Farming in a Fishbowl: Motivations Behind a Collective Riparian Restoration Project

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Abstract

We investigate a collective riparian restoration project in the southern interior of British Columbia, Canada. The project intends to coordinate restoration activities across several adjoining parcels, better aligning activities with the natural riparian processes than would occur through individual, uncoordinated actions. Since property boundaries seldom align with the natural processes occurring on the landscape, understanding the motivations for participation in this project may facilitate similar collective projects elsewhere. Important triggers included changing weather patterns that increase landowner costs and a threat of regulatory action. Landowners' perception of being in a 'fishbowl' in relation to a nearby residential subdivision created a perceived need to 'have each other's back'. The availability of a funding program targeted at collective projects enabled this project to proceed. Building on common interests, providing skillful facilitation, reducing participation costs and rewarding participation – financially and socially – can help encourage collective restoration projects.

Introduction

Within British Columbia, the changing climate will affect many watershed processes, impacting water quality, availability, and aquatic and terrestrial ecosystems (Pike et al. 2010). In some parts of B.C., there are already increased incidences of droughts and floods, having undesirable impacts on landowners (BC Agriculture & Food Climate Action Initiative 2016a; 2016b). These impacts are exacerbated by direct and indirect landscape modifications that have significantly altered channel morphology, flows, water table dynamics, and water quality in many water bodies. Livestock access to water bodies is believed to be the most prevalent cause of degradation in many parts of British Columbia (Pike et al. 2010). Climate change is compounding impacts of nutrient pollution, degrading drinking water sources and damaging salmon habitat.

Healthy, properly functioning riparian ecosystems produce a variety of services, including flood control, and have a substantial capacity to buffer climate change impacts. Restoring damaged riparian ecosystems can benefit agricultural landowners whose land parcels intersect these ecosystems. In many situations, riparian systems pass through multiple land holdings, making cooperative actions among these landowners the most effective approach to restoration. However, the environmental and societal benefits of these restoration initiatives might not be realized when landowners are not aware of the benefits to themselves, cannot afford to undertake actions that do not directly benefit them, and/or face barriers to their actions.

Motivations to participate in ecological improvement initiatives are closely related to a community's past experience with the natural resource, their means of creating and exchanging knowledge, and the compatibility of their interests and expectations in a broader social, institutional, and ecological context (Reed 2008; Campbell and Vainio-Mattila 2003; Kaplan and Kaplan 1983; Ostrom 1990; Ostrom and Ahn 2008; Berkes 2004). Understanding both the process and context in which motivations and objectives emerge and change can help facilitate collective actions. This includes understanding landowners' perceptions of climate change impacts on ecosystems, farm management practices and their livelihoods, and the effectiveness of their collective adaptation strategies (Mertz et al. 2009). Landowner knowledge about the role that natural systems play in preserving social and ecological resilience (Brody 2003), and the complexity of the restoration process, are foundational to these perceptions.

We examine the concept of collective action in the context of a collaborative riparian restoration project. The project involves several adjacent properties along a short reach of a small tributary in the Fortune Creek watershed in the North Okanagan, B.C. This project was initiated by a small group of landowners who played an active role in the planning and implementation. We seek to understand the barriers and opportunities for such collaboration, and its impact on motivations, knowledge, and attitudes of those involved.

Participation motives were examined using survey questions, interviews and a focus group. A mixed qualitative approach, founded in constructivist grounded theory, was applied in analyzing the transcripts. This analysis placed the observations within the contexts of social capital and collective action theories, particularly relating to collaborative environmental restoration or climate adaptation initiatives.

Collective action in the context of ecological restoration

Collective action and social capital

Collective decision-making is complex and subjected to numerous exogenous influences and endogenous feedbacks. In Maslow's (1943) theory of motivation, humans have a hierarchy of needs, with motivations driven by the lowest level unsatisfied need. Kaplan and Kaplan (1983) and Pretty and Ward (2001) argue that human motivations are largely influenced by the contexts in which people are situated. As the context alters, so do motives and resulting behaviours. Numerous attempts have been made to understand how the needs of multiple individuals can be integrated into a common interest. The theory of collective action is concerned with situations where there is a "group of people, a common interest among them, facing alternative courses of

actions between short-term selfish choices and choices that, if followed by a large number of individuals in a group, benefit all" Ostrom and Ahn (2008 p.5). The idea that all individuals in the group will act to achieve a common objective follows from the premise of rational and self-interested behaviour (Olson 1965). However, when delivering a non-excludable public good, rational self-interested individuals within that group might choose not to cooperate, unless the size of the group is relatively small, or cooperation is fostered by coercion (Olson 1965). Ostrom (1990) and others (Putnam 2000; Pretty and Ward 2001; Adger 2010; Landman 2004; Ostrom 2007) also argue that various forms of social capital can work together to alter underlying incentive structures and breed cooperation among rational, self-interested individuals in the group.

Social capital can be defined as "the presence of effective human networks and social cohesion, which are manifested in effective institutions and processes where people can cooperate for mutual advantage" (Landman 2004 p.38). Aspects central to the concept of social capital include relations of trust, reciprocity, common rules and sanctions, and networks and groups. It is believed that relationships of trust and reciprocity can enhance social networks governed by common rules with benefits extending to individuals, communities and beyond. These networks facilitate sharing of knowledge, risk, and information, effecting claims of reciprocity in times of crisis, and sanctions for non-compliance (Adger 2010).

According to Ostrom (1990) and Adger (2010) the combination of social capital with properly-devised informal and formal institutions, can create incentives supporting socially desirable collective action when there are compatible common interests. They further argue that in the absence of a common interest or crisis or absent properly devised institutions, social capital can constrain socially desirable collective action and create incentives to free-ride or inhibit action, leading ultimately to failure.

Motivations for undertaking ecological restoration

Clewell and Aronson (2006) use two broad, nonexclusive paradigms to describe various forms of motivation for initiating ecological restoration. The utilitarian or anthropogenic paradigm views environmental restoration as a practical step to increase the yield of ecological goods and services. Such pragmatic restoration relies on scientific worldviews and targets recovery of previously provided public goods by restoring natural capital and thereby improving overall socio-ecological resilience. The alternate paradigm is more idealistic, viewing humans as inseparable from nature and posits that humans and nature complement each other. The instrumental value of ecological goods and services is a secondary consideration, relative to the moral imperative to care for the natural system and reduce human impacts.

