PERCEPTIONS OF MARINE PROTECTED AREAS

IN PUGET SOUND

by

Erin M. Hanlon

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Erin M. Hanlon

has been approved for

The Evergreen State College

by

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Dr. Edward Whitesell
Member of the Faculty

_____

Date

ABSTRACT

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Erin M. Hanlon

Marine protected areas (MPAs) are used as a management tool to preserve and protect marine and coastal ecosystems, manage fisheries and preserve sites with cultural significance. When properly implemented and managed, MPAs can provide a multitude of ecological, social and economic benefits. Comprehensive MPA planning requires collaboration and buy-in from overlapping federal, tribal, state, and local jurisdictions, as well as a multitude of stakeholder groups. Using surveys and informal interviews, I examined whether marine protected areas in western Washington's Puget Sound show patterns of support, resistance, or the emergence of potential coalitions among resource users and managers. Qualitative and quantitative analysis of responses revealed three distinct coalitions that share common perceptions of Puget Sound MPAs. The analysis also identified where respondents were in agreement or diverged regarding challenges and proposed solutions pertaining to MPAs in Puget Sound. These findings will help to inform the work of MPA managers and facilitate decision-making through awareness of preferences, by revealing possible coalitions among key stakeholder groups, and by integrating the perceptions of these advocacy coalitions into a broader marine and coastal planning context.

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List of Abbreviations

ACF	Advocacy Coalition Framework
CAMP	Classification and Monitoring Planning Project
CMS	Conservation Management Status
COP	Conference of Parties
CZMA	Coastal Zone Management Act
EBM	Ecosystem-Based Management
FHL	Friday Harbor Labs
ICM	Integrated Coastal Management
IPC	Intergovernmental Policy Council
MLPA	Marine Life Protection Act
MPA	Marine Protected Area
MRC	Marine Resource Committee
MSA	Marine Stewardship Area
MSP	Marine Spatial Planning
NAP	Natural Areas Program

NGO	Non-governmental Organization
NMSP	National Marine Sanctuaries Program
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCA	Natural Resource Conservation Area
OCNMS	Olympic Coast National Marine Sanctuary
PSNERP	Puget Sound Nearshore Ecological Restoration Project
PSP	Puget Sound Partnership
SAT	Master Plan Science Advisory Team
SEPA	State Environmental Policy Act
UFWS	U.S. Fish and Wildlife Service
UW	University of Washington
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WDNR	Washington Department of Natural Resources
WRPC	Washington Parks and Recreation Commission

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Chapter 1: Introduction and Background

Marine Protected Areas (MPAs) are used as a management tool to preserve and protect marine and coastal ecosystems, manage fisheries and preserve sites with cultural significance. When properly implemented and managed, MPAs can provide a multitude of ecological, social and economic benefits. There are 127 MPAs in the state of Washington offering varying levels of protection to the resources therein and managed across 10 agencies, and in collaboration with one non-governmental organization (NGO) (Van Cleave, Bargmann, Culver, & the MPA Work Group, 2009). Previous research determined that these sites were created without overarching policy, design, or plan for coordination among management agencies (Van Cleave et al., 2009). There has been a significant effort in the past decade for a more coordinated approach to marine conservation. Comprehensive reports produced by Murray (1998) and Van Cleave et al. (2009) examined MPAs in the state of Washington and identified a need for consistency among MPAs and MPA managers to obtain coordinated objectives, consistent terminology, establishment criteria and a clear plan for future management and monitoring of the sites.

The legal, political, and socioeconomic context in which environmental planning and decision-making occurs is immensely important to its success (UNEP, 2011). A favorable socioeconomic context is particularly important for MPA planning. This requires collaboration and buy-in from overlapping federal, tribal, state, and local jurisdictions, as well as a multitude of stakeholder groups. This thesis seeks to understand, through surveys and informal interviews, whether

Marine Protected Areas in Puget Sound show patterns of support, resistance or potential coalitions among resource users and managers. This research proposes that stakeholder affiliations will emerge through qualitative and quantitative analysis of responses. Identification of potential affiliations will help to inform the work of MPA managers and facilitate decision-making through awareness of preferences and possible coalitions among resource users and managers.

Status of the Ecosystem in Puget Sound

The Puget Sound is a semi-enclosed glacial fjord system of inlets and sills dividing a vast estuarine ecosystem in northwest Washington State. The Puget Sound watershed includes 2,800 square miles of water, 2,500 miles of shoreline and is home to over 4 million people, a population that is expected to grow by 1.5 million people by 2025 (Puget Sound Partnership, 2008; Puget Sound Partnership, 2012b). With this growth, increased pressures to the Puget Sound ecosystem can be expected.

A healthy Puget Sound is imperative to a thriving local economy. The average annual value of commercial crab, mussel, shrimp, oyster, geoduck and other clam fisheries is $44 million, with recreational shellfish harvest valued at roughly $42 million. Annual revenue from recreational fishing is estimated at $57 million a year, with commercial fishing valued at approximately $4 million a year (PSP, 2012b). The value in protecting marine and coastal resources in the Puget Sound holds ecological, social and economic benefits.

Puget Sound hosts more than 100 species of seabirds, more than 200 species of fish, 15 marine mammal species, hundreds of plant species, and thousands of invertebrate species (Armstrong, Staude, Thom & Chew, 1976; Canning & Shipman, 1995; Thom, 1980). Several species are listed as threatened or endangered under the Endangered Species Act. The iconic Southern Resident killer whale (*Orcinus orca*) was listed as endangered as of 2005 (National Marine Fisheries Service, 2008). Of the estimated 211 marine fish species in the Puget Sound ecosystem, rockfish make up a significant portion, at 28 species (Palsson et al., 2009; Williams, Levin & Palsson, 2010). In 2010, three species of Puget Sound rockfish were listed for protection under the Endangered Species Act. Yelloweye rockfish (*Sebastes ruberrimus*) and canary rockfish (*Sebastes pinniger*) were listed as threatened, while bocaccio rockfish (*Sebastes paucispinis*) were listed as endangered (Drake et al., 2010). In the Puget Sound region, 73 marine bird species have been identified as highly dependent upon our marine and coastal ecosystems (Gaydos & Brown, 2011). Overall, species of concern within the Salish Sea, a body of water that includes Puget Sound, increased by 43% from 2008 to 2011. This increase from 64 species to 113 is concerning and may indicate poor ecosystem health (Gaydos & Brown, 2011). The 2013 "Health of the Salish Sea Ecosystem Report," prepared jointly by the U.S. Environmental Protection Agency and Environment Canada, documents declining trends for Chinook salmon (Onchorhychus tshawytscha), marine water quality, and marine species at risk (U.S. Environmental Protection Agency, 2013).

These listings and dependencies are among the many reasons to continue improving marine and coastal ecosystem conservation and management.

Many federal and state natural resource agencies, tribes, city and county governments are mandated to conserve and protect marine resources in the state of Washington (Van Cleave et al., 2009). Marine Protected Areas (MPAs) are one approach to meeting this mandate. MPAs are a management tool grounded in ecosystem-based management (EBM), used to control the effects of human use on marine ecosystems. EBM is defined in the literature as "an integrated approach to management that considers the entire ecosystem, including humans" (McCloud, Lubchenco, Palumbi & Rosenberg 2005, p. 1). Like MPAs, EBM differs from single-sector management approaches by considering the cumulative impacts of many sectors on the marine environment, to maintain a healthy, productive and resilient ecosystem (Lester et al., 2010; McCloud et al., 2005; Rosenberg & McCloud, 2005). When properly implemented and managed as part of a broader EBM management plan, MPAs can provide a multitude of ecological, social and economic benefits.

The purposes of the majority of marine reserves are marine conservation and the sustainable management of human activities, such as fishing, recreation, research, education, aesthetics, and cultural heritage (Roberts et al., 2003a). A crucial benefit of MPAs is that they can serve as ecological baselines, providing control variables for long-term ecological monitoring (Arcese & Sinclair, 1997). A gap analysis of 155 public and privately owned marine protected areas in the state of Washington found that only 20% offer high to medium protection for all

species, habitat and ecological processes. The remaining 80% of MPAs were assessed as offering low levels of protection, indicating that access, take and seabed alteration was allowed but restricted. The study also found MPAs offering the lowest level of protection to be the largest, with protected areas offering medium and high protection encompassing only 4% of state waters. In Puget Sound, only 7 MPAs offer the highest level of protection (no-take, no access) and encompass 0.1% only of the marine waters protected by MPAs (Smith, Bailey, White & Udelhoven, 2012).

Figure 1: The Puget Sound Watershed
(http://geography.wr.usgs.gov/pugetSound/)

A growing body of evidence suggests that fully protected marine reserves that prohibit all fishing and other disruptive activities are not only beneficial in protecting species and habitat, but can help to improve fishery management practices as well (Allison, Lubchenco & Carr, 1998; Bohnsack, 1998; Gaines, White, Carr & Palumbi, 2010; Roberts, 1997; Roberts, Halpern, Palumbi & Warner, 2001; Roberts, Hakins & Gell, 2005). As a result, sustaining fisheries is a goal of many no-take reserves, and there is evidence that reserves are effective in increasing yields of adjacent fisheries (Alcala, 1988; Gell & Roberts, 2003; Halpern, Lester & Kellner, 2010; Russ & Alcala, 2011).

The combined benefit of conservation and fisheries management has helped to advance the establishment of marine reserves worldwide (National Research Council, 2001). In many instances, marine reserve sites have been procured opportunistically or with protective measures implemented by different management agencies with a difference in desired outcomes (Roberts, 2000; Roberts et al., 2003a; Van Cleave et. al., 2009). This lack of coordination hinders efficacy as it obscures management and enforcement priorities and is likely to create confusion among stakeholder groups, managers, and end users.

A 2009 inventory of MPAs in the State of Washington identified a total of 127 sites, encompassing 644,000 acres and over 6 million feet of shoreline. This area is approximately 26% of the state's marine waters and 27% of the shoreline (Van Cleave et al., 2009). These sites are managed across twelve agencies and organizations (Table 1), with 8% falling under local jurisdiction in Clallam County, and the cities of Edmonds, Seattle and Tacoma; 83% under state

jurisdiction and 9% under federal authority. This thesis addresses MPAs that fall within the Puget Sound watershed (Figure 1). Of the 127 MPAs in Washington, 109 fall within the Puget Sound watershed area. As shown in Figure 1, this area is framed by the Olympic mountain range on the west and the Cascade mountain range to the east, including the San Juan Archipelago. The remaining 18 MPAs are along Washington's outer coast and were not included within the scope of this study.

Table 1. Washington MPAs by management authority and level of government (adapted from Van Cleave et al., 2009).

Agency	Government Level	MPAs	Size (Acres)	Shoreline (Thousands of Feet)
Clallam County	Local	1	25	9
Edmonds	Local	1	47	2
NOAA	Federal	1	309,113	1,310
NPS	Federal	2	1,752	370
Seattle	Local	6	108	11
Tacoma	Local	2	13	1
USFWS	Federal	9	1,531	1,215
UW	State	1	292,414	2,251
WDFW	State	22	1,942	128
WDNR	State	14	16,008	382
WDOE	State	1	12,075	151
WPRC	State	67	9,075	860

The first MPAs in Washington were the Flattery Rocks, Quillayute Needles, and Copalis National Wildlife Refuges. These sites were granted protection in 1907 under a federal seabird protection program created by President Theodore Roosevelt through Executive Orders No. 703, 704 and 705 (U.S. Fish and Wildlife, 2007). Among the first MPAs to be established within the Puget Sound watershed were Larrabee State Park and Dungeness National Wildlife Refuge in 1915 (Van Cleave et al., 2009). The most recent MPA established in the study area is the Nisqually Reach Aquatic Reserve, which is managed by the Department of National Resources and was established in 2011 (Washington Department of Natural Resources, 2011).

Current Management Structure and Levels of Protection

Marine and coastal resources in the state of Washington are managed by federal and state natural resource agencies, tribal governments, and city and county governments. These entities are mandated to promote the conservation of marine resources ranging from species, habitat, and shoreline protection to human and environmental health (Van Cleave et al., 2009). Myriad agencies are involved in creating and managing MPAs in Washington (see Appendix A: Washington State Marine Protected Area Inventory). MPAs designated under different management authorities have been designed, implemented and managed for a variety of reasons, to offer differing levels of species protection, and to allow for a multitude of uses.

The Washington Department of Natural Resources (WDNR) regulates the harvest of geoduck clams and seaweed. WDNR manages publically owned intertidal and subtidal habitat and uses three terminologies for MPAs within their jurisdiction: natural area preserves (NAPs), aquatic reserves, and natural resource conservation areas (NRCAs) (Van Cleave et al., 2009). The NAP aims to protect the best remaining examples of Washington's native ecosystems, plants, and animals. MPAs managed through WDNR's NAP program serve as ecological baselines and many of these sites have limited or guided access to protect these fragile ecosystems. WDNR's NRCAs are different from NAPs in that they often include unique geologic features, archeological resources and scenic attributes. Many NRCAs have developed public access facilities (Washington Department of Natural Resources, 2010).

Aquatic reserves are established by WDNR when a site is educationally, scientifically or environmentally important. The Aquatic Reserves Program aims to promote preservation, restoration and enhancement of state-owned aquatic lands. Aquatic reserves, NAPs and NRCAs all require management plans. Goals for aquatic reserves must be specific to the type of reserve (educational, scientific or conservation) and be consistent throughout the site-specific management plan. Management plans for NRCAs follow guidelines outlined in the 1992 NRCA Statewide Management Plan and address protection, enhancement, and restoration of resources as well as low impact public use provisions. NAPs are managed to allow natural processes to occur with minimal human intervention (Washington Department of Natural Resources, 2013).

The treaty tribes co-manage salmon, shellfish and steelhead with the Department of Fish and Wildlife. This unique government-to-government relationship is the outcome of the 1974 federal court case referred to as the Boldt Decision (United States v. Washington, 384 F. Supp. 312 (W.D. Wash., 1974)). The decision upheld tribal fishing rights as guaranteed by treaties between tribes and Territorial Governor Isaac Stevens in 1854, whereby the tribes ceded vast quantities of land to maintain their right to fish. The Stevens treaties provided that "…the right of taking fish at all usual and accustomed grounds and stations is further secured to said Indians in common with all citizens of the Territory…" (Treaty of Medicine Creek, 1854). Boldt had ruled treaty fishing of Northwest Indian tribes to be a right, not merely a privilege. Additionally, the decision ruled that "in common with" meant that the tribes were entitled to 50 percent of the harvestable run, and "usual and accustomed" allowed tribes to fish off reservation. For the state, this decision meant that fishing in Puget Sound and the ocean would have to be regulated so that 50 percent of the catch could make its way back to the rivers where tribes traditionally fished (Cohen, 1986). In the same decision, Judge Boldt also ruled that the tribes would regulate their share of the fishery and that the state can regulate off-reservation Indian fishing, but the state cannot discriminate against Indians and must meet due process standards for regulation. Through his decision, Boldt had made the tribes co-managers of the fishery and equally responsible for implementing quotas and conservation measures.

The Washington Department of Fish and Wildlife (WDFW) manages several MPAs in Puget Sound. Of the MPAs within WDFW jurisdiction, 9 are no-take conservation areas, 16 are marine preserves allowing limited take, and two are sea cucumber and sea urchin commercial harvest exclusion zones. These exclusion zones prohibit non-tribal commercial fishers from harvesting sea urchins and sea cucumbers. By agreement, treaty tribes also do not harvest urchins and cucumbers in these areas (Van Cleave et al., 2009).

The National Oceanic and Atmospheric Administration (NOAA) manages MPAs within the National Marine Sanctuaries Program (NMSP) and the National Estuarine Research Reserve System. Marine sanctuaries seek to protect natural and cultural features while allowing public use and access that do not impede conservation efforts. The Olympic Coast National Marine Sanctuary (OCNMS) is managed by NOAA and was designated in 1994. The management plan for the OCNMS was recently revised in 2011 and focuses on achieving collaborative and coordinated management; informing ecosystem-based management through collaborative research, assessments and monitoring; improving ocean literacy; conserving natural resources within the sanctuary; and understanding the cultural, historical and socioeconomic significance of the site (NOAA, 2011).

The National Estuarine Research Reserve System is a network of 28 areas representing different biogeographic regions of the United States that are protected for long-term research, water-quality monitoring, education and coastal stewardship. The reserve system was established by the Coastal Zone Management Act (CZMA) of 1972 and is a partnership program between the

National Oceanic and Atmospheric Administration and the coastal states. The Washington State Department of Ecology and NOAA cooperatively manage the Padilla Bay National Estuarine Research Reserve, one of the largest continuous beds of eelgrass in the United States. Every reserve within the National Estuarine Research Reserve System is required by federal regulation to have a management plan. The Padilla Bay management plan provides information about the reserve, describes current and planned programs, and establishes the goals and policies for management of the reserve (National Estuarine Research Reserve System, 2013).

Several of Washington's MPAs fall under the jurisdiction of the Washington Parks and Recreation Commission (WPRC). WPRC manages state parks for conservation and public use. Most state parks with marine shoreline prohibit the removal of seaweed and all state parks prohibit the removal of unclassified marine invertebrates such as moon snails, nudibranchs, shore crabs, starfish and sand dollars (Washington Department of Fish and Wildlife, 2013). Management plans are in place for some Washington state parks, and a procedure for developing management plans is in place. The Classification and Monitoring Planning Project (CAMP) was implemented in 1996 and is a four-stage process for park planning that encourages citizen involvement and input in the planning and development of Washington State Parks. The four stages of CAMP are to identify issues and concerns of park stakeholders, explore alternative approaches to issues identified, prepare preliminary recommendations to address or compromise on issues raised, and propose final recommendations for formal agency and commission adoption. Each park planning project will go through

these four stages or a similar iteration, depending on the park. The four stages reflect the standards of the State Environmental Policy Act (SEPA) and information collected through CAMP planning are used to support SEPA reporting requirements (Washington State Parks, 2013).

