

AN ABSTRACT OF THE DISSERTATION OF

Daniel T. Calvert for the degree Doctor of Philosophy in Environmental Sciences Presented on June 10, 2015.

Title: Social Learning and Adaptive Capacity in Collaborative Watershed Partnerships.

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Abstract

This dissertation examines learning driven adaptations in salmon recovery efforts and water resources management in Oregon. The case study utilizes a framework highlighting the connections between human and natural systems. Semi-structured interviews are used to analyze interactions between rural riparian landowners and watershed council staffs living and working in Oregon's Upper Willamette River basin. Findings indicate that 1) different types of learning interventions and peer-to-peer interactions are key drivers of learning, 2) natural resource management and learning interventions should be tailored towards social-ecological systems, and 3) collaborative watershed partnerships can integrate different knowledge types and increase adaptive capacity.

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Social Learning and Adaptive Capacity in Collaborative Watershed Partnerships

by  
Daniel T. Calvert

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Doctor of Philosophy dissertation of Daniel T. Calvert presented on June 10, 2015

Doctor of Philosophy

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

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Daniel Townsend Calvert, Author

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## CHAPTER 1: INTRODUCTION

Natural resources play a foundational role in the culture, economics and quality of life that make the Pacific Northwest unique. Salmon in particular are woven into the social fabric of the Pacific Northwest. In addition, almost every human action in the PNW in some way impacts salmon and the watersheds upon which they rely. These are inevitable challenges we must face. Unwise management of these resources has caused major disruptions particularly in salmon populations (Lee, 1994). Traditional natural resource management is based on a top-down regulatory approach, a resource management paradigm that views human and natural systems as separate entities. This decoupled approach has resulted in unanticipated changes to ecosystems, social and economic disruption, and significant reductions in salmon populations (Holling & Meffert, 1996). Despite decades of work and the expenditure of billions of dollars to manage salmon, their populations are a fraction of their historic levels (Lackey, Lach, & Duncan, 2006). The decline of salmon and their ecological systems, including the disruption of social and economic systems tied to salmon, have led to changing resource management perspectives that recognize the need to take into account the tight coupling of social-ecological systems.

Ecosystems are where the natural world and human society intersect. We call these intersections social-ecological systems (Berkes, Colding, & Folke, 2003). To be effective, steps towards salmon recovery require collective efforts driven by learning and adaptation to influence these social-ecological systems (Naiman, 2013). However, steering social-ecological change is hard (Folke et al., 2005). This is particularly true for managing watershed resources in socialecological systems (Parkes et al., 2010). Fortunately, *collaborative natural resource management* can help solve these problems and support salmon recovery (Berkes, 2009) and water resources management (Lebel, Grothmann, & Siebenhüner, 2010).

Collaborative natural resource management occurs when stakeholders choose to work together to develop locally-driven solutions to local problems (Koontz & Johnson, 2004).

Watershed councils represent one example of a collaborative resource management process.

Oregon watershed councils can be thought of as collaborative watershed partnerships focusing on watershed-scale, social-ecological conditions (Margerum, 2008).

Natural resource management in social-ecological systems necessitates a constant process of learning-based adaptations (Armitage, Berkes, & Doubleday, 2007; Folke et al., 2005).

Socialecological systems are unique and create distinct learning contexts and content (Lundholm & Plummer, 2010). *Adaptive capacity* can be thought of as the capacity to respond to, create and shape change in unique social-ecological systems. Developing the adaptive capacity of socialecological systems is increasingly recognized as an objective in natural resource management (Chapin, Kofinas, & Folke, 2009). In resource management, the manner in which individuals in a group develop collective knowledge to manage social-ecological systems is called *social learning* (Keen, Brown, & Dyball, 2005). Social learning is a key driver of adaptive capacity in social-ecological systems (Chapin et al., 2010). However, resource managers are still learning about how these systems work. The purpose of this project is to examine social learning and adaptive capacity as driven by watershed councils, philanthropic organizations and private landowners in seven river basins and 29 sub-watersheds involving a mix of public and private lands in Oregon.

This research has the following objectives:

- 1) To examine what facilitates and/or impedes watershed scale social learning.
- 2) To examine how outreach and engagement efforts influence social learning and awareness of social-ecological systems.
- 3) To examine how social learning leads to adaptive capacity.

## **CHAPTER 2: LITERATURE REVIEW**

This chapter provides a background of key theories and concepts of social learning and adaptive capacity in social-ecological systems. It presents information on how these ideas are applied to resource management efforts relating to water resources and salmon recovery in the PNW. This literature review will examine the concepts of adaptive capacity and its relationship to collaborative natural resource management and social learning. The concepts of social learning and adaptive capacity are used to create the analytical tools to interpret the study results.

### **2.1 Rationale for Topics Selected**

Natural resource management is becoming more complex and challenging. This relates to changing societal values, economics and knowledge of ecosystem processes. Traditionally the actions of humans were viewed externally from ecosystem processes (i.e. biological, chemical and physical interactions between organisms and the environment) (Chapin, Matson, & Mooney, 2002). This perception is changing, an important paradigm shift is the recognition that humans and nature are inextricably connected in social-ecological systems (Chapin et al., 2009).

Social-ecological systems thinking recognizes that human and natural systems are intertwined, one is not embedded in the other, in complex adaptive systems (Berkes, Colding, & Folke, 2003). They are continuously changing, adapting and self-organizing. They exist in multiple conditions and configurations and interact at different scales (Gunderson & Holling, 2002; Olsson, Folke, & Berkes, 2004a). *Complexity* relates to an inherent level of uncertainty associated with natural resource management and ecosystem processes. Complexity is used to explain that social-ecological systems adapt and change in ways that often cannot be anticipated (Folke, 2006). River basins (Plummer & Armitage, 2007) and salmon ecosystems (Augerot & Smith, 2010) are described as examples of complex adaptive social-ecological systems.

## 2.2 Social-Ecological Complexity and Adaptive Capacity

Adaptive capacity is increasingly recognized as an important aspect of natural resource management. The concept of adaptive capacity takes different forms in the literature. One approach to thinking about adaptive capacity is to view it as the ability to respond to socialecological and ecosystem complexity (Folke et al., 2002). This perspective acknowledges that both human and natural systems are adaptive, but focuses on how people learn and make purposive decisions to be adaptive in an evolving environment (Folke et al., 2010). Applying this perspective to the context of natural resource management, adaptive capacity is decision making, involving learning, to move systems toward a desired range of conditions (Chapin et al., 2009). Adaptive capacity is viewed as an important concept for salmon recovery and water resources management efforts. Future efforts to support salmon ecosystems and salmon recovery are thought to depend on the adaptive capacity of social-ecological systems of the PNW (Naiman, 2013). This is particularly true in light of likely ecosystems changes associated with climate

change (Mote et al., 2003). The analysis of learning to enhance adaptive capacity water in resource management has taken different forms, one of which is social learning (Leys & Vanclay, 2011; Mccarthy et al, 2011).

### 2.3 Social Learning

Social learning in environmental management is the manner in which individuals in a group develop collective knowledge about the management of social and ecological systems (Keen et al. 2005). Reed et al. (2010) describe two conditions for social learning: 1) a clear indication that changes in understanding have taken place in an individual. This can be measured through a demonstration of informational recall, and changes in attitudes, beliefs, or world views; and 2) a clear indication that these changes go beyond the individual and are present in the greater community. These changes must be observed in interactions associated with a social network. Social learning is increasingly viewed as a desired objective in natural resource management (Armitage et al., 2009; Rodela, 2013). True social learning involves an iterative process of critical reflection and learning; this is why it's described as playing a critical role in increasing adaptive capacity (Armitage, Berkes, & Doubleday, 2007; Chapin et al., 2009).

### 2.4 Collaborative Natural Resource Management

Collaborative natural resource management is cited as creating a framework for social learning in social-ecological systems (Rodela, 2011). In collaborative natural resource management multiple stakeholders employ a participatory approach to decision making and evaluation of natural resource management efforts (Conley & Moote, 2003). Researchers have found that the learning essential to adaptive capacity can be increased by collaborative

approaches to managing natural resources (Armitage, 2005; Fazey et al., 2007) and seems to play an important role in water resources management (Clarvis & Engle, 2013; Pahl-Wostl et al., 2007; Smit & Wandel, 2006) and salmon recovery (Bottom et al., 2011).

This research is influenced by past work examining what makes social-ecological systems unique and how this influences learning. Different sources highlight the manner in which social-ecological systems create unique learning contexts that shape perception and response towards natural resource management efforts (Ison et al., 2004; Tidball & Krasny, 2011). Mostert et al., (2008) specifically observe social learning in water resources management takes place within specific contexts created by social and ecological conditions. It's been observed that different stakeholders conceptualize and respond differently to social-ecological conditions; this diversity creates distinct social learning contexts (Pahl-Wostl, 2006). Several recent meta-analyses of social learning case studies demonstrate the importance of understanding social learning context is influenced by interactions and characteristics of social-ecological systems (Rodela, 2011, 2013).

Learning interventions, designed to deliver content in specific contexts, have been shown to increase awareness of social-ecological interactions (Buikstra et al., 2010; Lutha & Cicchetti, 2000). This includes social learning interventions in natural resource management contexts (Brown, Harris, & Russell, 2010; Patterson, Smith, & Bellamy, 2013). In this way social learning has served as a tool for addressing complexity in natural resource management (Armitage et al., 2009; Chapin et al., 2010). However, as noted by Bouwen and Taillieu (2004) there are different approaches to designing and implementing contextually appropriate social learning interventions. These sources highlight the value of an improved understanding of interventions designed to facilitate social learning in different natural resource management contexts.



Practical application of these ideas is one basis for the growing body of research focused on analyzing and operationalizing social learning in natural resource management (Bos, Brown, & Farrelly, 2013; Colvin et al., 2014; Rodela, 2011, 2013). For example, the management of salmon and water resources usually involves a diverse range of stakeholders as salmon ecosystems are typically a checkerboard of publicly and privately owned land, making watershed scale restoration and management particularly challenging. Any real gains relating to salmon recovery must be supported by watershed land owners and stakeholders; this often involves a socio-cultural shift and changing norms among both managers and stakeholders to support these efforts (Safford & Norman, 2011). Past analysis of social learning spans structured interactions such as workshops, meetings and policy initiatives to informal, less structured informal interactions (Reed et al., 2010). The literature finds this variety relates in part to the fact that some groups, particularly rural private landowners, are not comfortable interacting with agency partners nor are interested in participating in workshops or formal meetings (Muro & Jeffrey, 2008; Reed et al., 2009). Accounting for and recognizing this diversity is thought to be critical to understanding social learning in natural resource management (Pahl-Wostl, Mostert, & Tàbara, 2008; Rodela, 2011).

## 2.5 Social Learning and Natural Resource Management

Past work has shown facilitating and supporting true social learning for natural resource management decision involves bridging and integrating ideas across different social groups and communities of practice (Diduck, 2010). Researchers have found that successful social learning in natural resource management is based on a culture of collaboration, transparency and accountability. Conflict and tension can be important steps leading to the emergence of new

ideas; however power dynamics among participants need to be minimized or carefully managed so that multiple voices and viewpoints can be integrated into deliberation and learning. These factors represent descriptions of how social learning interventions can be contextually tailored for relevance in different social-ecological systems (Dyball, Brown, & Keen, 2007).

As outlined by Keen et al. (2005) social learning can be operationalized based on the concepts of loop-learning (Argyris & Schön, 1978), communities of practice (Lave & Wenger, 1991), and social capital (Coleman, 1988; Puntam, 2000). Each of these is discussed below.

## 2.6 Loop-Learning

Social learning in social-ecological systems is associated with the three potential “loops” (Figure 1): single, double and triple loops (Argyris & Schön, 1978; Armitage, Marschke, & Plummer, 2008).

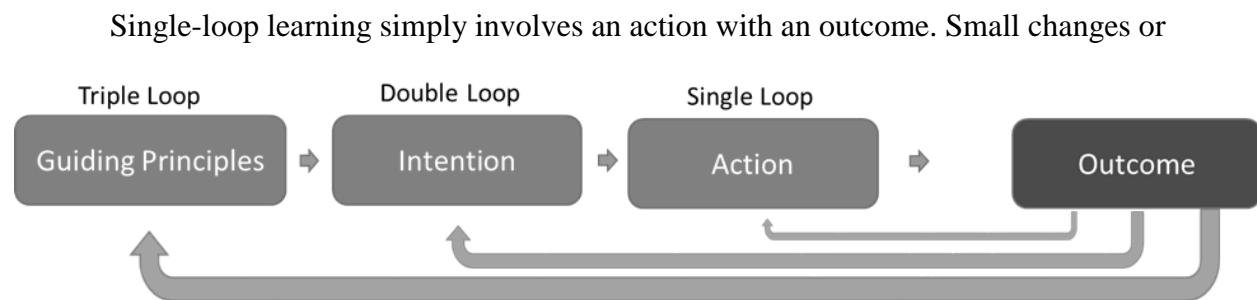


Figure 1. The sequence of learning cycles in loop-learning (adapted from Armitage et al., 2008).

improvements can be made to change the outcome(s) but the guiding assumptions or routines are static. Double-loop learning involves a deeper reflection and evaluation of an outcome leading to a changed objective. In double loop learning, experience can challenge the norms and frames of reference underlying decision making, resulting in modification or even rejection of the original learning goal. Any changes almost always stem from reflection and learning that leads to a new set of guiding assumptions. Triple-loop learning can be described as “learning about learning,”

where participants focus on the connections between action, outcome and goals, and are guided by an emerging set of governing principles or rules. Double- and triple-loop learning have been most directly linked to adaptive capacity (Pahl-Wostl, 2009).

## 2.7 Communities of Practice

Communities of practice (COP) is a theory for understanding how people learn from peers as part of a social group. A community of practice is a group of people with a mutual concern or shared interest they learn about through regular interactions (Wenger, 2011). In a COP learning is contextual, this is an important theme in the literature addressing social learning and COP in natural resource management (Cundill et al., 2012; Goldstein & Butler, 2010; Pahl-Wostl & Hare, 2004; Reed et al., 2010). The ideas underlying communities of practice have been used to better understand the social networks that drive learning among different groups in natural resource management contexts (Cundill et al., 2012; Ison & Watson, 2007; Pahl-Wostl, 2009; Nykvist, 2014).

In natural resource management situations COP have been observed as established or forming in response to new learning and information. Different sources describe COP as having a distinct learning style or culture that influence learning contexts (Collins & Ison, 2009; Cundill et al., 2012; Goldstein & Butler, 2010; Pahl-Wostl et al., 2008; Reed et al., 2010). COP are described as having boundaries, which develop through shared practice or specific interventions. These boundaries are created by the expertise, language and experiences that are shared between the actors in a COP. In a COP recognition of expertise and cultural competence is important; new ideas and concepts are thought to be better received when originating from an individual who exhibits these traits (Wenger, 2010).

It's recognized that individuals can be actors in multiple COP. Based on this, social learning can occur within and across COP by individuals acting as *brokers* between different groups. Communication and idea sharing across COP by individuals who are associated with multiple COP, referred to as *boundary spanners*, can lead to creative problem solving and the fostering of new ideas and social learning (Wenger, 2000). Boundary spanning communication in social (Bodin & Crona, 2009) and professional networks (Vogel et al., 2007) is viewed as a potential tool for addressing natural resource management dilemmas, and facilitating socialecological systems thinking (Berkes & Folke, 1998).

Researchers have found that interactions and learning in COP can influence perceptions and attitudes about environmental management (Pahl-Wostl & Hare, 2004). For example, Collins and Ison (2010) describe facilitating social learning interventions resulting in COP based on a common conceptual framework, including language and practices, for managing water resources across multiple jurisdictional and administrative areas. This theory has provided resource managers a means of identifying new and emerging groups collectively learning about managing watershed and other natural resources (Berkes, 2009a; Nykvist, 2014; Pahl-Wostl, 2009). Furthermore, researchers found that adaptive capacity in land management decision making by private landowners can be associated with learning in COP (Raymond & Robinson, 2013). These sources point towards the significance of identifying and understanding current and potential future COP in the management of watershed systems.

## 2.8 Social Capital

Social capital is the development of norms and trust created by civic engagement (Puntam, 2000). Different sources observe that social capital is an essential component of the

collective action associated with social learning (Axelsson et al., 2013; Cundill et al., 2012; Plummer & FitzGibbon, 2007). Eames (2005) describes social capital as the glue of social networks created through regular interactions, sharing ideas and learning together. He specifically identifies social capital as important to natural resource management based learning, including learning in social-ecological systems and about watershed ecosystems.

There are different types of social capital thought to influence social learning in natural resource management context: bonding, bridging and linking (Keen, Brown, & Dyball, 2005). In natural resource management contexts *bonding* social capital is used as a label for interactions within a group while *bridging* social capital occurs between groups. Pretty and Smith (2004) describe bonding and bridging social capital as occurring in horizontal networks, i.e. between groups with no hierarchy. Social capital in vertical networks between people in different positions of power or hierarchy is referred to as *linking* (Eames, 2005). In collaborative natural resource management social capital is thought to be a product of repeated interactions between different actors (Brondizio, Ostrom, & Young, 2009). According to Berkes (2009) recognition and familiarity with what fosters social capital in an approach to understand and identify social learning in social-ecological systems.

## 2.9 Summary

The theoretical perspectives that guide this research recognize the importance of learning and adaptation in natural resource management. This stems partly from recognition that knowledge about ecosystem function, and the outcomes of natural resource management decision making is limited. Social-ecological systems and ecosystems are recognized to be inherently dynamic, unpredictable, and continually adapting. This suggests that flexibility and

responsiveness can enhance efficacy of natural resource management. Numerous researchers have characterized the value of integrating social learning to increase adaptive capacity for improved resource management decision making in social-ecological systems.

The diversity in the literature on these topics necessitates the definition of the concepts and terms being used in a research project. Social learning and adaptive capacity have been described in different ways. In this research social learning is “. . . a change in understanding that goes beyond the individuals to become situated within wider social units or communities of practice through social interactions between actors within social networks” (Reed et al., 2010, p. 6). Adaptive capacity can be thought of as learning based decision making to purposefully influence the condition of social-ecological systems (Armitage et al., 2007; Chapin et al., 2009). It’s observed that social learning can increase adaptive capacity to move social-ecological systems towards a desired range of conditions.

### **CHAPTER 3: STUDY AREA**

#### **3.1 Overview**

This chapter describes and provides the rationale for the selection of the watersheds in the study area. The state of Oregon has chosen to support watershed councils, a form of collaborative natural resource management to support salmon recovery efforts. Watershed councils work with local stakeholders, including private landowners, to address declining salmon populations and manage water resources on a watershed scale (Margerum, 2008). As of January, 2015 there were 91 watershed councils (Figure 2) officially recognized by the Oregon Watershed Enhancement Board (OWEB) (OWEB, 2015).

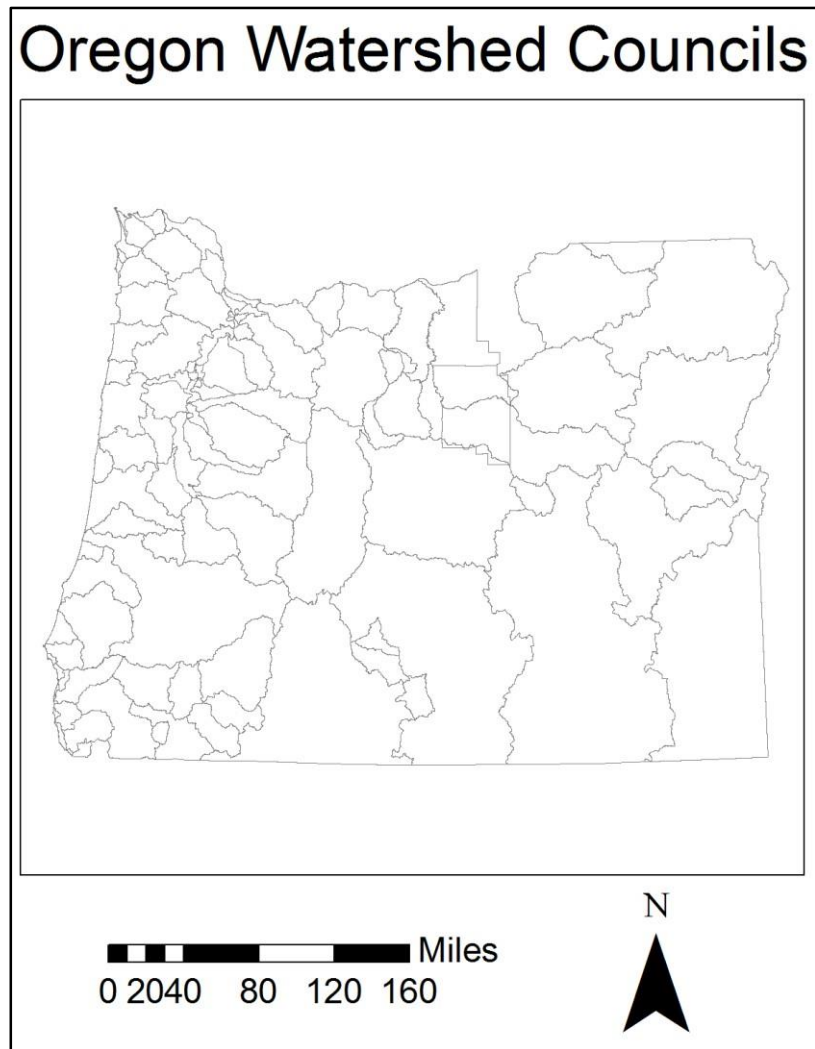


Figure 2. Oregon watershed Councils.

### 3.2 Upper Willamette Basin Study Area

This study is based in the Willamette River basin located in Western Oregon (Figure 3). The Willamette River basin lies in a valley between the Oregon Cascade Mountain in the East and the Coast Range in the West. The Willamette River flows from south to north to the main stem of the Columbia River, which flows west to the Pacific Ocean.