Miles, Sullivan, and Kuo (1998) and Kaplan and Kaplan (1983) describe situations where people's participation in environmental restoration or conservation initiatives were driven merely by psychological benefits from helping the environment and gaining a sense of community. However, Kaplan and Kaplan (1983) also argue that volunteering in environmental restoration without economic benefits can only take place if the satisfaction derived from this participation does not hinder economic development. This can be particularly relevant where landowners' livelihoods are dependent on land in a way that forces a choice between private economic needs and more collective or relational ecosystem needs. Farmers in particular are confronted regularly

with this dilemma. By virtue of their time on the land, they typically possess a deeper knowledge of natural processes occurring on their land. However, utilitarian worldviews embedded into western agricultural culture lead to a belief that farmers were entitled to manipulating and controlling their land (Sullivan 1996).

Maximizing benefits for affected communities is more likely if overall restoration goals are consistent with the private interests of individuals directly affecting the restoration process (Ostrom 1990; Campbell and Vainio-Mattila 2003; Berkes 2004). Participation depends on individuals choosing to participate in actions that affect them (Wandersman 1981). Most restoration projects begin in response to emerging and prominent needs. Individuals dependent on ecosystems for their livelihoods are primarily concerned with the recovery of ecological services that yield greater economic benefits to these communities (Rhoads et al. 1999; Adger 2010). A restoration project is a social process embedded within the socio-ecological contexts where it occurs (Wyant, Meganck, and Ham 1995; Higgs 1997). Understanding the socio-ecological context involves identification of socially desired ecological characteristics that, if substantially damaged, indicate an unsatisfied need and define the desirable outcomes (Wyant, Meganck, and Ham 1995) .

Heterogeneous communities might find it more challenging to negotiate which outcomes are beneficial to a greater number of community members (Irvin and Stansbury 2004; Rydin and Pennington 2000). It is common for stakeholders to have differing goals and different capacities to invest in the restoration activities. Individual stakeholders may insist on restoring ecosystems in ways that serve their particular interests, making it more difficult to arrive at a common approach (Wyant, Meganck, and Ham 1995; Pretty and Ward 2001; Campbell and Vainio-Mattila 2003; Berkes 2004). This effect was observed in the studied project.

Wandersman (1981), Ostrom (1990), Stringer et al. (2006) and Adger (2010) suggest that collaborative action in resource-dependent communities works best when the set of stakeholders is small and homogenous, with limited possibility that conflicts of interest between these stakeholders will be prohibitively costly to resolve. In a smaller community, longstanding social ties and the desire to maintain good neighbourly relationships can encourage cooperation (Dwyer and Hodge 1996) . Repeated interaction and communication in smaller groups also reduces the costs costs of monitoring each others' actions and allows these groups to devise sanctions to prevent non-cooperative behaviours (Pretty and Ward 2001).

Knowledge is important for triggering participation in restoration actions. Rhoads et al. (1999), Glicken (2000) and Raymond et al. (2010) point out several types of knowledge, of which scientific and experiential knowledge are two types commonly described in studies of environmental collective action. Each form of knowledge varies in the ways in which it is constructed, validated, and, even more importantly, in ways in which it can be shared and articulated (Glicken 2000). Scientific knowledge is formal and generalizable. It is often communicated in ways that are difficult for local stakeholders to understand. Experiential knowledge is based on personal experience, and within the context of that experience is 'common sense'. This includes local knowledge, which is often implicit. Such knowledge is not easily articulated. People might find it difficult to explicitly explain why they know what they know.

Furthermore, types of knowledge used for decision-making also depend on the nature of relationships between the members of the community and the relevant external institutions.

Study Site:

Physical Landscape:

This research takes place in the territories of the Secwepemcúl'ecw (Secwépemc) and Syilx (Okanagan) Peoples. While jurisdiction over these lands has not been ceded to the colonial Canadian government, it is the government of the Canadian province of British Columbia that has imposed a system of land titles and laws relating to land use. Our research focusses primarily on the decisions of people who hold land titles originally granted by the provincial government.

Most of the results discussed below are based on residents along two short stream reaches on tributaries of Fortune Creek (Figure 1). Fortune Creek originates in the highlands southeast of the town of Armstrong, flowing northwest until reaching the valley bottom and then continuing northeast until entering the Shuswap river. Alderson Creek is the first significant tributary joining Fortune Creek after it reaches the valley bottom. It enters the valley bottom in the upper part of the alluvial fan created primarily by Fortune Creek. Its course has been heavily modified to align with property boundaries and minimized interference with the operation of farm equipment.

Kendry Creek enters the valley bottom about a half kilometer northeast of Alderson Creek, beyond the extent of the alluvial fan created by Fortune Creek. Kendry Creek's lower reach, before entering Fortune Creek, is in a deeper stream channel than occupied by Alderson Creek. This topography, which makes modifying the stream channel more costly and complicated, means that Kendry Creek has not been modified to the extent that Alderson Creek has. The geographic proximity of Kendry Creek suggests it could serve as a comparison (control) site.

The redirection of Alderson Creek and Fortune Creek away from their natural channels, on a well drained alluvial fan, has resulted in substantial portions of their flow percolating into the alluvium, emerging as springs closer to the natural channel. A large portion of the flow in the reach of Alderson Creek that is the focus of this study originates from such springs. Research conducted in parallel with this project demonstrated remarkably stable stream flows and water temperatures for Alderson creek, and consequently important habitat for salmonids – cool in summer, flowing in winter (Bauer et al. 2018).

