Community Learning in Social Resilience

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by

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AUTHORIZATION TO SUBMIT DISSERTATION

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ABSTRACT

My project explores a new model with which to articulate increased social resiliency from community learning. The research question at hand is: **what contribution does community learning as an outcome of nonformal community-based education, play in social resilience**? This work builds on existing frameworks of group learning and of social capitals, to articulate community learning resulting in greater community adaptive capacity. Communities must assemble knowledge from multiple sources, along with local (place-based) cultural adaptations, to adapt to change (Armitage, et al., 2011). The research described in this dissertation includes four published or publishable chapters:

- Introductory and Literature Synthesis
- Extension Professional's involvement in multistakeholder groups as an alternative to the usual "focus group" method of identifying community needs
- Analysis of Volunteer Activity in Two University Extension Citizen Science Water Quality Monitoring Programs
- Synthesis of observed effects on community learning from involvement in extension programming, multistakeholder groups, and volunteerism: developing and pilot testing for validity, a conceptual model (framework) as an Extension tool.

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DEDICATION

This work is dedicated to the many people who have put up with my longstanding habit of finding myself too busy with other work obligations to finish this degree in a "normal" timeframe. My parents, Harv and Grace Ekins, must be especially weary of my ten-year journey. My university colleagues in the U-Idaho Service-Learning Center, Larry Young, Adrian Wurr, Suzi Billington, Eric Anderson, Matt Vaarstra, Ph.D., Katie Schiffelbein, Ph.D, and many others, allowed and encouraged me to embark on and continue this journey. My Extension colleagues are another source of grounding and support, including Mike Howell, Ph.D., Barbara Petty, Ph.D., Doug Finkelnburg, Jen Werlin, several Jims (Church, Lindstrom, Wilson), and Katie Hoffman, among many, many others. I am grateful for my colleagues' encouragement and support, all of us knowing that this degree will lead to absolutely no significant financial benefit within the University Extension system. I am grateful for the U-Idaho College of Agriculture and Life Sciences for unexpectedly tripling my required scholarly and creative performance expectations halfway into the five-year tenure track. An unanticipated consequence of this action was to permit more time to dissertate, and the change quite possibly saved my degree.

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Introduction

My interest in social learning stems from my observations of people interacting in collaborative groups, and in evaluations of nonformal community-based educational programs. The notion of social, or community, learning derives from the idea that groups of people share norms, values, beliefs, and understandings of the world around them. It can be argued that the tighter knit the community (and the networks therein), the greater the community's ability to develop adaptive capacity and resiliency. Of course, it can also be argued that, lacking new information via weak network ties, communities can also grow stagnant, rigid, and thus less resilient.

University Extension Service is an arm of the university that brings scientific knowledge in an understandable way to the people. Extension is often described as "community-based education." Through developing and delivering nonformal educational programming, community members can, without substantial out of pocket cost, learn about the areas of economic literacy, community development, leadership, family and consumer sciences, agriculture, soils, and natural resources management. Extension professionals are generally classified as researchers (specialists) or educators who carry the knowledge from research into the community. Extension educators are usually housed within individual counties and so are embedded within the community. County commissioners and other local leaders provide Extension educators with prioritized needs, and educators can also reach out to the community in other ways to find and develop educational priorities. It is in the nonformal nature of Extension work, and that educators are imbedded within the communities they work in, that trust is built, and local knowledge is integrated with research-based (institutional or top-down) knowledges. As an Extension educator, with an academic background in studying volunteer participation and attrition from watershed councils, I have a dual interest in studying the ability for each to improve community resiliency and adaptive capacity.

So, my research interests include articulating the power of nonformal, community-based generation and dissemination of knowledge (e.g., Extension programming and other nonformal processes of group learning like watershed/stakeholder groups) to enable common understandings of complex watershed and natural resources management issues and lead to resilience thinking. Whether this model results in better decision-making, increased adaptive capacity, and ultimately increased social-ecological resilience require assembling a number of other social science principles, is as yet unknown. Granovetter's (1973) understanding of weak ties bringing in new,

sometimes transformative, information into a group or social system can help explain how Extension educators can help communities find common meanings in landscapes (Greider & Garkovich 1994) and in renegotiating of landscape meanings in the pursuit of more holistic co-management.

Extension educators can be a bridge from the community to new information and new perspectives on how to apply that information. Active participation in multi-stakeholder groups brings people representing distant parts of the community together (my assumption here is that multi-stakeholder groups do not exhibit the homophily (Blau, 1977; McPherson et al., 1992) as other voluntary organizations), and is also a type of bridging activity. Different types of knowledge are needed in the construction of landscapes, and in the development of resilient (as opposed to static) co-management of natural resources. Different types of social capital are needed to build and sustain a resilient system, and social learning, in the form of reconceptualizing a landscape's multiple symbols and meanings into a rationality that leads to effective, resilient systems thinking (Williams, 2017). In short, I argue that Extension programming (and other forms of social learning), through creation of common place meanings can improve the practice of complex ecosystem management for providing a wider range of ecosystem services than the historic practice of managing for multiple use commodity production. The simple resynthesizing and communication of ever greater bodies of scientific knowledge to managers is no longer sufficient, and Extension programming should follow suit. Extension educators, who are usually embedded within their community (by the nature of being county-based) can apply and interpret scientific knowledge within the multiple layers of institutional (e.g., political, economic, and local values) context, some of which are in conflict among different groups, to more effectively develop place-oriented, or context-dependent, knowledge in the pursuit of improved sustainable landscape governance. This project will propose ways to improve the process behind developing community resiliency. That is, how might we better conceive of strategies for promoting continual learning and adaptation as a vital component of resiliency?

Learning Theories

The concept of learning is more than simply stated cognitive processes studied in laboratories with rats and mazes. The concept of learning is complex and problematic in that many theorists have devised many theories with overlapping ideas, practices, and synthesis. Fundamental

questions about what learning is, what knowledge is, where and how learning takes place, and how learning can be facilitated have yet to be universally answered. Instead, theories on learning stem from early Greek philosophers' debates on the nature of knowledge (Plato believed it to be inherited and un-learnable, while Aristotle believed it to be learned from sensory experience) through a range of early academic disciplines (philosophy, psychology, and biology) to newer academic disciplines (neuroscience, information science, sociology, behavioral science, political science, anthropology, management science, and genetics). Aristotle distinguished among four forms of knowledge: *episteme*, *techne*, *phronesis*, and *metis* (Flybjerg, 2001). *Epistome* refers to abstract and universal knowledge; *techne* refers to knowledge associated with long-term engagement with a craft or specific trade; *phronesis* is a type of practical wisdom like that created by the social sciences; and *metis* refers to local, practical knowledge that cannot readily be transferred by reductionist book learning. *Phronesis* emerges from "an intimate familiarity with the contingences and uncertainties of various forms of social practice embedded in complex social settings" (Caterino & Schram, 2006, p. 9). It is a political skillset used when reasoning about values, symbols, and power. *Metis* is not as refined or systematized as *techne* and is rooted in local problem solving and within a local historical context.

Some theorists overlap disciplines and attempts at categorizing learning theories find it difficult to delineate discrete theoretical areas. This difficulty to corral all learning theories into neat and tidy boxes is in large part because of considerable evolution of and development of learning theories over time. Much of this evolution has moved in the direction of focusing on the social nature of learning instead of the individual nature (Blackmore, 2007).

In summary, learning can be thought of as a process of acquiring new or different information that can be articulated through studies of cognition, learning styles, texts, and building on previous learning. Learning can also be viewed as qualitative outcomes. Both process and outcome learning, in the form of conversations and interactions among people, can be thought of as greasing of the cogs of a more smoothly operating machine; that machine being the community (Falk & Harrison, 1998). A variety of ways of conceptualizing and articulating community-based learning is described below, not necessarily in any particular order.

Social- and Community Learning

Community learning broadly refers to individual and group processes (conversations, interactions, meetings) that produce and sustain community capital and community resilience. Members of the community should each perceive that they have contributed to increasing the community's capacity and can describe knowledge that other parts of the community hold (Falk & Harrison, 1998). It is also sometimes referred to as social learning and derives from Vygotsky's (1978) Social Constructivism.

Social constructivism describes a process by which knowledge processes occur internally, but that the nature of these processes, and the context of the content, are driven by forces external to the person. Vygotsky (1978) developed some of the initial thinking on social constructivism in that learning is active and contextualized. Vygotsky's theories, like Bandura's on social learning, can be traced back to behaviorist approaches from the late 1890s, that included learning by imitation (Blackmore 2007). A learner brings past experiences, social interaction, and cultural aspects to constructing new knowledge or understanding of the world. Social constructivism can be thought of as a spot on a philosophical continuum far from positivism. People are social, and not objective, in thinking, nor in learning. Social constructivism extends from the concept of constructivism that a learner is not passively accepting knowledge but instead is actively constructing knowledge from incoming bits of information and assembling knowledge into a mappable network. Social constructivism can be framed as a social theory, a learning theory, or even an epistemological position; several new contemporary learning theories have been built upon the social constructivism's base.

Social learning traces roots from a form of adult organizational learning in the late 1970s (Argyris & Schon, 1978; Bandura, 1977; Bandura & Walters, 1963). More recently, Bouwen (2004) describes social learning as "understanding the limitations of existing institutions and mechanisms of governance" (p. 143) and actively experimenting in the polycentric governance of social-ecological systems. It requires a process of continual learning from adopting and then adapting management practices that can be thought of as experimental. Wenger (1998) goes further to describe social learning as a social and historical process, beyond a focus on collective learning. Social learning can happen at different levels, from consequences of individual actions (single-loop), and the assumptions behind our actions (double loop) to challenging the very values and norms that drive our actions and assumptions (triple-loop learning) (Keen et al., 2005; Keen & Mahanty,

2006). An Extension educator facilitating social learning needs to design a process through which people from different stakeholder groups can learn together how to improve a situation, and in which values and perspectives can be shared and contested. Through the process of dialogue and learning together, and through collaboratively experiencing the outcomes and consequences of particular management actions, future management actions can be improved.

Communities of practice (or learning communities) are groups sharing a common concern or interest, and who learn how to improve their activity within that concern/interest through regular interaction (Wenger, 1998). Wenger (1998) originally studied communities of practice in the context of the business environment, but then later used the concept to explore intergovernmental collaborations and other social-ecological contexts. Communities of practice are distinguished from other communities by (a) identity is rooted in shared competencies that are valued by other members and distinguish members from nonmembers; (b) engagement in shared activities and discussions, forging relationships and stronger learning pathways within their area of concern/interest; and (c) develop and share a base of "resources, experiences, stories, tools, and ways of addressing recurring problems" (Williams, 2017) in their area of interest. Case studies or other experiential learning are often a preferred method for transferring knowledge, as opposed to academic disciplines' reliance on top-down, deductive research and development of theory. Collins and Ison (2009) argue that communities of practice is a form of social learning. Again, like with Granovetter's (1973) weak ties, the learning that happens in communities of practice can change the social structure of the group. The structured learning that happens in communities of practice "confirm and change social practice and the associated interpretation of the environment" (Pahl-Wostl, et al., 2007, p.7), and it continually reshapes the group itself as learning occurs in the practice of ecosystem management.

Social learning processes and shared knowledge are preserved in communities of practice, and therefore can be thought of as a type of social capital. Higher levels of social capitals result in lower societal transaction costs required to enhance a public good like environmental quality. Communities of practice can be viewed as a type of social network in that they manage, generate, and store knowledge.

> This is of particular interest in the adaptive management of complex river basins in which different sources of knowledge and a continuous process of learning from experience and new insights are, or rather should be, at the core of management practices. (Pahl-Wostl, et al., 2007, p.7)

Communities of practice can also become the link between formal institutions such as those which hold legal responsibility for decision-making, and the informal or collaborative setting (Bouwen & Taillieu, 2004).

Collaborative learning is a set of techniques and a framework that can be used for complex multiparty decision making. It begins with a set of assumptions about the world, including that conflict is inevitable but manageable, that there are real limitations in nature and therefore also in the range of decision options, and that learning is an inherent part of the process (Daniels & Walker, 2001). Collaborative learning draws from the fields of conflict management (e.g., Deutsch, 1973), active/experiential learning theory (e.g., Dewey, 1938; Kolb, 1984), organizational and group learning theory (Senge, 1990), and systems thinking (Churchman, 1971; Wilson & Morren, 1990).

Another conceptualization of community learning has been described as "civic ecology" (Krasny & Tidball, 2010). Civic ecology describes the process of people and groups engaging in urban ecological restoration projects, with a deliberate focus on social learning. During the process of restoring natural function to previously urbanized places, the social learning focuses on critically examining institutional and physical contexts, management practices, and the restorative outcomes that change the original context (see also Pahl-Wostl et. al., 2007).

Participatory modeling (Sandker et al., 2010; Voinov & Bousquet, 2010) include mechanisms to increase and share knowledge and understanding of systems under a variety of conditions and states of change, and to demonstrate and identify potential impacts of a range of solutions to a given problem. Locally applied models include simple place-based exercises used to teach to middle school students at the Clearwater County 6th Grade Forestry tour and the Big Wood Simulation for 8th and 9th grade students at the Central Idaho NRM Camp, to adult audiences using the Futures Game, a planning exercise, and university students creating a planning-oriented board game that incorporates the biophysical elements and social meanings of place.

Cognitive mapping (C-maps) is a logically-defined method for graphically representing relationships among key concepts and feedbacks among them (Axelrod, 1976). This fits well with constructivist worldviews in that people make connections among representations of their world to develop new knowledge (Gray, et al., 2014). C-maps can represent how a person understands the world around them and the associations the person uses to catalogue, interpret, and create meaning to stimuli. A C-map is a graphical representation of direct linkages with action words connecting nodes representing a range of key concepts (Novak & Cañas, 2008). A new and exciting version of cognitive mapping, called fuzzy cognitive mapping (FCM) (Gray et al., 2015) "are highly

structured and parameterized versions of cognitive maps that represent direct and indirect causality by combining aspects of fuzzy logic, neural networks, semantic networks, and nonlinear dynamic systems in influential diagrams" (p. 2). Relationships have numerical value and so cumulative strength of relationships and communicate system dynamics.

Discourse is linked to social learning; it is in one sense the process of interpreting bits of information and using language to assemble coherent stories (Dryzek, 1997). Social learning produces discourse in the process of creating new ways of seeing, thinking, talking, and acting. And, discourses change over time; new and more complex knowledge and understandings are continually developed (Wenger, 2004).

Experiential learning focuses on learning by doing, reflect on their experiences, and then modify behavior. Active and ongoing reflection through hands-on activities produces comprehensive learning that can be applied broadly. Kolb (1984) describes the cycle of preparation-experience-reflection-transfer (see Figure 1.1), and this model is often used in K-12 and higher education settings, and emphasizes that without reflection, people tend to reinforce negative stereotypes and continue making the same mistakes. Experience requires being immersed in a task, and therefore suggests substantive involvement with a project, and not necessarily a single, one-off volunteer event. Transfer refers to abstract conceptualization and interpreting the experience so that the learner can improve on the experience later. It also supports active experimentation in the process of adapting knowledge to new experiences and situations. Experiential learning, in part, emerges from Dewey's (1938) pragmatist theory that learning is life and not preparing for life. Learning should, according to pragmatism, be facilitated through activities instead of relying solely on a teacher lecturing.
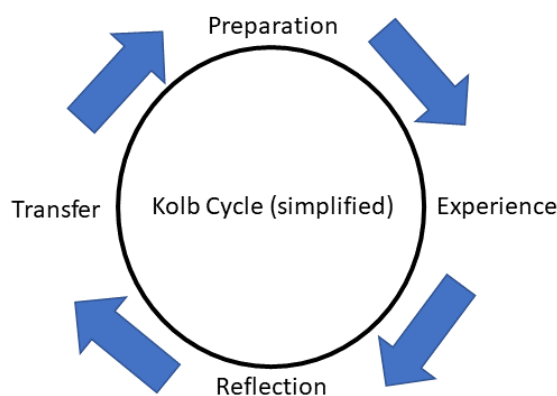
Figure 1.1: Kolb Cycle of preparation-experience-reflection-transfer

Organizational learning was described by Mumford (1992) as a process similar to Kolb's experiential learning, but with an open loop model in which the learner might not repeat the cycle, and instead, revisit a previous experience to gather more information or to amend conclusions based on another experience. This work focuses on learning within highly structured organizations (e.g., businesses).

Place and Community

Place is a physical location as well as a way of thinking about the world. Focusing on place can help ameliorate management problems from increasing complexity and uncertainty of scientific knowledge, bridge the gap between local/contextual knowledge and global/generalizable knowledge, and support bottom-up community-based social learning and knowledge formation about highly complex ecosystem and social systems (Cantrill, 1998; Williams, 2017; Williams & Stewart, 1998). Place can be thought of as a particular geophysical space, such as "third places" in landscape architecture; home being the first place, work being the second place, and third places being accessible spaces, including a welcoming feel, regularly used by regulars and new people, and food or drink when possible (Ahari & Sattarzadeh, 2017; Ganguly & Bhattacharya, 2013). "Hybrid places" can help acknowledge tensions when contradictory identities or discourses overlap within a place (Carter & Walker, 2010). Place can be applied in at least two levels: how people experience places and the content of place meanings; and on another level context-dependent governance/management of places and landscapes with a focus on the social process of producing, consuming, and contesting meanings (Williams, 2014).

Understanding exactly what is meant by place can be difficult due to a mix of epistemological roots. Place research can be traced to the disciplines of geography (and sub-disciplines of human and radical geography), sociology, psychology, planning theory, and economics (via hedonic consumption, identity affirmation, attachment to possessions, and consumer behavior). With so many different ways to frame the concept of place, it is difficult to tease out specific meanings, beyond that places embody both the material qualities and human-generated meanings.

