RESEARCH ARTICLE

Integrating Social Science in Puget Sound Restoration

Kelly Biedenweg, David J. Trimbach and Whitney Fleming

ABSTRACT

Social science is central to effective ecosystem restoration. It can enhance stakeholder-driven management practices; excavate assumptions about management strategies; and improve understanding of failures and successes from restoration efforts. In the Puget Sound of Washington State, social science is beginning to play a larger role in ecosystem recovery. In this paper, we use a governance-oriented science-policy framework to assess the ways in which social science has gained structural support in the Puget Sound. We then compare this analysis to responses from client users of Puget Sound restoration science to identify the extent to which they perceive governance support for social science integration. We found that the Puget Sound region has substantively enhanced the governance structure for integrating social science in restoration and partner agencies have improved their ability to engage in meaningful dialogue around social science needs. Nevertheless, existing top-down planning processes dominated by natural science perspectives often hinder its application.

Keywords: collaborative governance, ecosystem restoration, science-policy interface

Restoration Recap

- The Puget Sound region of Washington State, USA, has conceptually and symbolically integrated social science in ecosystem recovery planning
- Integration occurred at various points in the restoration governance system, including government mandates, internal and external funding and social scientific support, integrated planning frameworks, and interested clientele
- Clients from different scales of implementation, however, noted there are still several barriers to actually using social science in planning and restoration activities
- Functional (or instrumental) social science integration may rely on a science-policy interface that uses knowledge co-production with social scientists, natural scientists, and lay experts

Collaborative environmental governance is considered necessary for coordinating the recovery of complex social-ecological systems (Williams 2013, Newig and Moss 2017). It contrasts state-centric approaches by emphasizing the need for diverse partnerships to achieve shared social-ecological goals (Halimi and Shinn 2014). Science, including social science, is central to collaborative environmental governance (Brunner et al. 2005, Massaua, Thomas and Klinger 2016, Koontz and Thomas 2018). While the ecological sciences help understand the status of biophysical factors of the ecosystem, the social sciences contribute to understanding the causes and potential solutions to ecosystem threats. Science's centrality to restoration is illustrated by the range of emerging science-policy interfaces, including science-policy interface organizations (SPIORGS), that aim to facilitate the integration of science into environmental governance (Sarkki et al. 2019). There are many barriers to integrating social science in collaborative ecosystem restoration, however, including: a lack of prioritizing financial resources to social science; a lack of social science knowledge or expertise; and a lack of accepting and understanding the importance of social science for management (Robinson et al. 2012, Bennett et al. 2017, Guerrero et al. 2018).

In this study, we examine the role of a collaborative governance context in facilitating the integration of social science in large-scale ecosystem recovery in the Puget Sound of Washington State. We used a community-based participatory research approach that included context analysis and interviews with local and regional environmental planners to explore the extent to which governance influenced the integration of social science in Puget Sound.

Ecological Restoration Vol. 39, No. 4, 2021
ISSN 1522-4740 E-ISSN 1543-4079

Collaborative Governance, Science, and SPIORGs

Collaborative governance refers to collaborative policy making and collaborative management across public, private, and civic institutions (Emerson and Nabatchi 2015, Scott and Thomas 2017). Specifically, it has six key characteristics: 1) it is publicly initiated, 2) nonstate actors participate, 3) decision-making is collective, 4) formal, 5) aimed at consensus, and 6) deliberatively focused on policy or management (Ansell and Gash 2008). Collaborative efforts for environmental restoration emerged in the United States partially in response to the failure of centralized institutions to address non-point source pollution, and from changes in the trust and expectations of citizen roles in decision-making (Koontz and Thomas 2006). Collaborative governance processes can be enabled by collaborative platforms, defined as ". . .an organization or program with dedicated competences, institutions and resources for facilitating creation, adaptation and success of multiple or ongoing collaborative projects or networks," (Ansell and Gash 2017, p.20). Platforms are a way to bring together multiple networks to facilitate interactions ranging from discussion to decision making. Platforms include structures commonly described in environmental governance as "lead organizations," "boundary organizations," and "backbone organizations."

Science, including social science, plays a key role within collaborative environmental governance, informing both the structural development of the collaborative platform and the content shared within the platform. Social science specifically can provide descriptive, diagnostic, reflective, innovative, or instrumental benefits by enhancing stakeholder-driven management practices and processes; excavating assumptions, concepts, models, or practices about management; and creating opportunities to better understand failures, successes, and lessons learned (Bennett et al. 2017). Science integration in ecosystem recovery tends to be instrumental (direct application to problem solve), conceptual (generally understand and indirectly inform decisions), and/or symbolic (legitimation of predetermined decisions or actions) (Koontz 2017), yet social science is rarely integrated to the same extent (Guerrero et al. 2018). How these types of integration are operationalized depends on, and influences, governance structures.

The intersection of governance and science is the science-policy interface (Chilvers and Evans 2009, Buizier et al. 2011, Sarkki et al. 2019). Science-policy interfaces range from those that are top-down and include external (primarily natural) science expertise to those that are more integrated in which knowledge is co-produced within a multiscalar governance system among social scientists, natural scientists, and lay experts (Buizier et al. 2011). Such governance systems also reflect informal network models that entail building upon already existing capacities and structures; platform network models that are more institutionalized with clear formal roles; or blended models (Görg et al. 2016). Sarkki et al. (2019) propose the term SPIORG to describe these more integrated systems that center science within a science-policy interface. SPIORGs are influenced by the context within which they operate, and in turn impact the context itself. Some of the key factors that influence the functionality of a SPIORG include mandates and the flow of mandate application through the governance structure, funding, historical and current SPIORGs, implementing organizations, client organizations, supporting individuals, scientific approaches, actors providing knowledge, laws and regulations, and opposing stakeholders. SPIORGs are purposively created to support connectivity and interactions between science and governance contexts in order to address specific environmental problems. According to Sarkki et al. (2019) the role of SPIORGs is aligned with that of boundary organizations, which have been well-examined within environmental literature (Cash et al. 2002, McNie 2007). Like boundary organizations, SPIORGs can help incorporate science into policy (McNie 2007, Görg et al. 2016), translate scientific jargon into more accessible language (Schiller et al. 2001), bring diverse knowledge holders and types together (Görg et al. 2016, Diver 2017), help tailor research to local contexts (Cash et al. 2002), and foster trust between policymakers and scientists (McNie 2007).

In analyzing these interactions, it has been demonstrated that science, including social science, cannot be detached from policy or politics, as they take shape and shift concurrently in response to one another (Irwin 2008, Lave 2012, Pickett, Henkin and O'Lear 2020). We use this research around SPIORGs to identify the governance factors that influence how social science has been integrated within a large ecosystem restoration collaborative governance system, the Puget Sound Partnership.

