

Landowner experiences with soft shore projects in Puget Sound

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Abstract

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Soft shore projects have been implemented in Puget Sound as alternatives to hard armoring structures to ameliorate armoring-associated physical and ecological impacts. Private landowners steward the majority of Puget Sound shorelines and their perspectives are critical to informing management. Using qualitative research methods this study examined landowners' decision-making and evaluations of their implemented soft shore projects. Semi-structured interviews were conducted at 12 sites with 15 participants. Decision-making was focused around fulfilling goals of erosion control and securing access to the beach. A dozen other factors were involved with decision-making that varied across experiences. Landowners' evaluations of projects covered a broad range of themes including site-specific aspects, focused on erosion control and maintenance, and external impacts, including interactions with neighbors and neighboring sites. Experiences were also shaped by the broader management contexts including permitting and guidance, and respondents shared many ideas for improvements. There was variation observed in landowner goals, concerns, and overall evaluations. Incorporating the experiences and knowledge of local stakeholders helps foster shared understandings, expands the dialogue of what is considered important to landowners, gives implications for management grounded in real-life experiences, and demonstrates the value of attention to the social context within which shoreline management is embedded.

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This thesis is dedicated to my nieces and nephews, and all the future generations, who I hope get to play in the Puget Sound and enjoy the food that comes from it as I have been able to.

“That is, we need to show that adaptive management can create feasible accommodations for those who gain their livelihood from the land and waters, property owners, public officials, and environmental activists – as well as scientists.”

Kai Lee (1999, p. 14)

Introduction

Some of the most complex challenges for policy-makers and scientists today occur at the nexus of human and natural systems (Dillard, 2010). The concept of socio-ecological systems integrates the interactions and feedback between ecological and social dimensions (Folke, Hahn, Olsson & Norberg, 2005). Under this paradigm a community weaves both dimensions into one place-based system (Dillard, 2010). Management of socio-ecological systems requires an understanding of the whole community, not just the individual parts (Folke et al., 2005).

Nearshore systems are illustrative of the concept of socio-ecological systems. Human communities consume the ecosystem goods and services the nearshore provides, yet human activities can severely impact the systems providing those benefits (Yoskowitz & Russell, 2014). A major physical change to Puget Sound from human development is the modification of shorelines by armoring, usually in the form of concrete or rock bulkheads (Fresh et al., 2011). These are put in for a variety of reasons including erosion control, access, and landscaping (Shipman, 2010), yet they can impact the physical and biological conditions of the nearshore environment in a variety of ways depending on the design and location (Williams & Thom, 2001; Rice, 2010; Sound Science, 2007; Shipman, 2010; Heerhartz, Toft, Cordell, Dethier, & Ogston, 2015).

One alternative to harder armoring is the use of soft shore methods. Soft shore protection uses natural materials like logs or sediment in designs more similar to natural beach processes (Johannessen et al., 2014). Soft shore projects have garnered interest (Shipman, 2010) and the updates required by the Shoreline Management Act call for the preference of softer methods to

hard methods where alterations occur (Carman, Taylor, & Skowlund, 2010). There have been reports covering soft shore projects, mostly focused on site assessment, design assessment, or other physical performance of the projects (Zelo, Shipman, & Brennan 2000, Johannessen et al., 2014, Gerstel & Brown, 2006). Less attention has been given to the experiences and perspectives of landowners who have already implemented soft shore projects. Yet landowners are a key stakeholder in both the projects and in the overall health of Puget Sound since approximately 57% of the shoreline in Puget Sound is under private-residential ownership (Coastal Geologic Services, 2014).

Given the importance of considering both social and ecological dimensions, as well as the continual learning and adaptation needed within complex socio-ecological systems (Folke et al., 2005), this research looks into the experiences of landowners who have installed soft shore projects. Themes important to landowners emerged through the use of semi-structured interviews asking open-ended questions. The three main research questions addressed both the process and outcomes of experiences:

- a) What were landowners' motivations in pursuing these projects?
- b) What were the important factors for landowners in deciding to do the project?
- c) How do landowners evaluate their projects post-implementation?

The purpose of this study is to provide insight into landowners' experiences with their soft shore projects to improve the implementation and management of shorelines on private residences in Puget Sound. Understanding landowners' decision-making and evaluation of these projects gives grounded implications for management based on real-life experiences from multiple perspectives. This understanding can help guide outreach or ensure sustainable

management. More broadly, the study also contributes to understanding the social dimensions within a complex socio-ecological system: the shorelines of Puget Sound.

The organization of this thesis is as follows: Chapter 1 covers the background and literature relevant to this research. Chapter 2 discusses design, methods, data collection, and caveats of the study, including a section on interpreting analysis and organization of results to guide the reader. Chapter 3 provides the results and discussion of decision-making. Chapter 4 includes the results and discussion on evaluation post-implementation. Chapter 5 describes results and discussion of the evaluation of broader management dimensions. Chapter 6 contains the summary, management implications, and conclusions. Appendices include all other relevant material.

Chapter 1: Background and literature review

Background on nearshore function and shoreline armoring

The Puget Sound nearshore

Puget Sound (or “the Sound”) is a fjord-like estuary in Washington State.

The Sound contains over 2,500 miles of shorelines that form a diverse and productive environment

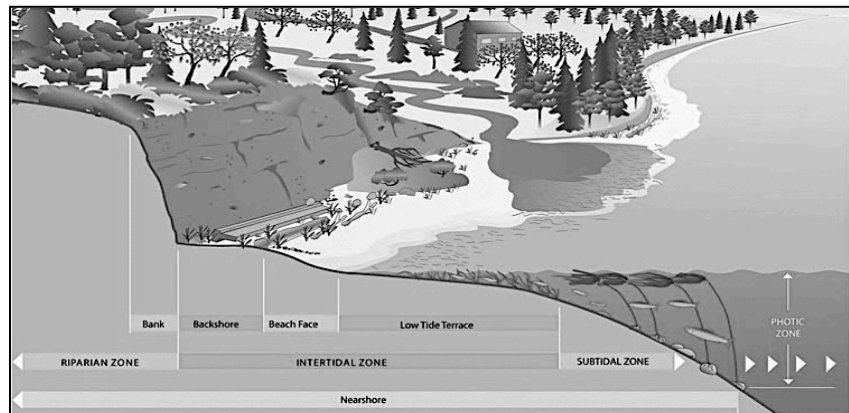


Figure 1. Diagram of the Puget Sound nearshore, from the upland bluffs and backshore to the end of the photic zone. Source: <http://www.pugetsoundnearshore.org/graphics/cross-section.jpg>

(Cereghino et al., 2012). The Puget Sound nearshore, from the backshore to the end of the photic zone, is the vital connection between terrestrial, freshwater, and marine systems (Fresh et al., 2011) (See Figure 1). Critical habitats on the nearshore include eelgrass beds, tidal marshes, and

wetlands (Williams & Thom, 2001). Federally listed endangered Chinook salmon and other salmonids use the shallow water of the nearshore during migration and juvenile stages. Forage fish spawn on the upper tidal, and waterfowl use this transitional habitat for foraging and perching (Sound Science, 2007). Processes such as nutrient cycling, groundwater exchange, and the provision of sediment to the beach are physical processes occurring at the nearshore (Williams & Thom, 2001). Vegetation on the shoreline provides sediment stability and filters runoff. Overhanging vegetation can improve microclimate conditions for surf smelt eggs and delivers terrestrial detritus along with invertebrate prey to the marine environment (Williams & Thom, 2001). Eroding bluffs are the main source of sediment to Puget Sound beaches, although streams and rivers may also provide sediment in certain areas (Shipman, 2010).

Shorelines are socio-ecological systems; in order to manage these systems the complex relationships between human and ecological components must be understood (Kittinger & Ayers, 2010). Human communities derive many benefits from the Puget Sound, including commercial fisheries, commercial aquaculture, recreation, tourism, marine transportation, culturally important shellfish, and a sense of place (Wellman, Biedenweg, & Wolf, 2014). Many of these benefits are linked to the use or existence of the nearshore environment. The views, proximity to water, and ability to access the beach are benefits that attract people to live near the shore (Zelo et al., 2000). The socio-ecological condition of Puget Sound is critically linked through many pathways to the nearshore.

Impacts of shoreline armoring on the nearshore

The last century of development in Puget Sound has produced key physical changes to the nearshore including: the reduction of area in river deltas with dikes and armor, a loss of coastal embayments, a loss of tidal wetlands from filling and dredging, and modifications of

beaches by armoring (Fresh et al., 2011). Shoreline armoring is the building of seawalls, revetments, jetties or other structures (Sound Science, 2007). As Fresh et al. (2011) states, present-day Puget Sound shorelines are less natural, reduced in length, and less complex. Approximately 27% of Puget Sound is armored, although rates vary across sub-basins and shoreforms (Fresh et al., 2011).

The impacts of shoreline armoring are challenging to quantify because of the collective nature of these impacts, the time required to see an effect, the dynamic nature of beaches, and the challenge of separating out other impacts of development, such as de-vegetation (Shipman, 2010). Potentially the largest impact of armoring is the sheer reduction of sediment delivery to beaches and subsequent indirect impacts on overall sediment within a drift cell (Williams & Thom, 2001). Williams and Thom (2001) also noted the alterations of the amount and type of sediment on the beach over time can change and/or reduce habitats and that hard structures can exacerbate on-site erosion because wave energy is deflected down onto the area in front of a bulkhead, causing winnowing of the beach sediment and flattening beach profiles (Williams & Thom, 2001). Shoreline structures can also exacerbate erosion down-drift of a structure (Shipman, 2010). Armoring can reduce or eliminate the entire upper shore, especially when placed lower on the beach (Williams & Thom, 2001). Shipman (2010) points out the hardening the shoreline cannot stop erosion occurring seaward of a structure and gradually narrows the beach, an impact that takes many years to observe. And finally, there is a loss of the connection between marine and land systems that can impact groundwater, nutrient transfer, and movement of species (Shipman, 2010).

These direct physical impacts of altering shoreline geomorphological processes, and reductions of habitat area, lead to effects further up the food chain. Armoring can impact

spawning habitat by altering sediment type and reducing upper beach habitat (Fresh et al., 2011). Rice (2006) found that the proportion of smelt eggs with live embryos on a paired armored site was half of what it was on the unarmored site. There were less suitable microclimate conditions for surf smelt embryos on the armored beach, potentially due to the loss of overhanging vegetation rather than armoring itself (Rice, 2006). Toft, Cordell, Simenstad, & Stamatiou (2007) found armoring can impact the fish assemblages, especially when structures protrude lower into the tidal zone, and that salmon diets at armored sites had less terrestrial riparian insects.

Heerhartz, Dethier, Toft, Cordell, & Ogston (2014) found armored sites, in comparison with paired unarmored sites, had reduced intertidal zone, less large wood, and reduced beach wrack (the vegetative detritus important to primary consumers). In the study there were major differences between the abundance of vegetation on the backshore on armored versus unarmored sites (6% mean on armored versus 70% on unarmored), which likely contributed to the observed reduced terrestrial vegetation on armored beaches. Less detritus on the beach of both terrestrial and marine origin translates to less food and shelter for invertebrates (Heerhartz et al., 2014). Heerhartz et al. (2015) reported reduced invertebrates on armored beaches and changes to the invertebrate community composition. These changes can eventually impact other parts of the food web (Heerhartz et al., 2015).

The role of single-family residences in shoreline management

Armoring is put in for a variety of reasons related to human use of the shoreline, including marine transit and erosion protection (Scyphers, Picou, & Powers, 2015). Rationales for armoring related to erosion include protecting bluffs, preventing flooding during storm

events, or maintaining fill (Shipman, 2010). Other motivations include access to the shoreline, landscaping, and property values (Shipman, 2010). As Shipman (2010) points out, within Puget Sound, armoring is functional because of the relatively low energy of waves, erosive nature of many beaches, and high shoreline property values. This underscores a challenge of shoreline management: armoring impacts the ecological function in Puget Sound, but has historically been and continues to be part of nearshore development for social reasons. Shoreline management has similar challenges to other wicked planning problems, first described in Rittel and Webber (1973), including a “...*plurality of objectives held by pluralities of politics...*” (p. 160).

Within the Sound, approximately 57% of the shoreline length is private-residential (CGS, 2014). Construction of shoreline armoring structures, like bulkheads or rock revetments, is often associated with the building of single-family homes (Carman et al., 2010). Approximately 48% of residential shoreline parcels are armored¹ and in local areas these rates vary; in King County 80% of all residential parcels are armored (CGS, 2014). Puget Sound is a region expected to see rapid growth (“Forecasts,” n.d.) and this will likely result in increased development on the shoreline (Shipman, 2010). Private property owners have and will have a vital role in the management and stewardship of shorelines within this context.

Background on soft shore projects

Soft shore methods definition

There are multiple definitions of soft shore. The following are principles of softer projects (Gianou, 2014):

- Use of natural and locally-derived materials rather than artificial materials or structures

¹ “Armored” is defined here as over 20 feet of shore armor

- Similarity to surrounding beach characteristics and original conditions
- Preservation or enhancement of connectivity between upland areas through overhanging vegetation, large woody debris, or sediment
- Use of methods which preserve natural movement of sediments, including accretion and erosion, as well as the accumulation of beach wrack and sediments
- Lower beach gradients than sites with hard armoring
- Maintained dynamic nature of the beach to accommodate short and long-term change
- Use of finer or softer sediments as opposed to large rock, which are either imported or allowed to erode (at a lesser rate) (Gianou, 2014)

Soft shore designs have been categorized into three main types, but can combine multiple methods including large wood placement involving the anchoring of logs, reslope/revegetation to upland areas, and beach nourishment with sediment (Johannessen et al., 2014). Soft shore can also be defined by what it is not. It is not concrete bulkheads, rock revetments, or log bulkheads (Gerstel & Brown, 2006). These definitions of soft shore alternatives show how techniques can vary, but all deviate from traditional hard armoring.

Soft shore designs have emerged as an engineering alternative to the building of concrete bulkheads. In recent guidance on soft shoreline stabilization, Gianou (2014) states “*The management intent of soft shoreline stabilization is to permit projects that balance the need for erosion protection while maintaining and enhancing shoreline ecological functions*” (p. vii). A recent survey of shoreline landowners found that 39% of landowners on unarmored sites said they were “*very*” or “*somewhat likely*” to install soft shoreline protection (Applied Research Northwest, 2014). Softer engineering designs are not going to be suited to all sites (Johannessen et al., 2014), but they are one alternative in an array of alternatives, including setbacks, drainage control, or harder armoring.

