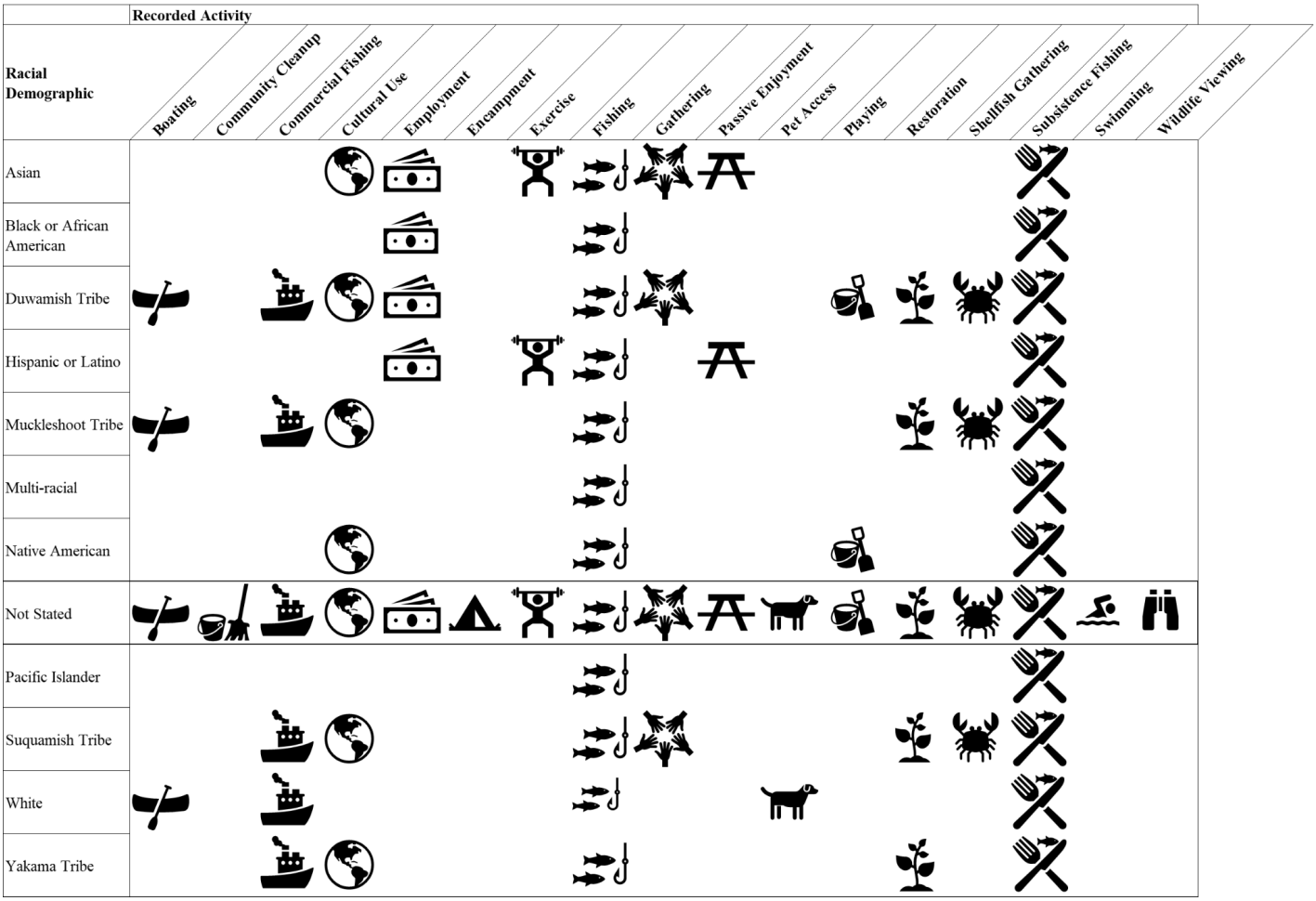

Figure 3. Activities performed in and along the Lower Duwamish River organized by census collapsed racial demographic groups.

The majority of our activities data (75%) did not have a racial demographic associated, which we categorized as “Not Stated”. Activities such as “Community Cleanup”, “Encampment”, “Swimming”, and “Wildlife Viewing” were recorded without any associated demographic. Alternatively, both “Fishing” and “Subsistence Fishing” were represented across all racial demographic groups.

Even when considering the limitations of this figure (see limitations section above), it provides important insight into what decades of outreach efforts have recorded and likely the most common activities people do. Figure 3 represents a broad diversity of activities that occur in and around the Lower Duwamish River and highlights the importance of fishing across cultures and forms.

To address the third component of this research question, we were able to visualize locations where people participate in some of the activities described above.

Theme 2 Detail: Activities and Location

As a further subset of our activities data, our subsample recorded 31 specific locations where people engage in 12 different activities. Of the 116 statements coded with a location (6.6% of total data), only 36

of them also referenced doing or observing a specific activity in those locations (2.1% of total data). Eight of the documents in the subsample held specific location information (these can be found listed in Appendix A). This took the form of people either stating where they used the river or where they had observed others engaging in an activity. The locations of specific activities are shown in Figure 4.