Puget Sound Governance

The Puget Sound of Washington State has the largest water volume of any estuary in the U.S., with over 2,500 miles of shoreline (Puget Sound Partnership 2018). The region is home to almost five million people, approximately 68% of the state's total population (Office of Financial Management 2017), residing in twelve counties. The region has a rapidly growing population, particularly in the greater Seattle metropolitan area (Office of Financial Management 2017).

In 2007 Governor Gregoire, through the Washington State Legislature, created the Puget Sound Partnership (Partnership) to coordinate the recovery of the Puget Sound from its many threats associated with human development, and now global climate change (Wellman et al. 2014). The Partnership is considered a backbone organization, rather than a regulatory or implementation agency, that focuses on developing regional science-informed

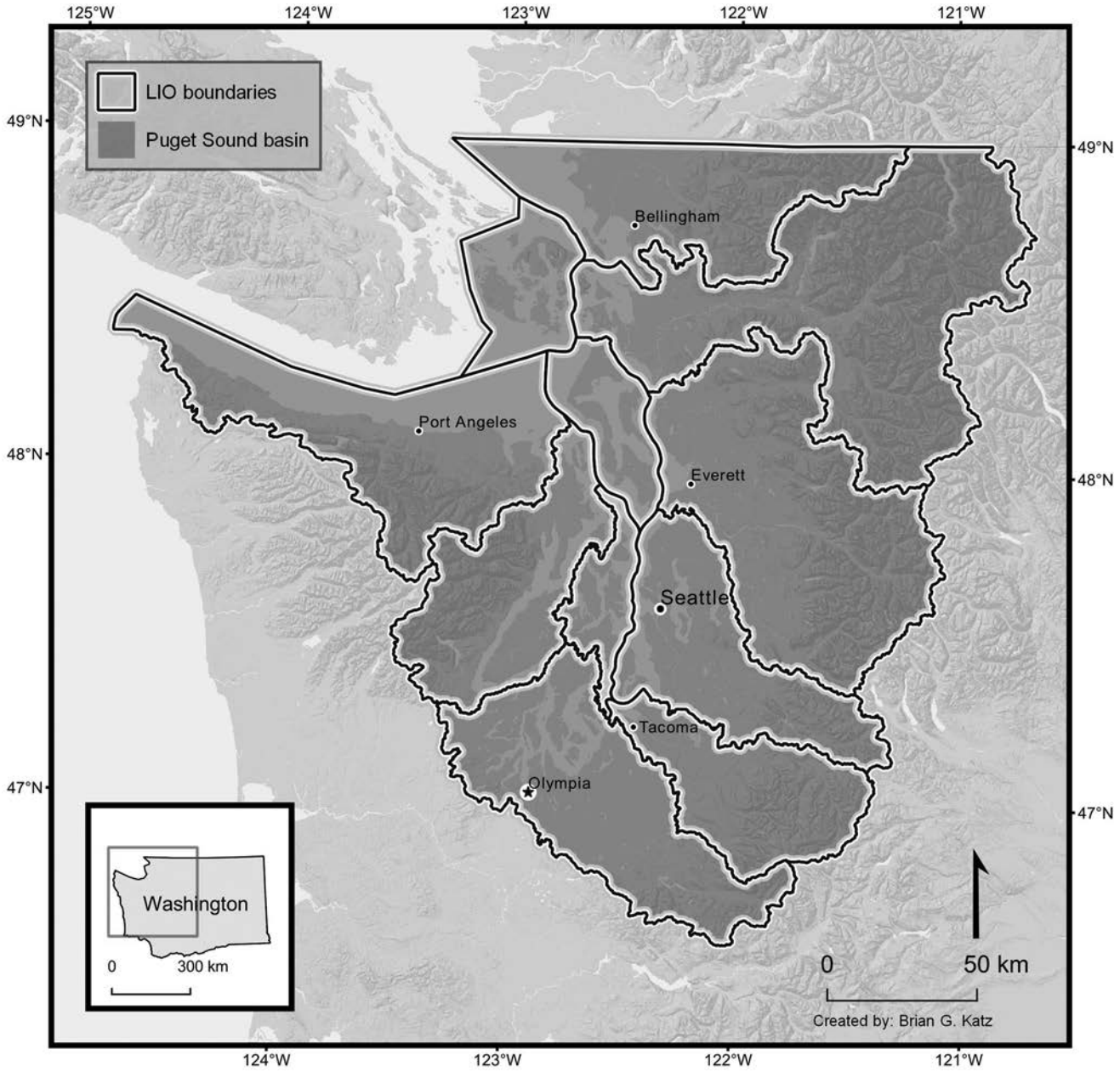

Figure 1. Map of the Puget Sound region in dark grey where all Implementation Strategy (IS) teams focus their work. Ten Local Integrating Organization (LIOs) boundaries show the locations of the approximately watershed-level governance groups for planning and implementing ecosystem restoration. *Map created by Brian Katz.*

recovery strategies, maintaining a monitoring program for the social-ecological system, and supporting state, federal, Tribal, county, non-profit and other partners in implementing restoration efforts (Puget Sound Partnership 2018). The collaborative governance structure of the Partnership is referred to as the Management Conference, the label used for these types of systems funded by the Environmental Protection Agency's (EPA) National Estuary Program (NEP). Specifically, the Management Conference is made up of the Partnership agency and its three statutory boards: Leadership Council, Science Panel, and Ecosystem Coordination Board (Figure 2). The agency's approximately fifty staff are divided into Science and Evaluation, Integrated Planning, and Communications teams. The Leadership Council is composed of seven governor appointees who set policy and strategic directions for Puget Sound recovery. The Science Panel currently has eleven elected scientists to provide independent scientific advice. The Ecosystem Coordination Board includes representatives from geographic action areas and various partner groups, including the business community, environmental interests, Tribal governments, each county, city and port district, and each state and federal agency with environmental management responsibilities. In all, approximately 200 formal entities

are involved in Puget Sound protection and restoration as partners (Wellman et al. 2014).

In addition to these bodies, the Partnership's mandate includes the use of science to ensure restoration planning is founded on and driven by best available science, including social science. The Partnership has recently begun to refer to this intentional support of science-policy interactions as the Inclusive Knowledge Network, representing the aspiration to support various sources of knowledge integration. All sources of knowledge represented in Figure 2 are considered part of this network, which we consider to be an example of a SPIORG. To date there is no formal structure to the Inclusive Knowledge Network, as there are for the aforementioned institutions. Rather, the concept of the Inclusive Knowledge Network calls specifically upon the scientific institutions and individuals who contribute to Puget Sound recovery to achieve the most relevant, useful, and responsive actions to the Puget Sound context.