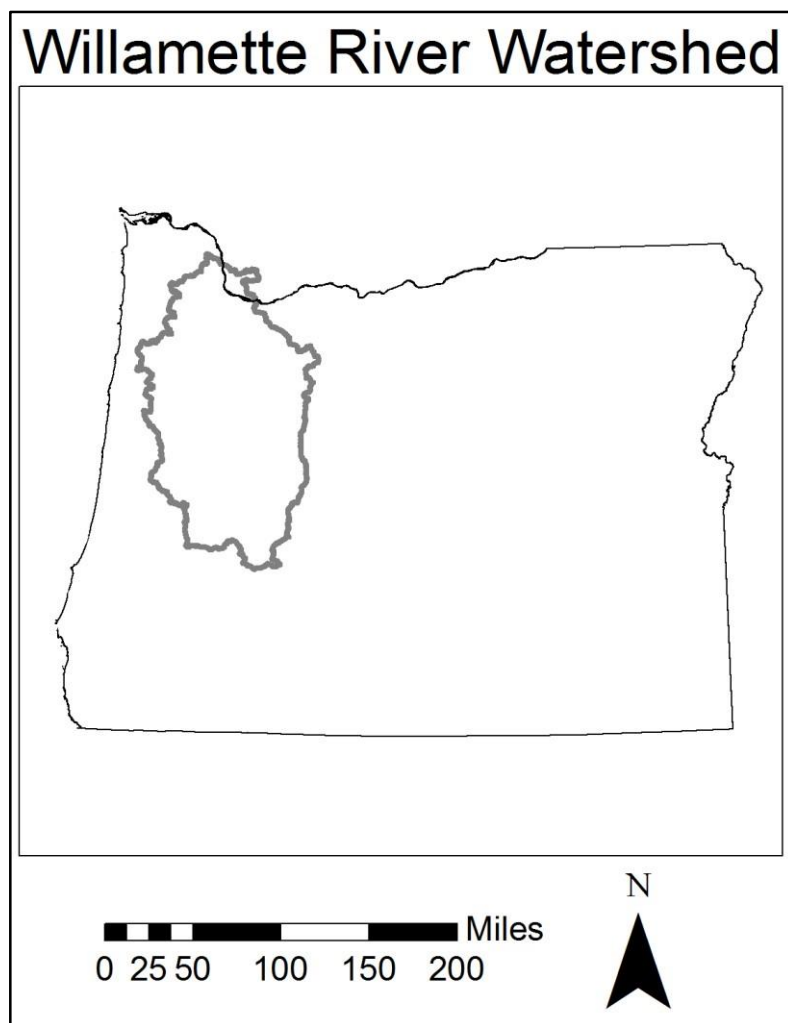


Figure 3. Willamette River watershed.

Within the upper portion of the Willamette Valley basin are seven smaller river basins comprising the study area: the North Santiam, South Santiam, Calapooia, Middle Fork Willamette, Luckiamute, Long Tom, and Marys Rivers (Figure 4). These basins cover a total area of 11,772 square kilometers. Each of these seven river basins has a watershed council associated with it.



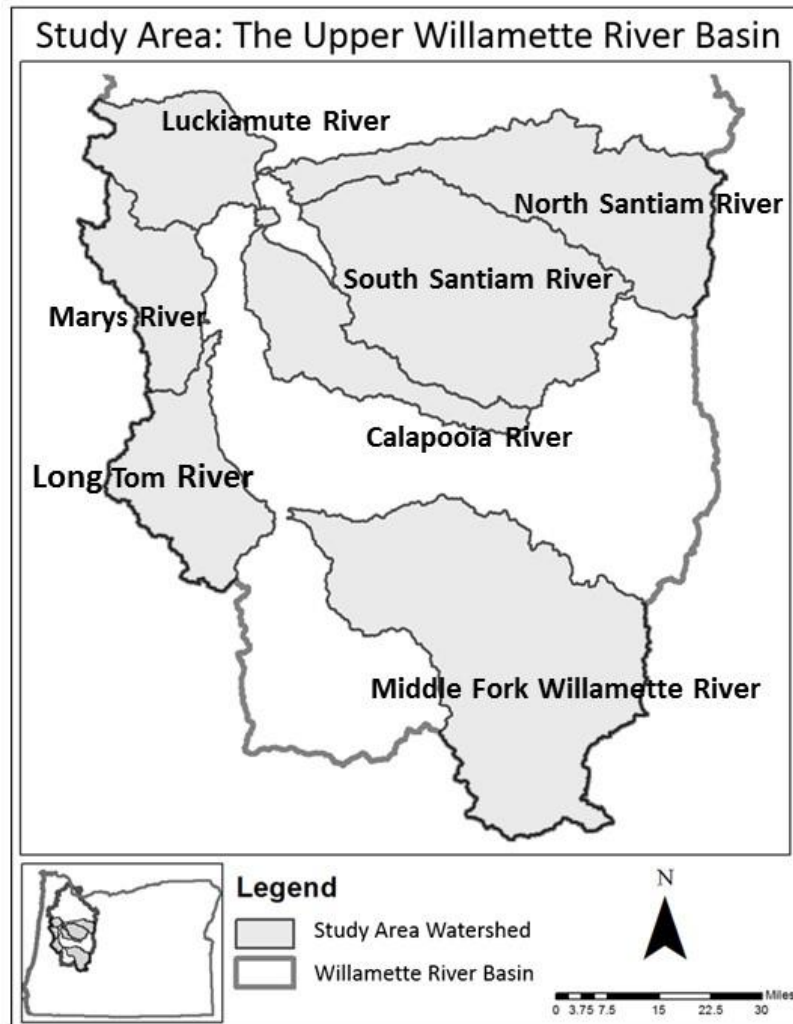


Figure 4. The Upper Willamette River basin. These seven river basins comprise the study area.

The Willamette Valley is Oregon's most populated region with large urban centers in Eugene, Corvallis and Salem (Figure 5). Based on the 2010 census Lane, Benton, Linn, Marion, Polk and Benton counties (comprising the bulk of the study area) have a total population of 859,125 people— 89% white, 4% Hispanic or Latino, <1% African American, 1% Native American, and 4% Asian. This is about 22% of the total population of Oregon. The economy of this area is based largely on forestry, wood products and agriculture, with some manufacturing jobs, as well. Though some communities have been hard hit by the decline of the timber industry, Benton, Lane and Polk counties have significant employment related to local universities. The

median household income in the study area is ~\$41,000/year, and ~\$52,000/year state wide. About 13% of households in the study area live below the poverty line. This is slightly lower than the state average of 16.2%, and the US average of 15.4% (US, 2013).

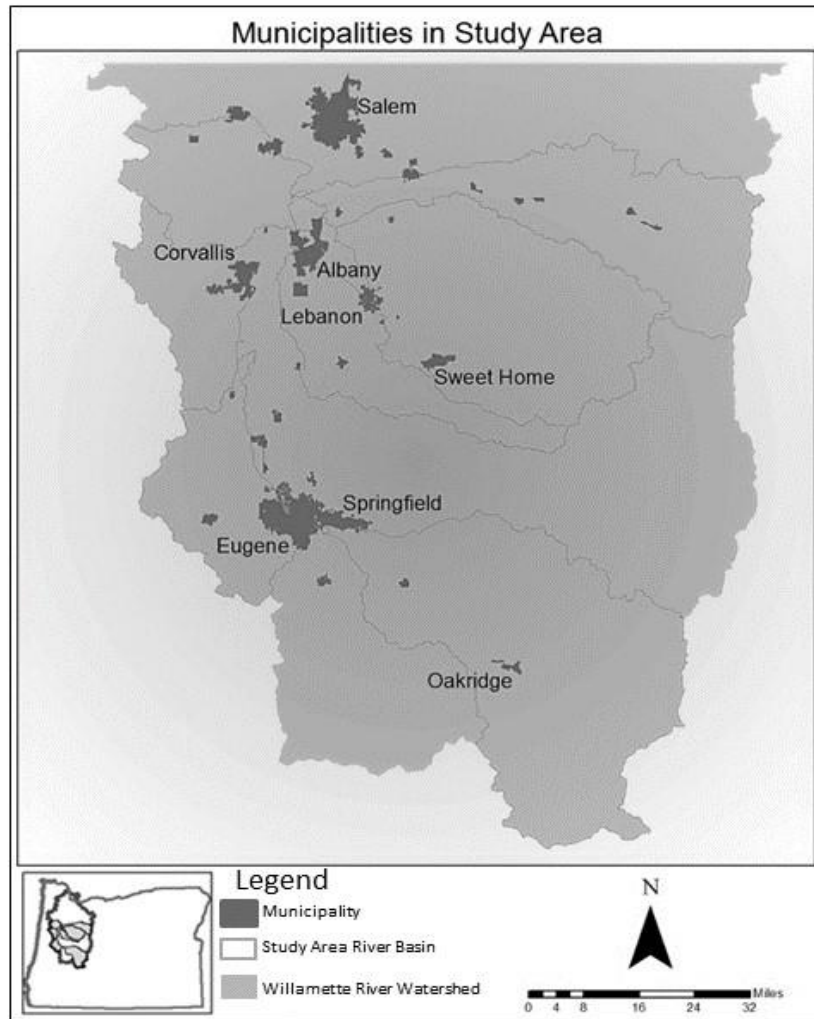


Figure 5. Municipalities in study area.

Different geophysical and socio-economic characteristics define the study area including the mix of public and private lands (Figure 6). Other characteristics such as geography, ecology, economics and land use contribute to and influence the configurations and interactions of the social-ecological systems in the study area.

The geography and geology of the Upper Willamette basin varies significantly. The eastern and southern portions of the study area, including the watersheds of the South Santiam, North Santiam, Calapooia and Middle Fork of the Willamette Rivers, drain the west slope of the Oregon Cascade Mountains. The western portion of the study area, including the watersheds of the Long Tom, Marys River, and Luckiamute Rivers, drain the eastern slope of the Oregon Coast Range. Precipitation varies in the area, with the Cascades and Coast Ranges receiving 80 inches of precipitation a year, while the valley receives an average of 40 inches per year (William, 2001). The landscapes of the Coast Range are typified by drainages and steep slopes caused by erosion from the significant rainfall this area receives (McGarigal and McComb, 1995). The area is characterized by a largely rural, forested landscape, while the land immediately adjacent to the historic Willamette River channel and floodplain is largely comprised of productive agricultural land.

The watersheds in this study have different patterns of land ownership (Figure 6). Significant portions of some basins are publicly owned, most of which falls under US Forest Service and Bureau of Land Management jurisdictions. The North Santiam and Middle Fork Willamette, for example, are comprised of nearly 75% public lands. The South Santiam is roughly 50% publicly owned. The watersheds of the Calapooia, Luckiamute, Long Tom and Marys River are quite different, each of which is roughly 95% privately owned. These patterns of land ownership make for distinctly different relevant stakeholders in different basins.

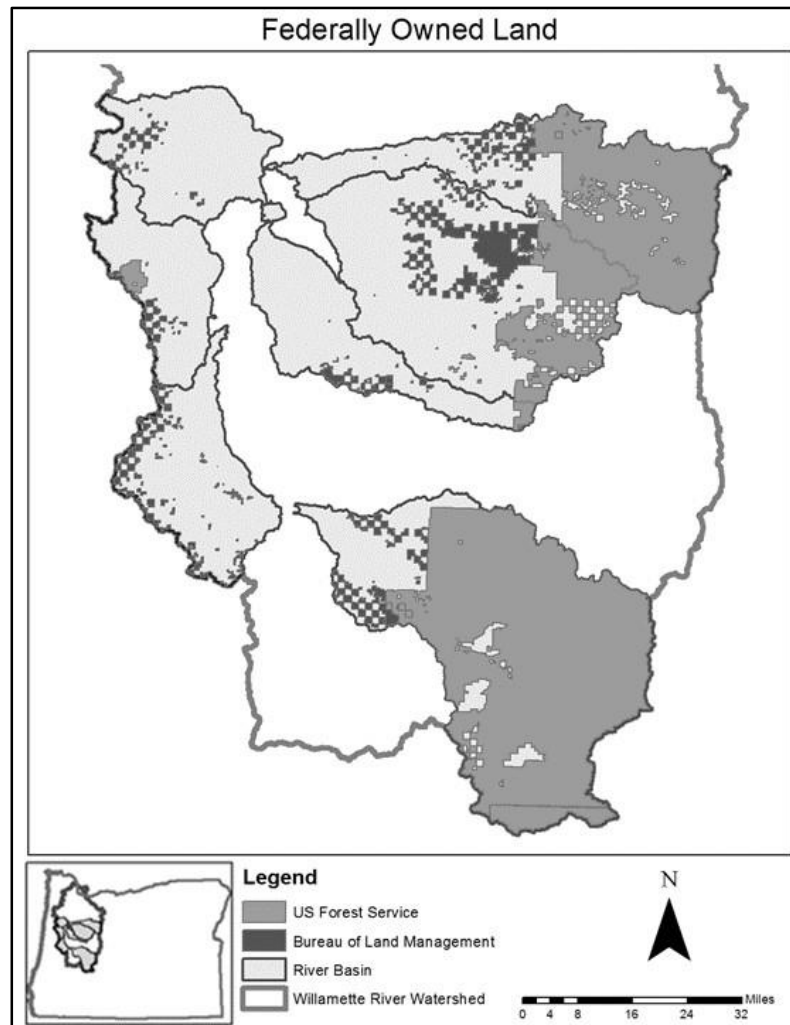


Figure 6. Distribution of Federal lands in the study area.

The Willamette River basin contains important habitat for several species listed under the Endangered Species Act including Chinook salmon (*Oncorhynchus tshawytscha*), Steelhead (*Oncorhynchus mykiss*), and the Northern Spotted Owl (*Strix occidentalis caurina*). Figures 7 and 8 display the historic habitat and current range of ESA listed Steelhead and Chinook in the Willamette River Basin. In many instances the declines in these species are driven in part by habitat changes caused by the traditional economic drivers of the area including forestry and agricultural activities. Although there are additional contributing factors, recovery efforts are often perceived as contributing to economic downturns in many communities. Different tactics

have been tried to meet the dual goals of recovering these species and meeting economic needs of local and regional communities (Lach and Calvert, 2014).

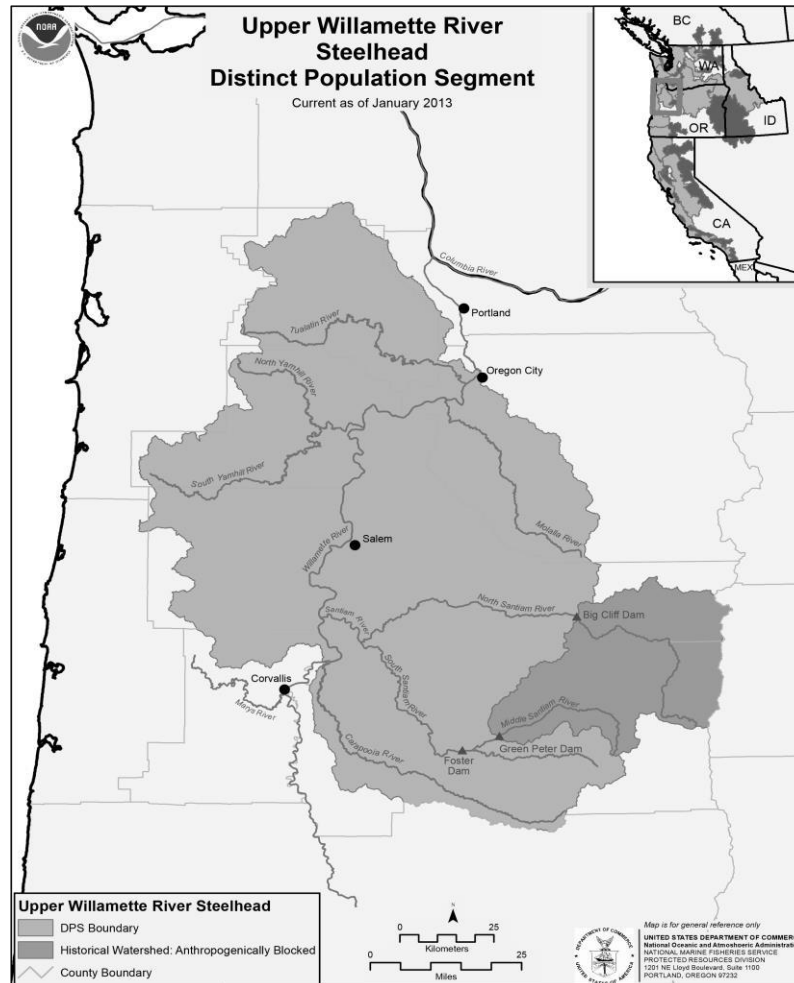


Figure 7. Current and historic range of ESA listed Steelhead in the Willamette River Basin. Retrieved from <http://www.nmfs.noaa.gov>

### 3.3 Watershed Councils and the Willamette River Model Watershed Grant Program

The seven watershed councils in this study have partnered with the Bonneville Environmental Foundation (BEF) and the Meyer Memorial Trust (MMT) in the Willamette River Model Watershed Grant Program (MWP). The MWP (Figure 9) is a collaborative watershed partnership supporting river restoration and salmon recovery. It is a unique philanthropic

approach based on driving social, ecological and economic uplift across the multiple watersheds in the Upper Willamette River Basin over a ten year period (Reeve, 2006).

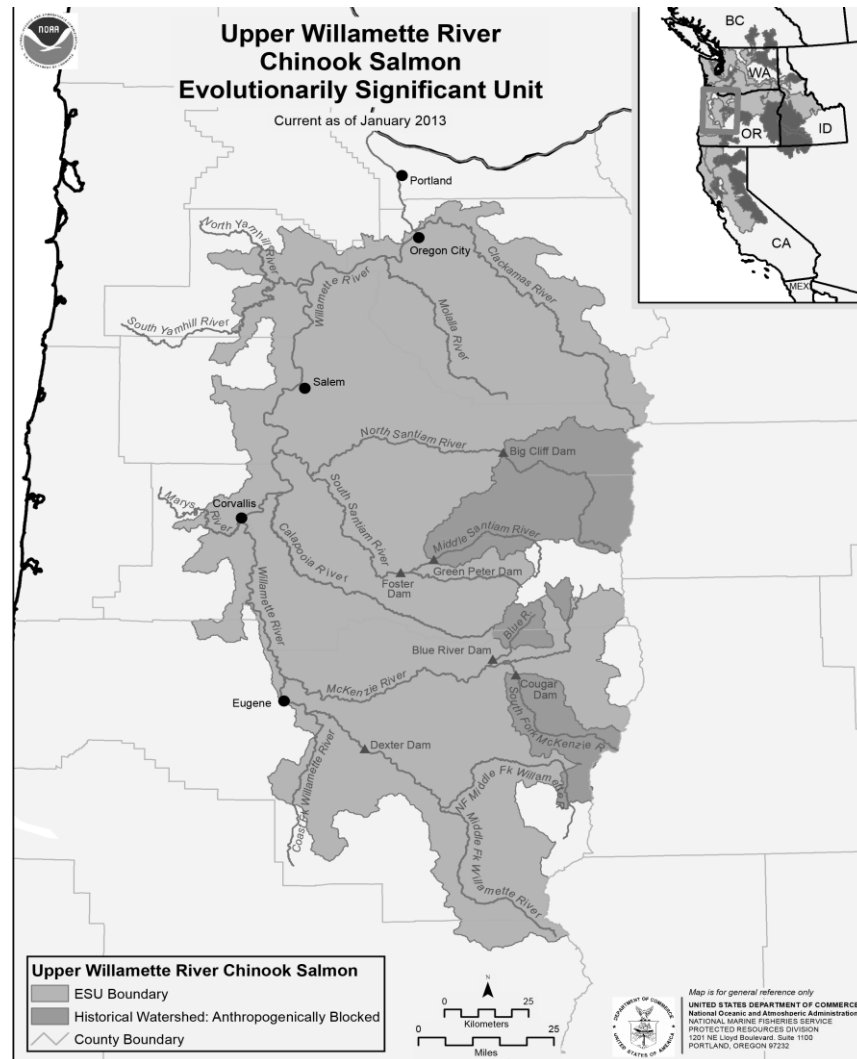


Figure 8. Current and historic range of ESA Chinook salmon in the Willamette River Basin. Retrieved from <http://www.nmfs.noaa.gov/>.

The actions associated with the MWP are implemented in *model watersheds*, sub-basins of 10,000-20,000 hectares largely comprised of private property. The interventions in the model watersheds involve restoration, monitoring, and outreach and engagement at a neighborhood and stream reach scale (BEF, 2013). The MWP provides a guiding framework with each council

using a slightly different implementation strategy. Each watershed council acts in accordance to the social, ecological and economic factors that underlie social-ecological systems and interactions in their watersheds. The MWP provides a unique opportunity to explore how social learning in collaborative groups can increase adaptive capacity in different watershed socialecological systems.

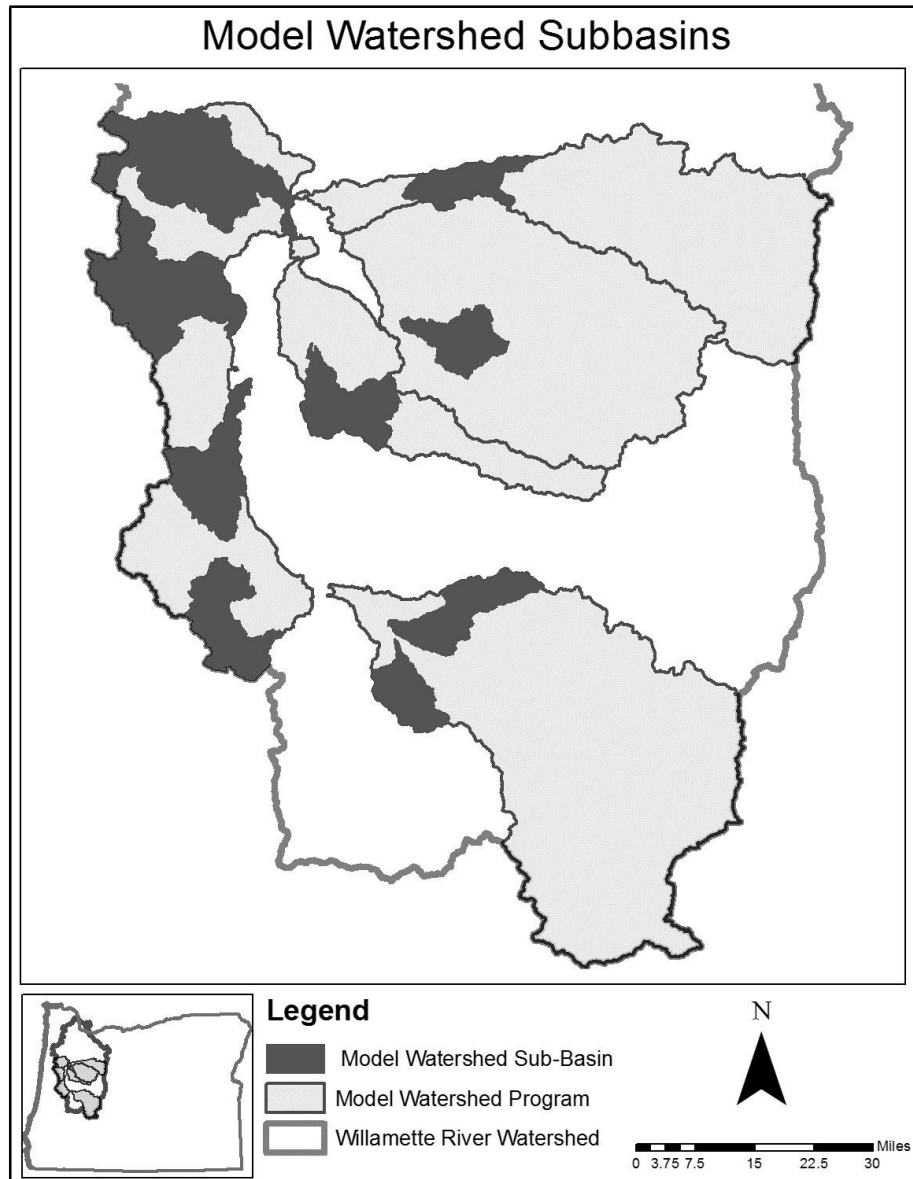


Figure 9. The river basins and sub-basins involved in the Willamette River Model Watershed Grant Program.