MPAs managed by the U.S. Fish and Wildlife Service (USFWS), referred to as wildlife refuges, are part of the National Wildlife Refuge System, whose mission is to administer a national network of lands and waters for the conservation, management, and as necessary, restoration of the fish, wildlife, plans and habitats within the United States for the benefit of present and future generations. These refuges provide habitat for more than 700 species of birds, 220 species of mammals, 250 reptile and amphibian species and over 1000 species of fish. The refuge system provides critical habitat for more than 280 threatened or endangered flora and fauna in marine and terrestrial environments across the U.S. (U.S. Fish and Wildlife Service, 2013).

A Network of Marine Reserves for Puget Sound

While protection of marine resources under this multitude of agencies does offer protection for species and habitat from commercial harvest and pressures from development, many argue for a more coordinated, networked-based approach. An ecological network of MPAs promotes larval dispersal and movement of juveniles and adults across sites. A network of MPAs can also aid in regional coordination by encouraging managing agencies to work beyond their

own interests and mandates to consider regional ecosystem-based outcomes of a network of protected areas (NOAA, 2008). The 2008 Puget Sound Partnership Action Agenda included the following near-term recommendation: "implement a strategic network of Marine Managed Areas and Aquatic Reserves that contributes to conserving the biological diversity and ecosystem health in the marine areas of Puget Sound" (Puget Sound Partnership, 2008). Despite efforts of federal, state, and tribal agencies and stakeholders to develop such a strategic network, progress toward this goal remains at a standstill.

There would be benefits and challenges to creating a network of MPAs in the state of Washington. Managing MPAs as a well-designed network would allow for increased connectivity across sites through dispersal of reproductive stages and movement of juveniles and adults; as well as fisheries and ecosystem benefits such as sustained fisheries through species recovery, spillover from reserve sites, conservation and habitat protection (Gell & Roberts, 2003; Gaines et al., 2010; Harrison et al., 2012; Lester et al., 2009; NOAA, 2008; Russ & Alcala, 2011). Linking smaller marine reserves into a larger, more cohesive network of reserves could also offer benefits to migratory species, support larval dispersal, recover biodiversity within their boundaries, and enhance stocks beyond their boundaries (Russ & Alcala, 2011). However, implementing a network of MPAs at the size and scale recommended by the literature is challenging due, in part, to the perceived socioeconomic impacts and resistance from marine resource users (Agardy et al., 2003). Among the challenges of creating a network is uncertainty

about whether a network of reserves—no-take or otherwise—would be the best tool to help Washington achieve conservation and management objectives.

Recently, Oregon and California established a science-based network of marine reserves and there has been some momentum for Washington to implement a similar network. As California and Oregon grow into their new MPA networks, there may be some opportunity to follow their lead and make educated decisions based on common experiences.

Oregon addressed uncertainties by making one of the short-term goals of its network a study of the effectiveness of networked marine reserves as a management tool. Long-term goals for Oregon's network include conservation of biodiversity and habitats, providing a framework for scientific research, and avoiding significant social and economic impacts (PSP, 2012a). Implementing short and long term goals similar to Oregon, could ease concerns regarding the efficacy and impact of a network of MPAs.

California's Marine Life Protection Act (MLPA) of 1999 sought to redesign California's system of MPAs to function as a network; to better and more coherently protect the state's marine life, habitats, ecosystems and marine heritage; and to enhance the educational, recreational, and research opportunities provided by marine ecosystems subject to limited human disturbance (California Department of Fish and Wildlife, 2013). At the time that the MLPA was enacted, only 2.7% of California's state waters were protected to some extent in 63 MPAs covering approximately 368 square miles (Gleason et al., 2013). These sites were

located near the shore, offered limited protection to species and ecological habitats, and were not established or managed as a network, resulting in often confusing regulations (Gleason et al., 2006). The network of MPAs established under the MLPA in 2013 includes approximately 16% of state waters within 124 interconnected MPAs that represent or replicate nearly all of California's marine and estuarine habitats (Gleason et al., 2013).

California's redesigned network of MPAs did not come without substantial costs. The project required a significant investment of $19.5 million in funding from private foundations and nearly seven years of public planning (Gleason et al., 2013). Much of the planning was completed between 2004 and 2011 through regional group processes in the Central Coast, South Coast and North Central Coast. The initiative planning process was carefully designed to bring capacity and resources to the planning effort, conduct planning regionally in a phased approach, allow scientists to participate in an advisory capacity, and involve stakeholders in developing alternative MPA proposals (Gleason et al., 2010; Kirlin et al., 2013). Saarman and others (2013) note that there were four key conditions that allowed for the integration of science into California's MPA planning process: (1) a strong legal mandate and consistent support for a science-based network of MPAs; (2) a planning process designed to integrate the best available science into the decision-making process; (3) clear, science-based MPA design guidelines consistent with the goals of the MPLA initiative; and (4) consistent involvement from scientists throughout the planning process.

Washington's 2009 MPA Work Group report acknowledges the importance of consistency in expectations of the role of science and scientists in MPA decision-making. Bernstein, Iudicello and Stringer (2004) interviewed MPA managers around the country and recommended that specific roles for scientists and a clear explanation of the role of science in the planning process be used in MPA planning. The authors also recommended integrating the work of scientists and stakeholders at all phases of the project, rather than assigning separate roles for each at different stages. California's success in integrating objective science and scientists into all phases of the planning process is consistent with the recommendations of Bernstein and others, and could be utilized by Washington in future efforts to plan a cohesive network of MPAs.

Overview of Thesis

There are many critical components of MPA planning and management: marine reserve size, ecological criteria, restrictions on fishing and other uses, planning for monitoring and assessment of reserve sites, and potential placement within a broader ocean management framework. Stakeholder buy-in and involvement are integral to the planning and implementation process as well. While efforts have been made to work toward a more cohesive network of MPAs in the state of Washington, there is still a lack of consensus on whether or not a network is needed; if it would contribute to the health of Puget Sound; what protected area definitions and terminology should be used; what the goals and

objectives should be; and which agencies should have management authority (PSP, 2012a).

Through survey research and in-depth follow-up questions, this thesis informs this dialog and facilitates decision making by examining perceptions of MPAs through a public policy framework—the Advocacy Coalition Framework (ACF, Sabatier, 1988)— that enables the identification of areas where managers and resource users might find common ground and form coalitions. Examining Puget Sound MPAs through an environmental studies lens and public policy framework is a unique and valuable addition to the existing literature and aids in the MPA planning process by integrating science and policy. From an ecological standpoint, survey questions approached valid concerns about existing MPAs regarding their size, placement and monitoring practices. The research also addresses public policy and planning needs through questions related to the definition of MPAs in the state of Washington; the perceived utility of MPAs as a management tool; MPA goals, objectives, and monitoring practices; the benefit of a network of MPAs; and beliefs about where management authority for MPAs should reside.

This thesis utilizes a purposive (non-random) sampling methodology, specifically targeting an attentive public with existing awareness of Puget Sound MPAs, including federal, state and tribal resource managers, local governments, Marine Resource Committee members, commercial and recreational fishermen, scuba divers, businesses, non-profit organizations, and universities. This thesis does not intend to generalize stakeholder perceptions throughout the Puget Sound

region, but rather offers suggestions to resource managers looking to engage with stakeholder groups to move MPA planning efforts forward. Future research efforts may choose to employ a similar study regionally, to gain a representative sample of stakeholders throughout Puget Sound.

A k-means cluster analysis of survey data identified three potential stakeholder coalitions whose perceptions about Puget Sound MPAs, and the challenges and potential solutions associated with them were similar. Results supported one of the hypotheses of the ACF, that coalition members do not necessarily share demographics or preferences (Jenkins-Smith & Sabatier, 1994). Coalitions were labeled after further analysis of follow-up questions and open-ended survey responses, revealing policy core beliefs found within each coalition. Although there was some variation among respondents in each coalition, the labels represent common themes that emerged through analysis of survey data and qualitative responses. Further statistical analysis revealed topic areas in which the coalitions and stakeholder groups diverge, highlighting potential focus areas for future MPA planning, education, and outreach efforts.

This thesis addresses an important gap in the literature with regard to stakeholder preferences as they pertain to MPAs in the Puget Sound, presents the application of a public policy framework that may help to move MPA planning efforts forward, and contributes to the growing body of work on MPAs in the state of Washington. Findings align with previous efforts in MPA planning in the state of Washington, indicating a need for complementary goals and management objectives; establishment of clear criteria, management practices, and

terminology; and monitoring practices that allow for site evaluation. Divergence among stakeholder groups with respect to knowledge and perceptions of Puget Sound MPAs and problems with Puget Sound MPAs demonstrates important areas for consensus building. The ACF predicts shared values among perceptions, problems and solutions to be likely to shift over time in response to new information and experiences. Findings indicate that there is substantial work to be done to make the case for a network of MPAs in the state of Washington.

Chapter 2: Literature Review

Studying marine protected areas (MPAs) requires an understanding of marine ecology, social science, and administrative frameworks. This literature review explores the peer-reviewed literature spanning overfishing and the decline of coastal ecosystems, ecosystem-based management (EBM) as an ocean management framework, the use of marine protected areas as a management tool to conserve and restore marine and coastal ecosystems, and factors contributing to the success of marine protected area planning. The purpose of this literature review is to contextualize the challenges in marine resource management; understand EBM as an emerging framework; comprehend the benefits and challenges of MPAs as management tools; and to identify opportunities to advance MPA decision making in the state of Washington.

Overview

Terrestrial environments were prioritized over marine environments for conservation status throughout the past century. Recently, marine protection has been quickly gaining momentum as coastal and marine ecosystems are becoming less resilient, due to human impacts such as fishing, oil extraction, wind and wave energy, offshore aquaculture, and recreation, coupled with pollution, habitat degradation and climate change (Lester et al., 2010). A 2008 study of anthropogenic stressors on marine ecosystems finds that virtually no areas are untouched, and that 41% of marine areas are suffering effects from multiple

stressors such as climate change, pollution, shipping and fishing pressures. These estimates are believed to be conservative, as comprehensive global data on recreational fishing, point-source pollution, aquaculture, disease and coastal development were not available (Halpern, McCloud, Rosenberg & Crowder, 2008).

Pauly and Christiansen (1995) report that we are using a quarter to a third of the primary production of marine ecosystems. Since the 1980s, global fish landings have declined by about 700,000 metric tons per year, indicating that landings are increasingly composed of lower trophic level species as populations of larger, predatory fish populations have declined (Pauly, Christensen, Dalsgaard, Froese & Torres, 1998; Pauly & Watson, 2003; Pauly & Palomares, 2005; Pauly, Watson & Alder, 2005). This decline of large predator fish from the marine food web threatens megafauna and disrupts the balance of marine ecosystems and communities. This global degradation of marine and coastal ecosystems is impairing the ocean's ability to provide sustenance, maintain water quality, and recover from damaging practices (Worm et al., 2006).

In October 2010 at the Conference of Parties (COP) for the Convention on Biological Diversity held in Nagoya, Japan, the COP reaffirmed and extended global targets for marine and terrestrial protected areas. The COP Strategic Plan for Biodiversity calls for "at least 17% of terrestrial and inland water and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, [to be] conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected

areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes" (CBD, 2010, p. 6). As of 2010, global MPA coverage was roughly 1.17% of the ocean surface (CBD, 2010). Following the addition of some recently established MPAs, the global ocean surface area estimate was adjusted to 2.3% (Spalding et al., 2012).

Marine protected areas (MPAs) are used to control the effects of human use on marine ecosystems and to provide myriad ecological, social and economic benefits. The drivers for the majority of marine reserves are marine conservation and the sustainable management of human use activities. Sustaining fisheries is a goal of many no-take reserves and there is evidence that reserves are effective in increasing yields both within and outside of reserve boundaries (Alcala, 1988; Castilla, 1999; Russ & Alcala, 2011; Sponaugle et al. 2012). No-take MPAs provide critical protection to animals and habitat within their boundaries, and contribute to surrounding fisheries through emigration and dissemination of offspring (Murray et al., 1999; Roberts & Hawkins, 2000; Roberts et al., 2005; Russ, 2002). Other human use objectives satisfied by MPAs may include recreation, education, research, aesthetics and cultural heritage (Roberts et al., 2003). If the goal of the protected areas is to conserve biodiversity, representative and unique marine habitats within the biogeographic region should be included within the MPA boundaries (Roberts et al., 2003b).

Figure 2: Map of the Salish Sea and Surrounding Basin (Stefan Freelan, Western Washington University, 2009).

Washington's coasts and marine environments are home to a number of species, many of which are threatened or endangered. A 2011 study by Gaydos and Brown of species of concern in the Salish Sea identified 113 native species, sub-species, or ecologically significant units dependent upon the Salish Sea ecosystem. The Salish Sea spans the jurisdictions of Washington State, British Columbia, the US federal government, and the Canadian federal government (see

Figure 2). Gaydos and Brown's 2011 study is the only comprehensive, baseline study of species within the Salish Sea ecosystem. Washington is currently working toward a complete assessment of species and habitat data for marine and coastal ecosystems within state waters. The WDNR has been engaged in surveys at select sites in the San Juan Islands and Central Puget Sound since 1992 to determine whether rockfish, lingcod and other rockfish respond to protection from harvest through MPAs. Preliminary results indicate that rockfish and lingcod increase in abundance and size even in smaller protected areas (Palsson, 2001a). A statewide biogeographic survey of marine and coastal areas is crucial to future marine reserve planning efforts as species and habitat is an important consideration for site selection.

In addition to increasing size, diversity, and abundance of marine fishes, conservation objectives achieved by MPAs may include preservation of biodiversity, critical species protection, maintaining genetic diversity, ecosystem health and services, and protection of vital nursery grounds (Alcala, 1988; Alcala & Russ, 1990; Castilla & Bustamante, 1989; Lester et al., 2009; Roberts, 1995; Russ & Alcala, 2011; Sponaugle et al., 2012). Furthermore, no-take MPAs can serve as ecological baselines, providing control variables for long-term monitoring and research (Arcese & Sinclair, 1997). Given that virtually no area of the marine environment is untouched and 41% of global marine environments are suffering from multiple anthropogenic stressors (Halpern et al., 2008) there is a sense of urgency among many scholars to protect ecological integrity where we still can (Dayton, Sala, Tenger & Thrust, 2000).

Pauly (1995) suggested that the decline of marine ecosystems has resulted in "shifting baselines," a social phenomenon in which generations set their expectations on their own experience, unaware of the experience of those who came before them (p. 430). Bohnsack (2003) proposes no-take MPAs as an opportunity to reset expectations and provide a common foundation for conservation.

Despite the importance of site selection to meet conservation objectives, in many instances marine reserve sites have been procured opportunistically or with protective measures implemented by different management agencies with differences in desired outcomes (Roberts et al., 2003a; Van Cleave et al., 2009). In Puget Sound, where only 0.1% of the total area included in MPAs is offered the highest level of protection from anthropogenic stressors (CMS level 1, Smith et al., 2012), there are limited existing areas that could serve as ecological baselines for the region. This highlights the importance of clear, regionally appropriate conservation objectives and ecological criteria for future site selection.

Collaborative Management in the State of Washington

Federal, tribal, state and local governments are key decision-makers in marine resource management, particularly in the state of Washington, due to the co-management authority of the treaty tribes. Collaborative management can be used to overcome obstacles in management frameworks, and to improve

outcomes of natural resource planning among different entities. There are well-documented examples of how collaborative management has been used in the Puget Sound region. The Nisqually Watershed Stewardship Plan, which covers the entire Nisqually watershed as defined by the Washington State Department of Ecology, and the Olympic Coast National Marine Sanctuary, which covers 2,408 square nautical miles of marine waters off the Olympic Peninsula coastline, are two prominent examples of management plans that have evolved from collaborative efforts (Nisqually River Council, 2010; NOAA, 2011).

The Washington State Legislature tasked the Department of Ecology with creating a comprehensive management plan for the Nisqually River and watershed in 1985. Working together collaboratively, the Nisqually River Task Force, made up of representatives from federal, state, and local governments, the Nisqually Indian tribe, businesses, and interest groups, cooperatively created the Nisqually Watershed Stewardship Plan. In 2005, the task force was recognized by the US Department of the Interior for creating a "blueprint for cooperative conservation" projects of the future (Nisqually River Council, 2010).

The Olympic Coast National Marine Sanctuary (OCNMS) was designated in 1994 and spans over 3,000 square miles of marine waters off the Olympic Peninsula on Washington's outer coast. The sanctuary is home to marine mammals, seabirds, an array of kelp and algae species and invertebrate communities. Additionally, the sanctuary is entirely comprised of the traditional harvest areas of four coastal treaty tribes—the Makah, Hoh, Quileute and Quinault Indian Nations (NOAA, 2011).

In 2007, these tribes, the state of Washington, and the National Oceanic and Atmospheric Administration (NOAA) formed the Intergovernmental Policy Council (IPC), a regional forum for resource managers from varying entities to exchange information, coordinate policies, and develop recommendations for resource management within the sanctuary (NOAA, 2013).