Planning and implementation of restoration activities occurs at two scales: the entire basin through issue-specific Implementation Strategy (IS) teams and local, spatially-explicit groups approximately equivalent to watersheds called Local Integrating Organizations (LIOs) (Figure 1). IS recovery plans focus on specific topic areas, such as shoreline armoring, stormwater, land development and cover, and shellfish, and are managed by regional planning teams made up of experts from partnering agencies such as the Washington Department of Ecology and Washington Department of Fisheries and Wildlife. All IS teams are funded by EPA's NEP, which is managed by the Partnership. LIOs, in contrast, vary in organizational background, membership, and staffing. Some are housed in local government agencies and some are led by local independent contractors or firms. These spatially explicit organizations were created to coordinate within the Partnership structure, where they receive limited funding, training, and agency staff support for planning and implementation.

Methods

To better understand how the governance context influenced social science integration in Puget Sound, our project blended a mix of methods in community-based participatory research, an approach that emphasized close-collaboration between researchers and project partners, face-to-face interviews, and cognitive mapping activities (Leavy 2017). The approach was facilitated through embedding our research team as social scientists working at both local and regional recovery scales.

First, based on over ten years of collaboration by the first author with the Partnership and approximately four years for the second author, we summarized the governance structure of the agency, identifying enabling factors for social science integration according to the findings of Sarkki et al. (2019).

Second, we conducted interviews with forty-six planning partners (the clients of the knowledge network) to understand what factors influenced their use of social science in Puget Sound ecosystem restoration. Participants were recruited through purposeful convenience sampling of active members of nine LIOs (n = 36) and regional planners (n = 10), mostly natural resource agency staff, involved in five ISs. They were mostly females (69%) and had lived in the region from two to 57 years. Respondents also reflected a range of ecosystem restoration roles, including three county commissioners, six environmental planners, and all nine LIO coordinators, among others. Interviews took place at a mix of locations, including public places and interviewee workplaces. Interview content was elicited through an open-ended cognitive mapping activity, allowing respondents to share all content associated with their perceptions of social science integration. Respondents were asked to imagine that they were communicating with someone completely unfamiliar with the restoration planning process and write on individual 3 × 5 cards the factors they believed "enable the integration of social data in the developing of Near Term Actions [discrete measurable actions related to ecosystem recovery]." We focused on the concept of Near Term Actions because it was a regionally-relevant component of the collaborative governance process. While the exercise focused on Near Term Actions, some participants did expand their responses and linkages beyond Near Term Actions. For example, respondents often included broader or narrower planning processes, actors, institutions structures, contexts, relations, and/or systems as part of their responses. Social data was subsequently defined as actual social data (e.g., human wellbeing data and public health data) and social science more broadly. This expanded definition of social data allowed us to better clarify our research topic, as respondents initially reflected common misperceptions of social data (e.g., Robinson et al. 2019). During the exercise, respondents could use as many or few cards as they liked.

The interviewers photographed each assortment of cards and the entire interview was audio recorded and later transcribed. Because of the open-ended responses, our first step in analyzing cognitive map data was to develop a codebook (Bernard et al. 2017). A single coder developed the codebook that was validated for face validity and logically consistent inclusion and exclusion criteria by two researchers. The coder then applied the codebook to identify the factors on all cards. Frequency for each factor was calculated using SPSS 25 and analyses of variance were used to test for differences in the frequencies at the local and basin scales. The types and frequencies of factors were also qualitatively compared to the factors identified from the governance structural analysis described above.

Finally, the second author conducted content analyses for the entire interview content (Dittmer 2010) using the