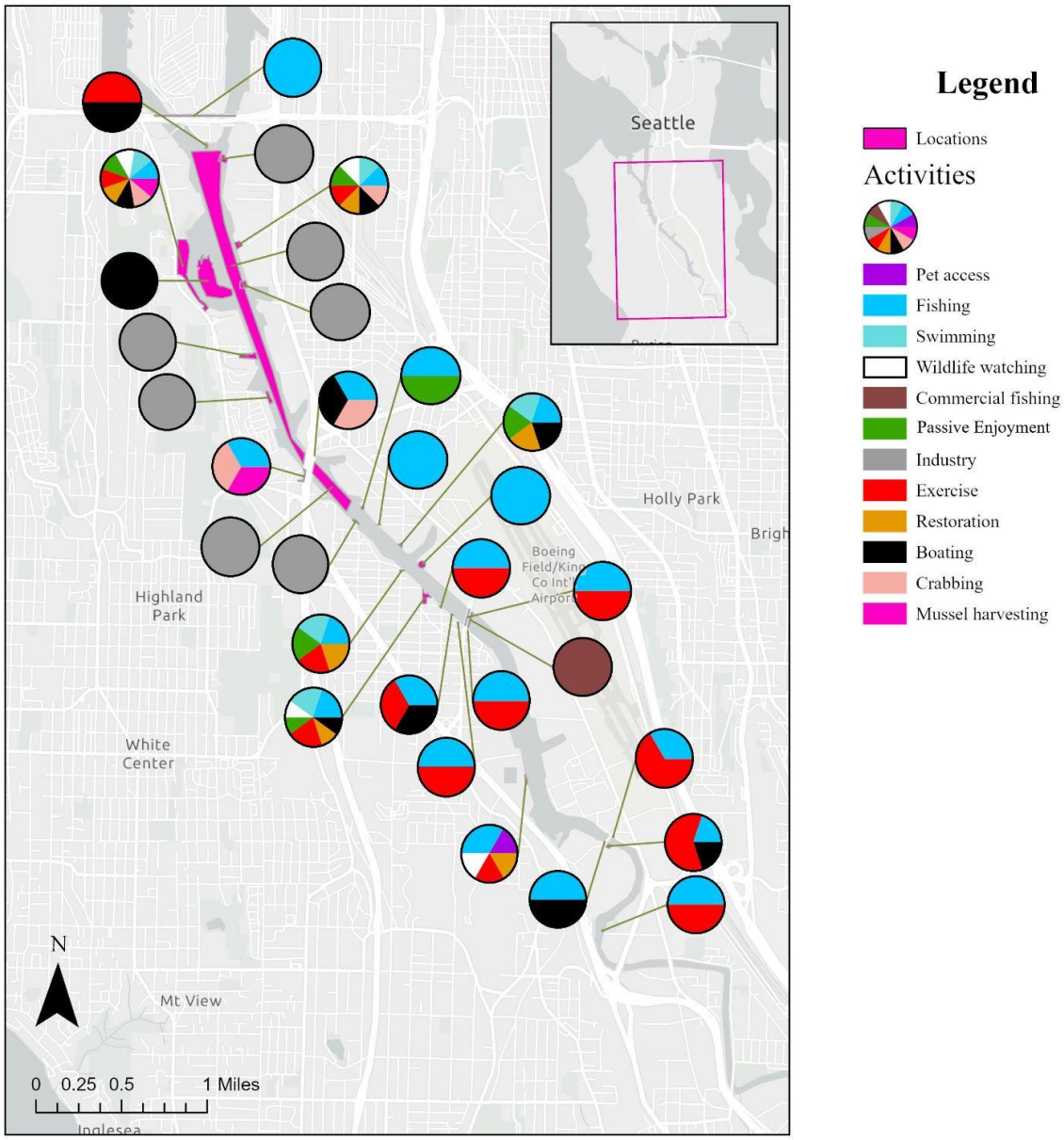

Figure 4: Locations of recorded activities that people either state they do or have observed others doing. The fishing shown in light blue could be either recreational or subsistence; most of the comments did not differentiate. Exercise includes walking, jogging, and biking.

Like the rest of the data, the maps are highly influenced by the structure and purpose of documents coded. For example, the industrial activities shown in Figure 4 were all coded from the 2014 EPA Part 3 Responsiveness Summary where business owners shared concerns about where they believed the proposed remedy would impede their work.

Of the 31 locations specified in our data, 21 of those locations were used for fishing or shellfish gathering. This is due to the interests of the report authors in fishing patterns and consumption for human health reasons, but also reflects the importance of fishing all along the river. We also acknowledge the locations recorded are not exhaustive of where people access the river.

For comparison, we checked to see what activities were advertised at two public restoration sites vs what activities our data showed people participating in. Herring's House Park and həʔapus (pronounced hah-ah-poos) Village Park and Shoreline Habitat (second from the top icon on the west bank of the LDR) border each other and together advertise trails, lawns, picnic tables, allowed pet access, hand-carried boat launches, art, and informational signs (Port of Seattle, 2022b). Our data revealed people doing all of these activities as well as fishing, crabbing and swimming.

At the Duwamish Waterway Park (sixth icon from the bottom on the west bank of the river), hand-held boat launches, BBQ grills, picnic tables, and lawns are advertised (City of Seattle, 2023). Our data shows that people use all of these amenities as well as swimming and fishing.

In conclusion, these multi-use sites are popular and people do a variety of activities, whether or not there are amenities offered to support said activities. At both locations, fishing and swimming have been recorded, even though neither location advertises water access in these ways. Fishing has surfaced as a common activity and the impacts of consuming LDR fish leads to the next theme, human health and safety.

Theme 3: Human Health and Safety

This theme was supported by the greatest number of statements (590). Several inductive codes were created to capture this theme, including "Concern: health of humans", "Concern: pollution exposure", and "Solution: pollution prevention". There are many unique sentiments captured by this theme.

Most commonly were concerns about human health. Sentiments of anger about environmental injustices were communicated clearly in the public comments following the EPA's 2021 proposed lowering the acceptable cleanup standards of carcinogenic contaminants. Below are public comments collected by the EPA and by the DRCC TAG:

> *"Our health is not negotiable for government profit and savings."* (EPA, Explanation of Significant Differences, 2021b)

> *"The science indicating that BaP is "less carcinogenic" than in previous estimates is highly disputed. Scientists, including those at nearby -- and well-respected -- University of Washington, believe there is not enough data to make that determination, given that the data relied on are over 20 years old."* (EPA, Explanation of Significant Differences, 2021b)

> *"It will be wholly unfair and inequitable to trade a .33% cleanup cost reduction for increased human health risks."* (DRCC TAG, 2021)

> *"What if you live by the river and have had cancer[?]"* (DRCC TAG, 2021)

> *"Please take our concerns seriously. The risk to our communities' health is too great. Thank you"* (DRCC TAG, 2021)

Many concerns were about disproportionate health risks such as higher cancer and asthma rates caused by air pollution, particularly from industry and industrial transportation.

> *"Survey respondents listed pollution, water, and air quality as the second most important of physical conditions in the neighborhood that should be addressed immediately." [Safety/increase police presence was first]* (Marti et al., 2006)

> *"[P]articipants identified air pollution as a high priority environmental concern, based on their knowledge and perception of air pollution from industry, vehicle emissions and experience with noxious odors in some neighborhoods."* (Simson et al., 2009)

Stormwater management was a widespread concern that people seemed to be highly educated about, and many solutions were proposed.

> *"Preferred strategies for control and treatment of stormwater from city streets and residential areas include bioswales and "green streets;" natural drainage systems; porous sidewalks, driveways and parking lots; and use of wetlands as stormwater treatment ponds."* (Simson et al., 2009)

> *"Improve fresh water sources and storm water systems for overflow control."* (Green-Duwamish Watershed Alliance, 1998)

Another common concern was about pollution exposure through fish consumption. The coded statement below was captured from a workshop held by the Washington State Department of Health (WA DOH) in 2003, early in the Superfund health risk education process:

> *"One participant's nephew fishes and gives the fish away to family members. Another participant knows someone who fishes in the LDW and sells to a local fish market. One woman indicated she recently consumed a crab (which she often does) from the LDW and described the crab as "muddy and oily", even though she cleaned it well. She said the flesh was bitter and that she later became sick to her stomach but did not seek medical attention. Vietnamese participants were very concerned that they had no previous knowledge of LDW pollution. Both groups agreed that if there is a concern about the river, the information needs to shared with the community. Neither group was aware of signs communicating any type of a warning." (WA DOH, 2003)*

Much work has been done since 2003 to educate people about the health risks of consuming resident fish, salmon, and shellfish, but people still hold concerns about the severity of health risks and lack of health education in their community.

> *"Everyone we talked to knew how polluted Duwamish is, yet not many are aware how bad it will affect them and their family as they eat those salmon in the river. If we don't start doing something about the river, it is scary to know the river is polluted and people still fish there."* (DRCC, 2010)

Some fishers reportedly only catch salmon but others who do catch resident fish state that because the fish do not look or smell of poor quality, they trust that they are safe to eat.

> *"Fishers appear to evaluate risk using empirical evidence (i.e., smell or physical appearance of water, visual inspection of fish, experience of sickness after eating fish, or through information from others). Unseen chemical risks did not appear to be well understood. Discussions in the key informant interviews suggest that some fishers did not understand the information on the fish advisory."* (Windward Environmental LLC, 2016)

Community relevant education was often suggested as a solution. In particular, fishers wanted informative signs along the river in a variety of languages about health risks. One example of this was when a Vietnamese community health group suggested a variety of culturally relevant locations such as senior centers, where the information would be helpful.

Theme 4: Polluter Accountability and Government-Community Relationship

As mentioned previously, there are complex tensions between communities, government, and polluters on the LDR. Comments often mentioning holding polluters accountable for cleanup including criticisms of the government not acting quick enough. Some comments included some doubt that the government would prioritize community health in their decisions. Many sentiments echo the history of trust-breaking between local communities and all levels of government who have favored the economic and social development of wealthy residents or business owners.