The primary activities of the IPC are participation in the review of the OCNMS management plan, developing a five-year Ocean Ecosystem Monitoring and Research Initiative, identifying research priorities, establishing a plan for transitioning to ecosystem-based management, and securing long-term funding to sustain the work of the IPC (NOAA, 2013). The contribution of the IPC to the management plan for the OCNMS provides a prime example of government-to-government consensus building and decision making for natural resource management in the state of Washington.

The management plan developed for the OCNMS was the result of a collaborative effort driven by public participation. It involved the Intergovernmental Policy Council and the Sanctuary Advisory Council; a group of representatives from tribes, state and local governments, and federal agencies; the maritime and fishing industries; plus education, tourism, and conservation organizations, and other members of the public. The OCNMS management plan works with the treaty tribes to frame the significance of the sanctuary's treaty trust responsibility (NOAA, 2011). Integrating treaty tribes into management decisions for MPA planning is crucial to the success of the planning process, as well as the sustainability of the protected area.

The significance of collaboration across governments is echoed in the Puget Sound Action Agenda, the official policy statement for Puget Sound recovery. The Action Agenda states that: "collaboration with the many governments and interests in Puget Sound will be essential in implementing solutions and sustaining actions that support a healthy ecosystem while moving forward with a vibrant economy" (Puget Sound Partnership, 2008, p. 2). While coordinating interests across governments and management entities can be challenging at times, there are myriad benefits to be realized from such collaboration, and the collaborative frameworks utilized in the Nisqually Watershed Stewardship Plan and the Olympic Coast National Marine Sanctuary management plan set important precedents for this work.

Theoretical and Management Frameworks

Marine protected areas are supported by ecological theory and research (Airamé et al., 2003; Murray et al., 1999; Roberts et al., 2003a). Much of the literature on site selection and reserve design emphasizes the importance of ecological criteria. Roberts and others (2003b) outline important ecological considerations for marine reserve design: biogeographical representation; habitat representation; vulnerable habitats; species of concern and in critical life stages; exploited species; ecosystem function, processes and services; human threats and natural catastrophes; as well as size and connectivity. Utilizing these ecological criteria as a theoretical framework for site selection, Airamé and others (2003)

present an approach to marine reserve design utilized in the Channel Islands, California, that meets goals set by agencies, organizations and individuals for conservation of ecological biodiversity, sustainable fisheries, economic vitality, natural and cultural heritage and education.

Often, human use data are incorporated into marine reserve design; in particular when protected areas are a part of a greater, strategic ocean and coastal planning framework (Crowder & Norse, 2008; Kelleher & Kenchington, 1992). However, there is broad agreement that socioeconomic criteria alone should not drive the placement of a marine reserve (Kelleher & Kenchington, 1992; Roberts et al., 2003a; Roberts et al., 2003b). In situations where one or more sites are ecologically suitable, socioeconomic criteria may be used to make the final selection (Kelleher & Kenchington, 1992).

MPAs are also supported to some extent by the theory of island biogeography, developed by Robert H. MacArthur and Edward O. Wilson in 1967 (MacArthur & Wilson, 1967). The model was built to explain the species-area relationship and was later applied to protected area design; since the number of species generally increases with area, larger reserves tend to support more species. Not only do larger areas allow for a greater variety of habitats, and communities, they also provide greater geographic isolation. Greater geographic isolation supports larger populations per species, and greater individual populations. These factors increase the likelihood of speciation and decrease the probability of local extinction of newly evolved and recently arrived species (Primack, 2010). Brown and Lomolino (2000) point out that the fundamental idea

of island biogeography, that species diversity on an island is held in equilibrium between immigration and extinction, has not kept pace with advances in ecological theory and a greater understanding of the complexity of nature. The debate as to whether a single large or several small (SLOSS; Soulé & Simberloff, 1986) reserves will support more species, has been thoroughly explored in the past decade and is discussed in depth later in this chapter.

There is agreement that no-take MPAs are a key component of marine conservation and resource management, but are most effective when grounded in a broader ocean management framework, since many anthropogenic stressors on marine environments such as pollution and climate change cannot be solved by MPAs alone (Allison et al., 1998; Halpern et al., 2010; Roberts, 1997). Halpern and others (2010) examined the connections between MPAs and EBM. The authors stated that MPAs are most effective at mitigating adverse impacts when there is coordination among the management entities responsible for fisheries, coastal development, pollution control, oil and gas extraction, wave energy and shipping (Halpern et al., 2010). Broader ocean management planning frameworks, bring all of these interests to the table. Using MPAs as a tool within this framework allows for consideration of all of the exogenous variables, increasing the likelihood of MPA effectiveness.

Additionally, because no one government entity has executive authority over all marine and coastal resources, management decisions are often hindered by conflicting uses and interests among authorities. For this reason, embedding MPAs into broader marine and coastal planning frameworks such as ecosystem

based management and integrated coastal management contributes to their efficacy. Integrating MPAs within an EBM or ICM framework into regional marine spatial planning efforts further amplifies their success by offering a comprehensive, ecosystem-based, proactive approach to managing competing uses to optimize ecological outcomes.

Ocean and Coastal Management Frameworks

Ecosystem-based management (EBM) is an ocean management framework that differs from a single species management approach, or focusing on a particular sector, activity or concern. Alternatively, EBM considers the cumulative impacts of different activities and the benefits provided by our coasts and oceans (Lester et al., 2010; McLeod et al., 2005). EBM drives us to consider the tradeoffs associated with marine resource use and seeks to find balance in the ecological, social and economic components of coastal resource management. The objective of EBM is to ensure the long-term availability of ecosystem services. Many of the tenets of EBM are rooted in integrated coastal management (ICM) (Lester et al., 2010). Considering ICM in EBM planning efforts increases the efficacy and sustainability of protected areas by considering their placement within the broader context of marine and terrestrial uses.

ICM is defined in the literature as "a process by which rational decisions are made concerning the conservation and sustainable use of coastal and ocean resource space. The process is designed to overcome the fragmentation inherent in

single-sector management approaches…in the splits in jurisdiction among different levels of government, and in the land-water interface" (Cicin-Sain & Knecht, 1998, p. 1).

It is suggested that marine reserves are more successful when they exist as part of a broader ICM plan, rather than as stand-alone protected areas (Keller & Kenchington, 1992; NRC, 2001). The rationale behind this belief is that activities that occur beyond the boundaries of protected areas (e.g., marine transportation, fishing, and land-based sources of pollution) have substantial effects on resources within the MPA (Cicin-Sain & Belfiore, 2005). Embedding marine reserves within ICM reduces the potential for competing objectives by recognizing and planning for the many interrelationships between marine and terrestrial environments.

Building on EBM and ICM frameworks and quickly gaining global attention is marine spatial planning (MSP). In 2010, President Obama signed Executive Order 13547, which established the first comprehensive national policy for the stewardship of our oceans, coasts, and the Great Lakes, per the recommendation of the U.S. Commission on Ocean Policy in 2004 (Executive Order 13547, 2010). One of the primary objectives of the policy is an adaptable framework for coastal and marine spatial planning that addresses conservation, economic drivers, conflicting uses and sustainable use. MSP is defined in the policy as a "comprehensive, adaptive, integrated, ecosystem-based and transparent spatial planning process, based on sound science, for analyzing

current and anticipated uses of ocean, coastal and Great Lakes areas" (Thorsteinson et al., 2011).

Agardy and others (2011) suggest that integrating MPAs into a greater management context, such as MSP, can help address some of the challenges inherent with MPAs; such as their tendency to be ecologically insufficient due to small size or poor location, insufficient management and planning, failure due to degradation of surrounding ecosystems, displacement and other unintended consequences, and MPAs that offer an illusion of protection on paper when, in reality, little protection is offered. Alongside challenges associated with MPAs as a stand-alone management tool, human populations in coastal areas continue to increase, and emerging uses such as large-scale aquaculture and renewable energy continue to materialize, intensifying the already worrisome decline of ecosystem health. Ecosystem-based MSP is believed to be a solution that addresses the need for balancing the growing number, array and intensity of human activities with the ability of the oceans to provide ecosystem services; incorporates ecological, economic and social perspectives; and supports management efforts scaled to support ecosystems and jurisdictions (Foley et al., 2010).

Ecosystem-based MSP achieves these objectives through an integrated planning framework that informs the spatial distribution of activities in the marine environment to support current and future uses and maintain ecosystem services for future generations in a strategic way that supports ecological, economic and social objectives (Douvere, 2008). Foley and others (2010) illustrate the guiding principles for ecosystem-based MSP through a flowchart demonstrating how key

ecological principles can be used throughout the planning and implementation process (Figure 3). This process has been designed for use in the MSP planning process in conjunction with similar diagrams outlining the key economic, governance and social components to a comprehensive marine spatial plan (Foley et al., 2010).

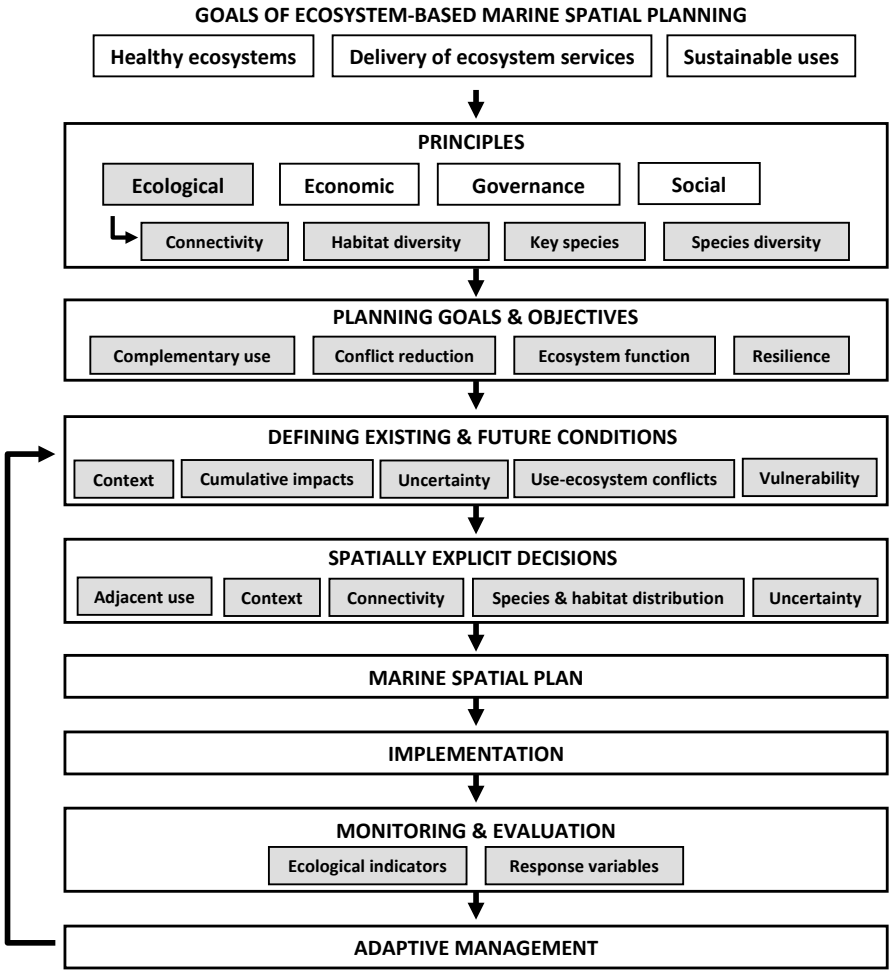

Figure 3: Goals of Ecosystem-based Marine Spatial Planning (Foley et al., 2010)

Application of The Advocacy Coalition Framework

Much work has been done to understand the role of stakeholder values and preferences with regard to marine and coastal planning. The advocacy coalition framework (ACF), a public policy framework developed by Sabatier (1988), predicts that policy core policy beliefs of stakeholders influence their interactions with other stakeholders, and these interactions will occur predominantly with other actors of similar policy core beliefs (Weible & Sabatier, 2005). The ACF examines policy change in policy subsystems, where actors from many public and private institutions who are actively concerned with a public policy or issue, are seeking to influence policies surrounding the issue (Jenkins-Smith & Sabatier, 1994). Policy subsystems are defined by geographic scope, a substantive issue, and a population of engaged stakeholders from all levels of government, research institutions, and interest groups (Sabatier & Jenkins-Smith, 1999). In the context of this thesis, the policy subsystem of our analysis is MPAs in Puget Sound. The ACF assumes that actors within a policy subsystem who share a set of normative and causal beliefs can be grouped together into advocacy coalitions who often act in unison (Jenkins-Smith & Sabatier, 1994; Sabatier, 1988).

The ACF proposes beliefs to be a causal driver for political behavior, and places beliefs into three tiers; deep core beliefs, policy-core beliefs and secondary beliefs (Weible, Sabatier & McQueen, 2009). The belief systems are organized into a hierarchical structure with higher, broader levels containing more specific beliefs (Jenkins-Smith & Sabatier, 1994). At the top are deep-core beliefs, the broadest in scope and most stable. Deep-core beliefs are normative, exist across

all policy subsystems, and are, as the name suggests, deeply rooted. Examples of deep-core beliefs are political ideologies, and attitudes toward individual freedom versus social equity (Jenkins-Smith & Sabatier, 1994; Weible, Sabatier & Lubell, 2004; Weible, Sabatier & McQueen, 2009).

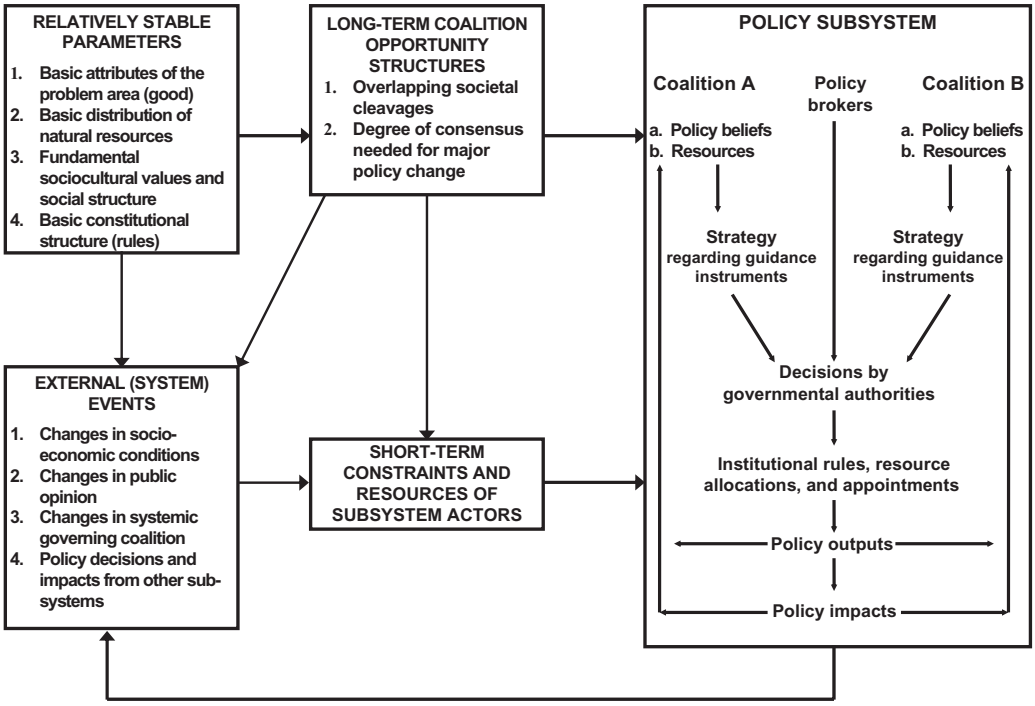

Figure 4: Diagram of the Advocacy Coalition Framework (Sabatier, 2007)

Policy-core beliefs make up the second tier of the hierarchy, and are constrained to the scope of the policy subsystem, and are representative of a coalition's normative values and perceptions pertaining to the subsystem. They reveal value priorities such as the balance between economic development and environmental protection, the gravity and principal causes of a problem, and strategies for solving a problem within a subsystem (Jenkins-Smith & Sabatier, 1994). Policy-core beliefs are resistant to change, but are more likely to shift over

time in response to new information and experiences than deep-core beliefs (Weible, Sabatier & McQueen, 2009).

In the final tier are secondary beliefs, which are the most limited in scope, and are often empirically based. They may concern the magnitude of the problem, policy preferences regarding regulations or budgetary allocations. Secondary beliefs are the most likely to change in light of new data, experience, or a change in strategic frameworks (Jenkins-Smith & Sabatier, 1994). This thesis utilizes the ACF to examine policy-core and secondary beliefs within advocacy coalitions and across stakeholder groups in reference to MPA planning and management in the Puget Sound. Some work has been done to apply the ACF to marine and coastal planning and management in the states of California and Washington (Lipsky & Ryan, 2011; Weible, Sabatier & Lubell, 2004; Weible & Sabatier, 2005).

Weible, Sabatier and Lubell (2004) applied the ACF to stakeholder perceptions of two environmental decision-making processes used in two phases of implementation of California's Marine Life Protection Act. The first attempt at implementation was a top-town process driven by a master plan team of scientists who created an implementation plan without public input. The second attempt brought stakeholders and scientists together in a collaborative process to create a range of recommendations (Weible, Sabatier & Lubell, 2004). The authors found that stakeholders with strong preferences for scientific management support evidence-based claims about the value of MPAs for preserving habitats and protecting against the pressures of overfishing. Stakeholders with pro-collaborative beliefs were more supportive of local-knowledge and comfortable

with the analytic and deliberative approach that involved a diverse array of stakeholders (Weible, Sabatier & Lubell, 2004). In this study of the ACF in California's Marine Life Protection Act, the authors measured beliefs at all three levels of the ACF, including deep-core beliefs that placed stakeholders on the pro-scientific or pro-collaborative scale. While this thesis only measures policy-core beliefs and secondary beliefs as they relate to perceptions of MPAs in Puget Sound, further studies could incorporate a measure of deep-core beliefs, possibly integrating the pro-scientific and pro-collaborative scales used by Weible, Sabatier and Lubell (2004).