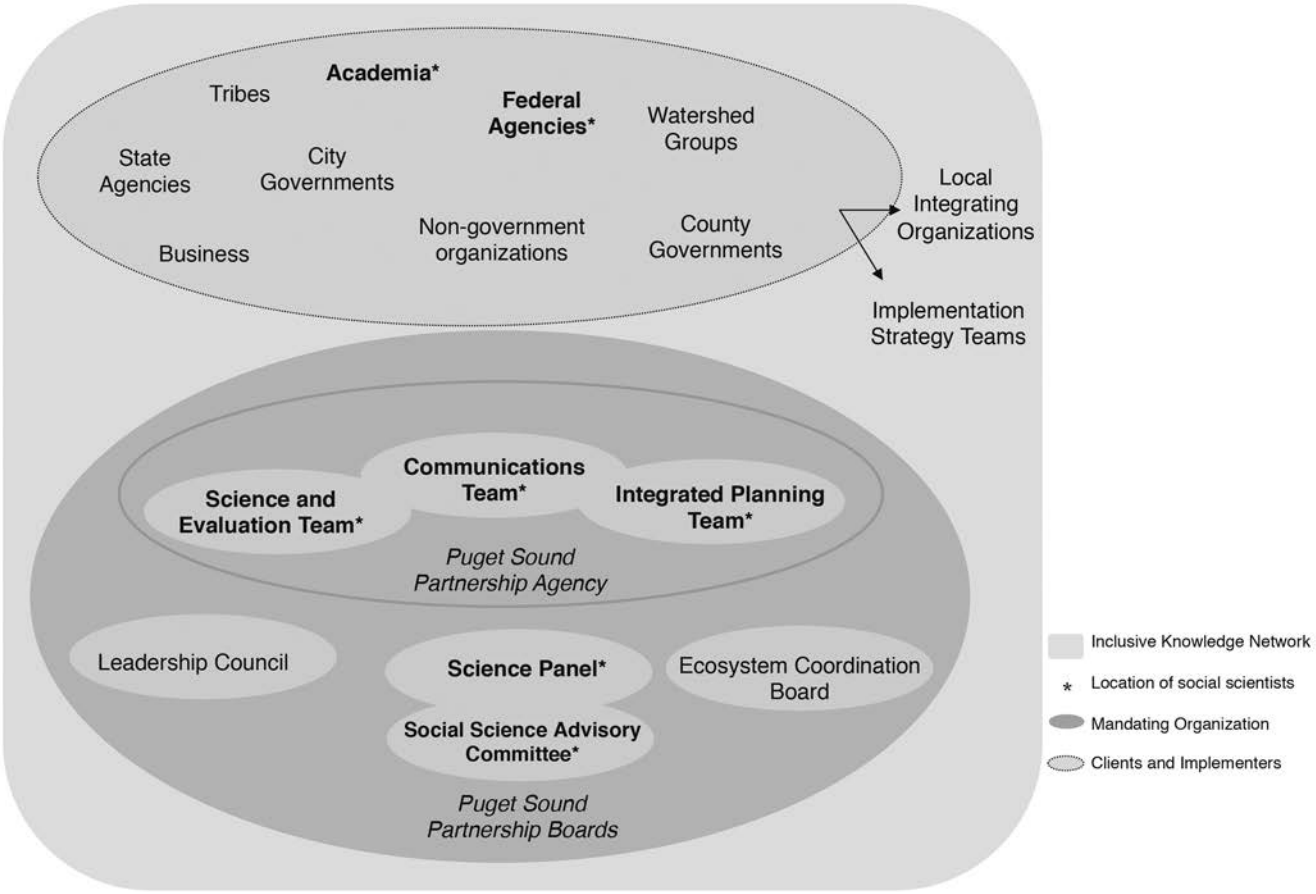

Figure 2. Conceptualized Inclusive Knowledge Network with the mandating organization, clients, implementing organizations, and supporting groups. The Puget Sound Partnership state agency and its respective boards form a core mandating organization that interacts with other knowledge producing and using actors in the region. All actors interact in formal and informal ways. 2021 location of trained social scientists identified with bold and asterisks.

qualitative data analysis software NVivo 12 to inductively identify common themes around (in)effective social science integration. We purposefully did not use the exact categories of governance factors to guide analysis to allow for ideas that extended outside the Sarkki et al. (2019) framework. This broader qualitative analysis focused on the interview transcripts, including elaboration provided during the cognitive mapping exercises. The first author reviewed the codebook created by the second author for face validity and the two reconciled confusing inclusion and exclusion criteria. The complementary quantitative aspect of the cognitive map with the qualitative textual analysis contributes both thin and thick descriptions (Cloke et al. 2004) of the responses, contexts, and meanings associated with this particular prompt.

Findings

Structural Analysis of Social Sciences in Puget Sound Restoration Governance

The newly developing Inclusive Knowledge Network within the Puget Sound Partnership can be considered a SPIORG for integrating science with ecosystem restoration governance. While the network itself is a new conceptualization, the historical integration of science with Puget Sound ecosystem restoration is not new. Scientists have held positions within the state department of ecology, fisheries and wildlife, Tribal governments, and other partner institutions for decades. Social scientists, however, have been limited to a couple of partner institutions, including the National Oceanic and Atmospheric Administration (NOAA) and academia (Figure 2). This limited physical integration does not mean there are no pathways to integrating social science in large scale ecosystem restoration in the region, though. Using the relevant governance factors influencing SPIORG effectiveness identified by Sarkki et al. (2019),

Table 1. Social Science Integration Opportunities within Puget Sound Governance (based on Sarkki et al. 2019 framework).

Key Nodes in Governance System	Opportunity for Social Science Integration
Mandates	• Statute identifies two social goals • Statute requires use of science to meet goals • Statute requires monitoring of goals • Organization responsible for implementing mandate (Partnership) plays a role within the SPIORG (Science Enterprise)
Scientific Approaches	• Creating a common language that clarifies the difference between social science and social marketing • Adoption and support of conceptual frameworks that integrate social science
Funding	• Individual lobbying by external social scientists brought external funding to support doctoral-level social science FTE • State funding was dedicated to support social indicator monitoring and social science research • A portion of federal NEP funding was dedicated to social science integration
Client Organizations	• Local and regional clients (LIOs and IS teams) can request specific science support • Some local and regional clients have some ownership of social science integration due to collaborative research
Supporting Individuals	• Some agency planning staff have social science training • Internal agency committee with representatives from planning, science, communication and policy departments synthesizes social science and finds avenues for integration in planning • Occasional post-bacc fellows focus on social science integration • Doctoral-level social science positions on Science Panel • Social science advisory committee to the Science Panel

we describe the ways in which social science has been integrated to the Partnership's collaborative governance structure to date.

Mandates

The same statute that created the Partnership and defined the management conference identified six recovery goals to guide all the Partnership's initiatives: 1) healthy human population, 2) vibrant quality of life, 3) thriving species and food web, 4) protected and restored habitat, 5) abundant water quantity, 6) healthy water quality. These six goals have informed the recovery vision, from the development of indicators (called Vital Signs) that are continually monitored for the framing of all strategic planning. Although the first two goals were largely ignored in the initial years of Partnership work, recent efforts to integrate social science have capitalized on the Puget Sound's unique mandate to consider human impacts, implying the need for social science (Table 1).

Scientific Approaches

Since the creation of the mandate, the integration of social science in Puget Sound scientific dialogue has gradually increased. Much of the focus has been on developing common understanding of what social science is, how it differs from social marketing, and how it can benefit ecosystem recovery. There has been consistent confusion about the differences between outreach, education and social marketing (applied strategies to change public attitudes and behaviors), and social science (scientific studies of social phenomena). It has taken time to build a common understanding among a few "champion" natural scientists and planners that while social marketing employs findings from social science, it is not science itself.

In the 2018–2022 Action Agenda, the document that outlines a shared Puget Sound strategy for restoration, social science was highlighted as helping the Partnership "understand how individual and collective human behavior can enable or limit progress" and that it is "increasingly used to develop and hone recovery strategies" (Puget Sound Partnership 2018, 31). One conceptual step toward linking complex social and biophysical goals of restoration was the Puget Sound Integrated Ecosystem Recovery Conceptual Model that highlights the interactive nature of social and biophysical goals with management strategies to create a desired ecosystem state (Harguth et al. 2015). Equally important to conceptualizing social science integration has been the Partnership's use of adaptive management and the Open Standards for Conservation tools. The latter, developed by an international consortium of conservation NGOs, government agencies, funders, and private companies to measure conservation effectiveness and openly share lessons, walks practitioners through the identification of threats and pressures to the ecosystem and facilitates the identification of potential impacts of proposed restoration strategies to both ecosystem and

human wellbeing goals. Moreover, the Open Standards for Conservation framework recommends that all pressures and outputs should be identified and monitored over time as they are impacted by or impact recovery actions (Conservation Measures Partnership 2016).

Funding

Funding to support social science has been critical for integration. Among the most substantive funding is that obtained by the lead author, an external social scientist who lobbied for national funding to support their research program focused on developing human wellbeing Vital Signs and integrating human wellbeing in restoration planning. Two federal sources of funding supported seven years of postdoctoral dedication to the study of social science for Puget Sound recovery. The Partnership and partnering social scientists leveraged this base funding to obtain additional sources from state and partner agencies to conduct other social scientific research projects. Starting in 2017, funding from the EPA NEP program to the Partnership was dedicated to social science integration at the basin scale. This funding supported a social science postdoctoral scholar as a half-time employee housed within the agency. State funding was also dedicated to supporting social scientific research and implementation, including projects associated with sense of place (Poe et al. 2016), human wellbeing monitoring (Fleming and Biedenweg 2019), and social science priority setting (Breslow et al. 2020 among others).