> *"Latino residents of South Park expressed the view that their environmental and social needs have been neglected and 'forgotten' by officials."* (Simson et al., 2009)

> *"[T]he EPA has not meaningfully engaged the Black, Indigenous, and People of Color (BIPOC) communities who will suffer the most from your plans to reduce cleanup efforts. To scale back the cleanup of the Duwamish River is to continue to poison BIPOC neighborhoods and to do increasing harm to the sovereign land of the Duwamish people."* (EPA, Explanation of Significant Differences, 2021b)

> *"Continue to overcome barriers of language, culture and class that keep community members from actively participating in community meetings and events. Develop sustainable methods to keep the diverse South Park community members informed and engaged in community events and decisions."* (Marti et al., 2006)

Comments about the government's responsibility to hold polluters accountable often expressed the sentiment that polluters have been excused to exploit the environment since the beginning of colonization

and industrialization in the region. People want those polluters to take financial responsibility for the harm they caused, and they want the government to enforce this responsibility and represent the interest of the public, instead of caving to the desires of responsible parties.

> *"Hopefully this will not only get the river cleaned up but also hold the companies who pollute and city accountable."* (DRCC TAG, 2021)

Another component of this theme is the frustration around information sharing between the government and the public, more so around the Superfund cleanup and pollution impacts than about restoration efforts. People hold a variety of opinions and desires about the process of information-sharing as well as the technicality and specificity of information being shared.

Some people feel overwhelmed by the number of government agencies and their distinct roles around LDR work and want more streamlined processes of receiving simplified information and offering feedback. For example, people think fish health warnings should be coordinated between public health agencies and WDFW (EPA CIP, 2016). Many comments asked for more of specific things from agencies, such as being consulted about restoration efforts (Seaport Planning Group, 2009). An additional sampling of coded statements show the requests for involvement and government cohesion:

> *"The Remedial Investigation and Feasibility Study] for the Lower Duwamish Waterway is carried out under an enhanced Public Participation Plan. The Duwamish River Valley Residents have come to expect that level of public [engagement]."* (NOAA, 2013)

> *"The EPA and Ecology should work together and be explicit about their respective roles."* (EPA CIP, 2016)

> *"The EPA should work with the local health department (Public Health Seattle and King County), WA State Department of Health, and federal Agency for Toxic Substances and Disease Registry to design better health messages. Work to find better strategies to reach people so that the message is heard."* (EPA CIP, 2016)

Government agencies and NGOs have made huge efforts since the 1990s to educate the public about health risks associated with consuming resident fish and shellfish from the river. While there are still issues around how to best communicate health risks to fishers and those who consume fish, the lack of public knowledge has improved since the 1990s compared to recent evidence of public awareness.

As these examples show, people's frustrations with government and polluting industries are directly related to the disenfranchised nature of their communities. The idea that the LDR has been abused and taken advantage of aligns with how some people feel they have been treated based on their identities.

Theme 5: Identity

The river is a piece of the Georgetown and South Park neighborhood character, as well as part of the personal identity of individuals. The strong reactions to the EPA's proposed changes in 2021 were not just about concerns for human health, but because they feel the polluted state of the river is a metaphor for

how they have been treated by the government. Some people tie their racial identity to their environmental activism:

> *"You and I can make a difference! It is also our responsibility as part of the Hispanic community in Seattle to care about the environment and to ensure the well-being of our natural resources, such as the Duwamish River – Seattle's ONLY river."* (DRCC, 2014)

> *"In general, the fisher culture creates a social identity and influences social interactions such as sharing of catch, communal consumption of fish, and sharing of traditions, such as learning how to fish. Although some cultural details may differ by ethnicity, the broad aspects of Duwamish fisher culture are shared by fishers across the various ethnicities and result in more commonalities than differences."* (Windward Environmental LLC, 2016)

> *"I wish that some day, the banks of the river will be green and the water will be clean. On that day I will call out: 'Yes, the Duwamish is my river, and South Park really is my home town!'"* (DRCC, 2014)

Though our report does not claim to summarize tribal opinions, the cultural and kinship relationship that Indigenous groups have with the LDR is well documented:

> *"The Suquamish culture finds its fullest expression in the acknowledged relationship of the people with the land, air, water and all forms of life found within the natural system."* (The Suquamish Tribe, 2000)

> *"The entire river is sacred and of utmost importance to the Duwamish Tribe, and it is shameful that the EPA would attempt to further shirk its duties even more than in the 2014 agreement for the cleanup."* (EPA, Explanation of Significant Differences, 2021b)

From the project team's personal communications with BJ Cummings (transcribed in Appendix C), a local community leader and subject matter expert around LDR issues, viewing the river as kin or a central piece of identity is not unique to Indigenous people. When presenting talks around Seattle about her recent book on the Duwamish River, she was approached by many people who communicated the significance of personal connections to the Duwamish as well as other water bodies close to their home (B. J. Cummings, personal communication, April 19, 2023).

Theme 6: Ecological Health

Due to the extreme destruction of the ecosystem, people care very strongly about improving the ecological health of the LDR both for the restoration of plants and wildlife, and also for more symbolic justice reasons. One of the most commonly described desires was to increase habitat for salmon in the river. This is not surprising, as salmon are a keystone species in the Pacific Northwest and are one of the most culturally significant species for Tribes, fishers, and the regional culture.

> *"Change Duwamish slough back into the Duwamish River. 'Put the kinks back into it."* (King County Department of Metropolitan Services Panel, 1994)

> *"It's important to keep the river clean for the river wildlife."* (EPA, Explanation of Significant Differences, 2021b)

> [Increased costs associated with cleaning up the East Waterway to the original decision level] *"...is a small price to pay for the survival of salmon, orcas and clean air and water for people."* (EPA, Explanation of Significant Differences, 2021b)

> *"Some commenters expressed their concern that the cleanup address risks to fish and wildlife, and some stated concern that the cleanup be protective of specific species, including salmon, ospreys, ducks, and killer whales."* (EPA, Part 3: Responsiveness Summary, 2014)

Comments did not make a distinction between community and government-initiated habitat restoration efforts, and frequently perceived Superfund cleanup and restoration work as interchangeable or deeply connected. Our data reflected that people are well educated about and advocate for specific ecological improvements because of the robust community activism and environmental education efforts on the LDR.

Theme 7: Connections Between Ecological and Human Health

Different from the previous theme, this one specifically addressed the interconnections of human health and the state of the river. A healthy river that supports abundant wildlife is also seen as a river that will support healthy human communities, mentally and physically. If the river is safe for fish and wildlife, people believe it will be safe for humans.

> *"I fish for salmon, herring and whatever bites the bait. I go fishing to be next to the river and relax, and be by nature."* (Windward Environmental LLC, 2016)

> *"Most everyone was drawn to the site in part to simply look at the water; they found it relaxing or soothing. [A comment from a specific interview stated] 'The trees around the cove... they're like a hug.' [When asked why they come to the river, two other interviewees stated] 'And I like the solitude… no one bothers me' [and] 'Hah, it's the only way I can get some peace and quiet.'"* (Currier, 2019)

Green spaces were also frequently praised for their contribution to community cohesion and health.

> *"Though many people appreciated the sense of community in South Park, they also expressed the need for more activities, and for public and community spaces."* (Simson et al., 2009)

> *"'What kind of open space improvements would you like to see in Georgetown?' 'Places for people to stand and talk with seating.'"* (Seattle Parks Foundation, 2017)

> *"'How well does the Gateway Park North concept design respond to the needs of the community?' 'Needs a community space for meetings, safer roads, more trees, sidewalks, drainage, #1 project, please help make it happen.'"* (Seattle Parks Foundation, 2017)

Positive commentary about industry came from business owners or was about local employment opportunities. A river that was healthier is viewed as one that has more green space which would, in turn, support individual and community health. As mentioned previously, the efforts to improve ecological health are seen to mirror how local communities are treated.

