

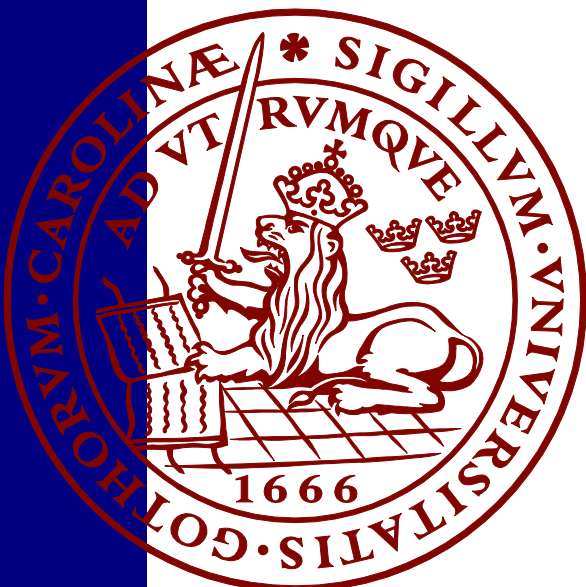
Sustaining the Salish Sea in uncertainty

A case study of sustainable transboundary water governance

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Lund University Centre for
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Abstract

Water is essential to life. In many communities, social, cultural, and economic practices are closely linked to hydrologic flows and the ecosystems that depend on them, creating complex socio-ecological systems. With the increasing pressures of climate change and urbanization, particularly in coastal areas, sustainable socio-ecological systems governance is imperative. However, many wetland ecosystems cross political and social boundaries, creating challenges for governing fluid resources. Resilience and sustainability scholars have identified new processes for adaptive and anticipatory governance that focus on polycentricity, participation, indigenous knowledge, social learning, and foresight to manage natural resources in uncertain conditions. These frameworks can help inform adaptable and future-focused decision-making without reducing the complexity of dynamic transboundary systems.

This thesis explores the case of the Salish Sea, one such transboundary socio-ecological system under threat, where shared waters and resources are governed by the United States, Canada, First Nations, and tribes. There are many collaborations and environmental policies in the region that have improved water quality over time, but economically and culturally significant species are still in decline. Through document review and key informant interviews, the current structure and processes of transboundary governance are analyzed to understand the extent of adaptive and anticipatory capacity in the face of future uncertainty. The findings indicate that there is both top-down and bottom-up collaboration on socio-ecological system governance in the region and several mechanisms through which participation, learning processes, and diversity of knowledge are included in decision-making. However, anticipating future crises and building adaptive capacity is still quite limited. Some potential barriers include a lack of symmetry in governance structure across political borders, recognition of and infringement on indigenous treaty rights, and capacity for implementing change and increasing participation. Several opportunities to increase knowledge-sharing, collaboration, and self-determination that may improve adaptiveness and anticipation towards long-term sustainability are identified.

Keywords: Socio-ecological systems, adaptive governance, anticipatory governance, climate change, polycentricity, indigenous knowledge

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List of Abbreviations

B.C.	British Columbia
CIG	Climate Impacts Group (University of Washington)
CWA	Clean Water Act
DFO	Department of Fisheries and Oceans
ECC	Environment Cooperation Council
ECCC	Environment and Climate Change Canada
FBC	Fraser Basin Council
GMA	Growth Management Act
KI	Key Informant
LIO	Local Integrating Organizations
MPA	Marine protected area
NEP	National Estuary Program
NGO	Non-governmental organization
NOAA	National Oceanic and Atmospheric Administration
NWIFC	Northwest Indian Fisheries Commission
PSEMP	Puget Sound Ecosystem Monitoring Program
PSP	Puget Sound Partnership
SCCI	Swinomish Climate Change Initiative
SES	Socio-ecological system
SoC	Statement of Cooperation

SSEC

Salish Sea Ecosystem Conference

SSRC

Salish Sea Research Center (Northwest Indian College)

USEPA

United States Environmental Protection Agency

1 Introduction

1.1 The problem of water governance

Wetlands, the water-saturated lands where water systems and land systems meet, are some of the most productive ecosystems, essential for sustaining environmental, social, and cultural processes (USEPA, 2015). These critical habitats provide flood, storm and erosion protection, clean drinking water, and support many economic activities (Gardner et al., 2015). Yet wetland loss and degradation continues to increase (Gardner et al., 2015). Globally, nearly 70% of wetlands have been lost or degraded, resulting in more than 20 trillion USD worth of losses in ecosystem services in recent decades (Constanza et al., 2014).

With the onset of climate change, wetlands are vulnerable to sea level rise, changing patterns of precipitation, and changes to spring snow melt (Erwin, 2009). However, robust wetlands can also aid community resilience in the face of climate change as buffers to extreme weather events and as carbon sinks (Erwin, 2009). Nevertheless, the fluid nature of water poses a governance challenge for sustainability. There are roughly 276 transboundary river basins, in which 40% of the world's population live; yet, two-thirds of these systems lack a cooperative management framework for deliberating disputes and actively protecting critical resources (SIWI, n.d.).

In response to the cross-boundary nature of water and efforts to improve cooperative management, many scholars have suggested rescaling water governance to better match 'natural' or 'holistic' geographical boundaries rather than the political boundaries (Vogel, 2012; Molle, 2006). However, negotiating new scales of water governance is inherently a political and power-laden process (Norman et al., 2015). Changing the boundaries or scale of governance structures does not necessarily ensure participatory, equitable, or sustainable decision-making (Cohen & Davidson, 2011). Therefore, the process through which transboundary water governance mechanisms are (re)structured and (re)scaled and the overall goals of socio-ecological system management plays a pivotal role in protecting and restoring wetland systems.

1.2 Water governance for sustainability

Our social and environmental systems are closely intertwined, requiring sustainability issues like water pollution and land use change to be addressed through a holistic, socio-ecological systems (SES) lens (Kates et al., 2001). With the increasing pressures of urbanization and climate change, building strong,

flexible systems of water governance to maintain and restore healthy wetlands is an important component of ensuring long-term socio-environmental resilience for current and future generations. Resilience is defined here as the ability of the natural system to absorb the impacts of pressures like climate change without significant change to the characteristics and functions of the system that we depend on for human wellbeing (Folke et al., 2005). In response to increasingly uncertain pressures, taking a precautionary approach to environmental management as well as anticipating and preparing for threats and crises requires an adaptive and anticipatory governance model for decision-making (Folke et al., 2005; Quay, 2010). In a transboundary water context, governing resources is further complicated by border politics (Norman, 2015). Therefore, it is important to consider historical power dynamics and political scales in the water basin and build inclusive and transparent governance mechanisms.

1.3 The Salish Sea

The Salish Sea (see Figure 3 in section 3.1) encompasses the transboundary inland waters of the Pacific Northwest of North America. It includes the largest wetland in the United States and is a critical economic and cultural resource increasingly under threat of environmental degradation from urbanization and climate change (PSP, 2018). Over 7 million people live in the Salish Sea region, which includes the large metropolitan urban centers of the greater Seattle-Tacoma area and Vancouver, British Columbia (B.C.), where population continues to increase (Wong & Rylko, 2014). Water quality issues resulting from urban and agricultural runoff and fishing catch limits have long been a concern in the region. More recently, climate change has been impacting water temperature and acidity, leading to harmful algae blooms, impacting salmon spawn, and threatening shellfish health (Siemann & Binder, 2017). These pressures on the ecosystem have cascading affects not only on aquatic and land species, but also on fisheries, tourism, and quality of life (Siemann & Binder, 2017). Indigenous communities are particularly vulnerable due to the impacts on economic, subsistence, and ceremonial harvesting essential to traditional ways of life (PSP, 2019).

The Salish Sea is managed by many governing actors across multiple jurisdictions in the United States and Canada (Clauson & Trautman, 2015). It is also an ecosystem that humans have participated in managing since time immemorial (Norman, 2015). Areas of the Salish Sea continue to be traditionally managed by Indigenous tribes and nations where indigenous rights are retained in U.S. and Canadian treaties to Usual and Accustomed lands (Norman, 2015). At the national level, the U.S., Canada, and Indigenous nations are responsible for setting and enforcing environmental management legislation (Clauson & Trautman, 2015). Ecosystem management goals and regulations trickle down to the sub-

national or provincial level where the state of Washington and the province of British Columbia are largely responsible for implementing policies (Clason & Trautman, 2015).

The recent recognition of the Salish Sea as one hydrologic system by the Canadian and U.S. national governments (Tucker & Rose-Redwood, 2015) and the growing leadership of First Nation and tribal governments in re-scaling water governance (Norman, 2015) may signal increased cooperation in transboundary management. Renegotiating the mechanisms through which the Salish Sea is governed may represent opportunities to improve SES management for ecosystem recovery and to anticipate and adapt to change in an uncertain future.

1.4 Research Questions

The aim of this thesis is to increase understanding and knowledge of sustainable transboundary water governance in the context of uncertain future threats to support strong inter-relationships and harmony between social and ecological systems for current and future generations. I explore the structure and processes of transboundary water governance in the case of the Salish Sea with a critical lens to the historical impact of bordering, participation, and adaptive and anticipatory capacity. While the objective of this thesis is to be concretely useful to ecosystem managers in the Salish Sea, by identifying leverage points for improved collaboration and sustainability my process of analysis and findings may be generalizable to transboundary ecosystem governance more broadly.

To assess the long-term sustainability of transboundary Salish Sea governance, it is important to first examine who is involved in current governance and how socio-ecological decisions are made. Therefore, my first research question is:

1. What is the current structure of SES governance (including actors and mechanisms) in the Salish Sea?
 - a. How do actors involved in transboundary governance work together?
 - b. Who is involved in long-term decision-making and how is participation determined?

After establishing the existing governance structure, I employ theories of adaptive and anticipatory governance to uncover:

2. To what extent is the current governance of the Salish Sea adaptive and anticipatory?
 - a. What are important characteristics for building adaptive and anticipatory capacity?

Section 2 outlines my theoretical framework, defining sustainable governance for complex SESs and mechanisms for adapting to and anticipating future challenges. Section 3 focuses on the context of the Salish Sea to better illustrate the historical legacy of environmental management that informs the current governance structure. These two sections help inform my methodology in section 4 and provide a foundation for my findings in section 5, which outlines the structure of governance and presents examples of adaptive and anticipatory capacity in the Salish Sea. Section 6 considers key findings and potential opportunities for strengthening adaptive and anticipatory SES governance for long-term sustainability.

