



**COASTLINES AND COMMUNITIES: A PRELIMINARY
GLANCE AT THE RELATIONSHIP BETWEEN
SHORELINE ARMORING AND SENSE OF PLACE IN
PUGET SOUND**

Dr. David J. Trimbach
Human Dimensions Lab
Department of Fisheries and Wildlife
Oregon State University



October 2019

TABLE OF CONTENTS

Executive Summary.....	1
Shoreline Armoring and Sense of Place in Puget Sound.....	2-3
Methods.....	4
Demographics.....	5
Shoreline Issues.....	6
Shoreline Priority and Use.....	7-8
Sense of Place.....	9-10
Ideal Shoreline.....	11-12
Conclusions.....	13
References.....	14-18
Appendix A.....	19-20
Appendix B.....	21-27

Acknowledgments: The author of this report would first like to acknowledge all of the indigenous peoples who have lived in what we now call the Puget Sound region since time immemorial. The author would also like to express sincere gratitude to Dr. Kelly Biedenweg at Oregon State University, Citizens for a Healthy Bay, the Applied Geography Specialty Group of the American Association of Geographers, and the Center for Pacific Northwest Studies at Western Washington University.

Cite as: David J. Trimbach. 2019. Coastlines and Communities: A Preliminary Glance at the Relationship between Shoreline Armoring and Sense of Place in Puget Sound. Human Dimensions Lab, Department of Fisheries and Wildlife, Oregon State University. Corvallis, Oregon.

All images included in this report are the author's.

EXECUTIVE SUMMARY

Puget Sound's shorelines contribute to the social-ecological richness of the region. Due to coastal population increases and sea-level rise, among other pressures, natural shorelines are being modified with hard shoreline armor (e.g., seawalls, riprap, etc.). Such infrastructural modifications are known to negatively impact natural nearshore processes and ecological systems, like forage fish habitat. While much is known about the ecological impacts, there remains a dearth of research on the relationship between shorelines (including armor) and social systems (e.g. coastal communities). In order to better understand this relationship, Dr. David J. Trimbach from the Human Dimensions Lab and Department of Fisheries and Wildlife at Oregon State University conducted a study focused on shorelines and Puget Sound communities' sense of place.

Sense of place is a multidimensional construct that includes: place attachment, place identity, place meaning, and place dependence (Masterson et al. 2017). Such dimensions vary, depending on discipline, theory, or approach; however, sense of place is expanding as a useful natural resource management and ecosystem recovery concept, if not applied tool (Masterson et al. 2017; Vergrugge et al. 2019). Sense of place along with shoreline armoring are both designated Puget Sound Vital Signs (measures) by the Puget Sound Partnership, a Washington public agency tasked with coordinating ecosystem recovery in the region. While both are continuously assessed, both have not been linked together. This study seeks to make that social-ecological linkage in order to better inform multi-scalar shoreline management, planning, and policy.

A mixed-methods study was implemented, including a 12-county web-hosted survey (n=413) and 4-county intercept cognitive mapping activity (n=54) with Puget Sound residents from January-August 2019. **Preliminary findings illustrate natural shoreline prioritization. For example 66.3% of respondents considered wildlife-natural areas as a high priority for shoreline use. Preliminary findings also reflect a relationship between shorelines and sense of place, specifically place attachment and sense of belonging. For example, 62.2% of respondents agreed that they felt an attachment to the region's shorelines.** As such, these findings reflect a potential linkage between coastlines and communities, reflecting a need to increase community input on shoreline management, planning, and policy. Additionally, the preliminary results lead to more questions, that will inform forthcoming analyses and publications.

SHORELINE ARMORING AND SENSE OF PLACE IN PUGET SOUND

“Puget Sound and its shoreline are a valuable resource and, like other natural resources, should be used for the benefit of all people,” – Thomas A. Terich (1987)



Puget Sound contains 4,000 kilometers (~2,500 miles) of shoreline, approximately 30% of which have been modified through the installation of hard shoreline armor (Ramirez 2018). The practice of armoring refers to the construction of infrastructure (hard shoreline armor), including seawalls, riprap structures (e.g., revetments, breakwaters), and/or hybrid combinations along coastal shorelines. Armor is installed to protect public lands or resources, infrastructure, private property, communities, cultural sites, and industries from erosion, flooding, and other hazards. The amount of shoreline armoring varies in Puget Sound, ranging from 54.6% of coastlines in King County to 6.3% in San Juan County (Ramirez 2018). It is estimated that approximately 14% of the United States’ shorelines are armored (Gittman et al. 2015). These percentages (local, regional, and national) are likely to experience additional social-ecological pressures due to increases in coastal resident populations and impacts of sea-level rise, among others (Lightbody 2016).

Although armor is a seemingly benign infrastructure, armoring negatively impacts natural nearshore processes, wildlife, and ecosystem health both near and far from the installation site (Dethier et al. 2016; Dugan et al. 2018; Gittman et al. 2015; Puget Sound Partnership 2017). For example, armor disrupts and reduces crucial habitat for plants, forage fish, and salmon (Dethier et al. 2016; Puget Sound Partnership 2017). This disruption negatively impacts the marine food web that includes orca and humans. Shoreline armoring is currently a biophysical Vital Sign (metric) of ecosystem health and recovery used by the Puget Sound Partnership to monitor and coordinate regional restoration efforts (Puget Sound Partnership 2017). Armor removal is recognized as an effective action that can positively benefit larger recovery efforts (Lee et al. 2018). While much is known about the impacts or relationships between armoring and ecological systems (Dethier et al. 2016; Gittman et al. 2015; Dugan et al. 2018), armoring’s impacts on or relationships with social systems and coastal (human) communities remains limited.

SHORELINE ARMORING AND SENSE OF PLACE IN PUGET SOUND

While some interdisciplinary social science research has been conducted related to shorelines (Gray et al. 2017; Landry et al. 2003; Landry 2011; Paterson 2014; Shuhei 2016), including in Puget Sound (Leschine 2009; Fishman 2019), this work has often primarily focused on shoreline property owners (Colehour+Cohen et al. 2015; Heidi Keller Consulting 2012; Johannessen 2012, 2013; Scyphers et al. 2015; Seidel et al. 2013; Smith et al. 2017). This study attempts to fill this research gap by linking armoring and sense of place (SOP) among Puget Sound communities, including those who do not own shoreline property. As the aforementioned Terich (1987) quote illustrates, shorelines belong to and benefit all people. This project was partly informed by the unique work of infrastructure studies' scholars, notably Shuhei (2016), whose work sought to understand the relationship between coastal communities and seawalls in post-tsunami Japan.

SOP is an interdisciplinary and multidimensional construct that refers to identification, attachment, dependence, and meanings associated with place formed through embodiment, experience, and engagement (Poe et al. 2016; Trimbach 2016, 2019a, 2019b; Masterson et al. 2017). Sense of place is well understood within interdisciplinary research, particularly as sense of place is related to and/or informs public health (Frumkin 2003; Ellis and Albrecht 2017), ecosystem services (Wartmann and Purves 2018), human wellbeing (Poe et al. 2016; Biedenweg 2017), behaviors (Anton and Lawrence 2016; Junot et al. 2017), place names (toponyms) (Trimbach 2019a), place-based knowledge (Worster and Abrams 2005), and conflict (Creighton et al. 2008). SOP is subjective, yet patterned, providing researchers with the ability to assess shared meanings, understandings, and the potential to predict perceptions and actions (Anton and Lawrence 2016; Masterson et al. 2017). As such, **this study can inform our current understanding and management of shorelines with an emphasis on communities' sense of place.**



METHODS

A web-hosted 12-county survey (n=413) via stratified sampling and a 4-county in-person intercept cognitive mapping activity (n=54) was conducted between January-August 2019. The survey included 413 adults aged 18 and older who currently reside in the Puget Sound region. Respondents were drawn from a Qualtrics' online research panel, an opt-in panel consisting of individuals who have been recruited to join and participate in online surveys. Participants are offered incentives for their survey completion. Qualtrics uses industry-standard techniques to qualify participants and to ensure that their demographic characteristics are valid and meet specific project criteria (e.g., demographic strata for sampling that matches population). Stratified sampling was used to solicit respondents via Qualtrics and is a form of sampling that emphasizes targeted respondent strata. Targeted strata included sex, age, and county of residence (proportionate to the 12-county region). This was conducted to allow greater generalizability between sample and population. For the purpose of this report, preliminary descriptive statistics are highlighted via frequencies. Survey questions were partly derived from the WA Department of Ecology's past shoreline perceptions surveys (League of Women Voters of Washington 1983; Social and Economic Sciences Research Center 1996; Canning 2003) with some modifications to include potential responses that reflect the purpose of this project (e.g., shoreline armoring, single family residences, sense of place, etc.).