Conclusions

The objective of this study was to summarize community concerns and preferences about working, living and recreating on and near the LDR. To avoid research fatigue and summarize previous outreach efforts, we analyzed 34 documents published between 1985 and 2021. We inductively and deductively defined seven themes that reflect patterns about how people feel connected to the river. These themes included concerns about how and where people access the river, desires for a cleaner river and more transparent cleanup process, and expectations that governments should maintain high standards for righting what they see as environmental injustices.

Current Conditions and Recorded Community Values

Our data provides evidence that despite industrialization and pollution, people are intimately connected to the LDR. They use it frequently and would use it more often if they believed it was clean and safe. There are many activities people engage in on the river, from playing on beaches to boating, with fishing being the most documented. Fishing has cultural, economic, and recreational importance ubiquitously across Duwamish Valley demographics. People desire the river to be “clean” (both scientifically and symbolically), which was most frequently correlated with human health risks, but also mentioned in desires for a river that could support diverse ecosystems. A level of cleanliness is desired both because people could participate in more activities and because it would restore what people feel they have lost.

We also found that community engagement is a sensitive and exhausted subject on the LDR. In some ways community members are highly engaged; there are many active nonprofits dedicated to river cleanup and coordinating community voices for outreach efforts. However, people are increasingly tired and skeptical of being used as research subjects and asked to comment on technical topics that are difficult to stay informed about. People feel like the frequent and culturally insensitive outreach by multiple government agencies do not lead to tangible benefits or action.

To address this research fatigue, we recommend looking into the fields of structured decision-making and public engagement outlined in the next section.

Fields for Further Investigation

We recommend that stakeholder objectives and action alternatives be clearly defined before future information is collected from community members. This report could be used to create more targeted outreach and reiterate that building relationships with the community, compensating them for their time and following up with tangible benefits from their feedback is essential. We believe that a successful environmental consultation should collect and organize information that specifically leads to decisions

and changes. An overemphasis on an inclusive consultation that captures all, often conflicting views, of community stakeholders is impossible for decision makers to carefully listen and respond to (Gregory, 2017).

We also suggest an approach to future research that still includes direct participation and public access to documentation, but also is applied to very specific decision points through a decision science framework (Keeney, 1992; Hemming et al., 2022; Failing et al., 2007; Norton, 2012; Turner et al., 2008; Rushing et al., 2020; Runge et al., 2020; Landis, 2009). This includes providing the necessary structure and resources for community members to identify and articulate their fundamental values at risk, effective communication of relevant facts by asking qualified experts and deliberative processes to decide which impacts and trade-offs are most important (Gregory, 2017).

Further Analysis of Data

The majority of our subsample (18/34 documents) was published between 2013 and 2021. Our themes appeared across all documents, but analyzing how sentiments change over time was not included in the scope of this project. This would be a valuable next step if one were to continue analysis of this dataset.

Some comments in older documents about desires for access to specific locations and calls for better community involvement have since been addressed with government actions and restoration projects, but we did not distinguish whether those comments are still relevant. For example, records of shellfish gathering were recorded in the Suquamish Tribe Consumption Survey (2000), LDWG Results from Survey of Potential Human Access Locations on the Lower Duwamish Waterway (2005), Duwamish History and Duwamish Voices (2014 University of Victoria Dissertation), and the EPA Part 3 Responsiveness Survey (2014), but there have been numerous and ongoing actions by the EPA and the WA Department of Health to communicate health risks reduce shellfish consumption not contextualized in this study. Analyses of activities, locations and government interventions over time would be another interesting question for future research.

Recommendations for Engagement and Research on the LDR

Our findings also showed that there is a rich history of community organization and involvement in the LDR. Approaching community outreach well-informed is an important step in building trust and working collaboratively. Understanding the themes, values and activities from this report would be helpful for future engagement by building a baseline of understanding of community concerns.

We also believe that future restoration efforts could expand the definition of what constitutes restoration of damages to include things like public access and amenities alongside ecological habitat. An expansion of this definition can better align restoration projects with community desires. Habitat restoration and public access are often seen as having incompatible goals, but these competing objectives can both be considered in urban restoration. Our data revealed that people want a more natural and green river that is healthy for wildlife and accessible for recreation. This is directly connected to concerns about limited

green space near these communities. Our data includes identities from cultures across the globe connected to values people hold the LDR, and rivers more generally.

For example, recent restoration successes on the LDR include the opening of the Duwamish River People's Park in 2022. This early action site formerly the site of an asphalt plant and known as Terminal 117 has been lauded for including both aquatic habitat and shoreline access (Port of Seattle, 2022a). Another success in 2023 was the EPA's proposed clean-up plan for the East Waterway that will maintain the original, higher cleanup standards as promised in 2014 (EPA, Harbor Island Superfund Site, 2023d).

In conclusion, thoughtful outreach methods could also help in understanding the ability of communities to adequately participate in the ongoing regulatory processes and break down barriers that prevent meaningful engagement. Increased transparency in restoration decision making is an opportunity to promote social objectives such as trust building, applying valuable local knowledge, and promoting a culture of environmental stewardship (Junker, 2007). We believe this report supports a shift in restoration decisions that increasingly incorporate community desires and cultural values throughout the entire process.

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Appendix A - Content Analysis Documents

A zip file of the document PDFs are available upon request by emailing kahusiak@uw.edu, htennent@uw.edu, or csheban@uw.edu.

Author Type	Document Group	Author	Document Name	Year	Used in location data set (Figure 4)
Community org	Community	Seattle Parks Foundation	Georgetown Open Space Vision Framework	2017	Yes
Community org	Community	Just Health Action	Addressing seafood contamination for subsistence fishers	2016	No
Govt agency	Government	Mayfield et al	Survey of fish consumption patterns of King County recreational anglers	2007	No
Community org	Community	DRCC	Duwamish Valley Cumulative Health Impacts Analysis	2013	No
Community org	Community	DRCC	Duwamish Valley Cumulative Health Impacts Analysis Appendix B - Community Based Participatory Research	2013	Yes
Govt agency	Government	EPA	Explanation Of Significant Differences September 2021	2021	No
Govt agency	Government	EPA	Part 3 Responsiveness Summary	2014	Yes
News org	Other	International Examiner	Is Fishing Making You Sick	2011	No
Govt agency	Government	City of Seattle	South Park Action Agenda	2006	No
Govt agency	Government	NOAA	Final Lower Duwamish River NRDA Restoration Plan and Programmatic EIS	2013	No
Community partnership	Community	Seattle Parks Foundation	South Park Green Space Vision Plan	2014	No
Community Org	Community	DRCC	DRCC Comments on ESD for LD Waterway Superfund Site	2021	No
Govt agency	Government	Port	LDR Habitat Restoration Plan	2009	No
Community org	Community	ECOSS	Duwamish Riverfront Revival: A Waterfront for Salmon and People in South Park	2001	No
Govt agency	Government	WA DOH	Lower Duwamish Waterway Public Health Assessment	2003	Yes
Community org	Community	DRCC	An Open Letter to EPA, Seattle Mayor McGinn, King County	2014	No