### 3.4 Describing the Cases

Past research has shown there are different factors that influence interactions and configurations of social-ecological systems. Examples include the work of Elinor Ostrom, which provide a foundation for much literature addressing natural resource management in socialecological systems. She identifies specific variables for understanding fisheries and water resources management in social-ecological systems (Ostrom, 2007, 2009). The resilience literature is another source for understanding context and content factors in underlying socialecological complexity (Anderies, Walker, & Kinzig, 2006; Chapin et al., 2009; Walker & Salt, 2012; Walker et al., 2006). Examples from case studies examining natural resource management in social-ecological systems provides further insights (Alberti et al., 2011; Liu et al., 2007; Naiman, 2013).

Figure 10. Box 1.

Variables describing differentiating factors in watershed social-ecological systems (adapted from Alberti et al., 2011; Andries, Walker, & Kinzig 2006; Armitage, Berkes & Doubleday 2007; Chapin et al., 2009; Ostrom 2007, 2009; Liu et al., 2007; Naiman, 2013; Walker & Salt 2012; Walker et al., 2006).

- Location
- Geography
- Spatial extent/size of a systems
- Ecological characteristics
- Ecosystem Processes
- Population size and demographics
- Socioeconomics
- Type and patterns of land use and ownership
- Social capital
- Social norms and performance measures
- Information sharing and social networks
- Regulatory and Administrative structures
- Leaderships
- Interactions with other social-ecological systems



Taken together these sources provide a guiding framework and variables, labelled *differentiating factors*, utilized in this research to distinguish the watersheds in the study area. These differentiating factors include: location, geography, spatial extent of a system (this can include a watershed), ecological characteristics, population, socioeconomic conditions, type(s) of land use, patterns of land ownership, social capital, social norms and performance measures, information sharing, social networks, regulatory and administrative structure, leadership, interactions and influences from other social-ecological systems. These are listed in Figure 10.

The seven major river basins that make up the study area have some or all of the differentiating factors described in Box 1. These variables are used to determine *watershed characteristics* that describe and differentiate the watersheds in the study area. These watershed characteristics include: basin size, population, pattern of land ownership, number and size of municipalities, transportation/road networks, geography, and land use patterns. Table 1 lists which differentiating factor variables are associated with a watershed characteristic.

Table 1. Relationships between the differentiating factors and the watershed characteristics used to create the watershed cases for analysis.

Differentiating Factor	Watershed Characteristic
Spatial Extent of a system	Basin Size
	Location
Type and pattern of land use and ownership	Federal and private land ownership
	Land use patterns
	Ease of transportation and extent of road networks.
Geography	Geography
Population and Demographics	Size of municipalities

Ecological characteristics	Presence of ESA listed salmonids
----------------------------	----------------------------------

After an initial analysis of the interview data some distinct trends and patterns emerged that further differentiate the watersheds in the study area. These include: evidence of an existing identity, length of time an individual or their family has owned a property, and social capital. These three factors, referred to as *initial interview findings*, were incorporated in the analysis structure for the project and contributed to the case study design (Table 2).

Table 2. Social-Ecological Context Factors associated with the initial interview findings.

Interview Finding	Differentiating Factor
Evidence of existing identity	<input type="checkbox"/> Socioeconomics <input type="checkbox"/> Type of land use- agriculture or private forestland <input type="checkbox"/> Social norms and performance measures <input type="checkbox"/> Information sharing and social networks
Evidence of existing Social Capital	<input type="checkbox"/> Social Capital
Length of Residence	<input type="checkbox"/> Location <input type="checkbox"/> Population size and demographics

The watershed characteristics and initial interview findings were used to create three cases: the West, South and East. Table 3 describes the watershed characteristics associated with each of these cases. Table 4 lists the initial interview findings that were associated with each case.

### 3.5 West Case

#### Watershed Characteristics

The West Case (Figure 11) is comprised of the river basins that drain the East slope of the Coast Range including the Luckiamute, Long Tom, and Marys Rivers and cover 2682 km<sup>2</sup>.

There are several municipalities including Eugene, Corvallis and Salem in the West Case and

good transportation corridors. These river basins are at least 90% privately owned with a mix of urban and rural residential areas and contain large tracts of private forestland and agricultural areas.

Table 3. The watershed characteristics used to establish the watershed cases.

Case	Basin Sizes	Federal and Private Land Ownership	Transportation and Municipalities	Population (Relative to other cases)	Salmonid Species	Geography	Land Use Patterns
<b>East Case</b> <b>North Santiam</b> <b>South Santiam</b> <b>Calapooia n=14</b>	5619 km <sup>2</sup>	Federally owned headwaters, areas of public land in upper half of basin.	Good road access and transportation. Close proximity to municipalities.	Medium	ESA listed Chinook, Steelhead	Drains west slope of the Cascades	Strong agricultural identity. Many rural residential areas.
<b>South Case</b> <b>Middle Fork Willamette n= 6</b>	3471 km <sup>2</sup>	Small private property in watersheds surrounded by federal lands. Almost 75% of the watershed is public land.	Limited road access and transportation corridors, isolated communities, few municipalities	Small	ESA listed Chinook	Drains west slope of the Cascades	Mostly private rural residential with some hobby farms.
<b>West Case</b> <b>Long Tom, Luckiamute, Marys River n=18</b>	2682 km <sup>2</sup>	All ~90-95% privately owned.	Good road access and transportation. Close proximity to municipalities.	Large	Cutthroat Trout	Drains east slope of coast range.	Large tracts of private of forestry lands, strong agricultural identity, identity associated with proximity to universities and municipalities. A mix of rural residential and more urban areas.

Table 4. Summary of the initial interview findings used to establish watershed cases.

Case	Existing Identity	Length of Ownership	Evidence of Social Capital
<b>East Case</b> <b>North Santiam</b> <b>South Santiam</b> <b>Calapooia n=14</b>	Agricultural identity. Long term ties to area/deep roots.	Almost 50% (7 out of 18) are multigenerational landowners	Relatively strong. Nearly all interviewees mentioned friends and neighbors. Roughly half heard about the council from a friend.
<b>South Case</b> <b>Middle Fork Willamette n= 6</b>	None identified. Perhaps individuals who cherish their privacy and want limited interactions with neighbors. People who tend to keep to themselves.	No multigenerational landowners	Limited. Many interviewees recently moved there. Few interviewees heard about council from friend. Typified by isolated communities with neighbors who generally keep to themselves.
<b>West Case</b> <b>Long Tom, Luckiamute, Marys River n=18</b>	Agricultural identity. Private forestland owner identify. Proximity to municipalities. Long term ties to area/deep roots.	Almost 50% (6 out of 14) are multigenerational landowners	Relatively strong. Nearly all interviewees mentioned friends and neighbors.

The rivers all have cutthroat trout, but no ESA-listed Steelhead or Chinook. For a number of reasons the watershed councils in this case are reluctant to formally partner with other councils and prefer to maintain their autonomy.

Landowner Interviewees

Four agricultural landowners, six rural residential landowners, and eight private forestland owners from the councils in the west case area were interviewed for this study. There was one interviewee from the West case whose interview data was not included. This person was originally included as a private forestland owner. During the interview it was determined they actually work for several large timber companies and therefore did not actually qualify as a private forestland owner.

### Initial Interview Findings Utilized

Based on the initial survey used to select the cases, about ~40% of the landowner interviewees from this case group described how their families have lived on their property for multiple generations; however, ~25% of the interviewees do not actually live on the property. Roughly three-quarters first learned about the watershed council from a mailing, email or phone call. Nearly every respondent referenced a friend or neighbor during his/her interview. There is also evidence of existing identity relating to proximity to a municipality, or private forestland or agriculture.

## 3.6 East Case

### Watershed Characteristics

The East Case (Figure 12) is comprised of the river basins draining the west slope of the Cascades including the North Santiam, South Santiam and Calapooia Rivers covering 5619 km<sup>2</sup>. There are several large communities in the East Case including Sweet Home, Lebanon and Albany, while the closest municipality is Salem. The area has good transportation corridors and significant agricultural activity. These river basins have ESA-listed Chinook and Steelhead and

are a mix of public and private land ownership. The headwaters of these river basins are federally owned while the lower portions are mostly private. The watershed councils in this area chose to formally partner and share staff and resources. This partnership is referred to as the CalSan partnership.

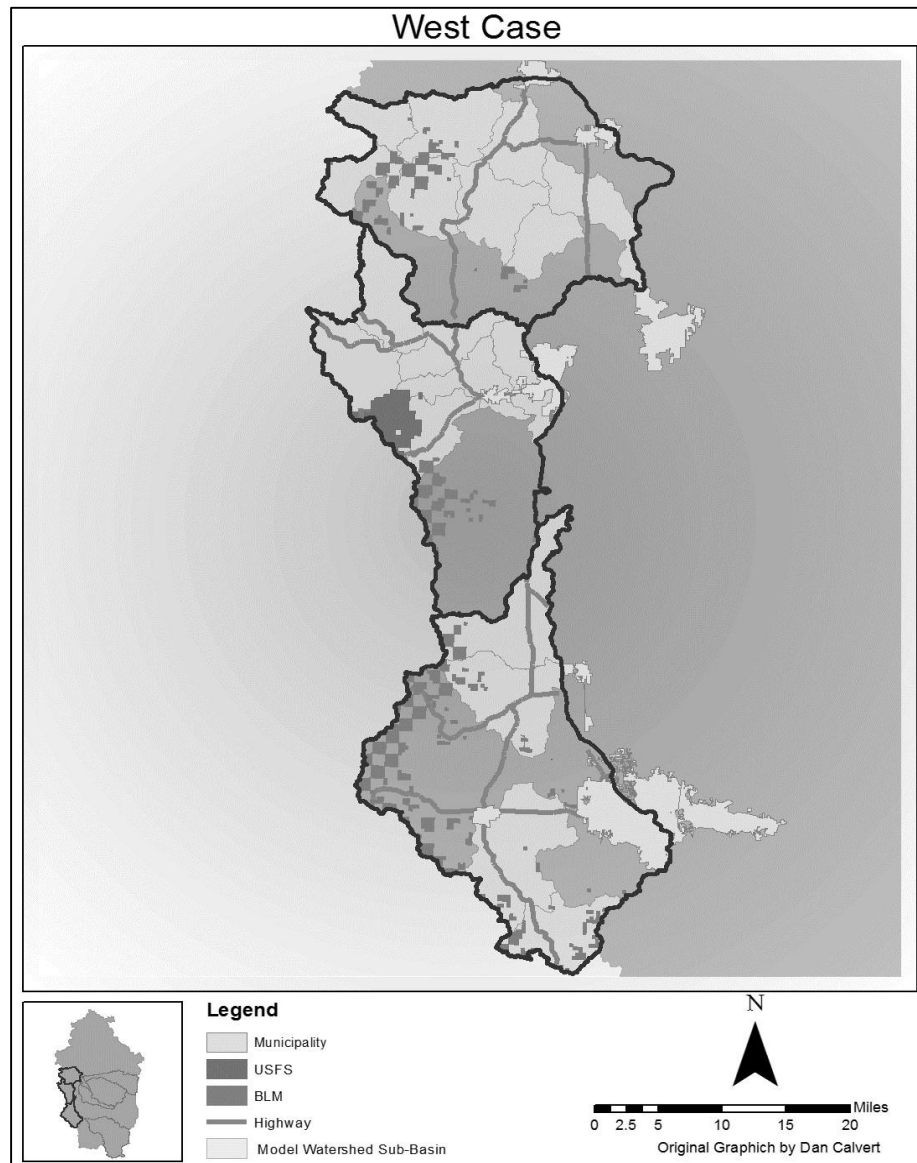


Figure 11. Watershed characteristics of the west case.

Landowner Interviewees

Nine agricultural landowners and five rural residential landowners were interviewed for this study.

### Initial Interview Findings Utilized

Based on an initial survey to select the cases, there is evidence of existing social capital in this area. The families of ~40% of the landowner interviewees have lived on their property for multiple generations, and almost every landowner actually lives on property involved in a restoration project. Roughly one-third learned about the council first hand from a friend, neighbor or relative. Nearly every respondent referenced a friend or neighbor during his/her interview. There is also evidence of existing identity relating to agriculture in the basin.

## 3.7 South Case

### Watershed Characteristics

The South Case (Figure 13) includes the Middle Fork Willamette River basin, which drains the west slope of the Cascades and is the largest basin in the study area at 3471 km<sup>2</sup>. This river basin is ~75% federally owned, primarily by the US Forest Service or the Bureau of Land Management (BLM). . There are only a few small communities in the South Case, and the closest municipality is Eugene. There are limited transportation corridors and many fairly isolated property owners. There is no dominant land use type on private property. The model watershed participants in this area are mostly rural residents with a few hobby farms and some private forestlands. This river basin has ESA listed Chinook. It is unknown if the council in this area has considered a formal partnership with other watershed councils.

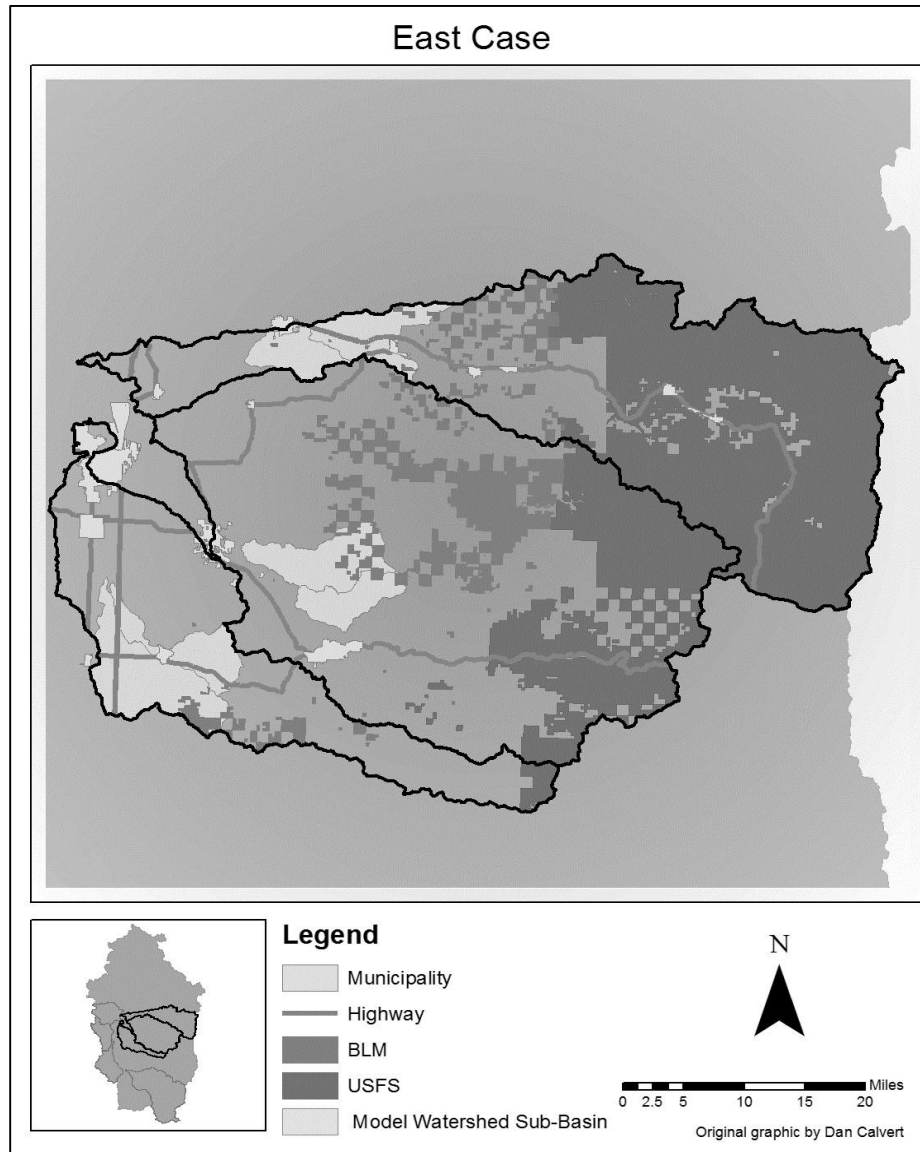


Figure 12. Watershed characteristics of the east case.

#### Landowner Interviewees

One agricultural landowner and five rural residential landowners were interviewed for the study.

#### Initial Interview Findings Utilized

Based on the initial survey to select the cases for the study area, there is little evidence of existing social capital. None of the landowner interviewees from this case have lived on their

property for multiple generations. Only two learned about the council first hand from a friend, neighbor or relative.

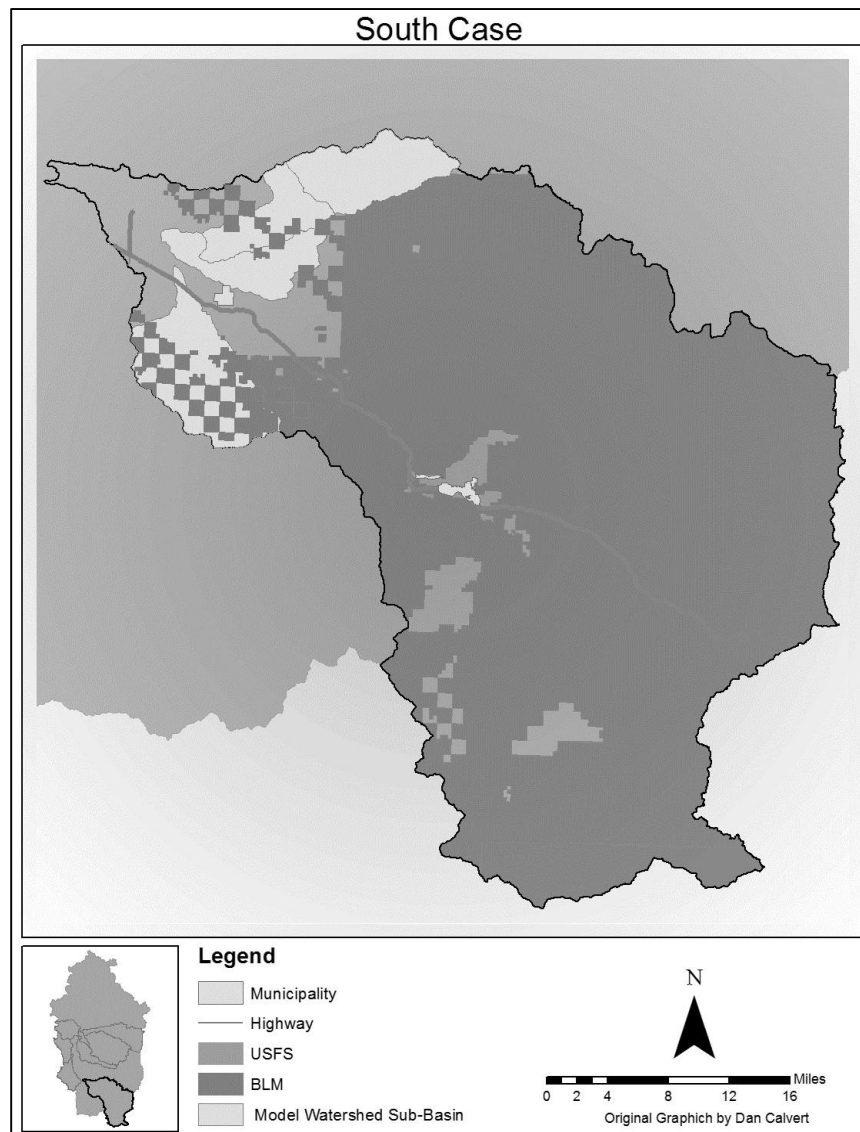


Figure 13. Watershed characteristics of the south case.

## CHAPTER 4: RESEARCH METHODS

### 4.1 Research Design

Research relating to social learning and natural resource management from a socialecological systems approach is often performed using qualitative interviews (Rodela,



Cundill, & Wals, 2012). This study used an explanatory case study format with an embedded, multiple case design (Yin, 2009). This type of case study format, with an interpretive inquiry approach, was also based on past examples of social learning research (Axelsson et al., 2013; Rodela et al., 2012). In addition, a purposive sampling strategy was used to identify representatives of the population of interest to interview. The sampling frame and sample development will be described further in this chapter. Finally, this research was performed using deductive and inductive analysis. The coding and analysis was performed in an iterative manner (Robson, 2002) using a content analysis approach to analyze the results of the interviews (Berg, 2006).

#### 4.2 Research Philosophy: Constructivism

An important construct of social-ecological systems in natural resource management is based on understanding how humans relate to their natural environments (Dyball, Beavis, & Kaufman, 2005). The topic has been explored by scholars from different philosophical camps relating to positivism and interpretivist epistemologies (Berkes et al., 2003). The foundational underpinnings of these divergent beliefs stem from scientific, disciplinary, and philosophical differences. The research philosophy associated with this project aligns with the qualitative constructivist paradigm (Cupchik, 2001), which is also well suited for exploring socialecological interactions (Berkes et al., 2003), social-ecological complexity (Cundill, Fabricius, & Marti, 2005). and social learning (Keen et al., 2005).

Much of the research addressing the functioning of natural systems and natural resource management has used positivist approaches (Berkes et al., 2003). The positivist tradition rests on the idea that there are absolute truths and reality that exists independently of humans (Guba,

1990). The positivist research tradition does not always capture the complexities of socialecological systems and underlies some of the shortcomings associated with command and control natural resource management (Berkes et al., 2003).

Constructivism is based on the understanding that reality and perceptions are influenced by social factors (Lincoln & Denzin, 2011). Constructions of reality are “not more or less true” (Denzin & Lincoln, 1994, p. 111), but stem from the perception of an individual as he/she interacts with the world. Constructivism recognizes that the perceptual lens of a researcher is shaped by life experience. This highlights the concept of the researcher as an instrument associated with qualitative, inquiry based research (Creswell, 2003).

The subject matter of this study, social-ecological systems, relates to how individuals conceptualized and choose to interact with their local environments. This is not a concept that can readily be captured with quantitative measures (Diduck, 2010). Researching these topics necessitates interpreting multiple view points and knowledge systems (Cundill, Fabricius, & Marti, 2005). Learning for resilience involves understanding changes in how an individual views the world (Krasny, Lundholm, & Plummer, 2010). Based on these factors the constructivist paradigm provided the strongest approach for interpreting the results of the study.