Regulatory context of shoreline management

Two primary state regulations guide shoreline management: The Shoreline Management Act (90.58 Revised Code of Washington) and the Hydraulic Code (77.55 Revised Code of Washington). Other regulations or permissions come into play on a more site-specific basis (Carman et al., 2010). The Shoreline Management Act (SMA) is administered by the Washington State Department of Ecology (DOE) to provide coordinated planning “*to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines*” (RCW 90.58.020). DOE develops guidelines that form the basis for developing local Shoreline Management Plans (SMPs) that are implemented in cities and counties across Washington State (Carman et al., 2010). Local governments have been updating their plans after new SMP guidelines were released in 2003 (Gianou, 2014).

The experiences of landowners within this study may or may not have been under new guidelines, depending on the status of the updates of their local SMPs at the time of the project inception. Regardless, this discussion shows the current regulatory context in relation to soft shore stabilization. The new updates to local SMPs required by the SMA give preference to modifications with less of an impact on ecological function, and preference to soft shore approaches over hard approaches, where modifications occur (Carman et al., 2010). Washington Administrative Code (WAC) 173-26-231 (3)(a)(iii)(E) states when there is a need for modification: “*Soft approaches shall be used unless demonstrated not to be sufficient to protect primary structures, dwellings, and businesses*”(WAC 173-26-231). The review of projects under the new SMPs is likely different depending on whether the project is a replacement of an existing structure or placed on a natural site (Gianou, 2014).

The Washington State Hydraulic Code requires the issuance of a Hydraulic Project Approval (HPA) permit prior to a project (Carman et al., 2010). WAC guidelines state “*The purpose of the HPA is to ensure that construction or performance of work is done in a manner that protects fish life*” (WAC 220-660-010). The Hydraulic Code Rules were updated in 2014 and include updates on bank stabilization in saltwater (WAC 220-660-370). Other regulations can be pertinent, but are dependent on the site-specific factors of the project. Consideration of the Army Corps of Engineers is necessary when activities go below Mean High High Water (MHHW) in marine waters (Carman et al., 2010). In addition, consideration of the Washington State Department of Natural Resources (WDNR) is needed in areas where there is state owned tidal land (Johannessen et al., 2014). Projects may involve other local, state, federal, or tribal permits or permissions specific to the site or jurisdiction.

Research on soft shore methods in Puget Sound

Efforts started decades ago on alternative designs for shorelines. Three reports of alternative stabilization methods unique to Puget Sound are discussed below. Zelo et al. (2000) documented the designs of alternative shore stabilization methods. The report covered costs, a detailed description of the projects, the design specifics, and a discussion of monitoring and success. The report emphasized the importance of monitoring for improving design, implementation, and identification of issues or maintenance needed (Zelo et al., 2000).

Gerstel and Brown (2006) evaluated soft shore stabilization projects. The main focus of the report was on the effectiveness of the projects in regards to addressing erosion, and also on the designs by examining the site conditions, concerns with the site, design specifics, and construction. The report generated a number of recommendations, including improved physical characterization of the site conditions, streamlined permitting, and better guidelines on design

and materials. Both public and private property owners were asked about their perspectives on institutional barriers, evaluations of the project's success at meeting objectives, and concerns. Homeowner satisfaction was shaped by concerns with erosion, views, cost, and access. The report found permitting was a challenging process for property owners that did it on their own and there were varying degrees of dedication to doing maintenance. The report also concluded more rationale should be given on why soft shore was required and there should be more involvement from local planners. Gerstel and Brown (2006) went beyond the physical evaluation of the projects and their findings gave insight to the potential findings of this study, although the entire focus of this study is focused on landowners' experiences.

In 2014, The Marine Shoreline Design Guidelines (MSDG) (Johannessen et al., 2014) examined 25 case studies of a range of shoreline designs from harder to softer stabilization. The guidelines were developed for multiple reasons, including assisting with decision-making on shorelines, improving construction, and presenting less impactful alternatives to the community. The detailed case studies give insight into how different methods weighed in terms of benefits (i.e. slowing of erosion towards land, enhancing vegetation, cost) and impacts (i.e. nearby erosion, maintenance, covering of intertidal). It gave detailed evaluation of the project design and construction materials used within each method. The benefit-to-impact ratios of soft shore projects were higher than harder methods, and these ratios varied across project types (Johannessen et al., 2014). The focus of the literature on already implemented soft shore projects has been on design, performance, and physical dimensions. There is less of an in-depth understanding of landowners' experiences, both the process and outcomes, with soft shore projects.

Context of sea level rise

Climate change impacts and associated sea level rise should be incorporated into all coastal planning (Adelsman & Ekrem, 2012). It is expected within Puget Sound sea level will rise anywhere from 3”-22” by 2050 and from 6”-50” by 2100 (Mote, Peterson, Reeder, Shipman, & Whitely-Binder, 2008). This rise will likely increase erosion and coastal flooding (Adelsman & Ekrem, 2012; Johannessen et al., 2014). The resilience of the beach in the face of sea level rise depends on a number of factors, including sediment supply and natural beach profiles to allow for the landward migration of all portions of the beach (Johannessen et al., 2014). Rising seas on armored beaches will likely result in a loss of the upper beach, a process called coastal squeeze (Johannessen & MacLennan, 2007).

Management strategies to deal with the impacts of climate change are not limited to stabilization methods, they also include the avoidance and movement of infrastructure to less vulnerable areas (Adelsman & Ekrem, 2012). Some literature from a national level has discussed soft shore methods, specifically nourishment projects, related to managing sea level rise. Kittinger and Ayers (2010) discussed how nourishment projects are costly and not sufficient to address sea level rise. Neumann et al. (2000) states beach nourishment is closer to addressing the fundamental problem of dealing with a need for increased sediment, although cost effectiveness remains a question. Johannessen & MacLennan (2007) point out armoring is not sustainable over the long-term as a strategy with coastal sea level rise, although there will likely be increased demands for hard armoring. Factoring in the impacts of climate change and associated sea level rise in relation to infrastructure can foster sustainable long-term decisions between management options (Johannessen et al., 2014).

Literature review

This literature review covers a broad array of subjects, including adaptive governance, decision-making, and social regulations. The framework of adaptive governance is utilized within this research as a set of principles to address challenges of natural resource management of socio-ecological systems. The literature on decision-making outlines a framework for potential factors involved in decision-making and examples from other arenas. The social regulation literature informs the discussion of broader management evaluations. This research also draws on the previously covered background literature on soft shore projects and the context of shoreline management.

Adaptive governance framework

Adaptive management, a framework that views policies as experiments to be continuously learned from (Holling, 1978), is a commonly used framework in ecosystem management. However, this framework is too limited for this study. Adaptive governance, which arose in part due to issues associated with exclusively science-based management, incorporates human-ecological interactions more explicitly and continues the focus on evaluation and feedback (Dietz, Ostrom, & Stern, 2003; Folke, 2007). Adaptive governance involves a variety of practices that differ from traditional scientific management including: the integration of multiple goals, the importance of both scientific and local knowledge, a focus on evaluation, taking into account the diversity of contexts, and a more open model of participation (Brunner & Steelman, 2005).

Many of the reports on implemented soft shore projects have focused on monitoring the more technical and design aspects of projects. As Brunner and Steelman (2005) state, “*Adaptive*

governance also includes the adaptation of policy decisions to experience on the ground as real people interact with each other and the soils, waters, plants, and animals in specific contexts” (p. 19). Other literature related to socio-ecological systems shows the importance of including the social dimension and the risk of overseeing critical elements if discourses are not opened to other stakeholders (Waltner-Toews, 2003). Understanding and incorporating the on-the-ground, context-specific experiences of landowners to inform management follows these adaptive governance principles.

Decision-making

Armitage et al. (2009) states reflecting on the complete experience, both activities and outcomes, can contribute to learning and foster innovative change. This literature covers several applied examples of managing private lands and a framework for decision-making from Stern (2000). Ernst and Wallace (2008) found motivations for land protection varied amongst landowners who conserved private land in Colorado, but motivations were more closely linked to protecting resources and community objectives. Kurtz and Lewis (1981) outlined a model for organizing decision-making including three steps: motivations, objectives, and constraints. Motivations to engage in private forestland management included elements such as incomes, investment, and more intangible motivations including aesthetics, or responsibility to future generations. Objectives included production, preservation, or recreation. Constraints involved markets, capabilities, site-constraints, or regulations (Kurtz & Lewis, 1981).

A recent study from Maine on shoreline decision-making found the presence of armoring on neighboring properties was the largest predictor of whether or not a shoreline was armored (Scyphers et al., 2015). When shoreline homeowners were asked about current preferences, the status of the neighboring shoreline had a strong effect on preferences. Often the decision to alter

the shoreline was related to the erosion impact of neighboring bulkheads. This shows the importance of neighboring decisions on influencing on-site decision-making (Scyphers et al., 2015). The examples from applied literature show the complexity of decision-making and diversity of factors involved, including less outwardly tangible elements like neighbors, norms, values, and communities.

Stern (2000) presents a detailed framework that encompasses a wide-range of decision-making factors. Stern's framework is divided into four main categories of factors including attitudinal, habitual, personal, and contextual. Attitudinal factors include values, norms, and beliefs and habit-related factors related to established modes of behavior. Personal capabilities such as time, knowledge, financial resources, or power can also influence decisions. Contextual factors include community norms, external regulations, incentives, technical assistance, or technological constraints (Stern, 2000). Limiting explanations to certain factors precludes a full understanding of the key factors involved in decision-making (Stern, 2000). Having a thorough understanding of decision-making can illuminate the central needs, interests and constraints of landowners and better align outreach or programs (Kurtz & Lewis, 1981).

Social regulation framework

The framework from May (2002) gives guidance on how to relate the broad management evaluations, which arose in interviews, to a larger body of literature. Social regulations are those which dictate what actions need to be taken by individuals or firms for the public good. Social regulations, including shoreline management, set out the rules and administration of the regulation. The four principles for assessing social regulation include legitimacy, efficiency, equity, and effectiveness.

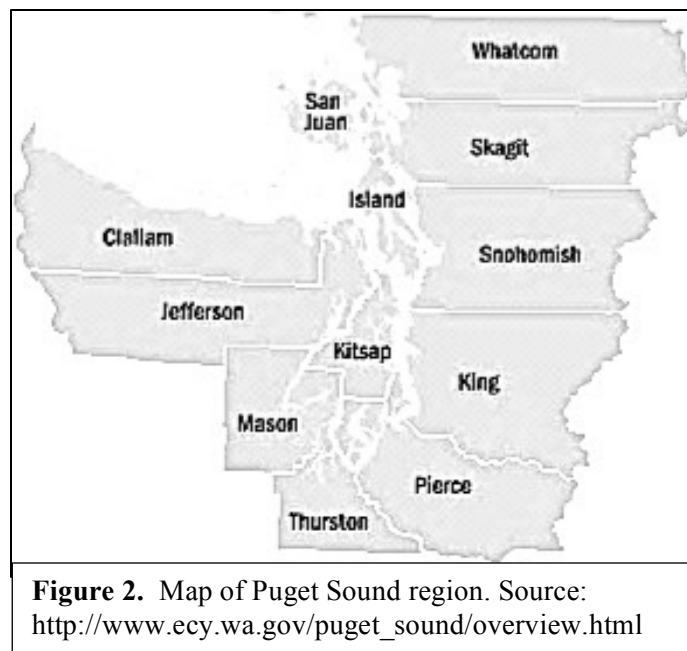
The following paragraph is adapted from content within May (2002) and describes each of the social regulation principles. Legitimacy is the perception of the regulation as a reasonable and necessary requirement, which ties into willingness to follow regulations. Another contributor to the principle of legitimacy is the general trust in the governing body. The principle of efficiency relates to benefit-to-cost ratios of the regulation and achieving outcomes at the least-cost method. Equity of social regulations is connected to applying rules consistently when situations are the same, while allowing for exceptions where qualified. Effectiveness has to do with having funds to ensure rules are followed, having rationale requirements, and cooperation in abiding with regulations. The concept of manageability also ties in with effectiveness; as impacts are spread out and cost-benefit ratios are challenging to quantify, the regulations become tougher to manage (May, 2002). The framework for evaluating social regulations helps connect discussions about broader management contexts to larger principles of equity, efficiency, effectiveness, and legitimacy.

Chapter 2: Design, methods, and caveats of the study

Sampling and data collection methods

Study scope

The study scope included landowners in Puget Sound who had implemented soft shore alternatives on their shoreline. The geographic area was limited to the counties in Puget Sound including Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Thurston, and Whatcom.



Snohomish, Whatcom and Thurston counties (See Figure 2). The study was limited to soft shore projects five years or older in order to ensure projects had weathered a storm cycle, since this has been discussed as important to evaluation (Zelo et al. 2000).

Publicly available Hydraulic Project Approval (HPA) permits were used to identify 49 potential projects for inclusion in the pool of potential participants. All soft shore projects were considered within Water Resource Inventory Areas 1-19 from 1997-2009. Projects were considered if they were installed after a bulkhead was removed or on a natural shoreline. In determining which projects were “soft”, any project title listing soft armoring or stabilization, bulkhead removal, or bank protection in the title of the permit was considered. Projects were excluded if they were hard armor. It was often challenging to understand if a project was soft since the wording and descriptions varied greatly and interpreting permit information was difficult. The criteria used was if there were mixed methods on a site, the project was included if over 50% of the project was soft shore. Condominiums or apartment buildings were not included since the focus was on private residential.

The potential pool of projects identified likely represent the lower end of the spectrum of total soft shore projects. This is related to the difficulty in understanding permits, the challenge of multiple definitions of what is “soft shore,” likelihood of missing permits, interpreting the content of permits in regards to the project design, or errors within the database. It also did not include projects less than five years of age or before 1997. From the pool of 49 potential projects identified through the HPA permits the pool was reduced to 34 projects since many names did not match the address or the information was incomplete. This may have biased the sample towards younger projects because older projects had more of a chance to change ownership.

The sampling method used within the study was purposive. In purposive sampling, the goal of the study is the guiding principle for how to design sampling as opposed to the ability to create a statistically generalizable sample (Patton, 2002). In relation to the purpose of understanding decision-making and evaluations, it seemed appropriate to include as many participants in as varied of situations as possible. The intent was to have an in-depth focus across a wide breadth of experiences. Potential participants were not selected from the potential pool randomly, instead all were sent introductory letters. The projects were not stratified by jurisdiction or project type.