			Executive Constantine, Port CEO Tay Yoshitani		
Govt partnership	Government	Elliott Bay	Duwamish Restoration Program Concept Document	1994	No
University	Other	Currier	Spaces for People and Salmon along Restored Urban Shorelines: A Critical Reflective Analysis	2019	No
Community org	Community	DRCC	River For All webpage	2014	No
Govt agency	Government	EPA	Environmental Justice Analysis for the Lower Duwamish Waterway Cleanup	2013	No
Govt agency	Government	EPA	Groups Cite Novel EPA Equity Analysis To Seek Stricter Duwamish Cleanup	2013	No
University	Other	Allain	Duwamish History in Duwamish Voices: Weaving Our Family Stories Since Colonization	2014	No
Govt agency	Government	EPA	Community Involvement Plan for Lower Duwamish Waterway Cleanup	2016	No
Community partnership	Community	Green-Duwamish Watershed Alliance	Lower Duwamish Community Plan - scanned public comments	1998	Yes
Community org	Community	DRCC	Duwamish Valley Vision Map and Report	2009	Yes
Tribe	Government	Suquamish Tribe	Fish Consumption Survey	2000	No
University	Other	Moses	Duwamish Interviews	1985	No
Govt agency	Government	EPA	Lower Duwamish Waterway Fishers Study Data Report	2016	Yes
Govt Agency	Government	WA DOH	Program Community Partnerships for Culturally Competent...	2004	No
Govt agency	Government	NOAA	Potential toxicant exposure among consumers of recreationally caught fish from urban embayments of Puget Sound	1985	No
Govt agency	Government	EPA	Asian and Pacific Islander Seafood Consumption Study	1999	No
Govt partnership	Government	LDWG	Results from Survey of Potential Human Access Locations on the Lower Duwamish Waterway	2005	Yes
Community part	Community	Duwamish Subsistence Fisher Pilot Project Team	Fishing and Us (Câu cá và tôi)	2016	No
Community org	Community	DRCC	A River Revealed: Talking with Fishermen of the Duwamish River	2010	No

Appendix B - Codebook and Definitions

Code	Subcode	Definition
# OF PEOPLE		**The number of participants providing comments in a document.**
ACCOMPLISHMENT		**Something that the community *itself* highlights as a win. Does not include accomplishments from government representatives, or people outside the community.**
	Community education	Education either from the government or other sources (NGOs, academics, etc).
	Govt - community collaboration	Creation of working groups. Clear communication.
	Language accessibility	Any efforts done in appropriate languages.
	Pollution control	Efforts made to manage pollution in/around the LDR (water, air, land).
	Tribal incorporation	Considering tribal knowledge, way of living, rights, fish consumption.
ACTIVITY		**Observed or self-reported activity that people have done in the past or do presently in/along the LDR.**
	Avoided	People stating that they don't do activities on the river.
	Boating	Recreational boating of any type (kayak, sailboat, motorboat etc).
	Citizen clean up	Cleaning up litter.
	Commercial fishing	Fishing (usually salmon) in the LDR with the intent to sell for profit.
	Cultural use	Practices specific to certain regions or communities (not including Native peoples) that aren't fishing. Includes long-term visits.
	Employment	Relying on the river for employment/work.
	Encampments	Living near or on LDR riverbanks.
	Exercise	Activities that people identify as being active such as running or biking.
	Fishing	Fishing without any other context. Fishing for recreational or cultural purposes.
	Gathering	Spending time with people, frequently family members.
	Passive enjoyment	Relaxing along the river, includes picnicking, quiet reflection, sitting on grass fields, etc.
	Pet access	Pets playing in/along the LDR.
	Playing	Children playing in/along the LDR.
	Restoration	Restoration done by community groups or individuals in/along the LDR (invasive plant removal, native planting).
	Shellfish gathering	Harvesting shellfish from the LDR, occasionally mentioned consuming the shellfish.

	Subsistence fishing	Fishing with the intention of eating the fish they catch from the LDR.
	Swimming	Swimming in the LDR.
	Wildlife viewing	Going to the LDR and specifically watching wildlife (birds, seals, etc).
CONCERN		**Something that people see as an issue or problem about the LDR and the Duwamish Valley. This could also be a reason for not engaging with some activity despite their desire to do so.**
	Access	Reasons why people are not engaging with the river that don't fit into other categories, as well as specific physical access constraints.
	Burden to community	Statements about cumulative pressures that communities face, comments about systemic issues and historical experiences.
	Clean up	Specifically about the Superfund cleanup including concerns about timeline, cost, thoroughness, etc.
	Future generations	Any concerns for the health, opportunity, or even just state of the river for future people/children.
	Government - community relationship	Includes concerns about how the government functions and engages with the community (being ignored, not enough staffers, etc.). Also includes issues of communication.
	Health impacts of cutting fish from diet	Concerns about having to reduce fish consumption from a diet because of LDR pollution. Replacement food is less healthy than seafood.
	Health of humans	Concerns about human health in relation to the river.
	Heath of wildlife	Concerns about the health of wildlife that live in (or are unable to) interact with the LDR habitats.
	Human impact	Statements about the negative impacts that humans as individuals have on the LDR ecosystem and inhabitants.
	Impact to industry	Concerns about how industry will be affected by habitat restoration or general increased accessibility.
	Industry	Statements about the negative impacts that industry has on the LDR ecosystem and inhabitants.
	Liveability	Not feeling comfortable in a place. Difficulty in living/economic conditions. This includes concerns about gentrification.
	Pollution	Concern about any type of pollution, including sewage, entering/affecting the LDR. Both from Superfund damages, as well as current pollution that may not be included in Superfund considerations.
	Pollution exposure	Human health risks, including river sediment pollution, fish consumption, and air pollution.
	Recreation	Concerns about the safety of recreating in/along the LDR.
	Sustainability of fishing	Concerns about the future of fishing in the LDR.
	Transportation	Any concerns about lack of or statements about improvements needed to public transportation (bike paths, buses).

	Uncertainty	Concerns, mostly about the unknown health risks of pollution, but also about people not knowing about technical/bureaucratic processes around the river.
DEMOGRAPHIC		**Any identifying information about people who provided input. Identifiers might be self-assigned, selected from options, or assigned to groups of participants.**
	African American	
	Asian & Pacific Islander	
	Blackfoot Tribe	
	Business leaders	
	Cambodian	
	Caucasian	
	Chinese	
	Community activists	
	Community leaders	
	Community members	
	Delridge/Youngstown residents	
	DRCC	
	Duwamish residents	
	Duwamish Tribe	
	ECOSS	
	Environmentalists	
	European	
	Filipino	
	Fishermen	
	Food bank clients	
	Georgetown Community Council	
	Georgetown community members	
	Georgetown employers	
	Georgetown residents	

Georgetown workers	
Govt representative	
Hispanic/Latino	
Hmong	
Homeless	
Immigrants	
Industrial workers	
Japanese	
Khmer	
Lao	
Low-income	
Mexican	
Mienh	
Monolingual - english	
Monolingual - non-english	
Muckleshoot Tribe	
Multi-racial	
Multilingual	
Native American	
NGOs	
Not stated	
Polynesian	
Recreational users	
Restoration volunteers	
Samoan	
Social service providers	
Somali	
South Park community members	

	Suquamish Tribe	
	Thai	
	Tongan	
	Ukrainian and Russian	
	Unemployed	
	Vietnamese	
	Yacht club members	
	Yakama Tribe	
	Youth	
DESIRE		**Something people want more of that already exists, or something they want on the LDR that doesn't exist. It is something that the researchers think could be on or near the LDR.**
	Access	Wanting or liking public access to the river, statements about access, equitable access, and connections to public sites.
	Alternative energy	References to community scale energy projects such as biogas digesters.
	Appropriate language materials	Wanting written materials to be available in a variety of languages, including informational signage as well as outreach materials and in-person events (translators).
	Boat launches	Areas and amenities for launching boats, sometimes specified as hand launch ramps.
	Boating	Wanting to be able to boat on the river. Some sentiments specified canoes or small motorized boats.
	Buffers between industrial zones	Green spaces, frequently described as being publicly accessible, between industrial land parcels.
	Built element	Small human-made elements people want (signs, walking paths, benches, art installations).
	Business development	Comments about employment from/along the LDR.
	Clean river	State of the river mentioned directly in association to the clean-up and/or specifically using the word "clean".
	Community center	Comments directly about desire for a community center (access, creation, maintenance, etc).
	Community involvement	Desires about how people could engage with LDR (outside of govt/community relationships which are captured by govt accountability code).
	Connections between public sites	Increase connectivity between public sites to improve recreation.