In the practice of understanding and managing complex ecosystems for multiple ecosystem services with constant change and uncertainty, some scholars view knowledge as related to where

a person is positioned within an institutional or ecological framework (Lowe et al., 2009; Williams, 2017). Everyone has a somewhat unique view of the world due to a mix of culture, history, training, and experiences. In opposition to the positivist, science-based approach, knowledge can't be integrated into a single understanding and instead should be viewed as a plurality of perspective. When people come together in a social learning environment, being exposed to others' competing perspectives can enrich the range of perspectives held within the group and can explore assumptions and values that may have otherwise been kept hidden. This is especially important in balancing and managing the power of those people who normally dominate how knowledge is mapped and used (Hayes, 1995). Managing for complex ecosystem services requires operating on multiple scales. But geographic scale can greatly affect individual and group ways of knowing and, also, shared understanding a place or landscape (Cheng & Daniels, 2002). Generally, participation in and relevant knowledge about adaptive decision-making is enhanced when working in smaller geographic scales.

Most communities are closely linked to a particular history and culture. And, the most resilient of these communities are made of people and organizations that anticipate, perceive, remember, and adapt to change. Gusfield (1975) described communities as having both a locational (territorial) and a relational component. Communities not only take up a particular geographic space, but also a particular niche in socio-demographic space.

Communities exist within a specific geographic location which includes locally based institutions like schools, churches, families, laws, government, industries, organizations, values and norms. The geographic location also can be characterized by natural or human-centric boundaries and the history and demographic patterns of the place (Chaskin et al, 2001).

There are also relationships among the people who live in that location; these include a sense of place, sense of belonging, a sense of commitment to the place and to each other among the members of the community, an ability to access resources, make decisions, and solve problems and shared interests and beliefs (Chaskin, 2001; Magis, 2007). Chaskin (2001) goes farther to focus people's agency (one's ability to influence social relations/structures, and to actively control her or his own being (Dwiartama & Rosin, 2014)). In viable communities, this agency is directed toward common objectives for the community. Geographical boundaries drawn by some can be seen as arbitrary by others, and some scholars (Caroll & Lee, 1990; Donoghue & Sutton, 2006) focus on a community being described as groups who share attachments to one another, the landscape, and shared lives or livelihoods, and focus less on precise geographic boundaries.

Communities exist within a larger context including the resources and setting surrounding the community. As an example, forest communities are adjacent to forest systems or are dependent on forest industries (Kusel, 1996 and 2001). And communities exist within conditions set by the larger society. Political, social, ecological, and cultural contexts provide opportunities and constraints to community capacity building and agency for decision making and change (Chsaskin, 2001; Gibbon, Labonte, & Laverack, 2002). "Communities are profoundly affected by these forces and often have little control over them" (Magis, 2007, p. 7).

With effort (that is with the application of agency, or spending of community capital), communities can transform into new socio-demographic spaces, or they can adapt to changes without major changes to the sociodemographic space currently occupied. For instance, in the face of large-scale economic changes that are being felt all over the western U.S., Leavenworth changed its entire identity to draw in the tourist dollars, while Dayton kept its former community character and manages to also draw in tourist dollars. Both communities are experiencing economic success relative to, say, Priest River, ID, which has retained its former community character but is not flexible in the face of change (Pulsipher, 2011). But it is likely that there are some groups and individuals within all these communities that particularly lost out (or found a windfall) because of the chosen trajectory. Like with individual resilience (from the psychological viewpoint), resilience of communities and groups within a community can change over time, can ebb and flow, and can be unequal even within a given community. Sub populations of a community might have very different levels of vulnerability and resilience which can have severe implications for recovery from natural or societal (e.g., economic) disturbances, but also for the ability to develop adaptive capacity in advance of disturbance or change (Cutter, 2003).

Multiple types of capital exist within communities. Several lists of capital exist in the literature: economic, social, and cultural (Bourdieu, 1986); financial, human, social, produced, and natural (Goodwin, 2003); cultural, economic, functional, linguistic, personal, political, professional, social and symbolic (Bourdieu, 1991, p. 230-251). Goodwin's list of five capitals provides a useful and concise framework:

- Financial capital refers to a system of control of physical capital.
- Human capital refers to the inherited and acquired productive capacities of a person, including knowledge, skills, behavioral habits, energy levels, physical health, and mental health.

- Social capital consists of a combination of trust, mutual understanding, shared values, and socially-held knowledge that facilitates social coordination of activities.
- Produced capital is a type of physical capital, describing physical assets built by people
- Natural capital is another type of physical capital, referring to ecosystem services and natural resources.

Social capital includes three subcategories, bridging, bonding, and linking capital. Putnam and Feldstein (2003) describe communities as either *bridging* or *bonding.* Bridging communities consist of diverse people looking towards the future who are able to "converge around ideas based on their common vision and create purposeful actions for the present and future" (Pulshiper, 2011, p. iii). Bonding communities, on the other hand, consist of citizens with similar mindsets and "focus inward rather than outward when approaching problems or addressing issues" (p. iv). Linking communities include network ties that extend to groups and institutions with less or more power/influence (Szreter & Woolcock, 2004).

Dialogue: Social resources (capital) is built on individual interactions between people. These micro-level interactions, while completely co-imbedded in meso and macro-scale social structures, are a form of learning from a workplace learning theoretical background. "Human agency, exerted through social interactions, creates the processes of learning and change which produce economic outcomes" (Falk & Kilpatrick, 2000, p. 5). Habermas (1981) conceptualized the idea of communicative rationality and collaborative dialogue that builds the necessary conditions for discourse and emancipatory knowledge.

Roling and Wagemakers (1998) discuss the importance of creating social and institutional space for dialogue and innovation during and following crises to stimulating learning and resolving social uncertainties. Post-crisis learning often starts with small groups of innovators operating in informal transition spaces, setting goals, experimenting with innovative approaches, facilitating societal learning, and then institutionalizing the transformation (Pahl-Wostl et al., 2013). But somewhere, somehow, the informal space needs to be linked to the formal, multilevel governance system. Through a process of "triple-loop-learning" not only is there an incremental improvement of action strategies and revisiting of assumptions of values and norms, but also there is the reconsideration of values, beliefs, and worldviews that assumptions are based on (Pahl-Wostl, 2009). Institutional learning influences development of goals, implementation, and monitoring of decisions. It can, in the case of transformative (triple-loop) learning, influence the framing of problems, setting strategic goals, and formulating policy.

It is active and ongoing dialogue and innovation that enables double-loop learning, evoking social-ecological memory, expanding frames of reference, and reorganizing existing conceptual models to fit a new understanding of how a crisis came about. Institutions are reshaped (adaptability), and also emerge (transformability) from disturbance and crisis (Folke et al., 2003).

Norgaard's (2011) research on social institutions is key to understanding how an individual's public identity is constructed by describing the production and use of legitimating background narratives" (p. 140). Again, institutions provide the framework for collaborative processes and dialogues to occur, and they tend to frame the problem and issues (Pahl-Wostl, 2013). These narratives and stock stories (social discourses about who the people of a particular community, or even nationality) are generally produced or reinforced by government or powerful institutions and are conveyed by the media to the public at large. This is not always the case, especially with regard to individual communities' local stories. All of these narratives, however, are then picked up and used to limit or guide conversations about what is or is not important to communities; this institution-derived framing of socio-ecological issues/objectives runs counter to community-based co-management of ecosystem services. It is through conversation and dialogue that informal settings are created to find ways to strengthen communities. And, it is the vertical connection between those settings and the existing levels of governance where innovation and social learning can inform policy processes.

In many parts of the intermountain west, for example in the Silver Valley Communities, there are deep suspicions of outsiders and governmental intervention. A distrust of the EPA's reclamation and restoration projects (Superfund site) harkens back to Habermas' (1976) concerns with legitimation problems and the management of natural resources. Legitimation can be ameliorated through active listening and proactive community outreach explaining the scientific background underlying natural resource decision-making (McGuire & Sanyal, 2006, p. 903).

Pulsipher (2011, p. 36-37) describes implications for community development and engagement that might be related to resiliency. Five fundamental characteristics to promote communities moving in a positive direction include:

1. Presence of a community vision
2. Effective and purposive communication among sub-communities and groups
3. Effective leadership (and not necessarily powerful leaders, hence my inclusion of "studying down" to often-unrecognized leaders)
4. A forum for collaboration and a context to work within

5. Consist of a diverse group of individuals with different skill sets, training and abilities.

Looping back to Krasny and Tidball's (2010) concept of civic ecology, participatory group learning can be the link between social and ecological systems and people's understanding of complex systems via Extension. Humans, according to Aldo Leopold, are a part of the landscape and are not necessarily destructive agents. But people need to have a set of individual knowledge about the ecological system, and need to develop a notion of "biophilia" (Wilson, 1984); that is, people need to value and understand the role of natural systems, even in urban areas. Krasny and Tidball (2010) developed a term, civic ecology, to describe a sort of learning that happens when people come together to learn about an ecosystem, and then act to measurably and memorably improve their social and natural environment. Civic ecology describes one mechanism for linking place, adaptive capacity, learning, and community resiliency. Numerous examples exist of people coming together to engage with the natural world after a disaster. Converting vacant lots to public garden spaces in NYC, restoring savannah habitats in Chicago, planting trees after Hurricane Katrina, and restoring the Los Angeles River are urban examples. Myriad more examples of people volunteering to restore wetlands and streams exist in rural areas. Civic ecology can build new understandings and meanings of place.

Mechanisms of Community Learning

In brief, collaboratives, or watershed groups, or multi-stakeholder groups, or community based natural resources management (other designations exist for similar groups) can be characterized with a few common attributes. They are a mechanism to address environmental and socio-economic goals; that is, to balance use and conservation of ecosystem services within a local context. Co-management by these groups require some degree of bottom-up decision-making transition from centralized power/authority to more decentralized community-led approaches. Decision-making arrangements and responsibilities must be created or changed. Access and control over common resources are exercised by local resource users through community institutions and practices. While both local and non-local actors are involved, local knowledge and resources are used in many of the decision processes. Finally, stakeholders with widely varying needs, values, knowledges, and beliefs are linked and intermixed to enable flexible, adaptive management of the resource, and environmental conservation (Armitage, 2005).

Challenges to the idea of collaborative natural resource management include that the concept of community is idealized, simplified, and inherently separated from larger institutions; other institutional elements (e.g., property rights or access to a resource) may severely constrain what actions a collaborative can engage in; and an assumption that traditional resource use and livelihoods are sustainable. And, even with much time and effort applied to social learning and adaptive management, these groups sometimes include agents with differences in world views among participants and among institutional interests at the local, regional, and national scales. Integration of diverse knowledges (Berkes & Folke, 1998) and overcoming historical social and cultural contexts within communities (Nadasdy, 2003) and between communities and formal resource management institutions, or legitimation of the institutions (McGuire & Sanyal, 2006; Peet & Watts, 1996).

Understanding social learning started out in studies of individual activity, within the context of a social environment. People learned by observing and imitating others (Bandura, 1977). This concept focuses on cognitive processes of individuals. Group processes such as the development of shared meanings and values as a basis for joint action require a shift to interrelated "distributed cognition" coupled with an understanding of group processes (Roling, 2002). Most early applications of learning on the part of entire social entities can be found in the organizational learning field (Argyris & Schön, 1978, 1996; Senge 1990; Wenger, 1998). More recent developments include the application of distributed cognition's outcome of shared understandings, frameworks, values, and worldviews to collaborative governance or co-management of natural resources.

Social learning is a multiscale process that happens at a shorter-term time scale among individual collaborating stakeholders, at medium time scales as networks of stakeholders grow and change, and at longer-term scales with changes in governance patterns and structures. Like with double- and triple-loop learning, social learning involves exploration and transformation of underlying values and beliefs (Pahl-Wostl, et al., 2007). If a safe socio-intuitional space is made available or created, adaptive networks develop to explore possibilities in sustainability transitions. That is, self-organizing groups of policy makers and community leaders engage in joint fact-finding, brainstorming, and visualization in the attempt to achieve desired improvements to the institutional structure and ecosystem.

Some scholars have emphasized the role of social learning in transforming an existing social–ecological system, rather than perpetuating it (Wilson 2013). In resilience theory,

transformability is the capacity ''to create untried beginnings from which to evolve a new way of living'' (Walker et al. 2004, 7). Goldstein (2008) analyzed the notion that disasters may provide windows of opportunity to transform social–ecological systems. He studied the role of informal and community-based knowledge networks (skunkworks) to challenge the narrative that ''enhancement of the technological capacity and authority of government [was] the only reasonable response to fire disaster' (Goldstein 2008, 24, also, Berkes & Ross, 2013, p.9)

Governance structures, like collaboratives, provide a context for social learning. This structure includes pertinent institutional (legal and organizational), cultural, and socioeconomic parts of a community. Governance structures have a strong influence on social learning processes. Rigidity, secrecy, opaque information control, and monocentric governance impede social learning, while flexibility, encouragement of dialogue, open access to information, and polycentric governance enhance social learning. As with the development of individual or institutional power, interactions among people are the core of social learning. "Relational practices may take different forms, such as joint field visits or common training sessions" (Pahl-Wostl, 2007, p.5).

Adaptive governance (Folke et al., 2005) and adaptive management were concepts born from the organizational learning field in the late 1970s (Argyris & Schon, 1978; Bandura, 1977 Adaptive management is highly place-based, relies on the full range of types of knowledge generated by collaborative groups, and can be thought of as a process by which communities of practice manage and learn and explore.

Co-management (sharing of management power and responsibility among institutions and local groups (Berkes & Turner, 2006), a form of adaptive governance or adaptive management, relies on feedback learning (Lee, 1993). The expectation is that adaptive management will protect against Carpenter and Brocks' (2008) "rigidity traps", referring to inflexibility and rigidity in top-down decision-making. This feedback learning, sometimes described as single-, double-, and triple-loop learning (Fernandez-Gimenez, et al., 2008) and reportedly enhance the flexibility and responsiveness and resiliency of social-ecological systems. Fernandez-Gimenez (2008) also found that social learning and communication deep into the remainder of the community was enhanced when a broad cross section, and a large number, of local community members participate in a collaborative project and when social learning or civic engagement are express, intentional approaches from the beginning. Adaptive capacity is critical to adaptive management of resources in that it reflects the ability to learn and experiment while fostering innovative solutions to complex

socio-ecological situations (Armitage, 2005; Folk et al., 2003; Gunderson, 2003; Walker et al., 2002). More about adaptive capacity later in this chapter.

What I noticed in substantive involvement with collaborative stakeholder groups is that people from different perspectives on social-ecological problems, even sometimes with entrenched positions on an issue, came together, developed a shared understanding of the systems, and thus were more likely to come to some agreement on solutions. I have seen the same phenomenon in my Extension programming. With a carefully, locally, community-based framing of scientific principles related to water quality protective BMPs (e.g., talking about preserving riparian buffer zones in ranching communities during IDAH2O and youth programs), participants were able to come to a greater acceptance of what would otherwise be conceptually unpalatable. My perspective on social learning aligns with Pahl-Wostl (2007) in that it arises from multiparty processes with regular direct interactions among representatives from stakeholder groups on a more or less formalized basis. Through the process, adaptive networks are built, and institutional level governance either adapts or transforms to meet current and new challenges.

Resiliency and Vulnerability

The concept of social-ecological resilience stems from psychology, disaster relief and military, ecological and biological sciences, and from engineering and environmental sciences. From the social sciences perspective, the oddball of these is the engineering perspective, but all have variations that should be discussed. Resilience in hazards research emphasizes three critical features: persistence, adaptability, and transformability (Miller, et al., 2010). Vulnerability, which should not necessarily be thought as a negation of resilience, has been conceptualized in its own right in hazards research. We are in the midst of a convergence of resilience and vulnerability thinking, and it is somewhere in this messy mix where I think clues exist toward improving (some) communities' resilience and adaptive capacity.

Engineering resilience is a measure of how fast a system returns to an equilibrium, or steady, state after a disturbance; it is also referred to as "return time" (Holling 1996; Walker, 2006*a*). Until the early 1970s (and even beyond), ecosystems and communities have been analyzed in terms of departure from a stable state. Community Stability and maximum sustained yields were once sought-after states for forest systems and the rural communities of geography that relied on a big lumber supply for the mills (LeMaster & Beuter, 1989). But these constructs proved problematic

as economic drivers forced increases in cutting beyond sustainable levels and the eventual sharp decline in harvest on federal lands created sharp economic woes in rural communities (Parry, et al., 1989). This conceptualization of stability with a reluctance to deviate from a normal state failed to account for the naturally transient state of natural (Holling, 1973) and social (Gray et al., 2015) systems and ultimately was not sufficiently insightful for the long term management of either. Holling (1973, p. 15) predicted that managing for stability would result in instability and reduced ecological resilience.

Resilience of individuals is a classic concept in psychology and mental health fields (Luthar, 2006). It describes the phenomenon of individuals' positive adaptation and development despite adversity. Early studies of psychological resilience trace back to pioneering research on children of schizophrenics as early as the 1960s. Some of these children expressed unusually healthy adaptive patterns that bucked the trend of the majority of children in this situation who followed or were engulfed by the parent's psychopathology (for example, Anthony, 1974; Garmenzy, 1974; Rutter, 1979). In the 1980s, psychological resilience research took a turn toward understanding additional attributes external to the person including family and wider social environments (Luthar, 2006; Rutter, 1987; Werner & Smith 1992). Individual resilience involves adversity and adaptation as well as the social and physical environments that affect the functioning of individuals (Bukistra, et al., 2010). People (and societies…) can gain and lose resilience, and resilience is always in a state of flux. This work on individual resilience has been extended to the community level, relating to disaster management and building on a community's strengths (Berkes & Ross, 2013). In this light, resilience is seen as a process; a continual development process in adaptation and improvement.

Resilience from an ecological perspective refers to "the magnitude of disturbance that can be absorbed before a system changes to a radically different state as well as the capacity to self-organize and the capacity for adaptation to emerging circumstances" (Adger, 2006, p. 268). In other words, resilience is descriptive of a natural system's capacity to absorb or withstand perturbations while remaining the same regime/function/relationships (Holling, 1973).