An in-person 4-county intercept (Flint et al. 2016) cognitive mapping activity (Biedenweg and Monroe 2013; Trimbach 2016; Wade and Biedenweg 2019) was also conducted with 54 residents aged 18 and older who currently reside (full- or part-time) in Clallam, Island, Pierce, or Whatcom counties. Counties were chosen based on the following criteria: (1) diverse location, physiography, and level of development (e.g., North Sound, South Sound, urban, rural, island, mainland); (2) variations in armoring and status change (e.g., increase, decrease); and (3) presence of local partners interested in project implementation. The intercept took place at 3 farmers markets and 1 local community festival (all fairly close to shorelines, most in visible range). Unlike the survey, the intercept was conducted face-to-face and was highly interactive with consenting residents. This intercept activity was conducted in order to provide additional rich local perspectives to this project. The findings highlighted in this brief report include partial preliminary descriptive statistics (frequencies) of these data. More advanced analyses will be completed for future publications.

DEMOGRAPHICS

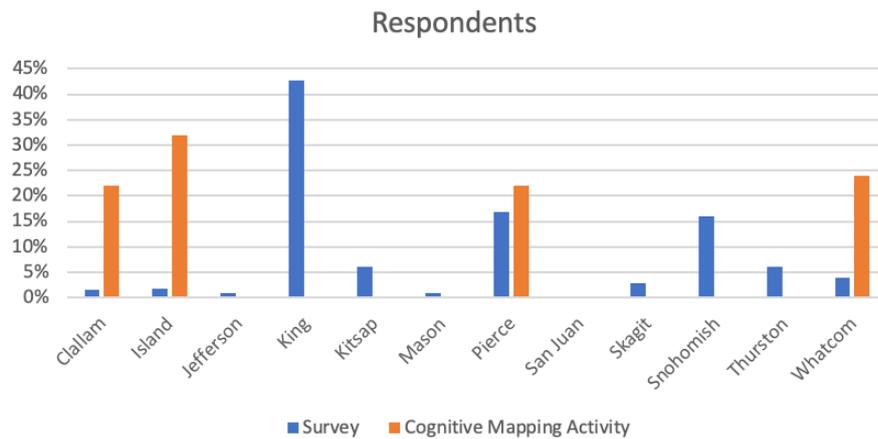


Chart 1. Respondents by County (survey, n=413; activity, n=54)

Project participants reflected the diversity of the 12-county Puget Sound region. Survey respondents were stratified based on specified demographic criteria in order to ensure a more generalizable representative sample. The criteria used were sex, age, and county of residence (based on current data from the Washington Office of Financial Management). As such, respondents included female (51.6%) and male (47.9%) adult residents. Of those, their ages ranged from 18-85 or older. Respondents included residents from all 12 counties of Puget Sound (Chart 1). While all 12 counties are represented, these are representative of the region as a whole (e.g., more respondents from King County than San Juan, under 1%). Additionally, respondents include individuals who also own (7.3%) and do not own (92.7%) waterfront property in the region. While age, sex, and place of residence were solicited as stratified sampling criteria and are representative of the population at large, it should be noted that equitable representation for all demographic attributes was not possible due to project foci and limitations; however, the survey sample was largely representative of the region's population with some variations (e.g., specific racial or ethnic groups). Survey results presented are not weighted and no missing data or responses were recorded. More detailed demographics along with other demographic attributes are outlined in greater detail in Appendix A. Cognitive mapping activity respondents included 54 individuals from Clallam, Island, Pierce, and Whatcom counties (Chart 1). This sample was less demographically representative, perhaps illustrating the typical demographics of the spaces used to engage residents and/or the demographics of individuals more likely to participate in this type of approach; however, the responses provide a rich local perspective contributing to how residents understand and engage the region's shorelines. Respondents included more females (68.5%) than males (31.5%) and while ages ranged from 19-79, more than half (57%) were over 60 years old.

SHORELINE ISSUES

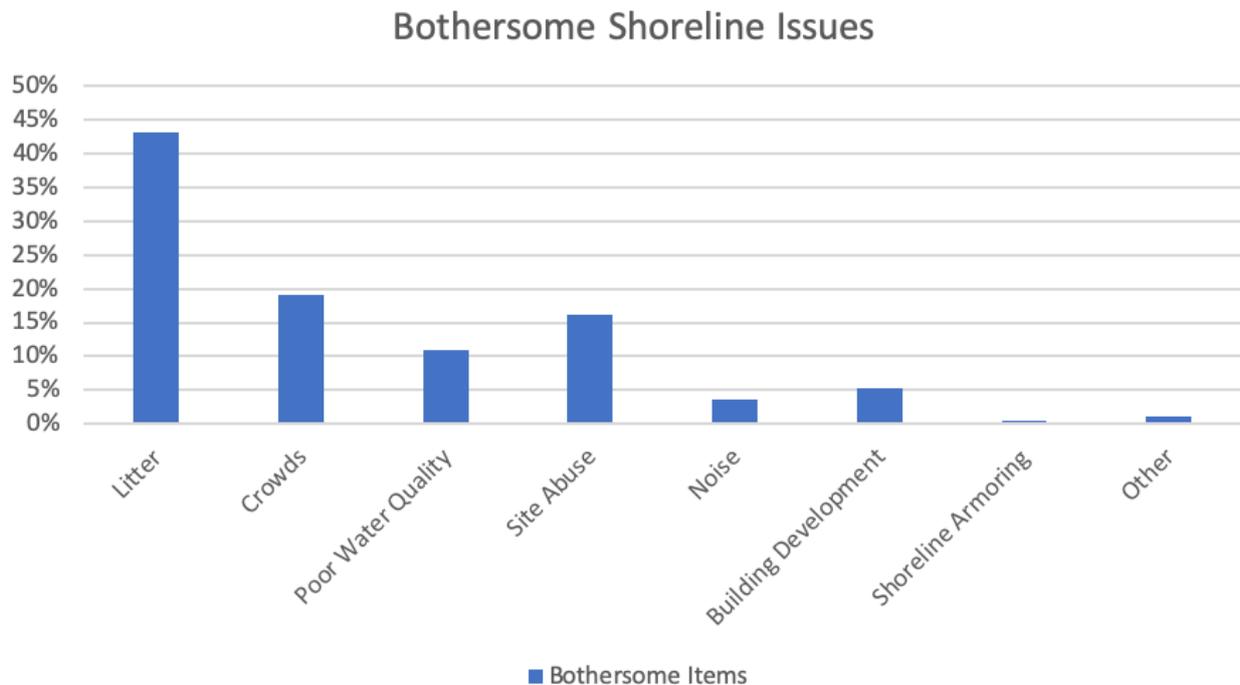


Chart 2. Bothersome Shoreline Issues (n=413)

Puget Sound residents, like many coastal communities, engage and enjoy their respective shorelines through a myriad of activities. Such direct active engagement (e.g., walking, swimming, fishing, tide pooling, shellfish harvest, etc.) or indirect passive engagement (e.g., seeing/viewing) helps foster a sense of place among residents, that can inform their understandings, attitudes, or behaviors as it relates to the natural environment, including perhaps nearshore change, planning, or policy (e.g., hard shoreline armoring, shoreline development, Shoreline Master Programs, shoreline restoration projects, etc.). Such engagement and enjoyment are often frustrated or bothered by specific issues.