2 Theoretical Framing

To give context to why this thesis investigates transboundary water governance and adaptiveness and anticipation for the long-term sustainability of socio-ecological systems (SES), subsections 2.1 & 2.2 introduce concepts of sustainable governance and apply them to SES in section 2.3. Section 2.4 expands on important considerations for rescaling water governance and section 2.5 outlines the theoretical framework of my analysis, drawing on the previously introduced concepts.

2.1 Governance for sustainability

Whether described as ‘sustainable governance’ (ECFESD, 2000), ‘governance for sustainable development’ (Ayre & Callway, 2005), or ‘earth-systems governance’ (Beirmann, 2007), a common theme has emerged in response to the social, economic, and environmental impacts of ecosystem degradation. These various calls to action ask for a stronger focus on developing governance processes and strategies that aid sustainable transitions, not only demonstrating the widely regarded importance of governance for sustainability, but also the many ways through which governance can be approached.

First, it is important to distinguish that ‘governance’ does not reflect an individual actor/agency (‘government’) or an individual action (‘governing’) but is rather the overall emerging effect of all the actors and actions that govern the system (Ostrom, 2005). There are three prominent discourses of governance (Adger & Jordan, 2009). The first is about how the mode of governance changes over time (Adger & Jordan, 2009): for example, the shift towards decentralization in water governance observed in the last several decades, where local actors have taken more responsibility for enforcing regulations and monitoring than national actors (Norman & Bakker, 2009; Norman et al., 2013). The second discourse of governance is about different ways of governing, such as through markets, networks, or

hierarchies (Adger & Jordan, 2009). The third discourse is of governance as a normative prescription: for example, the idea of ‘good governance’ is based on a particular vision of what governance should achieve (Adger & Jordan, 2009). As my aim is to analyze the ability of a governance system to achieve sustainability goals, this study will focus on the third discourse. Sustainability science is often described as a normative discipline as it has clear intentions to sustain natural resources for present and future generations (Miller, 2012). In the following sections, I identify ‘good governance’ characteristics for sustainability from sustainability science, SES studies, and resilience theory which will build toward a theoretical framework for assessing sustainable governance in uncertainty.

2.2 Characteristics of a sustainable governance model

Sustainability has two important interrelated dimensions regarding governance: outcomes and processes (Adger & Jordan, 2009). Outcomes represent the overall sustainability goals of achieving human and ecosystem wellbeing for present and future generations, but sustainable outcomes are also dependent on decision-making processes (Adger & Jordan, 2009). Natural sciences tend to focus on sustainable outcomes only, like maintaining critical habitats and species (Levin, 1999). However, focusing on the social processes that decide what, how and for whom natural resources should be sustained can prevent conflict and unintended consequences in complex SESs (Adger & Jordan, 2009). For handling future ecological uncertainty, this thesis will focus on processes of sustainable governance.

2.2.1 Participation and precaution in sustainable governance processes

Two major themes for sustainable governance processes can be identified in foundational sustainable development agreements: participation and precaution. As agreed by international leaders in the Rio Declaration on the Conservation of Biodiversity (UNCED, 1992), citizen participation in environmental governance is necessary (article 10), particularly the participation of women (article 20) and indigenous people (article 22). The Rio Declaration also outlines what is widely known as the ‘precautionary principle’ (article 15), stating that a “lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNCED, 1992). Furthermore, organizations like the Commission of European Communities (2001) have highlighted the importance of agency, accessibility, transparency, representativeness, and equity in the process of sustainable governance.

From this perspective, the process of decision-making and governing for sustainability may include transparent, representative and participatory decision-making that ensures those bearing the brunt of

environmental burdens lead in developing the action agenda. Participatory processes also allow for more divergent framings of problems and solutions that can offer complementary understandings rather than focusing on consensus-based prescriptive recommendations (Stirling, 2009). This plurality of worldviews can enhance social agency and self-determination, thereby increasing social capacity for responding to crisis (Gomez-Baggethun et al., 2012). Diverse ways of knowing and framing socio-ecological issues can help avoid unintended consequences of sustainability policies. Without fully understanding the extent of potential impacts on ecosystems, social systems, and cultures, we cannot plan for long-term sustainability.

2.2.2 Inviting complexity: the socio-ecological system perspective

Foundational works on sustainable development, like the Bruntland Report (1987), identify society, economy, and environment as the three main pillars of sustainability. Additional research has illuminated the interdependence of social and natural systems by which human society and natural systems co-evolve through complex interactions (Norgaard, 1994; Berkes & Folke, 1998). Studying resources or institutions within these interconnected systems without reducing the complexity of their interactions is often done through a 'socio-ecological system' (SES) perspective (Berkes & Folke, 1998). Elinor Ostrom's (2009) years of work on self-organization to sustainably manage commons without depleting natural resources has resulted in a framework for studying SESs and a set of key indicators that can positively or negatively influence self-organization. Some of these key indicators include the size of the resource system, resource mobility, number of resource users, knowledge of the SES, and importance of the resource (Ostrom, 2009). Factors external to the SES can also affect sustainability. For example, the impact of colonial rule replacing self-organization has often led to over-exploitation (Mwangi, 2007).

For the Salish Sea, U.S. and Canadian colonization has created a more competitive and exploitative governance structure, which has replaced local, traditional self-organization (Norman, 2015). The Salish Sea is also a very large SES with some highly mobile resources and many users and governing actors, inhibiting self-organization. Therefore, the following sections will focus on how SES governance can incorporate more participation and precaution towards sustainability through adaptiveness and anticipation.

2.2.3 Adaptive governance

Since sustainability requires systemic change in society (Adger & Jordan, 2009), complex SES governance needs to maintain the ability to adapt and continue to respond to uncertainty and new challenges in the future (Folke et al., 2002). Meadowcraft et al. (2005) make the point that the

processes of governance for sustainability should be reflexive and interactive. For Folke et al. (2002), socio-ecological resilience, as defined by adaptive capacity, is key to long-term sustainability. Folke et al. (2002, 2005) introduces four main principles of building resilience and adaptive capacity for SES (Figure 1), which have been used to some extent by other scholars to assess cases of social learning or resource management systems (Paul-Wostl et al., 2007; Olsson et al., 2006).

- Learning to live with change and uncertainty
 - Evoking disturbance
 - Learning from crises
 - Expecting the unexpected
- Nurturing diversity for reorganization and renewal
 - Nurturing ecological memory
 - Sustaining social memory
 - Enhancing social–ecological memory
- Combining different types of knowledge for learning
 - Combining experiential and experimental knowledge
 - Expanding from knowledge of structure to knowledge of function
 - Building process knowledge into institutions
 - Fostering complementarity of different knowledge systems
- Creating opportunity for self-organization
 - Recognizing the interplay between diversity and disturbance
 - Dealing with cross-scale dynamics
 - Matching scales of ecosystems and governance
 - Accounting for external drivers

Figure 1. Folke et al. (2002) Principles for resilience and adaptive capacity for SES. Adapted from their original appearance as Table 14.1 in Chapter 14 - Synthesis: building resilience and adaptive capacity in socio-ecological systems; Navigating Socio-Ecological Systems.

From this perspective, adaptive governance is governance that builds adaptive capacity through learning processes that respond to crisis as well as anticipate change (Folke et al., 2002). It is also reliant on strong relationships between society and ecosystem, diverse ways of knowing and sources of knowledge, and aligning the scale of a problem to the scale of governance (Folke et al., 2002).

These principles of adaptive governance are also found in disciplines beyond resilience theory. Brunner (2010) defines adaptive governance as a ‘reform strategy’ that emerged from environmental and natural resource policy failures as “a means of advancing the common interest” (pg. 305). From this perspective, adaptive governance is similarly characterized by decentralized networks, participation, iterative learning, cooperation, and supplementing scientific inquiry with local knowledge (Brunner, 2010).

2.2.4 Anticipatory governance

In conjunction with adaptive governance, anticipatory governance has gained popularity among agencies and organizations in response to economic uncertainty and climate change (Boyd et al., 2015). Anticipatory governance involves techniques like forecasting and visioning to predict and prepare for future threats while continuously adjusting management plans as new information and data comes to light (Quay, 2010). Nuttal (2010) explains the human-oriented nature of anticipation: it is how we think about the future. Different from adaptation, anticipation is about “intentionality, action, agency, imagination, possibility, and choice; but it is also about being doubtful, unsure, uncertain, fearful, and apprehensive” (Nuttal, 2010, pg. 23). From this perspective, anticipatory governance has to do with how we choose to imagine the future and proactively work towards change (Nuttal, 2010), which complements the reflexive learning processes of adaptive governance.

In case studies, Quay (2010) demonstrates how cities are implementing anticipatory governance through their use of scenarios to develop flexible climate change adaptation plans. However, foresight-based flexible planning must be followed up with constant monitoring and reflection to mitigate risks in uncertainty (Quay, 2010). Quay (2010) also suggests that wide stakeholder participation with anticipatory governance may be necessary for ensuring political and public support for long-term planning that extends beyond usual political cycles. Future focused ways of thinking are also included in socio-ecological resilience to “anticipate change and shape it for sustainability in a manner that does not lead to loss of future options” (Berkes et al., 2003, pg. 354). Anticipation is a way of harnessing human predictiveness and foresight to inform and orient SES governing processes towards long-term sustainability.

Adaptive and anticipatory governance perspectives can improve stakeholder and public engagement through participatory processes and ensure a precautionary approach to environmental policies by utilizing foresight and iterative learning. While these methods can strengthen sustainable governance decision-making, it is also important to recognize their susceptibility to dynamics of power (De Marchi et al., 2000; Stirling, 2006). Awareness of the current and historical power relations is particularly important when talking about transboundary issues where political borders are often infused with colonial legacy (Norman, 2015).

2.3 The scale of transboundary water governance

Water systems are often described in terms of the watershed: the geographical area of land where rainfall drains to a common body of water. In the 1990s, a new water governance framework where

the watershed delineation became the boundary of water management decision-making gained popularity (Cohen & Davidson, 2011). This ‘watershed approach’ to water governance is a political process of rescaling and decentralizing management to a more local set of actors that share a hydrologic system (Cohen & Davidson, 2011). A watershed approach is not necessarily a sustainable governance approach. The mis-match of watershed boundaries with other social or economic governance boundaries, or even other environmental boundaries like ecosystems or airsheds, can increase the complexity of decision-making across multiple jurisdictions (Cohen & Davidson, 2011). Additionally, rescaling governance through a watershed approach does not inherently empower local actors nor ensure participation and equitable decision-making (Cohen & Davidson, 2011).