Lipsky and Ryan (2011) utilized the ACF framework to understand stakeholder values and coalitions with respect to the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP). In their study, the authors use the ACF as a policy analysis tool in the early stages of policy implementation to understand what coalitions may form in the policy subsystem, rather than the more common application, which is to reflect on coalitions that had already formed (Lipsky & Ryan, 2011). This analysis sought to understand both the values and preferences of Puget Sound nearshore stakeholders, and asked under which of these shared values might coalitions form? This study used a purposive sampling technique and survey respondents were selected from 12 stakeholder categories with a stake in Puget Sound nearshore restoration. The survey included 20 scaled questions on values that could become policy-core beliefs within the PSNERP policy subsystem focusing on severity, causes, and potential solutions to problems (Lipsky & Ryan, 2011). Sabatier and Weible (2007) identified severity,

causes, and potential solutions to be values around which advocacy coalitions typically form.

Analysis of survey and interview data yielded five potential coalitions who shared values regarding Puget Sound nearshore restoration (Lipsky & Ryan, 2011). One hypothesis of the ACF is that coalition members do not necessarily share demographics or preferences (Jenkins-Smith & Sabatier, 1994). The coalitions identified by Lipsky and Ryan (2011) support this hypothesis, as individuals from the same organization often gave radically different answers and were therefore placed into different coalitions. The potential coalitions identified by Lipsky and Ryan (2011) are an important resource for PSNERP managers looking to better understand the scope of value systems within their stakeholder population, and to tailor stakeholder educational, outreach and involvement activities more effectively. This is an immensely important next step for future MPA planning efforts in the Puget Sound. As such, the methodology and application of the ACF used by Lipsky and Ryan (2011) substantially informed the research methodology for this thesis.

Stakeholder Preferences in Marine and Coastal Planning

Stakeholder involvement is crucial to the success of marine reserve planning, and important work has been done globally and along the U.S. West Coast with regard to stakeholder involvement in marine resource planning. This is critical, as studies have demonstrated that efforts to create marine reserves

without the involvement of stakeholder groups are prone to failure (NRC 2001). The National Research Council (2001) asserts "effective implementation of marine reserves and protected areas depends on participation by the community of stakeholders in developing a management plan (p. 4). Christie and others (2003) found biological and social success of MPAs to be linked to the inclusion of social science research in MPA decision making. The term stakeholder is defined in this context as anyone who can directly or indirectly influence or be affected by, the management process (Geoghegan & Renard, 2002). Stakeholder involvement in the planning process often results in greater ownership of management decisions, opportunities for empowerment and democratization through a more collaborative policy making and implementation process, and management decisions that integrate the needs, aspirations and knowledge of all parties (Geoghegan & Renard, 2002, p. 18).

While there are valid concerns that public participation can conflict with conservation objectives (McCloskey, 1999) and can be too resource intensive, as it requires time, money and staff to coordinate the process, the risks associated with excluding stakeholders from the planning process are too great. After the public expressed anger at public meetings following exclusion from a yearlong MPA planning process, California developed an open process to develop criteria for MPAs (Bergen & Carr, 2003). The redesigned network of MPAs in California required a significant investment of $19.5 million in funding from private foundations and nearly seven years of public planning (Gleason et al., 2013).

Successes and challenges inherent to involving stakeholders in the planning process have been well documented in the Puget Sound region. The regional studies reviewed helped me to build a critical understanding of stakeholder participation and perceptions of the marine resource planning process in the state of Washington.

Evans and Klinger (2008) examined an example of bottom-up marine EBM in San Juan County, Washington, where a citizen advisory group led the effort to develop an ecosystem-based management plan for the San Juan County Marine Stewardship Area. A key aspect of the planning process was the incorporation of social dimensions through sociocultural and biodiversity targets (Evans & Klinger, 2008). In reviewing the planning process, the authors identified many challenges related to bottom-up conservation planning. Among the issues identified were a lack of practical approaches for implementing EBM, information deficits, uncertainty and the inability to make decisions under uncertain circumstances, conflicting objectives, and the appropriate scale for EBM (Evans & Klinger, 2008).

Hard, Hoelting, Christie and Pollnac (2012) conducted a social survey in seven communities near Puget Sound MPAs to measure perceived collaboration between government agencies and the public near MPA sites, identify factors related to government agency/public collaboration, and test whether this collaboration is related to an increase in process legitimacy. The authors found significant correlation between MPA support and measures of perceived collaboration and process legitimacy (Hard et al., 2012). This finding is important

to the work of MPA managers in securing public support for protected areas in Puget Sound.

Building on the work of Hard et al. (2012), Hoelting, Hard, Christie and Pollnac (2013) utilized the same dataset to examine relationships between indicators of participatory democracy and process legitimacy, and general support for MPAs. The goal of the analysis was to examine the degree to which variables related to the participatory process influenced MPA support. The authors found environmental beliefs, perceived ecological success of MPAs and demographic variables to account for 70% of the variance in MPA support. Though these studies did not inform the scope or design of my study, the results reported by Hard and others (2012) and Hoelting and others (2013) are critical to informing the ongoing collaborative governance process and socio-cultural dynamic dialog around MPAs in the Puget Sound, and validate the need for public participation, collaboration, and transparency.

Some work has been done to understand perspectives of treaty tribes in relation to the use of MPAs as a management tool. Whitesell, Schroeder and Hardison (2007) conducted interviews with tribal representatives and found tribes to be accepting of MPAs under certain conditions. Among their recommendations are to involve tribes in all aspects of MPA planning through government-to-government relations; treaty rights and usual and accustomed grounds must not be at stake; bureaucratic processes and regulation around MPA management and design must become streamlined; and, to receive tribal support, prospective MPA sites must have clear, site-specific scientific justifications for resource protection

(Whitesell et al., 2007, p .28). These findings are consistent with other documentation of tribal perspectives toward MPAs in the state of Washington.

The MPA Tribal Policy Statement, clearly states that regulation of tribal activity under an MPA is only appropriate when it is necessary as a conservation measure, does not discriminate against a tribe's reserved right to harvest resources, if regulation of non-tribal activities alone will not meet the conservation needs, and if the tribe's own conservation measures prove insufficient. The policy statement asserts that MPAs shall not be the goal in the absence of a demonstrated need for conservation (NWIFC, 2003). However, a key to successful conservation planning is to understand where extractive human uses such as fishing occur, along with understanding the ecological characteristics of a particular area in both habitat and populations of organisms. In the absence of perfect information on habitat and species assemblages, a sound strategy in marine planning is to take a precautionary approach and protect a variety of representative habitats (Crowder & Norse, 2008).

Measuring Success in Marine Protected Areas

There are many factors that contribute to the success of marine reserves. We've already discussed how considering MPAs within a broader ocean management context can attribute to their success, but there are other factors within MPA boundaries that are critical to their success as well, such as size and location (Bergen & Carr, 2003). While size, location and other biological factors

may contribute to the performance of an MPA, the success of a protected area is more accurately measured by comparing intended goals and outcomes.

The theory of island biogeography (MacArthur & Wilson, 1967) has sparked an important debate with regard to whether a single large or several small (SLOSS) reserves will support more species. Simberloff and Abele (1981) reviewed published data addressing the SLOSS debate and found that, for a variety of species and habitat types, there was no clear distinction between several small sites or one large site in achieving conservation goals. A more recent study by Halpern (2003) also addresses the SLOSS debate by exploring the effect that reserve size may have on the biological factors of density, biomass, size and diversity.

Halpern's study finds that reserves generally have a significant positive impact on all four of the biological factors analyzed (density, biomass, size, diversity) of fish and invertebrates within protected areas. Halpern found that, on average, marine reserves appeared to double density, almost triple biomass and increase organism size and diversity by 20-30% relative to reported values for unprotected areas (Halpern, 2003). Unsurprisingly, smaller reserves were found to have some limited functionality compared to their larger counterparts. Halpern (2003) states that equal relative differences in density, biomass, size and diversity almost always translated to greater values for these measures in larger areas. While the presence of MPAs, large or small, had a positive effect on biological factors, larger reserves had a more significant impact.

In addition to increasing biomass, density, size and diversity of marine organisms, larger reserves have been found to be superior at protecting fish stocks, as they allow more space for habitat, larval dispersal and nursery grounds for juvenile fish (Roberts, Bohnsack, Gell, Hawkins & Goodridge, 2001). Kelleher and Kenchington (1992) note the value of large MPAs that cover entire marine ecosystems. The size of larger marine reserves allows species within to be more protected against edge effects and their large size is attributed to more spillover benefit to fishers than their smaller equivalents (DeSanto, 2013; Kelleher & Kenchington, 1992). Additionally, Lauck, Clark, Mangel and Munro (1998) make a case for large reserves due to the inevitable uncertainty pertaining to marine environments. The authors cite an array of fisheries management failures and suggest that large, no-take MPAs may provide some insurance against failed fisheries management practices (Lauck et al., 1998).

Recognizing the challenge of allocating large areas for MPAs, Gaines and others (2010) suggest the applicability of marine reserve networks to increase the benefits of many smaller reserves, especially for larger, predatory fish. The authors note that, frequently, reserve size is minute compared with the geographic extent of many species, particularly those that are overfished and in need of refuge. Positive changes in biomass or density within a reserve offer limited benefits to the species as a whole in smaller, isolated reserves. An alternative approach is aggregating the benefits of small reserves through networks of MPAs (Gaines et al., 2010).

Research suggests that marine reserves can also be an effective conservation tool for megafauna such as cetaceans, pinnipeds, sea otters, polar bears, sea birds, sharks and predatory fish (Hooker, Whitehead & Gowans, 1999; Hooker & Gerber, 2004). They are particularly effective for these populations when site selections are the result of a quantitative assessment of cetacean behaviors most vulnerable to anthropogenic stressors; such as killer whale (*Orcinus orca*) feeding behaviors in the north-east Pacific (Ashe, Noren & Williams, 2010; Williams Lusseau & Hammond, 2006).

Determining the best location for MPAs is discussed thoroughly in the literature (Airamé et al., 2003; Bergen & Carr, 2003; Hooker & Gerber, 2004; Kelleher & Kenchington, 1991; Roberts et al., 2003a). Roberts and others (2003a) have also contributed to the discussion on MPA site selection, outlining critical ecological criteria for prioritizing MPA sites, including biogeographic representation, habitat representation and heterogeneity, human threats, natural catastrophes, size, connectivity, vulnerable habitats, critical life stages, species and populations of special concern. Kelleher and Kenchinton (1991) outline key considerations in determining a location for protected areas (Table 2), but ultimately the success of the protected areas is measured against the goals set for the area. Among the goals commonly used for protected areas are conservation of biodiversity, ecosystem protection, restoration of ecosystem integrity, and fisheries enhancement (Hooker & Gerber, 2004).

Table 2: Guidelines for determining suitable MPA sites (Kelleher & Kenchinton, 1991).

Naturalness	• The extent to which the area has been protected from, or has not been subject to human-induced change
Biogeographic importance	• Either contains rare biogeographic qualities or is representative of a biogeographic "type" or types • Contains unique or unusual geological features
Ecological importance	• Contributes to maintenance of essential ecological processes or life-support systems e.g. source for larvae for downstream areas integrity • The degree to which the area either by itself or in association with other protected areas, encompasses a complete ecosystem • Contains a variety of habitats contains habitat for rare or endangered species contains nursery or juvenile areas contains feeding, breeding or rest areas contains rare or unique habitat for any species preserves genetic diversity i.e. is diverse or abundant in species terms
Economic importance	• Existing or potential contribution to economic value by virtue of its protection e.g. protection of an area for recreation, subsistence, use by traditional inhabitants, appreciation by tourists and others or as a refuge nursery area or source of supply for economically important species
Social importance	• Existing or potential value to the local, national or international communities because of its heritage, historical, cultural, traditional aesthetic, educational or recreational qualities • Value for research and monitoring
Scientific importance	• Is or has the potential to be listed on the World or a national Heritage List or declared as a Biosphere Re-serve or included on a list of areas of international or national importance or is the subject of an international or national conservation agreement.
International or National significance	• Degree of insulation from external destructive influences social and political acceptability, degree of community support
Practicality/ feasibility	• Accessibility for education, tourism, recreation compatibility with existing uses, particularly by locals ease of management, compatibility with existing management regimes

While much of the scholarly work on MPA success can be attributed to work in the global South, biological benefits of MPAs in temperate zones are becoming more apparent (Roberts, Hawkins & Gell 2005). Benefits in temperate regions are realized, even within smaller reserve boundaries, when reserves are strategically placed to benefit migratory species, through carefully selected sites where species aggregate or there are migration bottlenecks characterized by quality habitat and plentiful feeding opportunities (Hawkins & Gell, 2005). In Puget Sound, success is typically measured with biophysical indicators such as density, fishery catch rates, size of individuals, and fecundity. Spawning grounds, nursery areas, feeding areas and migration corridors are prioritized for no-take areas (Palsson, 2001b; Van Cleave et al., 2009).

Efforts have been made to improve the conservation and management of rockfish in the Puget Sound. Currently, three species of Puget Sound rockfish are listed as either threatened or endangered; yelloweye rockfish (*Sebastes ruberrimus*) and canary rockfish (*Sebastes pinniger*) have been listed as threatened, while bocaccio rockfish (*Sebastes paucispinis*) is listed as endangered (Drake et al., 2010). Numbers of other rocky reef fishes have responded positively to protection from harvest (Palsson, 2001a; Palsson, 2001b; Palsson et al., 2009). In the past decade, rockfish harvest has been reduced by 90% (Palsson et al., 2009). However, there are many factors influencing the fate of rockfish in the Puget Sound outside of fishing pressures. Palsson and others (2009) report that fishery removals, derelict gear, hypoxia and food web interactions are among the top stressors of rockfish populations. MPAs in the Puget Sound provide refuge

from harvest and a baseline for population monitoring (Palsson et al., 2009) and will continue to be an important component to rockfish recovery.

The Washington Dilemma: To Network or Not to Network

The idea of creating a network of marine reserves is not new to Washington State. In 1995, the Washington MPA Work Group convened to develop a strategy to design and implement a network of MPAs in the state. This multi-agency group worked collaboratively and envisioned a new process for establishing MPAs cohesively, departing from the uncoordinated approach historically in place. The work group produced a draft strategy in 1998, but never a full report. Their strategy called for a draft policy for MPAs; evaluation of sites by a policy and technical committee; significant involvement by tribes, local governments and the public; integration of the precautionary principle; adaptive management; and evaluation of outcomes at individual sites (Mills, 1998 as cited in Van Cleave et al., 2009).

In 2009, the challenge of MPA planning was revisited by a new multi-agency group, by a similar name, the MPA Work Group. Considering past efforts by the Washington MPA Work Group, the MPA Work Group agreed that the efficacy of MPAs in Washington would be greatly increased through the implementation of a coordinated strategy to implement an ecologically significant network of MPAs (Van Cleave et al., 2009).

The MPA Work Group contributed to this effort by making a series of recommendations to the Legislature to support the development of a strategy building toward the implementation of a network of MPAs. Among these recommendations were suggestions to improve coordination and consistency, boost integration, and enhance effectiveness of protected areas in the state (Van Cleave et al., 2009).

To increase coordination and consistency, the MPA work group suggested complementary goals and management objectives; establishment of clear criteria, management practices, and terminology; and monitoring practices that allow for site evaluation. To improve integration in MPAs, the work group suggested a role for scientists and consideration of the implementation of additional marine stewardship areas (MSAs), which offer roles for diverse stakeholders to participate in carrying out the stewardship mission and goals of protected areas. To improve effectiveness, the work group agreed that there should be a coordinated strategy to create an ecologically meaningful network of MPAs, as well as evaluation of existing sites to determine if they are providing sufficient ecological benefit and being managed efficiently, given current agency resources (Van Cleave et al., 2009).

In the fall of 2012, the Puget Sound Partnership hosted an MPA planning workshop. All agencies that took part in the MPA Work Group were invited to attend. There were 27 workshop participants who were marine managers and technical experts from federal, state and local agencies, tribal governments, and The Nature Conservancy. The intent was to bring together Puget Sound marine

managers to increase collaboration; discuss ecosystem protections afforded under current MPAs; discuss ecosystem threats, conservation concerns and other goals that an integrated network of MPAs may address; and identify information needs and next steps for improving marine protection in Puget Sound (PSP, 2012a). The group requested that the Puget Sound Partnership continue the conversation by leading a collaborative process to (1) assess the need for and ability of an MPA network to meet Puget Sound conservation priorities; (2) agree to definitions of a network, as well as a scientific basis for such a network that includes socio-ecological factors; and (3) assure that this collaborative and exploratory process includes all MPA managers – both tribal and non-tribal. The group outlined a multi-staged process of next steps, the first of which included conducting a needs assessment and matching MPA needs to conservation priorities (PSP, 2012a).