> A perturbation is a major spike in pressure (e.g., a tidal wave or hurricane) beyond the normal range of variability in which the system operates. Perturbations commonly originate beyond the system or location in question. Stress is a continuous or slowly increasing pressure (e.g., soil degradation), commonly within the range of normal variability. Stress often originates and stressors (the source of stress) often reside within the system. (Turner et al., 2003, p. 8074)

Note that this (and most other) definition of perturbation is housed within an ecological/biological/physical world framework. One of the apparent weaknesses of the concept of resilience from a social science perspective is that early applications to communities/social situations were simplistic in that they relied only on an undeveloped social science theoretical base (Boonstra, 2016). Resilience from a social science research perspective is relatively new and is still under development (Berkes & Folke 1998; Berkes & Ross, 2013). Resilience studies usually focus on three concepts: persistence, adaptability, and transformability. Adaptability describes a capacity to learn and use knowledge in adjusting behavior in response to changes from within or outside a social-ecological system. Through adaptation, or adaptive capacity, people or organisms or systems remain within a normal range of variability of the system. Transformability is the capacity for a person or system to change regimes, and to create a fundamentally new system (Boonstra, 2016; Folke et al., 2010).

Then again, conventional disciplines in the social sciences (anthropology, sociology, political science, human geography, economics, and psychology) have taken varying approaches in engaging with the biophysical world (Stone-Jovicich, 2015). So, there is a lot of room for social scientists and natural scientists to come together on the issue, and this is still evolving. Even in the beginning, and certainly later, Holling (1973 and more-so in 1996) hinted at applying these ecological principles to social systems, and others have developed this line of reasoning since from a natural resources management viewpoint.

> A management approach based on resilience, on the other hand, would emphasize the need to keep options open, the need to view events in a regional rather than a local context, and the need to emphasize heterogeneity. Flowing from this would be not the presumption of sufficient knowledge, but the recognition of our ignorance; not the assumption that future events are expected, but that they will be unexpected. (Holling, 1973, p. 21)

From both the social and ecological perspective, there is the question of whether a system can maintain its structure and functions without degrading into a different or lower state of being governed by a different set of variables and processes (Walker et al. 2006*b*). Holling (1973) differentiates between stability, "the ability of a system to return to an equilibrium state after a temporary disturbance (p. 14)" and resilience, "a measure of the persistence of systems" (p. 14). The more stable a system, the more rapidly it returns to a state of equilibrium. Less fluctuation in response to disturbance equates to greater stability. But stability in a system can actually reduce

resilience. And, most natural system situations exhibit tremendous instability, that is great variations between components (e.g., populations between predator and prey) resulting in greater resilience (Holling, 1996, p. 36). And, in evolution (as well as, say, finance), one major strategy is to maintain flexibility above all else, including efficiency or any given reward or status.

Then there is the separate question of what happens to a system perturbed beyond its adaptive capacity that can no longer maintain its function and relationships. Herein lies the concept of transformation. Some natural systems appear to be stable even with prolonged human over-extraction (e.g., fish populations under heavy fishing pressures in the great lakes), that suddenly and unexpectedly collapse due to the introduction of a much smaller factor. Permanent transformation is likely for systems that experience reduction in resilience and go beyond an ability to adapt. These systems transform to a different and less productive or useful state. Rarely do systems transform into an equally productive state unidentifiable from the previous system.

> The new state of the system may be less desirable if ecosystem services that benefit humans are diminished, as in the case of productive freshwater lakes that become eutrophic and depleted of their biodiversity. Restoring a system to its previous state can be complex, expensive, and sometimes impossible. (Scheffer et al., 2001; see also the main web page at www.resilience.org).

Holling (1996), at this juncture, predicted that a sole focus on stability for informing management activities will contribute to a reduction in resilience and stability. In some cases, systems lose the capacity to maintain function and relationships and then fall to a lower state of function or resilience. And, Holling also made mention about learning being essential to continued resiliency (p. 38), through describing the continuing case study of the Canadian budworm-forest-pulp industry interaction (a social-ecological system). Industry and institutions learned that pest control only reduced harvests and created public distrust and reduced multi-use of the landscape and required a transformation of the social system (institutional change and adaptation) in the long run. This led to adaptation via restructuring of the social system (new law that restructured licensing and management into a more adaptive system) to better reflect and support resilience of both systems instead of stability of harvest (Holling, 1996, p. 42).

The psychological approach provides the backdrop for resiliency within the field of natural disaster and hazards research. Hazards research has focused mostly on the concept of vulnerability and only later on resiliency. In the late 1960s and early 1970s, hazards thinking focused on people living in hazardous areas (floodplains, seismic and coastal zones) through suburbanization, people

moving to hazardous places because of increased mobility, institutions growing large enough to be able to absorb loss and therefore locating infrastructure in more hazardous places, and increasing reliance on mobile homes for affordable housing (White & Haas, 1975). By the late 1990s, a philosophical change emerged; from focusing on locations and infrastructure to focusing on communities growing more disaster-resistant. An emphasis on coupled natural and human systems looked at hazards and disasters as being produced by people (Mileti, 1999), and not being "natural."

Vulnerability is defined (Adger, 2006, pp. 268-269) in terms of the susceptibility of a social-ecological system to be harmed. It describes pre-event inherent characteristics of a social system that increase or create a potential for harm. According to the Intergovernmental Panel on Climate Change (IPCC) (McCarthy et al., 2001) vulnerability is degree to which a system is susceptible to and is unable to cope with adverse effects. That is, vulnerability is a function of a) exposure and b) sensitivity of a system to a disturbance.

Vulnerability assessments exhibit a number of common elements, all tying back to the philosophy that "natural" disasters are really human in cause (Brooks et.al., 2005; Cutter, 2008; Sarewitz et al., 2003):

- Examination of vulnerability from a coupled social-ecological perspective
- Importance of place-based studies and focus
- Vulnerability should be conceptualized as a human rights or equity issue
- Vulnerability assessments identify hazard zones and provide a basis for mitigation planning

As I noted before, the intellectual worlds of vulnerability and resiliency have had difficulty in convergence, due to epistemological and methodological differences, while also having some fundamental connections and complementarities (Miller et al., 2010). Much of the work in social vulnerability has been led by constructivist social scientists while much of the research in resilience has been led by ecologists and other post-positivist natural scientists, and only recently have attempts been made to overlay or compare principles of ecological resilience to social resilience (Miller et al., 2010). That is, in reality, the worlds of resilience and vulnerability research are only starting to come together, and considerable dialogue is still necessary to bridge the epistemologies from which the two concepts derive. Early work on vulnerability identified three components: biophysical, built environment, and social (Cutter, 2003). Resilience researchers delving into the vulnerability realm initially focused on that of the biophysical and built environment, and less on the social aspects of vulnerability. Vulnerability researchers delving into the resilience world initially

focused on access to assets and social support systems, and less on the interconnections between ecosystem and social resilience (with the notable exception of Adger's (2000, 2006) work on interconnections among resource dependency and institutions). Even fairly recent social scientists argue that a range of societal dimensions of resiliency and vulnerability (like historical, place, cultural, and political arrangements and human agency) are overlooked (Stone-Jovicich, 2015).

Social resilience and ecological resilience have often been imperfectly linked; but one successful area of thought is exploring direct relationships between social institutions and ecological systems (Adger, 2000). The link between the two can be related to the dependence of communities and their economy on ecosystems. Individuals, organizations/groups, institutions (formal structures with memberships, stakeholders, and constituencies like governance and law, and also less formal habitualized rules, norms, and behavior governing society), and communities are all, on different levels, and with different types of agency and power (interdependencies between people, and between nature and people (Boonstra, 2016), reliant on ecosystems, and on knowledge related to all of these structures. Social resilience can be contextualized by institutions, which can be resilient depending on factors like legitimacy, relevance, history, ecological and social agenda, and maintenance/availability of social capital (Adger, 2000). Institutions permeate all social systems and determine the economic system's structure and distribution of assets. Social resilience can also be examined by observing social inclusion/exclusion, power/marginalization, and social capital, which gets us closer to a link to vulnerability studies. As with species within an ecological system, communities and institutions reliant on diverse ecosystems (like coastal communities whose complexity reduces vulnerability to sudden economic shifts) are more resilient than those reliant on less diverse ecosystems (like a community dependent on a single underground mineral resource/mine). In both cases, institutions and groups interplay to develop the resource(s), grow, learn, adapt, and increase (or decrease) adaptive capacity. With complex social (or ecological) systems, the possibilities for innovation, creativity, and the development of many social capitals are greater than with less complex social systems.

Social institutions are subject to external pressures and shocks associated with both political and economic change. The ability to absorb these changes depends on social capital but also on the role of surprises and the characteristics of the resource system. (Adger, 2000, p. 359)

Social resilience research has drawn one important characteristic from the ecological approach, describing the functioning of the whole system beyond the stability of a single

component or system state (McIntosh et al., 2008). From households to institutions to communities, change and disruptions can come from societal or ecological forces. Resiliency to disruptions focuses on enhancing wellbeing of a social system through building "adaptive capacities that permit some level of control over future direction… rather than being solely left at the mercy of unmanageable external forces" (McIntosh, et al., 2008, p. 3; see also Deveson, 2003).

Resilient, adaptive social systems possess several inherent properties (Ecotrust, 2000; Steiner & Cleary, 2014)

- Sense of responsibility
- Diversification of economy and labor and/or specialization/finding a niche
- Intelligent risk taking for expanding opportunities
- Understanding barriers
- Long term approach and vision; build at multiple scales
- Networking and collaborating; develop rich relationships
- Planning for Change
- Design for Learning

The following list of critical factors for building adaptive capacity in communities is from Berkes, et al., 2002:

- Learning to live with change and uncertainty
  - o Evoking disturbance
  - o Learning from crises
  - o Expecting the unexpected
- Nurturing diversity for reorganization and renewal
  - o Nurturing ecological memory
  - o Sustaining social memory
  - o Enhancing social-ecological memory
- Combining different types of knowledge for learning (see my response to Question 2)
  - o Combining experiential and experimental knowledge
  - o Expanding from knowledge of structure to knowledge of function
  - o Building process knowledge into institutions
  - o Fostering complementarity of different knowledge systems
- Creating opportunity for self-organization
  - o Recognizing the interplay between diversity and disturbance

- o   Dealing with cross-scale dynamics

- o   Matching scales of ecosystems and governance

- o   Accounting for external drivers

This expands upon the idea of maximizing flexibility that Cutter (1996) emphasized in her initial resilience work. Developing within communities the inherent characteristics of resilient communities, beyond simply protecting them from change (thus attempting to maintain a static state) is a change in focus of community design from previous engineering-resilience-focused strategies.

This change of focus brought about an interest in building disaster-resistant communities on the part of the U.S. federal government and internationally (Cutter, et al., 2008). Today in sustainable development circles, there is an awareness of a direct link between reducing poverty and natural hazard risk through developing sustainable, resilient communities (Wisner et al., 2004). A focus on vulnerability has been important but is insufficient to fully describe a community's response to socio-ecological disturbances. Communities also need to focus on increasing resiliency, decreasing vulnerability, and use a wide swath of social science and ecological research to do both. Communities can manage for social resilience by enhancing and using the above-mentioned critical factors and other types of capacity-building (Ross, et al., 2010).

Two additional concepts, "power" and "system" should receive much more than the following brief description in this manuscript. People and institutions exhibit the fuzzy concept of power, which has not been a topic of intellectual rigor for most resilience thinkers. That resiliency, adaptation, and transformation refer to "capacity" indicates an individual's/group's/community's "power" to increase capital, make decisions, improve knowledge, and otherwise add to/improve the (individual/group/community) adaptive capacity. Sociologists have traditionally viewed power as a property of individual actors or as a property of systems. But power is a squirrely concept, with thousands of possible definitions (Wrong, 2009), and as such, so is the construct of resilience. People grow power through interactions with others and with institutions, and power can be viewed from an individual (the power to…) or an institutional (the power over…) context.

A system in the natural world "consists of a mosaic of spatial elements with distinct biological, physical, and chemical characteristics that are linked by mechanisms of biological and physical transport" (Holling, 1973, p. 16). Self-organization, learning, and adaptation are essential functions that exist in varying degrees within any system (Walker et al., 2004). Like the concept of

"power", "system" has many definitions, but this is all I have capacity to deliver within the confines of this work; this leaves much room for exploration.

Adaptive Capacity

Resilience and vulnerability studies can find some convergence with the concept of capacity. People and institutions can increase (or decrease) individual and societal capacities to engage in activities that result in greater (or decreased) resilience, and in decreased (or increased) vulnerability to disturbances and changes. This can be articulated as adaptive capacity, that is the ability (capacity) of people to influence resilience (Folke et al., 2003). This happens via social networks and learning communities (Goldstein, 2012). Community resilience, according to Magis (2010), is the "existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise" (p. 402). Different ways of knowing enable different capacities; or, put another way, communities must assemble knowledge from multiple sources, along with local (place-based) cultural adaptations, to adapt to change (Armitage, et al., 2011).

There are multiple types of capacities; these capacities involve learning, thinking at multiple scales, developing rich relationships, expanding opportunities, and planning for change (Ecotrust, 2012). There are multiple types of capital that can be built up and used to increase resilience; Human, social, produced, and natural (Falk & Kilpatrick, 2000). There are multiple ways of learning and knowing about natural and cultural resource issues; tacit v. express (Pahl-Wostl, et al., 2007), theory v. practice (Arthur et al., 2012), science v. story, context independent v. place-based (Williams, 2-17). And, the concept of place brings constraints and opportunities related to the place itself (e.g., forest communities v. Palouse farming communities) and contributes to people's and institutions' sense of place. All of these come into play when discussing adaptation related to resilience.

Like with social-ecological resilience, adaptive capacity can be viewed from an ecological lens and a societal-institutional lens. This gap has implications for understanding differences in theoretical and practical approaches. In ecology, adaptive capacity refers to a system's ability to cope with large scale change within the context of slow-variables and domains of stability (Gunderson, 2003). Slow variables include overall species composition and spatial connectivity. Fast

variables like insect outbreaks of fire intensity provide variability, novelty, and force flexibility in the system within the context of the slow variables (Gunderson, 2003; Walker et al., 2002).

In the social context, adaptive capacity is related to attributes of individuals, organizations, and institutions. Critical attributes include fostering learning about change and uncertainty, willingness to learn from mistakes, and faithfully engaging in collaborative decision-making, and even encouraging institutional diversity (Folke, et al., 2003). Slow variables in the social context might be worldviews and values or constitutional rules that create stability; fast moving variables that encourage experimentation and flexibility could include individual economic preferences, operational rules and other institutional contexts, and the expression of local knowledge (Armitage, 2005).

In a major departure from the ecological framework, humans (individually or in groups) can influence these variables and can anticipate effects of changes in those variables. According to Armitage (2005) a most significant challenge is to sustain adaptive capacity on the part of social actors asked to flexibly respond to surprise, disturbance, and change, while also maintaining the value in social and institutional stability. Here, I would argue that Extension can moderate this apparent conflict by providing new information thus linking knowledge systems and supporting learning, encouraging innovation, contributing to cataloguing and curation of collective memory, provide guidance through difficult discussions, understand and facilitate power sharing for more inclusive dialogue, and assist with maintaining organizational diversity through interpersonal networking (see Armitage, 2005, p. 707 for a discussion of these attributes).

In another departure from the ecological framework, people's (as well as groups' and institutions') capacity to learn and anticipate effects also brings the capacity to create meaning, values, symbols, and relationships. Preceding most social-ecological systems thinking, Lewin (1951) studied social change and developed some of the social-psychological and ecological-psychology that can help frame systems thinking and sense of place. His Field Theory describes a method of analyzing relationships within social systems, including external drivers and internal forces that characterize a system. Lewin theorized the environment as having non-psychological factors that act as boundaries on human action in, for instance, a landscape and also psychological factors describing how people perceive and interact with the objective environment. Lewin used the term, "life space" instead of "social-ecological system", or "place" but the term has been used to refer to a system that includes humans (Hobman & Walker, 2015).

Greider and Garkovich (1994) define natural landscapes as more than just biophysical elements; landscapes are instead rich with socially constructed meanings, values, and symbols that reflect the people living within the landscape. Different people and groups can assign different meanings (and therefore different understanding of the landscape) to the same geophysical space. When changes happen within a landscape, there is a process of renegotiation of how that change is reflected in and among the different groups of people within the place. Place symbols and meaning from some groups are also imposed upon other groups (e.g., marginalized peoples) through the use of power. Formalized community groups (like with service-learning and other forms of experiential education) themselves can be a method for bolstering historic power structures. As an example, people in poverty and lower SES (social-economic status) tend to engage in informal participatory processes, and less so with formal groups. It has been argued that imposing a formalized collaborative decision-making process on people in poverty is just as foreign to them as a top-down institutionalized form of decision-making (Williams, 2004). As an example of barriers to participation in watershed councils, people of low SES often work side jobs and within informal work arrangements, have transportation issues (especially in rural areas) and, therefore, have difficulty with long term, substantive participation in collaborative groups (Woliver, 1996). Informal pathways for people of low SES need to be integrated within collaborative decision structures to grow adaptive capacity and social capital.

Holistic ecosystem management follows the tenants of social-ecological resiliency by focusing on multiple scales, place-based planning, inclusiveness of decision-making (via collaborative groups) (Cheng & Daniels, 2003), planning for change, developing rich relationships among stakeholders, and continued learning. Folke (2006) questions management approaches that are solely "expert-driven." Similar to the real or perceived "Town-Gown" divide, an epistemological "lay-expert" gap has emerged in natural resources management and in governance of social-ecological systems. This split can also be informed by exploring the messy dichotomy between tacit knowledge and explicit knowledge. And, this gap is different from the science-practice gap in the use of place-based, context-dependent knowledge.

Collaborative groups bring potentially affected citizens and scientists together to analyze problems and make decisions. But collaborative decision making requires blending of different ways of knowing; social values and norms are blended into the mix along with quantitative biophysical resources. This blending of the social science's concept of "sense of place" with ecological systems science's concept of ecosystem management is similar to the challenge of

blending vulnerability and resilience thinking. Again, I argue that this is one way to bridge people and new knowledge through tapping into weak ties within and outside of the community.