#### 4.3 Sampling Frame and Participant Recruitment

The sampling frame was dictated by the geographical scope of the seven watersheds, the model watershed sub-basins in the study, and the populations of interest. Initially all seven watershed councils agreed to the random stratified sampling strategy to develop the landowner sample. However, three of the councils later chose to use a stratified and non-random approach.

A total of 61 interviews were conducted with 21 watershed council staff and 40 private landowners using a semi-structured format to encourage a free flow of information and to address the research objectives. The sampling and recruitment process strategies for watershed council staff and private landowners are described below.

#### 4.4 Watershed Council Staff Selection and Recruitment

Every watershed council staffer who had regular contact with private landowners was included in the sampling frame. A minimum of two watershed council staff members from each individual watershed council were asked to participate: one serving in a leadership role, another in a staff or volunteer role. Existing research indicates the importance of interviewing an organizational leader and a subordinate as a means of getting an objective perspective (Lubell, 2004). Watershed council interviewees included seven individuals serving in a leadership position (i.e. coordinator or executive director), two landowner outreach coordinators, four ecological monitoring coordinators, five administrative staff, and three education and outreach staffers for a total of 21 interviews.

#### 4.5 Private Landowner Selection and Recruitment

The initial random sample of private landowners was comprised of residents who met the following criteria: (1) lived in one of the model watershed sub-basins; (2) fit a specific land use category; and (3) had allowed watershed council staff access to their property for restoration or survey activities at some point in the past. In addition, the landowner sample was stratified to capture riparian landowners whose actions impact salmon recovery and water quality (Allan, 2004). The stratification categories were: 1) rural residential; 2) agricultural practitioners; and 3) non-industrial timber landowners (properties <500 acres in size).

In December 2012 a list of watershed residents was provided by watershed council staff resulting in a frame of individuals from four watersheds: the Marys River (n=337), Long Tom (n=177), Luckiamute (n=58) and Middle Fork Willamette (n=75). These individuals all fell into one of the three stratification categories. This initial list had no names or other means of identification. Instead each landowner was assigned a number (1-647) then a random number generator was used to create a list of 12 potential interviewees from each of these four watershed councils.

Participants from the remaining three watersheds, North Santiam, South Santiam and Calapooia, were non-randomly sampled. The watershed councils provided a list of every landowner (n=30) who had allowed the local watershed council to do a project on his/her property

#### 4.6 Sample Development and Participant Recruitment

The watershed councils involved in the study are distinct, autonomous organizations with unique means of interacting with local private landowners. During the planning of this research project it became clear that there is significant rapport and trust between the watershed council staff and the private landowners. Watershed council staff members are very protective of these relationships. The research protocol was carefully designed to not disrupt those relationships.

Because each watershed council has a specific communication approach it was not appropriate to write a generic script for the watershed council staff to use when recruiting private landowners. The watershed council staffer provided a general description of the research project and the objectives in a manner they deemed appropriate for the specific landowner. Furthermore, watershed council leaders indicated they believed asking the private landowner interviewees to

sign a written consent document might make many respondents uncomfortable. They believed this might negatively influence the study and potentially affect their own relationships with the landowners. In an effort to address these concerns they preferred a verbal consent document to be used in the study (Appendix B).

Starting in December, 2012 a representative from each watershed council contacted the landowners selected from within their watershed and told them that, pending his/her approval, a researcher from OSU would soon be contacting them. During this initial contact with each land owner the watershed council staff indicated they were comfortable with and had agreed to participate in the study. Importantly, they did not ask the private landowner to participate. They indicated that whether or not the private landowners decided to participate in the study would in no way impact his/her relationship with the watershed councils.

The researcher attempted to contact 65 private landowners and arranged interviews with 42 individuals. Three of these 42 cancelled the interviews at the last minute. Of the remaining 13, twelve never responded to multiple contact attempts and one individual declined to participate. Thus the total sample for private landowners was 39 interviews. If a private landowner did not agree to be contacted, he/she never interacted with, nor had his/her name or contact information divulged to the research team. If the private landowner agreed to participate, his/her name and contact information was provided for inclusion in the study.

Starting in January 2013, landowners who agreed to participate were contacted by the researcher. After a brief introduction the private landowners were asked if they had any initial questions as to the purpose of the interview. During this initial contact a scripted statement detailing the purpose of the study was read (Appendix B) and the landowner was asked whether

he/she was willing to participate. Permission to record interviews was sought, and all interviewees agreed to this.

#### 4.7 Interviews and Data Collection

##### Watershed Council Staff

Interviews with council staff began in January 2013 and was completed by July 2013. During the initial contact the researcher explained that all responses were completely confidential, that no identifying information would ever be made public, that participation in the study was completely voluntary, and that participation would not impact his/her job in any way. The semi-structured interviews ranged in length from 15 to 90 minutes and averaged roughly 40 minutes in length. Audio recordings of the interviews were made. The watershed council staff member's name was not mentioned during the interview process.

The interviews were performed in a variety of locations including watershed council offices, coffee shops and restaurants, and inside a car. A common format was a visit to the watershed council office and meeting in a private room or office with different council staff. Before initiating the interview the student researcher provided a copy of the explanation of research document (Appendix B). He next read the verbal consent document and provide a written copy to the interviewee (Appendix B). Once the interviewee had indicated his/her willingness to proceed by the interview began.

Upon completion of an interview the student researcher spent 10-30 minutes writing a reflection on the content of the interview. This reflection described the setting, mannerisms of the interviewee, and noted important points.

##### Private Landowners

The private landowner interviews were conducted between January and May, 2013. The semi-structured interviews ranged in length from 15 to 90 minutes and averaged about 40 minutes in length. Audio recordings of the interviews were made, and the landowner's name was not mentioned during the interview process.

After agreeing to participate the student research asked whether or not the individual preferred to speak in person or over the phone. In some instances trying to arrange a time for face to face interviews proved too challenging, thus leading to a phone interview. The interviews occurred in different locations ranging from coffee shops and restaurants, personal residences and outdoor settings. Before initiating an interview the student researcher provided a document explaining the purpose of the research (Appendix B). The student researcher then read the verbal consent document and provided a written copy to the interviewee. Once the interviewee has indicated his/her willingness to proceed, the interview was performed (Appendix B).

The private landowner interviews were audio recorded and transcribed in the same manner as the watershed council staff interviews. The data were also stored and analyzed in the same manner.

#### 4.8 Data Management

A master list matching the numbers from the original list to the names of landowners who agreed to participate (without contact information) was created. This master list was stored in a separate file on the PI's OSU server account. To ensure confidentiality of the respondents there was never a document that contained the numbers, names, and contact information of the private landowners stored on the researcher's computer. Instead the researcher maintained a printed hard copy under lock and key in his personal residence. The audio recordings were transferred to the

password protected computer of the researcher and subsequently erased from the audio recorder. The interviews were transcribed verbatim into written text by the researcher (5 interviews) or a professional transcription service (55 interviews).

#### 4.9 Data Analysis

The qualitative data analysis software, NVivo, was used to analyze the verbatim interview transcripts. The coding was an iterative process using a content analysis approach to find themes and concepts (Berg, 2006). Due to the interpretive, constructivist approach of the data each stage of coding is both deductive and inductive; however some stages are more soundly grounded in the literature than others and are thus described as deductive.

The analysis and reporting are influenced by past research, the literature, and the data. Social learning and adaptive capacity are not linear. The literature on both describes the importance of recognizing iterative processes of critical reflection. Past thinking on complex adaptive social ecological systems commonly observes spatial and temporal disparities. This project found what is observed in the literature; analysis of social learning, adaptive capacity, and social-ecological interactions involves describing events occurring in different places, at different rates that are interconnected in different ways. I believe this can be linked to the concept of complexity. Because of this one portion of coding was an iterative process that in some instances lacks clearly discernable boundaries and distinct stages. It also involved connecting disparate ideas and relationships. In the following passages I describe how I applied the relevant literature to relationships that emerged from trying to understand learning and adaptations in response to social-ecological complexity.



Initially each transcript was coded for examples of social learning as defined by Keen et al., (2005). This initial round of coding involved at least five passes. Later in the analysis process each transcript was coded at least ten more time as new concepts and ideas emerged through the iterative analysis process. During these subsequent ten codings specific themes and concepts were counted to create descriptive statistics.

#### 4.10 Social Learning Analysis

The systems based analytical approach outlined by Keen et al., (2005) provides a framework for identifying social learning in collaborative natural resource management partnerships. Through evaluation of past case studies they found five orienting concepts to evaluate social learning in environmental management: reflection, systems orientation, integration, negotiation and participation (Figure 14). The strands interact and overlap but each is important and provides guidance for identifying, prioritizing and managing change in socialecological systems. This approach was used for identifying examples of social learning in this project. The first two levels of coding were based on this framework. Each level of coding was deemed complete once a transcript had been coded on separate occasions with the same block of text and themes consistently associated with each other.

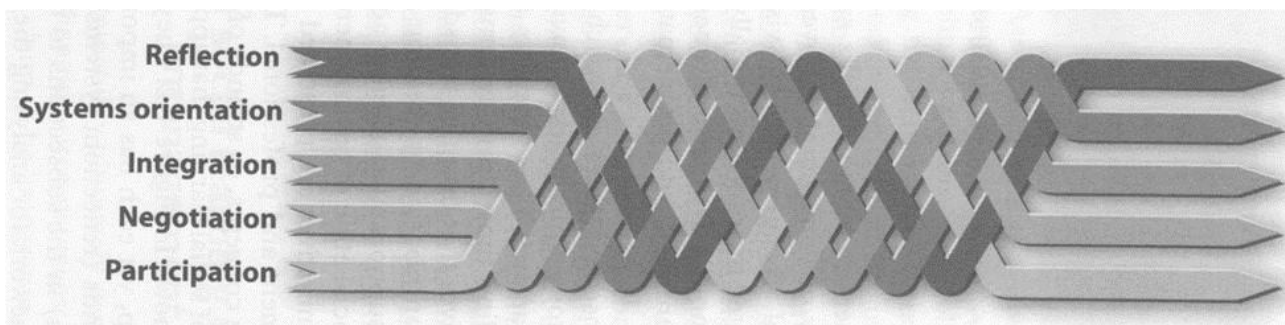


Figure 14. The "five braided strands" of social learning. This figure illustrates the nature of the five strands utilized to operationalize social learning (taken from Keen et al., 2005).

#### 4.11 Codebook Description: Social Learning Analysis

The social learning analysis involved three distinct levels of deductive coding. The primary coding approach associated blocks of text with different themes associated with social learning. Each transcript was coded at least twice during primary coding. Secondary level coding of social learning related to the five strands of social learning (Keen et al., 2005). Table 5 displays the codebook for the primary and secondary coding associated with the Social Learning Analysis. The primary and secondary coding was primarily deductive.

Table 5. Codebook for the Social Learning Analysis primary and secondary coding

Primary Code	Secondary Code-The five braided strands
<b>Social Learning</b>	<b>Negotiation</b> -Actions that build social capital, establishing rapport and relationships and better communication and information sharing
	<b>Participation</b> -Actions that build social capital, relationships and perception of mutual obligations and potential.
	<b>Reflection</b> - Statements (or actions) that reflect diagnosing what matters, designing what could be, developing a deeper understanding from evaluation of practical experiences. Recognition of the connections between individual and community actions and attitudes, and actual and potential on the ground outcomes.
	<b>Systems Orientation</b> - Statements (or actions) that reflect awareness of connections between individual and community actions and condition of watershed and/or ecosystem.
	<b>Integration</b> - Descriptions of experiences or interactions resulting in altered epistemological perspectives and increased understanding. The application of a variety of factors and information sources for innovative decision making.

During the third level of the Social Learning Analysis deductive coding was performed to look for examples of loop-learning (Löff, 2010; Pahl-Wostl, 2009), and social capital (Berkes, 2009a; Eames, 2005; Pretty & Smith, 2004; Pretty, 2003) (Table 6). This level of coding was performed on the blocks of text identified in coding levels one and two of the Social Learning

Analysis. Coding for loop-learning focused on double-loop learning occurring in contexts highlighting changing awareness of social-ecological systems and the connections between human and natural systems. The coding for social capital involved identifying the examples of, and differences between bonding, bridging and linking capital.

Table 6. Codebook for the third level of coding of the Social Learning Analysis.

<b>Third Level Coding</b>	
<b>Double-Loop Learning</b>	<b>Social Capital</b>
Learning based reflection on the connections between human and natural systems. Changes in guiding set of assumptions in the ability, and manner in which humans interact with and influence watershed ecosystems.	<b>Bonding capital</b> -occurs within groups <b>Bridging capital</b> -occurs between groups <b>Linking capital</b> - occurs between groups with different hierarchical structure.

The fourth level of coding was iterative and inductive. During this level of coding a new set of social learning variables were developed. These variables were based on the emergence of three main interconnected themes that underlie social learning and included: 1) information from ecological monitoring data; 2) motivation to act; and 3) barrier removal. These new variables provided a means of operationalizing social learning. These are separate but interconnected variables with non-linear relationships. The non-linearity of these variables is based on recognizing social learning is an ongoing iterative process. These variables provided a means of reporting results to interpret relationships in the data. This level of coding linked the three social learning variables with social-ecological characteristics. Social-ecological characteristics include differentiating factor variables (Box 1), and patterns that emerged relating to the landowner stratification categories, watershed councils, individual model watersheds and the watershed cases.

Table 7. Factors included in the iterative coding to understand learning in complex adaptive social-ecological systems.

<b>Fourth Level Coding</b>
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New Social Learning Variables	Social-Ecological Characteristics
<p><b>Ecological Monitoring Data-</b> information describing ecosystem condition and processes.</p> <p><b>Motivation-</b> Based on receiving and processes information. Occurs through peer-to-peer interactions and via other outreach</p> <p><b>Barrier Removal-</b> provision of funds, expertise and other support to implement restoration projects. Recognition that watershed councils are non-governmental and non-regulatory.</p>	<p>Landowner stratification categories</p> <p>Watershed Case-West, East, South</p> <p>Watershed Council</p> <p>Individual Subbasin-</p> <p><b>Differentiating Factors-</b></p> <ul style="list-style-type: none"> <li>□ Location</li> <li>• Geography</li> <li>• Spatial extent/size of a systems</li> <li>• Ecological characteristics</li> <li>• Ecosystem Processes</li> <li>• Population size and demographics</li> <li>• Socioeconomics</li> <li>• Type and patterns of land use and ownership</li> <li>• Social capital</li> <li>• Social norms and performance measures</li> <li>• Information sharing and social networks</li> </ul>

The fifth level of coding found communities of practice and was deductive (Nykqvist, 2014; Pahl-Wostl, 2009; Wenger, 1998, 2010). Coding for COP also involved finding instances where bridging social capital changed to bonding social capital (Pretty & Smith, 2004).

Table 8. Codebook describing communities of practice.

Fifth Level Coding
Communities of Practice
<p>-Existence of an intentional learning community based on mutual concerns and interests.</p> <p>-Use of common terms to describe and discuss events and concepts.</p> <p>-Development or existence of cultural norms and social networks.</p> <p>-The existence of bonding social capital, and/or bridging social capital changing into bonding social capital.</p>

#### 4.12 Codebook Description: Adaptive Capacity

The coding for adaptive capacity was deductive and inductive (Table 9). This analysis was deductive and based on examples in the literature but it was inherently subjective and thus partly inductive. Coding for adaptive capacity related directly to the outcomes from the coding

for social learning described above. Adaptive capacity included: purposive action(s) based on changed awareness of social-ecological systems and underlying social-ecological interactions; and actions and decisions made to move social ecological systems towards a desired range of conditions (Armitage et al., 2007; Chapin et al., 2009). Determinants of adaptive capacity were based on decision making and actions, associated with social learning, made with an intent to influence the condition of a watershed ecosystem. They also include what could be perceived as changed recognition of the connections between human and natural systems. Because of the relationships among adaptive capacity, social learning and complexity, coding for adaptive capacity was iterative. The third level coding was inductive based on patterns that emerged relating to the landowner stratification categories, model watershed sub-basins, the watershed cases, and to patterns associated with COP.

Table 9. Adaptive capacity codebook

Primary Code	Secondary Level Code	Third Level Code
Social Learning	<b>Adaptive Capacity-</b> Actions and decision making driven by social learning to move a social-ecological system towards a desired range of conditions.	<b>Landowner type</b> <b>Model Watershed Subbasin</b> <b>Watershed Case</b> <b>Watershed Council</b> <b>Community of Practice</b>

#### 4.13 Study Limitations

While this study was designed with a high level of scientific rigor there were limitations. The use of a purposive sampling strategy in a specific geographic area, and case study format limits the generalizability of the results. The inferences made from this study should be carefully applied to the sampling frame associated with this study. Many landowner interviewees speculated as to why their friends, neighbors and relatives might be reluctant to cooperate with a

watershed council. The opportunity to actually speak with some of these individuals would likely have benefited the study and added to the generalizability of the results. However, this was not an option for a number of reasons.

Staff from several watershed councils involved in the study were not comfortable with the research team interacting with private landowners who were not currently willing to work with a watershed council. In order to have a uniform approach across all seven basins this population segment was not included in the study. Additionally, it would have proved challenging to develop a representative sample of landowners who had not allowed the watershed council to access their property.

The project was designed and implemented with well-established boundaries and protocols agreed upon by all seven participating councils. It took more than two years of conversations between watershed council staff and the OSU research team to develop the study design. While the final protocol could have been improved upon, the project would not have moved forward without the cooperation of all seven watershed councils. The final protocol represented a middle ground that allowed the research team to interact with the private landowners in a manner all seven watershed councils approved.

## **CHAPTER 5: RESULTS**

### **5.1 Introduction**

The qualitative nature of this study means the findings are not linear. Interpreting the results necessitates describing social-ecological interactions in which many interrelated but separate occurrences are happening at the same time. My analysis approach attempts to bridge events and ideas spanning differing temporal and spatial scales by focusing on discrete ideas and

concepts. I approach this by identifying specific uniform themes and concepts that occur, do not occur or simultaneously occur in The East, West and South cases to explore patterns in actions and to attempt to tease out significant differences. The interviews present a rich source of data that could be interpreted to describe different phenomena. For the purposes of this dissertation, I have synthesized the information for analysis. I have chosen to focus on explaining examples that I perceive underlie the definition of adaptive capacity including social learning, social capital and communities of practice (COP). This chapter will define and then identify the ways in which social learning, social capital, and COP interact within and across the three cases to influence adaptive capacity keeping in mind that these concepts are overlapping and often simultaneous. When reading this chapter the numbers of landowners from each case should be kept in mind as well: West case n=18, East case n=14, South case n=6.

## 5.2 Adaptive Capacity

The literature and study findings recognize that adaptive capacity is a process not an endpoint. In this project, adaptive capacity is based on different ways respondents recognize watershed ecosystems as social-ecological systems, which include humans in ecosystem processes, and that adaptive capacity is exemplified by actions, driven by social learning, with the intent to have influence on a watershed ecosystem. Examples of adaptive capacity actions occurring among private landowners includes changed land use and/or project implementation. For private landowners, the focus is almost always on a single local watershed. Within each watershed, examples of adaptive capacity actions among watershed council staff include changed institutional structures and processes within their organizations. Adaptive capacity is not discussed beyond this point. The results only examine what led to the increased adaptive capacity action described above.

### 5.3 Social Learning

I analyze social learning based on the emergence of three main clusters of findings that include: 1) gathering and dissemination of information from ecological monitoring data; 2) that leads to motivation to act; and 3) leads to the removal of barriers to act. These ideas represent the variables used to describe social learning. While these are distinct ideas they are interrelated (Figure 15). They are often intertwined and overlapping. Ecological monitoring data usually relates to water quality or fish populations. Importantly water quality data is most significant in the context of fish recovery. Ecological monitoring provides a window to understand ecosystem processes and the condition of watershed ecosystems. Motivation describes interest in acting to influence or improve a watershed ecosystem and is driven by information. The source of information, and the manner in which it is delivered, influences motivation, such as monitoring data that leads to changed understanding of ecosystem processes. There are additional sources of information, as well as different methods of delivering it such as education and outreach that influence motivation. However, information delivered through peer-to-peer interactions is generally the most significant. The concept of “barriers” describes impediments toward acting to influence or change a watershed ecosystem. One significant barrier is landowner support for a land use change or restoration project on their property. Another major barrier is the acquisition of funds and expertise to implement restoration projects. Attitudes towards government and environmental/land use regulations are an additional barrier. Almost every landowner expressed frustration and mistrust towards governmental agencies. Many landowners are very reluctant to interact with a government agency if it can possibly be avoided. The results describe examples and situations in which barriers are removed.



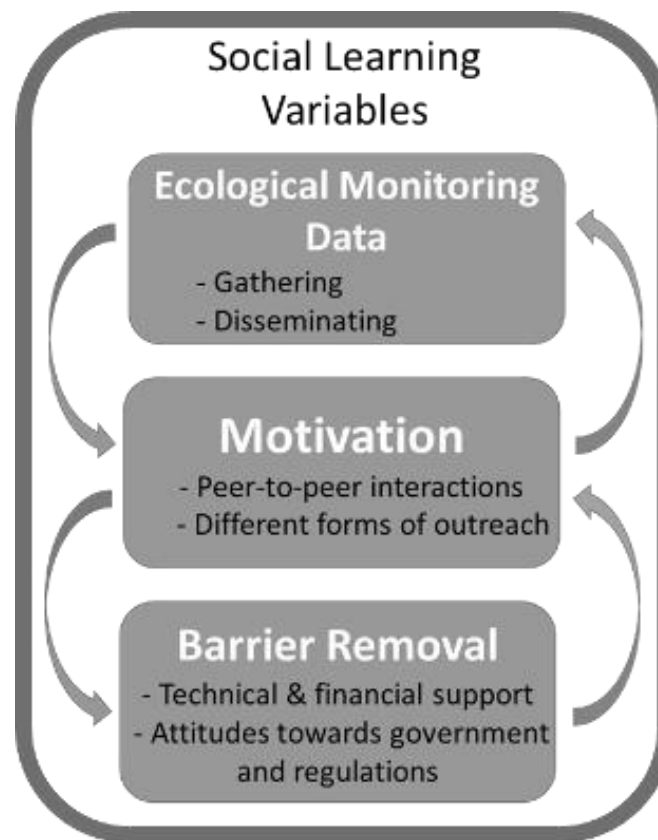


Figure 15. Interconnected social learning variables.

Watershed councils remove barriers to financial and technical support in different ways. One important form of barrier removal involves watershed councils clarifying what they are, and, what they are not. These organizations must work hard to not be perceived as advocacy based environmental organizations with an agenda. They also need to identify themselves as non-governmental, non-regulatory organizations. However, they also remove barriers by acting as a middlemen or conduits allowing private landowners to access funds and expertise from governmental sources. For example, in the East case watershed council staffs specialize in helping agricultural landowners sign up to participate in the Conservation Reserve Enhancement Program (CREP). In CREP programs farmers agree to take land out of production for 10-15 years and move it into restoration. The restoration projects are paid for and the farmer receives

an annual payment to offset lost revenue from the property. The removal of different kinds of barriers is described in the different cases.