Data collection process

The Institutional Review Board at the University of Washington reviewed this study. The Human Subjects Review Coordinator approved this study under minimal risk on November 17, 2014 under application #48599. Letters of introduction to potential participants to voluntarily participate in the study (See Appendix C) were sent out in January 2015. After consulting with advisers, a second round of letters was sent at the beginning of April 2015 to potential participants who had not yet responded. If respondents agreed to participate, a follow up phone call or email was used to answer any questions respondents had ahead of time and schedule a meeting.

Respondents were able to choose where they wanted to be interviewed, and thus interviews took place on or off-site. Prior to interviews the process of informed consent was followed (See Appendix B for consent form). Participants were informed the study was completely voluntary, would be kept confidential, that any identifying information would be removed from transcripts, and only non-identifying quotes would be used to ground the research. They were also informed the data would be used for future publications. A few important

contextual notes were kept during the interviews and included the general beach type (bluff or low bank) and the general type of project (beach nourishment, bulkhead removal, revegetation/reslope, large wood placement), although these were kept general enough so as not to be identifying. Participants were informed the above general beach information would be noted, but no photos would be taken. A total of 12 interviews with 15 participants were conducted between March and May of 2015. Interviews were audio-recorded and transcribed verbatim by the author, although identifying information was removed from the transcripts. Audio-recordings were deleted within 30 days of recording. Given the diverse site conditions and experiences just within the sample, and the overall small sample size, this study cannot be considered representative of or generalizable to all landowner experiences with soft shore projects in the Puget Sound region.

Data collection method

This research employs qualitative semi-structured interviews using open-ended questions to answer the research questions. Qualitative interviews help the researcher to gain an in-depth understanding of experiences, processes, and the many perspectives on a topic (Rubin & Rubin, 2005). Survey methods were not used because it would presume ahead of time what the important questions were to ask and interviews allowed the researcher to adapt and probe deeper during data collection (Bliss & Martin, 1989). Questions were framed in an open-ended manner to reduce interviewer bias towards certain subjects or themes based on their prior experiences (Schuman & Presser, 1981). The interview guide (See Appendix A) was developed with guidance from the thesis committee, input from other advisors, and one shoreline landowner not included in the study.

Data analysis methods

This research uses content analysis, a qualitative analysis method, to identify the key themes and patterns from the data (Patton, 2002). In the process of content analysis the transcripts are analyzed to reduce the data into the main messages derived from the total content. The analysis was issue-focused as opposed to case-focused; it examined similar themes across cases (Weiss, 1995). A method to facilitate analysis is coding, the process of capturing the essence of the research story, finding patterns, and isolating themes (Saldaña, 2009). The transcripts are thoroughly analyzed line-by-line, categorized into different thematic topic areas, and codes are used to capture the abbreviated content of the topic areas. Within each code the process of content analysis examines the commonalities, contradictions, or missing information of the theme (Tesch, 1990). Atlas TI software was used to facilitate the process of coding.

Codes were first developed inductively following grounded theory methods, whereby the transcripts were read by the researcher and coded based on the meaning derived from the text (Glaser & Strauss, 1967). In this method the codes emerge from the text and subtext organically. The purpose of completely generating codes inductively was to not limit codes to preconceived notions of what would be discussed. After analyzing the first eight interviews, ninety codes had emerged. These codes were cross-examined for repetition between the codes developed inductively and deductively to create a full list of codes. The transcripts were then re-coded based on this new coding scheme. The remaining four interviews were analyzed using this coding scheme and any new, inductively developed codes were then applied to see if they were found in previously coded interviews. It was important to return to previous interviews again to recode based on a full coding scheme developed by all the interviews, because often coding of one interview can influence the coding of another (Saldaña 2009). Codes were organized into

categories in a time-linear fashion according to the way a landowner would move through the process of implementing a soft shore project (e.g. motivations, decision-making, evaluation). The final coding scheme is located in Appendix D.

Interviews were all coded twice by the researcher and then returned to for the purposes of checking consistency between coding sessions. Analysis consisted of two main steps as outlined in Rubin and Rubin (2005). First, analysis summarized the variation and commonalities within each theme, even if infrequently mentioned. This stage of analysis is presented in the results sections. The second stage of analysis connected these findings to other literature, developed the narrative to answer research questions, and discovered connections to broader implications. This is presented in the discussion section following the results (Rubin & Rubin, 2005).

Caveats and limitations of the study

This study was limited in size and therefore not representative or generalizable to the experiences of all landowners with soft shore projects in Puget Sound. Given the small number of participants sampled, it is not possible to say that the sample covered the full range of experiences. There are also several considerations for bias within the sample collected. First, it could have been biased towards younger projects because it is more likely that older projects had been sold. There is also potential for a response bias from participants, both that landowners who had either positive or negative experiences were motivated to participate. Other bias could result due to having differing rapport with each interviewee, interviewer bias, and interviewer interpretation bias (Crouch & McKenzie, 2006).

Interpreting analysis and organization of results

Division of analysis

The analysis is organized into three main chapters of analysis: decision-making, evaluation post-implementation, and broader management dimensions. In each results section a table outlines the major themes and related sub-themes. These themes emerged from inductive coding and represent all of the discovered themes within each category of results. They do not imply that these themes were present in all interviews. Within each chapter there are two related results sections followed by a discussion. This follows the outline of the two stages of analysis outlined in Rubin and Rubin (2005) as discussed above. The results present all the variation and subthemes whereas the discussion connects these findings to the research questions, other literature, and implications.

Interpreting quantitative measures in the analysis

When interpreting the analysis it is valuable to consider how the semi-structured nature of the interviews leads to wide variations in responses. For example, although erosion processes were not specifically queried for, many landowners went into depth describing these processes. This makes it challenging to interpret the prevalence of this theme across interviews because the variation in responses could be the result of not being prompted, or because it was not as important to the experience. The open-ended nature of the questions was both a benefit and a drawback; it reduced the influence of the research questions, but in turn meant themes were not covered in a consistent manner. Therefore, if five landowners mentioned cost as a consideration it may not necessarily mean it was not a consideration for others.

When possible, counts were given to show prevalence of themes (i.e. how many landowners talked about access as a motivation). However due to the lack of standardized questioning, as discussed above, and the variation within subthemes, these counts should not be interpreted as directly ranking relative importance. Each perspective, regardless of whether it was shared by others, warrants inclusion. If a theme surfaced during interviews at all, it signified some degree of importance to a landowner's experience. Interpretation of the analysis should focus on the detail and descriptions given by landowners of their experiences. However, the counts in some cases do give a relative idea of how themes were distributed across interviews. For example, if five landowners mentioned access and ten mentioned erosion, it showed the relative dominance of the concern over erosion. But for example if five respondents mentioned ecological factors and four mentioned aesthetics factors, that gives little implication for comparing the relative breadth of these themes. Methods such as surveys can more accurately give this type of information.

There are two important logistical notes to clarify prior to analysis. First, the words a "couple" and a "few" are used in a standardized manner to imply two respondents. The use of "several" was standardized to indicate three. Secondly, in interviews with two participants both voices were considered part of the same "case." So even though 15 participants were in the study, two people participating in one interview were treated as one "landowner experience." Sometimes opinions could differ between two participants in the same experience and these differences were incorporated.

Outline of results

The research questions, underlined below, are linked with their respective sections of analysis.

The following is an outline of the organization of results and discussion:

Decision-making

Research Question 1: What were landowners' motivations in pursuing the projects?

Research Question 2: What were the important factors for landowners in deciding to do the project?

- i. [Results Part 1](#): Motivations for doing a project on the shoreline
- ii. [Results Part 2](#): Decision-making factors
- iii. **Discussion of decision-making**

Evaluation post-implementation

Research Question 3: How do landowners evaluate their project post-implementation?

- i. [Results Part 3](#): Evaluation of site-specific dimensions
- ii. [Results Part 4](#): Evaluation of external impacts and interactions
- iii. **Discussion of site-specific and external impacts and interactions of projects**

Broader management dimensions

- i. [Results Part 5](#): Evaluation of permitting
- ii. [Results Part 6](#): Evaluation of broader management context
- iii. **Discussion of broader management dimensions**

General site information

All projects were alternatives to hard armor, yet it was challenging to categorize them since no analysis was done on the design and some interviews were off-site, so only descriptions were given. One project was a bulkhead removal followed by soft shore. Most projects loosely fell into the large wood placement with some elements of nourishment. One project was largely a re-vegetation/enhancement project and it did follow softer principles and so was included. The sites included in the study were a mix of bluff and beach (no/little bank) sites (seven and five respectively). Seven counties were represented in the sample.

Chapter 3: Decision-making

Results Part 1: Motivations for doing a project on the shoreline

This section addresses the question of why landowners were motivated to implement a project on their shoreline. Decision-making between alternatives is addressed in the next section.

Table 1: Summary of themes related to motivations for doing a project on the shoreline

Theme	Sub-themes covered
Access	Providing access; maintaining access
Erosion	Erosion as a motivation for doing a project; processes of erosion; desired degree of erosion control; connection between erosion and stewardship;
Other motivations	Improving aesthetics/property value; ecological function

Access

One motivation that contributed to initiating a project, discussed in five of the interviews, was improving or maintaining access to the beach. This included improving pathways to the shorefront, allowing for access to the beach, or maintaining access despite erosion. Although loss of access was often linked to erosion, this motivation is different from erosion control in that the ultimate motivation is access to the beach.

Erosion

Erosion was mentioned in all but one case to be a motivating factor for doing a project. Of the landowners motivated by erosion almost all discussed tangible observations of erosion. Several other sub-themes relating to erosion emerged from the interviews, including processes influencing erosion, desired degree of erosion control, and connections to stewardship.

The processes contributing to erosion and observations of erosion were discussed frequently. The sites included in the study were a mix of beach and bluff sites and the following

discussion is divided between these two types.² Of beachfront properties erosion factors discussed included storm events, general beach conditions (wave energy, composition of the beach), and neighboring bulkheads. Bluff landowners discussed a wide range of factors influencing erosion including marine front factors (wave energy, impact of nearby armoring) and sub-aerial factors (conditions of the bank, height of the bank, runoff). The most commonly discussed factor was marine induced erosion at the toe of the bank, but there were varying viewpoints of the importance of upland influences. For one landowner, marine induced erosion was the most important source of erosion, along with weather events, as opposed to upland issues.

“The toe of the beach is the important part. Once it is gone, the footing, it’s like taking the footing out from the bottom of a house, it’s going to tip to the direction where there is no footing.”

Another respondent emphasized the impact of human induced erosion because of runoff, as opposed to the conditions at the beachfront.

The impact of bulkheads was discussed at both beach and bluff sites as having impacts on beach sediment and erosion processes. Two landowners discussed how bulkheads exacerbated erosion at the ends of the property because of increased scouring around the edges of the bulkheads. In several other cases it was noted bulkheads generally impacted the beach.

The desired degree of erosion control was described in varying ways. For one landowner it was to stop erosion:

“(….)we really needed to do something to protect it and stop the rate of the erosion at the bottom of it.”

For another landowner it was to make erosion go more slowly:

“(….) just make it more slowly and make it mimic nature(….)”

² See Johannessen and MacLennan (2007) for description of differences in processes

And yet for another respondent the project transformed their objective as it relates to erosion:

“I think that the original goal was to have a top to bottom protection for the bank and that it, nothing would ever move. And once I put that aside I think this has less protection, or less obvious protection, I’m told it is better for the shoreline, and it is working.”

The description of the desired degree of erosion control listed above indicates a range of desired outcomes related to erosion control.

Another subtheme was the connection of erosion to other larger ideals of stewardship of shoreline trees or future generations. Several landowners talked about their desire to preserve shorefront trees and how this was ultimately connected to the motivation for controlling erosion. One landowner talked about how protecting from erosion connected to broader themes of preservation:

“(…) this erosion isn’t going to affect me in my lifetime, but I think if there is a way you can preserve the (location), preserve the beauty, then do it.”

Erosion control connects to themes beyond protecting infrastructure or access and can connect to values of stewardship.

Other motivations

In most cases, ecological and aesthetic factors were discussed during the decision-making process over what type of project to do, not as a main motivator for doing a project. However, for one landowner in particular the idea of improving or enhancing functionality of the shoreline as it would be in natural conditions contributed to the motivation for doing the project.

Another landowner’s motivations included improving aesthetics and enhancing the ecological function.

Results Part 2: Decision-making factors

For organization of the results, decision-making factors are divided into two categories: 1) factors involved in deciding what type of project to do (see Table 2) and 2) factors important in implementing the project (see Table 3). The division between these two categories is not rigid as factors involved with alternatives could be involved with implementation or vice-versa. The initial motivations from above, mainly erosion and access, still factor into decision-making since the ability to meet those project goals was paramount to the landowner undertaking a project.

In discussing decision-making on shorelines it is critical to understand the alternatives landowners were considering. In three-quarters of the cases landowners mentioned at some point considering hard armoring. Considerations of hard armor in decision-making was often related to other themes, like aesthetics, and are included within those themes below. The factor “bulkhead function” only covers how hard armor was discussed in relation to project performance.

Knowledge of soft shore alternatives also varied and likely influenced decision-making. Two landowners mentioned having prior knowledge of soft shore before entering the decision-making process and half of the landowners mentioned learning about soft shore alternatives during the process. This seemed to indicate less prior knowledge of soft shore alternatives before initiating a project.

Table 2: Summary of themes related to decision-making factors between project alternatives

Theme	Sub-themes covered
Aesthetics	Natural aesthetics; avoiding certain aesthetics; intrinsic value of naturalness
Agency position	Influence/interactions with agencies; direct influences; indirect influences
Bulkhead function	Bulkhead as proven method; as less effective in long-term
Cost	Lack of cost consideration due to limitations/need; comparing cost with alternatives

Ecological impact	Reducing ecological impacts; enhancing ecological function
Examples	Learning about examples of soft shore projects;
Neighbors	Influence of norms; collaborative efforts
Site assessment	Geohydrologist site assessment

Aesthetics

Aesthetics was a consideration in half of the interviews, whether it was creating an aesthetic or avoiding an aesthetic. Desired aesthetics were linked to a natural aesthetic, the use of natural materials like wood, or simply an improved aesthetic.

“That was the beauty of that lot was the natural look. We had lots of cedar trees and fir trees so we wanted to preserve that.”