When asked to identify the item that most bothers them, survey participants responded that litter (43%), crowds (19%), and (general) site abuse (16%) were the most bothersome shoreline issues (Chart 2). Such items were included in a longer predetermined list of potential issues, that included other items like water quality, shoreline development, and shoreline armoring, of which response rates were lower.

SHORELINE PRIORITY AND USE

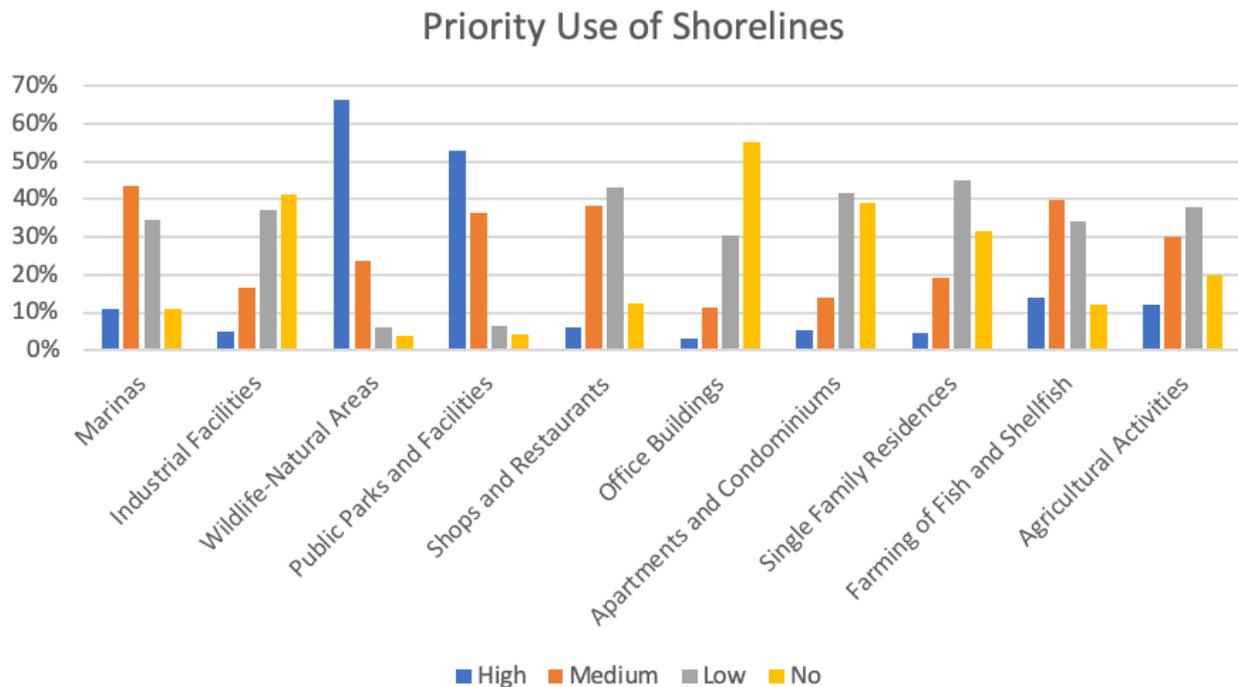


Chart 3. Priority Use of Shorelines (n=413)

Partly building upon two previous surveys supported by the WA Department of Ecology (League of Women Voters of Washington 1983; Social and Economic Sciences Research Center 1996; Canning 2003), this study replicated specific shoreline priority and use questions aimed at better understanding Puget Sound resident preferences for the region’s shorelines with some modifications. **When asked to assess the priority use of shorelines based on a range of potential uses (e.g., marinas, wildlife-natural areas, etc.), respondents preferred shorelines being used for wildlife-natural areas (66.3% high priority) and public parks and facilities (53% high priority) (Chart 3).** Conversely, respondents did not prefer shorelines being used for office buildings (55% no priority), industrial facilities (41.2% no priority, 37.3 low priority), and housing (apartments and condominiums - 39% no, 41.6% low; single family residences - 31.5% no, 45% low). The later noted use is highly pertinent, as the majority (over 50%) of new shoreline armor installation is largely associated with housing (single family residences) (Habitat Strategic Initiative 2018).

SHORELINE PRIORITY AND USE

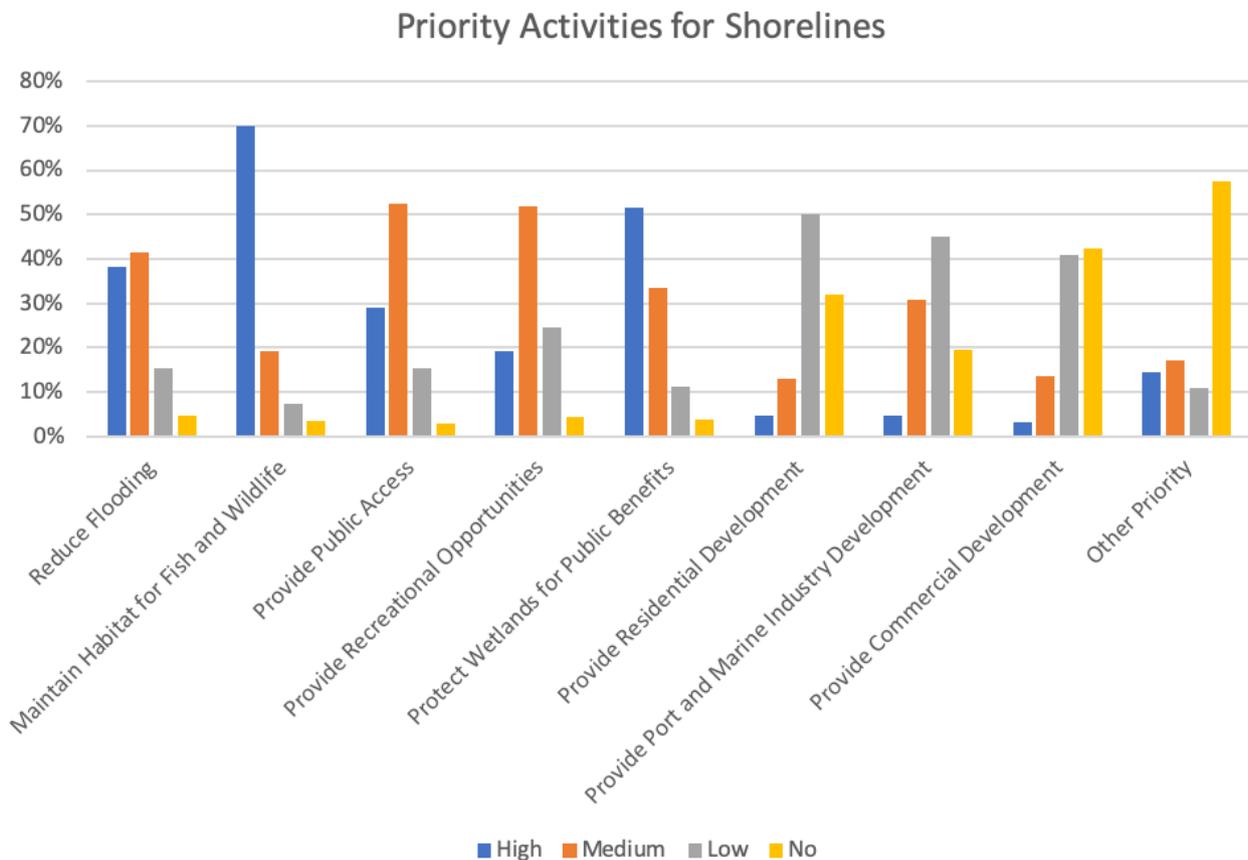


Chart 4. Priority Activities of Shorelines (n=413)

This environmentally-informed response pattern was mirrored when respondents were asked to assess the priority activities (e.g., reduce flooding, provide public access, commercial development) for shorelines. **Respondents again prioritized shoreline activities associated with maintaining habitat for fish and wildlife (70% high) and protecting wetlands for public benefits (51.6% high) (Chart 4).** Comparatively, respondents did not prioritize using shorelines to provide or foster commercial development (42.4% no, 40.9% low), residential development (32% no, 50.1% low), and other (57.4% no, 10.9% low). **Use and activity priority response patterns overlapped with a shared emphasis on natural or ecological priorities.** For example, respondents prioritized habitat, wildlife, and ensuring natural or critical areas remain protected from development. Such prioritizations and preferences for shoreline use may inform or be connected to the senses of place of survey respondents.