#### 5.4 Social Capital and Communities of Practice

The literature describes social capital and communities of practice as key contributors to social learning (Keen et al., 2005). The study findings present different patterns and means of describing social capital and communities of practice (COP). Figure 16 is a conceptual model illustrating the relationships between the social learning variables, social capital and COP in social learning and adaptive capacity. The social learning variables, social capital and COP are distinct but interrelated concepts. They influence each other in different ways, importantly in a non-linear manner. This non-linearity underlies the fact that social learning is an iterative process. Social capital is a key component of COP, but the existence of social capital doesn't always indicate a COP. One way I recognize the existence of a COP is when social capital moves from bridging to bonding.

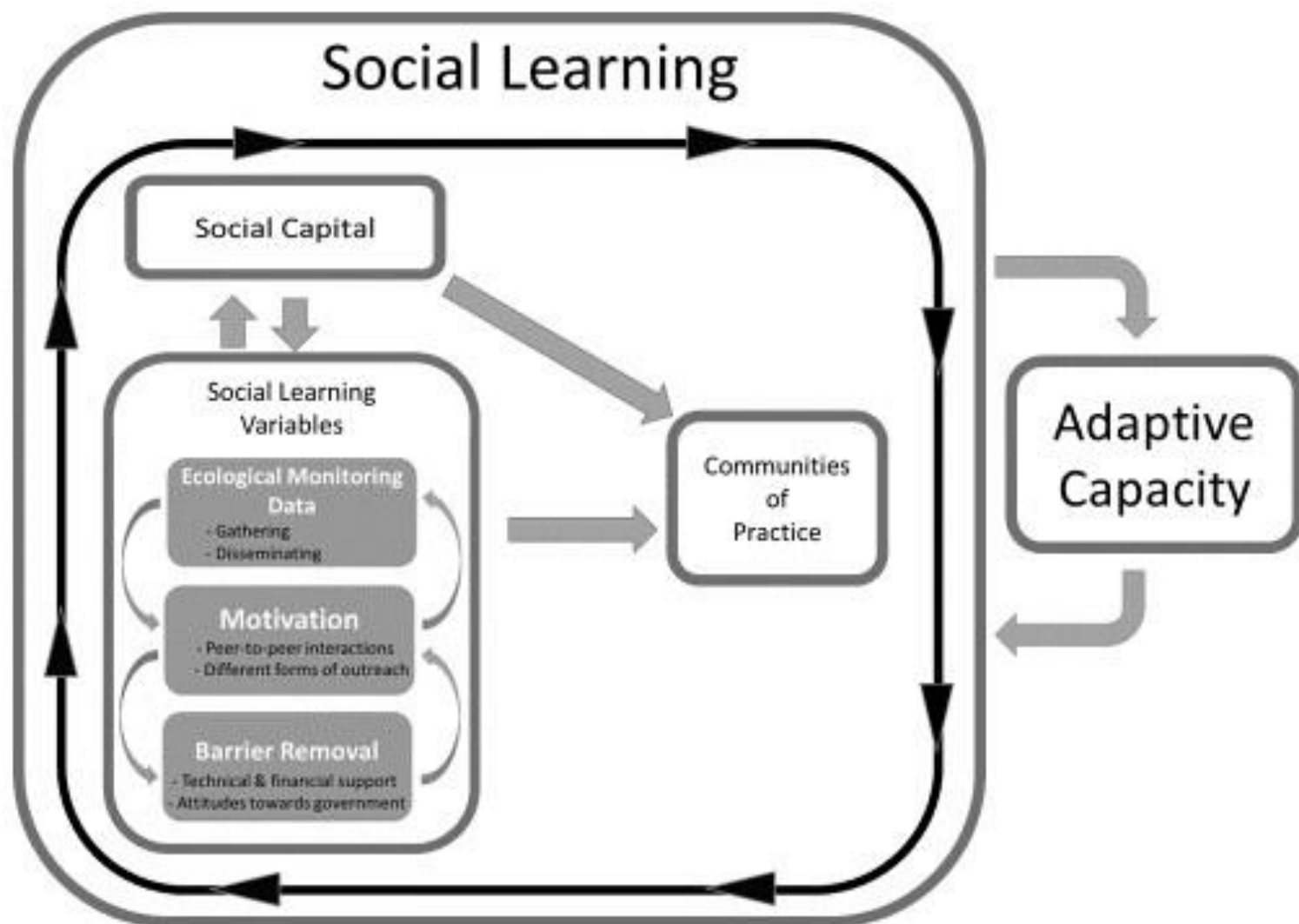


Figure 16. Relationships among social learning, social capital, communities of practice and adaptive capacity.

### 5.5 Landowner Awareness of Watershed Councils

Landowner awareness of the existence of a watershed council is an essential step in their cooperating with one. Table 10 displays where landowners first learned about the existence of the local watershed council, can be broken down into two categories. The first is indirect contacts through mailings, flyers, emails phone calls, etc. The second is a direct in-person contact from an actual person. One important finding is that in all three cases is sometimes took multiple contact

efforts for landowners to begin interacting with a watershed council. The percentages in the columns do not add up to 100% because some people forgot where they first learned about the watershed council.

Table 10. Where landowners first learned about the local watershed council.

	West Case (n=18)		East Case (n=14)		South Case (n=6)	
Where did landowner first learn about the local watershed council?	74%	Mail, email, or phone	36%	Mail, email, or phone	33%	Mail, email, or phone
	11%	From a friend, neighbor, or relative	36%	From a friend, neighbor, or relative	33%	From a friend, neighbor or relative
	6%	Agency or organization	14%	Agency or organization	17%	In-person contact from watershed council staff
	47%	Took multiple contact Efforts	36%	Took multiple contact efforts	36%	Took multiple contact efforts

There are three main types of multiple contacts: 1) some combination of a mailing, email and/or a phone call from a watershed council; 2) a mailing/email or phone followed up with contact from a friend who urged the landowner to work with the watershed council; and 3) a mailing or phone call followed up by in-person contact from a watershed council staffer.

This passage from a landowner in the West case provides an example of multiple contacts. When asked how he first learned about the local watershed council he said “They sent me a letter and then they called me by phone.” A statement from a landowner in the East case provides an example of multiple contacts involving a neighbor and mailings. He said he’d received mailings from the watershed council in the past and never opened them. When reflecting on why he finally opened one he said “We get a lot of mailings. I think maybe a neighbor - I think that's what alerted me to it being something I should pay attention to...he alerted me that it was a pretty good thing.”

When a friend or neighbor tells a landowner about a watershed council it involves social capital being spent.

Some examples of agencies or organizations referenced in Table 10 include the Oregon Small Woodlands Owners Association, the National Resource Conservation Service, a Soil and Water Conservation District, the Oregon Department of Fish and Wildlife, or the Oregon Department of Agriculture. When a landowner learned about a watershed council from an agency he/she was generally trying to access funds or seek expertise to implement a project on his/her property. The manner in which landowners first learned about the local watershed council relates to motivation and barrier removal of social learning variables. In this set of findings, motivation is initiated as landowners first learn about and begin cooperating with a watershed council. Knowledge about a watershed council is a critical step in barrier removal and access to resources supporting watershed restoration efforts.

In the West case 75% (n=14) of respondents first learned about the local watershed council by phone, email or mailing. Two respondents could not remember where they first learned about the watershed council. With two exceptions every private forestland owner in this case learned about the local watershed council through a mailing or email. In one of the three watershed councils in the West case more than 50 percent (n= 6) of the respondents knew one particular watershed council staffer prior to cooperating with the watershed council. These individuals said their relationship with this staffer influenced their willingness to cooperate with the council. This is an example of social capital. This passage from a West case private forestland owner describes how this staffer spent existing social capital, "I knew [name]...She's a member of the Small Woodlands Association which I'm involved in... She just sent an email I think, and said, 'We've

got this project going. Would it be okay if we have access to your property?’ I said, ‘Sure. No problem.’”

In the other two watershed councils in the West case respondents only knew staff through interactions with the watershed council.

In the East case about one-third ( $n=5$ ) of respondents first learned about the local watershed council by phone, email or mailing. One landowner first learned about the watershed council because she saw council staff working on their neighbor’s property. In the East case about one-third ( $n=5$ ) of the landowners learned about the local watershed council from a friend. Among agricultural landowners in the East case about three-quarters ( $n=7$ ) first learned about, and were encouraged to work with the watershed council from a friend. This is an example of peer-to-peer interactions, and social capital being spent in support of watershed restoration. In the West case it took multiple contact efforts in almost half ( $n=9$ ) the respondents, while in the East case it was only one-third ( $n=5$ ). This might be explained by the greater number of landowners who learned about the watershed council directly from a friend through peer-to-peer interactions in the East case.

In the South case 33% ( $n=2$ ) of respondents first learned about the local watershed council by phone, email or mailing. In the South case 33% ( $n=2$ ) of the landowners learned about the local watershed council from a friend. One landowner could not remember where he first learned about the watershed council. One landowner first learned about the watershed council directly from a council staffer who was going door to door introducing herself and the watershed council. 33% ( $n=2$ ) required multiple contact efforts to begin cooperating with the watershed council.

### 5.6 Double-Loop Learning and Ecological Monitoring Data

In all three cases there are examples of double-loop learning relating to ecological monitoring data, water quality and fish populations. The changed frame of reference of doubleloop learning involves new perspectives on the ways in which private landowners can influence watershed ecosystems through land management. Monitoring data couched in the context of fish recovery can increase motivation to enhance a watershed ecosystem. There are several interrelated findings that relate to ecological monitoring data. Ecological monitoring data influences different social learning variables based on: 1) the manner in which is it gathered or collected; 2) the way it is disseminated; and 3) the context in which it is presented.

Table 11. Respondents who mentioned monitoring data.

	%	%
Case	Respondents who mentioned monitoring data	Mentioned receiving this monitoring data from the watershed council
West (n=18)	67%	92%
East (n=14)	50%	36%
South (n=6)	83%	0%

The landowners in the three cases discussed ecological monitoring data differently. Table 11 displays whether or not respondents mentioned something related to monitoring data; this spans a simple mention of concern or interest about water quality all the way to collecting and interpreting monitoring data. The most significant pieces of information in Table 11 relate to the fact that in the West case 92% (n=17) of respondents said they had received some form of information about monitoring data from the watershed council. In the West case more council staff indicate they try to disseminate monitoring data to landowners when compared to the East and South cases.

With a few exceptions west case respondents do not specifically mention monitoring data from their property. Instead they reference the results of monitoring data from the greater watershed. For example an agricultural landowner with a watershed council facilitated CREP project on his property said

...it's kind of cool to see the stream coming back into a natural state. We've already seen the results with our upstream neighbors getting involved in the project. Seeing the water flow and how much clearer it is and colder...

These findings from the West case demonstrate the connections between monitoring information and motivation to support a project. This is an example of information influencing motivation. The CREP project facilitated by a watershed council is a removed barrier.

In the East case there is more evidence of double-loop learning resulting from monitoring data linked to individual properties than in the West case. When describing the relationship between monitoring data and his support for a restoration project on his property an agricultural landowner said, "At first I really wasn't looking at the conservation side of it as much as I was to get some help with some fencing...most people would tell you, there's no fish there [the stream on his property]."

He then mentioned that staff from the watershed council did a fish survey in the creek on his property. When discussing the results of this survey he said

...the thing that amazed me through that whole deal was how many fish were still living in there...Nobody thought there was any fish in there, but there were tons of fish. After all the problems that were there [referring to invasive species, straightened stream channel and lack of riparian vegetation], there were still fish



living in there...The more that I looked into and studied it, it seemed like a worthwhile project; it seemed beneficial to the land. I just went ahead and decided to cooperate...

Another example of double-loop learning from the East case come from an agricultural landowner. He was initially very reluctant to take land out of production for a restoration project. However, he did allow the watershed council to collect water temperature data from his property. He said this

...I knew that that was what they were after, was to cool the water down. To try and shade that creek to cool the water. Eric had that [temperature] monitor over here and the one down there at [neighboring property]. He sends me a read out on it...

The results showed a 10° F increase in water temperature over a short distance. This piece of information played a major role in his willingness to allow a project on his property as evidenced from this passage, "I couldn't believe it, it was 10 degrees. I thought, 'Man, that's a lot just in a mile and half.'"

He then went on to further describe his reasons for support for the project, "Hopefully what we've done and what the [neighbors] have done down there, maybe we can improve the quality or the temperature of the water anyway. There's fish in there. We know there's fish there."

In the South case there was one example of double-loop learning. In this instance a landowner specifically cites monitoring data from his property when describing why he chose to cooperate with the watershed council. The landowner said he supported the project on his property in part, "Because we have fish bearing stream...There's documented salmon smolt and a

number of species coming up [name] Creek...If we can improve that stream bed habitat, then we can do our part to increase it [salmon populations].”

Double-loop learning associated with ecological monitoring data can influence support for restoration projects and efforts to manage watershed ecosystems.

### 5.7 Landowner Motivation for Cooperating with a Watershed Council

Table 12 displays what landowners said motivated their cooperation with the local watershed council. In all three cases a significant majority were motivated by an interest to improve the ecosystem of their local stream. In the West and East cases a significant majority were also motivated by fish recovery efforts. Respondents consistently discussed fish recovery in two different ways. One group is interested in being able to catch fish in the local stream; many of these individuals are longtime watershed residents who grew up in the area and remember catching fish. For example one landowner said, “When I was in grade school I’d go out there and in a couple hours catch enough for family dinner...I’d like my grandson to be able to go out there and catch a fish if he wanted to.” The second group is not interested in actually catching fish. For example a landowner said his interest in fish, “Wasn’t because we’d like to go fishing. That had nothing to do with it...[it’s] the intrinsic value of seeing them in there.”

Table 10 also shows some relationships between the social learning variables and other descriptors of social learning. For example, good relationships with staff involves newly built linking social capital. Economic support for projects relates to barrier removal for project implementation. Respondents from the West and East case who wanted to improve their property for future generations were almost exclusively multi-generational landowners who were either farmers or private forestland owners.

One landowner from the West case who is listed as a private forestland owner but who also runs cows and farms his property when describing why he chose to cooperate with the council said “The biggest reason I went through with it was the water quality.”

Table 12. Landowner motivation for working with the watershed council.

	West Case (n=18)		East Case (n=14)		South Case (n=6)	
Motivation for working with the watershed council	67%	Fish recovery	72%	Fish recovery	33%	Fish recovery
	78%	Improve stream ecosystem/control invasive species	86%	Improve stream ecosystem/control invasive species	100%	Improve stream ecosystem/control invasive species
	33%	Good relationship with a council staffer	50%	Good relationship with a council staffer	50%	Good relationship with a council staffer
	33%	Economic support for projects	72%	Economic support for projects	17%	Economic support for projects
	17%	Council was respectful and kept them well informed	7%	Council was respectful and kept them well informed	50%	Council was respectful and kept them well informed
	28%	Improve property for future generations	21%	Improve property for future generations	0%	Improve property for future generations
	6%	Improve water quality	50%	Improve water quality	17%	Improve water quality

In the East case 50% of the landowners (n=7) comprising 78% of the agricultural landowners from this case specifically used the term “water quality” when describing their motivation for cooperating with the watershed council. The one agricultural landowner from the South case said part of his motivation for working with the watershed council was to “improve water quality.” It’s important to note that all these respondents are farmers. Based on this it appears that farmers are more aware of and concerned specifically about water quality when compared to other types of landowners.

### 5.8 Watershed Council Meetings

The watershed councils in the study hold public meetings roughly once a month. These meetings are designed to achieve different outcomes. They keep local stakeholders abreast of council actions and distribute different kinds of information. Meetings build social capital in the context of improving watershed ecosystems by allowing local landowners to meet each other (creating bonding social capital) and council staff (creating linking social capital). All three social learning variables occur in watershed council meetings. Different kinds of information are disseminated at these events. One interviewee from the West case specifically mentioned a presentation involving monitoring data at a council meeting including monitoring data... They [the watershed council] also work on having meetings where they present the data that they've found and what they've observed and things like that... how far up the fish go... where are the different spawning [sites]... No respondents from the East or South case specifically mentioned receiving monitoring data at a meeting. However, an East case resident said ...they have regular meetings and they send out reports. They let you know if there's seminars of interest. They bring in different experts to talk at the meetings so you're not just going to some boring meeting. They had one on pond management. I have a couple ponds here and so I went to the pond management seminar. I would not have known had they not had that information available to me...

These meetings also act to remove barriers by increasing landowner awareness of the resources watershed councils can make available. During these meetings landowners often first learn that a watershed council is not a governmental or regulatory agency.

There are patterns among landowner respondents from all three cases related to meeting participation. Watershed council meetings were mentioned by 78% (n=14) of West case, 86%

(n=12) of East case, and 66% (n=4) of South case landowner interviewees. In many instances attending watershed council meetings is an important step in landowner willingness to cooperate with a watershed council. Meeting attendance by a private landowner is almost always a predecessor to agreeing to a project.

Meeting attendance varies. The actual numbers of individuals attending meetings at different councils was not measured in this project. Staff from several councils indicated they would like to see increased private landowner turn out for meetings. Among landowner interviewees there is a general pattern. Most respondents said they more regularly attended watershed council meetings when they first learned about the organization. Once they learned about a watershed council and became more comfortable interacting with council staff landowners attendance often dropped off.

The councils in the West case hold meetings in different locations. They do this in part to make people in different areas of the watershed feel more valued and acknowledged. It's also likely in response to the large portions of the watershed that are privately owned, with more communities spread over a wider area than the East or South cases. There are better transportation corridors in the West case when compared to the East or South cases; this might make holding meetings in more locations more realistic. Multiple landowners (n=7) from the West case said they'd attended meetings where lots of local landowners showed up. A private forestland owner from the West case said when describing a meeting-

...There had to be 70 or 80 people in the room. We recognized a lot of them as our neighbors. Some of the old-timers. People that have been there a long time.

I think with that they made a good introduction to the community....

When describing his perspective on meetings a West case landowner said

...Well, it was a way to find out who your neighbors were. Other people on the river in that area, and what they were doing... They [the watershed council] made a point of having this meeting at the Happy Workers. An old place way the heck up in the sticks, our neighborhood, rather than down in Independence or Monmouth or where ever they have their usual meetings. I suppose that was kind of an outreach strategy on their part. Find out something about the neighborhood...

Conversely fewer landowners from the East (n=3) or South (n=1) case described high turnout at watershed council meetings. The councils in the East Case generally don't move the meeting locations, they are almost always in the same place. It's unclear why the councils in this case don't change meeting locations. Watershed council staff from the East case think travel time between the communities in their watersheds might prevent more landowners from attending. Meeting attendance by private landowners varies. When asked what changes would benefit the organization an East case watershed council staffer said

...Getting more people to meetings I think would be really nice. We've jiggered with the time of the meetings trying to get more people. We've actually moved from an evening to a late afternoon...

The council in the South case varies the location of their meetings. When discussing how they choose meeting location and topic a watershed council staffer from the South case said

...general council meetings...are topic based and spread out throughout the basin depending where an issue resides. Some of the ones we've done in the past are -- some of the bigger draws were blue-green algae for Lowell, the draw-down of

Little Fall, or, Fall Creek reservoir, the impacts through the system, and giving a -- basically giving a clearing house setting for topics to be discussed... it's a nonbiased place for the community to come together to have discussions about issues that are facing those communities...

Several landowners from the South case discussed the challenges with getting people to attend watershed council meetings. One landowner said

...I almost didn't go to the meeting because it started at 7:30 PM...By the time I get done with a day's work and you go and you sit down and get dinner and you ease into your chair, you're almost like, "If I wind down, do I want to get up and go?"...

Another South case landowner discussed the challenges in making watershed residents aware of, and more likely to attend meetings. This respondent discussed reaching watershed residents-

...Out here in the rural area, you either have postal mailing or a notice in the paper. Probably both of which don't really penetrate the market....

The informational content of meetings varies in the different cases. One watershed council staff from the West case discussed a presentation at an upcoming meeting relating to fish populations.

...We do have Pacific Lamprey. Lamprey are throughout the system. The lamprey research group on campus here at the Department of Fisheries and Wildlife...are doing research right here in our backyard on the Marys. There is actually data for lamprey on the Marys. I'm really looking forward to telling that story. We're going to feature their work in our April public meeting...

The following passage from an East case council staffer is another example of the kinds of information that might be delivered in a watershed council meeting. One theme in meetings is

...farming which is so important for our basin, big picture and sub-basin scale...crop diversity, different models, different profit models. Incorporating incentive programs for riparian buffers, but also other Farm Service Agency farm programs that promote organics or irrigation efficiencies...

Watershed council meetings can act to remove barriers, and clarify what watershed councils are and aren't, as evidenced by this passage from an East case agricultural landowner

...I first learned about the South Santiam Watershed Council through some fliers that came in the mail. They were holding a meeting at our local school here. I didn't know too much about it. I decided I would go and that's where I met several people from the council. I appreciated how they ran the meeting and found out that it was not a government agency. That it was funded through private money and that kind of thing. I felt good about that...

Location and informational programming of public meetings are important factors for facilitating social learning in the management of watershed ecosystems.

### 5.9 Increasing Awareness of Watershed Councils

Table 13 displays how landowner respondents believe the watershed council can get a broader recognition in the local community. The two top responses relate to the motivation social learning variable; this includes in-person interactions between landowners, and between landowners and watershed council staff. The manner in which landowners from the three cases



describe these interactions has implications for barrier removal. Landowners from all three cases made comments indicating watershed councils should provide information about the ecological condition of the stream, and how this condition is influenced by project outcomes. Importantly, this information needs to be presented in a value-free, non-regulatory, non-threatening format.

This passage, by a landowner from the East case, summarizes these sentiments and provides examples of motivation and barrier removal. It also shows that an important part of barrier removal is the watershed councils clearly demonstrating they are non-regulatory organizations.

... you take a look at improving the habitats of these streams and what not, there's just too much data out there that says, "This is the right thing to do." It's just a matter of taking all of that hard work and effort, that data that's been collected, and present it to people in a way that you're not trying to twist their arm or cram it down their throat. You're just trying to make them aware of it...

Landowners from all three cases came up with different ideas for outreach; these ideas are clumped and described as “More diverse outreach.” The most commonly cited examples are outreach in schools and to local kids, signage at restoration projects and around the watershed, articles in the local paper, and partnering with local businesses. In the West 61% (n=11) of landowner respondents said watershed councils can get a broader recognition through in-person contacts from watershed council staff, and through increased numbers of meetings. While 44% (n=8) said first-hand accounts from project landowners are important. This passage from a private forestland owner is an example of motivation from peer-to-peer learning and barrier removal.

...I would go back to the community hall meetings they had in Beaver Creek Valley and at the Beaver Creek Community Club. I felt that their presentations were well done. I thought that they communicated very well. The thing that I would probably encourage them with today would be to have, for lack of a better term, personal testimonials. Have somebody like my wife or I come and talk about our work with the council and what they did on our property. It was a positive event. That interpersonal appearance, that one-on-one - it's one thing if they hand me a brochure and it shows me a neat photo. That probably piques my attention. If my neighbor down the road steps up and says these were good people to work with, it's probably got a little more credibility...