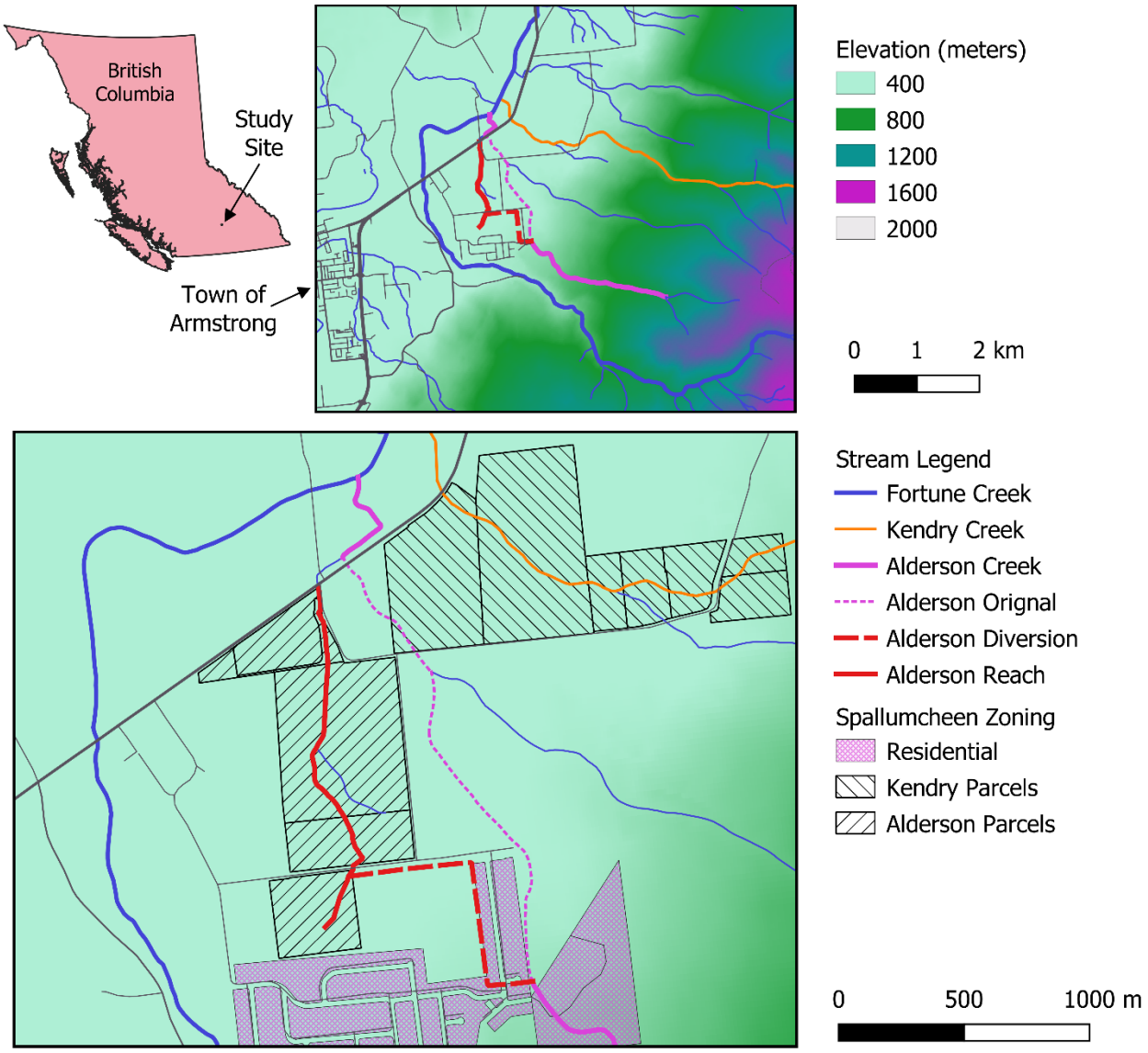

Figure 1. Study site location

Figure 2 illustrates issues with the state of the Alderson creek reach when the project was initiated. The lack of the nativetrees and brush shading the stream leads to an explosion of vegetation, particularly the invasive watercress, during the summer. This slows flow, and increases the risk of flooding from summer storms. Grazing cattle to and through the stream prevents the establishment of natural vegetation, increases erosion and reduces water quality. The reduced water quality contributes to algae growth in ponds along the stream reach, and cattle access to the pond has led to animal drownings.

Figure 2. Initial conditions of Alderson creek, showing rapid growth of watercress in unshaded stream, and livestock having access.

Climate Conditions

The Fortune Creek watershed is in the northern portion of the Okanagan Valley. Based on the Köppen-Geiger climate classification system (Peel, Finlayson, and McMahon 2007), the valley bottom in the southern portion of the valley is classified as warm summer, Mediterranean (Csb), with the higher elevation sides and northern portions of the valley classified as warm summer humid continental (Dfb). This climate has warm, but not hot, summers and long, cold and severe winters (Ahrens and Henson 2015).

Figure 2 plots several climate measures for the Vernon North climate station (latitude 50.34, longitude -119.27) (Environment Canada 2021), approximately 15 kilometers southwest of the center of the study site. The temperature and precipitation levels are clearly consistent with the classification: average summer temperatures below 20 C and above 10 C for at least four months, and average for the coldest winter month below -3 C, and without a distinct dry season. The figure plots average daily maxima and minima, with the average temperature falling about midway between these.