Explicit knowledge refers to objective facts and purely cognitive elements of learning and understanding the world. Tacit knowledge refers to situated and experiential understandings of the world. Both of these contribute to innovation, but tacit knowledge can only be shared by common practice (Pahl-Wostl, 2007). If one were to dismiss the dichotomy between "hard" and "soft" knowing, one realizes that all knowledge leads to skills and attitudes resulting from shared experiences. In practice, landscape managers need more than simple application of science to guide management actions. Complex ecosystems are patchy, dynamic systems with multiple system conditions present at a given time and changing over time in any given place. Science is, by definition, a type of context-independent knowledge wherein variables are limited to the extent possible. In practice management of complex systems requires context-dependent synthesis of science, other types of knowledge, economics, and other social institutions (power, politics, cultural norms, etc.). "In particular, informal learning environments in which actors are more willing to leave entrenched positions are perceived to be crucial for the adaptive governance of social-ecological systems" (Pahl-Wostl, 2007, p. 7; see also Folke et al., 2005).

Community Learning in Social Resilience

It is in this context that I begin to wonder about social learning, from the context of increasing capacity to react and adapt to socio-ecological change via institutional power over the course of a community's socio-political-economic situation. As an example, there has been research at the institutional level on adaptive governance in agro-ecological landscapes in which leadership, vision, and organization contributes to transforming local wetlands to a more desirable social-ecological state. Some research on the transformation of livelihoods in response to climate change demonstrate learning on the individual level (Miller et al., 2010). Research into rural southern African communities demonstrate that maintaining static agricultural coping strategies suppress innovation, increase poverty, and reduce the community's ability to address complex feedbacks within the social-ecological system. Private businesses in rural areas provide resilience through developing and providing access to existing resources, maintaining a demographic balance (e.g., a reason for working age people to stay in a rural area), supporting community services, and forwarding knowledge and information (e.g., fertilizer/pesticide information) to the populace

(Steiner & Cleary, 2014). Businesses can keep a community going, and can be the catalyst for continued survival, after a financial crisis. Close connections between businesses and the community in which they operate generates loyalty and stability. It is this sort of connections, including dense social networks, strong mutual knowledge, and sense of community cohesiveness that increase community strength (Chell & Baines, 2000). Social learning, communication across multiple institutions, a community's ability to reorganize, and build adaptive capacity are critical when increasing the resilience of rural or marginal societies.

Increases in and better delivery of nonformal education, I posit, enhance a community's ability to nurture diversity for reorganization and renewal and to foster and combine different kinds of knowledge (Berkes, et al., 2002). Because nonformal education is science-based, but also based on a community's interests, context, and identified needs, it can combine different knowledges to provide highly relevant local learning. That is, Extension education can, when properly developed and applied, enhance the institutional norms and values of a community, resulting in greater resilience.

If adaptability and resiliency requires anticipating that disturbance and change are inevitable (McIntosh et al., 2008); and also empowering people and organizations to actively develop agency through decisions, policies, and/or programs that make positive rather than negative outcomes achievable, then something must enable people, organizations, and communities to rise up to the challenge of (and the expense of) developing that agency/community capital/adaptive capacity. Assuming that adaptation is a social practice, community agency and structure provide the boundaries of adaptability (Wyborn et. al., 2015). People and groups with fewer resources (knowledge, social networks, funding/revenue, mobility, and other social capitals), as with simplified ecosystems, have a reduced adaptive capacity.

Communities consist of many groups of people, and while most groups exhibit many overlapping values and interests, these groups cannot be seen as entirely homogenous, and in some cases, groups have opposing goals, values, and agency. Extension education works within these overlapping values, and an experienced Educator will understand these and will facilitate the needs of different groups within the community. Each individual, and each group, is influenced by a range of factors that may increase or decrease adaptability. Perceived risk, willingness to work together or collaborate, sense of place, presence of community resources or initiatives, experience and knowledge, and even local culture, history, and setting can influence an individual's or a group's interest in or ability to increase adaptability, improve resilience, or even work toward

increasing community capital (Paveglio et al., 2016). One community in the wildland-urban interface (WUI) might have the sort of collective community values that enable public venues on firewise landscaping and encourage (normalize) a set of firewise practices. Other communities might be highly individualistic, might value wood-shingled homes hidden in the brush, and might not have the inclination or ability (through social network or infrastructure) to hold local public meetings or to normalize the concept of fire adapted communities (Fire Adapted Communities Coalition, 2013; Paveglio et al., 2015). Granovetter (1973) focused on the strength of ties within a community. McPherson et al. (1992) discussed the implications of weak and strong ties within groups. Weak ties bridge a group to sociodemographic space distant from that of where the group exists and bring different social worlds together. These tend to expose people to new information that would otherwise not appear with strong ties. Strong ties allow a greater amount of information to be shared and generates stronger emotional bonds. They reinforce shared tastes, outlooks, norms, and other features that are transmitted through a social network.

If the concepts of community development, community capital, and community sustainability are not appropriate or developed with diverse populations in mind, then what public good can come out of increasing community resilience for some and not for others? Extension education is explicitly developed for all, and is delivered expressly for all the public, and for the lowest cost possible. Many Extension publications are freely available online so that people of low SES (social-economic status) can access the knowledge for free. Extension programs (classes, workshops, online videos, etc.) are developed to meet community needs, as identified by the community through a number of methods and are presented in a wide variety of locations and venues so that the widest possible swath of the community is able to participate. County Agents and Area Educators develop programs for outside organizations as requested and also develop in-house programming to suit needs of clientele. K-12 programs such as 4-H are made available to the widest audience possible for the lowest cost possible, sometimes including free activities in public after-school settings. Likewise, watershed councils and other collaborative groups do not charge attendance fees (though people must have the ability to travel to attend), and function as nodes of information sharing as well as venues for deliberating options and coming to consensus (or not) about natural resources management issues that affect the community (decision-making). It may be in understanding the power of enabling of robust and complicated networks among people and institutions, via fostering weak ties and bridging tendencies, that nonformal education and community building is best assessed.

The academic work described in this dissertation follows the literature synthesized above and includes three research projects. First is an exploration into two social research methods commonly used by Extension educators to discover community education needs. Second is survey research of volunteer motivations and persistence within two complimentary Extension citizen science programs. Third is foundational research into development of a rubric to articulate how or whether community-based education and stakeholder-collaborative programs improve societal resiliency. The first two projects are published in Extension-relevant journals. The third is intended to be published as well. This introduction and literature synthesis is likewise intended to be published as a review article.

CHAPTER 2: EXTENSION INVOLVEMENT IN COLLABORATIVE GROUPS: AN ALTERNATIVE FOR GATHERING STAKEHOLDER INPUT

"Extension Involvement in Collaborative Groups: An Alternative for Gathering Stakeholder Input." Journal of Extension 56:2, Article 2IAW5. 2018, available at: https://www.joe.org/joe/2018april/iw5.php

Introduction

Extension professionals often conduct focus group research (Berg, 2007; Grudens-Schuck, et al., 2004) to assess community educational needs (Allen, 2004; Gamon, 1992; Malek, 2002; Vanderford, 2014). Extension professionals' participation in collaborative stakeholder groups, such as watershed councils, can provide educational needs assessments, too. I outline similarities between participant observation of collaboratives and focus group research, and then provide examples of meeting needs identified by collaboratives.

Focus Groups and Collaborative Stakeholder Groups, Defined and Compared

Focus group interviews share similarities with collaborative stakeholder groups, and have unique characteristics, too. Table 2.1 reviews design, participant selection, group process, and potential findings for each potential needs assessment method.

Focus group research requires more up-front administrative time (Krueger & Casey, 2015), whereas participant observation requires greater ongoing time commitment. By integrating oneself into an existing collaborative group, the Extension educator can apply time and energy in different ways. Either method requires time and planning. "Largely, such decisions are made on the basis of … advantages or disadvantages of each technique" (Berg, 2007, p. 152).

Participation in collaborative groups can be participant observation research (Schwandt, 2007, p. 219). In focus group and participant observation research, the educator becomes the key instrument in collecting data. Participant observation in collaboratives is a prolonged engagement approach (Goffman, 1989; Schwandt, 2007) and ethnographically naturalistic (Lincoln & Guba, 1985; Schwandt, 2007). Long-term participation allows for congeniality and trust to establish; participants can ask substantive questions of the group. Power and legitimation can affect outcomes and overall decision-making (Jamal & Getz, 1999), but a commonly developed range of

needs is established and prioritized in focus group or participant observation research. The Extension educator working with a collaborative group can immediately begin to gather rich detail to justify educational programming identified by the group.

Table 2.1. Characteristics of Focus Group Research and Participant Observation of Collaborative Groups

Focus Group Research Characteristics	Collaborative Stakeholder Group Characteristics
Design: "small groups of unrelated individuals, formed by an investigator and led in a group discussion on some particular topic or topics" (Berg, 2007, p. 144; also see Schutt, 2003).	*Design*: intentionally organized place-based organizations in which local, autonomous interests work together to identify and address landscape-scale challenges or improve conditions (Parker, et al., 2010; Wondolleck & Yafee, 2000).
Selection: "based on characteristics they share, as opposed to differences among them" (Larson, et al., 2004, p. 1).	*Selection*: Collaboratives include skilled, committed people with a common interest in natural resources management, agriculture, or other related fields (Flynn & Harbin 1987; Hinkey et al., 2005).
Process: "carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment" (Krueger & Casey, 2015, p. 5). Focus groups operate for a discrete amount of time, usually in the range of two hours. Multiple focus group interviews can be held over time, but each includes different participants.	*Process*: collaborative dialogue can be a type of deliberative governance strategy (Booher & Innes, 2001; Innes & Booher, 2003). The collaborative group meeting process is planned by a facilitator and topics are chosen based on relevance to the geographic area. Collaborative group meetings tend to last about two hours and largely the same group members meet regularly throughout the year.
Findings: exploratory and useful for research, program development, or evaluation (Bloor, Frankland, & Thomas, 2001; Merton & Kendall, 1946; Merton, et al., 1956).	*Findings*: "At their heart, collaborative processes are really just complex learning processes (Hinkey, et al., 2005)." Determining educational and research needs has been a natural outcome in my experience.

Being open to public participation, prolonged experience allows new needs to emerge. Collaboratives are effective synthesizers of educational needs because they are inherently educational in nature. Hinkey et al. (2005) further describe the educational nature of collaborative groups:

> … participants learn from each other… collaborative processes help identify better or more preferred solutions based on a gain of knowledge and information. Mutual learning results in all of the participants arriving at a new or different solution… because of their increased understanding of the issue.

Needs Assessment Examples from Collaboratives

Collaborative stakeholder groups I participate in articulate need for improved community knowledge about water resources. I triangulated this finding with survey data: people's perceptions of water quality are inconsistent with water managers' priorities (Robinson Research, 2015). Observations of collaborative group meetings resulted in my creating peer-reviewable video and print publications. Three specific examples follow.

With IWAC (ID-WA Aquifer Collaborative) support and encouragement, I developed the *Cleaner. Water. Faster.* multipronged education program. I wrote a grant to the National Fish and Wildlife Foundation's Five Star and Urban Waters grant program (see page five: http://www.nfwf.org/fivestar/Documents/2015_five-star_project-list.pdf). With this grant funding, I worked with IWAC members and U-Idaho graphic design service-learning students to create interpretive signs along a 60-mile non-motorized corridor across the Aquifer region. Each sign connects to a short peer-reviewed educational video related to protecting aquifer and rivers (Ekins, 2017a-d; Ekins, forthcoming (2018a-d). The series is located at the following address: https://www.youtube.com/playlist?list=PL6g6ZYcM47s9HMDtPaxT44P-hx9AhmwRS. To bolster the educational nature of the program, with help from IWAC partners, high school students engaged in service-learning projects and water science investigations. University students worked as summer graphic design interns to complete the signs.

I worked with the North Fork WAG (Watershed Advisory Group) to create a peer-reviewed brochure describing the structure and importance of riparian buffer zones for clean water and soil erosion reduction [Ekins, et al., 2018]. The North Fork Coeur d'Alene River is a rural, timbered watershed that attracts recreationalists from the Spokane-Missoula corridor. Privately owned

recreational and residential lots are the primary land use along the lower river. Emerging from WAG meetings, I learned that landowners often cut riparian vegetation for river views. These cutover areas experience serious erosion during high flows. Discussions with WAG members indicate a failure to realize that the vegetative buffer holds the land in place. Less aggressive cutting would enable access while protecting land from eroding away into the river. A brochure focusing on riparian vegetated buffers is under internal peer review and will become a formal Extension Bulletin. WAG participation made possible grant funding for graphic design, printing, and mailing to all riverfront lot owners.

With information gleaned from Lake Pend Oreille Nearshore WAG, I assisted with development of an education program for REALTORS® related to clean water. A peer reviewed Extension bulletin emerged from the process (Ekins, 2016). Observations by WAG members who interact with realtors and clients indicate that widespread misinformation exists about a wide variety of water issues related to rural home ownership: well safety, septic system location and operation, lakeshore protection from erosion, setbacks from streams and lakes. The bulletin provides information about septic systems, private wells, stream/lake setbacks (and other planning issues), riparian vegetated buffers, and an annotated directory of various water-related agencies. I secured no funding via the WAG, but WAG members and the coordinator organized much of the bulletin content, and almost all of the REALTOR course content.

Collaborative groups are open to public participation, so involvement is generally straightforward. I suggest contacting the group's coordinator or facilitator for updated information and email list inclusion. Read meeting minutes and agendas for context. Some topics will be difficult to understand without the context of continued involvement. Over time, acronyms, place locations, project names, etc., will become familiar. As needed, ask for clarifying information about projects, programs, locations, and acronyms, and what organization or agency participants represent. Moreover, actively seek out support for programs recommended by the group.

Conclusion

Although participation in collaboratives might not satisfy all extension educational needs assessments, consider it as an alternative method. Collaboratives offer great networking opportunities and provide additional, lasting side benefits. I value my time interacting with the other collaborative group participants on a peer level.

**CHAPTER 3: UNIVERSITY EXTENSION CITIZEN SCIENCE WATER QUALITY MONITORING
PROGRAMS: ANALYSIS OF VOLUNTEER ACTIVITIES**

Abstract

Volunteer citizen science program managers can benefit from understanding participant activity
patterns. It's helpful for maintaining long-term motivation and for recruiting new volunteers to
balance attrition. The objective of the study described here is to: 1) explore citizen science
participant patterns, and 2) ask why volunteers leave. These results can inform a reflexive space for
citizen science program managers and anyone considering developing such a program.

Introduction

Many University Extension programs rely on volunteers, including Master Gardeners, youth
development, and citizen science programs. Academic literature, plus my personal observations
indicate that understanding patterns of volunteer activity helps to improve all facets of volunteer
program management: communication, training, supervision, continuing education, developing
leader-volunteers, demonstrating impact, and celebration of accomplishments (see, for instance,
Boyd, 2004; Conners, 1995).

Two such programs in the West, and the two analyzed in this article, include the University
of Idaho Extension IDAH$_2$O Master Water Stewards and Utah State University Extension Utah Water
Watch. The University of Idaho Extension IDAH$_2$O Master Water Stewards (IDAH$_2$O) is a single-tier
volunteer program. A trained Master Water Steward (MWS) can adopt a stream location to conduct
regular monitoring with relatively unsophisticated protocols and equipment.

The Utah State University Extension Utah Water Watch (UWW) is a two-tier monitoring
program. Tier One monitoring is almost identical to IDAH$_2$O. The Tier Two monitoring uses more
sophisticated protocols and was not analyzed here. Both programs' workshops are educational with
an option to volunteer.

Background

Research on volunteer motivation has generally proceeded on two tracks. One track seeks characteristics of volunteers. The other track, which I focus on here, is the production of lists of benefits ("reasons") for volunteering. Altruism is the primary argument for volunteering but some scholars insist volunteers receive something for their efforts: feeling good about making a difference, social networking, improved sense of place, and other satisfactions (Penner 2004; & Measham, 2008, produced a long list). Social norms of praising altruism and disapproval of pursuing personal goals via volunteering create what researchers call a "social-desirability bias." Controlled tests of volunteerism are therefore difficult, but there are some research-based models to predict continued volunteer commitment, suggesting that volunteers actively weigh volunteering options. The study described here adapts Heckhausen & Gollwitzer's (1987) Rubicon model of action phases, with help from Azjen's (1991) Theory of Planned Behavior, to better understand how someone becomes a volunteer citizen scientist. These models tell us that becoming an active volunteer citizen scientist requires planning out a series of steps and then successfully following through. In IDAH2O and UWW, a new participant's first step into exploring volunteer citizen science is to participate in an educational workshop. This volunteer's second step is to think about monitoring and maybe even to register a stream or pond site with one of the programs, which can be done quickly at home. But the participant hasn't actually started monitoring yet. The third step is to actively monitor a stream or pond for a little while to see how it goes. If it seems to be worth the effort, the volunteer will go to the fourth step, continually monitoring consistently as long as they can.

Methods

In our study, participants were divided into "action phase" groups based on those four steps:

- Certified (pre-decisional): engaged in a training workshop;

- With Registered Site (post-decisional): registered a monitoring site;

- Active (actional/evaluative): collected data and then decided to quit;

- Consistent (maintenance): monitored more than one season/year, or continually.

In 2016, both programs administered a nearly identical survey (online and pen/paper) to ask about activity level, using Dillman's (1991) total design survey method to triangulate volunteers' data upload patterns. I tallied the most frequent responses about why they quit. I did not inquire further with respondents who only "took the workshop for the educational opportunity" (pre-decisional action stage). Likewise, I did not inquire further about persistence with multi-year/consistent respondents.

Results

While total numbers of Master Water Stewards (MWS) are increasing, volunteer numbers decrease with each action stage. At the end of 2016, there were 379 Certified IDAH$_2$O MWS. Thirty percent of these had registered a site (n=114). Of those with a site, 29% were actively monitoring (n=33).