Implementing and Client Organizations

Sarkki et al. (2019) describe that having implementing organizations represented in the SPIORG and client organizations that can demand content from the SPIORG are important components of the governance structure. The implementation and audience for Knowledge Network products include state, national, local, academic, and cross-agency teams who often participate in one of the many boards associated with the Management Conference. As such, these entities are often both clients and implementers of social science, and they have been largely dominated by natural resource agencies. Historically, most of these clients and implementation bodies did not request or specifically support social science, however our anecdotal evidence has shown an increase in demand following examples of what social science can address. Most motivating social science inclusion, however, has been an increased interest in diversity and inclusion in ecosystem recovery processes.

Supporting Individuals

Most social scientific support to the Knowledge Network comes from in-kind support. The Science Panel has had up to three social scientists at a time, representing economic, public policy, anthropology, and psychology fields. A special Social Science Advisory Committee to the Science Panel is comprised of over a dozen volunteer social scientists from government and academic institutions to provide social science specific feedback to the Science Panel, and occasionally the Partnership staff directly. Most social scientific research, as with most research in the region generally, is conducted by scientists outside the Partnership agency. While some are housed with federal partners (e.g., economists and anthropologists with NOAA's Northwest Fisheries Science Center and WA Sea Grant), most work for academic institutions or for-profit contracting and do not hold formal partner roles to the Management Conference. There are few environmental social scientists in the region, and even fewer with jobs that allow for service to environmental policy and management efforts. As such, these individuals rely on granting to conduct research or contribute their support voluntarily.

While the Partnership does not have internal social science staff on the science team, there have occasionally been year-long post-graduate fellows specialized in social science. Many planning staff also have relevant degrees in planning, conflict management, and social science that they rely upon when informing the agency's efforts. These individuals have been critical for translating social science data and advice to policy from the inside. An internal Human Dimensions Working Group within the Partnership agency brings together individuals from the science, planning, monitoring and communication teams with external social science contractors for monthly conversations about integrating existing research and implementation initiatives with regional restoration planning.

Client Perspectives

While we identified enabling factors for science integration within the Puget Sound science-policy interface according to the framework by Sarkki et al. (2019), we recognize that this framework was not developed specifically for social science integration. Considering the known deficiency of social science in restoration, we sought to broadly understand the factors that clients perceived as motivating, enabling, or preventing social science integration. The 46 LIO and IS participants responded with 18 themes (Figure 3). Because of the inductive analysis these themes do not identically match those from the Sarkki et al. (2019) framework, but they are closely related. Stakeholder diversity, equity, and inclusion was the most common factor described as motivating the inclusion of social science integration (86% of all respondents). This was illustrated through a wide range of responses such as "getting other, more social science, social justice/environmental justice, etc. groups to the table and involved in planning and decision-making processes," and "strong participation, by local tribes". Such responses illustrate the development of a shared goal of getting more diverse groups included in the planning process. The next most frequent themes

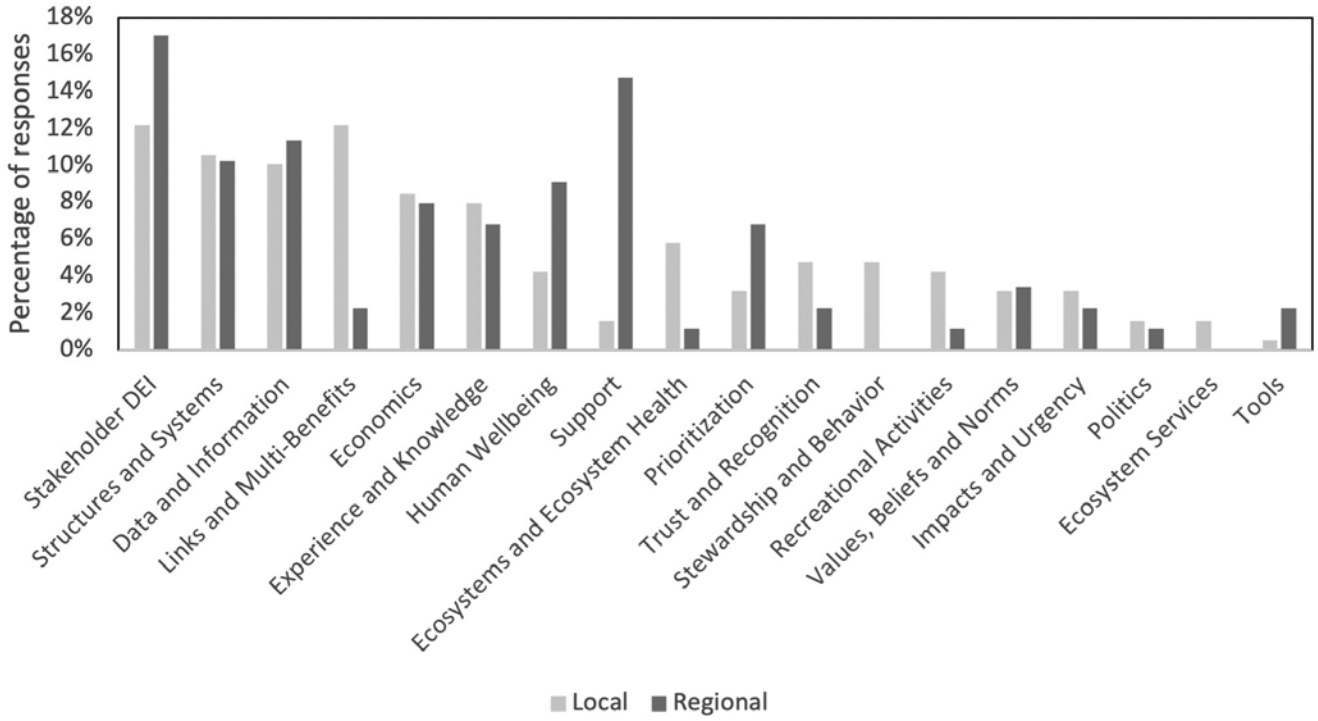

Figure 3. Frequency of client organization responses that referenced these factors as motivating, enabling, or disabling the integration of social science in Puget Sound restoration.

were the availability of relevant social data and information (identified as a barrier due to lack of it), the ability of social science to identify multibenefit restoration strategies (identified as a motivator), the ability of social science to identify economic costs and benefits of restoration and ensure natural resource employment (as a motivator), and the need for support to integrate social science (as primarily a barrier due to lack of it). The only statistically significant difference in the frequency of factors identified at the two geographic scales was that of support for integration (e.g., financial, staff, capacity, and/or broader institutional), which was most frequently identified at the basin scale ($F = 13.83$, $p = 0.001$). Local-scale respondents expressed lower knowledge of the support options for integrating social science, revealing that general support is either lacking or less known to those clients.