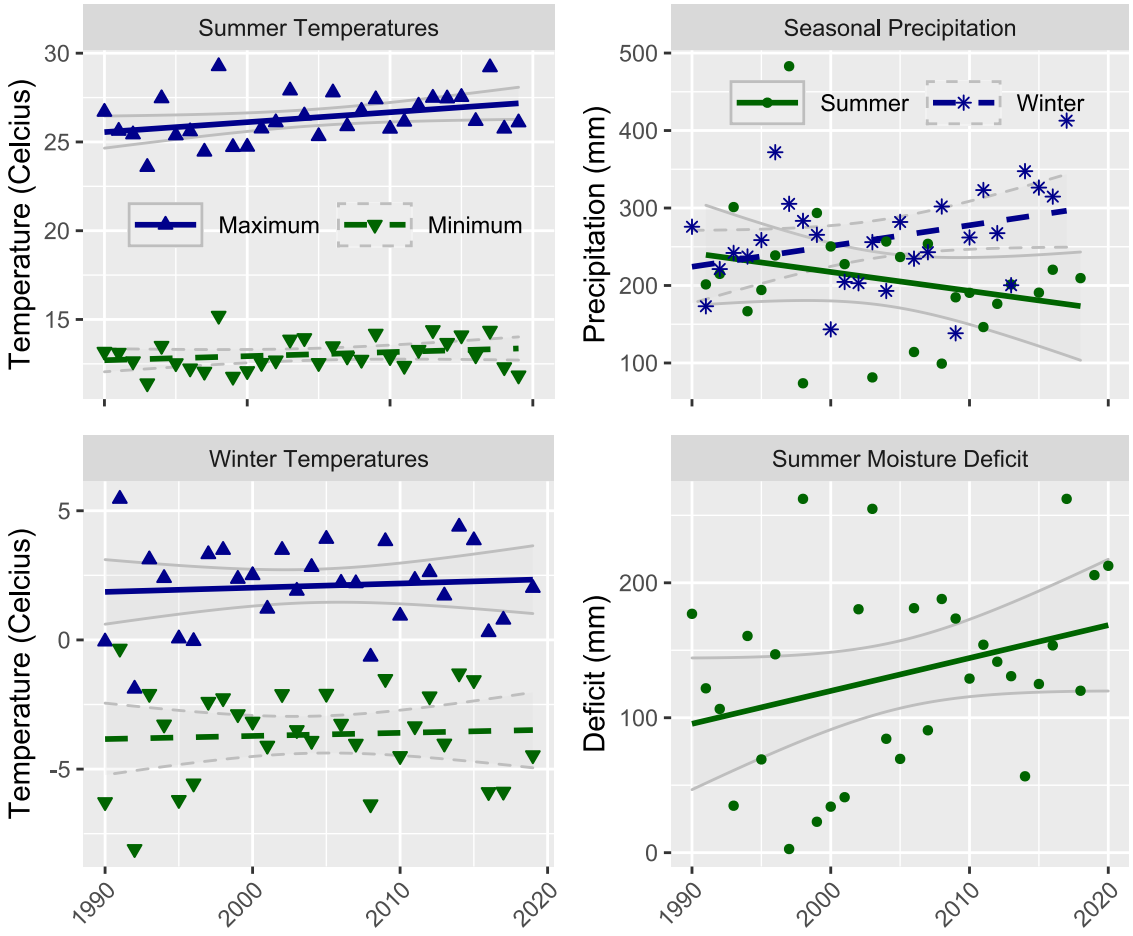

Figure 3 Climate measures for the Vernon North climate station

The trends are consistent with climate change projections for the area. Minima and maxima are increasing in both seasons, although more pronounced for summer temperatures. Winter precipitation is trending upwards, while summer precipitation is trending down. Consequently, a summer moisture deficit trend, calculated with the ClimClass package (Eccel, Cordano, and Toller 2016) in R (R Core Team 2020), suggests an almost doubling of the average summer moisture deficit. These seasonal averages show considerable variation over the plotted history, and in most cases the trend lines are not statistically significant. Further, hourly data was not available for this station. Therefore, trends in extremes, particularly precipitation extremes, are not reported. We expect landowner perceptions of climate change are shaped by a combination of knowledge about these long-term trends together with personal experience of weather events that are salient enough to be retained.

Socio-economic landscape

The local area consists mainly of agricultural parcels, with a small residential subdivision upstream of the study reach. Farmland along both Alderson and Kendry creeks is used for growing

hay, tree fruits, vegetables, raising livestock, and chicken farming. For most residents farming does not constitute the primary source of income. Table 1 summarises some demographic variables. While not identical – Kendry Creek residents are somewhat younger and more educated – the lack of extreme differences together with the spatial proximity is taken to be sufficient to make Kendry Creek residents a useful comparison group. We will refer to these groups as the Alderson group and the Kendry group.

Table 1. Select demographics for Alderson group and Kendry group.

	Alderson Group	Kendry Group
Age range	35-65	31-53
University degree	2/6	4/6
Land providing ≥50% income	0/6	1/6
Years living here	1-45	1-53

The restoration project

This restoration project was initiated following years of landowner challenges with the creek. These included numerous failed attempts to reduce flooding impacts, and the threat of an enforcement action for the illegal removal of sediments. At the time of this research, the Alderson group had formed the Alderson Creek Restoration Society and prepared an Environmental Farm Plan Group Plan. Such group plans were a new initiative under the provincial Environmental Farm Plan program at the time (BC Agricultural Research and Development Corporation 2010). This initiative implicitly recognized that ecological services are not naturally confined by property boundaries, and ecological objectives could be more effectively achieved by coordinating activities on nearby parcels. Completion of the plan enabled the landowners to apply for government funding to assist with undertaking the works set out in the plan. The project works include:

1. Stream bank stabilization to reduce erosion,
2. Fencing to exclude livestock from a riparian buffer,
3. Planting native vegetation,
4. Constructing low impact stream crossings,
5. Installing off stream livestock watering,
6. Installing tile drainage in water affected lands near the stream.

Total project cost was estimated at over $160,000 CDN, with the landowners expected to provide about one third as cash and in kind (labour, equipment, etc.). These works were meant to achieve two main objectives: restore natural functioning to the stream so that it would be able to remove water from the area, and provide improved drainage to lands adjacent to the stream. Beyond the property owners, the larger community would benefit from enhanced ecosystem services such as natural habitats, improved downstream water quality and aesthetics. While a cost benefit analysis is beyond the scope of the present paper, the potential for a net social benefit makes it valuable to understand what factors lead the Alderson group to come together. We consider two aspects in

seeking such an understanding: 1) the role of prior or emerging knowledge about ecosystem functioning and local climate change impacts and 2) the role of the social context.

Complementary research

Two of the authors are involved in continuing research examining agricultural adaptation to climate change in the Cariboo and the Okanagan, regions experiencing increased water scarcity, forest fires, pests, and flooding. Observations of landowners along the Bonaparte River, near Cache Creek, resonate particularly strongly with the results of this project, and are briefly described where relevant.

Methodology

We followed a grounded theory approach and used a combination of data collection methods. Grounded theory explores interactions, processes and changes over time (Morse, JM., Richards 2002; Charmaz 2014). This approach can be used to identify experiences that triggered collective action and the change in perceptions or behavior resulting from this action.

Striving to resolve issues or meet needs motivates and organizes people in a given context (Glaser 2002). Ecological restorations are collective actions undertaken to address undesirable changes impacting ecosystem goods and services that are essential for communities (Clewell and Aronson 2006). Over the project's 3-year timeframe, researchers worked together with study participants and restoration practitioners to collect qualitative and quantitative observations. We use these observations to reconstruct the collective experience of this small group of landowners that led to initiating a collective restoration project. As this research overlapped with project activities, we could observe changes in experience and motivation, highlighting barriers as they emerged. Data collection was designed to facilitate individual and collective recollection of relevant experiences, initial project activities and their perceived and actual consequences, and lessons learned.

An initial survey of both groups measured landowners' knowledge about climate change and its impacts, knowledge about riparian biophysical processes, adaptation experiences, and environmental attitudes. The questionnaire combined agreement with offered statements using a five point Likert scale and open ended questions allowing space for elaboration. Environmental attitudes were measured using the New Environmental Paradigm (R. E. Dunlap et al. 2000; R. Dunlap 2008). Semi-structured interviews with members of both groups explored in greater depth the critical events prior to and during the project, and the impact these events had on knowledge, beliefs, and attitudes, and thereby motivations.

Following a preliminary analysis of the survey and interview results, a focus group discussion was organized with the Alderson group and the restoration practitioners involved with the project planning and implementation. This focus group expanded the dialog beyond the immediate individual and collective interests of the project participants, enabling reflection on the larger social and institutional environment within which the project is embedded.

Results and discussion:

Knowledge about ecosystems and climate change and adaptation strategies:

Survey results show that both groups appreciated healthy riparian ecosystems and acknowledged the degradation that has occurred. They also recognized the need for restoration and the importance of funding for facilitating such actions. However, the Kendry group showed no inclination to initiate restoration in the foreseeable future, even with funding and facilitation availability.