Forty five percent (n=15) of the "active" MWS consistently uploaded data for at least two years. Seventy percent of total MWS (n=265) never registered a site after the certification workshop (pre-decisional). Fifty-five percent of MWS who became active, did so for a year or two, then quit being active (actional/evaluative). Forty-five percent of active MWS (13% of those who registered a site) maintained their activity consistently (maintenance). Figure 1 summarizes IDAH$_2$O action stage participants. UWW tracks volunteer participation differently from IDAH$_2$O, so I did not attempt a similar activity analysis. However, anecdotal communications with UWW leadership indicate similar trends.

Numbers of IDAH$_2$O Volunteer Types
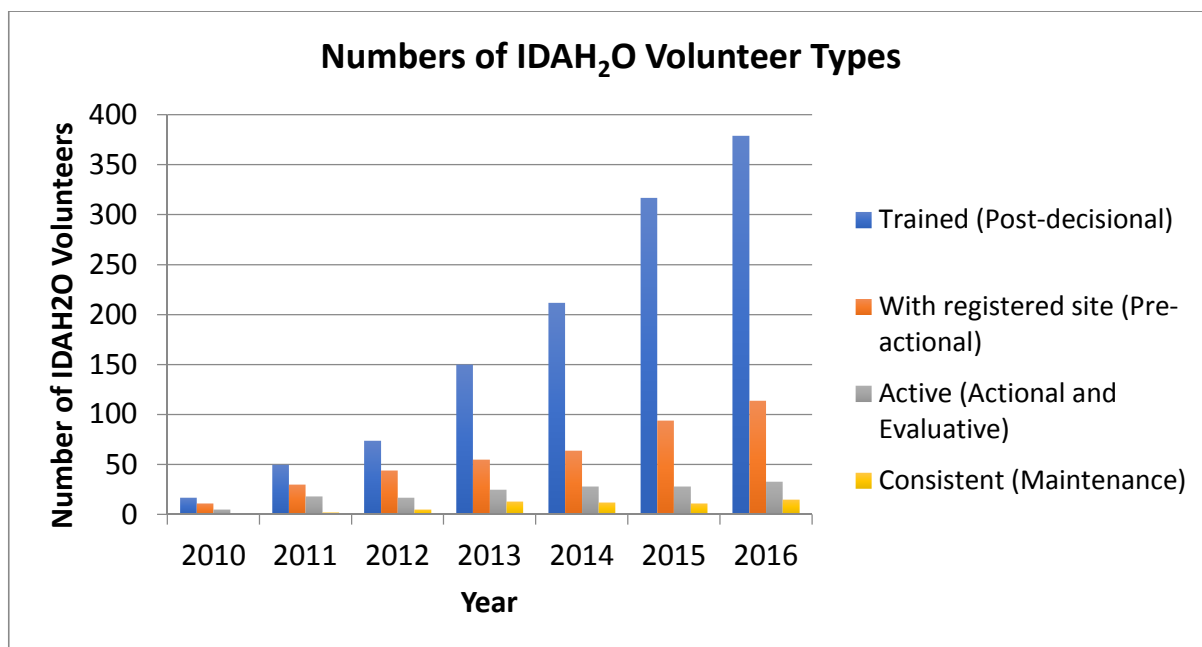
Figure 3.1: IDAH$_2$O participants by action stage

From the survey, 10 of 53 complete responses from IDAH$_2$O, and 19 of 80 from UWW, indicated they participated "strictly for the educational opportunity." An additional group of pre-decisional participant (eight IDAH$_2$O, and three UWW) respondents indicated they "thought about monitoring but never did." When asked why, these participants mostly indicated:

- Less Spare Time than I thought I would have (n=8)
- Change in schedule and can no longer monitor (n=7)
- Found another volunteer opportunity more convenient (n=5)
- Decided the educational opportunity was sufficient (n=4)

Waited too long after the workshop to start (n=4) (three of these also indicated "can't remember the protocol well enough")

Eight of 53 IDAH$_2$O respondents, and two of 80 of the UWW respondents, indicated reaching the post-decisional stage. These respondents completed a "half-step" toward action by registering a site, but not the second "half-step" to actively monitor. When asked why they stopped:

- Less spare time than I thought I would have (n=7)
- Feel like I waited too long after the workshop (n=4)
- Actually, collected some data but never uploaded it (n-4)
- Decided the educational opportunity was sufficient (n=3)

Eleven IDAH₂O respondents and three UWW respondents indicated reaching the actional/evaluative stage by monitoring once then quit or monitoring one season then quit. These respondents made it past both "half-steps" to action, and later through the evaluative process decided to turn their volunteering attention elsewhere. When asked why they stopped:

- Change in schedule and can no longer monitor (n=4)
- Less Spare Time than I thought I would have (n=2)
- Moved Away from the Monitoring Site (n=2)
- Monitoring Partner Quit (n=2)
- Couldn't find anyone to monitor with me (n=2)

Discussion

All IDAH₂O and UWW volunteers expressed concern about clean water. Survey respondents who "thought about monitoring," "registered a site but never uploaded data," or stopped after monitoring for some time, often responded by being satisfied with the educational opportunity. This helps support the importance of non-formal educational programming on water quality.

Survey responses from participants who register a site and monitor for a limited time (e.g. up to one year/season), find barriers in available spare time, and schedule or home location changes. A few respondents in each program indicated short-term monitoring "satisfied my curiosity about the water body I monitored." Six respondents indicated they "feel the data is insufficient for management decisions." These findings point to educational-level program instructors working to carefully manage expectations.

IDAH₂O and UWW observed two unique "half-steps" between post-decisional and actional/evaluative stages. First, is registering a monitoring site; described by Montada, et al., (2007) as post-decisional but pre-actional, it does not necessarily result in action. The second half-step is the act of collecting and uploading water quality data from the site. These programs were set up under the assumption that site registration leads to data collection. However, 21% of all IDAH₂O post-decisional participants (and a smaller percentage of UWW participants) registered a site, but never uploaded data. The additional half-step to move from post-decisional, to actional/evaluative, may be a barrier.

For those respondents who decided to end active participation after monitoring for a while, the reasons for quitting active participation include reasons noted above, and additional barriers to consistent active participation like having a partner quit and not finding another.

The importance of collecting longitudinal data for early detection of environmental problems leads many program managers to place great value in long-term (maintenance stage) volunteers. Based on the results of this survey, managers could also continually recruit and train volunteers, assigning previously registered monitoring sites to new volunteers. This eliminates one possible barrier: the first half-step of registering a site.

Water quality monitoring has long-term benefits, but so, too, does providing ongoing educational opportunities for lay community members. And while consistent volunteers can be most valuable to a water quality monitoring program, attention to continually recruiting new volunteers, and assessing the correct action level for them, will also benefit water quality volunteer programs.

Author's Note

I am grateful for the efforts of volunteer citizen scientists. You are studying important phenomena; without your efforts we would know so much less about our world. While IDAH$_2$O and UWW focus on water quality, there are many other forms of citizen science to engage just about anyone's interests. I am also grateful to be working with the wonderful staff and faculty at UWW, and to be able to analyze the survey data they collected.

CHAPTER 4: DEVELOPING A NONFORMAL COMMUNITY EDUCATION RESILIENCE RUBRIC

Introduction

I describe in this chapter my foundational research into the question of whether community-based education and stakeholder-collaborative programs improve societal resiliency. The mixed methods study described here operationalizes the following mental model, which I use as a research statement: communities that are engaged in nonformal natural resources learning are encouraged to develop conservation-oriented social norms and increase social capitals. This leads to improved ecosystem services management, which in turn leads to increased adaptive capacity, manifest as improved resiliency. The idea with this project is to provide stakeholders with a "resilience rubric" derived from the mental model as an evaluative process that has practical utility and credibility. The research described here is the first step in developing the rubric and eventually a calibrated scoring procedure that can be used by nonformal educators and community-based program administrators.

The research goal is to discover how existing concepts of collective learning can be developed into a framework for articulating the non-monetary value of community-based learning. Existing concepts described in detail in chapters 1 – 3 are summarized and organized in an initial draft of the "Program Process Model", below in Table 4.1. Professional experiences from my and others Extension practice also emerge within the table. Development of this table enabled development of list of topic areas to explore with the questionnaire.

Table 4.1: Program Process Model, Draft Version

Reactive Project Process	Prescriptive Project Process	Adaptive Project Process	References
System maintenance	System change	System transformation	Friedmann, 1987, p. 30;
Problem-fix; single-focus, lack of analysis due to institutional response	Narrow focus response to problem and analysis by diagnosis of disturbance	Broad, holistic focus, response to improving conditions by actively seeking patterns within larger context	Wenger, 1998; Collins and Ison, 2009; Pahl-Wostl, 2007
Rely on limited previous learning, or none at all/ Single-loop learning	"A-B" learning/ Double-loop learning	Response to problem, analysis, and experience/learning; Broad, meandering learning/ Triple-loop or complex learning	Wenger, 1998; Keen et al., 2005; Keen & Mahanty, 2006
Identification of community need: immediate disturbance, seen as threat with high uncertainty	Identification of community need: anticipated, or recurring (looming) disturbance that may transition from being seen as a threat or an opportunity	Identification of community need: anticipated complex disturbances across space and time, seen as an opportunity as uncertainty is reduced through monitoring	Sandker, et.al, 2010; Voinov and Bousquet, 2010; Ekins, 2018
Single-event process/incremental planning and reactive planning	Short-term process/strategic planning and reciprocal planning (less of an exchange of knowledge, but of effort)	Long-term process/structured decision-making (SDM) and transactional planning (knowledge and expertise is exchanged/traded)	Friedmann, 1987; McGuire & Sanyal, 2006; Gregory, et.al., 2012
Localized issues and decision-making	Localized issues with somewhat regional decision-making	Bioregional issues and decision-making	Ecotrust, 2012
Spending (losing) social capital	Spending and gaining social capital	Increasing/building social capital; investing rather than spending	Falk & Kilpatrick, 2000
Community fragmentation: only specific portions of the community are immediately involved or benefit	Mostly bonding social capital (possibly weakly linking for financial/resource provision)	Bridging and Linking social capital	Adger, 2000; Wyborn, et. al., 2015; Paveglio, et.al. 2015; Granovetter, 1973; Putnam and Feldstein, 2003
Objective is to stop the disturbance in the shortest time, often with other consequences	Objective is to minimize damage from disturbance, reduce vulnerability for some groups	Objective is to benefit from disturbance through knowledge gain, and to reduce vulnerability community-wide	Pulsipher, 2011; Paveglio, et.al. 2015
Volunteerism as immediate emergency response	Volunteerism as education-based, maybe as protest, or single-project-based	Volunteerism as equal partner in education and communication – building programs together collaboratively	Krasny & Tidball, 2010; Krasny et al., 2009; Ekins, 2019
Episodic volunteerism with untrained volunteers, citizen volunteers	Repetitive, periodic volunteerism with trained, certified volunteers or retired agency volunteers with background knowledge	Consistent volunteerism with citizen volunteer leaders and/or agency volunteers with broad background knowledge	Keen et al., 2005; Kransy & Tidball, 2010; Ekins, 2019

The model can be considered in two ways. First, program administrators can self-asses the program's relative societal position based on the three main columns, Reactive, Prescriptive, and Adaptive. Programs intended to move from a lower state of system process to a higher one can use the rubric to prioritize the steps toward achieving that goal. Programs intended to stay in a given process can use the rubric to optimize activities and objectives so that resources are not wasted by straying into a higher (or lower) process column. For example, a program that is consistently developed to systems change would be wise to focus on activities related to short-term strategic planning with an exchange of effort rather than knowledge. A program consistently developed for a fast response to an immediate threat should not slow itself down through a long-term decision-making process like structured decision-making (SDM). Instead, it should have benefitted from prior efforts in planning to enable the best single-focus problem fixes, and immediate response to acute needs, rather than spend time deliberating after the fact.

The research objective is to develop a model, and test the model in the form of a rubric for two trustworthiness criteria: credibility and dependability (Guba & Lincoln, 1989; Lincoln & Guba, 1985) as a first step toward examining the relationship between the outcomes of community learning and increased social-ecological resiliency. The rubric manifests as a questionnaire that is easily understood and completed by natural resources-related education program administrators, and that will be used to articulate areas of programmatic strength related to social resilience.

The research outcome is continued development of the model to synthesize observed effects on community learning from involvement in extension programming, multi-stakeholder groups, and volunteerism. The intended output, in the form of a scoring rubric derived from the model, can also be thought of as a music studio soundboard or mixing board for organizations to understand the extent to which each of these areas contribute to greater social resiliency. It will help organizations fine-tune their own outputs related to their strengths, and to community needs. The Reactive Program Process Table will be presented again in updated form in the Discussion section, below.

Questionnaire Development

The process described in this chapter is a robust pre-testing of the rubric to determine credibility and dependability. To develop the questionnaire, I followed survey and interview schedule development suggestions by Patton, (2002) (see also, Spradley, 1979) by developing a

rough outline. In this case, it includes seven broad categories suggested by the literature (listed in the "Questionnaire Structure" section, below). Sequencing, phrasing, language reading level, and style were developed based on a target audience of professionals who run an education or collaborative program. I assumed that these professionals have some sort of college degree and some years of experience in their field. Another assumption in my communications is that this demographic is relatively homogeneous, and so the questionnaire is consistently written at a college undergraduate reading level.

To help improve my communication with the respondents, I provided an opening informational project description of the reasoning behind the survey. In it, I state that the intent of the questionnaire is to be turned into a rubric, which will eventually provide a reference point or number for each of the topics/constructs addressed.

This questionnaire is draft form of a rubric, to articulate how much community-based education programs can contribute to a community's resilience to disturbances. By community, we refer not only to geographic communities like towns, but also larger more dispersed areas like watersheds, in which people share resources and consequences of disturbances. Disturbances can happen to social systems or natural systems.
In short, I'm genuinely curious about your program, and how we can articulate its usefulness in developing community resiliency.

Eventually, with input from participants like you, I will create a useful rubric (a scoring framework, or measurement tool) so that anyone running a community-based education program will be able to demonstrate its positive impact on their community's resilience. Today's goal is to try the rubric out, and to gather your comments about each question. I will combine your responses with those from additional participants to improve and calibrate this rubric to assess how nonformal learning programs can influence resilience within the community.

Please answer the questions below about a single, specific community-educational program that you oversee. If you organize more than one program, with a different audience or focus, you will have an opportunity to repeat the process if you would like. While you are working through the form, please interject by adding your own comments, questions, observations, critiques, and ideas.

We are not trying to be representative of everything you are doing; rather we are using your

expertise and experiences with nonformal education programs to help us develop this

framework for understanding the role of non-formal education in building community

resilience to disturbance.

This paragraph is in addition to the required informed consent letter. The consent letter is found

with the survey instrument in Appendix A. The consent letter is also framed to provide broad

guidance to the respondent about the reasoning behind the instrument.

With every subsequent section, I provided a definition of the topic at hand and/or a brief

description of the concept being studied. For instance, at the beginning of the *Building Adaptive*

Capacity section, "Learning takes many forms. Help us understand the types of learning and

decision-making that your program is designed for, and how that learning is transmitted more

broadly. Select the one response that best represents your program; each selection also includes

the selections above."

Early drafts of the questionnaire were critically reviewed by other qualitative researchers.

This helped identify and fix poorly worded questions, and tested for other problems like affectively-

worded, double-barreled and overly complex questions (Berg, 2007). The second step in this

process is pre-testing of the instrument. I followed the suggestions from Chadwick, Bahr, and

Albrecht's (1984) work (see, p. 120) about assessing a questionnaire's effectiveness, with a specific

focus on their third and fifth question, related to credibility and pragmatic quality, respectively:

1. *Has the researcher included all of the questions necessary to test the research*
   hypothesis?

2. *Do the questions elicit the types of response that were anticipated?*

3. ***Is the language of the research instrument meaningful to the respondents?***

4. *Are there other problems with the questions, such as double meaning or multiple issues*
   embedded in a single question?

5. ***Finally, does the interview guide, as developed, help to motivate respondents to***
   participate in the study?

The assessment of quantitative and qualitative responses described in this chapter asks

whether the refined rubric is understandable to stakeholders. This assessment also asks whether

the rubric exhibits credibility and dependability as a tool for further inquiry into assessing

nonformal education program effect on specific aspects of social resiliency. I built the rubric using

existing research that defines the constructs of social capitals (Adger, 2000), social construction

(Vygotsky, 1978), group learning (Bandura 1977), communities of practice (Wenger, 1998), adaptive capacity (Armitage, 2005), resilience and vulnerability studies (e.g., Miller et al., 2010), homophily (Blau, 1977; McPherson et al., 1992) and bridging v. bonding communities (Putnam & Feldstein, 2003). The prior research on which I built the rubric control for traditional threats to internal and external validity (Campbell & Stanley, 1963). Pragmatic quality (Morris, 1970), credibility, and dependability (Lincoln & Guba 1985) is verified by gathering program data combined with contextual qualitative responses by members of the expert panel via the questionnaire and follow-up interviews.

Credibility roughly parallels internal validity, addressing whether respondents will view the process (particularly the meanings underpinning each question) the same as I (and future inquirers) do and have. Dependability (consistency) is roughly parallel to reliability, requiring my process to be logical and documented with a traceable inquiry trail (Lincoln & Guba, 1985).

Testing for credibility and dependability will help ensure the rubric's pragmatic quality. The study described here does not aim to demonstrate direct cause and effect, but instead to demonstrate that my interpretations of the constructs and data are credible to the respondents who provided the data based on their lived experience administering community-based programs (Eisenhart & Howe, 1992). It is up to the audience, future users of the rubric and its data, to determine whether rubric use is valid for their purposes. Therefore, the rubric must be designed to be understandable by present users and be able to distill data in a way that is useful for them.