Avoiding certain aesthetics also played a role. For one landowner avoiding the aesthetics of splitting bulkheads played into the decision. Improving aesthetics were also linked to improved property value for one respondent. Although aesthetics were linked to a sense of naturalness, the natural condition of a site also held intrinsic value separate from aesthetics for several landowners.

Agency position

Agency position refers to the interactions or influence of state or local agencies involved with implementing shoreline regulations. The position of the agency was a decision-making factor in the overall process that could be direct or indirect and was only absent in two cases as an integral part of the decision-making. In half of the cases, landowners were told they could not do a bulkhead and their decision-making was dominated by this factor. As this quote below describes:

“...Because there was really only one method allowed(...), I think cost might have been a consideration if there were choices, but there weren't choices so, whatever you could do you had to do.”

This demonstrates how the position of the agency could reduce consideration of other factors.

In four projects the position of the agency was still a factor, although less directly. In one case the influence was unclear, since the landowner seemed to want to follow agency guidelines, regardless of other options. In another case, the alternative of soft shore was suggested at a site visit. In two other cases the landowners considered permitting would be easier with soft shore as compared with hard armor.

Bulkhead function

Discussions over bulkheads was also related to other factors like aesthetics or ecological function covered in other sections. This section only covers how bulkheads were discussed in regards to performance of erosion control. For several landowners the function of bulkheads was mentioned as a factor in their initial decision, although it varied in the way it was discussed. Bulkheads were discussed as being “*proven methods*” of erosion control. In a couple cases, bulkheads were not seen as being effective in the long-term and this factored into decision-making.

“(...) we just could see the inherent risks of building some big huge retaining wall that probably wouldn't be effective in the final analysis anyways(...)”

For another respondent vertical bulkheads were not seen as desirable because they do not dissipate energy gradually and so would cause the waves to undercut the bulkhead over time.

Cost

Costs were mentioned both as less of a consideration or being a consideration in decision-making. In two cases, considering costs was limited by the need to protect the site and lack of other alternatives.

“You know, at all costs (family member) and I really wanted to protect the piece of property. That was the most important thing and so as long as there was somebody out there that had something that they could offer us, even though the cost had seemed high at the time, it doesn’t seem that high now.”

This quote shows how the urgency of getting protection trumped cost considerations. Two landowners thought a solid barrier would be more expensive than soft shore and this factored in to their decision-making.

Ecological impact

Five conversations covered ecological impacts during decision-making over alternatives. For the landowners who mentioned ecological impacts, some saw soft shore as an enhancement of natural beach function, whereas others saw it as avoiding ecological impacts of hard armor. A few landowners talked about avoiding the ecological impacts of a bulkhead.

“(…)I want a path down to the beach and I do want to be mindful of not constructing a structure that is not good for this fairly (descriptor) body of water here. So, then I just began learning about the other kinds of things, much more natural things that we could do with the property(…)”

In another example, learning about soft shore made a bulkhead seem less desirable for environmental reasons.

In contrast to reducing ecological impacts, several landowners talked about how they saw soft shore potentially enhancing the environmental value of their site. In one case the respondent described how part of the design was to create more natural conditions on a site previously manipulated by humans. For two landowners it was the ability to create habitat, including the connection between terrestrial and marine systems, and for forage fish and birds.

Examples

Learning or seeing examples of soft shore projects were mentioned as steps in the decision-making process at both stages. Learning about examples of soft shore projects was sometimes information based: in one case the landowner was given information during an agency site visit, another was able to hear through an outreach event about soft shore, and another read a guidance booklet. Hearing about these examples was a consideration in decision-making, despite in some cases not having other options.

“(…)and we said well you know it has obviously been done other places so, and with success. And again, it came back to, it was the only thing that anybody would ok. And so we decided yeah, that is what we (are) going to have to do.”

Seeing physical examples of projects was also important to the overall process although this theme is covered in the next section.

Neighboring sites and neighbors

Neighboring sites have already been discussed in the section on erosion processes since structures on nearby sites were noted to have on-site impacts. This theme examines the context of the neighborhood, which was influential in creating norms and related to collaborative efforts. The presence of a neighboring bulkhead at one site was attributed to be a reason a bulkhead was the original desire for the project, since it would allow for the ability to match structures. As another respondent remarked, the norm of the neighborhood influenced the original desire to have a bulkhead put in.

“(…)I think that was just part of the culture at the time. You know to build that bulkhead, people could see there was some sloughing, maybe that didn't understand, well we just didn't understand you know how (water) stay healthy. So, I just came to a thought in my head in thinking that, oh gosh, I need a concrete bulkhead too.”

This shows how neighborhood norms could impact decision-making.

Three respondents mentioned an effort to make the project collaborative, which likely influenced decision-making over alternatives, as well as implementation. In one case this did not work out because of different site conditions on neighboring properties. In the other two, collaborative projects made working with neighbors an important part of the process. It was noted the importance of being in agreement with neighbors and also the challenge of bringing in other neighbors who did not see erosion as an issue during their lifetime. Two landowners mentioned how collaborative projects can lead to cost savings of the project.

Site assessment

Finally, one landowner did discuss an assessment by a geohydrologist on the property that concluded a lack of immediate risk. Since this was mentioned as a “*turning point*,” it seemed a critical element of this landowner’s decision-making process.

Decision-making factors related to project implementation

Table 3: Summary of themes related to decision-making factors for project implementation

Theme	Sub-themes covered
Access for construction	Access to the beach; construction time and space restrictions
Design elements	Design elements specifically desired out of project; seeing examples for design
Securing materials	Finding materials; costs associated with materials
Shoreline professional	Finding professional; considering professional

Access for construction

Obtaining access for construction and restrictions to access were steps during decision-making mentioned by four landowners. The specific sub-themes included getting equipment to the beach as well as obtaining permission between access points and the site. One landowner described how having so many properties in between an access point led them to not pursue this

method of access. In another experience the landowner had difficulty with neighbors not wanting them to access the beach. Other access factors were related to limitations on construction. In one instance this was related to the restrictions on space within which to have equipment, and in two instances related to the narrow time restrictions in order to protect fish habitat.

Design elements

This theme covers the specific design elements desired out of the project as well as seeing design examples. Specific design elements desired out of the project are likely related to motivations like fulfilling erosion protection or access. In seven instances, specific design elements came up in regards to what landowners wanted and they varied across cases. Desired design elements included: providing coves for habitat, natural features for aesthetics, the strongest method possible, larger rocks to attenuate waves, large rocks for secure access points, and the removal of historic man-made debris.

Two landowners mentioned how seeing examples during this stage of the process helped define what they wanted for the design. For one landowner they wanted their design to be natural looking and by going to a number of projects they were able to build a picture of what their desired project would look like. Another landowner saw more natural looking projects but decided to go more for a design just focused on serving the purpose of protecting the bank.

Shoreline professional

This theme encompasses finding or considering a shoreline professional, a term encompassing either an engineer or contractor since this distinction was not often made. Hereafter, professional is used to abbreviate the term shoreline professional. There was variation in the ways landowners found a professional: a few were given suggestions by agencies, a couple

through research, and a couple others through personal connections. For one landowner this was a particularly challenging step in the process.

“So I had then to kind of cast about and look at what some other people had done (...) so I just began to kind of learn about, and learn about some professionals here in (location) who had done some kind of alternative work on beaches, so then that took me 2,3,4, or 5 years before I could figure out kind of what was to be done.”

One landowner described how without being given the name of a professional, they would not have known what could be done. Another mentioned how getting guidance from the agency in this regard was helpful. There was a suggestion in another case to have a list of people available who could do this type of work.

Conversations also covered sub-themes related to considering a professional. For one respondent, hiring a professional was associated with cost considerations. Two landowners mentioned the ability of the professional to understand the requirements of regulations. Another two interviews saw previous examples of the professional’s work. These were the sub-themes mentioned in relation to considerations of working with a professional.

Securing materials

Securing materials refers to the process of finding the proper materials and the costs associated with that process. Five landowners discussed finding or securing materials as part of the implementation process. For some, receiving or having materials on hand was mentioned as a positive aspect of the implementation process. In one case the landowner was able to reduce costs by securing free logs and in another example having existing large logs on the beach facilitated the project. Three landowners mentioned the extensive amount of time or effort it took to secure materials. This included finding suitable logs in a variety of ways: from out-of-state,

securing them from nearby areas, waiting for permission from other landowners to acquire logs, or waiting for them to wash up at the site.

Paying for materials was also mentioned as a factor by landowners both in getting materials to the site and the cost of the materials. In one case the challenge of finding materials was closely tied in with the variability in cost estimates. For another landowner the expense of getting and transporting outside materials was a factor in deciding to stick with local materials. Not only were the actual materials costly, but the time and effort spent securing them in order to save costs was an important component of the overall process.

Discussion of decision-making

Landowners were largely motivated to take action on their shoreline to control erosion, usually based on tangible erosion. The importance of erosion in shoreline decision-making is found in other literature. Zelo (2000) found property protection was the most important motivator in a case study on a soft shore project. A survey of shoreline property owners done recently showed the most common concern was erosion (Applied Research Northwest, 2014). Secured or improved access was also central in many cases to motivations for doing a project. Scyphers et al. (2015), in a study on shorefronts in Maine, found water access was ranked lower than effectiveness, durability, or cost. Gerstel and Brown (2006) mentioned the importance of access to landowners. The findings from this study show the critical importance of shoreline access to a sub-set of landowners.

Erosion control was central to landowner motivations in doing a project and some notable points of variance and nuance existed within this theme. Discussions over erosion also linked to stewardship values, like preserving land or shoreline trees, not just protecting infrastructure. This adds complexity to the understanding of landowners' perspectives on erosion control. There

was variance between landowners in terms of their goals over the degree of erosion control desired out of their project, suggesting landowner expectations of erosion control vary along a spectrum of degrees. There was also variance at bluff sites within the ways people described the relative strength of erosion processes between upland issues, like runoff, versus marine front processes. Although site conditions have a strong influence on the different erosion factors, in Puget Sound erosion is usually driven by some combination of upland, sub-aerial, and marine front processes (Johannessen & MacLennan, 2007). Considering all these different processes could help ensure all potential sources of erosion control are addressed.

As Stern (2000) stated the factors involved in decision-making can be diverse and those presented here are no exception. One of the principal factors discussed was the contextual factor of regulation, either directly or indirectly influencing decision-making. Other contextual factors included the influence of neighbors and the availability of design examples. Attitudinal factors—values, beliefs, and norms—were present in themes of ecological impacts and norms of local shoreline management. Personal capabilities—knowledge, financial resources, or time—were present in themes including cost, securing materials, knowledge of alternatives, or access to a shoreline professional. Specific to the factor of knowledge of alternatives, few landowners mentioned knowing about soft shore prior to the decision-making process as opposed to the many landowners who were considering harder alternatives. This difference in knowledge indubitably has an influence on the decision-making process. Learning about soft shore was therefore an important step in the process.

The 12 factors present during decision-making varied widely across experiences and also within themes. The root motivations of doing a project, usually controlling erosion and access, are implied to continue throughout the decision-making process. The position of the agency was

the most commonly present decision-making factor, but the degree and manner of the influence varied. Agencies were sometimes direct in telling landowners not to do a bulkhead, other times agencies encouraged alternatives, or landowners could be indirectly influenced by knowledge of regulations or permitting. Factors beyond agency position were also important to decision-making. Scyphers et al. (2015) study found waterfront landowners perceived natural shorelines were more aesthetic and caused less environmental harm. In this study the factors of aesthetics and ecological impacts were also present in decision-making. Aesthetics connected to natural appearances and ecological factors included enhancement of ecological function, not just reduction of harm. This diversity of and variance within factors demonstrates the value of inductive research through semi-structured interviews in describing details or complexities landowners face during decision-making.

One main derivative of this discussion was the multiplicity of ways neighboring sites influenced decisions, including creating norms, influencing erosion, collaborations, and access. Scyphers et al. (2015) found the most accurate predictor of armoring at a site was the presence of neighboring armoring and that many landowners decided to armor only after having felt impacts from neighboring armor. In two cases neighboring bulkheads were mentioned in connection to erosion on-site. But neighbors had more complicated roles than just impacting the site. One of the primary drivers behind behavior is looking at examples of what other people have done (Schultz, 2011). Neighborhood norms, like putting in a bulkhead, were described to be “*part of the culture,*” and influential in initial consideration of alternatives. Collaborations with neighbors can be challenging due to variation in the physical aspects of a site and different approaches to shoreline management, but vital to the implementation and cost savings of a collaborative project. In Zelo (2000), a detailed case study on one collaborative project, the unity

of the group was a major factor for the successful collaboration and required multiple levels of leadership and involvement. Neighbors were also an important consideration when obtaining access for construction. The multiplicity of ways in which neighboring sites or neighbors influenced the process shows the prominence of the neighborhood context in decision-making processes.

Decision-making was also influenced by factors present during the implementation stage of the soft shore project. Securing materials seemed to be a particularly challenging step during implementation for some landowners. Although in a few cases people were able to secure free logs or had large logs available on site, for others the processes of waiting or finding materials took both time, effort, and contributed to variability in costs. It seemed support finding low cost large logs, as simple as this step sounds, would likely be helpful. Landowners had various ways they found a shoreline professional and several landowners mentioned either the importance of, or wanting help with this step. The theme of desired design elements highlighted the variability in what landowners wanted out of their site. These elements touched on many of the other different themes like relating to ecological or aesthetic values, or motivations like access or erosion. And finally, seeing examples was helpful in deciding on desired designs and in assessing a shoreline professional's work.

When researchers define what is important, it is often defined from their own disciplinary perspective, whereas other actors in the same system will define a different set of important factors (Waltner-Toews, 2003). Factors like shore type, backshore width, wave energy, or project length are important from a coastal processes perspective in selecting an appropriate technique for the shoreline (Johannessen et al., 2014). The subset of landowners included within this study considered different factors during decision-making that were not uniform across experiences.

Bliss and Martin (1989) found in their study on motivations regarding private forestland management that a major contribution of the study was simply identifying variables previously not thought of as important to landowners. This study presents a wide-ranging array of decision-making factors relevant to landowners on their shorelines. Other stakeholders involved in shoreline management, including agencies, professionals, or outreach organizations may benefit from having a better understanding of the considerations and challenges faced during decision-making from landowner perspectives.