Oregon and California have been successful in establishing a science-based network of marine reserves, and examining their planning process may be of some benefit to MPA managers in Washington. Biological success of MPAs has been linked to compliance with reserve rules (McClanahan, Marnane, Cinner & Kiene, 2006), and compliance with reserve rules has been significantly attributed to clearly defined MPA boundaries, robust ecological monitoring, education, and formal consultation with the local community (Pollnac et al., 2010). A key component of California's success was the integration of science into the regional planning process. This was accomplished through the assignment of a master plan science advisory team (SAT) to the planning group for each of the four regions. The role of the SATs was clearly articulated to be advisory to the

planning process, not to be responsible for the design of MPAs. This distinction allowed scientific information to be used objectively in the MPA planning process by distancing it from political and social considerations. The SAT included 17-21 members who were publicly nominated and appointed by the director of the California Department of Fish and Game, and who had been selected from state agencies as well as public and private institutions with expertise in marine biology, oceanography, fisheries, social science and economics (Kirlin et al., 2013). Saarman and others (2013) note that there were four key conditions that allowed for the integration of science into California's MPA planning process: (1) a strong legal mandate and consistent support for a science-based network of MPAs; (2) a planning process designed to integrate the best available science into the decision making process; (3) clear science-based MPA design guidelines consistent with the goals of the MPLA initiative; and (4) consistent involvement from scientists throughout the planning process.

Washington's MPA Work Group acknowledges the importance of consistency in expectations of the role of science and scientists in MPA decision-making (Van Cleave et al., 2009). Bernstein and others (2004) interviewed MPA managers around the country and recommended that specific roles for scientists and a clear explanation of the role of science in the planning process be used in MPA planning. The authors also recommended integrating the work of scientists and stakeholders at all phases of the project, rather than assigning separate roles for each at different stages. California's success in integrating objective science and scientists into all phases of the planning process is consistent with the

recommendations of Bernstein and others, and could be utilized by Washington in future MPA planning efforts.

A network of MPAs provides even greater ecosystem support through linking protected areas ecologically and administratively by streamlining establishment criteria, goals and objectives, and monitoring practices. Embedding MPAs into a broader ocean and coastal planning context further boosts their resiliency by planning for the confounding uses outside of MPA boundaries. This thesis seeks to integrate perspectives toward MPAs by developing an understanding of the beliefs, problems and solutions through the analysis of responses from managers and stakeholders, and identifying advocacy coalitions that emerge in this policy subsystem. This thesis contributes to the dialog, planning process and growing body of work on Puget Sound MPAs, and identifies opportunities to advance decision-making around MPAs in the state of Washington.

Chapter 3: Research Methods and Findings

Methodology

This study focuses on two research questions: do MPAs in Puget Sound show patterns of support or resistance among stakeholder groups and do potential coalitions of stakeholders emerge based on shared beliefs? This research seeks to identify policy-core beliefs of key stakeholders and decision makers concerning MPAs in Puget Sound and to understand knowledge and awareness, and perceptions of problems and solutions for Puget Sound MPAs across groups using surveys and structured follow-up questions.

This study is exploratory, and utilizes a purposive (non-random) sampling methodology of an attentive public, most of which have participated in MPA planning or are affected by the outcomes. The scope of this research is limited to marine and coastal resource managers and key stakeholders at local, state, federal and tribal agencies; commercial and recreational fishermen; recreational scuba divers and scuba businesses; universities; and conservation and research non-governmental organizations. Individuals were identified through a review of public documents and Internet research. Recreational fishermen and scuba divers were approached at random in Seattle and Olympia, Washington. A thorough review of peer reviewed literature, reports, and other documents pertaining to MPAs in Washington, as well as informal discussions with staff from state agencies helped to inform the objectives of this study.

Survey responses and open ended follow-up questions were solicited from representatives from the agencies currently managing protected areas (i. e., the National Oceanic and Atmospheric Administration, National Park Service, US Fish and Wildlife Service, Washington Department of Ecology, Washington Department of Natural Resources, Washington Department of Fish and Wildlife, Washington Parks and Recreation Commission, The Nature Conservancy, and the University of Washington). Federally recognized tribes and key stakeholder groups were also solicited including the Northwest Indian Fisheries Commission and tribes in the Puget Sound region, environmental non-profits, commercial and recreational fishing groups and recreational scuba divers and diving organizations.

The purpose of this research is not to generalize perceptions of a representative sample of stakeholders with regard to MPAs in Puget Sound, but to identify potential coalitions based on an exploratory sample of individuals engaged in MPA planning or resource users, so as to guide future efforts in MPA management, implementation and enforcement, and to understand where these stakeholder groups agree and diverge with regard to perceptions, problems, and proposed solutions. These findings will allow MPA managers to focus efforts on distinct perceptions, problems and solutions, and to address potential coalitions in a more targeted and productive way. If these findings prove useful to MPA managers, this research could be scaled up and questions revised to include a representative sample population.

The methodology of this research was informed by the advocacy coalition framework (Sabatier, 1988) and by a study by Lipsy and Ryan (2011) about

stakeholder values and preferences as they pertain to Puget Sound nearshore restoration efforts. The survey titled "Perceptions of Marine Protected Areas in the Puget Sound" had 24 questions and three parts, and sought to determine knowledge and attitudes toward Puget Sound MPAs, causes of problems with MPAs in the Puget Sound, and potential solutions for Puget Sound MPAs (see Appendix B). The questions were informed by previous efforts in MPA planning in the state of Washington, such as the 2009 MPA Work Group report, the 2012 Puget Sound Partnership MPA Workshop, and the ACF, as causes of problems and potential solutions are areas in which advocacy coalitions typically form (Sabatier, 2007).

Understanding respondent's knowledge and attitudes about MPAs is important to understanding the characteristics of the survey population, as well as for the consideration of agencies and organizations involved with MPA planning efforts. In addition to being predictors to potential coalitions, determining agreement on causes of problems and potential solutions is broadly relevant to MPA planning efforts in Puget Sound.

The questions were primarily close-ended, asking respondents to indicate their level of agreement with a statement about Puget Sound MPAs (strongly agree, agree, neutral, disagree, strongly disagree). In addition, there were two open-ended questions, asking participants to identify challenges or solutions not addressed in previous questions, and a final portion of the survey, which asked the respondent to identify the stakeholder group with which they were affiliated. Respondents were given the opportunity to select an affiliation from the following

options: federal agency, state agency, tribal government agency, local government (municipal, county, etc.), university or college, non-governmental organization, conservation non-profit organization, recreational non-profit organization, other non-profit public interest organization, or "other."

Data Collection

Survey data collection began on April 1st 2013 and ended on May 2nd 2013. Respondents were sent an email message explaining the research objective with a unique link to the survey. A selection of respondents also received the survey via postal mail with a self-addressed, stamped envelope. Recreational fishermen and divers were approached at random in Seattle and Olympia, Washington, and given a paper copy of the survey, which was collected at the time it was completed. Respondents who elected to be contacted for follow-up questions were contacted via email on May 1st 2013 and asked to respond before May 10th 2013. The follow-up questions included preliminary findings from the initial survey and contained six open-ended questions exploring problems and solutions for Puget Sound MPAs. While 18 individuals indicated interest in participating in follow-up questions, only 7 individuals participated. Stakeholder groups represented in follow-up responses are state government, tribal government, conservation non-profit organizations, and scuba diving businesses.

Quantitative and Qualitative Analysis

The survey dataset provided an opportunity to report on common perceptions across stakeholder groups, but was primarily analyzed to identify potential stakeholder coalitions based on similar responses. The 21 scaled survey questions were assigned numerical values for analysis (1 = strongly agree – 5 = strongly disagree). First, a preliminary analysis of survey responses across stakeholder groups was completed to determine mean response, standard deviation and the percentage of respondents by level of agreement for each of the three categories of questions: knowledge and attitudes about Puget Sound MPAs, causes of problems with MPAs in Puget Sound, and potential solutions for MPAs in Puget Sound.

Cluster analysis was used to analyze survey responses to the scaled questions and to assign cluster membership based on commonalities in responses across stakeholder groups. Cluster analysis is an exploratory data analysis procedure used to find groups of similar entities in a sample of data (Alenderfer & Blashfield, 1984) and is commonly used when a researcher is not testing a hypothesis, as was the case in this study. Cluster analysis is well suited for small sample sizes, and is appropriate for a perception survey because it can be used to find structures in data, without providing explanation or interpretation (Lipsky & Ryan, 2011).

A k-means or iterative partitioning approach was used because of the small sample size (57 respondents and 21 variables). Although p-levels are

reported in k-means clustering, they are not appropriate, as this study is not testing a hypothesis but conducting an exploratory phase of research. Clusters are defined based on Euclidean distances so as to reduce the variability of individuals within a cluster, while maximizing variability between clusters (Kintigh & Ammerman, 1982). Clustering algorithms produce several groupings, which can then be validated using qualitative responses from open-ended and follow-up questions.

K-means clustering requires selecting the optimal number of clusters. To correctly determine the appropriate number of clusters, a hierarchical cluster analysis was run on the dataset using Ward's method to first determine the number of clusters. After the optimal number of clusters was selected, k-means cluster analysis was run, and cluster membership was assigned to each respondent for further analysis.

Descriptive statistical analysis was performed on the dataset to determine if the data were normally distributed. As the data were not normally distributed, Kruskall-Wallis and Tukey-Kramer analyses were run to test differences in means among assigned coalitions and stakeholder groups with respect to the 21 scaled survey questions. The Tukey-Kramer test is an exact alpha-level test if the sample sizes are the same, and conservative if the sample sizes are different (Hayter, 1984). Though the purpose of this analysis was not to test a hypothesis, reported p-values help to identify significant differences among responses. A p-value greater than 0.05 denotes a less significant difference between coalitions.

Qualitative data from follow-up and open-ended questions were analyzed and coded. A framework for coding responses was developed and used to sort responses into thematic groups (Rubin & Rubin, 2005). Qualitative data allowed an additional layer of examination for potential coalitions based on shared values, and were crucial to understanding and identifying shared values among coalition members outside of quantitative survey responses.

Results and Discussion

There were 57 survey participants. Respondents were categorized for the purpose of stakeholder analysis under the ACF framework, and for anonymity. Stakeholder groups and respondents used for the analysis include federal government agency (n = 3), tribal government agency (n = 5), state government agency (n = 14), local government and county marine resource committees (n = 10), conservation or research non-governmental organizations (n = 9), commercial and recreational fishermen (n = 7), recreational scuba divers, dive shop owners and diving organizations (n = 7), and universities (n = 2). Analysis of responses to each question in the three-part survey was completed to understand mean response, standard deviation, and the make-up of responses regardless of stakeholder affiliation. These global perceptions of the survey population are shown in Table 3 and discussed in the following sections.

Table 3: Mean responses across stakeholder groups to scaled survey questions
(1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

Part I: Knowledge and Attitudes Toward Puget Sound MPAs

	Mean	Standard Deviation	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Washington State law defines a marine protected area as: A geographical marine or estuarine area designated by a state, federal, tribal or local government in order to provide long-term protection for part or all of the resources within that area. (Substitute Senate Bill 6231, effective June 12, 2008).							
Does this definition fit the goals and objectives of MPAs in the Puget Sound? (n = 57)	2.19	0.83	14%	63.2%	14%	7%	1.8%
I am aware of Puget Sound MPAs and their history (n =57)	2.21	0.72	14%	54.4%	28.1%	3.5%	0%
I believe that MPAs in the Puget Sound are effective in their current state (n = 57)	3.44	0.90	0%	14%	42.1%	29.8%	14%
Puget Sound MPAs should share common goals and objectives (n = 57)	2.35	1.02	22.8%	36.8%	22.8%	17.5%	0%
Utilized properly, MPAs could be an effective tool to conserve and manage marine resources in the Puget Sound (n = 57)	1.60	0.70	50.9%	40.4%	7%	1.8%	0%
I believe that a network of no-take MPAs can and should be implemented in the State of Washington (n = 57)	1.93	1.07	45.6%	21.1%	24.6%	7%	1.8%

Part II: Causes of Problems with MPAs in the Puget Sound

	Mean	Standard Deviation	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Research has identified a number of factors important to the efficacy of MPAs. For the questions below, please indicate the extent of your agreement that the problem is one that limits the effectiveness of Puget Sound MPAs.							
Puget Sound MPAs are arbitrarily placed (n = 56)	2.77	1.10	10.7%	23.2%	39.3%	26.8%	0%
There are not enough MPAs in the Puget Sound (n = 56)	2.16	0.99	26.8%	35.7%	30.4%	5.4%	1.8%
Puget Sound MPAs are too small (n = 56)	2.23	1.08	32.1%	21.4%	33.9%	12.5%	0%
Fishing and gear restrictions in Puget Sound MPAs are too lenient (n = 55)	2.33	1.11	23.6%	29.1%	29.1%	18.2%	0%
Puget Sound MPAS fail to include the types of habitat necessary for species protection (n = 55)	2.51	1.01	10.9%	36.4%	34.5%	18.2%	0%
We do not know enough about species and habitat in the Puget Sound to identify the best location for MPAs (n = 56)	3.23	1.15	5.4%	23.2%	17.9%	44.6%	8.9%
Puget Sound MPAs are not regularly monitored (n = 56)	2.12	0.90	25%	39.3%	30.4%	5.4%	0%

Part III: Potential Solutions for MPAs in the Puget Sound

	Mean	Standard Deviation	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Coordinating and clarifying establishment criteria will help MPAs in the Puget Sound be more effective (n = 55)	1.79	0.72	27.3%	61.8%	9.1%	1.8%	0%
Creating a coordinated network of MPAs in the Puget Sound is necessary to improving the efficacy of protected areas (n = 55)	1.93	0.93	32.7%	40%	21.8%	5.5%	0%
Designating authority to one agency or the legislature is part of the solution to creating a successful network of MPAs (n = 56)	2.95	1.03	7.1%	21.4%	39.3%	28.6%	3.6%
Designating authority to a group of representatives from many management entities is part of the solution to creating a successful network of MPAs (n = 56)	2.53	1.14	14.3%	41.1%	25%	12.5%	7.1%
Finding common terminology for MPAs in the Puget Sound is important to their success (n = 55)	2.07	0.91	21.8%	49.1%	21.8%	7.3%	0%
Goals and objectives for MPAs should be consistent across managing entities (n = 56)	2.19	1.02	21.4%	50%	14.3%	12.5%	1.8%
A consistent monitoring plan across MPAs is crucial to their success (n = 56)	1.77	0.88	42.9%	39.3%	12.5%	5.4%	0%
Habitat mapping and species diversity and abundance studies and reports are necessary for the success of MPAs so that sites can be prioritized (n = 56)	1.61	0.64	42.9%	50%	7.1%	0%	0%

Knowledge and Attitudes Toward Puget Sound MPAs

The first part of the survey asked questions to determine respondents' knowledge and attitudes toward MPAs in the state of Washington, including whether or not MPAs are perceived to be an effective management tool, and opinions about the potential of MPAs in Washington. Most survey respondents identified themselves as being knowledgeable about Puget Sound MPAs, with 14% strongly agreeing with this statement and 54.4% agreeing. Only 3.5% of respondents felt that they were not knowledgeable about Puget Sound MPAs and their history.

There is agreement among survey respondents that MPAs are appropriately defined by Washington State law as "a geographical marine or estuarine area designated by a state, federal, tribal or local government in order to provide long-term protection for part or all of the resources within that area" (Substitute Senate Bill 6231, effective June 12, 2008). Survey respondents largely (77.2%) agreed that this definition fit the goals and objectives for Puget Sound MPAs.

Analysis of mean responses across stakeholder groups using the Tukey-Kramer test found significant differences between stakeholder groups for several of the questions about knowledge and attitudes. With respect to the state of Washington's definition of MPAs, there was a significant difference between mean responses from state agencies and tribal resource managers. Responding to a question about knowledge of MPAs and their history, there was a significant

difference between tribal resource managers—who reported a high level of knowledge—and fishermen, whose mean response was neutral. With regard to whether or not they believed MPAs to be effective in their current state, there were significant differences across several stakeholder groups (i.e., state agencies, local governments, conservation groups, tribes and fishermen). Conservation groups, fishermen, and scuba divers all diverged significantly with regard to the potential for MPAs as a conservation and management tool in Puget Sound. With regard to the final question in this section, "I believe that a network of no-take MPAs can and should be implemented in Washington State," there were significant differences among fishing, conservation and scuba stakeholders, as well as between local and conservation groups. There were no significant differences found with regard to goals and objectives, where there was agreement among all stakeholder groups that Puget Sound MPAs should share common goals and objectives.

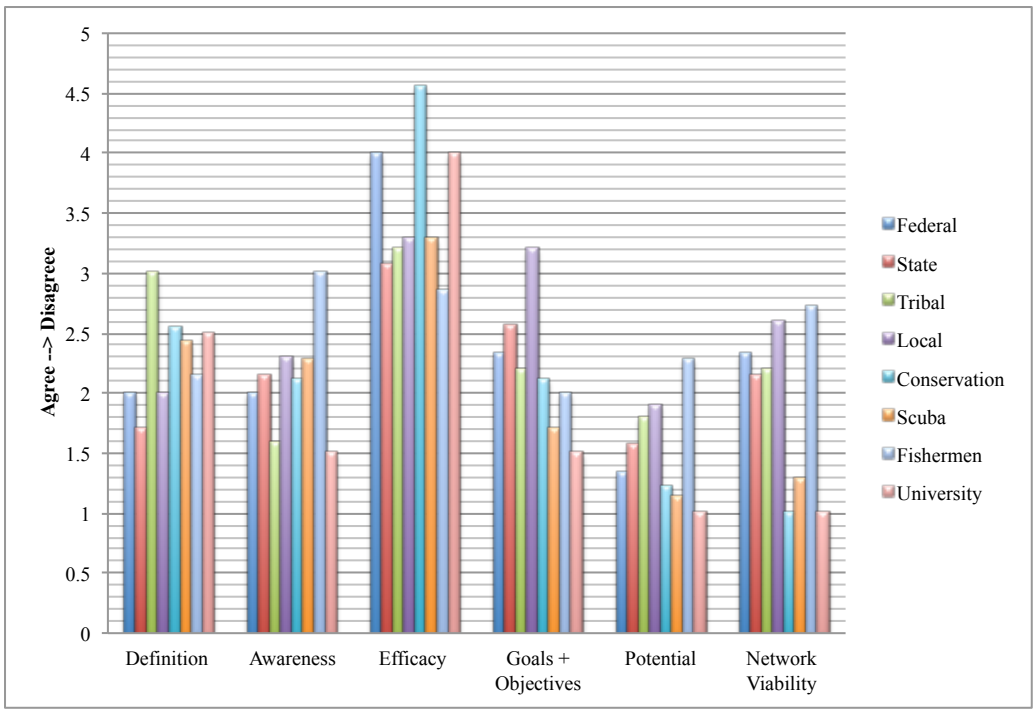

Figure 5: Mean responses across stakeholder groups to questions about knowledge and attitudes toward Puget Sound MPAs.