SENSE OF PLACE

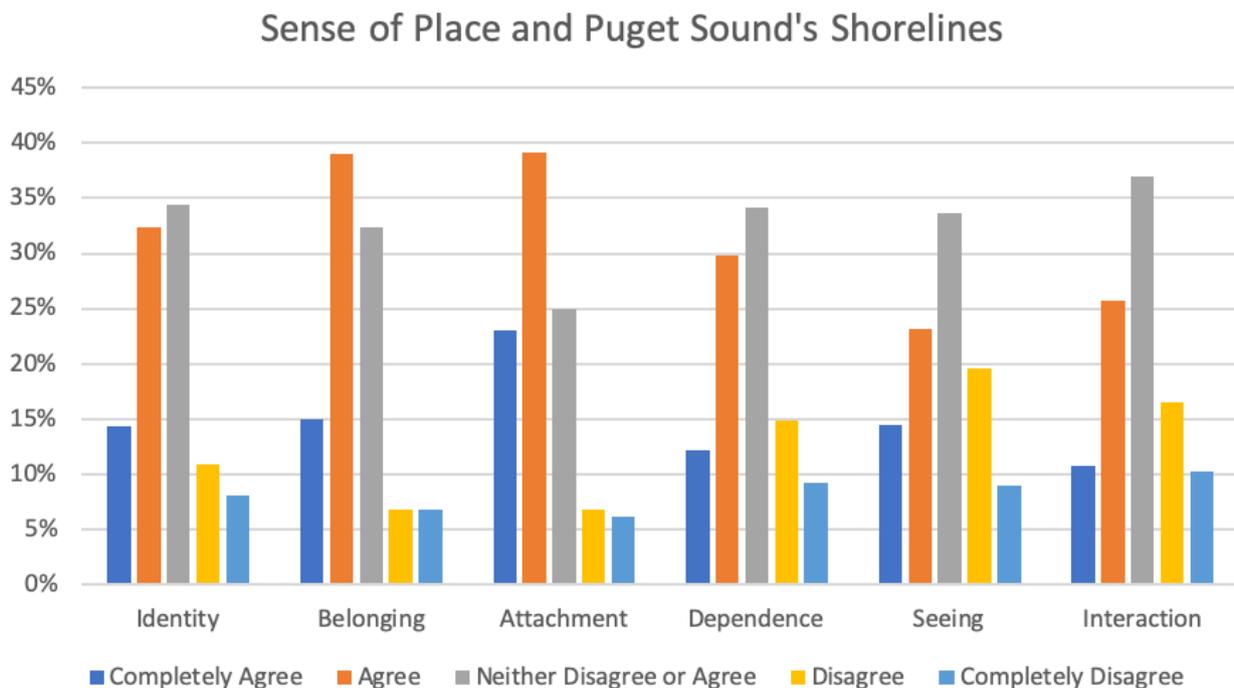


Chart 5. Sense of Place of Shorelines (n=413)

In order to understand sense of place of shorelines, respondents were asked about their level of agreement for 7 dimensions of SOP, including: place identity, sense of belonging, place attachment, place dependence, place meaning (open-ended and also used in cognitive mapping activity, see Chart 6), seeing (sensory) the shoreline, and interacting (sensory) with the shoreline (for report-relevant questions, see Appendix B). Each of these overlapping dimensions have been well understood and discussed within interdisciplinary SOP literature (Poe et al. 2016; Masterson et al. 2017). **Overall, respondents illustrated mixed levels of agreement among the sense of place dimensions; however, place attachment and sense of belonging shared high levels of agreement (both completely agree or agree combined over 50%) (Chart 5).** For example, respondents agreed with, "The Puget Sound's shoreline provides me with a sense of belonging," and, "I feel attached to the Puget Sound's shoreline," (see Appendix B for more question details). For other aspects of sense of place, responses varied or were a mix.

SENSE OF PLACE

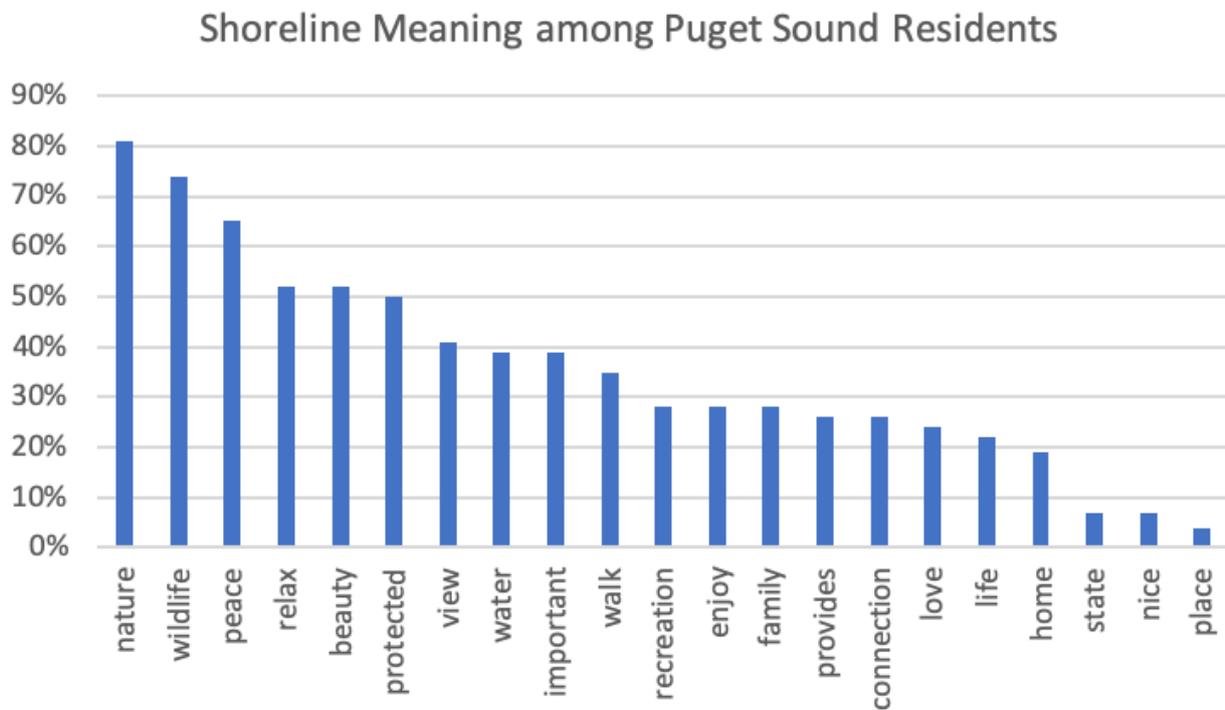


Chart 6. Place Meaning Responses (n=54)