Chapter 4: Evaluation post-implementation

Results Part 3: Evaluation of site-specific dimensions

Before discussing site-specific evaluations it is important to reiterate the purpose of this study is not to provide a technical assessment of projects. Evaluations of soft shore designs or methods have been covered in other reports, to varying degrees of quantitative or qualitative assessment (Johannessen et al., 2014; Gerstel & Brown, 2006; Zelo et al., 2000). This research is not attempting to provide that type of assessment. However, respondents discussed site-specific dimensions like the ability of the project to meet erosion control goals or maintenance. So although it is not possible to make any technical conclusions on project performance, it is still important to understand evaluations by landowners. The following table shows the themes related to evaluation of site-specific dimensions.

Table 4: Summary of themes related to site-specific soft shore project evaluations

Theme	Sub-themes covered
Access	Changes in access related to project
Aesthetics	Comparisons with bulkhead aesthetics; aesthetics related to soft shore; specific design elements related to aesthetics
Changes in Materials	Changes in logs; shifts in gravel; anchorage

Erosion control	Evaluation of project meeting expectations of erosion control; vegetation
Financial	Expense or value of project; financial assistance
Maintenance and longevity	Low/no maintenance; past maintenance; maintenance needed; concerns over how to accomplish maintenance; implementation process changes

Access

Evaluations of access were likely implicitly incorporated into other themes since access was related to erosion control and stability of materials. However, there were cases when access was specifically mentioned. For one landowner logs were recruited naturally to the site and hindered access to the beach, whereas hard bulkheads were noted to provide easier access. A couple landowners discussed securing stairways in relation to access. In one case the landowner talked about how having large rocks protecting the base of the stairway was crucial to the protection of access. In another case, the final point of access to the beach was compromised because the materials making the access possible had shifted. Secured access was also described as providing different amenities for two respondents, such as recreational access and wildlife corridors.

Aesthetics

Aesthetics were discussed in relation to comparisons with bulkhead aesthetics, aesthetic changes from soft shore projects, and specific design elements related to aesthetics. Two landowners mentioned the aesthetics of bulkheads, including how bulkheads expand lawns and provide places to sit. Soft shore aesthetics were tied into creating natural designs, gravel placement, and vegetation. This natural aesthetic was described in detail below.

“(...)and it’s also just lovely, you can, when you go down there, you know even to sit on those stones, you know, that is part of that, like this design as it could be and, you know you are also doing something, you are creating, replicating nature and it just looks good.”

One design element described to take away from the aesthetics was the unnatural placement of gravel on the beach, seen to be “*incongruous*” with the rest of the beach. Vegetation was linked to aesthetics and related to challenges with management of vegetation. In two interviews, although growing vegetation on bluffs was linked to aesthetics, it was noted to be difficult. For another landowner vegetation was critical to aesthetics, though continual maintenance required on getting the vegetation to grow was mentioned as being a frustration.

Changes in materials

Changes in materials were often connected to maintenance needs or concerns. In four cases deterioration of logs was specifically mentioned, and in another six cases shifts in logs were mentioned. Concern over these shifts in materials varied across a spectrum. A couple people cited small shifts in logs as part of the design of the project. Some respondents described improvements to anchorage including securing chains, toeing in logs, or adding larger rocks to amend these shifts. Four landowners mentioned how gravel placed on their site had shifted over time. In one case the landowner thought maybe it helped provide spawning habitat, but it still was frustrating to have spent money on something that shifted. Shifts in gravel were linked to a loss of the function of the design in relation to erosion control, again warranting different levels of maintenance. The movement of gravel to the beach was also related to changing the natural character of the beach for a couple landowners.

Erosion control

The theme of the ability to provide erosion control was the most frequently discussed theme related to recommendations, showing the importance of this element to landowners. This logically follows from the centrality of erosion control to motivations for doing a project. As

discussed previously in the motivations of erosion control, it was noted expectations varied amongst some landowners of the degree of erosion control expected or desired. One landowner mentioned how part of the purpose of the project was to allow for some degree of erosion. On the other hand, one landowner felt that because of the differences between what the environment wants (sediment) and what people want in regards to erosion (controlling erosion) it was an “*unsolvable situation*”. These differences show the challenge of interpreting these evaluations without a way to understand what degree of erosion control constituted success.

Evaluations of erosion control also included the sub-themes of vegetation’s role in erosion control and sea level rise. In two examples, both in which erosion was talked about as a motivator for pursuing a project, there was not much discussion over the ability of the project to control erosion. This could be because it was satisfied or because it was less of a concern than shifts in materials or other evaluation factors like access.

Three evaluations were grouped into the negative or uncertain evaluations. In one evaluation there was dissatisfaction with the ability of their project to meet their expectations of erosion control, since the rate of erosion was occurring like before installation. In order for the project to meet expectations at least some improvement with erosion control would need to have been met. Another landowner evaluated their site in the context of future sea level rise.

“And someday somebody might have to put a bulkhead in. Our logs have moved out and we are losing a little ground behind them but it might come to having to do that. And with the sea rising(...)”

Another evaluation was much less definitive and challenging to interpret, because of changes in goals related to erosion control during the process. The landowner described changing their expectations from full protection of the bank and their evaluation was based on a different baseline. Site-suitability (in relation to wave energy, current, and surrounding conditions) was

discussed twice, once directly related to why the project was not meeting expectations of erosion or related to performance overall.

Half of the landowners discussed the project's ability to meet goals of erosion control more positively, but expectations seemed to vary and respondents often placed a caveat of projected duration of the project, which also ranged greatly. One landowner felt they had reduced the erosion significantly, yet the ability to meet this was qualified by the need for continual (every couple years) maintenance. The evaluations also varied to the degree to which they saw changes continuing on their beach. In one case a landowner talked about how small sloughing was maybe actually adding to protection.

"(...)I'm really not seeing much change in the bank at all and what is happening on the bank now is kind of sloughing and the little bit that is happening, kind of sloughs down behind these large boulder and logs so, it's kind of forming perhaps a bit more of a protection there."

This was similar to a landowner who noticed small amounts of sloughing and noted part of the point of the project was to keep a degree of erosion. Another landowner noted the importance of using soft shore to control erosion within the context of sea level rise.

Vegetation was discussed in relation to erosion. Two landowners mentioned how dunegrass was helpful in holding sediment, although in another case it was cited how dunegrass was challenging to get to stay in place. Vegetation was also discussed in the ability to meet goals of maintaining slope stability, in one case being helpful with the addition of a buffer, in another case not being helpful with preventing slides.

Financial

This section aggregates discussions of overall value, investment, and financial assistance into one theme. Costs have already been discussed during decision-making including the cost of

securing materials, in regards to collaborative projects, and costs of a professional. It is also discussed in this section within the theme of maintenance. However, this section focuses on overall financial evaluations, not just where one specific contributor to cost was mentioned.

The overall expense of the project and the value of the project was discussed in a variety of ways. Three landowners mentioned the expensive nature of the project, but also as being a good investment as related to fulfilling original goals (erosion, access) or improving property value. One dialogue revolved around how the soft shore project saved costs compared with harder armor and enhanced property value. Finally, one landowner's overall financial evaluation was that it was not feasible to redo the project given the short longevity.

Two landowners discussed financial assistance. Specifically in terms of funding, one landowner felt like communities should "*more aggressively try to help*" those shorelines with high restoration value. Another respondent mentioned banks would be hesitant to finance this type of work, so a grant or low interest loans would be helpful.

"Yeah, something like that (referring to low interest loan) or maybe more of a government grant, or something like that, with lower interest terms or, the reason I never have thought of it until you asked was because of that one notion that some people wish you didn't have any bulkhead at all and that the shoreline might be healthier without it."

As mentioned in this quote, without all agencies being in agreement about the project it would be challenging to offer financial support from governments. There was also a suggestion to reduce state-level fees for enhancement-type projects. Financial concerns, including the cost of the project and property value, constituted the second most common theme (in four cases) for whether or not people would recommend soft shore. This shows the importance of costs or value to the overall evaluation.

Maintenance and longevity

Maintenance after implementation of the project was tied into sub-themes of low/no maintenance, past maintenance, maintenance needed, concerns over how to accomplish maintenance, and implementation process changes. These discussions were closely tied into the idea of landowners estimating longevity, or the duration of the project before repair and/or maintenance. Maintenance as a theme was present in every interview regardless of whether it was described as a concern.

Several landowners mentioned a low amount of maintenance on their project overall. These were usually tied in with positive expectations of longevity of the project. In these examples small adjustments like fixing chains, anchoring, or just throwing wood back on the pile were mentioned, but relatively little overall maintenance was discussed.

For other respondents more active maintenance was done in the past, currently needed, or in the future. Several landowners mentioned maintenance done in the past, but did not mention having immediate concerns. One landowner having done extensive maintenance before now felt secure about the longevity of their project. Another had a shorter estimation.

“(...) and this thing will probably last () ten years, then somebody’s going to have to do something about it, whether they put in a solid one and I don’t know that they are allowing solid shoreline.”

Even if not an immediate concern, as this quote above shows, maintenance remains a consideration for some point in the future.

For half of the landowners, maintenance needs were discussed as either more of a current issue or a concern. Figuring out what to do about deteriorating logs was a concern for two landowners. Discussions over what to do with deteriorating logs was often tied in with their estimates of longevity for the project; eventually there would have to be something done.

“(...) my only concern is logs are crumbling, what do you do. And that’s, I can see the big cables around the logs and it’s between where the cables are around it that it’s just eroding, these particular logs. And so there has to be some way to address that. But it will be addressed at some point.”

The other landowner with similar concerns described how they could likely replace the logs using anchor chains.

A few landowners had maintenance issues they had dealt with before and which continued to be more of an immediate concern to deal with. In one case, access to the beach and erosion control was compromised due to shifts in the project. The limited longevity of the project was related to the making it financially challenging to repeat in the same manner. In another case, maintenance during a storm event had been substantial and continued to be a concern during storm events, along with the general concern over the longevity of the project in the context of sea level rise.

Two respondents were unique in the constant approach to maintenance discussed. For one landowner maintenance was not really conceived of as separate from the design of the project and so was expected. As they said, *“(...)I wasn’t disappointed in that I knew it wouldn’t be permanent(...)”* They envisioned maintenance being needed every two years, but were unable to follow this maintenance schedule with the permit as given. Another landowner did vegetation maintenance continually on their project.

Some concerns were expressed with maintenance and these ranged from figuring out who to contact to do the maintenance, how to replace logs/re-anchoring material, or the cost of maintenance and repair. One landowner talked about the eventual need to figure out how maintenance could be done and who to contact for those needs, whether it was the agency involved or a professional.

Finally, evaluation regarding installation of the projects was included as a sub-theme of maintenance because it concerns design. There were a number of suggestions from one interviewee to improve the installation of the project. These included to ensure a competitive bid for the installation and a way to vet installers in terms of success with projects. It also included having an inspection on the installation before signing off on the project and later after a storm cycle. These suggestions, all related to improving installation, were critical in relation to if the landowner would do a similar project again.

Results Part 4: Evaluation of external impacts and interactions

Beyond the site-specific elements of the projects discussed, landowners also evaluated their projects in relation to external impacts and interactions with themes like connections to stewardship, ecological impacts, and interactions with neighbors and neighboring sites.

Table 5: Summary of themes related to external impacts and interactions of soft shore projects

Theme	Sub-themes covered
Connection to stewardship of land and community	Ecological stewardship; social stewardship
Ecological impacts	Causing no harm or less harm than hard armor; enhancing ecological function
Interactions with neighbors and neighboring sites	Benchmarks; physical interactions between sites; broader interactions with the neighbors/ community

Connection to stewardship of land and community

The connection of the project to stewardship included both stewardship of ecological and human communities. One landowner spoke about how learning about ecological processes taught them about actions that can improve the environment. For another respondent the project connected to the responsibility of shoreline landowners to be good stewards of the nearshore.

“(...) how would you call it, the, I guess responsibility as keeping your lands in the best possible production that it could be and that it’s mostly our responsibility for forage fish, you know to keep that.”

The theme of stewardship went beyond ecological impacts to connections with human communities. In one example, doing the project was connected to a landowner’s management for future generations, and for another respondent it was pride in passing on the project to the community. Finally, another landowner discussed feeling satisfied from fulfilling the goals of the agencies to not do hard armor.

Ecological impacts

In discussing the ecological impacts the discussions ranged from causing no harm, being better than a bulkhead, or actually enhancing ecological function. Seven respondents in total addressed this theme. A couple landowners discussed how their project did no harm to the beach or fish. A couple respondents discussed how impacts were reduced from that of a bulkhead. One of these was less certain about the reduction of harm, but another was detailed in how it reduced impacts and was important to function.

“That the ground really does need to feed the water. Rocks and nutrients, and that there are animals like smelt, which will come and reproduce in the (water) along the shorelines. They like to be in shallow water and up against rocks and stuff(...)”

Several landowners, instead of discussing avoiding impacts, actually felt their projects could or did enhance the ecological function of the shoreline. This included planting trees to shade the nearshore or enhance shoreline habitat. Several landowners linked these ecological enhancements or the preservation of ecological functions to why they would recommend soft shore.

Interactions with neighbors and neighboring sites

Landowners discussed interactions with neighbors and neighboring sites in a variety of ways. This included the use of neighboring sites as ways to benchmark their own projects, the physical interactions between sites, and the broader interactions with the neighbors and community. A couple landowners used neighboring sites as a benchmark for comparison with their projects. Several landowners talked about the neutral physical impact their projects had on neighboring properties shorefronts or access points.

“One thing that was indicated was that the ends of the project would affect the water flow to the neighboring properties, but they were not concerned about that and I haven’t seen that as a problem.”

It was not only these outward impacts of the projects on neighboring sites, but landowners also noticed the influence of nearby hard armoring projects on their sites or the beach in general, as discussed previously in the section on erosion processes.

The interaction between the projects and the surrounding community was another sub-theme. Two landowners specifically noted how their project had upset others, in one case because someone thought they had done unpermitted work and in the other case because the neighbors did not want activity on the beach. Another respondent talked about how their neighbors felt bad for them for not being able to get a bulkhead, but in contrast another mentioned how neighbors enjoyed the site’s natural features. Just for one respondent the responses were greatly different; on one side the neighbors were against the project whereas on the other side they were interested in replicating it.

“(…)the reaction was both good and bad depending on the type of person you are dealing with.”

The final influence of the project on neighbors was the idea of it serving as an example for other projects. These interactions show it is not just physical interactions, but also social interactions that factor into evaluations.

Discussion of site-specific and external impacts and interactions of projects

Based on the widespread motivation of erosion to the initial project decision-making, it follows respondents evaluated the ability of the project to meet erosion control goals or maintenance of the project in place. One clear pattern that emerged from this discussion is the centrality of maintenance to the experience, ranging from small maintenance or repair, to in one case, a need to more fully repair the project. Even in projects where there was an overall positive assessment of the ability of the project to perform, maintenance continued to have a role in people's evaluations of their experiences and thoughts about the future of the shoreline.