Causes of Problems with Puget Sound MPAs

Research has identified a number of factors important to the efficacy of MPAs, such as size, restrictions on use, monitoring, and placement. Most (62.5%) respondents agreed that there were not enough MPAs in the Puget Sound, and only 7.2% felt as though the number of MPAs in the sound was sufficient. Despite the limited availability of seafloor mapping data, only 28.6% of respondents felt that we didn't know enough about species and habitat to identify the best location for MPAs. The other 53.5% of respondents felt that we do know enough about species and habitat in the Puget Sound to identify the best location for MPAs. Despite this agreement about our knowledge of the best

sites, only 26.8% of respondents disagree that Puget Sound MPAs are arbitrarily placed, with 39.3% neither disagreeing nor agreeing, and 33.9% agreeing with this statement. These findings may incentivize MPA managers to provide further clarity around site selection when creating or updating management plans for MPAs.

Just over half (52.7%) of survey participants agreed that fishing and gear restrictions in Puget Sound MPAs are too lenient. Almost a third of respondents felt neutral about fishing and gear restrictions, and 18.2% disagreed. There is agreement that a lack of monitoring is one of the problems with Puget Sound MPAs, with 64.3% of respondents agreeing that Puget Sound MPAs are not regularly monitored, 30.4% taking a neutral position, and only 5.4% disagreeing with this statement.

Many of those surveyed responded to open-ended question about the kinds of problems facing MPAs in the Puget Sound, citing concerns about lack of enforcement in monitoring, especially in no-take areas. One respondent added that the question is not whether or not MPAs are being monitored, but rather if they are being monitored for the right things. Figure 6 shows survey respondents' answers to questions about the kinds of problems facing MPAs in Puget Sound (they are arbitrarily placed, there are not enough, they are too small in size, fishing and gear restrictions are too lenient, they are not regularly monitored, they do not include the right kinds of habitat needed for species protection, or we do not know enough about species and habitat). Since a response of 1 is equal to "strongly agree" and 5 is equal to "strongly disagree,"

there was general agreement about the kinds of problems, with only a few individuals disagreeing with problem statements.

Analysis of mean responses across stakeholder groups using the Tukey-Kramer test found no significant differences in mean responses across stakeholder groups for questions pertaining to the placement, size and habitat coverage of MPAs in Puget Sound, The same is true regarding knowledge of species and habitat, and potential concerns about regular monitoring. Significant differences were reported between fishing and conservation groups with respect to the leniency of fishing and gear restrictions and the number of MPAs in the Puget Sound.

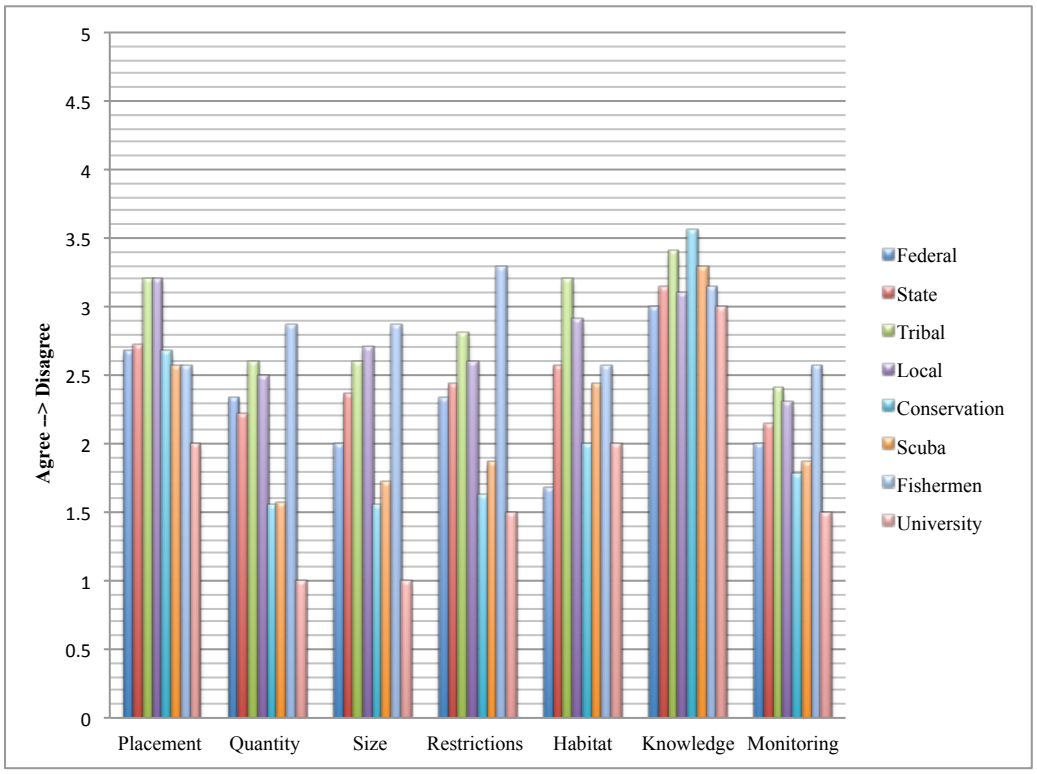

Figure 6: Mean responses across stakeholder groups to questions about causes of problems with MPAs in the Puget Sound

Potential Solutions for MPAs in Puget Sound

Efforts to date in MPA planning and management in Washington have identified a number of potential solutions to address the lack of coordination and uncertainty surrounding Puget Sound MPAs. The MPA Work Group noted that the coordination of objectives, establishment criteria, management, monitoring practices, and terminology by agencies managing MPAs are among the first steps to be taken in creating a network of MPAs (Van Cleave et al., 2009). The results of the survey (shown in Figure 7) reinforce this belief, with agreement among 89.1% of respondents that coordinating and clarifying establishment criteria will help MPAs be more effective; agreement among 71.4% that goals and objectives should be consistent across management agencies; and 82.2% agreement that a consistent monitoring plan is crucial to the success of MPAs in Puget Sound. Nearly all (92.9%) respondents felt that habitat mapping and species abundance and diversity studies and reports were necessary for prioritization of MPA sites.

Analysis of mean responses across stakeholder groups using the Tukey-Kramer test did not indicate any significant differences across stakeholder groups indicating that there is broad agreement on perceptions of solutions to problems with MPAs in the Puget Sound.

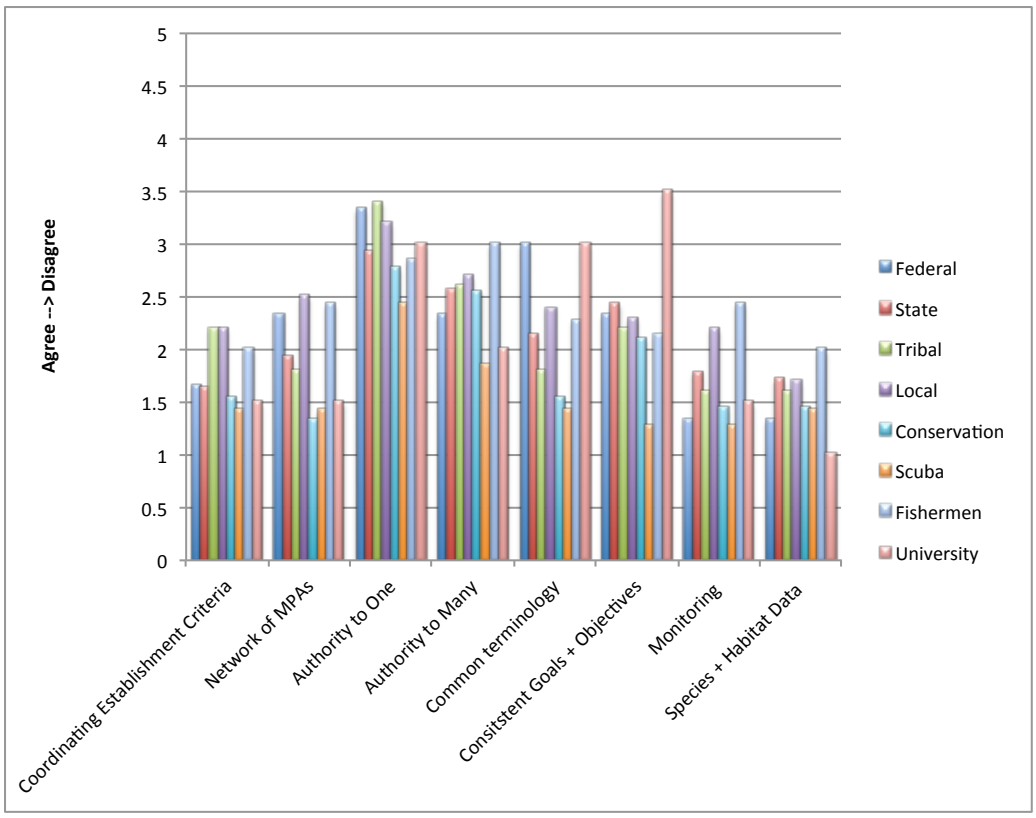

Figure 7: Means responses across stakeholder groups in response to possible solutions to problems with MPAs in the Puget Sound

Identifying Potential Coalitions

The first step to identifying potential stakeholder coalitions was through a preliminary exploration of qualitative and quantitative data. K-means cluster analysis requires a pre-determined number of clusters, so a hierarchical cluster analysis using Ward's method and applying squared Euclidian distance as the similarity measure was used to determine the optimal number of clusters. This analysis of the survey dataset revealed two groups of respondents whose shared values differentiated them from the other group. K-means cluster analysis was

performed on the dataset for two clusters, and respondents were coded by cluster for further analysis.

Thematic coding of the qualitative responses to open-ended survey questions and follow-up interview questions yielded three possible groups. Thus, the k-means cluster analysis was run again for three clusters, and cluster membership was assigned to survey respondents. The three potential coalitions were identified through analysis and review of mean responses to the survey questions, and qualitative data. The three coalitions were thematically named as follows:

1. No-take MPAs are crucial to conservation and biological diversity.
2. Education, trust and awareness will help build support for a network of no-take MPAs.
3. MPAs are one of many tools to manage marine resources.

Table 4 demonstrates mean responses by coalition to the survey questions, and identifies questions where the coalitions diverge. Less significant differences between groups are demonstrated by higher p-values. While there was some variation among respondents in each potential coalition, the labels created represent the mean responses for each group and are supported by responses to open-ended interview questions.

Table 4: Mean response across coalitions.
(Bold text indicates significant difference in mean responses.)

Knowledge and Attitudes Toward Puget Sound MPAs

	Coalition 1 Mean Response	Coalition 2 Mean Response	Coalition 3 Mean Response	*P* value
Washington State law defines a marine protected area as: A geographical marine or estuarine area designated by a state, federal, tribal or local government in order to provide long-term protection for part or all of the resources within that area. (Substitute Senate Bill 6231, effective June 12, 2008).				
Does this definition fit the goals and objectives of MPAs in the Puget Sound?	2.27	2.23	2.14	0.8004
I am aware of Puget Sound MPAs and their history	**2.20**	**1.69**	**2.45**	**0.0082**
I believe that MPAs in the Puget Sound are effective in their current state	**3.67**	**4.08**	**3.03**	**0.0015**
Puget Sound MPAs should share common goals and objectives	**2.07**	**1.85**	**2.72**	**0.0132**
Utilized properly, MPAs could be an effective tool to conserve and manage marine resources in the Puget Sound	**1.20**	**1**	**2.07**	**<0.001**
I believe that a network of no-take MPAs can and should be implemented in the State of Washington	**1.33**	**1.08**	**2.72**	**<0.001**

Causes of Problems with MPAs in the Puget Sound

	Coalition 1 Mean Response	Coalition 2 Mean Response	Coalition 3 Mean Response	*P* value
Research has identified a number of factors important to the efficacy of MPAs. For the questions below, please indicate the extent of your agreement that the problem is one that limits the effectiveness of Puget Sound MPAs.				
Puget Sound MPAs are arbitrarily placed	**3.13**	**1.92**	**2.97**	**0.0020**
There are not enough MPAs in the Puget Sound	**1.73**	**1.08**	**2.86**	**<0.001**
Puget Sound MPAs are too small	**1.73**	**1.08**	**3**	**<0.001**
Fishing and gear restrictions in Puget Sound MPAs are too lenient	**2**	**1.23**	**3**	**<0.001**
Puget Sound MPAs fail to include the types of habitat necessary for species protection	**2.80**	**1.69**	**2.72**	**0.0022**
We do not know enough about species and habitat in the Puget Sound to identify the best location for MPAs	3.73	3.08	3.03	0.0546
Puget Sound MPAs are not regularly monitored	**2.07**	**1.46**	**2.45**	**0.0025**

Potential Solutions for MPAs in the Puget Sound

	Coalition 1 Mean Response	Coalition 2 Mean Response	Coalition 3 Mean Response	*P* value
Coordinating and clarifying establishment criteria will help MPAs in the Puget Sound be more effective	**1.27**	**1.54**	**2.17**	**<0.001**
Creating a coordinated network of MPAs in the Puget Sound is necessary to improving the efficacy of protected areas	**1.20**	**1.23**	**2.62**	**<0.001**
Designating authority to one agency or the legislature is part of the solution to creating a successful network of MPAs	**3.13**	**2.23**	**3.17**	**0.0218**
Designating authority to a group of representatives from many management entities is part of the solution to creating a successful network of MPAs	**1.80**	**2.69**	**2.83**	**0.0117**
Finding common terminology for MPAs in the Puget Sound is important to their success	1.53	2.08	2.34	0.0629
Goals and objectives for MPAs should be consistent across managing entities	1.73	2.31	2.38	0.0854
A consistent monitoring plan across MPAs is crucial to their success	**1.27**	**1.23**	**2.28**	**<0.001**
Habitat mapping and species diversity and abundance studies and reports are necessary for the success of MPAs so that sites can be prioritized	**1.33**	**1.08**	**2**	**<0.001**

Potential Coalition 1:

No-take MPAs are crucial to conservation and biological diversity.

Coalition 1 is made up of 15 individuals from federal, state and tribal agencies, local governments, conservation non-profits, scuba divers and dive shop owners. Concerns about biodiversity, conservation, and a lack of no-take zones were among the top emergent themes, along with an emphasis on the need for enforcement of existing regulations in MPAs. Themes of secondary importance for this group were a need for increased collaboration and coordination among managing entities, as well as the involvement of stakeholder groups and public education. These themes are evident in the sampling of responses provided in Figure 8.

Mean responses to questions about knowledge and attitudes toward Puget Sound MPAs for this group indicated a strong belief that MPAs could be an effective tool to conserve and manage marine resources in Puget Sound, and that a no-take network can and should be implemented in the state of Washington. Overall, the group is aware of Puget Sound MPAs and their history, and agrees that they are not effective in their current state (Table 4).

In response to questions about problems with MPAs in Puget Sound, mean responses for Coalition 1 indicated strong agreement that there are not enough MPAs in Puget Sound, and that Puget Sound MPAs are too small. This group agrees that fishing and gear restrictions are too lenient and that one of the problems with Puget Sound MPAs is that they are not regularly monitored.

"Biologically, the most important outcome will be a series of habitats in which native species can flourish with minimal directed human impact. Politically, the most important outcome will be Sound-wide cooperation and collaboration among the many regulatory entities and stakeholders." – State

"Political will is crucial to making any effort to create an MPA network successful. Tribes and agencies need to come to the table and ALL will need to make sacrifices." – State

"People always take fright of the idea of "no-take" reserves — I suggest that they should be called "recovery zones" rather than no-take zones because the ultimate goal is to find out what an ecological community would be like if we left it alone to recover. People are more willing to let environments recover from human-caused disturbances — and people are less willing to have something taken away from them." –Tribal

"I don't think you need perfect science before establishing MPAs. Many other locations have created a network of MPAs and have standards/criteria based on science that Washington could build upon." – Conservation

"Many people are not aware of MPAs in Puget Sound. There are many different types of MPAs with different purposes and restrictions, so it is difficult to educate people about MPAs." –Federal

"It is not a question of arbitrary placement, or too little monitoring; it's a question of developing a network based on a defined set of regional goals and objectives, and focusing monitoring on answering specific research questions. MPAs are monitored, but are they being monitored for the right things?" –State

Figure 8: Selection of responses from Coalition 1 respondents by stakeholder group

Regarding solutions to MPAs in Puget Sound, Coalition 1 agrees that creating a coordinated network of MPAs in Puget Sound is necessary to improving the efficacy of protected areas. As a whole, they do not agree nor disagree that designating authority to the Legislature is part of the solution, but

do agree that designating authority to a group of representatives from many management entities will aid in the efficacy of a potential network of MPAs. Coalition 1 agrees that consistency of terminology, monitoring, goals and objectives across MPAs is crucial to the success of MPAs. Coalition 1 also agrees that habitat mapping, as well as species and abundance studies, are necessary for the success of MPAs so that sites can be prioritized. Open-ended responses from this coalition reinforce this finding, emphasizing a need for baseline data for conservation purposes.