An open-ended question was asked regarding place meaning in the web-hosted survey. The top 20 responses (determined using NVivo software) were then included in the in-person cognitive mapping activity conducted at the four aforementioned local community spaces (n=54). The cognitive mapping activity included a card sorting exercise, where 20 potential responses to the question, “What does the Puget Sound’s shoreline mean to you?” were listed on sticky notes on a poster board and individuals were instructed to choose and then arrange (sometimes with assistance) the responses based on the level of importance. The response pattern complemented the survey findings. **Respondents largely chose descriptive items or constructs related to the natural environment. The top two responses included nature (81%) and wildlife (74%) (Chart 6).** Other top responses included: peace (65%), relax (52%), beauty (52%), and protected (50%). **Overall place meanings reflected the shoreline’s natural features, wildlife, and feelings of peace and relaxation, among others.**

IDEAL SHORELINE

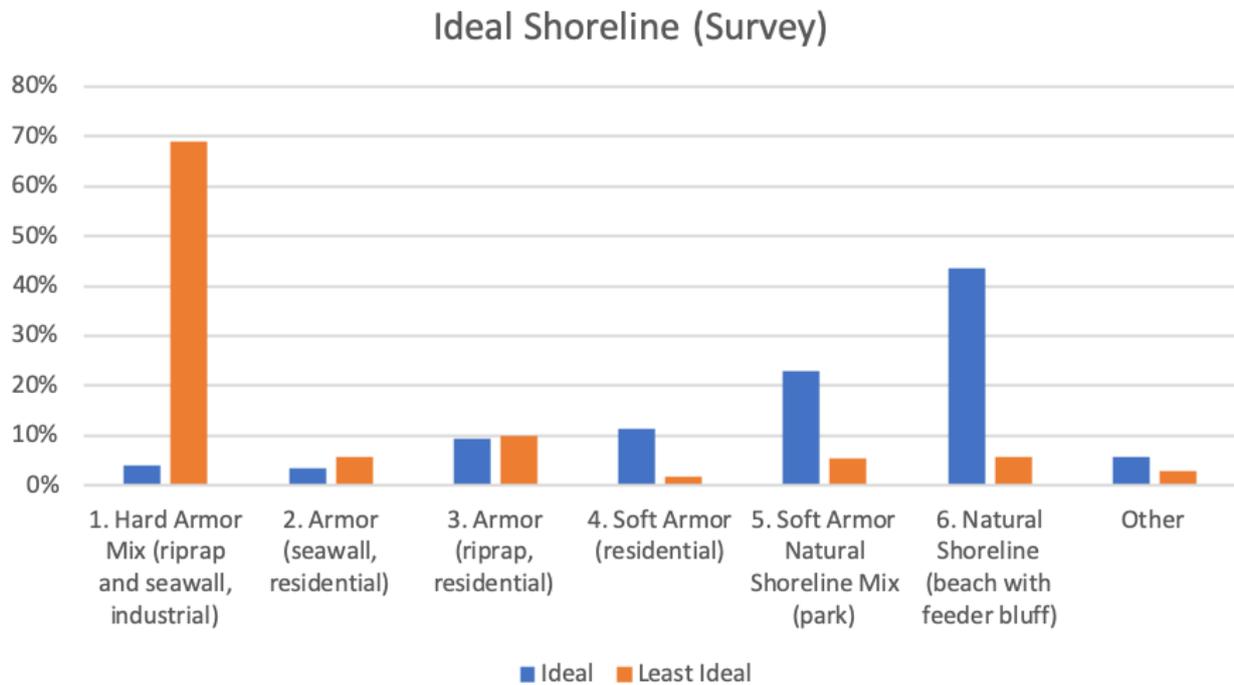


Chart 7. Ideal Shoreline (n=413)



Images #1-6 Shoreline Armor Scale Photos

Working in collaboration with Citizens for a Healthy Bay, a Tacoma-based nonprofit organization, the author was able to capture photos of diverse shoreline features and structures. A series of 6 photos (Images #1-6; image size does not illustrate actual size used in survey or cognitive mapping activity) illustrating a visual scale (although the physiographic images may be place-specific and may not fully encapsulate the diverse shorelines of the region) of shorelines from a near absolute hard (with a mix of armor types) to an absolute natural or soft shoreline was used. **When survey respondents were asked to select their ‘ideal’ and ‘least ideal’ shorelines, they selected hard shorelines as their least ideal (69%, #1) and natural or soft shorelines as their ideal (23%, #5 and 44%, #6).**

IDEAL SHORELINE

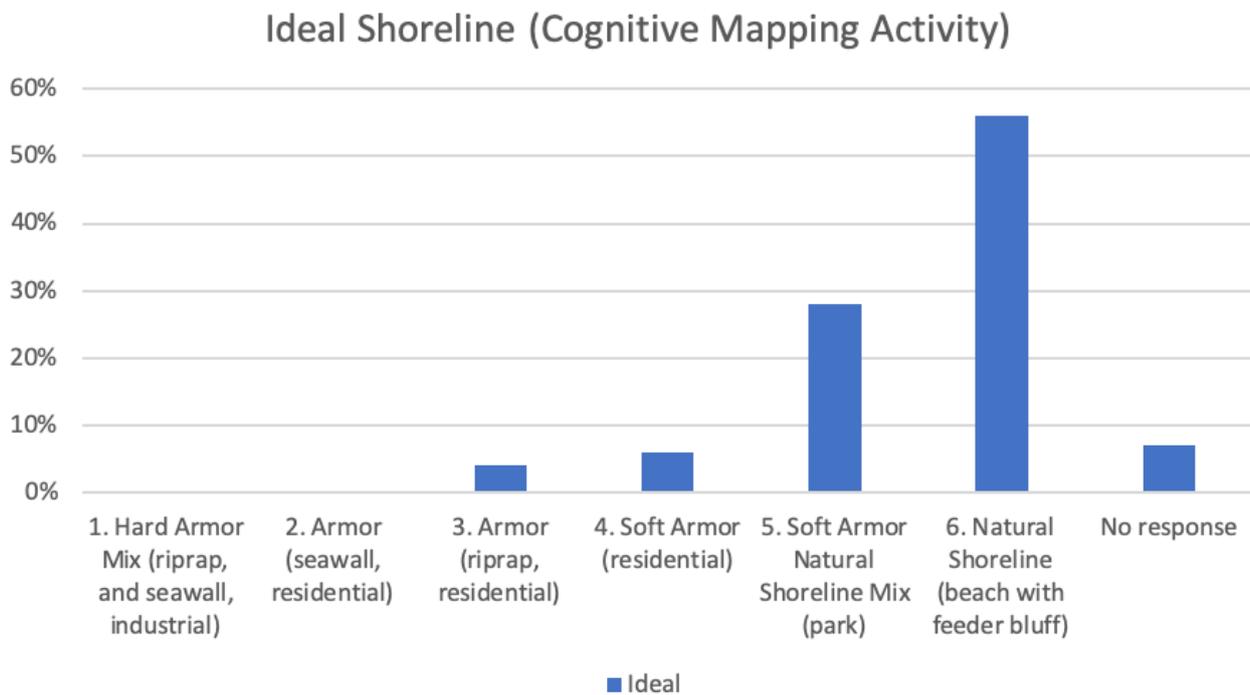


Chart 8. Ideal Shoreline (n=54)

This same question was also posed during the in-person cognitive mapping activity. The photos (Images #1-6) were provided and the same question was asked. Again, these responses were complementary to the survey results. **Overwhelming, respondents chose the more natural or soft shorelines over the hard armored shorelines as their ideal shoreline. The most natural shoreline (#6) garnered the most responses (56%) (Chart 8).** Additionally, the two most hard armored shorelines (#1 and #2) were not even selected from the potential responses.