There were differences in evaluations in relation to maintenance. For some respondents a positive evaluation was linked with no concerns of maintenance needs, yet for others a positive evaluation was linked with maintenance and needs in the future. This seemed to indicate some differences in expectations or responses to maintenance. One perspective related to maintenance that was unique was the idea of managing soft shore projects more *"like a garden"*. This represents a completely different paradigm from a large infrastructure project like hard armoring, but may be a way to communicate the nature of soft shore projects.

Some of the dialogue around maintenance dealt with shifted materials, and while some landowners felt small shifts of logs were part of the design, issues with anchorage warranted maintenance. Shifts in gravel were a frustrating loss of the design of the project, but sometimes it was uncertain as to if this was part of the design or not. There remained some concerns over how to deal with eroding logs, who to help with maintenance, and costs associated with maintenance.

One clear implication, due to the centrality of maintenance in interviews, indicates there should be guidance on what to expect, who to contact, how to deal with maintenance needs, and when maintenance should be required.

The results show the ability of the project to meet erosion control is a main way in which the site-specific dimensions are evaluated by landowners. A finding related to evaluation of erosion control was the seemingly varying baselines of how erosion control was evaluated or what constitutes “successful” control. One landowner described concern over seeing pre-project levels of erosion; an unacceptable degree of erosion. But other landowners discussed observing small degrees of sloughing or erosion, but did not seem concerned about it. In addition, the previous discussion (See Results Part 1 on erosion control) showed how there could be different desired degrees of erosion control. This made it challenging to compare similarities or differences in evaluations. Zelo et al (2000) also observed, within nourishment projects, the standards for what constituted a “successful project” varied, since some people acknowledged some degree of erosion as inherent to the design.

Once again it is important to reiterate the purpose of this study is not to provide a technical assessment of projects. None of the conclusions here are based on technical evaluations, but instead rely on interpretation of evaluations made by landowners. Although this small sample is not representative of Puget Sound, it does show variance in the ability of the soft shore projects to meet goals of erosion control according to landowners’ evaluations. For those cases where erosion control was a motivation, in total there were two evaluations that did not cover erosion control. Within those that did there were three negative or uncertain evaluations of the project’s ability to meet erosion control and six generally positive evaluations, although

landowners placed caveats on the expected longevity of the project and, as stated above, likely held varying expectations of erosion control.

Due to the variance in baselines and lack of technical assessment, the only concrete conclusion from these results is that from a landowners' perspective, the ability of the project to control erosion is critical to the overall evaluation of the project. Additionally, within this small sample there was a mixture of evaluations in regards to erosion control. Site-suitability, along with design and implementation, was mentioned as contributing to issues with the project performance. Soft shore is not going to be appropriate at all sites and additional guidance at the outset of projects could help landowners feel they were more informed in regards to site-suitability. One respondent's suggestion on how to improve overall implementation included project inspections, competitive bidding, and vetting of installers; processes similar to other construction projects.

Adelsman and Ekrem (2012) point out how associated sea level rise should be incorporated into all coastal planning efforts. Only two landowners mentioned sea level rise within evaluations of erosion control. Although this was not a direct question asked, which may have contributed to the infrequency of the topic being brought up, the lack of discussion over sea level rise was noted.

The dialogue around overall value of the project ranged from being a good investment despite expense, to savings compared to hard armor alternatives, and being too costly due to repair needs. There were a few suggestions to help with costs including reducing fees at the state level, offering low interest loans, or in general trying to help more with enhancement-type projects. This in combination with the discussion of costs during decision-making, which

included materials and cost savings associated with collaborations, shows the weight of financial factors in the overall experience.

Designs are not just about achieving erosion control, but also about access, aesthetics, and a number of other factors. Access was important to landowners in recreating and providing safe access to the beach. Gerstel and Brown (2006) also found access and stable banks were linked to owner satisfaction. Large stones were discussed as critical to securing access while on the other hand log recruitment, likely helpful to protecting the bank, hampered access. Aesthetic improvements were also a central component to evaluation and often tied to natural features. The addition of gravel to non-gravelly beaches was cited to be inconsistent with the natural aesthetics of the site, showing how design can impact aesthetics in unforeseen ways. Aesthetics was also linked with improvements in shoreline vegetation and growing vegetation was a challenge landowners noted. This shows how landowners have other objectives beyond just erosion control and evaluate projects on the ability to fulfill these other values as well.

Evaluations of projects are not only linked to the sites themselves but connect to external dimensions. Shoreline property owners face a complex, interconnected system in which management of individual properties both impacts and is impacted due to cross-boundary processes of nearshore functions. As discussed during decision-making the physical impacts among sites (i.e. impacts of adjacent armoring, impacts of their project on others) are important elements for landowners. But the connections to the neighborhood extend beyond the physical impacts. Neighboring sites also serve as benchmarks in the overall evaluation of their site, showing how neighborhood norms continue to shape experiences.

Neighborhoods are communities and reactions from the neighbors and outward community were part of evaluations of the project. Especially for landowners who saw their

project as being ecologically beneficial, having negative reactions by neighbors or the public could negatively impact their experience. On the other hand, when neighbors reacted positively to their projects, it seemed to add meaning to the overall project. A key implication of this discussion is the influence and consideration of outside impacts and interactions to landowners' evaluations, beyond the site-specific scale of the project. The interactions with nearby sites can be challenging to deal with and communication with neighbors about a project could potentially be a way to address the importance of this element in the overall experience.

Stewardship values and connections to future generations expressed during interviews demonstrate how the project can connect to broader meanings beyond the site itself. Many landowners discussed ecological impacts of their project, whether it was avoiding impacts, or actually enhancing ecological function. The general awareness of nearshore processes, the prevalence of discussions on ecological impacts, and the connections to community, demonstrate how landowners' evaluations connect to broader stewardship. Some landowners see their projects as having enhanced ecological function over natural sites, which may be different from agency perspectives, and have implications for developing mutual understanding.

Chapter 5: Broader management dimensions

The chapter on broader management dimensions is divided into landowner evaluations of permitting and broader management contexts. Evaluations of projects extended into the broad management dimensions in which these experiences took place. Often landowners discussed recommendations for how to improve some of these experiences. The agencies landowners mentioned interacting with were mainly at the local level, both city and county, as opposed to the state level. Interactions with local governments were coded approximately twice as many times as interactions with the state. Four landowners mentioned having a shoreline professional deal

with the permitting process entirely. In other cases it was unclear as to the degree of landowners' involvement in the permit process.

Results Part 5: Evaluation of permitting

Table 6: Summary of themes related to permitting

Theme	Sub-themes covered
Permit process time	Permit process time; ways to improve efficiency
Permit documentation, fees, extensions; design requirements	Discussions of reporting; interactions with agency; fees related to permitting; extensions; evaluations of specific design requirements made in permit

Permit process time

In seven interviews time was discussed in relation to permitting. Several respondents discussed the amount of time and effort as if it were an existing condition they took into account before starting the project. For one landowner, the amount of time was the main negative aspect they could recall about their experience.

“So I would say that was the only thing that was kind of disappointing about the whole project is it took a lot of time, which is money, to get it approved. And I kind of felt like it was nonsense.”

The uncertainty over the amount of time permitting would take was also cited as a concern, and it was suggested to give guidance on the “*navigation*” of the process at the outset of a project so landowners knew what to expect.

Permit documentation, fees, extensions, and design requirements

This theme covered permit documentation, fee requirements, extensions, and design requirements. One landowner extensively discussed the amount of paperwork required to do their soft shore project. Two points were made about the requirements, including the redundancy of yearly reports, despite little noticeable difference year-to-year. The second was the reporting for State Environmental Policy Act (SEPA) checklist, of which the landowner felt many of the

questions were inapplicable to the project. Another landowner commented about the number of non-overlapping reports required for different agencies that they found frustrating and costly.

Two landowners mentioned the complicated nature of having so many entities to deal with.

Fees and extensions were also discussed in relation to permit requirements. For one respondent, the requirement of a fee prior to submitting an application was confusing. Two landowners discussed extensions in the permit process. In one case, the landowner found it frustrating to have to apply again for a new permit if more work was needed on a project and suggested changing permitting time limits to be able to do the same amount of work over a longer period of time.

Some of the design elements required from agencies included buffers, specific gravel additions, or anchoring methods. In one case, the landowner was required to put in a buffer and ended up being pleased with this requirement since it seemed to help stabilize the bank. On the other end of the spectrum, one landowner had to put in gravel multiple times and felt frustrated with seeing it wash out. Another specific requirement from an agency was to use a type of anchoring method that ended up not functioning.

Results Part 6: Evaluation of broader management context

Table 7: Summary of themes related to broader management context

Theme	Sub-themes covered
Guidance and feedback	Guidance on best management; guidance related to soft shore; feedback post-implementation
Management capacity and staffing	Resources; staffing
Shoreline management	Variability of management; question on why bulkheads not allowed
Variability in response to soft shore from agencies	Supporting soft shore; neutral to not supporting; consensus

Guidance and feedback

The sub-themes within this section included guidance on best management, guidance related to soft shore, and feedback post-implementation. The first theme was having more outreach to waterfront landowners on best management practices. Another landowner suggested best management practices also include teaching landowners about the value logs have in reducing erosion. Other pre-project guidance was related to information on regulations prior to starting the project, rather than going to find a professional right away.

“Maybe to know what options are rather than having to go seek professional help necessarily. To start with, if you could understand that, for instance if there was a website that guided you through, well where are you on the sound, here is what we are currently seeing happening for people who need to replace bulkheads or need to maintain bulkheads, here is what the agencies are allowing, so you can get an idea before you go into it. I guess, maybe that would be helpful. So people could try to think ahead.”

The information would consist of a website to guide landowners on current regulations, what is allowed, and a general outline of what to expect.

The second sub-theme was improving guidance related specifically to soft shore, including having more guidance on alternatives and site-suitability. Two landowners spoke specifically about how when told what they could not do, they were not given many details of soft shore alternatives. In one case guidance on details from the agency was described as being “I’ll know it when I see it” and this was frustrating for the landowner because it vague, but was acknowledged to give flexibility for design. In regards to site suitability, another landowner specifically mentioned how prior to starting a project they felt they did not have much guidance or input on site-suitability, and that type of information would have been useful.

As opposed to guidance related to the outset of a project there was a desire for more information about performance of soft shore projects. Three landowners mentioned wanting to

know more about how other soft shore projects have performed, whether it was for anticipating any needs on their own project, or understanding what the consensus was on soft shore projects currently.

“I would be curious to know if they are doing this same approach for bulkheads now and if it was just somebody’s bright idea at that time or and if they aren’t doing it why they aren’t doing it. Because that means something that we have to be alerted to with ours.”

For another landowner, it was less about wanting to be alerted to their own site, but more related to curiosity about what the “*current thinking*” is on soft shore projects, including whether it was a “*valid thing*” for others. The last sub-theme mentioned in one interview was having some sort of check-up on the project every five years.

Management capacity

The sub-themes within management capacity related to a variety of different capacities and agency staffing. Two landowners within this sample mentioned funding and resources at the local level in relation to the ability to provide guidance or assistance. The capacity to provide guidance was also linked to the need to educate local staff about alternatives and retain staff. One respondent linked the separation between planning and permitting departments to inconsistencies with the application of rules.

Landowners also discussed interactions with staff in relation to their experiences. A few landowners reported specifically about how having a consistent staff member was important to their experience, whether it was helping them through the project process, or just understanding their site. One landowner spoke about how the lack of interaction was a negative part of the evaluation.

“But if they have any doubts, I wish they would take the time to leave the office and come out and look at what they are dealing with and maybe they could then be in a better position to make a decision.”

At a broader level, another respondent made the point about the importance of public involvement to management overall, and this process being more challenging at local levels with restricted resources.

Shoreline management

This theme was related to critiques of shoreline management overall. It included sub-themes of consistency within management and questioning requirement of soft shore design as a whole. One landowner described the requirement to not do hard armor as *“luck of the draw,”* which does not suggest a sense of consistency was perceived across management. Consistency of management was related to lack of enforcement and less attention to upland areas. Two landowners mentioned lack of enforcement.

“So it, this is very discouraging for private landowners to not have a county that can clearly keep their policies, articulate them when it comes down to you know where the rubber meets the road, you know the implementation.”

After having seen changes on other sites one landowner described *“(….)there is no follow up and so what is the point of these regulations when there is no follow up.”* The third point within this sub-theme was related to the focus on shoreline management in comparison with upland issues. One landowner described how they closely followed all management practices, but the lack of restrictions on clearing upland areas impacted the shore through increased runoff.

Finally in one interview the question of why bulkheads were not allowed was discussed.

“(…) just from an individual standpoint you wonder why it isn't ok to put up an armored bulkhead (…) when really what you are trying to do is create the environment on the other side of the armored bulkhead.”

This quote illustrates how the interviewee saw the purpose of soft shore was to create habitat on the nearshore, which they did not see as contradictory to having a bulkhead in place behind the habitat.

Variability in response to soft shore from agencies

Landowners described variance in the way agencies responded to or interacted with the soft shore projects. In one example, even within one agency, there was inconsistency among departments of what was recommended to do on the shoreline. In about a quarter of the cases respondents felt supported by agencies in pursuing a soft shore project. This came in the form of suggesting soft shore as the method to use, helping landowners figure out whom to contact, or just generally supporting the use of this method.

On the other hand, a few landowners did not feel supported on their soft shore projects. One landowner attributed a permitting delay to philosophical differences with the staff, who they felt were against any interaction or involvement by humans in the environment, contrary to their beliefs.

“I think that what we are capable of doing, we can assist in what Mother Nature can do as far as producing, or making environment better, or holding it like it is. And in some places our efforts can improve on Mother Nature.”

A couple other landowners talked about how the response from the agency was for them to do nothing at all.

“But you are sort of dealing with sort of a scientific, bureaucratic view that sort of feels like, what do you need a bulkhead for, that’s nature, let it just let it go, I mean (...). It’s ok and so if we’re doing it for green reasons you have to decide if that’s true or fair.”

As shown in the example above, even though the landowner was pursuing soft shore for ecological reasons they encountered pushback from an agency. For another landowner who

heard a similar request to do nothing with the site, they discussed how they would have felt lost without another option. And finally, one landowner did not receive pushback, but also felt no support for a project they saw as enhancing the functioning of their site as habitat. As one landowner noted, enhancing consensus on the response to soft shore would be helpful, especially since they felt many people could use this method.