Therefore, this thesis adopts a critical perspective on scale with regards to transboundary water management in line with three key points outlined by Norman, Cook, & Cohen (2015): (1) hydrological scales are not apolitical, (2) current water governance is historically influenced, and (3) scales are tools for decision-making. Since the geographical boundary of the Salish Sea as an SES is the result of political negotiations and cultural legacy, these points will guide the analysis of transboundary governance.

2.4 A framework for assessing sustainable governance for SES

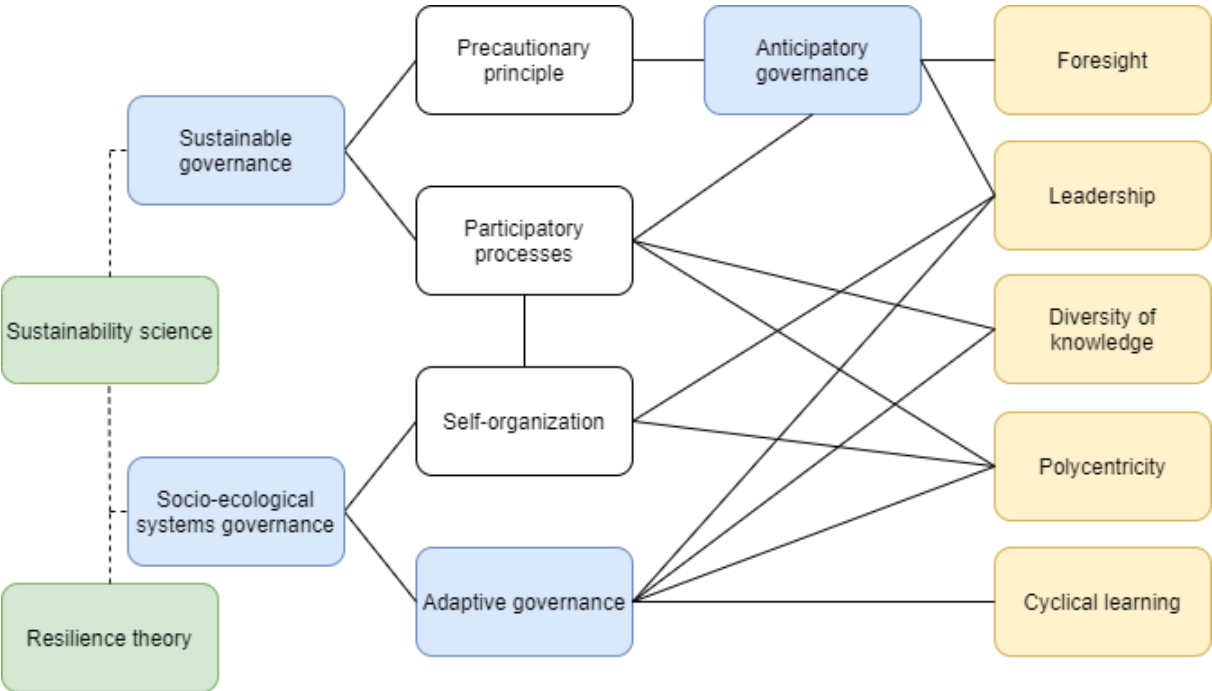


Figure 3. Developing a theoretically informed framework. This flow diagram simplifies and illustrates some of the connections between theories of adaptive and anticipatory governance, resilience, and sustainability science. It also highlights common themes for transitioning to more sustainable forms of SES governance.

As illustrated in Figure 2, several important factors for adaptive and anticipatory governance have been identified in the literature. First, transitioning requires key leadership to help create windows of

opportunity and drive change across different political scales (Olsson et al., 2006). Leaders can also facilitate knowledge building and networking, which are two other necessary components of adaptive governance and align with Folke et al. (2002) principles 3 and 4 (see Figure 1) (Olsson et al., 2006). Second, polycentric institutional arrangements that balance power between top-down and bottom-up approaches for flexible, collaborative, learning-based management has been a central tenant of SES and adaptive governance (Ostrom, 1999; Folke et al., 2005; Brunner, 2010). This polycentric governance approach is also commonly referred to as “adaptive co-management” (Folke et al., 2005). Third, cyclical systems of social learning and reflexive processes strengthen anticipatory and adaptive capacity (Tschakert & Dietrich, 2010; Paul-Wostl et al., 2007). Fourth, traditional knowledge or indigenous knowledge¹ and its role in social learning, knowledge building, and collaborative decision-making can facilitate socio-ecological resilience and long-term sustainable responses to crises (Gomez-Baggethun et al., 2012; Folke et al., 2005; Gadgil, Berkes, & Folke, 1993). Based on these common themes for sustainably governing SESs, I have outlined the following key elements to guide my case study investigations:

1. Polycentricity/network
 - a. Relationship and communication between actors
 - b. Bi-directional influence of actors on each other’s policy and decision-making
2. Leadership and empowerment
 - a. Participatory processes
 - b. Decision-making processes
3. Cyclical Learning/Experimentation
 - a. Project and policy evaluation process
 - b. Monitoring criteria and data collection
4. Diverse forms of knowledge
 - a. Types of knowledge guiding decision-making
5. Foresight/Anticipation
 - a. Responding to crises
 - b. Planning for climate change and managing uncertainty
 - c. Future visioning

¹ There are many similar terms used to describe the multi-generational information and practices held by Indigenous people including traditional ecological knowledge, traditional knowledge, and indigenous knowledge. This is information that is passed down through cultural processes and teachings from one generation to the next but it is also a way of knowing and approaching human-environment relations. Central to indigenous ways of knowing is that people and society are a part of rather than separate from nature and natural processes.

3 Contextual Framing

3.1 Case Description: Rise of the Salish Sea

The shores of the Salish Sea teem with activity – tourist cruise liners, fishing docks, shipping containers, beach-goers; as well as beauty – turquoise waters, pine-laden islands, skyscrapers framed with snow-capped mountains. The Salish Sea is a rich SES that is engrained in the lives of the people who live and work there. Tribal and non-tribal community members alike feel deeply connected to the region and its systems (Poe et al., 2016). Not only are livelihoods and cultural traditions dependent on ecosystem factors like water quality and beach access, but personal identity is strongly embedded in a sense of place (Poe et al., 2016). As one tribal participant in Poe et al.'s (2016) focus group on sense of place and heritage expressed: “shellfish and me are one in the same” (pg. 9). Similar statements have been collected by many ethnographic studies highlighting the deep connection between Coast Salish people and marine resources and access to harvesting. As put by another interviewee, “to us, it is not about money or jobs, it is directly related to what it means to be a Salish person” (Norman, 2015, pg. 108). A deep sense of place and identity in natural systems and resources can inspire environmental activism and stewardship, driving forward progressive environmental policy (Eisenhour et al., 2000; Wyman & Stein, 2010). However, using the term ‘Salish Sea’ to describe the ecosystem is relatively new.



Figure 3. Map of the Salish Sea watershed. (Freelan, 2009).

Community members may identify with local ecosystems, but a burgeoning sense of regional identity pushed the national and subnational geographic naming authorities to add 'Salish Sea' to the maps in 2010 (Tucker & Rose-Redwood, 2015). Freshwater flows downstream into the Salish Sea (see Figure 3) from the Vancouver Island Mountains and Olympic Mountains in the West, the Coast Mountains in the North, and Cascade Mountains in the East (Mitchell, 2019). In the Strait of Georgia and Puget Sound, this freshwater mixes with saltwater entering through the strait of Juan de Fuca from the Pacific Ocean (Wong & Rylko, 2014). These three estuarine waters have been recognized as one inter-connected hydrologic system by scholars, environmental non-profit organizations, and indigenous groups as the Salish Sea (Tucker & Rose-Redwood, 2015).

The term Salish Sea does not replace the older water body names - The Strait of Georgia, Strait of Juan de Fuca, and Puget Sound - but denotes the larger water system that these three smaller bodies are a part of (Tucker & Rose-Redwood, 2015). As previously described, watersheds are nested levels of hydrologic drainage. Therefore, the Strait of Georgia still represents the common body of water of the Georgia Basin watershed (see Figure 3). The Salish Sea represents a new, higher-level watershed designation, encompassing 16,925 square kilometers of seawater and 7,470 kilometers of coastline (Wong & Rylko, 2014). This designation was first proposed at a conference in 1988 by marine biologist, Bert Webber, in support of a 'bioregional' perspective on ecosystem management (Tucker & Rose-Redwood, 2015). Bioregionalism is a movement to use natural or ecological boundaries as our social and political system boundaries (Tucker & Rose-Redwood, 2015). Tucker & Rose-Redwood (2015) describe the process of the Salish Sea naming as an example of *toponymic rescaling*, "whereby the act of naming is one of the primary place-making strategies used to reconstitute the scalar delimitation of geographical spaces" (pg. 196). While it may have long been a physically present feature of the landscape, naming the Salish Sea constructs the social and political dimensions of the space to rethink the scale and scope of the SES.

The naming of the Salish Sea is also politically and culturally important as it gives recognition to the Indigenous communities that have continuously lived in and managed these lands (Tucker & Rose-Redwood, 2015). Though 'Salish Sea' is not a term that was traditionally used by Indigenous people to denote the common waters, it has been embraced by Indigenous leaders and scholars as a way of decolonizing the map and rekindling social and cultural connections among tribes and First Nations, previously separated by political borders (Tucker & Rose-Redwood, 2015; Norman, 2015). Recognizing the heritage and history of Coast Salish tribes and First Nations through the Salish Sea designation does not erase the colonial legacy of place names, but it does help reimagine the space beyond political borders.

3.2 Historical perspective on ecosystem management and bordering

As a result of colonization and westward expansion, the Pacific Northwest was largely claimed and divided up by the United States and Britain. The 1846 Oregon Treaty drew a line along the 49th parallel dividing the Washington Territory (later Washington State) from the colony of British Columbia (later the Canadian province of British Columbia) with no consideration given to the tribal territories or ecological systems it bifurcated (Norman, 2015; Wadewitz, 2012). Indigenous groups that had managed and depended on resources in the Salish Sea with their own borders, relations, and governance systems were now split, and management practices that had been used since times immemorial were ignored (Wadewitz, 2012). By the 1800's, nearly 80% of many indigenous communities in Washington State had been decimated by Western diseases like small pox (Combs, 1999). State authorities, in the hopes of increasing settler population and economic output, sought to negotiate for tribal lands (Combs, 1999). This resulted in the Stevens Treaties where twenty tribes ceded the majority of their lands to the state for the protection of fishing rights in Usual and Accustomed areas and jurisdiction over small tracts of reservation land (Combs, 1999). A similar system of reserves developed in British Columbia where First Nation reserve lands were owned by the Crown and indigenous rights regulated by the Indian Act (Harris, 2011).