The final sentence saying “if my neighbor down the road steps up and says these were good people to work with, it's probably got a little more credibility” is an example of how existing social capital can be spent or tapped in support of watershed restoration.

Table 13. Best ways for watershed councils to gain broader recognition in the community.

	West Case (n=18)		East Case (n=14)		South Case (n=6)	
Best ways to get broader recognition for the local watershed council	61%	In-person contact from watershed council staff	93%	In-person contact from watershed council staff	75%	In-person contact from watershed council staff
	44%	First-hand accounts from local landowners & project tours	93%	First-hand accounts from local landowners	83%	First-hand accounts from local landowners & project tours
	61%	More mailings & meetings	36%	& project tours	83%	More mailings & meetings
	22%	Clarify NGO	36%	More mailings & meetings	0%	Clarify NGO
	28%	Provide economic and technical support	7%	Clarify NGO	0%	Provide economic and technical support
	28%	Provide information about the ecological condition of stream and project outcomes	14%	Provide economic and technical support	25%	Provide information about the ecological condition of stream and project outcomes
	61%	More diverse outreach	72%	Provide information about ecological condition of stream and project outcomes	83%	More diverse outreach

In the East case 93% (n=13) of respondents believe first-hand accounts (i.e. peer-to-peer interactions) can increase recognition of watershed councils in the local community. This passage from a farmer in the East case touches on barrier removal and motivation from in-person contacts with watershed council staff, and first-hand accounts from local landowners. His comments demonstrate an important finding about the context of motivation from peer-to-peer learning: people are more receptive to information coming from a recognized expert. This provides some evidence for learning in an occupation-based COP. This example shows that farmers are more likely to listen to other farmers. There were similar patterns with private forestland owners in the West case.

...It's too bad that there aren't more opportunities for the watershed council to come to some organizations [farming based organizational meetings] because the farmers as a whole in the watershed go to the same meetings all the time. That's when I'm hoping I can figure out ways to introduce the watershed [council] to more farmers. I really find it exciting for well-meaning folks, for us to do the best we can...I think it's up to me and a few other farmers who care about this stuff to get them where they need to be...

In some instances social capital is described as a component in peer-to-peer learning. This comment from an agricultural landowner describes the influence of peer-to-peer interactions. It also describes how to tap into existing social capital. Her comment speaks to motivation through peer-to-peer interactions and barrier removal relating to land use regulations.

... they can use land owners that are already a part [i.e. project landowners]... get 'em" to say, 'Hey, here's your neighbor. Look what they're doing.' You talk about a non-regulatory way to do it. One of the most effective ways things gets done is by looking at your neighbor...

A rural residential landowner from the East said of project landowners, “Each person that has success with it [the watershed council], . . . are almost ambassadors to help talk with their neighbors.” In relation to this an agricultural landowner from the East case described how a project tour influenced her perception of the watershed council. This is evidence of motivation and barrier removal.

...one of the things they did with us is they took us around and showed us some of the other projects that were earlier projects, and what it looked like. So they could do, ‘If you're interested in finding out what we're doing, let's do a bus tour and we'll go around and do a group viewing of the projects and how it's helping.’

And that type of thing. Instead of trying to do it one person at a time...

Her referencing the value in involving “a group” is an applied example of social learning. This approach likely builds bonding social capital in the context of watershed restoration.

In the South case a majority of the respondents also cited the value of in-person contacts with watershed council staff, and first-hand accounts from project landowners. This respondent broached the concept of marketing, which is an idea mentioned by landowner interviewees from all three cases. His comments describe ways to build bonding, bridging and linking social capital between landowners in the context of watershed restoration and management.

...If they could pick those people who they've had a good success on an improvement project, and then maybe use those folks as testimony. Either written testimony or public testimony. Have a meeting at the local fire station and publicize it and offer those people to come forward and say, ‘Here's been my experience...’ That's probably worth its weight in gold. Here's been my

experience working with these folks. Here's what we achieved and here's some pictures. A pictures worth a thousand words. I think that might get at that question of how do you market? You're really talking about a marketing scheme. You got to sell yourself. They've got a service. It's for the public good, but how do they market it?

Table 14 lists different ways landowners believe watershed councils can implement more projects. This table provides insights into the concept of barrier removal. There are similarities between the information displayed in Table 13 and Table 12, but there are important differences. One major difference is the numbers of landowners who cite the importance of economic and technical support for projects. Across all three cases almost 70% (n=10) of agricultural landowners and 88% (n=8) of private forest landowners indicate economic support for restoration project implementation is important. A second difference is that more respondents think watershed councils should clarify they are non-governmental, and non-regulatory.

Table 14. How watershed councils can do more project on private property.

	West Case (n=18)		East Case (n=14)		South Case (n=6)	
How council can do more	37%	In-person contact from watershed council staff	50%	In-person contact from watershed council staff	50%	In-person contact from watershed council staff
	50%	First-hand accounts from	57%	First-hand accounts from	33%	First-hand accounts from

projects on private property		local landowners & project tours		local landowners & project tours		local landowners & project tours
	50%	Clarify NGO, nonregulatory, and nonadvocacy intent	43%	Clarify NGO, nonregulatory, and nonadvocacy intent	50%	Clarify NGO, nonregulatory, and nonadvocacy intent
	50%	Provide economic and technical support	50%	Provide economic and technical support	50%	Provide economic and technical support
	22%	More meetings & mailings	29%	More meetings & mailings	50%	More meetings & mailings
	33%	Provide information about ecological condition of stream and project outcomes	21%	Provide information about ecological condition of stream and project outcomes	50%	Provide information about ecological condition of stream and project outcomes
	28%	Seek opinion of landowner and involve them in decision making	43%	Seek opinion of landowner and involve them in decision making	0%	Seek opinion of landowner and involve them in decision making
	45%	More diverse education and outreach	43%	More diverse education and outreach	0%	More diverse education and outreach

About half the respondents (50% (n=9) from the West case, 43% (n=6) from the East case

and 50% (n=3)) from all three cases said watershed councils need to clarify they are nongovernmental organizations. Watershed council staff are aware this is important. A council coordinator from the East case said, “We learned early on, be sure to separate yourself from the government. We are not a government agency, we are a non-profit. The more clear that is to land owners the better.” A council staffer from the South case said, “We do not want to be viewed as a regulatory agency, because we’re not. We don’t want to be viewed as a government agency.”

One-half (n=9) of the landowners from the West case said economic and technical support will increase projects. When describing the importance of this economic support for restoration projects on her property a private forestland owner from the West case said, “the economic partnership is so vital. It's so vital...I could not afford to pay for a lot of the work that's been done.” This passage expresses how this support removes barriers to restoration.

Among landowners from the West case 50% (n=9) said watershed councils need to clarify they are non-governmental organizations. An agricultural landowner from the West case

discussed his frustration with governmental regulations. His statement shows the approach taken by the watershed council did not make him feel threatened and ultimately removed a barrier to participation.

...I'm a firm believer in smaller government...most people are...the government keeps growing and infringing on the public's rights...The two young people that came out and inspected the culverts and did some measuring, they were very nice about it. They didn't tell me I had to do this or do that. They just wanted to measure it and...give advice to the watershed council....

One-half of West case respondents (n=9) mentioned that first-hand accounts from project landowners and tours will increase the ability of watershed councils to do more projects. These respondents also reported that watershed councils should provide ecological information, but also highlight current and potential future positive outcomes of projects (66%, n=6). This passage from a multi-generational private forestland owner who did a watershed council-administered CREP in the West case integrates these ideas. She learned her local watershed once had a salmon run, and that the watershed council was trying to involve landowners in salmon recovery projects. It also shows how information and peer-to-peer learning can motivate landowners and remove barriers to restoration. She said

...I never knew it in my lifetime, that it was a salmon stream...I would be delighted if that could happen. Just even talking about it, I physically feel something... of awe, of wonder, of excitement. Oh my word, that would be so cool! I think the watershed council is making a positive difference. Part of it is raising awareness. Part of it is the presentation that caught my interest in talking

about the projects that they've done and the success they've had. It's always easier to network with people when you have someone that is part of their social group, church group, part of their network already. The way that this is going to move forward is through networking. It's going to move forward person to person...the positive attitude that has been shown in information that we've gotten. In the mail. It's always progressive. It's positive. This is what the future looks like and it's a positive look...And that makes a difference...

Half the landowners (n=7) in the East case also made statements indicating that economic and technical support removes barriers. Watershed councils can remove barriers by acting as an intermediary between landowners and government agencies. They facilitate landowner access to funds and expertise. This passage from an East case agricultural landowner provides an example

...I got involved in the watershed council because of bank erosion on my ranch. The inability to deal with all the bureaucratic agencies. One agency comes out and they want this, another agency comes out and they want this, another agency comes out and they want this, and you couldn't get the three or four of them to work together and come up with a decent plan that you can do. That's been the biggest advantage of working with the watershed council, is you've got someone centrally located that has those contacts that can get the permits and get the Fish and Wildlife...and the rest of the groups to agree on a project...

He then went on to say working with the watershed council as an intermediary

...It was the only way it was going to get done. Bottom line, sometimes you make concessions to reach your goals...there was a lot of money spent on it. It



was beyond my financial ability to do...I couldn't get that done and meet all the DEQ and Fish and Wildlife requirements...I'm not opposed to giving up to set aside and making some concessions. That's my contribution to it. I don't have a quarter of a million dollars...

In the East case 43% (n=6) of landowners said watershed councils should involve them in decision making. With one exception these comments all came from agricultural landowners. For example an agricultural landowner said "You can't force or push people into things."

About half the respondents (n=3) from the South case said the watershed council should collect and provide ecological information about the condition of a stream. Respondents from this case made comments indicating that this information could be used as a form of barrier removal by making landowners aware of changes in their local stream.

...It would be nice if you guys could monitor sections of the creek areas or the watersheds and isolate the problem areas and target those people. Even show them what they're doing. I really think you'd get a lot better response...

Almost all the landowners from all three cases were supportive of watershed council collecting monitoring data. However some were concerned that it might lead to problems or have regulatory repercussions as evidenced by this passage from a South case rural landowner

...Here's what goes on. You guys are doing an independent study and you're creating a paper trail. Somewhere along that paper trail it gets turned back into the county. Now all of a sudden, somebody in the county pulls that stuff out and they have all this ammunition to go after people. It's a round-a-bout way of" - even you didn't realize it...DEQ tried that one time. They got a hold of some

paperwork they weren't supposed to have and tried to pull something off. Even though people mean well to do things, shit happens. That's all I'm trying to say...

The diversity among various interviewees describing effective pathways to implement more projects on private properties provides insights into complexity associated with social-ecological interactions.

#### 5.10 The “Face” of a Watershed Council

Social learning is linked to social capital; social capital influences motivation for project implementation and land use changes as well as barrier removal. In some instances existing social capital was spent, while in others social capital was built.

The councils involved in the study have different strategies for landowner outreach efforts that build linking social capital with private landowners. At the time of the interviews four councils (one from the West case and the three in the East case) had an outreach coordinator whose job focuses specifically on landowner outreach. Four councils (two in West Case, one in the South case and one in the East case) have project managers charged with developing landowner contacts in conjunction with project planning and implementation.

These individuals often represent the “face” of a watershed council and play key roles in building linking social capital between watershed councils and private landowners. Landowner respondents describe different kinds of relationships and rapport with these staffers. For each landowner respondent it was noted whether or not he/she referred to specific council staffer by name; this serves as a proxy for rapport and social capital. Relationships (i.e. social capital) between these council staffers and landowners are important factors in landowner willingness and motivation to support watershed council restoration and management efforts. These staffers

were frequently mentioned by landowner interviewees in both the West and East cases. A majority of landowner respondents (~88%) mention personal relationships and positive perceptions of how these staffers influenced their decision to cooperate with the watershed council which are described in more detail below.

There were important differences among the watershed councils in the West case. About 50% of landowner interviewees from the West case mentioned watershed council staff by name. One council in this case has an outreach coordinator who is actively involved with different natural resource management activities including logging and agriculture and has lived in the area for at least 30 years. More than 66% (n=6) of the interviewees from this council mentioned her by name. Just under half knew her prior to choosing to cooperate with the council; in these cases she spent existing social capital. She is described as patient, tenacious and methodical. Much of her success relates to established relationships and social capital, and her knowledge of the local community. Almost every landowner interviewee (n=7) from the council believes that she has contacted every riparian landowner in their watershed as evidenced by this comment from a rural riparian landowner

...I think she's really out there with the community, and my guess is she's had numerous conversations with every landowner, and probably knows who will never do it, and who she can tweak maybe and get them to come in to it...

A project manager from a second West case council was mentioned by two of the three interviewed landowners. They believe he has methodically contacted and tried to recruit every riparian landowner in the watershed. His contact efforts are almost exclusively related to removing invasive Japanese knotweed from the watershed, not trying to implement projects. This singular focus impacts the manner in which he interacts with watershed residents. Respondents

say his non-forceful approach is a major reason these landowners are working with the council.

A timber landowner from this watershed described why this individual is successful. His comments describe how linking social capital was built by this council staffer

... in this particular stretch of the river, there aren't many hold outs on this program, I would think. And I think that's because the guy that's doing it is very good at explaining what he's doing and very good at making sure you understand there are no strings attached. If he comes up today and you're unhappy, you can forbid him to come back tomorrow and that's it. People [council staff] go where they say they're going to go and do nothing else and it's well run and he's respectful...

This “walking your talk” increases landowner motivation and removes barriers. It’s important for councils to follow through and do what they say they are going to do.

The project manager in the third West case council was mentioned by 25% (n=2) of the respondents from that watershed council. When he was mentioned landowners said he did a good job of interacting with them. He did not make landowner feel pressured, and involved them in project planning and decision making. While he was not mentioned frequently by name, more than 50% (n=5) of landowner interviewees described staff from this council, not just the project coordinator, as “walking their talk.” This passage from an agricultural landowner illustrates this point while also alluding to barrier removal.

...I think they're just doing it by walking the walk... These projects come along, we sit down, we talk about them. We get going... They're a group of action people. Not a lot of bullshit... If they say they're going to do it, they're going to do it. And they'll listen to the land owner and see what works for you. [The project

coordinator] will talk with you, 'How's this planting orientation look? Is this going to work for you? If not, we'll change it.' ...It's not bureaucratic. It's logical and again, pragmatic...

It's important to note that based on the shared staff model in the East case staff work across all three watersheds. In the East case 93% (n=13) of landowners mentioned the outreach coordinator working in these three basins by name. She played a major role in their decision to work with one of the watershed councils in this case. She takes a different approach from the outreach coordinator in the West case, she is aggressive and energetic. More than 66% (n=9) of the landowners in this case said the outreach coordinator told them watershed councils are not government agencies during initial contact efforts; this played an important role in barrier removal. Several landowners mentioned that she had made a real effort to build relationships with landowners by doing things like attending 4<sup>th</sup> of July picnics and cutting wood for elderly women in the community. When describing her an agricultural landowner said "[Name] is just a ball of energy...she just...really got a lot of things done." Another agricultural landowner said, "[Name] did just a super job. And I think that's the key to the success of the program. I'm going to refer to her as the point person, or the contact."

Some events that are outreach and engagement activities help build social capital. Project tours and council meetings foster the development of bridging and bonding social capital. This social capital is being built in the context of watershed restoration and management. When landowner advocates reach out to fellow landowners, social capital is being spent.

#### 5.11 Watershed Councils and the Model Watershed Program

There is evidence of a new COP among watershed council staff based on participation in the MWP. This COP emerged in relation to the capacity of the seven watershed councils to influence social-ecological systems across the Upper Willamette Basin. There is a new culture of collaboration and purposive group learning. This COP is directly linked to peer-to-peer learning and the building of social capital in this distinct context. One example of this can found in this statement from a West case staffer, “At those peer-to-peer learning tours we look at each other’s projects and learn what worked and what didn’t work from them.”

This statement from a respondent in the East case provides further evidence for the emerging COP and newly built social capital

...there's been all these other benefits from the Model Watershed Program that aren't about that \$100,000 Meyer check. Which is the peer learning, which is the camaraderie of being part of the models and bonding with these other councils and having the meetings and the conference calls... There's just countless reasons why we've benefited...

Respondents from all seven watershed councils said the MWP provided a means of scaling up their operations. This statement made by a council respondent from the South case captures sentiments from all seven councils relating to this. It also describes the building of social capital.

...Learning from each other has been really powerful and beneficial. The funding, which allows us to attend conferences, workshops, or peer-to-peer learning opportunities, and allows us to go out and really target these land owners and work with them, and put together these large-scale projects, that’s the biggest difference, is: we’re receiving support for that. It’s like all these organizations have the nuts and bolts to do this work in a meaningful/significant/large-scale

way, but we didn't have the support financially; sometimes technically. What the Model Watershed Program has provided us is the support, the framework to conduct the work....

The concept and use of the term peer-to-peer learning provides evidence of the newly established COP. Peer-to-peer learning occurs in project tours, and in other structured and informal interactions associated with the MWP. The term peer-to-peer learning in MWP-based activities was used by 78% (n=7) of West case staff, 75% (n=6) of East case staff, and 50% (n=2) of South case staff.

For example, a respondent from the West case described the benefits associated with participation in the MWP, "The peer-to-peer learning tours have been really good that way because it's got the 'lessons learned' component and so that's always part of what we are to share when we're on a tour." A council staffer from the East case said, "I think it's always helpful to see how other people are doing it....I think that peer-to-peer learning is really important." Lastly, this comment came from a council staffer in the South case who described a benefit of participation in the MWP resulting from, "Peer-to-peer learning, and being part of a really productive, talented group of professionals in this field. Learning from each other has been really powerful and beneficial."

Peer-to-peer learning is a concept and specific term used in this COP. The use of the term demonstrates the common language, culture of collaboration, and purposive group learning underlying this COP. Peer-to-peer learning builds social capital and is also an example of motivation in watershed council staff.

Another example of this new COP relates to comfort in discussing mistakes and lessons learned. In this COP there is a cultural norm that encourages candid conversations and

information sharing. A significant majority, of West (89%, n=8) and East case (88%, n=7) council staff are comfortable discussing mistakes and lessons learned with the other MWP participants. Conversely, 33% (n=3) of West case, 38% of East Case, and 25% (n=1) of South case council respondents are not comfortable honestly discussing mistakes and lessons learned with funders (Table 15). In the South case 75% (n=3) respondents felt it was most appropriate to only candidly discuss mistakes and lessons learned with their supervisor. In this finding peer-to-peer learning and site and project tours play an important role. The peer-to-peer learning in these events creates motivation to act and helps remove barriers towards the councils managing the watersheds in the study area.

Table 15. Comfort discussing mistakes and lessons learned.

	%	%
	In MWP	With Funders
West (n=9)	89	33
East (n=8)	88	38
South (n=4)	25	25

When describing situations that allow honest discussions of mistakes and lessons learned a council staffer from the West case said

...The peer-to-peer learning tours have been really good that way because it's got the 'lessons learned' component and so that's always part of what we are to share when we're on a tour. We did this. It didn't work and we think this is why. Or, this isn't working – how come? Soliciting input from others and, yes, I feel that you're free to share that you haven't done it perfectly and you're not going to be smacked for not having done it perfectly...

When asked if he/she is comfortable honestly discussing mistakes and lessons learned with a funder a respondent from the East case said



...I don't think in any way, shape, or form, when you have a funder driven initiative, can you be candid. I think it's literally an oxymoron. You just can't do it. You can't. Honest with a funder? No. It somehow bites you in the ass...In a funder facilitated meeting like we had recently with OWEB and Meyer, they're just like, 'Let's talk openly.' It's like, 'No way.' It's funny that they think that we will...

The single council staffer from the south case who was comfortable discussing mistakes and lessons learned outside the council said

...Each watershed council has had the opportunity to host a peer-to-peer learning workshop where you focus on one or more project types and one or more project sites. What their strategy was, what some of the hurdles were, what the challenges were. What the lessons learned and the positive outcomes. Those were really valuable because you can, to a certain extent, get pretty frank. Now, some of them, they invited the grantors there and that definitely changes the tone of the conversation...

There is evidence of a new community of practice that emerged among the watershed councils based on participation in the MWP. The council coordinators and the leadership they provide is an important part of this new MWP based COP. The coordinators regularly talk with staff from BEF and/or MMT. However, they also took it upon themselves to do a separate monthly call with only the coordinators. Every council coordinator from all three cases mentioned these monthly phone calls. However, only coordinators from the West and South cases specifically referenced benefitting from coordinator only conference calls. The reason no

East case coordinators mentioned these monthly phone calls is likely related to the separate CalSan partnership; these coordinators regularly communicate as they coordinate activities across their respective councils.

When discussing the benefit of these monthly calls a coordinator from the West said

...we talk on a coordinator collaborative call once a month, without [BEF Staff name], and then have the monthly meeting. So, that's been great, you know, just having the monthly call...And just having that built-in, established network of people that you regularly communicate with. And you know you can pick up the phone and call any of them at any time, outside of that time. So, that's been really helpful, too. So, that framework was created by Meyer. It wasn't necessarily calling Meyer. But because of this program, it created that community...

Another coordinator from the West case said

...In the first year of the Model Watershed Program...we had monthly meetings. They were primarily a top-down, a BEF set agenda, and now what we're doing is we are, as coordinators, is having monthly telephone conference calls. That is an opportunity for us to share. I also try to take as much advantage, and I think the others do at this point too, to carpool together when we go places so that we can really, informally, share experience...

A coordinator from the South case reported, "We started off with a monthly meeting among directors or staff in the program...working together on something...the meeting of the minds...those monthly meetings where we work on things together have been really beneficial."

An aspect of this COP is based on social capital moving from the bridging to bonding type. Watershed councils depend on, and regularly apply for the same grants. This creates a sense of competition between councils. Participation in the MWP ameliorated some of this competition. The following passage describes the emergence of the COP, but also provides evidence of the developed bonding social capital, “One of the biggest things the Model Watershed Program has done for us is to really give us a peer group and a sense of community in that peer group rather than competition.” Another respondent from the West case said based on participation in the MWP she is now “Part of a peer group.” The evidence for bonding social capital stems from the term peer group. While they are obviously still distinct organizations, there is an emerging identity as a group based on new relationships from participation in the MWP.