Figure 4 presents the responses to twelve items that assess climate change perceptions and the fifteen items of the New Ecological Paradigm. The climate change perception questions are divided into a set of five capturing a broad awareness about climate change, a further six capturing an awareness of and/or experience of local climate change impacts and projections, and one statement (12) measuring support for ecologically minded land management (items reported in the appendix). For the first five items, variation within and between groups is low. People along each stream reach hold similar opinions, and those opinions are similar across the reaches. With respect to global changes, respondents tend to agree that climate change is happening.

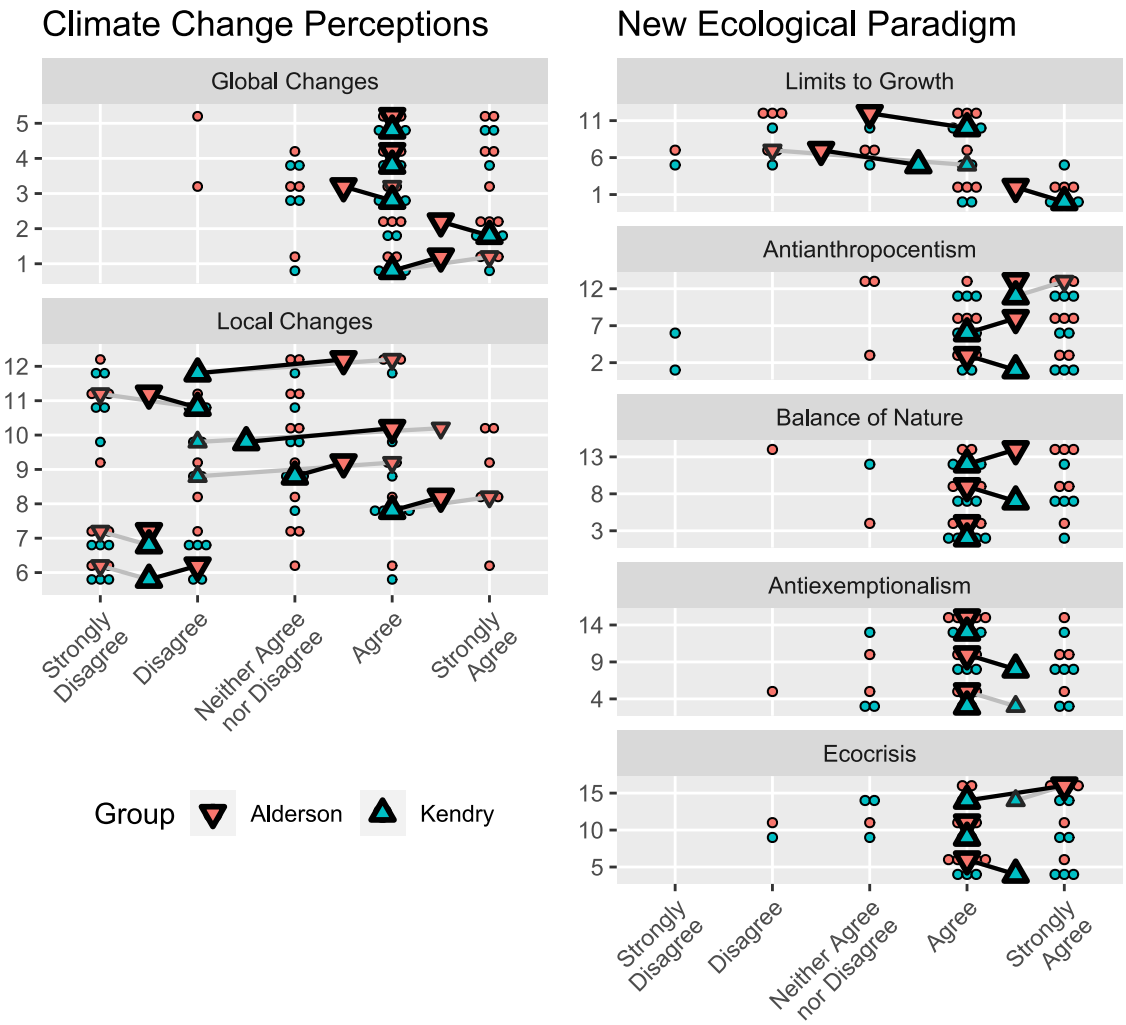

Figure 4. Initial survey results. Left panel reports level of agreement with statements about climate change. Statements 1 – 5 describe possible global changes and impacts, while statements 6 – 11 capture describe possible local changes and impacts. Item 12 captures preference for ecologically sensitive land management. Right panel reports responses to the New Ecological Paradigm items (Dunlap, 2000), arranged to reflect agreement with the eco-centric paradigm. Individual responses for each question are marked by points, median values by triangles, with the larger triangles inclusive of the "Neither Agree nor Disagree" category, and smaller triangles median values without including these responses. Lines connect median indicators for the two groups, for the same item.

The following six items are more closely related to climate change impacts that may directly affect landowners, such as changes in day-to-day local weather conditions or seasonal precipitation. The median respondent in both groups expects a different future weather normal. However, there is large variation in how respondents within both groups see this impacting their property. This variation may be partly due to differences in the specific context of the responder and their land. Some reflects differences in perspectives of how climate change will manifest itself locally.

The total number of responses is well below the threshold generally considered appropriate for assuming normality in statistical tests. Applying a Wilcoxon signed rank test on the responses

for each item, only question 10 showed a significant difference between the groups ($W = 31.0, P = 0.03939327$ for all responses and $W = 15.0, P = 0.05150834$ with neutral dropped). Climate projections forecast that winter precipitation will increase (Pinna Sustainability et al. 2020). The summer moisture deficit is expected to increase. The difference in responses to this item suggest that the Kendry group is more aware of the climate change projections of the Okanagan, and perhaps less inclined to have recent, memorable extremes that drive perceptions of longer-term trends.

Responses to the NEP items (right half of Figure 4) are ordered so that agreement always aligns with the eco-centric paradigm. Most respondents in both groups agree or strongly agree with the items in the NEP scale, thereby describing themselves as aligning with the more eco-centric paradigm. A Wilcoxon test showed no significant difference between the two groups.

Visually, median responses to items 6 and 11 stand out as more different between the groups than those for the other items, although within both groups there is considerable heterogeneity. Items 1, 6 and 11 measure the 'limits to growth' dimension of the NEP (for the item wording, see R. E. Dunlap et al. 2000). The difference observed may reflect the somewhat older and lower educational attainment of the Alderson group. Kendry group members are more likely to have had an education emphasizing the limited capacities of the planet to support humans.