Booming fisheries and canneries in the region led to fierce competition for resources, making it increasingly difficult to prevent illegal fishing at the border (Wadewitz, 2012). In 1909, the U.S. and Canada signed the Boundary Water Treaty forming the Canada-U.S. International Joint Commission to arbitrate issues related to the border and shared resources (Clayson & Trautman, 2015). The agreement did very little to relieve tension in what is referred to as the 'Salmon Wars', a race to the bottom facilitated by improved fishing vessel technology that increased catch rates (Wadewitz, 2012). By the 1940's many of the salmon fisheries had collapsed due to unregulated overfishing which led to the construction of salmon hatcheries to supplement the wild stocks and increased interest in conservation (Wadewitz, 2012).

During this period of intense salmon harvesting, roughly 95% of the catch was taken by non-indigenous citizens from state and private beaches (Combs, 1999). In the 1960's an indigenous rights movement to exercise treaty rights sought to reclaim fisheries management (Carson, 2014). In 1974, Indigenous activist prevailed and the landmark *United States v. Washington State* case upheld indigenous fishing rights in the controversial 'Boldt Decision'. Judge Boldt interpreted the original Stevens Treaties to allocate 50% of catch to treaty tribes in Usual and Accustomed areas. This additionally established

tribal governments as co-managers of Washington State fisheries through the Northwest Indian Fisheries Commission (NWIFC) (Treaty Rights at Risk, 2011).

In B.C., a process of First Nation reconciliation was prompted by the advocacy of the Union of British Columbian Indian Chiefs, a non-profit organization formed in 1969 in response to Canada's move to dismantle the Department of Indian Affairs and relegate treaties to the provincial-level (Hanson, n.d.). The New Relationship policy negotiated in 2005 works toward "a new government-to-government relationship based on respect, recognition and accommodation of Aboriginal title and rights" (B.C., 2017). Through this process, many First Nations are still in the process of renegotiating treaties (Clauson & Trautman, 2015).

3.3 Transboundary governance collaborations

In response to declining catch rates and the recognition that salmon stocks are transboundary by nature, the International Pacific Salmon Fisheries Commission was formed in 1985 to align salmon management throughout the western coast of North America. In 1992, Washington State and B.C. agreed to sign an Environmental Cooperation Agreement (Clauson & Trautman, 2015). This established the Environment Cooperation Council (ECC) which identified cooperation in the shared waters of Georgia Basin and Puget Sound as a high priority and formed a joint Marine Science Panel to assess ecosystem health through a set of environmental indicators (Wong & Rylko, 2014). However, the ECC was defunded and inactive for five years from 2009 to 2013 (Norman, 2015).

The state-provincial agreement was followed by a national level State of Cooperation (SoC) between the U.S. Environmental Protection Agency (USEPA) and Canada Environment (now Environment and Climate Change Canada (ECCC)) in 2000 to improve national-level agency communication (Wong & Rylko, 2014). The SoC working group created a set of international transboundary ecosystem indicators for monitoring and reporting on the state of Georgia Basin-Puget Sound region (now the Salish Sea) and identifying priority actions (Wong & Rylko, 2014). The results of monitoring these indicators are published regularly in a collaborative Health of the Salish Sea report. The SoC indicators focus on issues of transboundary interest like the international airshed, shared coastlines, and economically and culturally significant migratory species that routinely cross the border like Orca and Chinook Salmon (Wong & Rylko, 2014).

While the national and sub-national governments of Canada and the U.S. have agreed to formal collaborations, tribal and First Nation governments have formed their own informal collaborations. In 2005, the first annual Salish Sea Gathering took place, a meeting of Indigenous leaders representing

over 70 tribes and bands, to foster social and cultural reconnection between communities that have been separated by colonial borders (Norman, 2015). An outcome of the initial Salish Sea Gathering was the formation of the Aboriginal Coast Salish Leadership Council to coordinate future collaboration and as a mechanism of political alignment on key issues to leverage indigenous leadership in negotiations with the U.S. and Canada (Norman, 2015).

4 Methods

This thesis investigates adaptive and anticipatory sustainable governance for transboundary wetland socio-ecological systems (SES) using qualitative methods grounded in a case study of the Salish Sea. A combination of literature review, document analysis, and key informant interviews was used to iteratively uncover details of the current governance structure and process. Using multiple forms of data helped corroborate my findings with multiple sources through a process of triangulation (Rowley, 2002). My research began with the case study selection, followed by a review of literature on transboundary water governance generally and specifically to the Salish Sea to understand theories of rescaling governance to the watershed level as well as the history of the Salish Sea governance. A literature review of adaptive and anticipatory governance theory was additionally conducted to identify key elements for transitioning to and facilitating sustainable governance (see section 2.4). These key elements were used to outline semi-structured interview questions with key informants. Important documents referred to by key informants and in Salish Sea literature, such as international and tribal agreements, policies, and action plans, were also reviewed to identify areas where key elements of adaptation and anticipation are met as well as potential barriers.

4.1 Case selection

Though there are some over-arching principles for managing SESs, the specific relationship between resources, resource users, and governing actors that make up a governance system are locally specific. One strength of a case study methodology is the ability to investigate a phenomenon *in situ* (Rowley, 2002). In the case of the Salish Sea, the adoption of sustainable governance practices and expressions of adaptiveness and anticipation in transboundary water management are context specific phenomena shaped by historical socio-political relations and current leadership. Much of SES research that has contributed to theories of resilience, adaptive governance, and anticipatory governance is the result of case studies and comparisons of cases. However, most of these cases are very locally focused or exist within one political boundary. The application of these SES governance theories in a transboundary case requires more attention.

There are many transboundary water systems globally where SESs are at risk. The Salish Sea is unique in that the region has a long history of local environmental stewardship and international agreements to co-manage natural resources. In her 1999 paper, *Coping with Tragedies of the Commons*, Ostrom used the fisheries co-management system in Washington State as an example of how polycentricity can improve capability to cope with resource scarcity. This apparent polycentricity of governance and more recent rescaling efforts to further improve collaboration across borders suggests adaptiveness. Similar cultural values, political histories, and common language in the region suggest that transboundary collaboration at the U.S. – Canadian border should be easier than at more heterogeneous or politically contentious borders. Yet, ecosystem restoration continues to lag and socially integral species like Chinook salmon are at risk (NWIFC, 2016). These factors make the Salish Sea a particularly interesting case to assess for both innovations towards and barriers to more sustainable governance.

4.2 Developing a theoretical framework

Adaptive and anticipatory governance are emerging fields that can be approached from multiple perspectives. To identify key elements of adaptiveness and anticipation for sustainable governance of SESs, I started with two overviews of sustainability science literature as entry-points, Boyd et al. (2015) and Adger & Jordan (2009). From these two sources, I used a snowball method to collect relevant literature on sustainable governance of SESs, adaptation, and anticipation. From an in-depth reading this literature, several themes emerged: polycentricity, leadership and empowerment, cyclical learning, diverse forms of knowledge, and foresight. These five characteristics for transitioning to adaptive and anticipatory governance served as the guiding framework for my case-based research including the formation of questions for my semi-structured interview guide (See Appendix Section 9.2) and document analysis. To some extent, my narrow entry point to adaptive and anticipatory governance literature has constrained my theoretical framework to a more SES resilience perspective.

Though my initial investigations were guided by these five themes, I also left my data collection open to additional emerging themes during my interviews and analysis process to accommodate for other relevant processes and outcomes brought up by informants.

4.3 Genealogy of the Salish Sea

A basic genealogy of governance in the Salish Sea was assembled based on key literature found via Google Scholar and LubSearch searches for “Salish Sea” + “governance”. From key literature such as Clauson & Trautman (2015), Norman (2012), and Tucker & Rose-Redwood (2015), further historical sources of information were identified via a snowball method. These resources were additionally

supplemented by document recommendations from key informants. The genealogy was iteratively updated throughout the research process as more information was gathered about actors and governance mechanisms.

4.4 Characterizing current governance mechanisms and relationships

To answer my first research question, *what is the current structure of SES governance in the Salish Sea?*, a list of central actors and their relationships were mapped based on key literature described section 4.3. This map was further developed and new actors and relationships added following semi-structured interviews with key informants. Key informants were identified based on authorship of academic literature on Salish Sea water governance, the list of contributing authors to the Health of the Salish Sea report, speakers from the Salish Sea Ecosystem Conference and the Salish Sea Equity and Justice Symposium, and Indigenous leaders participating in the Northwest Indian Fisheries Commission. Some expert contacts were selected based on their individual experience with research in the Salish Sea or governance experience, while others were selected based on the institution or group they represented (Flick, 2009). Not all initially identified experts were interviewed, as responses to initial email contact varied. Some contacts suggested additional interviewees they felt were best suited for answering questions related to adaptive and anticipatory governance in the Salish Sea.

The majority of interviews were conducted in person over a two-week period in late February to early March 2020 in the Salish Sea region. Due to limited availability, some interviews were conducted via phone/Skype. Before the interviews, I developed an interview guide with several questions and sub-questions related to each of the five themes outlined in my theoretical framework (See appendix for interview guide). Due to the semi-structured nature of these interviews and the variation in key informant expertise, some interviews focused more on certain themes than others. Most questions were geared toward their experience as a member or representative of their organization or governance role. Some questions were more personal to gauge their individual opinion or personal experience in Salish Sea governance.

This approach limited my findings to the experts I was able to contact and interview in a timely manner. I was unable to interview any Tribal or First Nation governmental leaders or environmental non-profit representatives. Therefore, my analysis is lacking in local and Indigenous perspectives.

To answer my second research question, *to what extent is the current governance of the Salish Sea adaptive and anticipatory?*, I categorized statements and examples from key informant interviews and

key literature and documents by the five characteristics of adaptive and anticipatory governance outlined in my theoretical framework.

5 Findings

5.1 The structure of governance in the Salish Sea

There is no single overarching governing body in the Salish Sea. Rather, transboundary resources are governed by separate government agencies at many levels and split by jurisdiction. However, integrating organizations and inter-governmental agreements help align natural resource policies between actors. Several research institutions are also involved in data collection collaborations with various levels of government and creating forums for sharing and co-producing knowledge. The overlapping responsibility of local, regional, and national government agencies ensures that restoration and protection projects are pursued at multiple levels. The following map illustrates the complex relationships and agreements between some of the key actors and mechanisms in Salish Sea governance (See figure 4) revealed through my study. In many ways, this map is over-simplified and limited by the constraints of my methodology. There are numerous formal and informal connections between the actors not included here as well as many local and regional organizations and initiatives. For the most part, non-governmental organizations (NGO) are missing from Figure 4. This is in part a limitation of my study design but also reflects Säre's (2020) findings that, while NGOs have informal relationships across the border, formal cross-border NGO structures are limited in the Salish Sea. For the purpose of this study, I have chosen to represent the actors and relationships that will be further discussed in the following section, which characterizes the adaptiveness and anticipatory nature of this governance system.