Discussion of broader management dimensions

The broad management context and permitting evaluations gave insight into the priorities and concerns of this subset of landowners, and offers implications for management. The framework on social regulation from May (2002) is useful in linking the more specific evaluations with broader principles of effectiveness, legitimacy, equity, and efficiency. Permitting challenges have been explained in other reports, including the need to streamline permit process and conflicting requirements (Gerstel & Brown, 2006). The discussion around permitting relates back to the themes of efficiency and effectiveness as outlined in May (2002). Although the time required for permitting was discussed as a given within permitting processes, it was also mentioned as a frustration to some landowners. Even the experience for one landowner, where permitting time was the main drawback of the project, shows how this element can be critical to shaping experiences.

Permit requirements were also linked to the principle of reasonableness of these requirements, a component of overall effectiveness (May, 2002). In some cases, permit requirements were discussed as reasonable, like putting in buffers. Whereas in other cases, unreasonableness was tied to redundant documentation, requiring re-application for a project to do maintenance, or gravel additions that washed out. Ensuring requirements functioned as planned or were at least explained to landowners would seem to enhance reasonableness.

Allowing for maintenance after the permit window and reducing redundancy were other recommendations for improving permitting discussed by landowners.

The theme of outreach, guidance and feedback touched on all stages of the project process. Decisions on what to implement on shorelines are complex; they involve many different agencies and challenging technical information. It follows improved information regarding shoreline management was a central theme in the overall evaluation of management. Pre-project guidance included best management practices for the beach. It also included a location specific roadmap of what to expect with regards to shoreline regulations and the process of doing a project. The latter suggestion was linked to reducing unwarranted efforts or expenditures, and reducing uncertainty in expectations. Whereas some landowners received guidance, others found guidance to be lacking. Having guidance available on soft shore design when told not to do hard armor would be helpful for those landowners who prioritize efficiency over flexibility. Guidance on site-suitability was mentioned as critical, since soft shore is not going to be an appropriate method at all sites. Feedback after implementation included general feedback on soft shore project performance, less so on site-specific check-ups. This general feedback was discussed in relation to knowledge desired by landowners in regards to their own project and future concerns.

One of the themes present around management was the variation in experiences of landowners with regards to how agencies viewed their soft shore projects. Predictable rules are key to social regulations (May 2002). The lack of consistency in some cases from agencies regarding soft shore did not seem to indicate predictability across experiences. Especially for respondents who pursued soft shore for ecological rationales, it was confusing or frustrating to receive push back. Gianou (2014) notes understanding whether soft shore projects will improve or just maintain ecological function is challenging to ascertain, and depends on a number of

physical and biological impacts. However, consensus on soft shore would not only ease confusing messages to landowners, but also as noted by one respondent, be a necessary step for funding projects. At least within these experiences it seemed that clarifying the position of soft shore, both within and across agencies, could reduce confusion for landowners who felt they were doing the right thing, yet did not feel supported.

Evaluations of shoreline management discussed variability within application of this management, attributed in part due to a lack of enforcement and lack of addressing upland issues. In some cases this created a sense of unfairness or frustration as it conflicts with how some landowners felt they were doing the right alternative. The principle of equity in social regulation calls for consistent treatment of cases, with room for outstanding exceptions. The broader context of variability in management can have implications for the perception of equity within a landowner's experience.

Effectiveness is often tied in with local resources (May, 2002) and some respondents acknowledged the critical function of local resources within shoreline management overall. Resources, including education of staff, were linked to the ability to provide guidance to landowners. Staff was critical in providing site visits, providing consistency across the project, and in implementing regulations or giving guidance. Local resources and interactions with staff could be critical in shaping experiences.

Another challenge to the reasonableness of the requirements was related to questioning whether it was necessary to restrict bulkheads to provide habitat. Addressing whether or not there are engineering alternatives that could accomplish habitat goals while still having hard armor is beyond the scope of this research. The discussion does indicate, for at least one landowner experience, it was not completely explained why the alternative was necessary, and

indicated a need for clearer information on rationales. Gerstel and Brown (2006) found that shoreline landowners lacked information on why alternatives were implemented. Although there was little discussion over not understanding why alternatives were required, it seemed ensuring clear explanations of reasoning behind agency decisions is an important step in the process.

Chapter 6: Research summary, implications, and conclusions

Research summary

The management of socio-ecological systems, including the Puget Sound, necessitates attention to both human and ecological dimensions of communities (Folke et al., 2005). A major impact modern human societies have on the nearshore of the Puget Sound is the hardening and straightening of the shoreline (Fresh et al., 2011). This has repercussions for the ecological functioning of the nearshore, especially at a cumulative scale (Williams & Thom, 2001; Sound Science, 2007). Soft shore projects are an alternative to harder armoring and use natural materials and designs closer to natural functions of shorelines (Johannessen et al., 2014). Much of the feedback from implemented soft shore projects has focused on technical design, performance, and physical assessments (Johannessen et al., 2014; Gerstel & Brown, 2006; Zelo et al., 2000). Less attention has been directed to the social dimensions of soft shore projects, yet the experience of landowners with these projects is arguably the most important stakeholder perspective to understand. The majority of Puget Sound shorelines are under the stewardship of private-residential landowners (CGS, 2014).

Continual learning from a variety of perspectives and adaptation is key in adaptive governance of complex socio-ecological systems (Folke et al., 2005, Brunner & Steelman, 2005). Three main research questions addressed landowner experiences with soft shore projects including the process and evaluation of outcomes:

- a) What were landowners' motivations in pursuing these projects?
- b) What were the important factors for landowners in deciding to do the project?
- c) How do landowners evaluate their projects post-implementation?

Open-ended, semi-structured interviews were conducted at 12 different sites with 15 participants within the Puget Sound. The use of the interview method allowed for what was important to landowner experiences to rise organically thru interviews (Bliss & Martin, 1989). Through content analysis of transcripts, themes emerged (Patton, 2002), and were organized into a time sequential framework of motivations, decision-making factors, and evaluations post-implementation. Due to the small sample size, this study is not representative or generalizable to the experiences of all landowners with soft shore projects in Puget Sound. The following is a brief overview of the research findings, details are discussed in each discussion section.

The study found decision-making was influenced at the outset by motivations: mainly tangible erosion, and to a lesser degree, access. Descriptions of erosion processes and goals of erosion control varied across experiences, and erosion control connected to stewardship values for some respondents. Decision-making was influenced by 12 other factors, divided between decision-making over alternatives or implementation. These factors varied across cases and were discussed differently. Factors related to alternatives included ecological impacts, natural aesthetics, considerations of cost, and comparisons with bulkhead function. The influence of agencies and regulations associated with agencies was the most ubiquitous factor in decisions. This influence could be both direct, as in saying what could or could not be done, or more indirect, for example in landowners perceiving easier permitting for soft shore.

The influence of neighbors was present in both stages of decision-making including collaborations, the effect of neighborhood norms, physical impacts between sites, and access.

Learning about alternatives or seeing examples of soft shore designs were also important steps in decision-making. Implementation of projects revealed several challenges, especially the challenge or cost of securing large logs used in the projects. The results related to decision-making expand the discussion of what is considered important in decision-making, show the complexity of the factors, and demonstrate the variation within priorities or constraints across experiences.

Evaluations of projects post-implementation focused around erosion and maintenance, understandably, since erosion was key to motivations of a project. Maintenance was a theme present across projects and some landowners had already addressed maintenance needs, whereas others continued to see a need or had concerns with cost or future needs. No technical assessment of projects was done in this study, however landowners' evaluations of the ability of the projects to control erosion were one of the most widespread and central factors to evaluations. These evaluations over erosion control varied. The descriptions of evaluations, in combination with the variation described around goals of controlling erosion, may indicate different baselines regarding success. Site suitability was linked to concerns with project performance.

Financial evaluations, related to overall expense or value generated, varied as well. The ability to fulfill access and aesthetics goals were also themes discussed by landowners during evaluations of the projects. Finally, evaluations also considered impacts of the project on ecological function, connections with stewardship, and interactions with neighbors connected with the project. These results show how evaluations extend beyond the site itself to external values or connections. Within this small sample, landowners evaluated their projects post-implementation on a variety of factors, varying across experiences.

Broader management dimensions, including permitting and other management contexts, were also important components of the experience and often connected to implications for management. Permit time and requirements, including documentation and design, were in some cases linked to inefficiency or unreasonableness of permit requirements. The need for guidance was discussed at many stages: at the outset for best practices or giving a general outline of the process and regulations, during decision-making of design and site-suitability, and at the end for general information on soft shore project performance and rarely, site-specific check ups. There was inconsistency within the response from agencies to soft shore projects, and this could be challenging for landowners, especially when they felt they were doing the right thing. Themes related to shoreline management as a whole included variability in application of management that led to a sense of unfairness in some cases. The necessity to restrict bulkheads for habitat was questioned in one case. The role of local staff was noted as critical to some experiences and limited local resources or education were connected to the ability to provide guidance.

Management implications

The purpose of the study was to provide insight into landowners' experiences to improve implementation and management. Landowners' experiences, and the nuance and variation within these experiences, can inform management in a variety of ways through developing shared understandings, or giving more specific suggestions to the many local or state agencies, outreach organizations, or non-profits involved with shoreline management. Due to the diversity of experiences of individual landowners, some of the more specific implications listed below were derived from a small subset of interviews, and consequently the implications may not apply across cases. It should also be noted many landowners gave direct recommendations for changes. The following sub-set demonstrates the primary conclusions. Other implications are embedded

within each discussion section of each Chapter.

There is a need for flexibility and attention to project-specific contexts in addressing landowner concerns, needs, or objectives during decision-making: The twelve different factors involved in decision-making and the variation across these experiences show the complicated nature of the process. The decision-making framework derived from this study helps to build a shared understanding of the dimensions important to landowners, but this does not mean it holds uniformly across experiences. Managers, outreach, or anyone interacting with landowners should acknowledge the variability in landowners' priorities and where possible be flexible in addressing needs or concerns.

The cost and difficulty of securing natural materials used in projects was a major challenge for landowners: Some constraints related to implementation included access or finding a professional, but the challenge or cost of securing materials stood out during this step of decision-making. Help securing large logs is a key way to improve the ease of this step for landowners.

Prior to project implementation, explanations of erosion processes and expectations of erosion control should be discussed with landowners: Erosion control was central to the motivation of doing a project. The variation in the way landowners discussed goals of reducing erosion implied that at the outset of a project it may be important to ensure realistic expectations are set. The difference in landowners' emphases on erosion processes indicates a need for holistic consideration of processes to ensure all are addressed. Finally, the connection landowners described between controlling erosion and stewardship of land helps build a shared understanding of the significance of erosion control to landowners beyond property protection.

Maintenance guidance should be given to landowners: Clear guidance on what to expect and how to accomplish maintenance would be helpful for landowners doing soft shore projects. This set of guidance could include what to expect with certain designs, what constitutes a need for maintenance, and how to deal with maintenance needs when required. Maintaining shoreline vegetation could also be part of this guidance as it contributed to both sediment control and aesthetic improvements. Changing permit structure to allow for easier maintenance could facilitate addressing maintenance needs.

Neighbors and neighboring sites were critical components of landowners' experiences: There were a multitude of ways neighbors and neighboring sites influenced landowners. The neighborhood context influenced landowner decision-making through neighborhood norms, impacts of neighboring sites on erosion, collaborations, and access. During evaluation, neighboring sites continued to be a concern in terms of the physical interactions between sites, but also in less tangible ways such as receiving positive and negative feedback from neighbors. It is not only important for management to understand site-specific conditions, but also that the neighborhood context and community can be important to landowners. This could hold a variety of more specific implications, such as communicating with communities about projects, or acknowledging the larger scale at which landowners conceptualize the impacts and interactions of their projects.

Guidance should be given at all stages of the process: Pre-project guidance would include education on best management practices and also locally specific guidance on regulations and the project process. Guidance during decision-making could include soft shore design, although there is a tradeoff between guidance and flexibility, and site-suitability guidance, as alternative

designs are not suited to all a sites. Post-implementation feedback could include how soft shore projects were doing in general to inform landowners about their own project.

There is a need for improved consensus on soft shore projects within and across agencies:

Landowners received a mixture of responses to their soft shore projects. Mixed guidelines presented to landowners who believe they are doing the right thing generates confusion. Especially since some landowners described their projects as enhancements of ecological function, getting mixed responses shows disconnect between landowner and agency views of soft shore. Any type of financial assistance, like low-interest loans, would likely require improved consensus on soft shore as a method. Recently, guidance on soft shore has been produced (Gianou, 2014, Johannessen et al. 2014) and it should be noted the implications listed here do not take into account these efforts; they are just what was derived from this research on experiences in the past.

The broader management contexts and perceptions of reasonableness, efficiency, and equity are

key to the overall experiences of landowners: Landowners went beyond the site-specific evaluations to discuss the broad management contexts that shaped their experiences. Reducing or streamlining requirements and time required, as well as better explanations of requirements could improve landowner experiences. In addition, the design requirements made during permitting, such as using certain log anchoring methods, seemed particularly important to ensure follow-up with. Having explanations of why certain designs or methods are required could help landowners understand the rationale of requirements. Landowners also discussed equity of management, including lack of addressing uplands management, and inconsistency in management across sites that could lead to a sense of unfairness or frustration. Providing

consistent implementation and holistic management of shorelines and upland areas could positively impact experiences.

Conclusions

Puget Sound landowners play a vital role in the health of the nearshore ecosystem and their feedback and voices are critical in shaping management. Adaptive governance principles call for incorporating local knowledge, focusing on evaluation, considering the variety of contexts, and adapting policy to the actual experiences of people (Brunner & Steelman, 2005). By giving attention to the social dimension of this socio-ecological system, including the experiences of landowners with soft shore projects, three main conclusions were drawn.

First, incorporating evaluations from local stakeholder knowledge can foster shared understandings of experiences and give informed implications for management from a diverse set of perspectives. The results of this study show the importance of processes occurring outside property owners' sites, contexts beyond landowner control, and the embedded nature of the projects within an interconnected nearshore system. The understanding of this complexity and diversity would not have been possible without attention to the social dimensions of these systems and following adaptive governance principles. As with other challenges facing humans today, including natural resource management, there is not a singular answer, there is complexity (Allen, 2001). Capturing the complexity of these challenges is vital to understanding the system.