The overall similarity of environmental attitudes between the groups suggests these attitudes did not factor prominently in motivating the Alderson group to initiate a restoration project. Other motivators that differ between the two stream reaches, which directly impact Alderson group members, likely played a more important role (Kaplan and Kaplan 1983).

These initial survey results strongly suggest that the initial motivations for participation by the Alderson group members were not triggered by climate change concerns. While recognizing that climate change was happening, there was no strong commonly held perception that it would impact them directly. This is consistent with other work findings that local observations and scientific evidence are not necessarily driving farm management decisions, particularly if this knowledge conflicts with local stakeholder beliefs (Raymond et al. 2010; Rhoads et al. 1999).

Probing beyond the survey questions revealed that landowners' concerns vary based on the impacts along their particular reach. The Alderson group was mostly concerned about flooding and consequent challenges of farming their land. The Kendry group's concerns emphasized wildfire and pest risks. Individual adaptation actions reflected these context specific concerns. Alderson group actions aimed to improve drainage and reduce flooding impacts. Kendry group actions related to conserving water, managing water quality, and enhancing soil fertility. Actions being taken by people along both reaches appeared to be motivated by immediate concerns, be those biophysical (flooding) or socioeconomic (regulations). Previous work has also shown that farmers address first those things that are most limiting (Niles, Lubell, and Brown 2015), and that farmers are continually responding to changing economic and climatic conditions, especially where the climate variability is high (Smit and Skinner 2002). Adaptation is reactive, based mainly on experiential knowledge, and limited to addressing factors that limit their ability to operate their farmland. Encouraging restoration projects needs to fit with the local context and ongoing experiences of those who would participate.

Similar issue specific responses occurred in response to flooding and erosion of agricultural land along the Bonaparte River, near Cache Creek. The river meanders through a floodplain for several kilometers upstream of the town. It is normal for high flows to overtop the river banks and flood in a floodplain. The changing climate has manifested as higher peek flows during the spring freshet and more extreme rainfall, increasing the severity of these effects. For example, extensive flooding occurred in 2015 when 26 mm of rain fell in one hour, more precipitation than falls in a typical month (Azpiri and Silver Sweeney 2015).

These climate change impacts are consistent with forecasts. However, the original demarcation of private property did not allow for normal ecological functioning of the river. Farmers naturally respond by taking actions to minimize flooding impacts and reducing erosion, by diking and armoring stream banks. Such actions reduce the ecological functioning of the river, and may transfer flooding problems upstream or downstream. Unless the most ecologically and forward looking actions are made to coincide with the landowners own objectives, they are unlikely to be undertaken.

Specific experiences and motivation:

Transcripts of the semi-structured interviews with the Alderson Creek group were analyzed to identify higher level concepts and details of the initiation and initial implementation of the restoration they experienced. Table 2 and Table 3 document the differences between the two groups that emerged from this analysis. In both groups, neighbours' reciprocal relationships that provided support when needed were maintained. Interestingly, noted relationships in both groups aligned with the geographic connections of their stream reach. The Kendry group is connected through participation in water management decisions of a water district they belong to. The Alderson group formed the Alderson Creek Restoration Society in response to stream-related issues, and their perception that nearby suburban residents disapproved of their land management. In both groups, professional networks provided education, industry-related news, and climate-related information. All valued the agricultural landscape and were unhappy with the ongoing concentration of the agriculture industry into large operations and the social fragmentation of rural communities through non-farming immigration.

The interview conversations confirmed the survey results, demonstrating that both groups valued a healthy riparian environment and recognized the degradation that has taken place. They demonstrated an understanding of global climate change, and had noticed changes in local weather patterns. However, opinions differed on the relationship between the observed local changes and global climate change. They seldom discussed climate change among themselves, perhaps due to a lack of consistent and credible information flowing from local formal institutions. Both groups acknowledged anthropogenic impacts on their respective reaches, and all else equal would support practices that protect riparian health.

Table 2. Concepts emerging from analysis of interview transcripts, focussing on experience and knowledge of participants in both groups. Emergent themes organized by coding family.

Alderson group	Kendry group
Climate change: knowledge and observations	
Common adaptation practices – infrastructure, 'keep cattle out of stream'; Weather effects on agriculture; Weather trends not due to climate change; Farmers don't talk about climate change; Abundance of global climate information but lack of education	Common adaptation practices – management and infrastructure, resilient ecosystems and sustainable agriculture; Climate patterns may be regular cycle; Farmers don't talk about climate change; Overwhelming amount of info with varying interpretation; Lack of education about local impacts
Ecosystem knowledge and experience living by the stream	
Healthy creeks look natural and have fish; Healthy creeks have educational and recreational value; Watercress choking creek, causing flooding; Cattle in the stream causing bank erosion; Trying to resolve drainage issues and keep the creek clean; Blaming development upstream for further degradation; Township does not take care of its culverts	Healthy creeks look natural and have fish; Farmers care for ecosystems they depend on; Farming and environment can conflict; Health riparian systems benefit humans; Creek modified by farming and development; Degraded creek not a suitable fish habitat; Enjoying living by the creek; No direct negative impact from creek;
Social context – demographics	
Mixed land use; Income other than farming; Short-to-long term residents	Mixed land use; Income from other sources; Short-to long term residents
Environmental attitude	
Respecting environment; Good practices result from experience; Unaware of what riparian practices are illegal	No residential development along the creek, only farms; Respecting environment; Being too pro-environmental will alert other landowners
Relationships with neighbours and networks	
Resentful of larger agricultural operations; Reciprocal relationships; Connected by creek restoration society; Rapidly changing social environment; Growing residential development upstream	Reciprocal relationships; Connected by irrigation district; Rapidly changing social environment; Growing number of land parcels

Table 3. Concepts emerging from analysis of interview transcripts, focussing on factors that influenced participation in group restoration project for Alderson group, and analogous factors for Kendry group. Emergent themes organized by coding family.

Alderson Group	Kendry Group
Working as a group	
Working together to resolve creek issues; Advice from enforcement agency to hire restoration practitioners (RP); Inspired by successful restoration projects presented by RPs; Both riparian landowners and regulators want a healthy creek; Landowners have been in this problem together;	Common issues trigger and different interests hinder collaboration; Farmers cooperate if they depend on each other; Government agency should be facilitating; Satisfactory creek management by the irrigation district
Motivation, costs and benefits	
Experiencing drainage problems; Existing coping methods conflict with regulations; Restoration as an environmental compliance; Improved drainage, recreation, education, fisheries, positive image; Unexpected delays lead to frustration and intended return to past practice	Restoring habitat takes time and effort; Passive restoration might work as well; Recreational and fisheries benefits could be enhanced; Potentially high costs and need for funding

Ostrom (1998) describes that adaptation can emerge as a response to undesirable environmental change when environmental degradation induces greater social vulnerability by a majority of community members. Such actions may take the form of ecological restoration (Ostrom 1998; Adger 2010). The differences between the two groups and the actions taken are consistent with these insights.