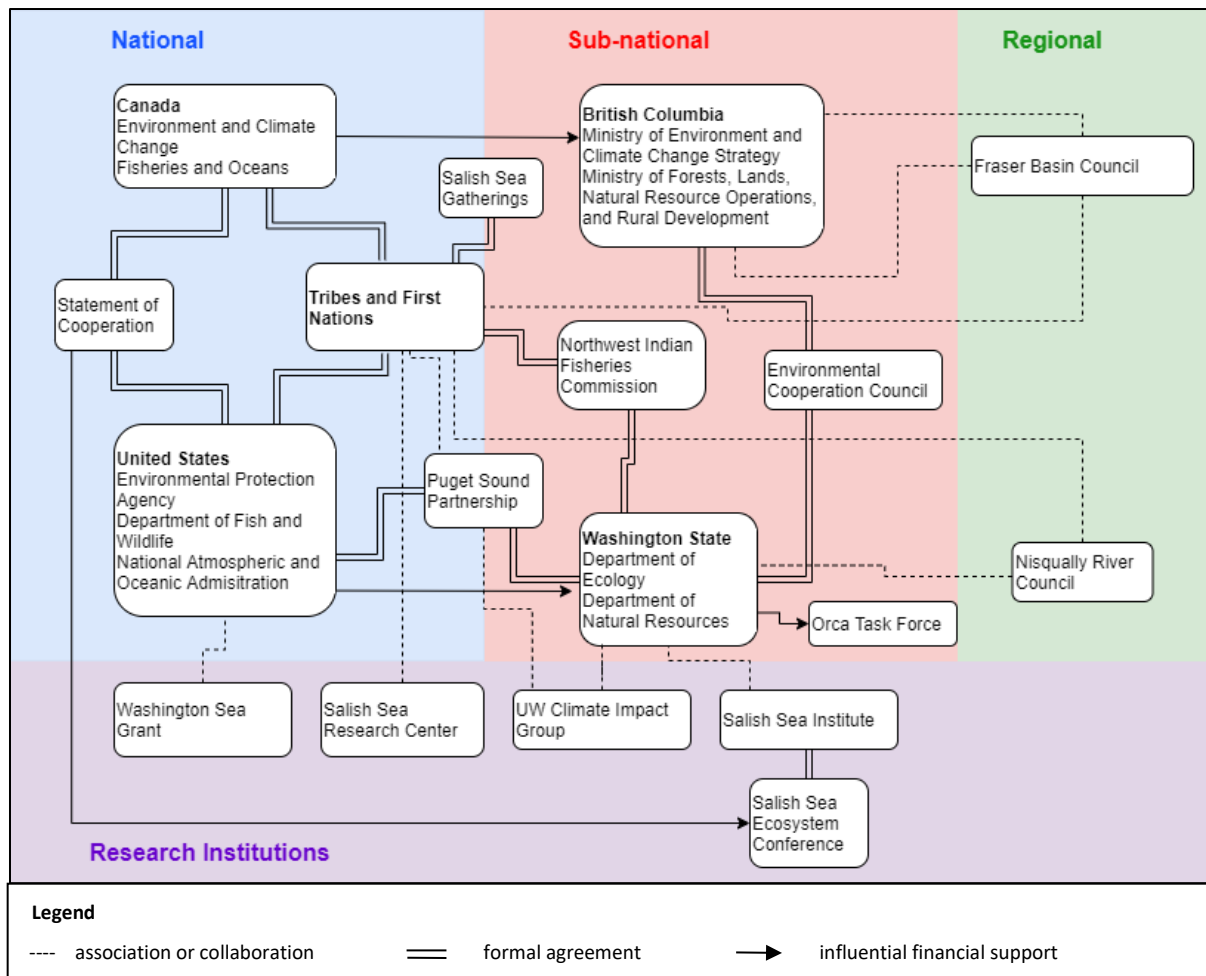


Figure 4. Map of transboundary water governance actors and mechanisms in the Salish Sea. Actors and mechanisms are represented by their geographical jurisdiction or scope. Research institutions are not limited to a specific jurisdiction.

5.2 Expressions of adaptive and anticipatory governance in the Salish Sea

5.2.1 Polycentricity in Salish Sea governance

Inter-governmental agreements

Collaboration for joint decision-making and aligning social and ecosystem goals in the Salish Sea is facilitated by inter-governmental agreements. First, the national agency Statement of Cooperation (SoC) between the US Environmental Protection Agency (USEPA) and Environment and Climate Change Canada (ECCC) has evolved over time from a formal communication channel on environmental policy that affected the shared watershed and airshed into a more informal continuous flow of information and coordination between regional staff and a multi-lateral decision-making forum (Key Informant (KI) 3, personal communication, 28 February 2020; KI 6, personal communication, 2 March 2020). The SoC working groups and management conference, though co-chaired by USEPA and ECCC, includes First

Nation and tribal leaders, NGOs, and other government agencies to better address Salish Sea issues and prevent siloed responses (KI 3, personal communication, 28 February 2020; KI 6, personal communication, 2 March 2020). Second, though it is not a formal agreement, the Coast Salish Aboriginal Council and annual Salish Sea Gatherings serve as a forum for Indigenous led inter-governmental discussion and priority-setting (Norman, 2015). Through the Salish Sea Gatherings, tribes and First Nations throughout the region align their goals to protect and sustainably manage resources in the Salish Sea for future generations and take action towards these goals in asserting Treaty rights and reclaiming traditional governance (Norman, 2015). These two intergovernmental forums aim to address the same geographical extent of the Salish Sea and are specifically focused on the needs and interests of the Salish region, though they differ largely in leadership and approach.

While intergovernmental agreements can help ensure that transboundary issues are discussed and jointly addressed, their effectiveness is still highly dependent on individual relationships. For example, one key informant attributed some of the success of the SoC to the informal sharing of information and collaborations between agency staff and their counterparts across the border (KI 6, personal communication, 2 March 2020). The formal agreement requires biannual meetings, but through these meetings, strong relationships are formed that contribute to nearly constant communication across the border (KI 3, personal communication, 28 February 2020; KI 6, personal communication, 2 March 2020). Additionally, the original establishment of the Washington State – B.C. Environmental Cooperation Council (ECC) was facilitated by the commitment and relationship between Washington and B.C. governors at the time (KI 8, personal communication, 4 March 2020). As new governors have come into office, setting their own agenda, the relationship built through individual trust and partnership has waned and ECC coordination lost priority (KI 8, personal communication, 4 March 2020). State-level commitment to transboundary work was reignited with the West Coast Governors' Agreement, but this agreement lacks ownership and does not encompass B.C. (KI 8, personal communication, 4 March 2020). The importance of interpersonal relationships to the success of collaboration and co-management was echoed by informants on tribal government and federal/state government agency relations. Personal trust is built up over time between individuals and when staff changes or structure changes, these relationships must be rebuilt which hinders participatory and holistic decision-making (KI 2, personal communication, 10 March 2020; KI 5, personal communication, 26 February 2020; KI 6, personal communication, 2 March 2020).

Integrating organizations and co-management

In Washington State, ecosystem recovery and protection in the Puget Sound is dictated at a federal level through the National Estuary Program (NEP), a relatively new program under the Clean Water Act

(CWA) where the USEPA supplies funding for ecosystem monitoring and restoration (KI 6, personal communication, 2 March 2020; USEPA, 2016). Regional action plans and priority setting is organized by the Puget Sound Partnership (PSP), which is not a regulatory but an integrating and planning agency that coordinates representative decision-making through the Leadership Council informed by the Science Panel, Ecosystem Recovery Board, and Salmon Recovery Board (KI 5, personal communication, 26 February, 2020). As a USEPA program, the focus of the PSP is solely on regional planning and coordination for Puget Sound recovery and does not extend to the full geography of the Salish Sea (PSP, 2018). The PSP does recognize the necessity for international collaboration, especially for highly mobile species like salmon and orca and water quality issues that have cross-border impacts (KI 5, personal communication, 26 February 2020; KI 6, personal communication, 2 March 2020) and does acknowledge the larger watershed of the Salish Sea by including a map of the Salish Sea in the PSP Action Plan (KI 8, personal communication, 4 March 2020; PSP, 2018).

So far PSP has engaged in transboundary research on social science indicators and the Science Panel also includes two Canadian representatives to facilitate data collaboration (KI 5, personal communication, 26 February 2020). PSP's recognition of the necessity for joint decision-making is growing; for example, a recent meeting on marine mammals and predation was held in Bellingham, WA, close to the Canadian border and scientists and First Nations representatives from both sides of the border were brought into the discussion (KI 8, personal communication, 4 March 2020).

Most NEP sites receive about 60,000 USD per year for wetland protection; due to the high priority of the Puget Sound and the diligent work of state and local resource managers, the Puget Sound receives roughly 54 million USD per year, a third of which goes to building local capacity (KI 6, personal communication, 2 March 2020). Local agencies and stakeholders in the Puget Sound, where this capacity is needed to implement regional ecosystem recovery plans, are represented in PSP by local integrating organizations (LIOs) divided by geographical regions (KI 5, personal communication, 26 February 2020; PSP, 2018). Since it is challenging to have all of the interests of the region present at the table for decision-making on regional action plans and strategies, PSP boards generally have three out of the ten LIOs represented at a meeting (KI 5, personal communication, 26 February 2020). This same caucus structure is applied to all partner groups (federal and state agencies, NGOs, cities, and tribal governments). However, including the 22 Treaty Tribes in decision-making the same way local jurisdictions are represented as sub-governmental agencies does not respect their independence as tribal governments nor reflect the appropriate government-to-government relationships (KI 2, personal communication, 10 March 2020). Rather, it treats tribal governments as stakeholders which may decrease interest in participation (KI 2, personal communication, 10 March 2020).

This integration of actors from multiple levels towards a common comprehensive regional plan and funding system is unique to the US side of the border where implementation of important ecosystem policies like the CWA and Endangered Species Act are highly decentralized (KI 6, personal communication, 2 March 2020; KI 8, personal communication, 4 March 2020). The responsibility of implementing and regulating ecosystem recovery falls to local jurisdictions which, through the PSP, participate in the agenda setting. While leadership and enforcement are decentralized to create a polycentric network of resource managers, the regional goals, funding, and monitoring are aligned through PSP as a regional coordinating organization.