A main contribution of the study is to potentially expand the breadth of what is considered to be important to landowner experiences. As Waltner-Toews (2003) stated, "*People living within the system may well choose different elements and different sets of relationships to pull into the foreground*"(p. 24). More obvious dimensions like erosion control or costs are paramount to decision-making and evaluation, but there are a number of other dimensions

involved in all stages of the experience. Values such as aesthetics, contexts of neighborhoods, and challenges of securing materials were all important dimensions to some landowners. In Bliss and Martin's (1989) study involving private landowners they found a main contribution to management was expanding the array of dimensions considered "important" and this study provides a similar contribution.

The third conclusion is based on the variance observed within landowners' experiences. For some respondents doing a project was as simple as controlling erosion within certain regulatory parameters, but for others it was deeply tied into values of aesthetics, ecological functions, the context of the neighborhood, securing access to the beach, and managing for future generations. Just as designs should not be applied to sites in a one-size-fits-all approach, nor should landowners be assumed to have similar concerns, parameters, and priorities with their shorelines. Adaptive governance calls for attention to specific contexts and adaptation of policies, and management of shorelines should follow these values of flexibility to specific contexts and adaptability based on prior experiences.

A few questions arose during the course of this research that could potentially be starting points for future research.

- What kind of maintenance guidance for soft shore projects exists or how could maintenance guidance be developed? Does having expectations of maintenance or clear guidance shape evaluations of projects?
- How important is the role of local budgets or resources in overall shoreline management?

- How much do expectations of the project's ability to control erosion, regardless of whether or not soft shore, impact overall expectations of the project itself? What are the differences between landowners' definitions of success with erosion control?
- How does the method in which agency/regulatory information is delivered to landowners impact their overall experience? How does the act of having a site visit compare against receiving a letter? How does receiving regulatory guidance ahead of a decision-making process shape experiences?

This research is a start to developing a more in-depth understanding of landowner experiences with soft shore projects, and more broadly shoreline management. These projects are one alternative in an array of management strategies to address the complex and challenging issues of shoreline management in Puget Sound. Continual adaptation and reflection on optimal management will be essential in the years to come, especially in facing the challenges of climate change impacts.

In the context of a growing region, private landowners are critical stakeholders in Puget Sound health, and their perspective is key to ensuring sustainable management. This requires constant attention to feedback, including the positive and negative aspects of policies, programs, or general impacts. Without thoughtful return to past experiences, adaptation cannot inform management towards sustainable and optimal approaches. Within ecosystem management it may seem simpler to focus on the ecological system alone, but considering both the social and ecological dimensions of the system is necessary in order for communities to flourish.

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Appendices

Appendix A: Interview guide

Opening Question:

These are some general questions to start out with:

1. So I am here to talk to you about your soft shore project, can you tell me a little about it?
What did you do, when, etc?

Introductory Questions:

Now I am going to move on to some questions on how you came to do this project

2. First off, what motivated you to do this project?
 - a. Probe: What led you to decide to do something with your shoreline?
3. What was your goal/objective with the project?

*Ok now lets get into the specifics of how you went through the process of deciding on this project: *Caveat: Try to keep conversation from only discussing permitting challenges.*

4. What factors were important to you in deciding to do this project? Who or what was important to you in deciding to move forward with the project?
 - a. *If they don't mention alternatives:* What alternatives were you considering?
 - b. *If they do not mention decisive moments in their decision between the alternatives:* How did you decide to choose this one over the alternatives?
 - c. Probe: *If they do not mention how they learned about these projects:* How did you learn about types of soft shore projects?
 - d. Probe: *If they mention any interaction with government:* Tell me about how you interacted with government agencies?
5. Was there something, like a moment or piece of information or anything else, that really helped you decide on the project?

Key Questions:

Now I would like to discuss your project overall. I would like to talk about what you think about your project after all the permitting and construction was done. Basically how has the project worked out? Feel free to discuss anything that has been important to you about this project.

6. What would you tell your neighbor about how the project has fared over the years? How would you evaluate your shoreline project?

Probes: Depending on what factors they bring up, ask follow up questions on each factor. For example, if they mention change in risk ask them why and how the risk has changed? If they mention maintenance, ask them how often they have to maintain it. On this question I will need an extreme amount of flexibility to be able to ask follow up questions depending on what factor they bring up. The potential topics include: property value, real estate, maintenance, risk, views, neighbors, access, ecological benefits etc.
7. Are there ways in which your action on your shoreline has affected you that we haven't talked about?

Reflection Questions:

Finally, I would just like to ask you a few reflection questions.

8. Do you think your original goals were met with this project? Why or Why not?
9. Why/why not you would recommend pursuing this type of project to another homeowner?
10. Looking into the future, how do you feel about your shoreline?
11. Considering the challenges you have faced, both past and future, what type of assistance would be useful to you?
 - a. Probe: *If they do not mention who would provide the assistance:* Who should provide that type of assistance and why?
12. Finally, is there anything that we haven't covered you would like to speak to?

Appendix B: Consent form

University of Washington Consent Form

Study: Homeowner motivations, decision-making factors, and evaluations of their soft shore projects in the Puget Sound

Researcher: Skadi von Reis Crooks, Graduate Student, University of Washington

Email: svonreis@uw.edu, Phone: xxx-xxx-xxxx

You are invited to be part of a research study on soft shore projects in the Puget Sound. By soft shore I mean shoreline modifications like bulkhead removals, re-vegetation, beach nourishment, or placement of large wood. You have been selected because of the soft shore project on your property.

The purpose of this form is to give you information you will need to help you decide whether or not you would like to be part of this study. Please read the form carefully and ask questions about the research purpose, the risks and benefits, your rights as a volunteer, what we would ask about, or anything else that is not clear. When all of your questions have been answered, you can decide if you would like to be part of the study or not. This process is called “informed consent” and is standard for any research conducting interviews. I will give you a copy of this form for your records.

Basic Information about the Study:

Purpose of this study: The purpose for this study is to provide insight into homeowners’ experiences with their soft shore projects on their private properties to improve the implementation and management of shorelines on private residences in the Puget Sound.

Voluntary Nature of the Study:

This study is completely voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Washington. If you decide to participate, you are free to skip any question you would like to or withdraw at any time without affecting those relationships or any penalty.

Study Procedures: In consenting to participate in this study, you are agreeing to an interview of approximately 1 hour. You will be asked questions about three main themes although you are free to skip any question you do not want to answer, and you may terminate the interview at any time without penalty. The themes of the questions are:

1. What were your motivations in pursuing these projects?
2. What were the important factors for you in deciding to do the project?
3. How would you evaluate your project post-implementation?

Ideally the interview would take place at the site of the soft shore project but if you are not comfortable with this, alternative arrangements can be made. Interviews can take place *as soon as possible* depending on your schedule.

Confidentiality:

In consenting to participate in this study you are also agreeing to allow the researcher (Skadi von Reis) to audio record the duration of these interviews to make it easier for to listen thoughtfully

and transcribe them later. After transcribing the interviews, the audio files will be destroyed, at the latest 30 days after the interview takes place.

This study will remain confidential. Any identifying information (like your name or location) that you say during the interview will be removed from the transcripts. Any links to identifiers needed for contacting interviewees (i.e. addresses) will be kept on a locked file, on a locked computer in a secure location. Only I will have access to identifying information. I will use quotations from the transcripts to ground my research conclusions, but will not quote your name. Some minimal, generalized information (fetch, beach type, project type, sediment type and neighborhood context) about the physical aspects of their site will be tracked but no photos will be taken. This information will be used to speak generally about what types of projects were included in the study or general trends. This information will not be used in a way that could allow for identification of specific sites but is necessary to understand key aspects of the site.

In consenting to participate in this study you are agreeing to allow the data that comes from the research to be used for future publications by the author. The content of the publications will remain confidential and will not contain links to personal identification.

Risks, Stress, or Discomfort: Discussing issues relating to these projects may be stressful, tiring or cause discomfort. Remember that as a participant, you can skip any question or terminate the interview if so desired and there will be no penalty for any of these actions. There is also a minor risk that because of the small number of soft shore projects in Puget Sound overall and because people helped me identify potential interviewees there is not 100% confidentiality in who was included in the study. But once again the interviews will not be linked back to identifying information.

Benefits: On a personal level, you may enjoy or receive benefits from reflecting on your experiences with your shoreline project. On a broader level, it is anticipated this research will give insight into how to improve outreach efforts to encourage soft shore projects where appropriate. It may also help managers better understand what how to ensure sustainable management and policy decisions of shorelines on private properties in the future.

Contacts and Questions: The researcher conducting this study is Skadi von Reis Crooks. You may ask any questions you have now. If you have questions later, you are encouraged to contact me at (xxx) xxx-xxxx or by emailing svonreis@uw.edu.

Printed name of study staff obtaining consent

Signature

Date

Subject's statement

This study has been explained to me. I volunteer to take part in this research. I have had a chance to ask questions. If I have questions later about the research, I can ask one of the researchers listed above. If I have questions about my rights as a research subject, I can call the Human Subjects Division, of the University of Washington, at (206) 543-0098. I will receive a copy of this consent form.

Printed name of subject

Signature of subject

Date

Appendix C: Recruitment letter

Dear ,

Date

My name is Skadi von Reis, and I am a graduate student at the University of Washington's School of Environmental and Forest Sciences and Evans School of Public Affairs. I am conducting my thesis research on homeowners' experiences with their soft shore projects in Puget Sound. By soft shore I mean shoreline modifications like bulkhead removals, re-vegetation, beach nourishment, or placement of large wood. I identified you as a potential interviewee from the publically available HPA permits. *If you are interested in being part of this study please contact me at svonreis@uw.edu or by calling xxx.xxx.xxx.* I have included additional information on the study below for your review:

The Study: The purpose for this study is to provide insight into homeowners' experiences with their soft shore projects on their private properties to improve the implementation and management of shorelines on private residences in the Puget Sound. My research questions basically cover:

1. What were your motivations in pursuing these projects?
2. What were the important factors for you in deciding to do the project?
3. How would you evaluate your project post-implementation?

Confidentiality and Voluntary Information: The study will be kept confidential and is completely voluntary. The interviews will be audio recorded and I may use non-identifying quotes to ground the research. Only my committee and I will have access to the transcripts of these interviews, which will not be linked to your identity. I will also be recording general beach information (*fetch, beach type, project type, sediment type and neighborhood context*) about the physical aspects of their site will be tracked but no photos will be taken. This information will be used to speak generally about what types of projects were included in the study or general trends.

Benefits and Risks of the Research: It is anticipated this research will give insight into how to improve outreach efforts to encourage soft shore projects where appropriate. It will also help ensure sustainable shoreline management and policy decisions in the future. There is also a minor risk that because of the small number of soft shore projects in Puget Sound overall and because people helped me identify potential interviewees there is not 100% confidentiality in who was included in the study. But once again the interviews will not be linked back to identifying information.

If you are interested in learning more or willing to be interviewed please contact me at this email address or by phone. I would like to interview you at the project site but alternative arrangements can be made if that would be best for you. You are also welcome to include other family members or people involved in the project if you so desire. Interviews are likely to last around one hour. I would greatly appreciate your help in conducting this research and value your contribution highly.

Thank you,

Skadi von Reis

Candidate for Masters of Public Affairs (2015)----Candidate for Masters of Science (2015)

svonreis@uw.edu

Ballard, WA

Appendix D: Coding scheme

Category	Code	Description
Motivations	Access	Motivations related to loss of access, providing access, maintaining access
	Aesthetics	Motivation of aesthetic improvements
	Ecological	Motivation related to ecological function
	Erosion	Motivation of erosion or concern over erosion of bank or bluff
	<i>Sub-code:</i> Descriptions of erosion processes	Way landowners discussed processes of erosion occurring or influencing the site
	<i>Sub-code:</i> Way landowner observed erosion	Way landowners discussed observing or noticing erosion at the site
Decision-making factors between project alternatives	Aesthetics	Related to aesthetics desired or avoided on site
	<i>Sub-code:</i> Naturalness	Related to intrinsic value of naturalness
	Agency position	Related to the indirect or direct influence of agencies or regulations
	Bulkhead function	Related to landowner evaluations of bulkhead function in relation to erosion control
	Cost	Related to costs or cost considerations
	Ecological impact	Related to habitat or nearshore ecological function
	Examples	Related to learning about examples of soft shore alternatives
	Neighbors	Related to discussions of neighbors and neighboring sites
	Site assessment	Assessment of site by geo-hydrologist
Alternatives considered	Alternatives considered	Alternatives considered during decision-making process
	Learning about soft alternatives	Processes of learning about soft shore alternatives
Decision-making factors for project implementation	Access for construction	Related to access considerations for construction of project or access to the beach
	Design elements	Related to certain characteristics desired out of the design like rock, habitat, etc.
	Securing materials	Related to the process of finding or paying for materials
	Shoreline professional	Related to finding a professional to do the project or considerations involved with this process

Interactions	Interaction with professional	Any discussions of interactions or evaluations related to working with shoreline professional
	Interaction with agency	Any discussions of interactions or evaluations related to shoreline agencies including local, state, federal
Evaluation of site-specific dimensions	Access	Related to evaluation of access after project completion
	Aesthetics	Related to evaluation of visual dimensions
	Changes in materials	Related to shifts or changes in materials intended for the design (as in not just part of the beach)
	Erosion control	Related to evaluation of control of erosion
	<i>Sub-code: Site-suitability</i>	Related to evaluation of site-suitability
	Financial	Related to overall cost evaluations, financial considerations, value
	Maintenance and longevity	Related to any discussions of maintenance needs, lack of needs, concerns with needs
	<i>Sub-code: Implementation process</i>	Related to changes in implementation process
Evaluation of external impacts and interactions of project	Connection to stewardship and community	Discussions of the project in relation to outside impacts on community or general connections with stewardship and the project
	Ecological impacts	Discussions on way project impacted/did not impact ecological functions
	Neighbors and neighboring sites	Discussions on interactions with neighbors including site interactions or more broadly
Evaluation of broader management dimensions	Permit requirements	Related to permit requirements
	<i>Sub-code: Design requirements</i>	Related to specific design requirements made by permits, as in things specified by landowner they had to do
	Permit process time	Related to permitting time
	Guidance and feedback	Discussions related to any information or guidance needs
	Management capacity and staffing	Discussions related to the capacity of management or related to staff
	Shoreline management	Discussions related to broader management
	Variability in response to soft shore	Discussions related to ways agencies responded to soft shore projects