Education about health risk	Wanting more education around the health risks of pollution exposure, either through fish consumption, inhalation (air pollution), or dermal exposure to sediment.
Education about river	Wanting more education about the river, including it's history, ecology, or current/future projects happening along the river.
Employment	Local/community employment associated with clean up/restoration efforts.
Feel of a place	When people describe the general atmosphere; some people want "family-friendly areas".
Fishing	Any type of fishing is included in the code.
Gathering	Social or cultural community events and the space to do so. Includes gatherings of all sizes (friends, family, neighborhood, picnics, etc).
Govt accountability	Includes education about Superfund process, NRDA processes, restoration process, lasting and committed relationships b/w public and private over the long term.
Habitat	Explicit mentions of habitat, restoration, water connectivity for ecosystem, etc.
Harvest and eat out of river	Fish (and to a lesser extent, shellfish) consumption from the river.
Health of humans	Desire for human health, both community and individual.
Health of river	Includes improving the ecological health, water quality, and health of wildlife.
Improved street ends	Cleaning and fixing street ends. Sometimes people mentioned wanting to create river access at street ends.
Industry	Desire for business, income, and economic opportunities along the river.
Maintenance	Desire for long-term maintenance of projects, relationships, or spaces around the river.
Multi-use spaces	Desire for river-related projects to be multi-use, mostly mentioned multiple types of recreation activities. Also occasionally mentioned balancing restoration and recreation.
No access	Limit the amount of public access, which was seen as destructive or counterproductive to restoration goals.
Parks/green space	Includes parks, fields, or natural areas that people can use. Excludes street ends.
Recreate	People want the river to be clean and safe enough to allow playing and walking on beaches. This includes mentions of other activities, like wildlife viewing.
Residential/industrial	Comments about balancing industrial and residential needs.
Restoration	Desire for both explicitly mentioned restoration projects as well as natural green spaces along the river.
Safety	Explicitly talking about a threat or safe/unsafe feelings in an area.
Salmon	Explicitly referring to improvements for salmon, or more generally increasing the number of salmon.

	Solitude	Enjoying the river because it offers the ability to be alone.
	Stricter clean up	Desire for more stringent requirements for clean up.
	Swim	Desire to swim in the river.
	Tribal use	Used when comment came from Native American identity in conjunction with other activities. It was used in addition to other codes.
	Vegetation	Wanting more plants, but not specifically for habitat, and smaller than green spaces.
	Youth benefit	Vision or desire for youth to enjoy, use or benefit from the river.
LOCATION		**Direct comments from people about places they like to go on the river or they don't like to go. (It is *not* locations suggested by the initiator or the organizer of a research workshop.) Was also used in conjunction with the desire, activity, solution etc that is also being expressed.**
OUTREACH	Places people avoid	These could be avoided for any reason.
	Places people go	These could be positive connotations or places people have positive associations with for any reason.
		Anything documented about how community outreach was accomplished, including methods of engagement (workshops, public comment periods, etc) or languages spoken and/or translators used.
	Language: Cambodian	
	Language: Cantonese	
	Language: Chinese	
	Language: English	
	Language: Filipino	
	Language: Hmong	
	Language: Japanese	
	Language: Khmer	
	Language: Korean	
	Language: Lao	
	Language: Mandarin	
	Language: Mienh	
	Language: Not stated	
	Language: Russian	

	Language: Samoan	
	Language: Spanish	
	Language: Tagalog	
	Language: Vietnamese	
	Method	Any outreach method was captured in this code. Included mailed surveys, townhall events, multi-day workshop events, focus groups, etc.
QUOTATION		**Anything that is a direct quote, spoken or written from an individual.**
SOLUTION		**Phrased specifically as a potential solution to a problem/suggestion from a community member.**
	Community aid from govt	Economic or social support from the government for communities along the river/impacted groups. Includes funds and cleanup-related local employment.
	Community stewardship	Involving community members in the cleanup and restoration maintenance.
	Daylight creeks	Daylight creeks to improve ecological functions.
	Good communication	Improve two-way communication opportunities, as well as communicating technical/process-based issues more clearly.
	Incentives for clean up	Provide incentives for businesses that have to do clean up.
	Integration of many solutions	Desire and acknowledgement that multiple issues need to be addressed at the same time (e.g. transportation needs, water access and business restoration incentives).
	Inter-agency coordination	Government agencies should coordinate better with the goal of making engagement easier for communities and cleanup/restoration more efficient.
	Limit development	Not allow for more development of industry or hard infrastructure around the river.
	Manage contamination	Different methods of dealing with contaminated soil (e.g. excavating and capping).
	Minimize impact	Solutions to river issues that focus on minimizing any negative impacts of the project. One prominent example was doing restoration during cleanup to reduce harm to the environment during cleanup.
	New places to fish	People should not fish in polluted places, and instead find other places to fish.
	Partnerships	Creating partnerships with and between community organizations
	Pollution prevention	Stopping more pollution from being added to the river or adjacent to the river. Includes air pollution.
	Remove barriers	Removing hard or “gray” infrastructure on shorelines

	Stormwater management	Managing stormwater to improve water quality. Includes comments about bioretention, green stormwater infrastructure.
	Support DRCC	Supporting the community engagement efforts and advocacy actions of the DRCC.
	Vegetation	Increase appropriate trees, plants etc. This includes comments about bioremediation.
	Water quality monitoring	Monitor water quality of the river. Also mentioned monitoring stormwater quality that runs into the river.
VALUE		**The reason why people have the desires/concerns they do, this is about broader statements about what is important in life. It is either stated by the individual or was assigned by the researchers. Values can also be more broad (community concerns not specifically about the river).**
	Benefits of natural space	Feelings around how being in natural spaces, such as the LDR riverbanks, is important for community connection and mental health.
	Clean river	The symbolism of what a cleaned and restored river would mean for the greater Duwamish Valley, including the care and attention to both community and ecological needs.
	Community connections	Explicit mentions of how community cohesion is created through time spent together on or near the river.
	Community health	These statements about health are greater than individual physical or mental health. These statements capture concern about the well-being of the entire community and are frequently more abstract than specific health concerns.
	Cultural	Statements where the speakers are passionate about their cultural connection with the river.
	Duwamish recognition	Statements about the Duwamish Tribe's fight for federal recognition.
	Ecosystem health	These statements often expand on why ecosystem health is important. They are passionate arguments for why ecosystem health matters to the speaker, and frequently capture more than LDR-specific issues.
	Equity/justice	Statements that specifically mention justice in relation to the river. Frequently, these comments discussed "wanting justice" or that river cleanup is a component of justice. Additionally, comments about desires or concerns in relation to demographics were tagged with this code.
	For future generations	Expressions of great concern over how the river might be for future generations or statements where the driving force behind the concern was the future.
	Polluter accountability	Statements where the commenter expressed the importance of polluter accountability. This code was often used in conjunction with other polluter accountability codes.

	Pride	Statements about feeling (or wanting to feel) pride or ownership about the LDR. This mostly captured feeling proud of the status of the LDR as Seattle's only river and strength of communities, coupled with encouragement to improve the subjects of pride.
	Tribal rights	Statements about indigenous people's rights (whether nationally recognized or not) or expectations for how relationships should be pursued or maintained, whether it be relationships to other humans, between communities, or relationships to the natural environments and non-human beings.
	Trust	Statements about the importance of trust, historical or current lack of trust in relationships or promises (or lack thereof) made. Usually referencing governments or polluters.