Methods

I tested the questionnaire as a model/rubric for pragmatic quality; that is, whether the model is understood by, and will be useful to, relevant users or stakeholders (Morris, 1970). I accomplished this through assessing model credibility (parallel with internal validity in qualitative inquiry) and dependability (parallel with reliability in quantitative inquiry) (Lincoln & Guba 1985) via survey- and semi-structured interviews with a panel of experts who run community-based, volunteer educational programs.

The questionnaire can be found in Appendix A. This survey design is intended to determine whether users/stakeholders found that the questionnaire/rubric successfully operationalized the above-mentioned social constructs; future research can use the rubric as a scoring matrix. That is, the respondents validated the questions by answering them and providing interview or written

comments about each question. I added semi-structured interviews with Tier-1 respondents to gather rich descriptions of their experiences with the questionnaire. I followed the questionnaire structure exactly, and then I added probing questions (Lofland & Lofland, 1984) to gather the respondents' narrative experiences, especially when a respondent had difficulty with a question or topic.

I transcribed the three Tier-1 interviews and questionnaire responses into an Excel spreadsheet. I noted incidences of questions for which any panelist expressed confusion or misunderstanding, and then I revised those to be more clearly stated. I copied the three Tier-2 questionnaire responses and qualitative comments into the spreadsheet, again noting incidences of questions for which panelists expressed confusion or misunderstanding. I color-coded all responses to help see patterns of understanding or misunderstanding:

- Green: apparently understood the question
- Yellow: not relevant to the program, but apparently understood the question
- Purple: respondent did not have the information or data, but apparently understood the question
- Red: misunderstood the question or thought it was unclear

Panel of Experts

The panel of experts consists of six community-based program administrators/coordinators. I selected these programs because I know something of their inner workings, and of their outcomes. Selection for the panelists is not necessarily representative of all community-based programs. I used a purposive, emblematic sampling approach, and not random sampling. I chose to examine a short list of cases that, from my prior experiences of engagement with the programs (that is, I knew many details about the programs, leadership, and participants), would provide good comparisons and contrasts (Glaser & Strauss, 1967). Three of the programs, the first tier, are very familiar to me, my having worked directly with administrator and participants, and having seen programs outcomes directly. The other three programs, the second tier, are less familiar to me, having worked occasionally with administrator and some participants, and having seen program outcomes indirectly. I grouped the coordinator/administrators of the first three programs as a "first tier" and of the second group as a "second tier" of expert panelists.

Below is a list of the organizations' descriptions for which the six participants in the expert panel responded in the process of calibrating the questionnaire.

- First Tier

    1. A traditional Extension adult education program (T1-1)

    2. A less-traditional Extension adult education program (T1-2)

    3. A watershed-based collaborative stakeholder group (T1-3)

- Second Tier

    4. A watershed-based collaborative stakeholder group (T2-1)

    5. A traditional Extension youth- and adult education program (T2-2)

    6. An Extension citizen science adult education program in another state (T2-3)

The first tier of panelists allowed me to assess pragmatic quality; whether the questions were understandable to the program administrators, and the extent to which the questions relate to the individual programs. My knowledge of all these programs, gained through participant observation over three to five years, allowed me to triangulate questionnaire responses with my lived experiences and observations within the programs, to check for questionnaire pragmatic quality. Face-to-face interviews with Tier 1 coordinators/administrators allowed me to further triangulate, and member-check, questionnaire responses for pragmatic quality of the questionnaire as a model/rubric.

I made minor edits to the wording of the questionnaire after the first three expert panelists responded. These edits were not substantial; they included readability and flow changes, with minor edits to wording for clarity of concepts. Once edited, I uploaded the questionnaire into Qualtrics for online dissemination. I sent the online questionnaire to three additional expert panelists to complete and provide qualitative written responses.

The second tier of panelists allowed me to assess the questionnaire/rubric's credibility and dependability. I did not interview these final three panelists, instead relied on their responses to indicate validity. With each subsequent Tier-2 response, I made additional clarifying wording changes to the questionnaire, but did not change it substantially.

Questionnaire Structure

The questionnaire was built upon previous research into social resilience outlined in the Literature Synthesis chapter. The questionnaire was constructed to gather data and insights into the following areas:

- Program Characteristics: assessed community needs, program duration, participant selection
- Participant Characteristics: community leaders, influencers, networked participants
- Volunteerism Patterns: where and to what extent do participants volunteer
- Adaptive Capacity: the nature of learning, how learning is transmitted
- Adaptive Management: group understandings, decision making, and adaptive governance
- Community Capitals: five community capitals that could be built
- Social Capitals: bonding, bridging, and linking social capitals that could be built

The literature describing related prior research are described in the first three chapters of this dissertation. Chapter one describes relevant research describing various definitions of the concept of community, social and group learning, adaptive management, resilience, vulnerability, adaptive governance, and sense of place. The rubric's questions are drawn from this research literature. Chapter two describes research into participant observation with collaborative groups to understand community educational needs. Chapter three describes research into volunteer volition, motivations, and persistence. The rubric section on volunteerism patterns draws from this work and from chapter 1.

Questionnaire Testing

I provided each Tier-1 expert panelist a copy of the questionnaire to read, complete, and provide written comments as a pen-and-paper or online survey. I followed this up with a semi-structured interview with each panelist, using the questionnaire/rubric as an interview schedule, and including multiple follow-up and probing questions. I allowed the interviewee to articulate her/his thoughts on the questions, how she/he answered the questions, and where questions were difficult to understand.

I sent this online version of the questionnaire to the administrators of three additional programs as a "second tier" (Tier-2) of my expert panel. I chose these three programs because I am familiar with them, but not as intimately as the first three. While I have some understanding of the inner workings, program administrators, participants, or outcomes, my familiarity with any of these are limited, and I am not familiar with at least one of these areas for each Tier-2 expert panelist. The second set of panelists provided quantitative and qualitative responses to the survey but were not interviewed.

Results

Tier-1 expert panelists provided quantitative responses to some questions, qualitative responses to other questions, optional written qualitative comments in addition to responses questions, and responses to semi-structured interview questions. I coded all Tier-1 responses according to whether the respondent apparently understood the question. I color-coded those responses indicating understanding differently from those that indicated lack of understanding. A few responses indicated understanding, but lack of relevance to their program; I differentiated these but kept the questions in the survey if it was relevant to others. Of 280 questionnaire and interview responses, including optional comments, 274 were assessed as understandable (valid) questions. 4 responses indicated that the question was not relevant to that program, but the respondent clearly understood the question. Two responses indicated understanding the question but did not know the answer.

Qualitative interview responses confirmed understanding of the questionnaire. Some examples include:

- I have refined the training and selection process and training process this year into better-selecting participants based on their skill set, filling a need within the program, based on their written application, before an interview…. If someone came to us and didn't want any involvement with the public… that's not what we do with the program, so this has given us a better hold on who's coming in. There are other outlets for non-service-oriented participants. (T1-1)

- We document everyone who comes to ask us a question, what that question is, how we researched it, the diagnostic process, etc. We look at trends of topics. They are collecting and filling out data. (T1-1)

- Yes, two are elected or are very close to an elected representative (a wife of an official). (T1-1)

- I don't know of any. (T1-2; response to the same question as the quote immediately above)

- It's getting better with the new training. We were not doing that before. Volunteering with Extension is very different from volunteering with other groups. It has an outward focus that is different from planting trees. A lot of my volunteers don't get that initial gratification; it's longer than that. Building the program and investing in social capital. Getting that broad, relationship-based investment. Investing in the volunteer, and that

ripples out from there, into the community. Building social capital is what I'm going for. (T1-1)

- It's not around issues, so much. It's about topical awareness. And, raising all the boats of understanding…; none of them (issues) really describe the program. (T1-2)

- These are/can be long-running groups of people really invested in the community/watershed over the long term. (T1-3; response to the same question as the quote immediately above)

- Now that we have this new process, I share, and we set priorities and how to get there. And tie our marketing and classes back to our priorities. I'm trying to create something that, when I'm done, I can hand this to someone, this is what works really well and how to do it. Before, our solutions to what we are doing within the community were all over the place. (T1-1)

- We have people of varying political stripes. This has been tested in the group. They took on climate change last year. We have a couple of people who faulted the program by showing only one side. (T1-2; response to the same question as the quote immediately above)

- Because I think there are… part of the function of the group is that we have diverse values. (T1-3; response to the same question as the quote immediately above)

Some interview responses indicating that some questions were not necessarily relevant to a given program. These responses indicate that the program operates within a "System Maintenance" or a "Systems Change" state, but not that of "System Transformation." Therefore, some rubric questions will not be applicable to all programs.

- I don't know if I would call any of them as influencers. But I've been learning more about how they are influencing things outside the organization. (T1-1)

- There's time where it's appropriate to affect policy. But it's one thing to inform elected officials, it's another to advocate for certain policies. (T1-2)

- I think that's asking too much of a volunteer program. To me it's a function of how healthy the body politic is within a community. If they can deal with shared issues together, vs. falling into ideological … and blame the other side about the uncertainty and unpredictability. (T1-2)

- And even there, you're only doing it if you are willing to do it. Some folks in really rural communities don't want to rock the boat, understandably. (T1-2)

One specific example of where a rubric question draws a sharp line between a program resulting in local process change v. broader policy change. In this first set of qualitative interview responses, Tier-1 program administrators commented about the rubric question, "solutions developed by the group are delivered to local agency staff for consideration in implementation of new alternatives":

- As individuals, [program participants] go out and talk to agency staff… to propose best practices. Maybe 15-20 people (30%) are active this way. They will seek out and bring documentation to such meetings or info gathering events. (T1-1)

- We have had several needs assessment and programs based on the needs expressed by the participants. (T1-2)

- Completely; that's their purpose. Plus, I'm there, so it's delivered directly. (T1-3)

The same administrators commented differently about the rubric question, "Over time, because of the actions of the group, governance decision-making processes improve, resulting in improved policy":

- Commissioner related… yes. I do believe so; I'm going to talk more with some of my key volunteers to get concrete examples. (T1-1)

- Not from elected representatives. (T1-2)

- Close to zero. Unfortunately. (T1-3)

These comments indicate that many volunteer programs will not affect policy decisions, but still have a value in connecting people within the community.

Questionnaire responses (Tier-1) related to improving a community's ability to thrive in the face of unpredictability:

- We talk about that often. We have brainstorming planning sessions, especially around the [demonstration project]. Many [program participants] don't see that it serves their goals and priorities very well. We talk about what do you want to see for this community, and what are the challenges in the face of that. We don't solve any problems; we just have a big piece of paper on the board, and we put up words on a board. There are training on bias awareness in the new training. I feel like we as a group are better at discussing future challenges coming. Or, if we don't feel like we have the initial power to face that challenge, what do we do to support... what are the words to support how to better face those challenges. To me, it's easier for us as a larger group to thrive in the face of unpredictability. (T1-1)

- I don't think that communities deal with those things irrespective of any volunteer program. These are things that humans don't deal with at all. I think that's asking too much of a volunteer program. To me it's a function of how healthy the body politic is within a community. If they can deal with shared issues together, vs. falling into ideological … and blame the other side about the uncertainty and unpredictability (T1-2)

- I was just thinking over the longer term. Because, an example: maybe there's a decision made by [outside agency], then some unknown-unknown happens, they can bring that to the group, and we can brainstorm. So, I think we do help cope with these things. Over the longer term, I have more questions. (T1-3)

Tier-2 responses included only questionnaire responses and written comments provided within the questionnaire. With no in-person interview process through which to clarify the questions, more participants than in the first tier responded to questions indicating a need for clarification. Also, more responses indicated lack of relevancy to their program, but were understood by the respondent. Of 197 total Tier-2 responses, 185 were assessed as understandable (valid) questions. Nine responses indicated misunderstanding the question or that it was unclear. Five responses indicated understanding the question but did not know the answer. No responses indicated that the question was not relevant to that program, but the respondent clearly understood the question.

Two of the "unclear or misunderstood responses indicated a need for additional refinement of the flow and readability of the questionnaire but did not indicate a lack of understanding of the content. Examples of flow-related comments:

- "was hesitant at first as to how to answer these as the cell appeared very small - maybe slightly larger cell unless you only want 1-2 words" (T2-1)

- "For the question above ("Learning is:", the first question in the Adaptive Capacity section) this should allow multiple responses." (T2-2)

Based on this feedback, I changed the wording for text comment prompts, indicating that the comments have no character limit. I changed the first question in the Adaptive Capacity section to indicate that "each selection also includes the selections above."

Two Tier-2 respondents comments indicate a need for a better definition of a community leader, related to the first question in the Participant Characteristics section.

- "How do you define community leader? Is it a position of rank, note, etc. or just someone involved in their community?" (T2-1)

- "If community leaders includes those who provide vital community services then the # would be 100%. If by community leaders you mean elected or appointed officials then [program]'s rating would be less than 10%" (T2-2)

I changed "Participants in this group are community leaders" to "Participants in this group are community leaders (elected or appointee officials)." To clarify that I am interested in knowing whether people in power are participating with the group. T2-3 responded, "I don't actually know this...that would be interesting to find out. Thanks for bringing this to my attention!", indicating that this clarified the question.

Based on one response to the second question in the Volunteer Patterns section, "'to help to' feels rough - tweak phrasing maybe?" (T2-1), I removed the second "to" in the question, "Do participants volunteer additionally to help to co-develop additional workshops, public events/meetings, or other gatherings related to this program?", and in the subsequent slider-bar and comments question. I received the following comment from respondent T2-3 indicating this had been corrected: "I haven't done this, but I think it's a great idea!".

With the slider questions, based on a respondent comment, "Would help in answering the slide question to have the phrasing from previous question visible - repeat the phrasing instead of 'if so'" (T2-1), I changed the prompts accordingly. For instance, below the question, "Do people volunteer their time to participate in regular **program-related meetings**?", I edited the slider bar prompt (for respondents who selected "yes") to "If "people volunteer their time to participate in regular Program-related meetings", then how many hours per year? (If more than 100 hours, include an estimate in the comment question below; If you cannot estimate volunteerism time, or if you are not confident in your estimates, that's okay, too, please briefly indicate that in the comments section below each question.)" and the comments prompt to "Comments (optional) about "people volunteering their time to participate in regular Program-related meetings." I made similar clarifying edits to the remainder of the questions in this section.

The most common qualitative response to the questions in this section was that the respondents did not know about participants' volunteering or serving in community leadership roles outside of the program. I re-colored these responses in purple in the data analysis spreadsheet.

- "A don't know option is needed." (T2-1)
- "don't know that I have enough knowledge of outside associations and time spent - need an unknown option." (T2-2)

- "Not sure. My apologies I don't have that data. That would be interesting to know and I'm thinking of including it now in surveys." (T2-3)

These respondents understood the questions, but comments indicate a lack of data or knowledge about the topic. So, while the question works as intended, it might not be helpful in assessing broader community program impacts into the community. To abbreviate this section for future participants, I will add a "don't know" option to the first of this series of questions. I will use Qualtrics options to skip the remainder of the volunteer slider questions if the respondent selects "don't know" in the first question.

One respondent (T2-2) provided a comment: "Are those participants who volunteer substantively within the community better prepared for their leadership because of their participation within the program? This question is confusing. Do you mean that their participation in IWAC makes them better leaders or leadership in other groups makes them better leaders in IWAC?" This indicates the potential for misunderstanding of the nature of the question. I am interested in learning whether the program results in whether program participants are better able to volunteer during a disturbance because they gained broader background knowledge in the program's area. I restructured the question to "Are your program's participants who do volunteer work better prepared for assisting the community in a time of need because of their participation within your program?" Respondent T2-3 did not answer the question, but this is consistent with their relatively recently becoming program coordinator, and not having the data or background information to answer.

Before I sent the questionnaire to the final Tier-2 respondent, I made clarifying edits to five questions that posed problems for the respondents. The final Tier-2 respondent indicated lack of understanding of two questions.

- How are people selected for participation in your group (check all that apply)?
  - "I was a little confused by the options. Basically, anyone that has an interest and goes through a training can join [program]." (T2-3)
- Do people volunteer their time to participate in regular program-related meetings?
  - "For "meetings" I'm including trainings. I don't know if that makes sense or not...sorry, feel free to include or discard based on your needs." (T2-3)

I added one additional response to the question, "How are people selected for participation in your group (check all that apply)?": "Requires formal training (in-person)." And I edited the first

questions in the Participant Volunteerism Pattern section to read, "Do people volunteer their time to participate in regular program-related meetings or in-person trainings?"

Qualitative comments associated with questionnaire responses confirmed understanding of the questionnaire. Some examples include:

- "In our case some range or variation of norms and values help to create a range of viable solutions to the need or situation." (T2-1)
- "I gave the above ratings because the [program participants] have built relationships … and can collaborate to propose solutions for regional issues." (T2-2)
- "I haven't done this, but I think it's a great idea!" (T2-3)

Additionally, qualitative responses indicating that some questions were not necessarily relevant to a given program include:

- "… depends on the scope of question and my limited exposure to their work outside of [program]." (T2-1)
- "… No way of knowing how many hours." (T2-2)

As with Tier-1 responses, some Tier-2 responses also provided specific examples of where a rubric question draws a sharp line between a program resulting in local process change v. broader policy change. For the question, "How is the learning transmitted within the community, outside the group" respondents selected the following responses:

- New alternatives are created. "we are dealing with working with a community sector over time verse dealing with one or more specific issues." (T2-1)
- Existing Alternatives are analyzed or proposed. [No text comment] (T2-2)
- Information is simply shared. "For the purpose of this program, it is very much sharing "this is what's happening" and providing that information to the [outside government agency] and letting them decide how to deal with it and assisting when possible." (T2-3)

In general, the series of questions in two sections, Volunteer Patterns and Adaptive Capacity, resulted in most responses indicating unclarity or irrelevancy to the program. The rewording and restructuring of the questions were focused almost entirely in these two sections.

In summary, among all the responses in both tiers, there were 578 possible responses. 459 were assessed as understandable (valid). Nine responses indicated misunderstanding the question or that it was unclear. Seven responses indicated understanding the question but did not know the answer. Four responses indicated that the question was not relevant to that program, but the respondent clearly understood the question. 87 questionnaire responses were left unanswered, the

vast majority of these (83) were comment text boxes. Of the four non-text box non-responses, one was a program that had only two specific community needs. The remaining three remained unanswered for no obvious reason.