Additionally, as a result of the Judge Boldt Decision, fisheries and salmon recovery are co-managed by Washington State Treaty Tribes and the Department of Fisheries and Wildlife through the Northwest Indian Fisheries Commission (NWIFC) and the annual North of Falcon Conference where hatchery and catch quotas are set (KI 5, personal communication, 26 February 2020; KI 7, personal communication 9 March 2020). This co-responsibility and management can be seen as polycentric (Ostrom, 1999). However, managing salmon stocks is more complex than hatcheries and catch quotas (KI 2, personal communication, 10 March 2020; PSP, 2019). Access to healthy streams and prey involve many other realms of governance including agricultural practices, logging, flood management, and culvert placement and maintenance (KI 6, personal communication, 2 March 2020; NWIFC, 2016).

Neither the national level integrated planning and policy alignment structure of PSP, nor the legally-backed co-management system of fisheries is replicated on the Canadian side of the border in the Salish Sea. Case law in B.C. does support First Nation rights to fishing and land as well as the need for consultation on matters that may affect First Nation rights and traditional lands, but the right to consult is not equivalent to consent or the responsibility of co-management (Clason & Trautman, 2015). For example, in the case of the Trans Mountain pipeline extension that would affect the traditional lands of the Tsleil-Waututh Nation in Burrard Inlet and increase vessel traffic and the potential for oil spills in Georgia Strait, the Canadian Court of Appeals did not rule in favor of the Tsleil-Waututh Nation due to their inherent rights to manage traditional lands and resources, but because the Trans Mountain project had not followed the correct process of consultation and ecosystem impact assessment (Curran et al., 2020). Section 35 of the Constitution Act, 1982 defines Aboriginal and Treaty Rights as the “reconciliation of the pre-existence of Aboriginal societies with the sovereignty of the Crown” (Delgamuukw v. British Columbia, 1997, para. 186). Reconciliation has mostly been expressed through the Canadian government’s responsibility to consult and accommodate First Nations when making a decision that may affect Aboriginal or Treaty rights (Curran et al., 2020). This law does not protect First Nation rights but rather enforces a process of consultation. The fact that representatives of the Tsleil-

Waututh Nation had to resort to litigation to have their rights represented demonstrates a lack of participation in decision-making. However, the New Relationship agreement of 2005 between B.C. and the First Nations Leadership Council has begun a process of negotiating co-managed land agreements and revenue sharing agreements with First Nation leaders and other local stakeholders (Clouston and Trautman, 2015).

Additionally, at a more local watershed level, the Fraser Basin Council (FBC) has taken on an integrating role for coordinating ecosystem management among the different levels of government, First Nations, and other stakeholders (FBC, n.d.; KI 1, personal communication, 3 March 2020). Rather than being a federal agency like PSP, the FBC is a non-profit organization (FBC, n.d.). However, the lack of a national-level integrating organization or structure complicates cross-border work. While all national and sub-national agencies in the Puget Sound are aligned on strategies and communicate through the PSP, when US agencies wish to engage with Canadian agencies, they must develop individual agreements or relationships with each agency separately (KI 6, personal communication, 2 March 2020). For example, USEPA and ECCC have established strong communication for monitoring ecosystem health through the SoC but there is no transboundary forum for Southern Resident Orca protection because the US National Oceanic and Atmospheric Administration (NOAA) and Canadian Department of Fisheries and Oceans (DFO) lack a similar formal agreement (KI 6, personal communication, 2 March 2020). Orca protection is a priority on both sides of the border and through informal research collaborations and NGOs, Washington State and B.C. have adopted similar vessel traffic regulations (Danelesko, 2020). This has been facilitated by Washington governor's Orca Task Force and a similar Southern Resident Killer Whale initiative in B.C., but each process established independent regulations rather than common transboundary regulations (Danelesko, 2020).

5.2.2 Importance of leadership for adaptive and anticipatory governance in the Salish Sea

As expressed by Pahl-Wostl et al. (2007), leadership and facilitation play a central role in multiscale, multiparty learning processes for water governance. As in the case of the Salish Sea where many actors are involved in SES management, collaborative leadership is necessary since it “can mobilize energies, generate trust, give vision, and support the collective finding of a clear direction in a multiparty process” (Pahl-Wostl et al., 2007, pg. 9). There are several ways in which actors are asserting leadership towards more adaptive and anticipatory forms of governance to improve long-term sustainability of the Salish Sea SES. First, through convening other actors to share information and build partnerships; and, second, through participatory structures for co-produced knowledge and action plans.

Research institutions are leading social and ecological science data collaborations and creating opportunities to share information across the border. For example, the Salish Sea Institute and Border Policy Research Institute at Western Washington University focuses specifically on border studies and have taken on a leadership role in organizing the Salish Sea Ecosystem Conference (SSEC) bringing together Salish-wide researchers and agencies every other year to share knowledge and insights (KI 8, personal communication, 4 March 2020).

Several organizations have also created good opportunities for participation and leadership. The structure of the Pacific Salmon Commission has encouraged indigenous leadership and participation across political boundaries (KI 2, personal communication, 10 March 2020). At the Washington State level, the NWIFC has served as a platform for indigenous leadership in fisheries co-management. The NWIFC also produces a State of Our Watersheds report, similar to the SoC's Health of the Salish Sea report, synthesizing data from 20 local watersheds within the Usual and Accustomed fishing areas, and identifying progress and gaps towards habitat recovery for salmon protection (NWIFC, 2016). However, the State of Our Watersheds places Treaty rights at the forefront of ecosystem monitoring and restoration, focusing more on the pressures and drivers of ecosystem change and differentiating between local watersheds rather than the transboundary indicator focus of the Health of the Salish Sea report.

The State of Our Watersheds report emerged from the Treaty Rights at Risk initiative (NWIFC, 2016). The NWIFC was actively involved in producing the Treaty Rights at Risk seminal paper, which brought together many indigenous leaders and scholars in a call to the federal government to take action on habitat loss and salmon protection as inaction infringed on Treaty rights (Treaty Rights at Risk, 2011; KI 2, personal communication, 10 March 2020; KI 7, personal communication, 9 March 2020). While individual tribes and First Nations have different interests and face different local risks, Treaty Rights at Risk identifies common problems limiting co-management and traditional practices where federal and state agencies have the responsibility to implement solutions (Treaty Rights at Risk, 2011). This demand for action from the federal government demonstrates the leadership role Western Washington Treaty Tribes play in driving sustainable SES restoration.

Local actors are also taking leadership in preparing for climate change. This includes local data collection and modeling for impacts like sea level rise and ocean acidification that will have very locally specific effects and need to be incorporated into future planning (KI 4, personal communication, 18 March 2020). For example, in 2007 the Swinomish Tribe started the Swinomish Climate Change Initiative (SCCI) and has developed a climate adaptation action plan and toolbox to support a wide variety of strategies. The initial study of climate change impacts to the reservation were carried out in

partnership with the University of Washington's Climate Impacts Group (SCCI, 2010). The resulting action plan is explicitly guided by the principles of comprehensiveness, long-term sustainability, adaptive and flexible strategies, financial requirements and feasibility, non-regulatory cooperative strategies, and alignment with community goals (SCCI, 2010). The action plan advisory group also included representatives from the County government, the town of La Conner, and Shelter Bay Community (SCCI, 2010). Local climate change planning efforts like this are helping to shape regional level climate change planning at PSP (KI 4, personal communication, 18 March 2020).

5.2.3 Cyclical learning for adaptive governance and anticipation

A key feature of adaptive and anticipatory governance is integrating systems of iterative learning into the governance process so that new information and the outcomes of previous projects can feed into a model of governance that constantly evolves to match the system it represents (Tscharkert & Dietrich, 2010; Pahl-Wostl et al., 2007). These learning processes can invite innovation and creativity into governance to proactively analyze and learn about change rather than only be reactive to the impacts of crisis or climate change (Tscharkert & Dietrich, 2010). There are three main methods through which actors in the Salish Sea are incorporating learning into SES governance: updating working documents, reevaluating procedures and goals, and sharing research.

The SoC, though they do not have a specific mechanism for adapting their management strategy, has created a flexible enough structure in its initial 2000 agreement to change over time. The SoC action plans, updated every three years, have gotten progressively more specific and adapted to what is most relevant to its diverse working group members (KI 6, personal communication, 2 March 2020). The SoC working group has also undergone a review of their transboundary indicators to incorporate feedback from stakeholders and existing monitoring systems (KI 3, personal communication, 28 February 2020). These indicators, which have largely focused on monitoring the ecological state and impacts of urban growth and climate change, are potentially moving towards encompassing more of the social impacts as well as upstream pressures for evaluating the health of the Salish Sea (KI 3, personal communication, 28 February 2020). Additionally, the Health of the Salish Sea Ecosystem report is a working document in that it is continually updated to reflect the latest data (USEPA, 2018). The report has also recently been moved to an online platform on the USEPA website to increase its accessibility and to facilitate updates and expansion with additional comprehensive indicators (KI 3, personal communication, 28 February 2020).

More explicitly, PSP has adopted an adaptive management strategy for action planning (PSP, 2018). PSP follows the guidelines of Conservation Standards which is an open source strategy for iterative

conservation and recovery project management designed for multiple points of learning (KI 5, personal communication, 26 February 2020). PSP's recovery projects are developed in stages and implemented after action review to inform successive stages of projects (PSP, 2018). Part of such review is a structured question survey of local partners involved in implementation; however, a lack of capacity at the local level to communicate all insights up to the regional level limits strategic planning (KI 5, personal communication, 26 February 2020). Feedback is also received informally by PSP staff members who work closely with partners and LIO representatives have the opportunity to communicate feedback and lessons learned during PSP board meetings (KI 5, personal communication, 26 February 2020; ECB observation, 27 February 2020). Currently, PSP staff are working on a mechanism for evaluating the adaptive management process to determine where it works best and how it too may need change over time (KI 5, personal communication, 26 February 2020; PSP, 2018). This is an example of PSP potentially moving from a single-loop to a double-loop learning process to further question their planning process in addition to making management corrections through project review (Tscharkert & Dietrich, 2010). PSP is also working on intermediate progress measures for its action plans which have a longer-term focus to provide additional points of reflection (KI 6, personal communication, 2 March 2020; PSP, 2018).

Outside of individual organizations, inter-organizational learning also takes place through convening. Several key informants stressed the importance of the SSEC for sharing information and identifying solutions. The SSEC brings together researchers, government agencies, NGOs, and business leaders north and south of the border to share research and discuss the state of the Salish Sea, best practices, and future opportunities (SSEC, 2020). Though not a formal exchange of information, the SSEC can be a place for collective reflection and opportunity to build stronger cross-boundary relationships.