CONCLUSIONS

What is the relationship between shoreline armoring and sense of place among Puget Sound residents? Based on the preliminary results, Puget Sound residents recognized the importance of the region's shorelines to their sense of place. Respondents specifically connected the region's shorelines to their place belonging and attachment, two overlapping dimensions of sense of place. Respondents also shared shoreline place meanings with the two most frequently selected responses being nature and wildlife. Respondents also emphasized and prioritized natural shorelines and their respective ecological attributes, including fish, wildlife, and habitat. This shared emphasis on nature or the naturalness of shorelines was reiterated in the responses to numerous questions associated with priority use, priority activities, place meaning, and ideal shoreline composition. While more work is forthcoming to determine direct associations or predictions, the population samples and/or demographic attributes may be connected to the results for the survey and in-person cognitive mapping activity. For example, demographic attributes like place or length of residence may have influenced question responses, including the sense of place agreement statements. Additionally, the over-representation of female respondents over 60 years of age likely informed the cognitive mapping findings.

What do these findings mean for shoreline management? This high emphasis on nature or the naturalness of shorelines has numerous implications for shoreline management, planning, and policy in Puget Sound, the State of Washington, and beyond. Recognizing that shorelines are a shared natural resource with ecosystem services or benefits should be considered when making key shoreline decisions, including coastal development and armoring decisions, as exemplified by Shoreline Master Programs, Hydraulic Permit Approvals, WA Department of Ecology's Shorelands and Environmental Assistance program, among other key coastal planning and regulatory bodies. Additionally, opportunities to engage or include communities' sense of place can be a valuable tool to better plan and develop policies aimed at managing our shared natural resources, like shorelines.



REFERENCES

Anton, Charis E. and Lawrence, Carmen. 2016. The relationship between place attachment, the theory of planned behaviour and residents' response to place change. *Journal of Environmental Psychology*. 47: 145-154.

Biedenweg, Kelly and Monroe, Martha. 2013. Cognitive Methods and a Case Study for Assessing Shared Perspectives as a Result of Social Learning. *Society and Natural Resources*. 26 (8): 931-944.

Biedenweg, Kelly. 2017. A comparative study of human well-being indicators across three Puget Sound regions. *Society & Natural Resources*. 30 (3): 362-376.

Canning, Douglas J. 2003. Public Opinion on Shoreline Management in Washington State (Publication 04-06-028). Washington Department of Ecology, Olympia.

Colehour+Cohen. 2015. Shore Friendly Final Report. WA Department of Fish and Wildlife and WA State Department of Natural Resources. Olympia, WA.

Creighton, Janean H., Blatner, Keith A., and Carroll, Matthew. 2008. People, Place, and Politics: The Role of Place Attachment and Conflict in Forest Communities. *Western Journal of Applied Forestry*. 23 (4): 232-235.

Dethier, Megan N., Raymond, Wendel W., McBride, Aundrea N., Toft, Jason D., Cordell, Jeffrey R., Ogston, Andrea S., Heerhartz, Sarah M., Berry, Helen D. 2016. Multiscale impacts of armoring on Salish Sea shorelines: Evidence for cumulative and threshold effects. *Estuarine, Coastal and Shelf Science*. 175 (20): 106-117.

Dugan, J. E., Emery, K. A., Alber, M., Alexander, C. R., Byers, J. E., Gehman, A. M., McLenaghan, N., and Sojka, S. E. 2018. Generalizing Ecological Effects of Shoreline Armoring Across Soft Sediment Environments. *Estuaries and Coasts*. 41 (Suppl 1): S180-S196.

Ellis, Neville R. and Albrecht, Glenn A. 2017. Climate change threats to family farmers' sense of place and mental wellbeing: A case study from the Western Australian Wheatbelt. *Social Science & Medicine*. 175: 161-168.

Fishman, Sydney. 2019. Implementing Shoreline Stabilization Regulations on Puget Sound. Washington Department of Ecology, Olympia.

REFERENCES

Flint, Courtney, Oldroyd, Zack, Wynn, Elizabeth, Brown, Alexandra, Mascher, Charles, Valle, Phillip Andre, Cannon, Quinton, and Unger, Bethany. 2016. Public Intercept Interviews and Surveys for Gathering Place-Based Perceptions: Observations from Community Water Research in Utah. *Journal of Rural Social Sciences*. 31 (3): 105-125.

Frumkin, Howard. 2003. Healthy Places: Exploring the Evidence. *American Journal of Public Health*. 93 (9): 1451-1456.

Gittman, Rachel K., Fodrie, F. Joel, Popowich, Alyssa M., Keller, Danielle A., Bruno, John F., Currin, Carolyn A., Peterson, Charles H., and Piehler, Michael F. 2015. Engineering away our natural defenses: an analysis of shoreline hardening in the US. *Frontiers in Ecology and the Environment*. 13 (6): 301-307.

Gray, Jaime D. Ewalt, O'Neill, Karen and Qiu, Zeyuan. 2017. Coastal residents' perceptions of the function of and relationship between engineered and natural infrastructure of coastal hazard mitigation. *Ocean & Coastal Management*. 146: 144-156.

Habitat Strategic Initiative. 2018. Narrative. Shoreline Armoring Implementation Strategy. Washington Department of Fish and Wildlife and Washington Department of Natural Resources.

Heidi Keller Consulting. 2012. Exploration of Shoreline Property Owner Knowledge and Awareness of Shoreline Management and Habitat Issues. 2012. WSU Mason County Extension.

Johannessen, Tracie. 2012. Summary of Needs Assessment for Targeted Outreach to Shoreline Landowners in the Port Susan Marine Stewardship Area. Northwest Straits Foundation.

Johannessen, Tracie. 2013. Targeted Outreach to Reduce Impacts from Shore Armor in Port Susan Marine Stewardship Area: Site Visit Summary Report. Northwest Straits Foundation.

Junot, Amandine, Paquet, Yvan, and Fenouillet, Fabien. 2018. Place attachment influence on human well-being and general pro-environment behaviors. *Journal of Theoretical Social Psychology*. 2: 49-57.

REFERENCES

Landry, Craig E., Keeler, Andrew G., and Kriesel, Warren. 2003. An Economic Evaluation of Beach Erosion Management Alternatives. *Marine Resources Economics*. 18: 105-127.

Landry, Craig. 2011. Coastal Erosion as a Natural Resource Management Problem; An Economic Perspective. 39 (3): 259-281.

League of Women Voters of Washington. 1983. Public perception of Washington Shoreline Management Act. Shorelands and Coastal Zone Management Program, Washington Department of Ecology, Olympia.

Lee, Timothy S., Toft, Jason D., Cordell, Jeffery R., Dethier, Megan N., Adams, Jeffrey W., and Kelly, Ryan P. 2018. Quantifying the effectiveness of shoreline armoring removal on coastal biota of Puget Sound. *PeerJ*. 6: e4275.

Leschine, Thomas M. 2009. Human Dimensions of Nearshore Restoration and Shoreline Armoring, with Application to Puget Sound.

Lightbody, Laura. 2016. Living Shorelines: A Key Line of Defense Natural stabilization techniques help reduce effects of erosion and habitat loss. Accessed September 25, 2019, <https://www.pewtrusts.org/-/media/assets/2016/05/livingshorelinesakeylineofdefense.pdf>

Masterson, Vanessa A., Stedman, Richard C., Enqvist, Johan, Tengo, Maria, Giusti, Matteo, Wahl, Darin, and Svedin, Uno. 2017. The contribution of sense of place to social-ecological systems research: a review and research agenda. *Ecology and Society*. 22 (1): 49.

Paterson, Shona K., Loomis, David K. and Young, Sarah E. 2014. The Human Dimension of Changing Shorelines Along the U.S. North Atlantic Coast. *Coastal Management*. 42 (1): 17-35.

Poe, Melissa R., Donatuto, Jamie, and Satterfield, Terre. 2016. "Sense of Place": Human Wellbeing Considerations for Ecological Restoration in Puget Sound. *Coastal Management*. 44 (5): 409-426.

Puget Sound Partnership. 2017. 2017 State of the Sound. Olympia, Washington. November 2017.

REFERENCES

Ramirez, Mary. 2018. Shoreline Armoring in Puget Sound: Reporting on the Chinook Salmon Recovery Common Indicators. University of Washington: Seattle, WA.