Appendix C - Conversation with BJ Cummings

We met with BJ Cummings on April 19th, 2023 for 30 minutes over Zoom to share our findings and supplement them with her expert perspective. BJ Cummings is the manager of Community Engagement at UW Superfund Research Program. She founded the Duwamish River Cleanup Coalition (DRCC) in 2001 and authored *A River Revealed - an environmental and social history of the Duwamish River*, published in 2022. She is also an author on several of the documents in our subsample, including the Duwamish Valley Cumulative Health Impacts Analysis.

Our goal in using content analysis methods was to avoid research fatigue and to provide a primer on community values from existing research to researchers before beginning in-person research. However, we recognize that it's also important to share our work with those whose views it claims to share so they can comment on its accuracy. We wanted someone with more lived experience around the Duwamish to ground truth and contextualize our findings.

We shared our document subsample, our seven themes, our activity by demographic figure, and an overview of the demographics included in certain documents. Below, we share a summary of Cumming's comments as well as our questions and Cumming's full responses. Both questions and answers have been edited for clarity and additions are shown in brackets.

Interview Summary

Our analysis revealed that people's values surrounding the river aren't limited to only the river. They are intertwined with their identities, their feelings about the government, their knowledge levels around the river, and their perceived health risk, among other issues. This resonated with Cummings who highlighted that the river is a piece of people's identities and river issues are larger than just the pollution exposure risk.

Cummings argued that our demographic findings are limited and that people of all demographics are engaged in activities around the river. If an organization isn't hearing from a certain demographic or believes the people within it aren't engaged, she encouraged the organization to evaluate their own practices. She spotlighted the community's expertise in outreach, as well as the government's reliance on this work.

Finally, Cummings emphasized that public access is crucial to restoration projects both as an equity issue and to gain public support. The river is an important local resource to neighboring communities and public access will create more public buy-in to protect and maintain the restoration project. She says it best in her own words: "So both in terms of climate change [mitigation], and urban environmental justice and access to resources. I think that these habitat restoration sites, not only can but *have to* meet a multitude of needs".

Transcribed and Adapted Interview

Researchers: *[Shared seven themes from research]* Have these themes shown up in your work? Are these concerns you hear people talking about?

Cummings: I actually think you did a great job distilling a lot of very common themes and frequent issues and concerns that people raise. I was really impressed with this list. It really captures that it's not just an exposure issue, right? It captures that there's all kinds of other, you know, values, that are wrapped up in the state of the river for folks. That one about identity is really key. One thing that might be worth calling out on that, just because I think some people tend to see the issue of identity with very narrow blinders on is that it's true, whether you're indigenous or an immigrant (and I'm throwing everybody else in that [immigrant] bucket). So it might be worth stating that just so that folks don't think that this is something that, for example, only applies to Native people.

I've been giving a lot of talks about Duwamish history recently because of the history book that I wrote a couple of years ago. One of the things, if I give the audience a chance to talk about whatever water body that they identify with, eventually people describe it as home and that just has such deep meaning.

Researchers: *[Shared activity and demographic figure]*. In this figure, we share the activities we found people do in the documents. What do you see missing from this figure? What suggestions do you have?

Cummings: So my first two top line thoughts about this was 'Ooh, pretty.' And then 'I'm not sure I understand the purpose'. I do think that if some people were to look at this, they would be like, 'Why do you think that I'm not interested in participating in voluntary cleanup? Or why do you think I don't? Or like [you think] people in my ethnic racial community don't go out and do community cleanups? We do'. I think it's tricky. Because what you're summarizing here is what you found in your curated list of documents and people might not see themselves reflected in this for that reason.

So, you know, you don't have Black or African Americans as wildlife viewers. That doesn't necessarily mean that they're not wildlife viewers. It just means your documents haven't captured that. Does that mean that they need to be reached out to? Or does that mean you need to be doing something yourself?

One thing I would encourage you to do [is] adjust the language under citizen cleanup. You can use the word community or volunteer. But yeah, citizen science, citizen cleanup. Non citizens are participating in these activities and definitely have communicated that they feel erased or unwelcome if it's only citizens.

Researchers: *[Shared a graphic that showed which documents recorded reaching out to people in specific demographic groups, i.e. NOAA document recorded statements from white people, Black people, and Vietnamese people. Our document sample showed that the government documents recorded a greater variety of demographics than the community documents did]*. It looks like, in our curated sample, that government groups are reaching more diverse groups. We are curious if that resonates with you or if you'd disagree with that.

Cummings: I would definitely disagree with that. So I think one of the things that is really important to understand is, for example, when there is a public comment on the proposed cleanup plan, that comment, nine times out of ten, is coming because the community organizations have done the outreach. They've said ‘it's really important that you comment on this government document’.

Researchers: So perhaps some of the groups we ended up counting in government documents are actually present because community groups have done the work on the ground?

Cummings: Very much. I promise you, the government agencies are not doing better community outreach than the community is. For the most part, the community documents are community created, community generated. So they may or may not include a pull quote from somebody, but they were written either by or to reflect everything they heard from the community. This is part of why I got really confused by this one *[referring to the researchers’ figure]*. I do think a basic analysis doesn’t reflect the ways things actually work, the way these documents are generated. So I would encourage you to think about this one. See if you can kind of come at it from a different angle. Because I think otherwise, you know, you kind of wind up with a conclusion that we know isn't right but we can't figure out how we got there.

Community organizations have pushed the government agencies to do any other languages [apart from English] over the last 20 years and it has been like pulling teeth. The agencies really rely on the community. I mean, there’s a community advisory group for the Duwamish Superfund site. The agencies rely on the community organizations to get [community members] to respond to the government documents.

Researchers: Do you think restoration work can address the varied community needs along the Duwamish River? How can habitat restoration contribute to justice and equity?

Cummings: Restoration can meet a lot of the varied needs. We had a real struggle for a number of years and I’d like to think we’re past this now but you know, we had a big struggle with NOAA around creating habitation restoration with public access. In order to get the most credit for your restoration it has to be very undisturbed from a very narrow set of needs of fish and wildlife. Any public access, essentially, got you points taken off of your restoration. So, for a while there was a real loggerheads. We had to push back and be like ‘You're building a restoration project, on the waterfront, in my neighborhood, in an urban area, and you rely on this community to make sure that the restoration site that you're building is protected and maintained. We don't love what we don't know so we're not going to take care of it; we're not going to make sure that it's protected’.

So we felt like there was a real need for educating NOAA specifically, in this instance, of the value of public access to really get the best restoration as well as just the equity issues involved. This is the South Park waterfront. You're not going to block off the South Park neighborhood from the South Park waterfront on our river. So I do think that [restoration] can meet a lot of varied needs and public access is one of them. Public education, in general, is one of them. A really fantastic example, if you haven't seen it, is what's now called the Duwamish River People's Park. That was where we had the real bare knuckles fight over how these things were going to be done together so that they could meet more than one need.

The other big need now that we're really understanding is that the best way to combat climate change and risks of flooding, in particular on the Duwamish River, is to build natural areas that are also habitat. Maybe that's not even your main reason for doing it but, if you restore floodplains on the Duwamish River, it is going to be habitat. The polar opposite of that is a seawall and that's going to destroy so much of what we've invested in, in terms of restoring salmon and habitat on the river. So both in terms of climate change, and urban environmental justice and access to resources, I think that these habitat restoration sites, not only can but *have to* meet a multitude of needs.

Appendix D - Map Location Names

This appendix provides the name of each location shown on Figure 4. The location name is taken from how people described the location in the documents.