The results find evidence of an emerging, or nascent COP among landowners in one watershed council in the West case. This COP is based on a belief that landowners are collectively influencing a watershed ecosystem. The emergence of this potential COP relates to all three social learning variables with elements of social capital as well. The information is gleaned from monitoring data, specifically water temperature data. This information, in conjunction with some peer-to-peer interactions between project landowners and watershed residents leads to more landowners becoming interested and involved. Ultimately this removes barriers to restoration. This COP is not as identifiable as the MWP COP described above. It appears to be driven by specific awareness that other watershed residents have undergone land use changes to support restoration on their properties. The evidence of this COP includes landowners from the West case using similar language to describe how they are cooling the local stream. These landowners also expressed an awareness of being part of a collective effort. It

should be noted that every staff member from the watershed council where this COP is emerging mentioned the importance of providing monitoring data to watershed residents. An agricultural landowner from one sub-basin said

...Most everybody upstream from us, and many downstream now, have got on board with livestock exclusion and planting and a more natural approach with the fish habitat and so forth. I would say that the environment around here has improved since the watershed council got started in the past 15 years or so... we will definitely enjoy the benefits of it, and our children will...it's kind of cool to see the stream coming back into a natural state. We've already seen the results with our upstream neighbors getting involved in the project. Seeing the water flow and how much clearer it is and colder...

A private forestland owner said she supported restoration on her property in part to keep, "The water cool from our area on down." This statement by another private forestland owner who also runs cattle on his property shows that while there might be an emerging COP, there are still landowners who are not cooperating with the council:

... above our property...[there's]...another project. There's two more projects upstream. And then the neighbor below me has done a project. Below him, there's a guy. He's got the oldest water rights. He irrigates every summer and everything he can suck out of there and still be legal. His cows go back and forth. He isn't interested....

There is no evidence of a COP in the other two watershed councils in the West case.

There is some evidence supporting emerging communities of practice in one watershed in the East case. In the South Santiam watershed 75% (n=3) of interviewees are aware that other landowners in their sub-basin have implemented projects. The fact that other landowners are implementing projects influenced their decision to allow a project on their property. They also mentioned the significance of their collective efforts to influence a watershed ecosystem. However these project landowners believe they are a minority and there is no evidence to support a restoration-based COP in these areas. Additionally there is no evidence of a COP in the other East case watershed council, or in the South case.

There is evidence for a COP based on occupation. When describing trusted sources of information for making land use decisions 50% (n=2) of West case, 78% of East case, and 100% (n=1) of South case of agricultural landowners said they rely on other farmers. Across all three cases there are 14 agricultural landowners, 72% (n=10) of whom said they rely on other farmers as trusted sources of information for making decisions about land use. Further evidence for an agricultural landowner based COP stems from the fact that 72% (n=10) expressed an explicit desire to “improve water quality” as part of their reason for cooperating with a watershed council. The COP is based on the intentional learning community, agricultural landowners drawing on each other’s knowledge for making land use decisions.

## **CHAPTER 6: DISCUSSION**

This chapter discusses the research findings in relation to the relevant literature and the research objectives. The chapter starts out with discussions of the analysis relating to adaptive capacity, and social learning. It then describes how themes in the findings relate to each of the

three research objectives. The concept of social-ecological complexity is explored in the conclusion of this chapter. As with the findings, this chapter describes interrelated events occurring simultaneously across different spatial and temporal scales.

## 6.1 Explaining Adaptive Capacity

One research objective is to examine how social learning leads to adaptive capacity. Identifying and operationalizing adaptive capacity proved challenging for different reasons. The different definitions and examples in the literature were part of this challenge. I tried unsuccessfully to utilize the concept of resilience and the related definitions of adaptive capacity as a guiding framework for my research. It proved too difficult to come up with an analysis framework and operational measures based on resilience. My analysis instead draws on one of the many strands of literature associated with the concept of resilience; examples of adaptive capacity based on learning in social-ecological systems (Armitage et al., 2007; Chapin et al., 2009).

I identified adaptive capacity as what I perceive to be learning driven changes meant to influence a watershed ecosystem. Because watersheds are complex adaptive social-ecological systems (Naiman, 2013), adaptive capacity relates to social-ecological complexity. This means adaptive capacity includes an increasing awareness of social-ecological systems and the underlying social-ecological interactions. I moved backwards and examined adaptive capacity by unpacking and examining examples of actions and changed behavior.

In private landowners applied examples of adaptive capacity mostly include *support* for a land use change such as a restoration project. Importantly, *support* can involve an actual land use change or project, and/or taking actions to influence other watershed residents. In other words

adaptive capacity can include a changed sense of personal responsibility and self-efficacy to influence a watershed ecosystem in different ways. In watershed councils examples of adaptive capacity relate to changes in institutional processes, priorities, and organizational culture. In an applied sense adaptive capacity involves changes in facilitating on the ground projects and land use changes. Social learning involves a change in understanding that occurs through social interactions (Reed et al., 2010). This means adaptive capacity includes recognizing the validity of new sources of information and knowledge.

I focus on understanding how social learning increases adaptive capacity through awareness of social-ecological interactions. I identify trends and patterns in different learning contexts that resulted in the examples of adaptive capacity.

## 6.1 Explaining Social Learning

The two remaining research objectives both directly relate to social learning. Initial analysis of social learning was based on: 1) the approach described by Keen et al. (2005) based on the five braided strands of social learning; and 2) the definitions and requirements described by Reed et al. (2010). Both these sources describe similar patterns for understanding social learning including loop-learning, social capital and communities of practice. The literature (Mostert et al, 2008; Rodela, 2013) and my findings show social learning content and context varies. I believe this context and content is created by the interactions and configurations of social-ecological systems, and complexity. My findings for social learning in natural resource management align with the literature in different ways. I find social learning in natural resource management to be an iterative process, a common theme in the literature (Cundill & Rodela, 2012; Keen et al., 2005; Pahl-Wostl, 2009). I also determine that social learning in natural resource management spans spatial and temporal scales, a theme also backed by different sources

(Cumming et al., 2012; Gerlak, 2013). These descriptors and analysis of the data led to the emergence of three main social learning variables: 1) information; 2) motivation; and 3) barrier removal (Figure 17).



Figure 17. Variables used to operationalize social learning. Information relates to ecosystem processes and ecosystem condition. The actual information is most often ecological monitoring data that describes ecosystem condition and provides a window into ecosystem processes. Information can create motivation to act driven by a change in understanding or perspective. The source and delivery of this information is important. The findings show peer-to-peer learning and interactions to be a powerful motivating source. There are other sources and types of learning interventions that influence motivation as well. There are different economic, social, political as well as other barriers to acting on motivation. It's



important to recognize, and understand how to remove these barriers. These variables are interconnected and non-linear based on the fact that social learning is ongoing, iterative process.

6.3 Research Objective 1: To examine what facilitates and/or impedes watershed scale social learning.

The study findings and the literature (Brown et al., 2010; Chapin et al., 2010; Patterson et al., 2013) show learning interventions facilitate social learning in natural resource management settings. There are different examples of learning interventions: indirect and direct contacts; watershed council meetings; the “face” of a watershed council; site and project tours; and landowner advocates. These learning interventions are described below. Every landowner interviewee mentioned at least one of these learning interventions when describing where they first learned about a watershed council. At least one of these was also mentioned as a means for watershed councils to gain a broader recognition in the watershed, and as a way for watershed councils to implement more projects on private property.

Indirect contact methods include email, informational mailings, flyers and brochures posted in public places, and phone calls. Email is the least frequently mentioned of these. Mailings are a tool for watershed councils to get a broader recognition in the community. Indirect contacts influence social learning in different way; they disseminate ecological monitoring data, and influence motivation.

Mailings and other indirect contact methods need to be diverse and sustained. Landowners often ignore mailings for years before deciding to open and respond. The format of these mailings is important, specifically the informational content and the context in which this information is placed. Across all three cases 84% (n=32) of landowners said their motivation to

cooperate with a watershed council was based partly on the desire to improve the ecosystem of their local stream. Mailings are one means of disseminating ecological monitoring data. In this way mailings can influence landowner motivation to influence a watershed ecosystem.

Direct contact include in-person contacts from a watershed council staff, from a friend neighbor or relative, or from an agency or organization. Relatively few landowners learned about the watershed council from direct contacts. However, direct contact makes a strong impression. When a respondent said a friend told them about the council they act on this advice. It's easy to ignore a piece of mail, but harder to ignore a person.

Half of the agricultural landowners in the East case learned about the watershed council from another agricultural landowner (a direct contact). This is another example of social capital being spent. Private forestland owners (Giampaoli & Bliss, 2011) and agricultural landowners (Rogers, 2003) have been observed to rely on and trust information originating from fellow practitioners they recognize as competent and knowledgeable. The study findings validate this. When asked what kind of information might make him consider a new land management strategy a farmer from the West said "If we needed information we would just ask somebody that's been doing it longer than we have." This sentiment is common in these two groups and indicates the recognition of cultural competence and expertise that underlie COP.

Direct contacts between landowners influences social learning based partly on the expenditure of social capital built in other contexts. This represents an important theme that cuts across many findings; landowner advocates are one of the most important and powerful forms of learning interventions to facilitate social learning.

There are other factors, including social capital and potentially occupation-based COP that underlie direct contacts. In one watershed council in the West case 66% (n=6) of the landowners knew the outreach coordinator prior to their cooperating with the watershed council. She contacted these six landowners indirectly (i.e. via phone, mail or email) and identified herself as working for the watershed council. Thus, technically these individuals first learned about the watershed council indirectly, but existing social capital played a role. The outreach coordinator spent existing social capital from her prior relationships when asking them to consider working with the watershed council. Among these six landowners, five knew her in natural resource management contexts; three knew her through the Oregon Small Woodlands Owners Association (an organization that provides information and resources for private forestland owners), one had purchased blueberries from her, and she had purchased ferns from one landowner.

Every watershed council in the study is an organizations with multiple employees. However, in some instances one employee is particularly effective at building relationships with landowners and is the “face” of a watershed council. These individuals varied across the cases. The outreach coordinator described in the paragraph above is often the face of her council. One of her colleagues described why she believes the outreach coordinator to be so effective

...I think that part of what's made [name] wildly successful is that she'll talk to people at eleven at night or seven in the morning, or at two in the afternoon on a Sunday, or hang out over a glass of wine until midnight, or whatever, just listening. And an awful lot of its listening...

A different council in the West case has a project manager who also appears to be the face of the council. When describing him a private forestland landowner said, “He's figured

out how to work with the land owners and I think that's the key...I think having a guy that's good at what he's doing helps the program and the watershed council and everything else.”

In the East case all but one landowner mentioned one council staffer, the outreach coordinator. She is clearly the face of the council. She is boisterous and energetic, while the West case outreach coordinator is more laid back. The two landowner outreach coordinators from the West and East cases are very different indicating there is not necessarily a “right kind” of personality. However, there might a wrong kind of personality. During the study the outreach coordinator from the East case moved and a replacement was hired. This replacement worked in the position for about six months and was fired. An agricultural landowner from the East case who’d been won over by the original outreach coordinator reflected on this development, “I have met her replacement. He's been out here a couple of times. I don't think he's going to be as persistent as she is. A different personality.”

Having an employee who focuses on landowner outreach is an important social learning intervention. Having the right person might be even more important. These individuals are effective as social learning interventions when they can develop rapport and social capital in the context of managing a watershed ecosystem. They can facilitate social learning by increasing landowner motivation, and helping remove barriers so landowners gain access to technical and financial support for project implementation. Interactions between watershed council staff and landowners are different from peer-to-peer interactions between landowners in the social learning motivation variables. It represents a different form of outreach that influences

motivation. This is another example of an individual person serving as a type of learning intervention.

Watershed council meetings influence all three social learning variables, and also build social capital. Across the cases about 75% (n=28) of landowner interviewees have attended meetings. As a learning intervention watershed council meetings facilitate social learning primarily by increasing landowner motivation and by removing barriers. There is informational content delivered at watershed council meetings related to ecological monitoring data and the condition of watershed ecosystems. However the findings don't show that meeting content is of particular importance to the landowner respondents. The few specific references to actual meeting content came almost exclusively from watershed council staff. Watershed council meetings provide an opportunity for watershed residents to learn about the watershed council itself, and to meet other local landowners. These meetings facilitate peer-to-peer interactions between local landowners in the context of managing watershed ecosystems. They also provide a venue for first-hand accounts from project landowners, which are important for motivation and barrier removal. Attending watershed council meetings allows landowners to learn that watershed councils are not governmental or regulatory agencies. This is an example of barrier removal. These meetings build social capital in the context of watershed management through one-on-one interactions between watershed council staff and private landowners, and between private landowners.

The location of a meeting influences how it serves as a social learning intervention. In the West and South cases the councils regularly change the meeting location. More respondents in the West case have attended meetings with large numbers of landowners than those in the East or South cases. However, the West case also has a larger population and more communities spread

across a larger area than the East or South case. The South case has what appears to be an innovative approach of moving the meeting location to a specific area to address a specific topic. Landowners from the West and South cases generally recognize and appreciate the fact that the local watershed council had made an effort to hold meetings in different, often remote locations around the watershed. Landowners in the East case didn't seem to attach much significance to meeting location. Watershed council meetings appear to be more effective social learning interventions when they are held in different locations instead of always being held in the same place. These findings parallel the literature on social-ecological complexity in natural resource management. Rammel, Stagl, and Wilfing (2007) observe natural resource management interventions should account for different social and spatial scales in social-ecological systems. Holding meetings in different locations, and addressing locally relevant content is one way to incorporate social-ecological complexity in learning interventions.

In all three cases site and project tours, and first-hand accounts from project landowners represent important social learning interventions. During analysis these were collapsed together for reporting purposes. The references to site and project tours, and first-hand accounts from project landowners overlap but there are important distinctions. Tours of projects implemented on private property are interesting to respondents, but the opportunity to speak with the landowner is probably of greater importance. Tours provide the opportunity for peer-to-peer learning between private landowners; importantly these interactions are occurring in the specific context of managing a watershed ecosystem. First-hand accounts about projects help to reduce barriers perceived by landowners. This represents motivation from peer-to-peer interactions. This also supports the development of social capital in the context of watershed restoration. A

private forestland owner from the West case described how tours provide information about projects, and the opportunity to speak with the landowner

...I like that they [the watershed council] do, I think it's four tours a year of different restoration projects...opening up to the community members to have that hands-on...here is a project...it gives the community members the ability to talk with the home owner/land owner, and talk with other people on the watershed council...

Site and project tours were specifically mentioned only by agricultural and private forestland interviewees from the West and East cases. These respondents have an explicit interest in both seeing projects on working landscapes, and in talking to the landowner. This supports the common theme in the study that farmers trust and rely on other farmers, and private forestland owners trust and rely on other private forestland owners. This points towards the existence of occupation- and/or land use-based COP among these two landowner types.

Research has shown learning interventions that create structured and unstructured interactions between different organizations are important drivers of social learning in water resources management (Bos et al., 2013). In this study site and project tours are important learning interventions for staff from watershed councils to achieve social learning. Staff from all three cases used the terms “site and project tours” and “peer-to-peer learning” synonymously. During site and project tours bridging and bonding social capital (Pretty, 2003) was built between staff from different councils. These events facilitate all three social learning variables as watershed council staff share information and engage in peer-to-peer learning. In this way barriers to success are removed. These events are instrumental in the development of the intentional learning community of the COP that emerged.

Interactions and information sharing occurring outside of site and project tours are examples of bridging social capital moving towards bonding social capital. The regular use of the same terminology and references to the new culture of collaboration and learning underlies the emergence of the new COP among watershed council coordinators. These events provide a rare opportunity for open, honest dialogue including the ability to discuss mistakes and lessons learned. Clearly these types of learning interventions are of great value in collaborative watershed partnerships and are important drivers of social learning.

Staff from every watershed council initially thought site and project tours were a waste of time. Most interviewees simply thought they knew the best way to achieve a desired outcome. In the words of one council staffer, “I think a lot of us tend to think we know what we're doing and not question our motives or our decisions.” The learning interventions of the MWP fundamentally changed these attitudes. Participation led to recognition of the expertise and knowledge that exists in other councils. It resulted in changed organizational and institutional practices and priorities. As noted in the literature review sometimes creative conflict can lead to the emergence of new ideas (Dyball et al., 2007). Integrating ideas and organizations is not always a smooth process. While there is evidence of an emerging COP among the participating watershed councils the individual organizations are still independent. This statement from a council staffer reflects the balance of maintaining organizational independence while working as part of the collaborative

...each of the watershed councils is a different and unique organization. We work within a similar framework, but each organization has its own culture, its own priorities, different programs within the watershed councils, different staff positions...We work within different cultures within the basins that we do our work



in. Sometimes it's hard to lump us all together – ‘these are Model Watersheds, this is how they operate and this is what they do’ - because I think we're each unique in our own way...

A different council interviewee reflected on the overall challenge of coordinating different organizations

...It's a tough thing to manage. All these councils with their different ideas and different focuses...trying to put them all into a box of sorts has been really difficult. I'm glad I haven't had to be the one to do it. They give up some of their autonomy in getting into a program like this and I know that a number of them have struggled with it

The MWP processes remains a work in progress through social learning driven adaptations. However it is clear that every council respondent believes the MWP has positively contributed to their organizational capacity.

First-hand accounts from project landowners are tightly linked to the idea of landowner advocates. Landowner advocates represent a learning intervention that influences watershed scale social learning. A significant majority of landowner respondents said first-hand accounts from project landowners and landowner advocates are a good way for watershed councils to gain a broader recognition. However fewer respondents believe these individuals will result in more on the ground projects. There are other factors such as providing economic and technical support, and clarifying that watershed councils are NGO's that are also important to project implementation. This shows a difference between social learning motivation and barrier removal. Watershed council staff recognize the potential of landowner advocates as evidenced by this comment from a West case staffer

...It's really key to find that person in a given sub-watershed that will be your host and your ambassador. It's really hard when you don't have a good ambassador to do this sub-watershed enhancement approach...

There were several other types of learning interventions mentioned by landowner respondents. Landowners from all three cases mentioned outreach in schools, and programs designed for children. Several landowners from the West case said watershed councils have brought groups of students to their properties. They believe this instills an interest in improving watershed ecosystems in kids. It's also possible these children will talk to their parents resulting in increased awareness of watershed council efforts and support for watershed management.

Some learning interventions are more effective than others for facilitating social learning. However, this is no "best" or "right" way to implement a learning intervention. The social learning literature substantiates this (Muro & Jeffrey, 2008; Reed et al., 2010; Rodela, 2013). The information displayed in Tables 9, 10, 11, and 12 in the results section demonstrate this. Implementing social learning interventions necessitates diverse, sustained efforts utilizing different mediums.

The study results, and past research (Johannessen & Hahn, 2013) show social learning is not always associated with learning interventions. Peer-to-peer interactions in established social networks provides some of the most concrete examples of social learning. This almost always involved built social capital. Ideas and information are freely exchanged between individuals with established relationships and rapport. People rely on and take advice from those they know and trust. For example, an agricultural landowner from the East made this comment when describing his community, "This is a small town. Everybody knows everybody. You get more done sitting on a bar stool than you do at most meetings." This is why it's so significant when a

project landowner talks to a friend or neighbor about working with the watershed council. This is part of the reason landowner advocates and first-hand accounts from project landowners are so commonly referenced. Peer-to-peer interactions between landowners who know each other is an important example of what drives watershed scale social learning.

The connections between collaborative natural resource management and social learning are well documented (Fernandez-Gimenez, Ballard, & Sturtevant, 2008; Schusler, Decker, & Pfeffer, 2003). Social learning in organizations is found to influence water resources management efforts in different ways (Lebel, Grothmann, & Siebenhüner, 2010; Pahl-Wostl et al., 2008). Building on this literature there are different examples of watershed scale social learning among the watershed council interviewees. All three of the social learning variables occur in the MWP based social learning but in slightly different contexts from private landowners. One difference is that watershed council staff are generally the ones collecting ecological monitoring data. The processes for collecting this data emerged through social learning. Respondents from every council mentioned the collaborative approach and group learning that went into developing the ecological monitoring protocols

...There's a monitoring group within the Model Watershed Program and that has allowed us to pool resources with other groups...to develop a regional monitoring framework....we're collecting data in the same way as all the other watershed councils are in the Model Watershed Program so that we can get bigger sample sizes. That's another benefit. We're all doing similar project types so we can collect the same data. We can pool that together and look for trends at a larger scale. That's a definite benefit of the Model Watershed program...

Respondents from every watershed council mentioned the benefit of peer-to-peer interactions and learning (motivation variable). The funds, expertise and resources provided by the Bonneville Environmental Foundation and the Meyer Memorial Trust removed barriers to restoration.

This research shows relationships between COP and watershed scale social learning. These findings are bolstered by a body of research showing connections between COP and social learning in natural resource management (Berkes, 2009b; Blackmore, 2007; Pahl-Wostl, 2009). Wenger (1998; 2010) finds social learning can lead to development of COP, but interactions in COP also facilitate social learning. This is an example of the iterative and non-linear nature of social learning in social-ecological systems. This study finds at least two examples where social learning appears to play a role the emergence of a COP, and one example of social learning resulting from an existing COP.

The existing COP are found among agricultural landowners. There are multiple COP relating to agricultural landowners living in different watersheds. Nykvist (2014) finds evidence of social learning in agricultural based COP, but also determines this social learning does not always improve natural resource management. His research shows social learning in agricultural based COP improves natural resource management when an individual takes a leadership role. This is a contextual example of the influence of landowner advocates to facilitate social learning in the management of watershed ecosystems. Across all three cases agricultural landowners said they rely on and trust other agricultural landowners for information about land use decision making. At least one farmer said he felt a personal responsibility to reach out to other farmers and encourage them to consider working with the local watershed council.

The emerging COP include the watershed council staffs, and the watershed residents from two sub-basins in the West case. This is evidence of social learning occurring at different spatial scales. In both of these instances social capital is evolving from bridging to bonding.

Mostert et al., (2008) show that COP can emerge among non-governmental organizations in the management of water resources. They also show that social learning both leads to the emergence of COP, and is facilitated by interactions in COP.

6.4 Research Objective 2: To examine how social learning influences awareness of socialecological systems.

This research objective has several underlying goals. One is to better understand how to increase awareness among landowners that they live in a watershed ecosystem. Another is to increase awareness that landowners are part of their local watershed ecosystem. The actual term “social-ecological system” is never used by any interviewees which is not surprising. What matters is recognition of the concepts and relationships associated with social ecological systems.

This project, and much past research strives to better understand learning in natural resource management in response to change in social-ecological systems. It is observed that learning interventions in natural resource management often lack identifiable expectations and purpose. Armitage, Marschke, and Plummer, (2008) (and others) call for specificity and clarity of learning goals and objectives for natural resource management in social-ecological systems. In response this portion of the discussion identifies how social learning build awareness of socialecological systems and social-ecological interactions. The study finds there are specific

issues and topics, and types of learning interventions that build awareness of social-ecological interactions.

A significant majority of landowner respondents cite the desire to *improve* a stream ecosystem as a major reason they are willing to work with a watershed council. In order to see something *improve* there needs to be information documenting change. Information from ecological monitoring data can document current condition and future change (in the conclusion is a brief discussion about potential problems with documenting ecosystem level response or improvement from restoration actions). Distribution of ecological monitoring data achieves the goal of building awareness that landowners live in a watershed ecosystem. Landowners talked about information documenting change in relation to activities on their property and the local watershed. Information from individual properties has an impact but only four landowners specifically mentioned they'd received monitoring data associated with their property. There is greater interest in information documenting conditions and changes across a watershed. This highlights the value in social learning interventions providing information about the condition of a local watershed.