Kendry group members agreed that a common issue could trigger interest in a collective response, while difference between members could compromise efforts. Facilitation and financial support was seen as important for initiating and sustaining any actions. They saw farming communities as likely paces for collection actions, as community members more often have relationships of reciprocity. Kendry group members recognized that ecological restoration of their stream reach would benefit the ecosystem and the larger society. However, they saw no pressing need for restoration of the creek. They had only experienced minor nuisances, such as blocked culverts and cattle in the stream, which were easy to deal with. That the Kendry group members were not experiencing adverse impacts from the creek on their desired land uses mitigates against their undertaking a collective restoration project.

In contrast, Alderson group members described numerous impacts adversely affecting their land use, leading to reduced profits from crops and increased animal care costs (disease and even drowning). While the nature and scale of the issues varied among the group members, they had in common the state of the creek as a source of problems. Beyond these specific issues was the specter of regulatory actions threatening at the time of project initiation, and potentially emerging in the

future. This latter issue added the need to strengthen relationships within the group to the need to address specific issues on each property. This was sufficient to motivate all six landowners to contribute their share of the costs of the project, even as only half of them were currently suffering adverse effects.

Enforceable government regulations are known to be important influencers of action by groups of stakeholders (Olson 1965; Rhoads et al. 1999). Pretty and Ward (2001) note that a need to comply with tightening government regulations has been an additional trigger for the formation of partnerships in the context of environmental management. In this study, a threat of enforcement action against one of the landowners was an important trigger that may have been instrumental in bringing these landowners together.

Those contributing participants who were not suffering directly from the state of the reach did so to support their affected neighbours. Participation hereby serves to build stronger reciprocal relationships with neighbours. (Adger 2010) defined bonding social capital as based on locality and ties formed within defined socio-economic groups. The actions of the Alderson group served to build bonding social capital. They had been working together for several years through the inception of the project. They were committing to investing financially and in kind to addressing issues generated by the degraded state of the reach. The members who were contributing with no direct benefit had a similar farming relationship with the land. This homogeneous aspect of the group helped tie them to each other, and separate them from the suburban residents nearby. The threatened regulatory action and the potential for more further enhanced the value of tightening the bonds within the group.

Finally, the process of this project aligns with Wandersman (1981) description of the role that ecological or geographical community characteristics can serve as source of identity for community residents. The connection between neighbours along the reach was a physical reality that defined one space of relationships. It provides a visible connection between these landowners, creating an awareness of their interconnectedness, and a space where collective action can occur.

Hidden motivations to engage in riparian restoration collective action

A focus group was used to explore collectively constructed motives not clearly evident through the survey and interviews. It took place two years after the interviews, including the Alderson group and restoration practitioners associated with the project. Participants were presented with anonymized results from the survey and interviews, and were asked to reflect on their experience of involvement with project activities, interactions with group members and the restoration practitioners, and impacts of the restoration activities. Completed activities at this date included cattle excluding fencing and channel naturalization and revegetation. The focus group was recorded and transcribed, with analysis as for the interviews (see Table 3).

Table 4. Themes emerging from focus group discussion analysis. Emergent themes organized by coding category.

Climate change adaptation
Infrastructure solutions might be ineffective and costly; Recognizing signs of climate change locally
Restoration collective action
Expected greater attention and support from public agencies; Restoring environment is everyone's responsibility, incl. government; Varying scope of work on individual parcels equates longer authorization process; Getting everyone involved is critical but difficult
Knowledge building resulting from landowners and RPs/scientists interaction
Naturalized portions are drier; Hydrological change is a result of natural and anthropogenic perturbations; Riparian health is the only viable solution to current drainage problems
Motivation – law enforcement vs "Fishbowl"
Digging ditches as an act of "preserving their land"; "Preserving their land" is a common practice; Riparian alterations on private land are rarely detectable by regulators; Enforcement action was driven by subdivision resident report; "Living in a fishbowl" - Feeling "watched" by subdivision residents; Restoration as manifestation of group's pro-environmental attitude

The focus group revealed participation motives not clearly articulated during the interviews. The landowners had years of experience with the stream reach, during which they had repeatedly attempted to reduce the flooding problems they were experiencing. One typical short-term strategy is using machinery to remove the watercress blocking the channel. This at best provides temporary relief, and as 'works in and about a stream', is illegal without authorization under the provincial Water Sustainability Act (Province of British Columbia 2014). The landowners understood that this activity was illegal, but as regulatory actions were complaint driven, the perception was that the risk of enforcement was limited. They felt morally, if not legally, entitled to take actions for "preserving their land". Rural landowners often considered it appropriate to adjust the surrounding landscape to enhance the services they value. Therefore, if the drainage issue is unresolved through this project, the Alderson group will likely resume their earlier interventions, irrespective of impacts on the environment and broader societal objectives.

The Bonaparte River situation described above has similarities. The normal functioning of the river includes gradual movement of the river channel across the floodplain, discharging energy in the moving water and sorting and moving sediment. This process helps create and maintain important riparian habitats. When crown land grants were made and parcel boundaries established, those boundaries coincided with the then existent river channel, and did not reflect the ecological and geophysical processes occurring. Landowners view the river as a source of hazard and take actions that reduce their exposure to the hazard. As stated by one owner: "well, we did you know, sometimes we were repairing it", in reference to armouring the riverbank with rip rap. Such repair successfully reduces erosion, but reduces ecological functioning. There have been efforts along the Bonaparte River to enhance the ecological functioning. Along the Cache Creek corridor, the

river was naturalized, taking it from a "great wall of rock" to a more natural fish habitat where scour pools were created for spawning grounds.

The idea of a "Fishbowl" also emerged clearly during the focus group recollection. Residents in the small subdivision upstream of the Alderson creek reach were in a position to watch how the farmland along the reach was managed. Several residents regarded agricultural practices in their neighbourhood as a nuisance. Some Alderson group members suspect that one or more subdivision residents reported the illegal excavation, initiating the threatened enforcement action. The Alderson group viewed the restoration as demonstrating their environmental compliance, shielding them from future complaints and enforcement actions. As stated by one participant: "That was just an example, one example, but how many other people are working on the ... trying to preserve their farmland that you and I are not aware of because they're not in the fishbowl. They're up in an area where no one sees them".