Scyphers, Steven B., Picou, J. Steven, and Powers, Sean P. 2015. Participatory Conservation of Coastal Habitats: The Importance of Understanding Homeowner Decision Making to Mitigate Cascading Shoreline Degradation. *Conservation Letters*. 8 (1): 41-49.

Seidel, Valerie, Richards, Hunter, and Beitsch, Owen. 2013. Evaluating Coastal Real Estate Value vs. Risk in the Wake of Sea Level Rise. *Real Estate Issues*, 38 (3): 16-27.

Shuhei, Kimura. 2016. When a Seawall is Visible: Infrastructure and Obstruction in Post-tsunami Reconstruction in Japan. *Science as culture*. 25 (1): 23-43.

Smith, Carter S. Gittman, Rachel K., Neylan, Isabelle P., Scyphers, Steven B., Morton, Joseph P., Fodrie, F. Joel, Grabowski, Jonathan H., and Peterson, Charles H. Hurricane damage along natural and hardened estuarine shorelines: Using homeowner experiences to promote nature-based coastal protection. *Marine Policy*. 81: 350-358.

Social and Economic Sciences Research Center. 1996. Survey of Washington households of the Shoreline Management Act and related shoreline issues. Shorelands and Water Resources Program, Washington Department of Ecology, Olympia.

Terich, Thomas A. 1987. *Living with the Shore of Puget Sound and the Georgia Strait*. Duke University Press: Durham, NC.

Trimbach, David J. 2016. *Understanding Narva and Identity: Local Reflections from Narva's Russian-Speakers*. *Baltic Worlds*. 1-2: 4-12.

Trimbach, David J. 2019a. *Salish Sea Survey*. Prepared for the SeaDoc Society. May 2019.

Trimbach, David J. 2019b. *Sense of Place in Narva*. Human Dimensions Lab, Department of Fisheries and Wildlife, Oregon State University. Corvallis, Oregon.

REFERENCES

Vergugge, Laura, Buchecker, Matthias, Garcia, Xavier, Gottwald, Sarah, Muller, Stefanie, Praestholm, Soren, and Olafsson, Anton Stahl. 2019. Integrating sense of place in planning and management of multifunctional river landscapes: experiences from five European case studies. *Sustainability Science*. 14: 669-680.

Wade, Eric and Biedenweg, Kelly. 2019. Exploring the diversity of mental models associated with Belize's Managed Access Fisheries Policy. *Ocean and Coastal Management*. 178.

Wartmann, Flurina M. and Purves, Ross S. 2018. Investigating sense of place as a cultural ecosystem service in different landscapes through the lens of language. *Landscape and Urban Planning*. 175: 169-183.

Worster, Anneliese Mueller and Abrams, Eleanor. 2005. Sense of place among New England commercial fishermen and organic farmers: implications for socially constructed environmental education. *Environmental Education Research*. 11 (5): 525-535.

APPENDIX A

Survey (n=413)

Sex

Female: 51.6%
Male: 47.9%
Other: .5%

Age

18-19: 3.4%
20-24: 9.2%
25-29: 9.9%
30-34: 9.2%
35-39: 8.2%
40-44: 9.4%
45-49: 9.9%
50-54: 9.9%
55-59: 9.0%
60-64: 7.5%
65-69: 5.3%
70-74: 3.4%
75-79: 2.7%
80-84: 1.7%
85 or older: 1.2%

Place of Residence

Clallam: 1.5%
Island: 1.9%
Jefferson: 1%
King: 42.6%
Kitsap: 6.1%
Mason: 1%
Pierce: 16.9%
San Juan: .2%
Skagit: 2.9%
Snohomish: 16%
Thurston: 6.1%
Whatcom: 3.9%

Ethnicity and Race

American Indian and Alaska Native: 1.5%
Asian: 11.6%
Black or African American: 4.1%
Hispanic or Latino: 3.6%
Native Hawaiian and Other Pacific Islander: .5%
Other: 2.9%
Two or More Races: 2.7%
White: 73.1%

Waterfront Property Ownership

Yes: 7.3%
No: 92.7%

Level of Education

None: 1.2%
Less than high school: 1%
Some high school, no diploma: 2.9%
High school graduate: 10.4%
Vocational training: 4.8%
Some college, no degree: 18.2%
Associate's degree: 9.9%
Bachelor's degree: 31.7%
Master's degree: 14.5%
Professional degree: 2.7%
Doctoral degree: 2.7%

Household Annual Income

\$10,000 or less: 5.1%
\$10,001-\$20,000: 4.6%
\$20,001-\$30,000: 5.3%
\$30,001-\$50,000: 15%
\$50,001-\$70,000: 22.3%
\$70,001-\$99,999: 16%
\$100,000 or more: 31.7%

APPENDIX A

Survey (n=413)

Length of Residence (years)

Less than 1: 3.9%
1-5: 15%
6-10: 11.6%
11-15: 7.7%
16-20: 8.7%
21-25: 11.9%
26-30: 7.3%
31-35: 5.8%
36-40: 6.1%
41-45: 5.1%
46-50: 6.1%
51-55: 4.6%
56-60: 2.2%
61-65: 1.5%
66-70: 1.2%
71-75: .7%
76-80: .5%
81-85: 0%
86-90: 0%
91-95: .2%

Cognitive Mapping Activity (n=54)

Sex

Female: 68.5%
Male: 31.5%

Age

18-19: 1.8%
20-24: 1.8%
25-29: 1.8%
30-34: 5.5%
35-39: 7.4%
40-44: 3.7%
45-49: 9.2%
50-54: 5.5%

55-59: 5.5%
60-64: 14.8%
65-69: 12.9%
70-74: 24%
75-79: 5.5%
80-84: 0%
85 or older: 0%

Place of Residence

Clallam: 22.2%
Island: 31.4%
Pierce: 22.2%
Whatcom: 24%

Type of Residence

Part-time: 9.3%
Full-time: 90.7%

Waterfront Property Ownership

Yes: 14.8%
No: 85.2%

Length of Residence

Less than 1: 3.7%
1-5: 42.5%
6-10: 5.5%
11-15: 5.5%
16-20: 7.4%
21-25: 7.4%
26-30: 11.1%
31-35: 3.7%
36-40: 0%
41-45: 1.8%
46-50: 5.5%
51-55: 0%
56-60: 0%
61-65: 0%
66-70: 3.7%
70 or older: 0%
No Response: 1.8%

Distance from Shoreline

Less than 1 mile: 40.7%
1-5 miles: 46.2%
More than 5 miles: 9.2%
No Response: 3.7%

APPENDIX B

Survey

Survey Questions: Survey questions were partly derived from the WA Department of Ecology’s past shoreline perceptions surveys (League of Women Voters of Washington 1983; Social and Economic Sciences Research Center 1996; Canning 2003) with some modifications to include potential responses that reflect the purpose of this project (e.g., shoreline armoring, single family residences, sense of place, etc.). Thus some question and response construction was directly or partly derived from these previous survey efforts. This was done with the initial intention to illustrate response pattern comparison overtime; however, the geographic scale of analysis for past surveys (based on original data source knowledge and electronic conversations with WA Department of Ecology staff) includes only state-wide and east-west (based on an undefined regionalization scheme), making it difficult for direct comparisons. Although geographic scales vary, indirect comparisons will likely be highlighted in future publications. Additionally survey and cognitive mapping questions do have some overlap for consistency purposes.