Discussion

My knowledge of the programs being assessed by the rubric, combined with the follow-up semi-structured interviews, allowed me to triangulate and member-check the panelists' questionnaire responses for pragmatic quality. Pragmatic quality describes whether the model can be understood by all relevant stakeholders. That Tier-1 expert panelists understood all questions was prima facie evidence that the model/rubric expressed pragmatic quality (that is, it's on the right track), and should be send off to the Tier-2 expert panelists for further review. Tier-2 responses indicated that five questions needed some re-wording for clarification.

Overall, the questionnaire was well received, and mostly understood by all six expert panelists. In general, the series of questions related to volunteer characteristics and learning included the most responses indicating unclarity and irrelevancy to the program. These are difficult topics and subjects for any coordinator to grapple with. By the final respondent, the questions had been clarified that only two responses were left unchecked, and this followed a pattern that the respondent didn't know the answer, and so did not submit a response.

The expert panelists' responses helped to refine and improve the Program Process Model, too. An updated version of the Reactive Program Process Table demonstrates the refinements, below.

Table 4.2: Program Process Model, Updated

Description	Reactive Program Process	Prescriptive Program Process	Adaptive Program Process	References
Purpose	System maintenance	System change	System transformation	Friedmann, 1987, p. 30
Field of View	Problem-fix; single-focus, minimal analysis due to reactive institutional response	Narrow focus response to problem and analysis by diagnosis of disturbance	Broad, holistic focus, response to improving conditions by actively seeking patterns within larger context	Wenger, 1998; Collins and Ison, 2009; Pahl-Wostl, 2007
Scale of learning	Rely on limited- or no previous learning; Single-loop learning	"A-B", or double-loop learning	Response to problem, analysis, and experience includes broad, meandering learning, or triple-loop or complex learning	Wenger, 1998; Keen et al., 2005; Keen & Mahanty, 2006
Scale of Problem or issue	Identification of community need: immediate disturbance, seen as threat with high uncertainty	Identification of community need: anticipated, or recurring (looming) disturbance that may transition from being seen as a threat or an opportunity	Identification of community need: anticipated complex disturbances across space and time, seen as an opportunity as uncertainty is reduced through monitoring	Sandker, et.al, 2010; Voinov and Bousquet, 2010; Ekins, 2018
Temporal Scale	Single-event process, incremental planning, and reactive planning	Short-term process, strategic planning, and reciprocal planning; less of an exchange of knowledge, but of effort	Long-term process, structured decision-making (SDM), and transactional planning; knowledge and expertise is exchanged or traded	Friedmann, 1987; McGuire & Sanyal, 2006; Gregory, et.al., 2012
Spatial Scale	Localized issues and decision-making	Localized issues with somewhat regional decision-making	Bioregional issues and decision-making	Ecotrust, 2012
Role of Social Capital	Spending social capital	Spending and gaining social capital	Increasing/building social capital; investing rather than spending	Falk & Kilpatrick, 2000
Nature of Community	Community fragmentation: only specific portions of the community are immediately involved or benefit; some bonding social capital	Mostly bonding social capital; possibly weakly linking for financial/resource provision	Bridging, bonding, and linking social capital	Adger, 2000; Wyborn, et. al., 2015; Paveglio, et.al. 2015; Granovetter, 1973
Relationship to Disturbance	Objective is to stop the disturbance in the shortest time, often with other consequences	Objective is to minimize damage from disturbance, reduce vulnerability for some groups	Objective is to benefit from disturbance through knowledge gain, and to reduce vulnerability community-wide	Pulsipher, 2011; Paveglio, et.al. 2015

Role to Volunteerism	Volunteerism as immediate emergency response	Volunteerism as education-based, maybe as protest, or single-project-based	Volunteerism as equal partner in education and communication – building programs together collaboratively	Krasny & Tidball, 2010; Krasny et al., 2009; Ekins, 2019
Nature of Volunteerism	Episodic volunteerism with untrained volunteers, citizen volunteers	Repetitive, periodic volunteerism with trained, certified volunteers or retired agency volunteers with background knowledge	Consistent volunteerism with citizen volunteer leaders and/or agency volunteers with broad background knowledge	Keen et al., 2005; Kransy & Tidball, 2010; Ekins, 2019

Some of the programs studied within the project described here were in a process of growing from a lower program process to a higher one. The two collaborative groups in this study operated somewhere between a "System Maintenance" and "System Change" state. With some focused effort, each could operate more fully as a System Change agent, because they communicated across a broad cross section of local community leadership, and social learning is expressly a program intent (Fernandez-Gimenez, 2008). Some of the adult programs (e.g., T-1-2) remained solidly within one process state. It would not be resource efficient to attempt to change to another state. Responses from the coordinator of program T1-2 indicates it is designed for systems change, but not transformation. The questions in this rubric will provide systems state information to the administrator or coordinator who uses it to investigate the program.

Prior to this research project without panelist responses, I had difficulty developing a right-hand column of descriptions for each row. These descriptors emerged naturally from analyzing the panelists' rich experiential data. Other changes included refinement of wording for readability in a few of the cells. The model demonstrated usefulness in understanding a program's status related to characteristics of the program and participants, nature of volunteerism, adaptive capacity- and adaptive management, and development of different community capitals. I will be able to use these responses to enhance the rubric to demonstrate any program's strengths, areas for improvement, and location within the program process model.

Developing a scoring framework for the rubric is outside the scope of this study, as it is outside the bounds of what a single researcher can do properly. This task is best completed by a small group of experts trained in social science methodology, including Extension specialists and educators. Therefore, I intend to develop a small "Nonformal Resilience" team to develop the scoring system for each major topic, and to provide an assessment of the program process a collaborative or community-based education program falls within. From here, a program

administrator can choose the most efficient use of resources to either remain within the process state, or where to focus resources to move up to a higher state. Each section covers one or more topic areas. The scores may be displayed as a series of bar graphs, almost like signal strength graphs in an audio mixing board, demonstrating where program strengths (like, high notes in music) exist. Program coordinators could choose to build upon existing strengths, or to better-develop those areas with lower scores. This is not a task to be left to me alone.

Conclusion

Understanding the impact of publicly funded nonformal education programs is a constant struggle. I have heard many nonformal educators lament that in times of budget shortfalls, programs that are less critical (for example, non-emergency management) are often the first to see funding cuts. By linking long-term, impactful education programs to critical needs within the community, perhaps elected representatives and others in power can better understand their importance. By articulating a value in making communities less vulnerable and more resilient in the face of change and uncertainty, these battles may become less tenuous. The public benefit of a spray widget that minimizes water usage, reduces pumping costs, and preserves in-stream flows can be extrapolated over a large area to articulate monetary benchmarks like return on investment and public value. However, a specific dollar value of public benefit cannot be placed on many programs. If family foresters do some pre-commercial thinning, that reduces the risk of wildfire for everyone, but it is difficult to apply a fiscal value to that. If more people are keeping an eye out for erosion problems in our streams, when problems do emerge, solutions can be quickly applied, perhaps saving water treatment facilities the cost of added treatment.

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Appendix A: Nonformal Learning Resilience Rubric

Start of Block: Consent and Info

Q1.1 Survey Participant Consent Form

We invite you to participate in a University of Idaho Extension and Natural Resources and Society-supported research project. This project is conducted by James (Jim) Ekins, from the University of Idaho Extension Service. Mr. Ekins is trying to understand how communities build resiliency through non-formal education programs. Through the use of the combination of the following questionnaire, he would like to measure how the project you manage helps communities to build resiliency through the development of community capitals. The results will be used to help articulate the importance of non-formal community-based educational programs and other longstanding multistakeholder groups. The results may eventually be published in aggregate as a peer-reviewed journal article or dissertation.

If you decide to participate, the questionnaire will ask about your community program. This questionnaire is designed to help determine the extent to which non-formal, community-based programs play in contributing to resilience to disturbances. By community, we refer not only to geographic communities like towns, but also larger more dispersed areas like watersheds, in which people share resources and consequences of disturbances. Disturbances can happen to social systems or natural systems. Your interview responses, comments, and questionnaire responses will help craft this draft instrument into a measurement tool that can assess how nonformal learning programs can influence resilience within the community. I anticipate the questionnaire completion to take about 30 minutes.

Any information obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your express written permission. The University of Idaho Institutional Review Board has certified this project as Exempt. The information you provide will not be linked with any other information that can result in your public recognition. Information about you will not be released to anyone under any circumstances. Your name will be linked to an identifying number on a form called a code sheet. The number will allow us to track

your responses over time. At the end of the project, the code sheet will be destroyed, and the link between the data and you will be eliminated. Your privacy is of utmost concern.

Your participation is voluntary. Your decision whether or not to participate will not affect you in any personal or professional manner. If you initially decide to participate, you are free to withdraw your consent and discontinue participation at any time.

If you have any questions, please feel free to contact James (Jim) Ekins at 208-292-1287. Your clicking on the "Yes" button below indicates that you have read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent at any time and discontinue participation without penalty, and that you are not waiving any legal claims, rights or remedies. Your clicking the "No" button below will immediately exit you from the survey.

○ Yes, I agree to participate. (1)

○ No, I choose not to participate. (2)

Skip To: End of Survey If Survey Participant Consent Form We invite you to participate in a University of Idaho Extension a... = No, I choose not to participate.

Q1.2 Survey Background Information

This questionnaire is draft form of a rubric, to articulate how much community-based education programs can contribute to a community's resilience to disturbances. By community, we refer not only to geographic communities like towns, but also larger more dispersed areas like watersheds, in which people share resources and consequences of disturbances. Disturbances can happen to social systems or natural systems.

In short, I'm genuinely curious about your program, and how we can articulate its usefulness in developing community resiliency.

Eventually, with input from participants like you, I will create a useful rubric (a scoring framework, or measurement tool) so that anyone running a community-based education program will be able to demonstrate it's positive impact on their community's resilience. Today's goal is to try the rubric out, and to gather your comments about each question. I will combine your

responses with those from additional participants to improve and calibrate this rubric to assess how nonformal learning programs can influence resilience within the community.

Please answer the questions below about a single, specific community-educational program that you oversee. If you organize more than one program, with a different audience or focus, you will have an opportunity to repeat the process if you would like. While you are working through the form, please interject by adding your own comments, questions, observations, critiques, and ideas.

We are not trying to be representative of everything you are doing; rather we are using your expertise and experiences with nonformal education programs to help us develop this framework for understanding the role of non-formal education in building community resilience to disturbance.

○   Okay, already, let's go! (1)

○   Sounds complicated; I'm glad you're doing this. I'm ready to give it a try. (2)

End of Block: Consent and Info

Start of Block: Program Characteristics

Q2.1 Write is the name of the program or group?

_____

Q2.2 Comments (optional).

_____

Q2.3 Describe up to three specific community need(s) this group is tasked to help meet.

○   Click to write Form Field 1 (1) _____

○   Click to write Form Field 2 (2) _____

○   Click to write Form Field 3 (3) _____

Q2.4 Comments (optional).

_____

Q2.5 How many years has this program or group been active?

0   10   20   30   40   51   61   71   81   91   101

Number of years since it began ()	

Q2.6 Comments (optional).

_____

Q2.7 How long have you been involved with this program or group?

0   10   20   30   40   50   60   70   80   90   100

Number of years you've been involved ()	

Q2.8 Comments (optional).

_____

Q2.9 How are people selected for participation in your group (check all that apply)?

Anyone who has an interest can join (1)

By invitation from an existing program participant (2)

Only people with specific skills will be selected (3)

Only if affiliated as a leader with another group (industry, nonprofit, elected, civic, business, etc.) (4)

Other (explain in next question): (5)

Q2.10 Comments (optional).

_____

- -

Q2.11 Please explain your "other" response in the previous question.

_____

End of Block: Program Characteristics

Start of Block: Program Participant Characteristics

Q3.1 *Now, we would like to learn a little more about the characteristics of your participants. Use the sliders below to broadly describe your program's participants.* Participants in this group are community leaders (0 = "Not at all"; 100 = "Completely.")

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = Completely ()	

Q3.2 Comments (optional).

_____

Q3.3 Participants in this group are trusted individuals to whom other community members go to for advice or insight into local or regional issues. (0 = "Not at all"; 100 = "Completely.")

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = Completely ()	

Q3.4 Comments (optional).

_____

Q3.5 Participants in this group are connected to a broader community network of influential people. (0 = "Not at all"; 100 = "Completely.")

                                        0   10 20 30 40 50 60 70 80 90 100

| 0 = Not at all; 100 = Completely () | |

Q3.6 Comments (optional).

_____

End of Block: Program Participant Characteristics

Start of Block: Participant Volunteerism Patterns

Q4.1 *Even if your program is not focused specifically on volunteerism, we would like to know if your participants volunteer their time within the community, as related to the program. If yes, please use the slider below give us a sense of the minimum, typical, and maximum volunteer contributions by participants each year.*
  Do people volunteer their time to participate in regular **program-related meetings**?

◯   Yes (1)

◯   No (2)

Display This Question:
If Even if your program is not focused specifically on volunteerism, we would like to know if your p... = Yes

Q4.2 If so, then how many hours per year? (If more than 100 hours, include an estimate in the comment question below.)

                                          0   10 20 30 40 50 60 70 80 90 100

Low ()	
Typical ()	
High ()	

Q4.3 Do participants volunteer additionally to **help collect information and data** to share with other program participants?

○   Yes (1)

○   No (2)

Q4.4 Comments (optional).

_____

Q4.5 If so, then how many hours per year? (If more than 100 hours, include an estimate in the comment question below.)

0   10   20   30   40   50   60   70   80   90   100

Low ()	
Typical ()	
High ()	

Q4.6 Do participants volunteer additionally to help to **co-develop additional workshops, public events/meetings,** or other gatherings related to this program?
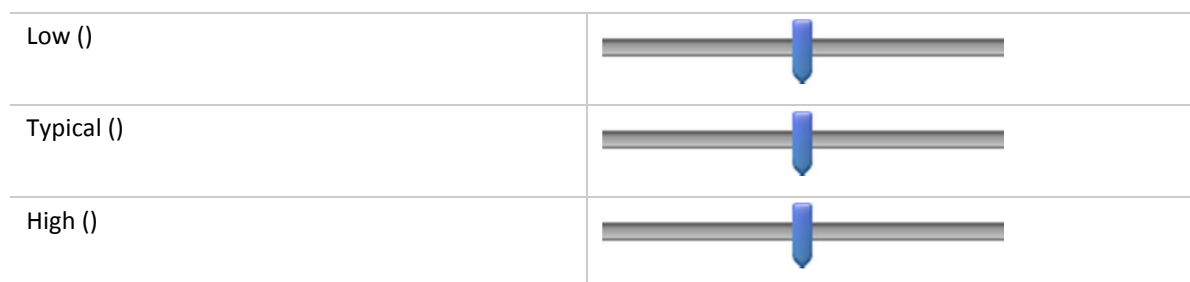
○   Yes (1)

○   No (2)

Q4.7 Comments (optional).

_____

Display This Question:
If Do participants volunteer additionally to help to co-develop additional workshops, public events/... = Yes

Q4.8 If so, then how many hours per year? (If more than 100 hours, include an estimate in the comment question below.)

	0 10 20 30 40 50 60 70 80 90 100
Low ()	
Typical ()	
High ()	

Q4.9 Do participants volunteer (serve) additionally within the community but **outside this program** (examples include serve on planning committees, boards of directors, outreach organizations, industry groups, advocacy groups, city councils, etc.)?
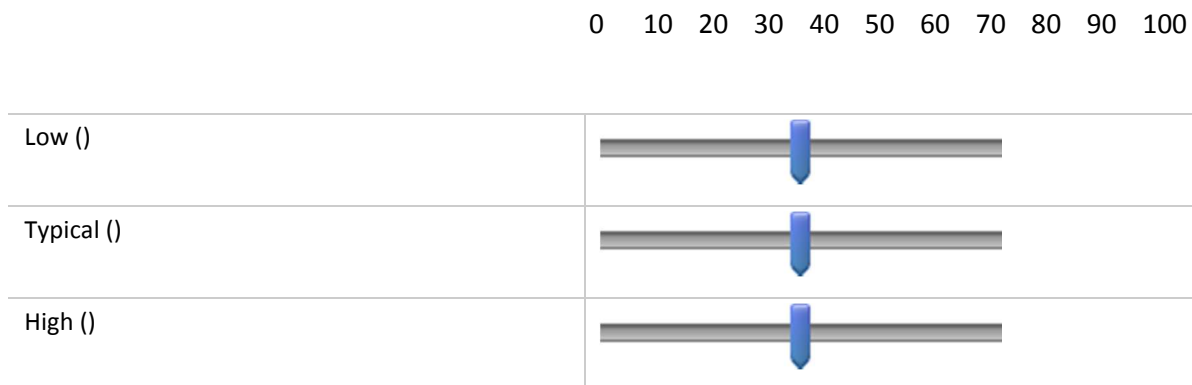
○   Yes (1)

○   No (2)

Q4.10 Comments (optional).

_____

Q4.11 If so, then how many hours per year? (If more than 100 hours, include an estimate in the comment question below.)

0   10   20   30   40   50   60   70   80   90   100

Low ()	
Typical ()	
High ()	

Q4.12 Do participants volunteer (serve) additionally as leaders within the community **as elected representatives**?

○   Yes (1)

○   No (2)

Q4.13 Comments (optional).

_____

Q4.14 If so, then how many hours per year? (If more than 100 hours, include an estimate in the comment question below.)

0   10   20   30   40   50   60   70   80   90   100

Low ()	_____	_____
Typical ()	_____	_____
High ()	_____	_____

Q4.15 Do participants volunteer (serve) additionally **as leaders within the community** as non-elected influential community mentors ("influencers")?

○ Yes (1)

○ No (2)

Q4.16 Comments (optional).