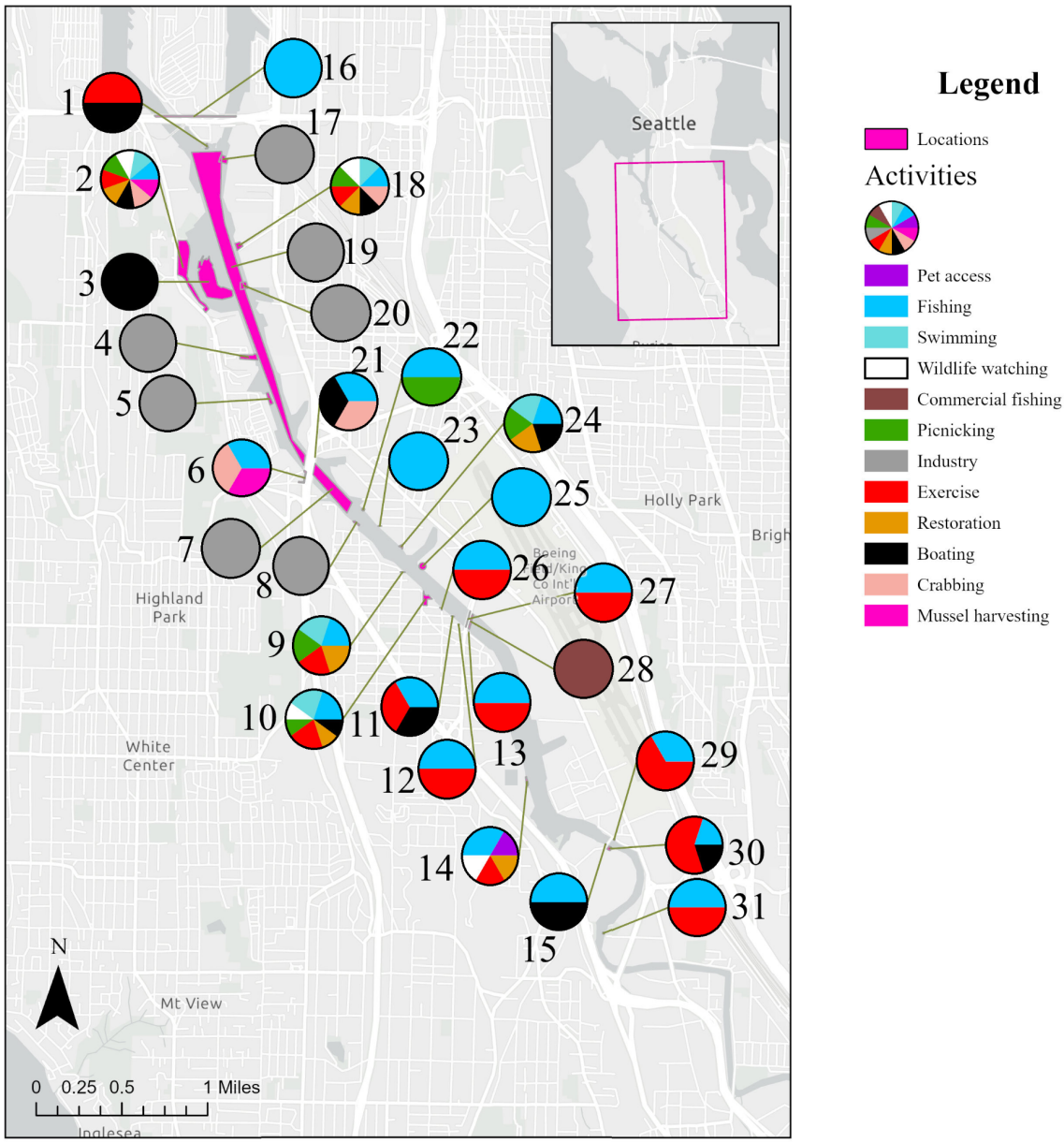

Figure 4: Locations of recorded activities that people either state they do or have observed others doing. The fishing shown in light blue could be either recreational or subsistence; most of the comments did not differentiate. Exercise includes walking, jogging, and biking.

Numbered location	Location name
1	Harbor Island Marina
2	Herring's House Park and həʔapus Village Park and Shoreline Habitat
3	Kellogg Island
4	RM 1.2 W (adjacent to Alaska Marine Lines)
5	RM 1.6 - 1.7 W (adjacent to Northland Services Marine Transportation)
6	Terminal 115 public access
7	Area south of the First Avenue South Bridge
8	RM 2.3 - 2.5 W (adjacent to Boyer Towing)
9	South Portland St end
10	Duwamish Waterway Park
11	South Southern Street End
12	S. Rose St.
13	14th Ave S st end (west side)
14	Hamm Creek Restoration Area
15	Adjacent to pedestrian bridge at river mile 4.8
16	Spokane Street Bridge
17	RM 0.0 – 0.2 E (adjacent to Ash Grove Cement Company)
18	sbəq̓ʷaʔ Park and Shoreline Habitat
19	Harbor Island to the First Avenue South Bridge
20	RM 1.0 E (Slip 1 and adjacent waterfront)
21	1st Ave Boat Ramp
22	South of Slip 3
23	S Othello St end
24	Gateway Park North
25	Boeing Public Access Site
26	12th Ave. S. & S. Elmgrove St.
27	South Park Bridge
28	North of South Park Marina
29	Norfolk East, River mile 4.8-5 E
30	Norfolk West, River mile 4.8-5.1 W
31	Rapids/North Winds Weir

Appendix E - Avoided Activities

Avoided activity	Coded statements
Playing on the shoreline	● "Some emphasized the importance of cleaning up the beaches and stated that they are currently reluctant to allow their children to play on the beaches or in the Duwamish due to the contamination" (EPA, Part 3 Responsiveness Summary, 2014).
Tribal exercise of treaty rights	● "However, the In-waterway Portion of the Site to which this ROD is addressed is largely an open aquatic environment subject to usual and accustomed tribal fish and shellfish harvesting rights derived from treaties of the United States. The entire LDW shoreline is accessible by boat. Tribes have made clear and it has been recognized in many contexts that tribal exercise of their treaty rights has been limited by long-standing LDW contamination" (EPA, Part 3 Responsiveness Summary, 2014)
Shellfish harvest	● "The community, Tribes, and natural resource agencies have stated that there are plans to create additional recreational and habitat opportunities in the LDW corridor. Shellfish collection is not limited to native species. While it is correct that the majority of clams are a non-native species (Mya arenaria), they are eaten on the East coast, where they are native, and the Tribes have stated that they would harvest them if they were not contaminated" (EPA, Part 3 Responsiveness Summary, 2014).
Fishing	● "My family doesn't fish here because we heard a lot of stuff about seafood at the Duwamish being polluted," says Som Phimmachack, a volunteer with the Duwamish River Cleanup Coalition. "But if they get this place cleaned up to par, and Boeing keeps its word, I think people will come back, especially the elder Asians, because I think they'd really love to be able to fish here" (Wu, 2011). ● "When questioned about the Duwamish River, members stated that they do not fish or swim in the river" (WA DOH, 2003)

Eating fishing catch	● The Lower Duwamish Waterway Fishers Study Data Report asked "Why don't you eat your catch?". 7 people said "pollution/cleanliness of fish", 1 said "Fish advisory" and 1 said "heard from others not to eat resident fish". There were other answers unrelated to avoided activities, like the catch being too small, intending to use the catch as bait, or catching something by accident (Windward Environmental LLC, 2016). ● "No but friends do fish. I do not eat the fish because I know about the toxics in the river" (Windward Environmental LLC, 2016).
Swimming	● "When questioned about the Duwamish River, members stated that they do not fish or swim in the river" (WA DOH, 2003) *(This is the same quote included in fishing but is included here as well to highlight that swimming is avoided).* ● "I would like to swim in the river one day with my brothers. Now we only see it from the park because it is dirty and polluted. Please clean our river." (DRCC TAG, 2021)
Walking along riverbanks	● "This place is like a jungle *[referring to riverbanks]*! There are too many plants. There's nowhere to walk, especially at high tide." (Currier, 2019).