5.2.4 Diversity of knowledge

As identified by Folke et al. (2005) through several examples of knowledge integration between researchers and local knowledge holders, diversity of knowledge can improve the adaptive capacity of an SES to respond to change and uncertainty. More specifically, traditional knowledge and the embedded socio-ecological memory in local cultures are important complements to science and technology in building adaptive and anticipatory governance approaches (Gomez-Baggethun et al., 2012). Taking a more pluralistic approach where multiple world views are not only represented but actively engaged with in decision-making can improve management not only by opening it to more solutions, but also preventing a single actor dominated power structure. Due to the history of top-down policies conflicting with locally-based traditional knowledge, this is particularly important in the Salish Sea.

For example, in 2002 ECCC set a goal to increase marine protected areas (MPA) in all national marine parks. Part of the national-level MPA strategy includes at least one permanent no-take zone (NTZ) marine park, including the Salish Sea. Ayers et al. (2012) study revealed that Hul'qumi'num First Nation members who are involved in fisheries management in the Strait of Georgia are supportive of MPAs and agree that NTZs would help reduce over-fishing and are necessary to restoration, but disagree with the permanent NTZ strategy. This disagreement is partly the result of different worldviews. From the perspective of the Hul'qumi'num members where humans are embedded in the ecosystem, permanent removal of human involvement is less salient than seasonal or temporary NTZs (Ayers et al., 2012). In accordance with traditional knowledge, certain marine resources, like clam beds, are more productive with some human intervention, as digging for clams loosens the sand (Ayers et al., 2012). Without this active harvesting, the sand becomes too compact for clams to flourish (Ayers et al., 2012).

To increase the multiplicity of perspectives in governance decisions, the SoC working groups and PSP boards stress the inclusion of tribal representatives, particularly in salmon recovery planning and monitoring shellfish beds (KI 6, personal communication, 2 March 2020). The SoC produced Health of the Salish Sea Ecosystem report claims to integrate traditional-ecological knowledge in its analysis and is also making an effort to supplement quantitative data with qualitative 'Sustainable Perspectives' vignettes (KI 5, personal communications, 26 February 2020; EPA, 2019). There is also a focus on improving indicators and models used to track important shellfish bed impacts like ocean acidification and pollutant runoff to update environmental conditions in real time (KI 6, personal communication, 2 March 2020). Constant monitoring can increase response time to prevent long-term ecosystem damage and can increase beach access in healthy shellfish beds.

Perhaps most significantly, indigenous researchers and Tribes/First Nations, with support from government agencies, are integrating diverse forms of knowledge. At the Salish Sea Research Center (SSRC) at Northwest Indian College, students and faculty members are designing environmental research projects based on traditional knowledge and technology (SSRC, n.d.). The SSRC fosters a specifically integrative native lens on environmental research, focusing on issues that are of high concern to and in service of indigenous communities, and embedding inquiry in a sense of place and worldview inclusive of diverse ways of knowing and research (Orloff & Norman, n.d.).

For example, a native environmental science student might ground a research question about a particular fishing site in interviews with tribal elders and family members on the history of use and yields from the site, and then use scientific methods and technology to corroborate social ecological memory to further explain change in the ecosystem (KI 9, personal communication, 4 March 2020).

Another example of diverse forms of knowledge used in research to inform adaptation and planning is a study of indigenous health and climate change by the Swinomish Indian Tribal Community in partnership with the Tsleil-Waututh First Nation and U.S. Geological Survey's Pacific Coastal and Marine Science Center and Western Fisheries Research Center (Donatuto et al., 2014). To explore the impact of climate change on indigenous communities, Donatuto et al. (2014) used a set of Indigenous community health indicators (IHIs) to identify adaptation priorities, combining community health and wellbeing with climate scenario modeling and environmental indicator data. Using Indigenous-based valuation tools like the IHIs can help build a common language, linking community wellbeing and social indicators with environmental indicators (Donatuto et al., 2014). Governmental funding agencies, like NOAA's Washington Sea Grant program, are increasingly supporting interdisciplinary research that is focused on meeting community needs, place-based decision-making, and multiple forms of knowing through partnerships with traditional knowledge holders (KI 7, personal communication, 9 March 2020).

5.2.5 Utilizing foresight for anticipating climate change

Anticipatory governance for climate change requires advanced real-time monitoring and locally relevant climate change scenario models that can be used in short-term decision-making for long-term sustainability (Quay, 2010). Furthermore, anticipatory governance relies on strong coordination towards a common vision and simple, accessible knowledge to overcome the barrier of real politics and the complexity of uncertain futures (Boyd et al., 2015). Climate change has clearly become a key concern to many actors throughout the Salish Sea, as there is wide acknowledgement of current and future climate impacts on the SES. However, anticipating future climate impacts is still a relatively new and uncertain practice for many actors.

The PSP climate advisory team is working on integrating climate change concerns into chapters of the Salmon Recovery Plan, the implementation strategies, and vital signs using scenario planning exercises (KI 4, personal communication, 18 March 2020; PSP, 2018). PSP is also encouraging LIOs to incorporate climate change in local planning and supporting the on-going work of several local watersheds in their climate change data collection and adaptation prioritization processes (KI 4, personal communication, 18 March 2020). Much of PSP's regional climate change scenario planning and the previously mentioned localized work of the SCCI has been supported by research and reports from the University of Washington Climate Impacts Group (CIG) (Siemann & Binder, 2017; SCCI, 2010). CIG is helping to interpret global climate change scenarios to specific impacts in the Puget Sound (Siemann & Binder, 2017). The Washington Department of Commerce is also publishing a report on incorporating climate

change into Growth Management Acts (GMA), pulling best practices from cities and counties that have already included climate change adaptation in their GMAs to guide local planning statewide (Idleburg, 2020).

Development in monitoring technologies and communication tools in the Salish Sea also reflect Quay's (2010) real-time monitoring requirements for observing current trends and anticipating future impacts. In B.C., OceanWise and the Vancouver Aquarium have launched PollutionTracker, an interactive web-based map of shellfish bed health (OceanWise, n.d.). User-friendly data sharing portals like PollutionTracker also contribute to the simplification and democratization of knowledge. Sharing monitoring responsibilities and methods is also facilitated at a regional scale by the Puget Sound Ecosystem Monitoring Program (PSEMP), an informal network of ecosystem monitoring agencies which collaborate within the PSP structure (KI 6, personal communication, 2 March 2020). The PSEMP Toxics working group produced a Salish Sea Toxics Monitoring Review in 2016 followed by a 2018 Salish Sea Toxics Monitoring Synthesis Report with input from over 50 research and monitoring projects across Washington State and B.C. to improve cross-border monitoring and identify priority areas for collaborative action (PSEMP Toxics Work Group, 2019).

Beyond improvements to models, indicators, maps, and data sharing, collaborative anticipatory visioning can help direct preemptive climate change adaptation. The Salish Sea Gathering and intergovernmental agreements like the SoC include vision statements for collaboration. The Salish Nation Drum Declaration clearly defines the vision, territory, and self determination of Coast Salish tribes and First Nations including the commitment to govern resources together for future generations (Norman, 2012). This Declaration makes a long-term commitment to sustain the economically and culturally dependent resources that Coast Salish people have an inherent right to protect and harvest now and for all future generations. The SoC makes a similar commitment to work together on complex ecosystem issues, including climate change, for the sake of future generations but focuses on the responsibility of government agencies (USEPA, 2000). In order to address the evolving landscape of climate change impacts and prepare for future change, these initial visioning exercises might benefit from regular reflection and revision to collectively determine how actors will work within an uncertain future towards sustainability.

6. Discussion

Though it is certainly limited in its scope, this study has characterized the relationships between and transboundary work of several key actors in Salish Sea governance. These relationships are made up

of government agencies collaborating through formal agreements and informal networks to share data and design environmental policies. Participation in decision-making is expressed through diverse representatives in working groups and on committees and boards. Research institutions that are focused on producing social and environmental knowledge relevant to Salish Sea governance also play a vital role in convening various actors, leveraging funding opportunities, and championing diverse ways of knowing. By bringing these bodies together, actors are creating opportunities for polycentricity, leadership, cyclical learning, diversity of knowledge, and foresight, towards adaptiveness and anticipation in the face of future uncertainty like climate change. While the current governance structure includes elements of adaptive and anticipatory governance, there is room for improvement.

The diverse network of actors at multiple scales across different jurisdictions involved in governing the Salish Sea contribute to the polycentricity of decision-making. However, much of the power to regulate is still held by governmental agencies at the federal and state/provincial level. The Salish Sea Gatherings and efforts to include tribal members and leaders in participatory processes may be an opportunity to reclaim Indigenous decision-making power and include a wider variety of worldviews and knowledge in SES governance. This opportunity is complicated, however, by the current limitations of the co-management structure in Washington and B.C and a lack of strong government-to-government relations. The phrase “fifty percent of nothing is still nothing” was shared with me to describe current co-management (KI 2, personal communication, 10 March 2020). Without healthy, functional ecosystems to support keystone species like salmon, Treaty rights are not protected and ecosystem services are lost (NWIFC, 2016). Therefore, co-management is necessary at every level of the socio-ecological system, including upstream land management and stream flow. Additionally, government-to-government relations could be improved through collaborative visions like that of the New Relationship between First Nations and B.C. or potentially by extending intergovernmental agreements like the Statement of Cooperation to tribal and First Nation governments to recognize their sovereignty.

To improve anticipatory governance, the Salish Sea region needs not only more comprehensive monitoring and modeling of climate and urban development stressors on a local level, but also integration of this knowledge across the border. PSEMP’s Salish-wide toxics reports are a step towards integrating knowledge, but the results of these cross-border indicator and monitoring collaborations should be reflected in easy-to-use transboundary tools which they do not currently have. For example, with international support, tools like PollutionTracker that are already publishing shellfish bed data in an accessible and interactive manner (OceanWise, n.d.) could integrate data from both the Georgia

Basin and Puget Sound instead of stopping at the border. Beyond the technical capacity to model and monitor climate change impacts and ecosystem health, using participative exercises to harness foresight in building a collective vision of Salish Sea adaptation across actors could help align goals and worldviews and reduce conflict.