_____

Q4.17 If so, then how many hours per year? (If more than 100 hours, include an estimate in the comment question below.)

0   10   20   30   40   50   60   70   80   90   100

Click to write Choice 1 ()	_____	_____
Click to write Choice 2 ()	_____	_____
Click to write Choice 3 ()	_____	_____

Q4.18 Are those participants who volunteer substantively within the community better prepared for their leadership because of their participation within the program?

○   Not at all (1)

○   Not very much (2)

○   Yes, a little (3)

○   Yes, a lot (4)

End of Block: Participant Volunteerism Patterns

Start of Block: Building Adaptive Capacity

Q5.1 *Learning takes many forms. Help us understand the types of learning and decision-making that your program is designed for, and how that learning is transmitted more broadly. Select the one response that best represents your program.*   Learning is:

○   Basic awareness of a single issue (1)

○   Generating tactical reactions to an issue (2)

○   Developing a strategic understanding for how related issues acutely affect the community (3)

○   Developing partnerships and other forms of cooperation to handle short term issues and plan for future ones (4)

○   Developing partnerships that lead to new knowledge that benefits the community in the long run (5)

Q5.2 Comments (optional).

_____

Q5.3 How is the learning transmitted within the community, outside of the group? *Select the one response that best represents your program.*

○ Information is simply shared ("this is what's happening") (1)

○ Existing alternatives are analyzed or proposed ("this is what's happening and here are some alternatives to deal with it") (2)

○ New alternatives are created ("this is what's happening, here are a range of alternatives, including some new ideas, for how to emerge better off in the long run") (3)

Q5.4 Comments (optional).

_____

Q5.5 How is the learning used for the betterment of the community? *Select the one response that best represents your program.*

○ Best practices are suggested (1)

○ New alternatives for best practices are suggested (2)

○ Management decisions are implemented by staff (3)

○ Policies are officially enacted by elected representatives (4)

Q5.6 Comments (optional).

_____

End of Block: Building Adaptive Capacity

Start of Block: Building Adaptive Management

Q6.1 *One way to measure contributions to community resilience is to consider outcomes of the program.* Use the slider-scale below each statement to provide your estimate of the strength of each of the following outcomes related to the program.

A shared understanding of the underlying and historical situation contributing to community needs. 0 = "Not at all"; 100 = "Completely"

0   10   20   30   40   50   60   70   80   90   100

0 = Not at all; 100 = Completely ()	

Q6.2 Comments (optional).

_____

Q6.3 **Shared** norms and values contribute to a common group understanding of a range of solutions to the community need. 0 = "Not at all"; 100 = "Completely"

0   10   20   30   40   50   60   70   80   90   100

0 = Not at all; 100 = Completely ()	

Q6.4 Comments (optional).

_____

Q6.5 **Disparate** norms and values contribute to a common group understanding of a range of solutions to the community need. 0 = "Not at all"; 100 = "Completely"
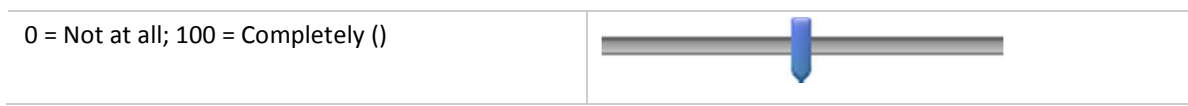
0   10   20   30   40   50   60   70   80   90   100

0 = Not at all; 100 = Completely ()	

Q6.6 Comments (optional).

_____

Q6.7 Solutions developed by the group are delivered to local agency staff for consideration in implementation of new alternatives. 0 = "Not at all"; 100 = "Completely"

	0	10	20	30	40	50	60	70	80	90	100

| 0 = Not at all; 100 = Completely () | |

Q6.8 Comments (optional).

_____

Q6.9 Solutions developed by the group are delivered to local community governance for consideration in new policy enactment. 0 = "Not at all"; 100 = "Completely"
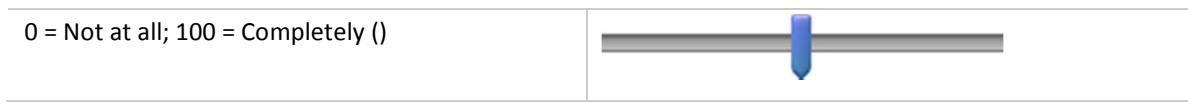
	0	10	20	30	40	50	60	70	80	90	100

| 0 = Not at all; 100 = Completely () | |

Q6.10 Comments (optional).

_____

Q6.11 Over time, because of the actions of the group, governance decision-making processes improve. 0 = "Not at all"; 100 = "Completely"

	0	10	20	30	40	50	60	70	80	90	100

| 0 = Not at all; 100 = Completely () | |

Q6.12 Comments (optional).

_____

Q6.13 The group is developing new community networks of knowledgeable people. 0 = "Not at all";
100 = "Completely"

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = Completely ()	

Q6.14 Comments (optional).

_____

Q6.15 Community leaders **expand opportunities for the community to thrive** in the face of the
identified need above, because of the group's efforts. 0 = "Not at all"; 100 = "Completely"

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = Completely ()	

Q6.16 Comments (optional).

_____

Q6.17 Community leaders better plan for change because of the group's efforts. 0 = "Not at all";
100 = "Completely"

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = Completely ()	

Q6.18 Comments (optional).

_____

Q6.19 Your level of confidence that, because of the group, the community is better able to thrive in the face of change (you should be thinking about the farther-out future, here). 0 = "Low Confidence"; 100 = "High Confidence."

0   10   20   30   40   50   60   70   80   90   100

0 = Low Confidence; 100 = High Confidence ()

Q6.20 Comments (optional).

_____

Q6.21 Your level of confidence that, because of the group, the community is better able to thrive in the face of uncertainty (you should be thinking about the near-future, here; as in Rumsfeld's "known unknowns"). 0 = "Low Confidence"; 100 = "High Confidence."

0   10   20   30   40   50   60   70   80   90   100

0 = Low Confidence; 100 = High Confidence ()

Q6.22 Comments (optional).

_____

Q6.23 Your level of confidence that, because of the group, the community is better able to thrive in the face of unpredictability (you should be thinking about the near-future, here; as in Rumsfeld's "unknown unknowns"). 0 = "Low Confidence"; 100 = "High Confidence."

0   10   20   30   40   50   60   70   80   90   100

0 = Low Confidence; 100 = High Confidence ()

Q6.24 Comments (optional).

_____

End of Block: Building Adaptive Management

Start of Block: Building Community Capitals

Q7.1 *The idea of Community Capitals helps to describe societal assets that can be relied upon to help a community recover and grow from a disturbance. We use a list of five community capitals, though some authors/scholars have developed different lists, including one list of eight community capitals.*

For each of the community capitals listed below, use the slider to describe the extent to which the program increases each. 0 = "Not at all"; 100 = "A whole lot"

Financial capital (a system of physical capital and/or monetary resources) is increased:

	0 10 20 30 40 50 60 70 80 90 100
0 = Not at all; 100 = A whole lot ()	

Q7.2 Comments (optional).

_____

Q7.3 **Human capital** refers to the productive capacities of a person, including knowledge, skills, behavioral habits, energy levels, physical health, and mental health.

	0 10 20 30 40 50 60 70 80 90 100
0 = Not at all; 100 = A whole lot ()	

Q7.4 Comments (optional).

_____

Q7.5 **Social capital** consists of a combination of trust, mutual understanding, shared values, and socially-held knowledge that facilitates social coordination of activities.

0 10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = A whole lot ()

Q7.6 Comments (optional).

_____

Q7.7 **Produced capital** describes physical assets built by people

0   10   20   30   40   50   60   70   80   90   100

0 = Not at all; 100 = A whole lot ()

Q7.8 Comments (optional).

_____

Q7.9 **Natural capital** refers to ecosystem services and natural resources.

0   10   20   30   40   50   60   70   80   90   100

0 = Not at all; 100 = A whole lot ()

Q7.10 Comments (optional).

_____

End of Block: Building Community Capitals

Start of Block: Building Social Capitals

Q8.1 *The idea of Social capital can also help describe how well **bonded** members of their community are with each other, how well they reach out to or **bridge** with others outside their community, and how well they **link** with others at lower or higher levels of influence or power.*

For each of the types of social capitals listed below, use the slider to describe the extent to which the program increases each. 0 = "Not at all"; 100 = "A whole lot" **Bonding** social capital (strong network ties **within** the community, largely valuing old traditions and ways of solving problems over new ideas)

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = A whole lot ()	

Q8.2 Comments (optional).

_____

Q8.3 **Bridging** social capital (network ties that extend **beyond** the community, largely valuing new ideas for solving problems over old traditions)

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = A whole lot ()	

Q8.4 Comments (optional).

_____

Q8.5 **Linking** social capital (network **ties** that extend to groups and institutions with less or more power/influence)

0   10 20 30 40 50 60 70 80 90 100

0 = Not at all; 100 = A whole lot ()	

Q8.6 Comments (optional).

_____

End of Block: Building Social Capitals

Appendix B: Image of Survey Responses, Categorized

Green: apparently understood the question;

Yellow: not relevant to the program, but apparently understood the question;

Purple: respondent did not have the information or data, but apparently understood the question;

Red: misunderstood the question or thought it was unclear;

Yellow rows follow each tier of respondents.

Orange row contains totals.

Appendix C: Permission to use "Extension Involvement in Collaborative Groups: An Alternative for Gathering Stakeholder Input" for Chapter Two

RE: article published in April 2018 issue of Journal of Extension as dissertation chapter

From: Debbie Allen <debbie.allen.edits@gmail.com>

Wed 5/6/2020 6:52 AM

Jim,

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Sincerely,

Debbie

Debbie Allen

Editor, *Journal of Extension*

513-262-2943

joe-ed@joe.org

Pronouns: she/her/hers

purpose, must include the copyright notice and a full citation. For author aids, the suggested citation format is this: Extension Journal, Inc. (n.d.). Title of document. Retrieved from the Journal of Extension website at https://URL. (Title of document and URL are specific to the particular document.)

From: Ekins, Jim (jekins@uidaho.edu) [mailto:jekins@uidaho.edu]

Sent: Tuesday, May 5, 2020 7:31 PM

To: Debbie Allen

Subject: article published in April 2018 issue of Journal of Extension as dissertation chapter

Hello Debbie,

I am in the final stages of completing my dissertation at U-Idaho (I suppose we can call it a "hobby"). The publication referenced here will be included as a chapter in my dissertation manuscript. I have the article properly cited. But I am required to include proper permission from the publisher as an appendix. An email, even a reply to this correspondence, from you or the appropriate person at JOE will be sufficient.

Would you please help me get the proper permission for the use of this article in my dissertation?

Many thanks,

--Jim

Jim Ekins

Area Water Educator, UI Extension

208-292-1287

jekins@uidaho.edu

From: Debbie Allen <debbie.allen.edits@gmail.com>

Sent: Tuesday, April 17, 2018 12:54 PM

To: Ekins, Jim (jekins@uidaho.edu) <jekins@uidaho.edu>

Subject: article to be published in April 2018 issue of Journal of Extension

Journal of Extension (*JOE*) Author,

Your article, "Extension Involvement in Collaborative Groups: An Alternative for Gathering Stakeholder Input" (*JOE* ID 17051IAW), will be published in the April 2018 issue of *JOE*, which should be posted on or around April 26th.

Please consider sharing your article on ResearchGate after the article is published. Doing so will allow you to reach an audience that is wider than *JOE*'s, track citations of your work, and receive notifications about works related to the topic of your article. For similar reasons, you may wish to include the article in your university's institutional repository, if one exists (please see the FAQ Does *JOE* have a policy on institutional archiving? for more information).

Thank you for your contribution to *JOE*.

Sincerely,

Debbie

Debbie Allen

Editor, *Journal of Extension*

513-262-2943

joe-ed@joe.org

Appendix D: Permission to use "University Extension Citizen Science Water Quality Monitoring Programs: Analysis of Volunteer Activities" for Chapter Three

Re: [EXT] Rural Connections Article as chapter in my dissertation

From: Betsy Newman <betsy.newman@usu.edu>

5/6/2020, 10:34 a.m.

Hello Jim,

A very hearty congratulations to you for being nearly done with your dissertation. WOO HOO! I am happy to provide the publisher's permission for the appendix and it is included below. If you need anything else or this information in a different format just let me know.

DATE: Wednesday, May 6, 2020

TO: University of Idaho

ATTN: Jim Ekins, University of Idaho

FROM: Betsy H. Newman, Assistant Director, Western Rural Development Center; Editor/Publisher, Rural Connections

SUBJECT: Copyright Use Permission for "University Extension Citizen Science Water Quality Monitoring Programs: Analysis of Volunteer Activities"

The Western Rural Development Center located at Utah State University, 4880 Old Main Hill, Logan UT 84322-4880, hereby grants Jim Ekins permission to use in his dissertation at University of Idaho the article, "University Extension Citizen Science Water Quality Monitoring Programs: Analysis of Volunteer Activities" by Jim P. Ekins published in Rural Connections, May 2019, by the Western Rural Development Center, Utah State University.

Best wishes,

Betsy

_____

Betsy H. Newman | Assistant Director

Western Rural Development Center

Utah State University Extension

Phone: 435.797.0218 | Email: betsy.newman@usu.edu

From: "Ekins, Jim (jekins@uidaho.edu)" <jekins@uidaho.edu>

Date: Tuesday, May 5, 2020 at 5:30 PM

To: Betsy Newman <betsy.newman@usu.edu>

Subject: [EXT] Rural Connections Article as chapter in my dissertation

Hello Betsy,

I am in the final stages of completing my dissertation at U-Idaho (I suppose we can call it a "hobby"). The publication referenced here will be included as a chapter in my dissertation manuscript. In the past, you mentioned that you would work with me on how best to cite this article in *Rural Connections* for inclusion in my dissertation. I have the article properly cited. But I am required to include proper permission from the publisher as an appendix. An email, even a reply to this correspondence, from you or the appropriate person at Rural Connections will be sufficient.

Would you please help me get the proper permission for the use of this article in my dissertation?

Many thanks,
 --Jim

Jim Ekins

Area Water Educator, UI Extension

208-292-1287

jekins@uidaho.edu

From: Betsy Newman <betsy.newman@usu.edu>

Sent: Wednesday, July 10, 2019 9:00 AM

To: Ekins, Jim (jekins@uidaho.edu) <jekins@uidaho.edu>

Subject: Re: WRDC-Rural Connections

Dear Jim,

Hello, as promised in my email dated 15 May, below are links to both your article and the entire issue of the Spring/Summer 2019 *Rural Connections*. This issue is being emailed to our more than 850 stakeholders on Thursday, 11 July at approximately 12:10 PM (MDT). Your printed copies are being created now and will be mailed to you in late July. To further distribute the information, I'll be sharing each article via Twitter (https://twitter.com/westernrural). Please feel free to share the information amongst your networks. Thank you.

Link to your article:

http://wrdc.usu.edu/files-ou/Ekins-Water-RCSPR19.pdf

Link to the full issue of *Rural Connections*:

http://wrdc.usu.edu/files-ou/RC-SPR-2019w.pdf

Issues of *Rural Connections* and individual articles are also accessible on the "Rural Connections" page on our website and in our "Publications" library.

http://wrdc.usu.edu/rural-connections/

http://wrdc.usu.edu/publications

Thank you again for contributing to this issue of *Rural Connections*!

Best wishes,

Betsy

_____

Betsy H. Newman | Assistant Director

Western Rural Development Center

Utah State University Extension

Phone: 435.797.0218 | Email: betsy.newman@usu.edu

Appendix E: IRB Outcome Letter for Volunteerism Patterns Survey Research

To: Jim Patrick Ekins

From: Jennifer Walker, IRB Coordinator

Approval Date: February 27, 2017

Title: Survey of Volunteer Persistence and Motivation

Project: 17-047
Certified: Certified as exempt under category 2 at 45 CFR 46.101(b)(2).

On behalf of the Institutional Review Board at the University of Idaho, I am pleased to inform you that the protocol for the research project Survey of Volunteer Persistence and Motivation has been certified as exempt under the category and reference number listed above.

This certification is valid only for the study protocol as it was submitted. Studies certified as Exempt are not subject to continuing review and this certification does not expire. However, if changes are made to the study protocol, you must submit the changes through VERAS for review before implementing the changes. Amendments may include but are not limited to, changes in study population, study personnel, study instruments, consent documents, recruitment materials, sites of research, etc. If you have any additional questions, please contact me through the VERAS messaging system by clicking the 'Reply' button.

As Principal Investigator, you are responsible for ensuring compliance with all applicable FERPA regulations, University of Idaho policies, state and federal regulations. Every effort should be made to ensure that the project is conducted in a manner consistent with the three fundamental principles identified in the Belmont Report: respect for persons; beneficence; and justice. The Principal Investigator is responsible for ensuring that all study personnel have completed the online human subjects training requirement.

You are required to timely notify the IRB if any unanticipated or adverse events occur during the study, if you experience and increased risk to the participants, or if you have participants withdraw or register complaints about the study.

Appendix F: IRB Outcome Letter for Resilience Rubric Survey and Interview Research

University *of* Idaho
Office of Research Assurances

Institutional Review Board
875 Perimeter Drive, MS 3010
Moscow, ID 83844-3010
Phone: 208-885-6162
Fax: 208-885-6014
Email: irb@uidaho.edu

To: Jim Patrick Ekins

From: University of Idaho Institutional Review Board

Date: February 10, 2020

Title: Articulating community learning's role in improving social resilience to disturbances.
IRB #: 19-253

Submission Type: IRB Protocol Amendment Request Form

Review Type: Exempt

Protocol Approval Date: 11/25/2019
Study Status Check Date: None

The Institutional Review Board has reviewed and **approved** the amendment to your above referenced Protocol.

This amendment is approved for the following modifications:

- Changes to survey

Should there be significant changes in the protocol anticipated for this project, you are required to submit another protocol amendment request for review by the committee. Any unanticipated/adverse events or problems resulting from this investigation must be reported immediately to the University's Institutional Review Board.