Four of our initial codes explicitly referred to governance factors: structures and systems, politics, support, and tools, which we further analyzed to explore how governance influences social science integration. Six distinct governance themes emerged from this second layer of coding that roughly integrate the SPIORG categories (Table 2). Three of them were most similar to Sarkki et al.'s (2019) mandates category, teasing it apart into the Partnership-derived planning processes (e.g., plan development, recovery action decision-making, and funding prioritization), political will of mandating, implementing and client organizations (e.g., elected officials and political buy-in) and policy alignment (connections to existing policies, e.g., watershed plan alignment or regional plan alignment). The other three themes reflect additional categories from Sarkki et al. (2019): 1) actors providing knowledge (new stakeholder input and engagement, e.g., Tribes, local communities, and social scientists); 2) supporting individuals and opposing stakeholders (existing partner or member dynamics, e.g., personalities, division of labor, or individual biases); and 3) scientific approaches (science and how science is already integrated, e.g., natural science, hard science, or physical science).

Overall, the mandating organization, and its top-down planning process, was overwhelmingly considered the primary factor that could, but currently does not, enable the integration of social data at both the regional and local scales. The second most frequent theme varied by scale, with actors providing knowledge, notably Tribes, local communities, and social scientists or representatives of alternative professional fields, being the second most frequent perceived enabling factor for regional planners, and political will of mandating, client and implementing organizations, including elected officials bought into the use of social data, being the second most frequent theme for local planners. These factors were framed as currently barriers to integrating social science in Puget Sound recovery. This was largely due to the nearly absent role of social data and social science-informed processes within the system overall. Some of this sentiment and reframing are reflected in the interview excerpt examples aligned with the themes in Table 2.

Table 2. Client interview themes, frequencies, and excerpt examples. Respondent codes: Implementation Strategy (IS) members vs. Lead Integrating Organization (LIO) members identifies the scale of respondent. Following abbreviation is associated with each specific IS or LIO group and the number is the unique identifier for that individual.

Themes	Frequency Regional (ISs) (n = 10)	Frequency Local (LIOs) (n = 36)	Example Quotes
Mandating organizations (Partnership-derived planning processes)	16	60	"So that's probably pretty high-level, so the way Puget Sound recovery planning is structured, I could be much more specific," (IS, E3). "So this most to least. I think especially for an outsider, it's important to understand the structure that we're working within," (LIO, PH1).
Political will of mandating, implementing, and organizations	4	24	". . . then there's always politics that come into play," (IS, WP1). "So much of what we do is about understanding and building political will. And that often starts with understanding the nature of the problem, identifying different potential solutions, and then building the social support for preferred solutions that then the policy makers and decision makers can get behind," (LIO, Chinook Salmon 5).
Policy Alignment	2	16	"I think a lot of people don't come up with new ideas based on the priorities. They fit their priorities to the existing ideas, so I think how they're going to be scored combined with the requirements," (IS, WP2). "We're being told it needs to be to aligned with whatever the highest priorities are for this round so they're for people who are gonna get the message and go, 'Oh, yeah. I'm gonna develop an NTA that's gonna be as strongly aligned as possible,'" (LIO, CS4).
Scientific Approaches	1	5	"Natural scientists, and it appears to be smaller and more engaged, which allows it to speak more cohesively and make more noise, kind of changing the relative gravity of the different bodies. So that pulls . . . Appears to me, from the outside, to pull conversations into a natural science focus," (IS, E3). "Especially since so much of our work, I think, is driven by engineers and scientists who maybe don't think first about human dimensions of the problems, (LIO, CS5).
Actors providing knowledge	7	8	"Yeah building the engagement, for players, figuring out how to bring them together, and I guess address their different concerns," (IS, H1). "Then also just in general, more high-level, getting other more social science or social justice, environmental justice groups with the different perspective involved and at the table in planning and decision-making processes around Puget Sound Recovery," (LIO, CS5).
Supporting individuals and opposing stakeholders	5	8	"I can only think of one, and it's who we put on our advisory teams," (IS, E3). "I strongly advocate for that and I'm often met with with silence or just no one pipes up and says, 'Yeah, I agree!'," (LIO, CS4).

Discussion

Social science integration is recognized as integral to, yet a considerable challenge within, collaborative governance for ecosystem restoration. This study provided a glimpse at the status of social science integration within a SPIORG in the Puget Sound, a region touted for its science-driven recovery efforts. This snapshot revealed that the increasing use of social science is largely facilitated and hindered by different aspects of the governance context, with some scalar variations. While we identified important places within the governance structure of Puget Sound where social science has been integrated, both local and regional clients experienced these enabling factors with different intensities or frequencies. The primary limiting factors are the shared, prescribed planning process that prioritizes biophysical science worldviews and confuses social marketing and outreach with social science.

Respondents at both scales of restoration responded that their motivations to integrate social science were driven by

wanting to integrate diverse knowledge holders and clients, a goal that they perceived requires the use of social science and data in planning. These equity considerations were more important motivators for social science integration than considerations associated with multi-benefits and the potential to improve ecological systems. This reflects Bennett et al.'s (2017) tenth contribution of social sciences to conservation: Facilitating more socially equitable and just conservation processes and outcomes. The focus on this tenth quality, rather than other factors such as interrogating underlying assumptions in restoration or improving restoration management practices, implies that there may not yet be broad acceptance that social science can benefit restoration, other than making sure there are no negative externalities as a result.

The factors identified as enabling and preventing social science integration in Puget Sound align with complementary research regarding social science integration within environmental science-policy interfaces or boundary organizations (Robinson et al. 2012, Bennett et al. 2017, Robinson et al. 2019). Robinson et al.'s (2012) case study of the U.S. National Estuarine Research Reserve System found enabling factors to include the provision of social science integration examples, access to individuals with social science training or expertise and social science resources, organizational or institutional mission that includes social science integration, and partner support. Disabling factors also mirrored our findings, such as a lack of funding, lack of social scientists, and lack of understanding or acceptance of the social sciences (Robinson et al. 2012). Bennett et al. (2017) also suggest that barriers to effective social science integration include a general lack of awareness or confusion about the social sciences, including the various disciplines, methods or potential outputs. This confusion may partly explain the social sciences being commonly equated with social marketing or outreach in the Puget Sound and elsewhere. Robinson et al. (2019) suggest similar barriers to social science integration within natural resource decision making, including a lack of familiarity and experience with the social sciences, misperceptions of social data, and failures to acknowledge the benefits of social science integration, among others. Interestingly, similar results have been shown with traditional ecological knowledge (TEK) integration (Diver 2017). Diver (2017) suggests that while TEK integration efforts, primarily through knowledge co-production initiatives, have transpired among science-policy interfaces, existing knowledge integration concepts or frameworks are largely inadequate to address inequitable power dynamics, political contexts, and indigenous knowledge. Social science it seems, similar to TEK, faces unique barriers to integration within SPIORGs due to the longstanding dominance of the natural sciences and their respective worldviews within such processes.

