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Research article

Who collaborates and why: Assessment and diagnostic of governance network integration for salmon restoration in Puget Sound, USA

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ABSTRACT

Governance silos are settings in which different organizations work in isolation and avoid sharing information and strategies. Siloes are a fundamental challenge for environmental planning and problem solving, which generally requires collaboration. Siloes can be overcome by creating governance networks. Studying the structure and function of these networks is important for understanding how to create institutional arrangements that can respond to the biophysical dynamics of a specific natural resource system (i.e., social-ecological, or institutional fit). Using the case of salmon restoration in a sub-basin of Puget Sound, USA, we assess network integration, considering three different reasons for network collaborations (i.e., mandated, funded, and shared interest relationships) and analyze how these different collaboration types relate to productivity based on practitioner's assessments. We also illustrate how specific and targeted network interventions might enhance the network. To do so, we use a mixed methods approach that combines quantitative social network analysis (SNA) and qualitative interview analysis. Overall, the sub-basin's governance network is fairly well integrated, but several concerning gaps exist. Funded, mandated, and shared interest relationships lead to different network patterns. Mandated relationships are associated with lower productivity than shared interest relationships, highlighting the benefit of genuine collaboration in collaborative watershed governance. Lastly, quantitative and qualitative data comparisons strengthen recent calls to incorporate geographic space and the role of individual actors versus organizational culture into natural resource governance research using SNA.

1. Introduction

"Stove-piped," "fractured," and "siloed," are phrases that many environmental managers can relate to. They refer to conditions where different organizations work in isolation and avoid sharing information and strategies. Such arrangements, called governance silos henceforth, pose a fundamental problem for environmental planning and problem solving (Crowder et al., 2006). Most environmental problems are multifaceted and affected by social and ecological processes operating in different places and at different rates (Galaz et al., 2008). Therefore, effective management requires different organizations to collaborate (Ostrom, 1990; Sabatier et al., 2005).

Governance silos can be considered a particular subset of institutional fit: i.e., how well the formal and informal rules of interaction and arrangements among organizations (Ostrom, 1990; Young, 2008) address the dynamics of a given natural resource system (Crowder et al., 2006; Galaz et al., 2008). One way to overcome siloes and improve fit is through governance networks that facilitate cooperation and coordination across jurisdictions, locations, and public/private sectors. (Bodin et al., 2011). Studying the structure and function of such networks, often referred to as social network analysis for natural resource governance (SNA for NRG), has become an important topic within the field of environmental governance (Fig. 1, Bodin and Crona, 2009; Bodin and Prell, 2011; Folke et al., 2005; Janssen et al., 2006).

There are many motivations for creating network relationships

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(Ostrom, 1990; Borgatti et al., 2009). In North American NRG networks, for example, organizations interact through a variety of formal, informal, and financially incentivized institutional arrangements (Ostrom, 1990; Schneider et al., 2003; Sabatier et al., 2005; Feiock, 2013; Shrestha et al., 2014). While recent studies using SNA for NRG have focused on relationships such as knowledge exchange, political influence, labor, and resource exchange (e.g., Cassidy and Barnes, 2012; Cohen et al., 2012; Crona and Bodin 2006; Vignola et al., 2013; Weiss et al., 2011), few compare formal, informal, and financially incentivized relationships. And with some examples notwithstanding (e.g., Berardo and Scholz, 2010), relationship types are infrequently evaluated in light of specific outcomes.

Additionally, NRG studies using SNA often classify organizations in ways that might not always support solutions oriented research needed by local practitioners (Lubchenco, 1998; Brondizio et al., 2009; Defries et al., 2012; Moss et al., 2013). Categories such as local, regional, and national (e.g., Cohen et al., 2012; Vignola et al., 2013) may be apt for addressing certain questions; but, local solutions require detailed local studies (Schneider et al., 2003; Vance-Borland and Holley, 2011; McAllister et al., 2013), something we aim to provide.

In this paper, we analyze NRG network integration among a detailed typology of organizations and consider formal, informal, and financially incentivized relationships alongside collaboration productivity. We focus on salmon restoration in a sub-basin of Puget Sound in the Pacific Northwest, USA, and answer the following questions: 1) How well integrated is the salmon governance network? 2) Why do different types of organizations collaborate, specifically considering mandated, funded, and shared interest relationships? 3) How productive are the aforementioned collaboration types? 4) How can understanding these patterns enhance restoration work in the region and provide a proof of concept to be applied elsewhere?