Potential Coalition 2:

Education, trust and awareness will help build support for a network of no-take MPAs.

Coalition 2 is comprised of 13 representatives of federal and tribal agencies, local governments, universities, conservation non-profits, scuba divers, and dive shop owners. Among the top emergent themes for coalition 2 were concerns about ecosystem protection and biodiversity, a need for additional no-take areas, and a necessity for education and communication with the public about the benefits and need for protected areas. A secondary theme from coalition 2 was a call for coordinated goals and objectives from management agencies. Representatives from coalition 2 were also concerned with tribal mistrust and treaty rights, connectivity among sites, and a need for additional research. Several respondents from this group also felt strongly that

we have enough knowledge about species and habitats to take action now, rather than wait for "perfect science" to designate optimal sites.

"This isn't an environmental problem, it is a political and economic problem." –Local

"Education is important—share results from elsewhere—but also listen to their input and try to compromise. Don't compromise to the point where the MPA in question wouldn't work." –Conservation

"MPAs should be designed to benefit all species, but in some cases certain sites may be spawning aggregates for a particular species, which is worth protecting." –Conservation

"Monitoring should not depend on agency funding (of which there never is any). Involving the public in monitoring helps engage others and contributes to "buy-in." REEF is a great example of a Citizen Science program for monitoring." –Scuba

"MPAs have been very successful in different parts of the world. Tying in local benefits (e.g., diving tourism to replace lost local community fishing access) is a good way to gather support." –Conservation

Start small. Be patient. Develop secondary economies for fishing destinations like Neah Bay (scuba diving). Show that the world doesn't end if we add marine parks that limit fishing; the Sound is large. Enlist the help of a progressive tribe that is willing to embrace the science of conservation ecology. Open channels with California and Oregon, where recent MPA successes have been won." –Conservation

"Engage NGOs. Need large outreach and education campaign to reach progressive Puget Sound residents and overcome the small but vocal anti-MPA recreational fishing community." –Conservation

Figure 9: Selection of responses from Coalition 2 respondents

Mean responses to questions about knowledge and attitudes toward Puget Sound MPAs for this group indicated agreement with the Washington's definition of MPAs and a strong awareness of MPAs and their history. As a whole, coalition 2 disagrees that MPAs are effective in their current state, but feels strongly that, if utilized properly, they could be an effective tool to conserve and manage marine resources in Puget Sound, and that a no-take network of MPAs can and should be implemented in the state of Washington. The group agrees that goals and objectives should be consistent among MPAs in Puget Sound, and that this consistency would help them to be more effective.

Responding to problems with MPAs in Puget Sound, coalition 2 strongly agreed that there are not enough MPAs in Puget Sound and that Puget Sound MPAs are too small. Mean responses from coalition 2 indicate agreement that fishing and gear restrictions in Puget Sound MPAs are too lenient, and that a lack of regular monitoring is also a problem. Qualitative responses (Figure 9) indicate that this may be attributed to a lack of funding, and that a Citizen Science monitoring program may be a solution that could increase monitoring of MPA sites without immensely increasing the need for public funding.

Coalition 2 agrees that creating a coordinated network of MPAs in Puget Sound is necessary to improve their efficacy, and that coordinating and clarifying establishment criteria would also aid in their efficacy. The group equally agrees that designating authority to a group of representatives from many management entities or to one agency or the Legislature is part of creating a successful network of MPAs. Coalition 2 also agrees that common

terminology, monitoring, and goals and objectives would help MPAs be more beneficial. More so than the other two groups, coalition 2 feels strongly that continued habitat mapping, as well as species diversity and abundance studies and reports, are necessary so that potential MPA sites can be prioritized.

Potential Coalition 3:

MPAs are one of many tools to manage marine resources.

The largest of the three groups, Coalition 3 consists of 29 individuals. The majority of coalition 3 is made up of representatives from state and local government, tribal agencies, and fishermen. There is also some representation from conservation groups, scuba divers, and federal agencies. Among the top emergent themes from open-ended questions from this group was a necessity to monitor the effectiveness of MPAs, enforce no-take areas, and clarify goals and objectives across sites. This group is also concerned with a lack of funding for MPAs and sees a clear need for more communication, education and outreach to the public about MPAs. Coalition 3 voiced concerns that MPAs have become politicized, and there was some skepticism among this group that MPAs are the best solution to address the problem (Figure 10). This group agreed that more research is needed to make a case for MPAs and that it will continue to be difficult to move forward in the absence of a legislative mandate.

Mean responses to questions about knowledge and attitudes toward Puget Sound MPAs for this group indicated agreement with the State of

Washington's definition of MPAs and some awareness of MPAs and their history. Mean responses show neither agreement nor disagreement that MPAs are effective in their current state, and only slight agreement that they should share goals and objectives. This finding is further validated by qualitative data, which shows an interest in clarifying goals and objectives, but not necessarily trying to have consistent goals across all sites. Coalition 3 agrees that MPAs could be an effective tool to conserve and manage marine resources in the Puget Sound, but there is not strong agreement that the best way to this end is through a no-take network of marine reserves.

Concerning problems with existing MPAs in Puget Sound, mean responses for coalition 3 hovered on or near neutral with regard to placement of current MPAs, whether Puget Sound MPAs are too small or too few, and in response to the question of whether or not fishing and gear restrictions were too lenient. There was some agreement from this group that Puget Sound MPAs are not regularly monitored, and that many MPA sites in Puget Sound fail to include the types of habitat necessary for species protection. However, coalition 3 neither agrees nor disagrees that we do not know enough about species and habitat to identify the best location for MPAs.

In response to questions about solutions for Puget Sound MPAs, coalition 3 agrees that coordinating and clarifying establishment criteria, and creating a coordinated network of MPAs would contribute to the success of MPAs. There is some agreement that this can be achieved by designating authority to a group of representatives from managing entities, rather than one

agency or the Legislature. Among other contributors to the success of MPAs agreed upon by coalition 3 are consistent terminology, monitoring plans, and goals and objectives. Coalition 3 also agrees that habitat mapping and species diversity and abundance studies and reports are necessary for the success of MPAs so that sites can be prioritized.

"If there's a particular management objective that would be served by a network of similar MPAs (e.g., protecting a certain habitat for restoration of particular species), I could see the value. But I don't think that should be the only approach for MPAs. MPAs are established by different entities, under different authorities, for different purposes, each of which might benefit society in different ways. Trying to fit them all into the same box might actually narrow the benefits. It might also reduce the number of areas protected, given the mandates/interests of the various agencies/entities that establish these protected areas." –State

"I think the public, stakeholders, and decision-makers need to hear a strong, science-supported argument why MPAs (especially no-take MPAs) are a needed approach for managing species and why other practices won't be successful." –State

"I agree that goals should be similar and shared. Currently MPAs are developed for political rather than ecosystem purposes." –Tribal

"Justification that an MPA is the most appropriate solution to a problem." –Tribal

"Lack of a legislative mandate and funding to govern/manage and coordinate MPAs". –State

"Clarification as to how species mapping will occur. No data does not necessarily mean absence of a species. Mapping species diversity and calculating cumulative effects on species-specific habitat criteria must done in a thorough and scientific way, and made public." –Tribal

"We presently have many programs, studies and regulations to help ESA species and the addition of new MPAs should utilize existing data. However, before more MPAs are developed, we should look at those already designated, to determine if they actually provide any long-term benefit to the environment beyond that provided by existing regulations." –Fishing

"There needs to be a clear legislative mandate and associated funding for MPAs (or an MPA network) in order to establish an authoritative management body (either one entity or group)." –State

Figure 10: Selection of responses from Coalition 3 respondents by stakeholder group

Chapter 4: Conclusions

The state of Washington has been engaged in MPA planning for several years, with limited change to existing systems. The 2009 MPA Work Group report suggested (1) improving efficiency through a coordinated strategy to create an ecologically meaningful network of MPAs and (2) evaluation of existing sites to determine if they are providing sufficient ecological benefit and being managed efficiently given current agency resources (Van Cleave et al., 2009). In the fall of 2012, marine managers and technical experts from federal, state and local agencies, tribal governments, and The Nature Conservancy gathered to consider ecosystem protections afforded under current MPAs; discuss ecosystem threats, conservation concerns and other goals that an integrated network of MPAs may address; and identify the information needs and next steps for improving marine protection in the Puget Sound (PSP, 2012a). This thesis contributes to this work by addressing an important gap in the literature with regard to stakeholder preferences as they pertain to MPAs in the Puget Sound. It presents the application of a public policy framework that may help to move MPA planning efforts forward, and contributes to the growing body of work on MPAs in the state of Washington.

Based on surveys and informal interviews, this thesis presents and analyzes beliefs and perceptions of marine resource managers and key stakeholders regarding MPAs in Puget Sound, weaknesses of existing MPAs, and potential solutions to address these challenges. The survey design was informed by the ACF, a public policy framework, which predicts that core

policy beliefs of stakeholders influence their interactions with other stakeholders, and that these interactions will occur predominantly with other actors of similar core policy beliefs (Weible & Sabatier, 2005). I found that, across all survey participants, 62.5% of respondents agreed that there were not enough MPAs in Puget Sound, and only 7.2% felt as though the number of MPAs in the Sound was sufficient. Significant differences were found between fishing and conservation groups with respect to the leniency of fishing and gear restrictions and the number of MPAs in Puget Sound.

The MPA Work Group noted that the coordination of objectives, establishment criteria, management and monitoring practices, and terminology is one of the first steps in creating a network of MPAs (Van Cleave et al. 2009). The results of the survey reinforce this belief, with agreement among 89.1% of respondents that coordinating and clarifying establishment criteria will help MPAs be more effective, agreement among 71.4% that goals and objectives should be consistent across management agencies, and 82.2% agreeing that a consistent monitoring plan is crucial to the success of MPAs in the Puget Sound. A full 92.9% of respondents felt that habitat mapping and species abundance and diversity studies and reports were necessary for prioritization of MPA sites.

A key to successful conservation planning is to understand where extractive human uses like fishing occur, along with understanding the ecological characteristics of a particular area in terms of both habitat and populations of organisms. In the absence of perfect information on habitat and species assemblages, which is the case in Puget Sound, a sound strategy in

marine planning is to take a precautionary approach by protecting a variety of representative habitats (Crowder & Norse, 2008). Approaching MPA planning through the broader lens of ecosystem-based MSP (Foley et al., 2010) may provide a guiding framework to do this. Ecosystem-based MSP achieves these objectives through an integrated planning framework that informs the spatial distribution of activities in the marine environment to support current and future uses and to maintain ecosystem services for future generations in a strategic way that supports ecological, economic and social objectives (Douvere, 2008). Embedding MPAs into a broader ocean and coastal planning context further boosts their resiliency by planning for the confounding uses outside of MPA boundaries. Deliberate and transparent site selection based on known ecological attributes and considerations for societal impacts (such as usual and accustomed fishing grounds) may help garner support for new or more restrictive protected areas.

Many of those surveyed responded to open-ended questions about the kinds of problems facing MPAs in Puget Sound, citing concerns about lack of enforcement in monitoring, especially in no-take areas. One respondent added that the question is not whether or not MPAs are being monitored, but rather if they are being monitored for the right things. While it is critical to ensure that MPAs have clear goals and objectives and thus monitoring practices, in the early phases of implementation, we can look to Oregon's newly established network of MPAs for guidance. One of the short-term goals of the state of Oregon's network of marine reserves was evaluating the effectiveness of marine reserves

as a management tool, while long-term goals included conservation of biodiversity and habitats, providing a framework for scientific research, and avoiding significant social and economic impacts (PSP, 2012a). The Washington State Department of Natural Resources (DNR) has already implemented a similar process into its marine reserves program by building adaptive management into its 10-year review process of management plans.

Adaptive management is a systematic method for continually improving the management of protected areas by learning from results of past management actions. Utilizing adaptive management, DNR will integrate changes in scientific knowledge concerning the site, conditions of habitats and species, and existing uses of state-owned aquatic lands. New knowledge gained through these activities will also aid DNR in determining if management of these areas is sufficient to meet the goals and objectives of the reserve. If not, they will be modified, monitored, and evaluated during the subsequent review process. New information will be included in updated management plans (DNR, 2013). These adaptive approaches may help to bridge the divide of uncertainty amongst stakeholder groups with respect to planning and implementing a network of MPAs in Puget Sound.

A cluster analysis identified three distinct groups based on responses to quantitative and qualitative data points. Table 4 identifies significant differences among coalitions in response to 17 out of 21 questions. In the first section, which explored knowledge and attitudes toward Puget Sound MPAs, there were significant differences among coalitions concerning the efficacy and potential of

MPAs as a management tool, and the benefit of shared goals and objectives across sites. While 2 out of 3 coalitions agree that a network of no-take MPAs can and should be implemented, there were also significant differences across coalitions in response to this question, indicating varying levels of support. This first section represents policy core beliefs in the policy subsystem. Policy-core beliefs are resistant to change, but are more likely to shift over time in response to new information and experiences than deep-core beliefs (Weible, Sabatier & McQueen, 2009).

Problems with MPAs in Puget Sound fall under the third tier of the ACF framework as secondary beliefs, while possible solutions are a hybrid of policy-core beliefs and secondary beliefs. Secondary beliefs are the most limited in scope, are often empirically based, and are the most likely to change in light of new data, experience, or a change in strategic frameworks (Jenkins-Smith & Sabatier, 1994). There were significant differences among stakeholder groups for all but one of the available problem statements. This may be due to the complex management structure of MPAs in the Puget Sound, as qualitative responses indicated confusion about sites and regulations. A clearer strategy for communicating problems associated with MPAs in Puget Sound would be helpful, not only for public support, but for making a case for a network of MPAs in the Sound.

Analysis of coalition response to proposed solutions for MPAs in Puget Sound identified topics of divergence across coalitions. The proposed solutions that did not have agreement from all three coalitions related to the coordination

and clarification of establishment criteria, the creation of a network, whether management authority should sit with one agency or representatives from many agencies, the need for improved monitoring practices, and the need for species abundance and diversity studies prior to selecting new sites. While survey results overall support coordinating and clarifying establishment criteria and the creation of a network, these divergent viewpoints among coalitions are a reminder of the key differences among coalitions, which may be contributing to Washington's slow progress toward a network of MPAs. Just as an argument must be made for the efficacy of MPAs, the same must be done for networks as well.

One of the emergent criticisms of the current administrative framework for MPAs in Washington is the confusion created by a lack of overarching goals and objectives across sites. However, some respondents countered this criticism, demonstrating concern that trying to put MPAs into a one-size-fits-all framework might narrow the benefit due to the fact that currently, MPAs are established by different agencies for different reasons. Utilizing MPAs as a tool within an EBM or ICM framework addresses this concern by planning for conflicting uses. Additionally, an ecological and administrative network of protected areas governed by representatives from many authorities would likely bridge agency interests through a collaborative management process.

Qualitative analysis identified concerns around political (rather than scientific) decision making in MPA placement, indicating that reserve sites have been procured opportunistically, rather than to meet specific conservation

objectives. This perspective demonstrates a lack of trust in MPA planning and management that could hinder future progress. The MPA Work Group identified a need for clear conservation concerns as a first step before determining a management response, which is consistent with the Northwest Indian Fisheries Commission's MPA policy statement (Van Cleave et al., 2009). We may look to California for inspiration in separating scientific information from non-scientific ones, to make a clearer case for MPAs.

In their analysis of the role of science in California MPA network planning, Saarman and others (2013) note that there are three crucial elements to bringing the best available science to environmental decision-making. First, the politicization of science can be avoided by distinguishing scientific issues from non-scientific ones (Fernandez et al., 2009; NRC, 2004; Sullivan et al. 2006). Second, they recommend creating a transparent and participatory process to identify the best-available information to inform decision making. Finally, they advocate effectively communicating uncertainty and its consequences for management decisions (NRC, 2004; Sullivan et al., 2006). In California's MPA planning process, isolating scientific questions from policy or budgeting issues, allowed the science team to make the best recommendations regarding MPA design principles and ecological issues, without concerning themselves with a contentious political environment.

It is clear from the results of this study that there is much work to be done by MPA managers to make a case for a network of MPAs in Puget Sound. While evidence suggests that single-species management is no longer sufficient

to support biological integrity in marine and coastal ecosystems, there is not consistent support among stakeholder groups that MPAs are the best option for Puget Sound. MPAs are one of many tools in the suite of management practices, and may be more effective when integrated into a broader planning context, such as ICM or EBM, than if used on their own.

Among the outcomes of the Puget Sound Partnership Workshop in 2012 was a consensus that the Puget Sound Partnership should continue the conversation by leading a collaborative process to (1) assess the need for and ability of an MPA network to meet Puget Sound conservation priorities; (2) agree to definitions of an MPA network, as well as a scientific basis for such a network that includes socio-ecological factors; and (3) assure that this collaborative and exploratory process includes all MPA managers – both tribal and non-tribal. The group outlined a multi-staged process of next steps, the first of which includes conducting a needs assessment and matching MPA need to conservation priorities (PSP, 2012a).