The scale of the Salish Sea, the complexity of its actors and interactions, and the somewhat entrenched top-down structure of ecosystem governance on both sides of the border limit the possibilities of self-organization and the likelihood of bioregionalism in region-wide governance. Therefore, informal networks and flexible formal agreements within the existing structure will be important for facilitating transboundary resource management and trust without losing institutional knowledge. This relates back to Säre's (2020) point that the Salish Sea lacks international funding options for non-governmental organizations and research institutes to support projects that go beyond nation-state boundaries. Here, research centers like the Salish Sea Institute and Salish Sea Research Center that are not bound by governmental structure or mandates and have greater access to creative concepts can play a pivotal role in creating a neutral convening space for both sharing ideas and creating innovative solutions to soften political boundaries.

7. Conclusion

As climate change and urban population growth continue to stress and constrain the complex wetland socio-ecological systems (SES) many communities depend on economically and culturally, innovative, participatory, future-focused governance strategies can guide sustainable transitions. Adaptive and anticipatory governance attributes can improve sustainable SES governance for dealing with uncertainty. This thesis has explored the extent of several such attributes: polycentricity, leadership, cyclical learning, diversity of knowledge, and foresight, in the case of transboundary water governance across the Salish Sea. While many actors and mechanisms of Salish Sea governance are already implementing elements of adaptiveness and anticipation, further collaboration, knowledge sharing, reflexiveness, and capacity for transboundary work is needed.

There are many complex interactions between ecosystem function, cultural identity, and Indigenous rights in the Salish Sea that are difficult to reduce to a set of indicators and targets for environmental restoration planning and policy-making. Indigenous led models of SES governance in collaboration with the latest scientific models of climate change and monitoring technology can potentially improve adaptiveness and sustainability. Additionally, transdisciplinary research that integrates diverse forms

of knowledge and indigenous research methodologies can help build socio-ecological indicators of health that align with collaborative visions of long-term sustainability.

Future studies of governance in the Salish Sea are necessary to further uncover actor relationships and barriers to knowledge integration and capacity for implementing adaptive and anticipatory processes. Sustainable governance for transboundary SES is an important component of ensuring that human-environment systems continue to flourish despite outside pressures. For the broader sustainability science research community, how political borders affect SES management and how socially and politically constructed barriers can be overcome are necessary areas of transdisciplinary inquiry for a sustainable future.

8. References

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9. Appendix

9.1 Key Informant Interview Guide

Introduction

1. My research:
 - Initially interested in how renaming the Salish Sea and taking a bioregion-perspective affects ecosystem management across political borders
 - Interested in governing SES where political and ecological boundaries are aligned
 - From a sustainable transition perspective, moving towards more adaptive and anticipatory forms of SES governance
 - What elements of adaptiveness are already present in Salish Sea governance? What are potential challenges? How might it continue to evolve?
 - Most interested in the network of agents governing and shift towards polycentricity and co-production of knowledge
2. Interviewee
 - Tell me about your role in [X organization]
 - What on-going projects are you working on or planning?

Polycentricity/network

1. Which other stakeholders do you work with the most?
 - a. Why do you collaborate more with them?
 - b. What advantages are there to working with them?
 - c. What challenges have you encountered?
 - i. How have these challenges been resolved or overcome?
 - d. How frequently are you in communication?
2. In your work at X organization, how often do you operate in a 'Salish Sea' context? Is 'Salish' as a term used to describe the scope of your work frequently or is there more of a focus on local watersheds/context?
 - a. Was there a point at which you felt you experienced a shift towards a 'Salish' perspective or observed some change?
 - i. When did you observe this change?
 - ii. What do you think was the main driver of that change?
3. To what extent would you say your work is influenced by projects in other jurisdictions/organizations?
 - a. How much of what you are working on do you communicate to other stakeholders?
 - b. To what extent would you say your work influences the projects of other jurisdictions/organizations?
 - c. Are there institutional incentives to collaborate? Is collaborate more the rule or the exception?

Leadership and Empowerment

1. When working together, who takes on a leadership role in setting the agenda for stakeholder meetings?
2. How are new ideas or projects raised?
3. How often do community members participate in this process?
 - a. Why? What are some of the challenges or successes of community participation?
 - b. What role do community members play in planning and monitoring projects?

Back-loop Learning/Experimentation

1. What processes are used for project development? What phases are involved?
 - a. How is learning integrated into the project process?
2. How do you evaluate the success of projects?
 - a. What kinds of data do you collect? Qualitative, Quantitative
 - b. How do you determine which criteria to monitor?
 - c. Who is involved in collecting data?

Traditional Knowledge/Knowledge integration

- Traditional knowledge as been identified by some scholars to enhance adaptive capacity and is an important source of ecological and social memory to respond to crisis (Folke et al., 2002; Gomez-Baggethun et al., 2012)
1. How/When is traditional knowledge included in decision-making?
 - a. At what points/phases in project/policy development are traditional knowledge holders included?
 - i. Ex. Design, planning, implementation, monitoring, evaluating
 - b. To what extent does TK serve as the foundation or inspiration for project/policy development?
 - i. What types of challenges/successes have you encountered in including TK?
 - ii. In your experience, has the integration of TK changed over time?
 1. Why do you think there has been change?

Foresight/Anticipation

1. If there have been previous challenges/crisis, how have you responded to them?
 - a. Why was that process of response used?
2. How do you plan for future environmental change or potential crisis in your work?
3. How do you manage the uncertainties of climate change?
 - a. How are climate change threats or projections incorporated in your project planning?
4. Looking towards the future, do you think the current governance structure of the Salish Sea will change?
 - a. In what ways might it be different?
 - b. Is there a specific actor or group leading this change? Who?
 - c. What is your ideal scenario for Salish Sea governance for the future?
 - i. How do you think the governance should be?
 - ii. What about the current system should be improved?

9.2 Table summarizing notes from Key Informant interviews on adaptive and anticipatory characteristics

Characteristic	Notes
Polycentricity	<ul style="list-style-type: none"> • Co-governance in BC is evolving • Collaborative priority setting for transboundary resources • Fraser river is ‘an onion’ of governance • US and Canadian responses to crisis differ • More coordination around oil spill response

	<ul style="list-style-type: none"> • Locally-based examples of collaboration: Swinomish and La Conner working together on restoration • Co-management often depends on individual relationships • Integrated management structure in Puget Sound • Example of collaborative research: Social Science for the Salish Sea Report • Some international representation on PSP boards • Transboundary indicator collaboration between USEPA and Dept of Fisheries Canada has gained increasing support with pressure of the Orca Task Force • Capacity limitation for effective representation • Lack of transboundary forum for Orcas, NOAA and Dept of Fisheries Canada don't have a formal agreement • The size of the Salish Sea may be a barrier for coordination, there are many different needs and priorities • SoC has become less formal and top-down over time and more multi-lateral with diverse participation
Leadership/Empowerment	<ul style="list-style-type: none"> • Canada has ambitious environmental goals but limited funding • Pacific Fisheries Commission is a good forum and structure for participation and indigenous leadership • Renegotiations of the Columbia River Treaty include tribal leaders and First Nations originally left out in 1964 • Every Treaty Tribe should have a seat at the decision-making table, government to government relationship, not stakeholders • SoC working group identifies action priorities such as key activities for 2017-2020, includes the Health of the Salish Sea Report and support for the SSEC • The role of PSP is still being defined for emerging issues like climate change • PSP cannot be prescriptive or financially support climate change planning but encourage local watersheds to take initiative on climate change and helps share information • Local watersheds are interested and willing to take the lead on climate change planning, many have already collected data and are developing comprehensive strategies • PSP as a coordinating organization is not directly involved in implementation, local integrating organizations implement • North of Falcon Conference for salmon recovery co-management • Lack of funding for LIOs • SoC management conference tries to bring in 3rd parties including tribal leaders, state and federal agencies. In the past there was more NGO support • Example of Peter Ross taking his research to Vancouver Aquarium and aligning data with Puget Sound monitoring • Boldt decision affirmed treaty rights in WA, important for co-management of resources • NWIFC produce State of Our Watersheds report • Treaty Rights at Risk initiative

<p>Back-loop Learning</p>	<ul style="list-style-type: none"> • SSEC is an opportunity to convene and share information and identify solutions • SoC action plans have gotten more specific than the 2000 agreement • Conceptual models for talking about health of the Salish Sea – have been using DPSIR model • Updating regional strategies • Social approaches are under review – ex. The Sound Behavior Survey looking for gaps and opportunities in social approaches • PSP uses Conservation Standards for recovery planning • Working on mechanisms for evaluating adaptive management process • PSP uses after-action review, surveys partners using structured questions and informal feedback to inform next process • Working on intermediate progress measures • Interactive project design for multiple points of learning • Puget Sound Ecosystem Monitoring Program is another informal gathering of agencies to allocate indicator monitoring work to the best equipped agency
<p>Diverse forms of knowledge</p>	<ul style="list-style-type: none"> • The phrase ‘integrating TEK’ feels very power dynamic influenced • Culvert are an example of a lack of real co-management • TEK is important for the application of information • Indigenous members on SoC working group • Stress importance of Chinook salmon • PSP is hoping to expand its climate change advisory team soon to include more local representation • PSP climate change team is definitely using tribal plans to inform regional strategies but it is challenging to know who has a plan and if the plans are relevant at the regional level • Tribes are represented on PSP boards via a caucus structure • Tribes are also involved at regional level in human wellbeing vital sign indicators – ex. Swinomish social science project for indicators • Developing more comprehensive monitoring and modeling for shellfish on ocean acidification and pollutants but integrating this knowledge across the border is necessary • First Nation rights in Canada are different from in the US, lack co-manager status • First Nations are regular attendees at PSP and SoC meetings • WSG interdisciplinary research increasingly focused on meeting community needs, place-based decision-making, and multiple forms of knowing • There is a lot of ignorance about salmon and orca management
<p>Foresight</p>	<ul style="list-style-type: none"> • See future of SES governance building on existing systems rather than creating new organizations or structures • Important to identify wins and challenges and organizations are learning to apply lessons learned more proactively

	<ul style="list-style-type: none">• PSP is integrating climate change into existing plans and processes such as the salmon recovery plan and action agenda• Need actionable plans and guidance for all levels and audiences• Use scenario planning exercises• Need to strike a balance between local importance and regional significance• Need increased capacity• Organize information for different scales of use• Improving state and federal relationship for better coordinated action plan for transboundary resources• Hope that Canada can replicate some of the US structure of integration and flexibility• NEP is moving towards a lens of scale of change over time and emphasizing protection rather than only measuring restoration gains• SoC has become more ecosystem-based over time• More real time tracking of pollutants to protect shellfish beds and maintain access to beds for traditional harvest• Recognizing human viability has been a next step in integration on linking community quality with environmental quality• Commitment to place is compelling and may be why informal structures have been successful• A successful governance means being able to harvest locally and managed sustainably• Tribes have so much to offer with models of sustainability and leadership, let them lead
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