By addressing where these barriers existed within the system, respondents emphasized that mandating, funding, and implementing organizations lacked social scientific focus and scientific approaches for institutionalizing and prioritizing social science within planning. This response was also reflected in an interview with a member of the mandating organization that was not included in the initial study sample. The representative noted that ". . .we never talked about social science, explicitly . . .," within the context of Near Term Action planning and evaluation (interview, 11 September 2018). Anecdotally, the embedded social science team acknowledges that, while the mandating organization has brought on staff with social science expertise or experience, many of the challenges or misperceptions are still held within the mandating organization. Therefore, for social science integration to systematically occur within the SPIORG, mandating organizations themselves may require change, including perhaps by altering or mandating what sciences are acknowledged, supported, and included within other components of the SPIORG. For example, mandating organizations may work to adjust their own perspective and planning to ensure social sciences are more equitably included and represented within scientific approaches, implementing organizations, and knowledge providers. These efforts would both address barriers of structures and systems and support identified by the client organizations and contribute to essential SPIORG factors of clarifying and promoting social science as a core component to scientific approaches. Additionally, mandating organizations could advocate for more social science among funding organizations.

Respondents' high emphasis on the role of all aspects of the planning process echoes Marshall et al. (2017), who noted "It's all about process," when it comes to social science integration within environmental governance. The fact that these perceived barriers contradict our structural assessment of social science integration opportunities at various nodes within the governance system demonstrates that simply having the conditions in place has yet to result in real integration. However, the fact that respondents were able to articulate their goals for and barriers to social science integration is a testament to the broader understanding that is growing across the Puget Sound SPIORG and its partners.

While the negative effect of prescribed, top-down planning processes was emphatically shared, each scale of implementation did have slight variations in their responses, notably that regional planners had more difficulty identifying and engaging diverse actors and social scientists while local planners found the lack of political will by mandating and implementing organizations to be more limiting. These scalar distinctions revealed that while partners engage in similar planning processes and interact with similar institutions or actors within the same SPIORG, scale matters to social science integration. While

the Partnership has a sophisticated and institutionalized science-policy interface, its multiscalar partners face some distinct contextual barriers that should be considered when social science integration efforts are designed and implemented.

These results build on the literature around conceptual, methodological, and functional science integration (Guerrero et al. 2018). Even if social science is conceptually, methodologically, and disciplinarily integrated within a SPIORG, functional integration is key to comprehensive multiscalar integration (Guerrero et al. 2018). While the Partnership has conceived of and created space for social science integration within its governance, our results reveal that the functional science-policy interface has been more focused on natural science experts actively discussing research with the mandating agency. Functional integration entails fuller integration of stakeholders and researchers in a planning process, which may include integrating social scientists early in a particular process to ensure effective integration; emphasizing the value-added benefits of social science; providing dedicated funding to interdisciplinary (or social science) projects; providing access to social scientist expertise; and even creating primer information or course of the social sciences to ensure some level of understanding and competency (Robinson et al. 2012). In fact, the LIOs and ISs that did include social concepts in restoration planning were those that explicitly integrated multiple knowledge holders, including social scientists, in their planning meetings. Such changes, mechanisms, or strategies could continue to take shape among or be emphasized within multiple SPIORG elements, although most are linked to or reliant on the mandating agency. As of 2021, the Partnership has begun movement in many of these directions, including competitive state funding specifically dedicated to interdisciplinary and social science research and supporting a "roadshow" of social science principles tailored for and presented to different Management Conference actors. These efforts, along with the continued development of the Inclusive Knowledge Network, are steps that may transform the multiscalar science-policy interface to one that is more reliant on knowledge co-production with social scientists, natural scientists, and lay experts. Future research on the effectiveness of these efforts at actually affecting the use of social science in planning efforts, and whether such inclusion enhances recovery goals, will be important next steps in this region.

Acknowledgments

The authors thank Dr. Trina Wellman for assistance with IS interviews and all research participants for their time dedicated to this project. Research was funded by an EPA STAR early career award to Biedenweg #83694601.

References

Ansell, C. and A. Gash. 2008. Collaborative governance in theory and practice. J*ournal of Public Administration Research and Theory* 18:543–57.

Ansell, C. and A. Gash. 2017. Collaborative platforms as a governance strategy. *Journal of Public Administration Research and Theory* 28:16–32.

Bennett, N.J., R. Roth, S.C. Klain, K. Chan, P. Christie, D.A. Clark, et al. 2017. Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation* 205:93–108.

Bernard, H.R., A. Wutich and G. Ryan. 2017. *Analyzing Qualitative Data: Systematic Approaches.* Thousand Oaks, CA: Sage Publications.

Breslow, S., et al. 2020. Social Science for the Salish Sea: An action-oriented research agenda to inform ecosystem recovery. Report to Puget Sound Partnership.

Brunner, R.D., T.A. Steelman, L. Coe-Juell, C.M. Cromley, C.M. Edwards and D.W. Tucker. 2005. *Adaptive Governance: Integrating Science, Policy, and Decision Making*. New York, NY: Columbia University Press.

Buizer, M., B. Arts and K. Kok. 2011. Governance, scale and the environment: The importance of recognizing knowledge claims in transdisciplinary arenas. *Ecology and Society* 16(1):21.

Cash, D., W. Clark, F. Alcock, N. Dickson, N. Eckley and J. Jäger. 2003. *Salience, Credibility, Legitimacy and Boundaries: Linking Research, Assessment and Decision Making: John F. Kennedy School of Government Harvard University Faculty Research Working Papers Series.* Cambridge, MA: Harvard University.

Chilvers, J. and J. Evans 2009. Understanding networks at the science–policy interface. *GeoForum* 40:355–362.

Cloke, P., I. Cook, P. Crang, M. Goodwin, J. Painter and C. Philo. 2004. *Practicing Human Geography*. London, UK: Sage.

Conservation Measures Partnership. 2016. Incorporating social aspects and human wellbeing in biodiversity conservation projects. Version 2.0. Foundations of Success. cmp-openstandards.org/guidance/addressing-human-wellbeing.