Research statement: Greetings! Oregon State University invites you to participate in this survey through Qualtrics. The survey is part of a project entitled, “Understanding the Interactions between Shoreline Armoring and Sense of Place to Inform Ecosystem Restoration,” being conducted by Dr. David J. Trimbach from the Department of Fisheries and Wildlife at Oregon State University. The survey focuses on Puget Sound residents’ experience and engagement with the region’s shoreline. The survey should take approximately 10-20 minutes to complete. All responses will be recorded anonymously. By participating in this survey and responding to subsequent questions via Qualtrics, you hereby provide your electronic consent to the survey process and certify that you are at least 18 years of age. For more information and/or if you have any questions, please contact Dr. David J. Trimbach at david.trimbach@oregonstate.edu. If you have any questions in connection with the protection of your personal data, please contact the Human Research Protection Program (HRPP) and Institution Board Review (IRB) at: irb@oregonstate.edu.

APPENDIX B

How often do you go to shorelines in Washington?

- Daily or almost daily
- Once (+) a month
- Once a year
- Several times a year
- Never
- I don't know

What shoreline area(s) do you go to most often?

- Lake
- River or stream
- Puget Sound
- The Ocean
- Some combination

Below is a list of things (activities) people often do at shorelines. For each thing (activity), please respond whether you do them frequently when you go to (any) shorelines? Check box for yes or leave box blank for no.

- Observing nature
- Fishing
- Boating or sailing
- Digging clams
- Swimming
- Camping
- Walking or hiking
- Work-related activities
- Other activities (please explain)

There are many qualities that attract people to the shorelines of Washington. For each quality, please respond if it is a quality that draws you to visit shorelines. Check box for yes or leave box blank for no.

- Beauty or scenery
- Quiet, peacefulness, or calm
- I like the water
- Natural setting
- Recreation activities (includes: boating, fishing, hiking, birdwatching, or viewing scenery)
- Commercial attractions
- To get away The atmosphere
- Other quality (please explain)

APPENDIX B

For each of the items below, please respond whether or not it takes away from your enjoyment of shorelines. Do these items take away from your enjoyment of shorelines? Check box for yes or leave box blank for no.

- Litter
- Crowds
- Poor water quality
- Abuse of the site
- Noise
- Building development
- Shoreline armoring (any artificial structure built along the shoreline, ex: seawalls, bulwarks etc.)
- Other item (please explain)

Of the following items, which one bothers you the most when you visit shorelines?

- Litter
- Crowds
- Poor water quality
- Abuse of the site
- Noise
- Building development
- Shoreline armoring (any artificial structure built along the shoreline, ex: seawalls, bulwarks, etc.)
- Other item (please explain)

People have various ideas on how the shoreline areas of Washington State should be used. Based on the list of uses below, please respond to what extent you think that use should be a priority for Washington State's shorelines [1 = High Priority, 2 = Medium Priority, 3 = Low Priority, 4 = No Priority].

- Marinas
- Industrial facilities
- Wildlife-natural areas
- Public parks and facilities
- Shops and restaurants
- Office buildings
- Apartments and condominiums
- Single family residences
- Farming of fish and shellfish
- Agricultural activities, such as grazing and growing crops

APPENDIX B

Where shorelines are developed already, they are mostly used for residences, businesses, industry, or recreation. Do you think the amount of development that has occurred on state shorelines is...(choose one of the following responses)

- Too Little
- About right
- Too much

Where shorelines are developed already, they tend to include hard shoreline armoring (ex: seawalls, bulwarks, riprap, breakwaters, etc.) or built structures that are constructed along the shoreline. Do you think the amount of shoreline armoring that has occurred on state shorelines is...(choose one of the following responses)

- Too little
- About right
- Too much

To what extent are you satisfied or dissatisfied with the location of development that has already occurred on shorelines? Would you say...(choose one of the following responses)

- Very dissatisfied
- Somewhat dissatisfied
- Somewhat satisfied
- Very satisfied

Maintaining shorelines involves a variety of activities. Based on the list of activities below, please respond to what extent you think that activity should be a priority for managing Washington State's shorelines [1 = High Priority, 2 = Medium Priority, 3 = Low Priority, 4 = No Priority].

- Reducing flooding
- Maintaining habitat for fish and wildlife
- Providing for public access to shorelines
- Providing recreational opportunities
- Protecting wetlands for public benefits
- Providing for residential development
- Providing for port and marine industry development
- Providing for commercial development
- Other activities, please explain

APPENDIX B

Assess your agreement level of the following statements on a scale of 1-5 [1 = Completely Agree, 2 = Agree, 3 = Neither Disagree or Agree, 4 = Disagree, 5 = Completely Disagree].

- The Puget Sound's shoreline is important to my identity.
- The Puget Sound's shoreline provides me with a sense of belonging.
- I feel attached to the Puget Sound's shoreline.
- I feel dependent on the Puget Sound's shoreline for recreation, work, community activities, and/or relaxation.
- I feel that it is important to see the shoreline on a weekly basis.
- I feel that it is important to interact (recreation, work, community activities, and/or relaxation) with the shoreline on a weekly basis.
- Shoreline development and built structures (ex: seawalls, riprap, bulwarks, etc.) negatively impact how I feel about the shoreline.
- Shoreline development and built structures, (ex: seawalls, riprap, bulwarks, etc.) negatively impact my attachment to the shoreline.
- Shoreline development and built structures (ex: seawalls, riprap, bulwarks, etc.) negatively impact how I interact with the shoreline.
- Shoreline development and built structures (ex: seawalls, riprap, bulwarks, etc.) negatively impact how I identify with the shoreline.
- Shoreline development and built structures (ex: seawalls, riprap, bulwarks, etc.) negatively impact my sense of belonging with/to the shoreline.
- Shoreline development and built structures (ex: seawalls, riprap, bulwarks, etc.) negatively impact my dependence (for recreation, work, community activities, and/or relaxation) on the shoreline.
- Shoreline development and built structures (ex: seawalls, riprap, bulwarks, etc.) negatively impact the shoreline and natural environment.

In your own words, describe what the Puget Sound's shoreline means to you [open-ended].

Based on the images below, please select the image that best reflects your ideal shoreline: Images 1-6 (see page 11); None of the above images (please explain your ideal shoreline)

Based on the images below, please select the image that best reflects your least ideal shoreline: Images 1-6 (see page 11); None of the above images (please explain your least ideal shoreline)

APPENDIX B

Thank you for your responses to the previous survey questions. Now, you will be asked to provide some additional demographic information.

Length of residence (in years) [see Appendix A for response options]

Ethnicity and/or Race [see Appendix A for response options]

Level of Education [see Appendix A for response options]

Household Income [see Appendix A for response options]

Do you own waterfront property in the State of Washington? [see Appendix A for response options]

If yes to previous question: Do you live at that property?

- Yes
- No

Do you live there year round or just part of the year?

- Year round
- Part of year

Cognitive Mapping Activity

Card Sorting: Using the cards/post-its provided, please (1) select what items illustrate what the Puget Sound shoreline means to you. If you do not see any items that reflect shoreline meaning, use the blank cards/post-its to write your own items. Select and/or write as many descriptive words as possible until you feel comfortable with your responses. Once you have completed writing your responses, (2) please order them based on their order of importance for your ideal shoreline. Each assorted scheme will be photographed for future analyses purposes.

Photographs: Based on the card sorting activity, please select the shoreline (one) that best matches your ideal shoreline from the photographs provided. If no photograph matches your ideal shoreline, draw what your ideal shoreline looks like to you on the back of this paper. Please write down the number associated with the photograph here: _ [see Images 1-6, page 11; · None of the above images (please draw) - Note: only 2 people drew responses.]

APPENDIX B

Demographics [many questions are open-ended]

Age

Sex

Place of residence (city, county)

Length of residence (in months/years)

Do you live there year-round or just part of the year (circle response)?

- YEAR-ROUND
- PART OF THE YEAR

Do you own waterfront (shoreline) property (circle response)?

- YES
- NO

How far do you live from the shoreline (in feet/miles or on)?

How often do you visit the shoreline (circle response that most closely aligns)?

- DAILY/ALMOST DAILY
- ONCE A MONTH
- ONCE A YEAR
- SEVERAL TIMES A YEAR
- NEVER
- I DON'T KNOW