Within the ACF, there are two paths to policy change in a subsystem. The first path is external subsystem events, which are defined as shifts in the policy core attributes of the subsystem. These may include changes in socioeconomic conditions, public opinion, governing coalitions, and other subsystems (Sabatier & Jenkins-Smith, 1999). In the context of this thesis, other subsystems may refer to embedding MPAs within the context of EBM or ICM to offer greater protection from pressures outside the boundaries of an MPA.

Such external events can induce change in a subsystem by shifting and growing resources, tipping the power dynamic of coalitions, and shifting beliefs. The second path to policy change within the ACF is policy-oriented learning. Policy-oriented learning is defined as "relatively enduring alternations of thought or behavioral intentions that result from experience and/or new information and that are concerned with the attainment or revision of policy objectives" (Sabatier & Jenkins- Smith, 1999, p. 123). Results from this analysis are consistent with current efforts underway to improve coordination and consistency among MPAs and MPA managers to obtain establishment criteria, coordinated objectives, consistent terminology, and a clear plan for future management and monitoring of the MPAs. Action on any of these factors may influence policy change within the subsystem, clearing a path for progress in MPA planning and management in the Puget Sound.

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Appendix A

Inventory of MPAs in Washington (Adapted from Van Cleave et al., 2009)

Managing Agency Owner/ Sponsor	**Reserve Name**	**Size (acres)**	**Shoreline (feet)**	**Year Est.**	**Protection Level**	**Harvest Restrict-ion**
Clallam County						
*	Tongue Point Marine Life Sanctuary/Salt Creek Recreation Area	24.71	9,181	1989	UML	ResAll
City of Edmonds						
WDNR	Edmonds Underwater Park (Brackett's Landing)	46.90	2,185	1970	NTL	ProAll
NOAA						
	Olympic Coast National Marine Sanctuary	309,112.72	1,310,915	1994	UML	NoRstr
NPS						
*	Olympic National Park	0.00	333,301	1909	NIL	ResAll
WDNR*	San Juan Island National Historical Park	1,752	36,976	1961	NIL	ResAll
City of Seattle						
WDFW*	Carkeek Park	24.65	1,883	2005	ZNL	ResAll
WDFW*	Discovery Park	40.98	2,950	2005	ZNL	ResAll
WDFW*	Emma Schmitz Memorial Marine Park	6.34	717	2005	ZNL	ResAll
WDFW*	Golden Gardens Marine Preserve Park	13.87	1,431	2005	ZNL	ResAll
WDFW*	Lincoln Park Marine Preserve	10.16	2,466	1922	ZNL	ResAll
WDFW*	Richey Viewpoint Marine Preserve	11.58	1,686	2005	ZNL	ResAll
City of Tacoma						
WDNR*	Middle Waterway	1.85	200	1997	UML	NoRstr
WADNR*	Olympic View Resource Area	10.90	857	1997	UML	NoRstr
USWFS						
*	Copalis National Wildlife Refuge		179,030	1907	NAL	ResAll
! *	Dungeness National Wildlife Refuge	1,004.04	74.546	1915	ZML	ResAll

Managing Agency Owner/ Sponsor	Reserve Name	Size (acres)	Shoreline (feet)	Year Est.	Protection Level	Harvest Restrict-ion
*	Flattery Rocks National Wildlife Refuge		84,465	1907	NAL	ResAll
*	Grays Harbor National Wildlife Refuge		26,500	1990	NIL	ProAll
*	Nisqually National Wildlife Refuge		58,161	1974	XML	ResAll
*	Protection Island National Wildlife Refuge	527.15	25,284	1982	NAL	ResAll
*	Quillayute Needles National Wildlife Refuge		357,996	1907	NAL	ResAll
*	San Juan Islands National Wildlife Refuge		78,092	1960	NAL	ResAll
*	Willapa National Wildlife Refuge		331,012	1936	ZML	ResAll
UW						
FHL*	San Juan County/Cypress Island Marine Biological Preserve	292,413.87	2,251,339	1923	UML	ResAll
WDOE						
	Padilla Bay National Estuarine Research Reserve	12,074.87	150,926	1980	UML	NoRstr
WDFW						
	Admiralty Head Marine Preserve	88.40	0	2002	UML	ResAll
UW	Argyle Lagoon Marine Preserve	13	3,252	1990	UML	ProRec/ ResCom
City of Edmonds	Brackett's Landing Shoreline Sanctuary Conservation Area	46.90	2,185	1970	NTL	ProAll
City of Des Moines	City of Des Moines Park Conservation Area	9.20	1,077	1998	NTL	ProAll
*	Colvos Passage Marine Preserve	3.30	502	2000	UML	Res/Rec
*	False Bay San Juan Islands Marine Preserve	94.70	14,560	1990	UML	ResAll
UW/FHL	Friday Harbor San Juan Islands Marine Preserve	427.20	13,861	1990	UML	ResAll
UW/FHL	Keystone Harbor Conservation Area	11.40	673	2002	NTL	ProAll
	McNeil Island Wildlife Area	0.00	56,341	1984	NAL	ProAll

Managing Agency Owner/ Sponsor	Reserve Name	Size (acres)	Shoreline (feet)	Year Est.	Protection Level	Harvest Restrict-ion
*	Octopus Hole Conservation Area	32.60	2,400	1998	NTL	ProAll
	Orchard Rocks Conservation Area	103.70	20	1998	NTL	ProAll
	Saltar's Point Beach Conservation Area	4.50	921	2000	NTL	ProAll
WPRC	Saltwater Underwater Park	9.84	300	2009	UML	ResRec
UW*	Shaw Island San Juan Islands Marine Preserve	432.50	17,177	1990	UML	ResAll
City of Des Moines	South 239th Street Park Conservation Area	0.20	16	1998	NTL	ProAll
	Sund Rock Conservation Area	71.20	2,866	1994	NTL	ProAll
Metro/Tacoma	Titlow Beach Marine Preserve	41.70	2,838	1994	UML	ResAll
	Tolvia Shoal Closed Area	162.50		2005	UML	ResAll
!	Waketickeh Creek Conservation Area	146.30		2000	NTL	ProAll
TNC/UW	Yellow and Low Islands Marine Preserve	187.20	4,266	1990	UML	ResAll
	Zee's Reef Marine Preserve	55.95		2002	UML	ResAll
*	Zella M. Schultz Seabird Sanctuary	0.00	5,083	1975	NAL	ProAll
WDNR						
TNC*	Bone River Natural Area Preserve	7.32	3.170	1987	NAL	ProAll
	Cherry Point Aquatic Reserve	3,092.10	20,959	2000	UML	ResAll
*	Cypress Island Aquatic Reserve	5,982.96	101,592	2007	UML	ResAll
*	Dabob Bay Natural Area Preserve	0.00	15,158	1987	NAL	ProAll
*	Elk River Natural Resource Conservation Area	150.79	106.784	1986	UML	ResAll
*	Fidalgo Bay Aquatic Reserve	694.62	14.189	2008	UML	ResAll
	Gunpowder Island Natural Area Preserve	0.00		1981	NIL	ResAll
	Kennedy Creek Natural Area Preserve	37.87	9.867	1990	NAL	ProAll
	Maury Island Aquatic Reserve	5,531.04	11,921	2000	UML	NoRstr

Managing Agency Owner/ Sponsor	Reserve Name	Size (acres)	Shoreline (feet)	Year Est.	Protection Level	Harvest Restrict-ion
*	Niawiakum River Natural Area Preserve	0.00	56,126	1987	NAL	ProAll
	Nisqually Reach Aquatic Reserve	14,826	205,656	2011	UML	ResAll
*	North Bay Natural Area Preserve	409.87	7,742	1988	NAL	ProAll
*	Skookum Inlet Natural Area Preserve	57.18	3,524	1986	NAL	ProAll
*	Whitcomb Flats Natural Area Preserve				NIL	ResAll
*	Woodard Bay Natural Resources Conservation Area	44.63	30,357	1987	UML	ResRec
WPRC						
*	Bay View State Park	37.18	1,285	1924	UML	ResAll
*	Belfair State Park	40.11	3,780	1952	UML	ResAll
*	Blake Island State Park/ Underwater Park	131.26	16,570	1974	UML	ResAll
*	Blind Island Marine State Park	1	1,280	1971	UML	ResAll
*	Bottle Beach State Park	5.90	6,844	2008	UML	ResAll
*	Burrows Island State Park	0.51	11,939	1979	UML	ResAll
*	Cama Beach State Park	26.96	4,796	2008	UML	ResAll
*	Camano Island State Park	46.69	6,700	1958	UML	ResAll
*	Cape Disappointment State Park	139.78	42,860	1938	UML	ResAll
*	Clark Island State Park	3.47	11,292	1964	UML	ResAll
*	Cone Island State Park	10.84	2,500	1973	UML	ResAll
*	Cutts Island State Park	2	2,100	1969	UML	ResAll
*	Damon State Park	28.30	6,400	2002	UML	ResAll
*	Dash Point State Park	56.89	3,251	1962	UML	ResAll
*	Deception Pass State Park/ Underwater Park	163.32	78.714	1925	UML	ResAll
*	Doe Island State Park	2.45	2,050	1967	UML	ResAll
*	Dosewallips State Park	229.47	5,500	1954	UML	ResAll
*	Fay-Bainbridge State Park	10.39	1,420	1944	UML	ResAll
*	Fort Casey State Park	26.70	15,635	1980	NTL	ResAll

Managing Agency Owner/ Sponsor	Reserve Name	Size (acres)	Shoreline (feet)	Year Est.	Protection Level	Harvest Restrict-ion
! *	Fort Ebey State Park	17.07	7,400	1981	UML	ResAll
! *	Fort Flagler State Park	121.48	19,100	1955	UML	ResAll
*	Fort Ward State Park	13.40	4,300	1969	UML	ResAll
*	Fort Worden State Park	21.73	11,020	1965	NTL	ResAll
*	Griffiths Priday State Park	0	5,507	1952	NAL	ResAll
*	Haley Property	32.99	1,980	1978	UML	ResAll
*	Hope Island State Park (Mason County)	25.36	8,541	1990	UML	ResAll
*	Hope Island State Park (Skagit County)	37.21	13,675	1925	UML	ResAll
*	Huckleberry Island State Park	10.00	2,900	1991	UML	ResAll
*	Iceberg Island State Park	0.00	1,380	1976	UML	ResAll
*	Illahee State Park	10.05	1,785	1934	UML	ResAll
*	James Island State Park	15.45	12,335	1964	UML	ResAll
*	Jarrell Cove State Park	6.41	3,506	1969	UML	ResAll
*	Joseph Whidbey State Park	66.01	3,100	1982	UML	ResAll
*	Kitsap Memorial State Park	4.44	1,797	1949	UML	ResAll
*	Kopachuck State Park/ Underwater Park	528.98	5,600	1972	UML	ResAll
*	Larrabee State Park	14.61	8,100	1915	UML	ResAll
*	Lilliwaup State Park	20.70	4,122	1961	UML	ResAll
*	Manchester State Park	20.65	3,400	1970	UML	ResAll
USFWS*	Matia Island State Park	150.00	20,709	1959	ZNL	ResAll
*	McMicken State Park	12.70	3,361	1974	UML	ResAll
*	Moran State Park	8.12	13,840	1921	UML	ResAll
*	Mud Bay Tidelands	73.37	11,360	1967	UML	ResAll
*	Mystery Bay State Park	6.65	685	1972	UML	ResAll
*	Old Fort Townsend State Park	20.04	8,810	1958	UML	ResAll
*	Olga State Park	1.41	60	1962	UML	ResAll
*	Penrose Point State Park	82.11	9,280	1953	UML	ResAll
*	Pleasant Harbor State Park	0.12	100	1955	UML	ResAll
*	Possession Point State Park	19.47	2,500	2001	UML	ResAll
*	Potlatch State Park	86.09	9,570	1960	UML	ResAll

Managing Agency Owner/ Sponsor	Reserve Name	Size (acres)	Shoreline (feet)	Year Est.	Protection Level	Harvest Restrict-ion
*	Right Smart Cove State Park	0.71	200	1978	UML	ResAll
*	Saddlebag Island State Park	4.71	6,250	1974	UML	ResAll
*	Saltwater State Park	0.00	1,445	1929	NTL	ResAll
*	Scenic Beach State Park	6.95	1,487	1963	UML	ResAll
*	Seashore Conservation Area	5,856.25	284,178	1967	UML	ResAll
*	Sequim Bay State Park	16.34	4,909	1936	UML	ResAll
*	Skull Island State Park	0.00	1,654	1960	ZNL	ResAll
*	South Whidbey State Park	21.03	4,500	1963	UML	ResAll
*	Spencer Spit State Park	78.70	7,840	1967	UML	ResAll
*	Stretch Point State Park	5.37	610	1967	UML	ResAll
*	Stuart Island State Park	15.29	4,790	1952	UML	ResAll
*	Sucia Island State Park	229.15	77,700	1952	ZNL	ResAll
*	Toandos Penninsula Tidelands State Park	62.49	10,418	1967	UML	ResAll
*	Tolmie State Park/ Underwater Park	25.02	1,800	1962	UML	ResAll
*	Triton Cove State Park	3.54	555	1990	UML	ResAll
*	Twanoh State Park	9.73	3,167	1923	UML	ResAll
*	Wolfe Property State Park	124.83	16,092	1967	UML	ResAll

* Indicates upland component associated with this MPA

! indicates seasonal protection

Inventory Key (Adapted from Van Cleave et al., 2009)

Column	Description
Managing Agency	Agency involved in administering the area – typically adopting laws, rules, or ordinances to create and manage MPAs.
Owner/Sponsor	Agency or organization responsible for day to day management of site, may also conduct monitoring or develop a management plan.
Acreage	Size of MPA including intertidal and subtidal areas.
Shoreline	Number of feet of shoreline included within MPA boundary at ordinary high tide.
Protection Level	Measure of harvest restrictions within MPA.
NAL	No Access MPAs prohibit all human access to prevent potential ecological disturbance.
NIL	No Impact MPAs allow human access, but prohibit all activities that could harm resources or disrupt ecological or .cultural services.
NTL	No-take MPAs allow human access but prohibit extraction or significant destruction of natural or cultural resources.
UML	Uniform multiple use MPAs offer a consistent level of protection and allowable activities including certain extractive uses.
ZML	Zoned multiple use MPAs allow some extractive activities but use marine zoning to avoid use conflict and adverse impacts.
ZNL	Zoned multiple use with no-take areas are ZML MPAs that contain at least one established zone where all resource extraction is prohibited.
Harvest Restrictions	Any limitation on commercial or recreational harvest.
NoRstr	No restrictions to harvest
ProAll	All harvest prohibited
ProCom	Commercial harvest prohibited
ProRec	Recreational harvest prohibited
ResAll	All harvest restricted
ResCom	Commercial harvest restricted
ResRec	Recreational harvest restricted

Appendix B: Survey

Introduction

The purpose of this survey is to understand the perceptions of resource managers and stakeholders regarding marine protected areas in the Puget Sound.

The term MPA will be used throughout this survey in reference to Marine Protected Areas, Aquatic Reserves, Marine Reserves, Marine Biological Reserves, Conservation Areas, Natural Area Preserves, National Wildlife Refuges, Marine Sanctuaries, Historical Parks, Marine Biological Preserves, Research Reserves, Marine Preserves, Resource Areas, Wildlife Areas, Closed Areas, Saltwater Underwater Parks and State Parks where marine or estuarine resources are protected within that area.

Part I: Knowledge and Attitudes Toward Puget Sound MPAs

Washington State law defines a marine protected area as*: A geographical marine or estuarine area designated by a state, federal, tribal or local government in order to provide long-term protection for part or all of the resources within that area.* (Substitute Senate Bill 6231, effective June 12, 2008)

1. Does this definition fit the goals and objectives of MPAs in the Puget Sound?

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. I am aware of Puget Sound MPAs and their history:

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. I believe that MPAs in the Puget Sound are effective in their current state:

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. Puget Sound MPAs should share common goals and objectives:

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. Utilized properly, MPAs could be an effective tool to conserve and manage marine resources in the Puget Sound:

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. I believe that a network of no-take MPAs can and should be implemented in Washington State:

Strongly Agree Agree Neutral Disagree Strongly Disagree

Part II: Causes of problems with MPAs in the Puget Sound

Research has identified a number of factors important to the efficacy of MPAs. For the questions below, please indicate the extent of your agreement that the problem is one that limits the effectiveness of Puget Sound MPAs.

1. Puget Sound MPAs are arbitrarily placed:

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. There are not enough MPAs in the Puget Sound:

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. Puget Sound MPAs are too small:

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. Fishing and gear restrictions in Puget Sound MPAs are too lenient:

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. Puget Sound MPAs fail to include the types of habitat necessary for species protection:

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. We do not know enough about species and habitat in the Puget Sound to identify the best location for MPAs:

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. Puget Sound MPAs are not regularly monitored:

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. Are there other problems with MPAs in the Puget Sound not addressed here?

Part III: Potential Solutions for MPAs in the Puget Sound

1. Coordinating and clarifying establishment criteria will help MPAs in the Puget Sound be more effective:

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. Creating a coordinated network of MPAs in the Puget Sound is necessary to improving the efficacy of protected areas:

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. Designating authority to one agency or the legislature is part of the solution to creating a successful network of MPAs:

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. Designating authority to a group of representatives from many management entities is part of the solution to creating a successful network of MPAs:

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. Finding common terminology for MPAs in the Puget Sound is important to their success:

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. Goals and objectives for MPAs should be consistent across managing entities:

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. A consistent monitoring plan across MPAs is crucial to their success:

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. Habitat mapping and species diversity and abundance studies and reports are necessary for the success of MPAs so that sites can be prioritized:

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. Are there solutions not addressed here you'd like to add?