Dittmer, J. 2010. *Popular Culture, Geopolitics, and Identity*. Lanham, MD: Rowman and Littlefield Publishers, Inc.

Diver, S. 2017. Negotiating Indigenous knowledge at the science-policy interface: Insights from the Xáxli'p Community Forest. *Environmental Science and Policy* 73:1–11

Emerson, K. and T. Nabatchi. 2015. *Collaborative Governance Regimes.* Washington D.C.: Georgetown University Press.

Fleming, W. and K. Biedenweg. 2019. *Visualizing Human Wellbeing in the Puget Sound.* Tacoma, WA: Puget Sound Partnership.

Görg, C., H. Wittmer, C. Carter, E. Turnhout, M. Vandewalle, S. Schindler, et al. 2016. Governance options for science-policy interfaces on biodiversity and ecosystem services: comparing a network versus a platform approach. *Biodiversity and Conservation* 25:1235–1252.

Guerrero, A.M., N.J. Bennett, K.A. Wilson, N. Carter, D. Gill, M. Mills, et al. 2018. Achieving the promise of integration in social-ecological research: a review and prospectus. *Ecology and Society* 23:38

Halimi, S. and C.W. Shinn. 2014. Multilevel environmental governance of conservation programs. Pages 180–110 in D.F. Morgan and B.J. Cook (eds), *New Public Governance: A Regime-Centered Perspective*. New York, NY: M.E. Sharpe, Inc.

Harguth, H., K. Stiles, K. Biedenweg, S. Redman, S. O'Neill. 2015. *Integrated Conceptual Model for Ecosystem Recovery*: Tacoma, WA: Puget Sound Partnership.

Irwin, A. 2008. STS Perspectives on Scientific Governance. Pages 583–607 in E.J. Hackett, O. Amsterdamska, M. Lynch and J. Wajcman. (eds), *The Handbook of Science and Technology Studies* (3rd edition). Cambridge, MA: The MIT Press.

Koontz, T.M. 2017. *How Science is Used in Puget Sound Ecosystem Recovery Planning: An Exploratory Survey of Members of Local Integrating Organizations.* Tacoma, WA: University of Washington Tacoma.

Koontz, T.M. and C.W. Thomas. 2018. Use of science in collaborative environmental management: Evidence from local watershed partnerships in the Puget Sound. *Environmental Science and Policy* 88:17–23.

Koontz, T.M. and C.W. Thomas. 2006. What do we know and need to know about the environmental outcomes of collaborative management? *Public Administration Review* 66:111–121.

Lave, R. 2012. *Fields and Streams: Stream Restoration, Neoliberalism, and the Future of Environmental Science*. Athens, GA: University of Georgia Press.

Leavy, P. 2017. *Research Design: Quantitative, Qualitative, Mixed Methods, Arts-Based, and Community-Based Participatory Research Approaches*. New York, NY: The Guilford Press.

Marshall, N., N. Adger, S. Attwood, K. Brown, C. Crissman, C. Cvitanovic, et al. 2017. Empirically derived guidance for social scientists to influence environmental policy. *PLoS ONE* 12:e0171950.

Massaua, M.J., C.W. Thomas and T. Klinger. 2016. The use of science in collaborative management of marine environments. *Coastal Management* 44:606–627.

McNie, E.C. 2007. Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature. *Environmental Science and Policy* 10:17–38.

Morgan, D.F. and C.W. Shinn. 2014. The foundations of new public governance. Pages 3–12 in D.F. Morgan and B.J. Cook (eds), *New Public Governance*. New York, NY: M.E. Sharpe, Inc.

Newig. J. and T. Moss. 2017. Scale in environmental governance: moving from concepts and cases to consolidation. *Journal of Environmental Policy and Planning* 19:473–479.

Office of Financial Management. 2017. County and City Data. Olympia: State of Washington. www.ofm.wa.gov/washington-data-research/county-and-city-data.

Pickett, N.R., S. Henkin and S. O'Lear. 2020. Science, technology, and society approaches to fieldwork in Geography. *The Professional Geographer* 72:253–263.

Poe, M., J. Donatuto and T. Satterfield. 2016. "Sense of place:" Human well-being considerations for ecological restoration in Puget Sound. *Coastal Management* 44:1–18.

Puget Sound Partnership. 2014. The 2014–2015 Action Agenda for Puget Sound. Tacoma, WA: Puget Sound Partnership.

Puget Sound Partnership. 2018. The 2018–2022 Action Agenda for Puget Sound. Tacoma, WA: Puget Sound Partnership.

Robinson, P., K. Genskow, B. Shaw and R. Shepard. 2012. Barriers and opportunities for integrating social science into natural resource management: Lessons from National Estuarine Research Reserves. *Environmental Management* 50:998–1011.

Robinson, K.F., A.K. Fuller, R.C. Stedman, W.F. Simer and D.J. Decker. 2019. Integration of social and ecological sciences for natural resource decision making: challenges and opportunities. *Environmental Management* 63:565–573.

Saunders, F.P., M. Gilek and S. Linke. 2017. Knowledge for environmental governance: probing science–policy theory in the cases of eutrophication and fisheries in the Baltic Sea. *Journal of Environmental Policy and Planning* 19:769–782.

Sarkki, S., E. Balian, U. Heink, H. Keune, C. Nesshöver, J. Niemelä, et al. 2019. Managing science-policy interfaces for impact: Interactions within the environmental governance meshwork. *Environmental Science and Policy* 113:21–30.

Schiller, A., C.T. Hunsaker, M.A. Kane, A.K. Wolfe, V.H. Dale, G.W. Suter, et al. 2001. Communicating ecological indicators to decision makers and the public. *Conservation Ecology* 5:19.

Scott, T. and C.W. Thomas. 2017. Winners and losers in the ecology of games: Network position, connectivity, and the benefits of collaborative governance regimes. *Journal of Public Administration Research and Theory* 27:647–660.

Wellman, K.F., K. Biedenweg and K. Wolf. 2014. Social sciences in Puget Sound recovery. *Coastal Management* 42:298–307.

Williams, D.R. 2013. Science, Practice, and Place. Pages 21–34 in Stewart, W.P., D.R. Williams, and L.E Kruger. (eds), *Place-Based Conservation: Perspectives from the Social Sciences*. London, UK: Springer.

Kelly Biedenweg (corresponding author), Department of Fisheries and Wildlife, Oregon State University, 104 Nash Hall, Corvallis, OR 97330, Kelly.Biedenweg@oregonstate.edu.

David J. Trimbach, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.

Whitney Fleming, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.