Efficacy is a foundational construct in the social learning literature (Bandura, 1977). Self-efficacy relates to the motivation social learning variable and is an essential part of social learning to manage watershed ecosystems. Germane to this research is understanding how self-efficacy relates to group dynamics and collective belief in the ability to achieve a desired outcome (Bandura, 2001). Prior and Eriksen (2013) measured the relationships between self- and collective-efficacy to understand the outcomes of natural resource management focused learning interventions. They find community-efficacy is increased by learning interventions that build awareness of social-ecological systems, and cohesion around the ability of a community to

collectively influence the condition of their local environment. Perception of self-efficacy has also been used to understand social barriers and limits to learning and adaptation in natural resource management (Adger et al., 2008). One way to evaluate and understand learning interventions in social ecological systems is to look for changes in efficacy across groups of watershed residents. This finding relates to the emerging COP in some of the model watershed sub-basins. There are clear changes in self- and community-efficacy to positively influence the condition of a watershed ecosystem. These changes are driven by social learning, and interventions including ecological monitoring data.

Double-loop learning can increase awareness of social-ecological systems. The most common examples of double-loop learning in the study involves ecological monitoring data and fish recovery. Landowner respondents express a strong desire to see fish populations recover, thus fish recovery efforts represent a contextually important tool for increasing awareness of social-ecological systems. Couching ecological monitoring data and ecosystem condition through the lens of fish recovery is one way to increase awareness of social-ecological interactions. Past research also shows double-loop learning underlies social learning relating to fish and water resources management in social-ecological systems (Armitage et al., 2008; Brewer, 2013).

Learning interventions can facilitate social learning to increase awareness of socialecological systems. In some instances they inform landowners about the condition of a watershed. In other instances they demonstrate how landowners can influence the condition of a watershed. In this way interventions can build awareness of social-ecological systems and socialecological interactions. Awareness of current and desired future condition, and interest in influencing this condition relates to the motivation social learning variable. Learning interventions to increase awareness of social-ecological systems are most effective if they are

transparent and straight forward. They will not be well received if perceived to have an agenda, or give the appearance of coming from an advocacy or environmental group. Learning interventions can remove barriers, however, in order to do this they must not have a regulatory tone. Learning interventions can also influence motivation to act, and thus relate to the concepts of self and collective efficacy.

Among watershed council staff social learning associated with participation in the MWP increases awareness of social-ecological systems. Olsson, Folke and Berkes (2004) posit that organizations involved in collaborative natural resource efforts should incorporate ecosystem and social-ecological feedback in their processes and priorities. The structured and unstructured interactions from the MWP moves towards this. For example, the emergence of the new watershed council COP is built in part on influencing social-ecological systems, and socialecological interactions in the Upper Willamette River basin. Prior to the MWP, there were different relationships and levels of communication between the councils. While they are all doing similar work (e.g., improve water quality, recover fish populations), they often were doing so independently with limited sharing of information and resources. The MWP ushered in a new level of formal and informal interactions creating a new culture of open communication and information sharing.

Informal social networks associated with collaborative natural resource management have been shown to provide innovation and adaptation in response to social-ecological complexity (Folke et al., 2005). An example of this is perhaps the most significant outcome of the MWP. Many council interviewees for the first time are thinking about their impacts as it relates to the greater Willamette River watershed, and not just their individual basins. This represents a



fundamental shift in organizational priorities. There is a clear sense that seven councils are working together in concert to achieve cross-scale outcomes. When describing the

MWP a watershed council staffer said

...Being able to work with partners on a more landscape level approach has been really cool. From an ecological perspective and looking at restoration priorities ...this is a big chunk of the Willamette and a big chunk of the restoration priorities. Ecologically, it's super cool being able to zoom out to a bird's eye view and implement priorities...

Collaborative watershed partnerships can support social learning and increase interorganizational cooperation and coordination. This partnerships provides a framework that pushes the participating councils to look outside of their basins and reevaluate their priorities.

### 6.5 Research Objective 3: To examine how social learning leads to adaptive capacity.

The study shows different ways in which social learning leads to adaptive capacity. Learning interventions can facilitate social learning leading to adaptive capacity. The results and discussion provide numerous examples and explanations of learning interventions. Learning interventions influence support for land use changes and efforts to influence watershed ecosystems. They increase awareness of social-ecological systems, and the role of humans as parts of ecosystems. They can also be tailored towards different stakeholders and socialecological systems. Efforts to increase social learning driven adaptive capacity in natural resource management are enhanced by a range of learning interventions.

Double-loop learning provides an operational measure to identify increasing adaptive capacity in social-ecological systems (Pahl-Wostl, 2009). The examples of double-loop social learning among private landowners demonstrate new perceptions of the connections between watershed residents and watershed ecosystems. Also, this learning influences changes in self-efficacy and perception of the ability of watershed residents to influence a watershed ecosystem.

Past research shows that adaptive capacity includes recognizing the knowledge and expertise that different stakeholders bring to understanding social-ecological systems (McCarthy et al., 2011). Collaborative natural resource management can achieve this by drawing on different types of knowledge to learn and adapt to social-ecological complexity (Armitage, 2005). Among private landowners, willingness to consider new land management strategies is an applied example of adaptive capacity. Another example involves landowners reaching out to other watershed residents to increase support for managing watershed ecosystems. Both of these examples of adaptive capacity are linked to changes in understanding from social learning.

Social learning has been shown to occur in structured and unstructured formats (Brewer, 2013; Pahl-Wostl & Hare, 2004). The study shows different ways learning interventions, and structured and unstructured interactions result in recognition of the validity of information and ideas from new sources and individuals. Watershed council staffs now seek the expertise of staff from other councils, whereas before they did not. The emergence of the MWP based COP is based in part on willingness to consider new ideas and types of knowledge.

## CHAPTER 7: CONCLUSIONS

The analysis and reporting of the results involved interpreting, connecting and explaining events spanning different spatial and temporal scales. This relates in part to the embedded case study design utilized in this research. These parameters, coupled with the qualitative, interpretive approach creates a narrative that is non-linear. Many of the findings are overlapping and integrated in different ways. It is my belief these challenges can be linked to social-ecological complexity. I believe complexity is woven into the fabric of my study.

Complexity means knowledge and understanding is always limited and never absolute. The historical legacy of command and control in natural resource management is based on the false assumption that ecosystems processes and social-ecological interactions can be predicted, and ultimately understood. Natural resource management decision making in complex socialecological systems must be dynamic and built on a foundation of learning and adaptation. Accordingly my study finds that learning and adapting is a process. In this chapter I try to explain parts of this process in the context of influencing watershed ecosystems.

The literature and the study findings illustrate different ways in which watersheds are social-ecological systems with differing conditions and configurations. There are similarities and patterns in the social-ecological systems in the study area, but no two are the same due partly to social-ecological complexity. Complexity is a poorly operationalized concept, as such it was not addressed in the results and was only briefly mentioned in the discussion. The following is a reflection on some factors that might relate to complexity. Some of these ideas come from deep immersion in the data. I do not claim to have strong evidence backing all these statements. The study and literature present different ways to understand social-ecological complexity. With this

section I hope to inform future research and provide some ideas to better understand the relationships between complexity and natural resource management in social-ecological systems.

One dimensions of complexity can be linked to evaluation of restoration outcomes. This project does not deal with actual ecological data, only the manner in which it is perceived. However, there are some potential concerns about the relationship between ecological monitoring data and support for restoration. This is a highly significant aspect of complexity.

Demonstrating direct relationships between restoration projects and ecosystem conditions is shown to problematic (Palmer et al., 2005). Salmon recovery provides an important example, despite billions of dollars in expenditures the actual outcomes of salmon recovery efforts are largely unknown (Barnas & Katz, 2011). Landowner respondents from all three cases made statements indicating they believe they have seen changes in their local watershed ecosystem they attribute to restoration efforts. Some examples include descriptions of clearer, cooler waters, more ducks and geese on the stream, and more fish. Staff from several watershed councils express concern that both funders and members of the public might have unrealistic expectations about restoration outcomes. It often can take years if not longer to see an actual ecosystem level response to restoration actions. Sometimes restoration projects are a complete failure and yield no actual results (Falk, Palmer, & Zedler, 2006). Future research should explore how to communicate expectations about watershed restoration efforts with members of the public.

Differences between the cases provides evidence of complexity relating to socialecological configurations. Past research shows factors such as the type of land use and proximity to a municipality influences support for restoration projects on private property (Kauneckis & York, 2009). There are patterns in the different cases that appear to align with these findings. In the study proximity to a municipality seems to influences landowner support

for voluntary land use changes. Landowners in the South case who do not live near a municipality are more independent and seem to have a different sense of identity than those from the West or East cases. Based on statements from landowners and watershed council staff from the South case it seems harder for watershed councils to build relationships in this area when compared to the West and East cases. Landowners from the West case are influenced by their proximity to the municipalities of Eugene or Corvallis. There seems to be more of an identity linked to these municipalities. There is a larger population base and greater affluence than the East or South cases. Landowner outreach and engagement efforts in more remote, isolated areas provides a unique set of challenges.

There a number of findings that set apart agricultural and private forestland owners. Among landowners from working landscapes there are distinct social learning contexts. In general, farmers tend to trust other farmers, and private forestland owners trust other private forestland owners. Both of these groups also interact through specific occupational based organizations. For example almost 75% of private forestland owners mentioned being involved with the Oregon Small Woodland Owners Association. Learning interventions geared towards these groups need to be provide contextually relevant information. Economics are particularly important to agricultural and private forestland owners. Robbins and Daniels (2012) observe the economics of restoration projects and land use is an important concept for ecosystems management efforts that does not receive ample attention. Economic support for restoration projects is an important theme in the study that clearly impacts social-ecological complexity. In many instances land use economics is a key factor underlying landowner support for a restoration project on their property. This is an issue that warrants a more in-depth analysis in future research.

Complexity relates to the concepts of barrier removal. All three of the variables used to operationalize social learning are significant in different ways. However, the concept of barrier removal is particularly complicated. The results show funding to support restoration projects is key to landowner support for projects on their property. If there were no funds available to support restoration projects the study results would almost certainly have been different. Very few private landowners are willing to pay for restoration projects on their property. As observed by Robbins and Daniels (2012) the relationships between ecological restoration and economics are important.

Support for salmon recovery and watershed management efforts have been connected to different socioeconomic factors (Becker et al., 2004). Among these are purely economic factors such as employment status and income. Across the study area about 13% of households are below the poverty line. Based on statements made by interviewees from both groups poverty is particularly pervasive in the South case. This is partly a reflection of declining timber jobs and isolated communities far from municipalities with limited economic opportunities. There are similar conditions in some areas of the East case. Landowners are not going to prioritize spending time and energy on restoration if they are struggling to make ends meet. Based on this the economic status of individuals and communities almost certainly influences complexity.

There are demographic and other socioeconomic factors that can also potentially be linked to complexity. Some of these factors include education, age, and length of residence in a watershed. The study did not specifically collect this data, however during the interviews this information sometimes emerged. Generally speaking, interviewees with higher education levels (i.e. college or graduate degrees) willingly cooperated with a watershed council. They took very little convincing and in some instances were willing to spend their own time and money in

support of restoration projects. Residents who had recently moved to the watershed, or who had grown up moved away and come back were more willing to cooperate with a watershed council when compared to long time watershed residents who had lived there all their lives. Generally speaking, long-time watershed residents were often more reluctant to consider new ideas or cooperate with the watershed council. The reluctance to consider different types of knowledge can be viewed as a barrier to adaptive capacity. Age likely impacts willingness to cooperate with a watershed council. Landowner and watershed council respondents both mentioned that older landowners are more set in their ways and less willing to consider new ideas. Multi-generational landowners from private forestland or farming families often talked about differences in the way they and their parents choose to manage the land. They frequently mentioned things their parents did that are no longer socially or environmentally acceptable, such as taking a bulldozer and straightening a stream or logging riparian areas. It's likely there are some older landowners who might never be willing to cooperate with a watershed council.

Social-ecological complexity relates to the size and location of a watershed. There are different findings that relate to the size of a watershed. It is important to note the study was not specifically designed to identify differences in landowner attitudes between smaller sub-basins and the larger river basins in which they are found. However, there is clear evidence the focused efforts underlying the Model Watershed Program are effective for different reasons. The study shows landowners are generally concerned about, and interested in their local watershed. The results show different ways social learning interventions yield distinct outcomes when associated with the local watershed. Other studies demonstrate scale influences support for efforts to collaboratively manage watershed ecosystems in Oregon (Hibbard & Lurie, 2015; Margerum, 2008). Cheng and Daniels (2005) found that among rural landowners in Oregon, the size of a

watershed influences support for restoration and management efforts. They found increased community support for efforts to manage smaller sub-basins, and less support for the larger river basin. They find this relates to a personal connection, sense of place, and identity linked to smaller sub-basins. The findings in the model watershed sub-basins align with this. The landowners in the study seem to have a connection to their local watershed.

In conclusion this project highlights the importance of understanding the connections between social-ecological systems and natural resource management decision making. The genesis of this project stems from my personal observation that the ecological sciences are more mature than the social sciences of watershed management efforts. I see this as a problematic; you can have money, expertise and resources to support restoration for salmon recovery but without willing landowners it doesn't matter.

Salmon are an iconic species. I and many others have an interest in trying to better understand how to build support for salmon recovery. However, salmon recovery is really a proxy for managing watershed ecosystems. Nationwide it is increasingly recognized that private landowners play a key role in influencing the condition of watershed ecosystems. Clearly these efforts necessitate viewing watershed ecosystems as social-ecological systems. That ecological sciences are more mature and receive greater support than social sciences in natural resource management creates barriers. This project contributes to a growing body of work seeking to remove these barriers. It is my hope this project might make a small contribution to future natural resource management efforts.



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## **Appendix A: IRB Documents**

### **INTRODUCTION TO PRIVATE LANDOWNERS**

Hello, my name is Dan Calvert, I'm a grad student at OSU.

I'm contacting you because you have interacted with the XXX watershed council.

I think the work that watershed councils do is important and underappreciated, I think it's important for more organizations to figure out how they can work on a cooperative voluntary basis with private landowners to improve the condition of streams and rivers.

I'm doing a study to get a better understand how watershed councils in the upper Willamette basin interact with private landowners. This study involves two parts, conversations with watershed council staff and private landowners from their basin. I'll be interviewing landowners and council staff from the seven watersheds in the Upper Willamette river basin; the Marys River, Long Tom, Luckiamute, North Santiam, South Santiam, Calapooia, and Middle Fork Willamette.

I'm contacting you because I'm hoping to have the opportunity to speak with you in person or over the phone to get a better understanding of you experiences working with the XXXX Watershed Council and to get a feel for the community you live in.

For starters like to ask your permission and see if this type of study is something you would be willing to consider being involved with.

Let me explain what being involved means. By involved I mean being willing to speak with me in person or over the phone. This will be a one time event at the date, time and location of your choosing. I'd like the opportunity to see the actual project that was done on your property and then chat about your experiences afterwards.

I'll tell you up front that I would plan to record our conversation, the only people that will hear the conversation will be me, my advisor, and individuals from a professional transcription service.

In my reporting process I'm going to merge all the responses I get into one document and I will not report any names or indefinable information.

I look forward to hearing from you.

Sincerely,

Dan Calvert



## EXPLANATION OF RESEARCH

School of Public Policy

Oregon State University, Corvallis, OR 97331-3703

### EXPLANATION OF RESEARCH

Project Title: Collaborations, social learning and stewardship: Understanding the drivers of adaptive capacity

Principal Investigator: Denise Lach, Professor

Transitional Director School of Public Policy

**Sociology Program**

Oregon State University

Corvallis, OR 97331-3703

Co-Investigator(s): Dan Calvert, **OSU graduate student (interviewer)**

You are being invited to take part in a research study funded by the National Oceanic and Atmospheric Administration aimed at learning the opinions of residents living in the Upper Willamette River basin who have worked with a watershed council. I am studying this because I hope to use the results to help watershed councils work more effectively.

We want to interview a variety of individuals who differ in age, gender, occupation, and other factors. If you agree to take part in this study, the interview will last about an hour and will be recorded for later analysis.

It's just a conversation that you can end at any time and your participation is completely voluntary. Your participation and decision of whether or not to participate will in no way impact your relationship with the watershed council. We hope you enjoy talking about your views with us, though you may not directly benefit. However, we hope that, in the future, other people might benefit from this study because of what we learn about the understanding and opinions of people we interview, concerning working with their local watershed council.

The information you provide during this research study will be kept confidential to the extent permitted by law. Your comments will be identified only by a number, not by your full name, and your comments will be added to those of other people and studied as a group. We acknowledge there is always a slight risk of a breach of confidentiality, and there is a risk that we could disclose information that could identify you. In an effort to avoid this all information gathered in this study will be stored on a secure OSU server. If the results of this project are published, your identity will not be made public. Your participation in this interview is completely up to you. You can withdraw from the interview before it ends, although in that case, we may keep information collected from you and include it in our study reports unless you explicitly ask us not to.

If you have any questions about this research project, please ask Dan Calvert in person, or call Denise Lach, at OSU, 541-737-5471. Address  
Transitional Director School of Public Policy  
**Sociology Program**

Oregon State University  
Corvallis, OR 97331-3703

If you have questions about your rights as a participant, please contact OSU Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-8008 or by email at [IRB@oregonstate.edu](mailto:IRB@oregonstate.edu).

### **PRIVATE LANDOWNERS INFORMED VERBAL CONSENT AND INTERVIEW QUESTIONS**

#### **Informed Consent Process: Verbal Preview**

*Before we begin, I need you to understand and consent to the interview. All of your responses will be kept confidential, and the recording we'll make will only be listened to by the research team and individual(s) from a professional transcription service. Also, you have the right to end the interview at any point, although it will really help us most if we're able to complete the interview. It should take about an hour. Although the study team will not publish or share any identifiable information such as names, there is always a risk that the nature of your responses will create a risk of breach of confidentiality. (Give them time to read the verbal consent form and offer them a copy if they would like one).*

Interviewer:

*In this project, we're trying to better understand how watershed councils work with local residents. There aren't "right" or "wrong" answers, we're really just interested in knowing what you think. If it's ok I'd like to get started*

#### **Questions for Private Landowners**

- 1) *I know that you are working with the watershed council, can you tell me about this experience?*  
Probes: How did it start, why did it happen? Can you briefly walk me through the experience from your end? If I don't get to why they are involved I can probe. How well known is the council in the community? How could they be better known? Are there economic, environmental, conservation or social factors? What have you learned by working with the watershed council? What did they do right and what did they do wrong? How do you think they could do a better job? How could they reach more people? Why do think some of your neighbors don't want to work with the council?
- 2) *What kinds of changes have you noticed in your watershed?*  
Probes: What is driving these changes? Are there any social or environmental factors associated with these changes? Do you think the watershed council is making anything change in your watershed, neighborhood or community? Has the watershed council made you more aware of your neighbors or where you are in your watershed? What are causes and consequences of these changes? How about the sub-basin where you live versus the bigger, river scale watershed? What kinds of changes would you like to see in your watershed and what might be preventing these types of changes?
- 3) *Where do you get information about how to manage your property?*  
Probes: Is it a person, group, publication or some other source? Why do you trust this source more than other? What do you do with this information? What kind of information would you

like more of? What would it take to get you to consider a new approach to managing your property? Where would it have to come from?

4) *What does stewardship mean to you?*

Probes: What does it mean to you and how do you define it? What does it mean in the context of the project on your land? What are behaviors, values and beliefs that might be associated with this type stewardship? What does this mean once a project is completed? What is the relationship between watershed council activities and your perception of stewardship? Have your neighbors or friends or some other source influenced your sense of stewardship?

5) *How long have you lived in the watershed?*

Probes: How long has your family lived in the watershed? How long has your property been used in the current manner? Is this important to you?

## **WATERSHED COUNCIL STAFFER INFORMED VERBAL CONSENT AND INTERVIEW QUESTIONS**

### **Informed Consent Process: Verbal Preview**

*Before we begin, I need you to understand and consent to the interview. All of your responses will be kept confidential, and the recording we'll make will only be listened to by the research team and individual(s) from a professional transcription service. Also, you have the right to end the interview at any point, although it will really help us most if we're able to complete the interview. It should take about an hour. Although the study team will not publish or share any identifiable information such as names, there is always a risk that the nature of your responses will create a risk of breach of confidentiality. (Give them time to read the verbal consent form and offer them a copy if they would like one).*

Interviewer:

*In this project, we're trying to better understand how watershed councils work with local residents. There aren't "right" or "wrong" answers, we're really just interested in knowing what you think. If it's ok I'd like to get started*

### **Questions for Watershed Council Staff**

- 1) Can you please explain your job with the watershed council?**
- 2) What are institutional, social, cultural and economic factors that relate to the institutional capacity of your organization?**

Probe: What is unique about your organization? How does this differ from the other councils in the Upper Willamette system? What are important historical factors? How do these factors influence your organization? What would you like to change?

- 3) What kinds of changes have you noticed in your watershed?**

Probes: What is driving these changes? Are there any social or environmental factors associated with these changes? What are causes and consequences of these changes? How about the sub-basin where you live versus the bigger, river scale watershed? What kinds of changes would you like to see in your watershed and what might be preventing these types of changes?

- 4) How do interactions with watershed residents influence the institutional processes of your organization?**

Probes: What situation or event might lead to institutional change in your organization? What does institutional change mean to you? Can you tell me about your strategies and approaches to working with watershed residents? What approaches used by staff in landowner interactions/outreach? What is your approach to "landowner interactions"? What are the mechanics and the philosophy? What do you think is important to the landowner in our approach? What are our "do's and don't's" of landowner

interactions? What have we learned works and doesn't work? What are the signals we get from landowners that tell us that our approach is or is not working?

**5) Where do you get information about land management strategies?**

Probes: Is it a person, group, agency, publication or some other source? How does this affect or relate to how you convey information to private landowners? Why do you trust this source more than other? What do you do with this information? What kind of information would you like more of?

**6) What does stewardship mean to you?**

Probe: How do you define it? What does it mean for your organization? What are behaviors, values and beliefs that might be associated with this type stewardship? How do you approach the concept of stewardship with landowners?

**7) How has your organizational philosophy and efforts changed in response to involvement with the MWP?**

Probe: Do they differ from non-model watershed? Has it influenced your institutional capacity? Would you reevaluate any of your previous answers based on your experiences with the MWP? Can you think of any mistakes, missteps or changes might want to make for lack of a better term? Has your experience with the MWP shaped the answers to the other questions? What could BEF have done or be doing better?

**8) How do you define social capital?**

**9) When I look at watershed council staff, I'm always amazed at how many different hats you all have to wear and how intensively you work. How do you make your job sustainable on a personal and professional level?**