Our study supports both theory and application. From a theoretical perspective, we relate network collaboration reasons with perceived productivity. We also engage in a critical reflection about how units of analysis (e.g., organizations and individuals) affect NRG network function, a needed and understudied research priority (Newig et al., 2010). Additionally, we discuss how geography affects the analysis of NRG silos. From an applied perspective, we identify collaboration needs and discuss how practitioners might address them. We provide a proof of concept for diagnosing and assessing governance silos and contribute to a growing literature using SNA to identify interventions, often called "network weaving," to improve NRG networks (Vance-Borland and Holley, 2011; Beilin et al., 2013; Mills et al., 2014).

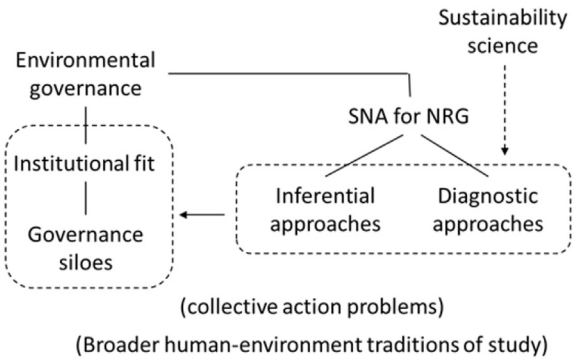

Fig. 1. Conceptual framework. See definitions in main text. Our study addresses governance siloes, a subset of the institutional fit literature, which falls under the umbrella of environmental governance (Crowder et al., 2006; Galaz et al., 2008). We approach institutional fit from the SNA for NRG literature (also a subset of environmental governance) because networks can bridge siloes and improve fit (Ernstson et al., 2010; Bodin et al., 2011; Guerrero et al., 2013). NRG studies using SNA are often inferential, i.e., relating variables to inform theory, or diagnostic, i.e., evaluating network structure and inferring function based on theory, often for application. Our study contributes to both and is in line with wider sustainability science that seeks to unite theory and application to solve real-world problems, such as governance silos (Kates et al., 2001). Governance siloes also relate to studies of collective action, a literature that we do not specifically call out in the text, though it informs our study through associated references (e.g., Feiock, 2013; Ostrom, 1990; Sabatier et al., 2005).

2. Study area

Our study was conducted in the Whidbey Basin (WB), a large semi-enclosed coastal basin in Puget Sound, Washington State, USA. (Fig. 2). WB consists of four major rivers that drain approximately 14,850 km^2 of land (Beechie et al., 2001; PSP, 2014) and account for 68% of Puget Sound's freshwater input (Yang and Khangaonkar, 2010). We focus on collaborations among organizations involved in salmon restoration, a logical case for studying NRG networks because salmon restoration requires that organizations in different locations collaborate. As a hydrologically and biophysically connected basin, any actions taken in one part of WB will affect natural resources in other locations (NRC, 1992; Stanley et al., 2012; Wilhere et al., 2013). For example, salmon spend their adult life at sea, return to spawn in specific rivers, and use the entire nearshore during their juvenile life stage (Beamer et al., 2013; PSP, 2014). Land-use, development, conservation, and restoration actions in one part of WB will affect salmon, positively or negatively, in other locations (NWIFC Member Tribes, 2012; Wilhere et al., 2013).

WB hosts several species of salmon listed as threatened under the U.S. Endangered Species Act, which provides a legal mandate to restore salmon (Lyshall et al., 2008; Bottom et al., 2009; Wilhere et al., 2013). Because of these listing, and salmon's important cultural and economic role in the region, many restoration and recovery efforts are state and federally promoted initiatives, often coordinated through watershed planning bodies and driven forward using competitive grant funding cycles. Additionally, numerous grassroots initiatives also exist (PSP, 2014). While the state tried for several years to advance a WB-wide recovery planning and implementation effort, it was not supported by local organizations leaving decisions in recovery planning and implementation to be made at smaller geographic scales (PSP, 2014).

Major jurisdictions in WB include four counties (a fifth overlaps in northern headwaters, but lands are in federal holding, so this county is rarely, if ever, a player), seven Native American Tribes, more than 30 towns and cities, federal and state agencies, and many special purpose districts, which are autonomous quasi-government entities with taxation authority that manage specific issues such as flood control or port management (Lyshall et al., 2008; MRSC, 2012; PSP, 2014). Several land trusts, numerous non-profits, and citizen groups are also involved in salmon restoration (Lyshall et al., 2008; PSP, 2014). A very small percentage of forested headwaters cross into Canada, but we focus this study on the vast majority of the basin residing in Washington State.

3. Methods

We took a mixed methods approach, common to NRG studies using SNA, that integrates quantitative network and qualitative interview analysis (Prell et al., 2009; McAllister et al., 2013). We collected data by interviewing and surveying restoration practitioners. Our survey and interview guide were developed based on attending local and regional restoration planning meetings and

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