In contrast, the Kendry group resided in a relatively homogenous social environment without outside observes. The Kendry group members were more inclined to feel watched by each other. For example, "… if I were to champion like friends of the Creek or whatever. I could see some people like …watch out …like I am kind of worried about you gonna try to take my ability to water my field from me…". This pressure mitigated against group members with strong pro-environmental attitudes engaging in obvious pro-environmental behaviors.

This focus group discussion, two years after the interviews, revealed how participation in the project had built knowledge. Working with the restoration practitioners helped them to better understand the processes taking place on their land, and how changes to the stream channel would change those processes. Planning the project was a cooperative activity involving the owners and restoration practitioners, and implementation required regular coordination between these same practitioners, any laborers, and the owners. Early in the project, before the works were in place, they experienced two consecutive years of flooding, which challenged their view that such events were part of natural variation. They observed the stream drying up and resurfacing at previously dry locations and described their failing attempts to maintain proper drainage. The insights about the hydrology of alluvial fans provided by the restoration practitioners resonated with their own experience. Their experience, complemented by the professional expertise, lead to a realization that short-term solutions like clearing culvert blockages and excavating watercress from the channel is not a long-term, cost effective solution. Observing the functioning of the first restored stream segment further convince the owners that this was the best approach. From a participant: "But let's go back a few years, we didn't know all this stuff. You (restoration practitioners) weren't around, you weren't around yet".

Even though participating landowners faced numerous barriers to their collective action, including the internal challenge of reconciling differences in works and impacts among the neighbouring participants, the external challenge of the regulatory hurdles in securing required permits and financial support, they were still determined to proceed with restoration effort. This analysis highlights that the emergence and execution of this project was the result of a coincidence of enabling conditions. The inability of the landowners to successfully address their drainage issues created the opportunity for a new approach. The potential legal action foreclosed simply scaling up the previous unsuccessful approach. The presence of the suburban observers created a

risk of further unexpected actions impacting on the choices the landowners could make, creating an additional motivation for working cooperatively. The existence of the group environmental farm plan provided a means of accessing funding and technical support to create and implement the restoration project, and through that an opportunity for the landowners to learn more about the creek and to deepen their commitment to stewardship and to their neighbours.

In nearby Kendry creek, the only enabling condition present was the environmental farm group plan. The creek was not negatively impacting desired land use in the way it was on Alderson creek. There had not been any observed illegal activity that was leading to enforcement actions, and no suburban residents nearby to observe what landowners were doing on their land, leaving landowners wary of how departures from normal practice may be interpreted by their peers. Thus, while there are certainly environmental and societal benefits that would be generated as a result of restoring a more natural system along Kendry creek, the conditions are not presently in place for such an action to take place.

We end with some thoughts on how the insights here can be used to facilitate similar collective restoration projects. In this case, that a government official involved with the threatened enforcement pointed out the potential for a restoration project may have been a critical piece of information. Perhaps enforcement branches of government should not focus on enforcement alone in situations like this. If landowners do not understand that a longer-term solution, such as restoration, can better address their issues, then they are not going to engage in it. If regulators begin by working with landowners to address the reasons illegal activities are occurring, they may be able to move more people towards restoration type solutions. Recognition of participants, on farm tours, etc. could also play a role in education about restoration benefits to landowners.

Financial and technical support are normally important, as they were in this project. Covering initial costs helps get a project done. However, projects like this also have ongoing costs, such as maintaining exclusion fencing. Recognition that landowners have foregone some land as natural habitat through reductions in property taxes or payments for ecosystem services would help ensure restoration projects are not simply abandoned. Using property tax reductions as reward for the provision of environmental services is being used elsewhere (Whatcom County 2021).

In some situations, it may be possible to create a fishbowl. A growing demand for recreational opportunities in rural and undeveloped areas – hiking and cycling trails, etc. – could be satisfied by adding trails or observation sites to restoration projects. Rural landowners may worry about the fishbowl effect, if such rural-urban collaborative solutions can be implemented, it may also enhance understanding of rural activities by urban residents.

Conclusion:

The Alderson Creek restoration project saw a small group of landowners along a short reach of this creek come together to restore the ecological functioning of creek. They all contributed cash and in kind to the project, even though only half of them were suffering adverse effects from the state of the creek.

Two important triggers initiated this project: ongoing challenges with flooding that were not effectively mitigated by landowner actions, and a threatened enforcement action for illegal excavation in the stream. The existence of the BC Environmental Farm Group Plan provided access to financial support and technical expertise specific to collective projects like this. Further, a fishbowl effect created by the presence of a nearby suburban development created a sense that these rural landowners needed to "have each other's back" so as to protect against nuisance complaints and possible future reporting of suspected environmental violations. Over the course of the project, participants strengthened their bonds with each other, and gained a deeper understanding of the natural processes occurring on their land and how those are impacted by their actions.

Comparing Alderson Creek to nearby Kendry Creek – without a restoration project - highlighted the importance of context in the initiation and implementation of such projects. Providing landowners engaging in short-term mitigation action with information from trusted sources about alternative, longer-term ecologically preferred alternatives may help encourage similar projects. Financial support for both project implementation and ongoing costs is important. In some cases, it may be possible to create common interest with non-rural residents by providing recreational opportunities in tandem with restoration projects. In all cases, proponents of restoration need to take the time to clearly understand the situation of landowners and how such projects can be implemented to generate benefits for individuals and communities of landowners.

References:

Adger, W. Neil. 2010. "Social Capital, Collective Action, and Adaptation to Climate Change." In *Der Klimawandel*, 327–45. VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-92258-4_19.

Ahrens, C. Donald., and Robert. Henson. 2015. *Meteorology Today : An Introduction to Weather, Climate, and the Environment*. 11th ed. Boston: Cengage Learning.

Azpiri, Jon, and Marlisse Silver Sweeney. 2015. "Cache Creek Mayor Declares State of Emergency after Flash Flooding, Storms." *Global News*, May 26, 2015. Cache Creek Mayor declares state of emergency after flash flooding, storms.

Bauer, Bernard, John Janmaat, Nargiz Rahimova, and Noelle Richardson. 2018. "Economic, Social and Environmental Benefits of Riparian Restoration as a Climate Change Adaptation Strategy for Agriculture: Final Project Report." Kelowna. https://www.climateagriculturebc.ca/app/uploads/FI05-Benefits-Riparian-Rehabilitation-Strategy-2018-report.pdf.

BC Agricultural Research and Development Corporation. 2010. "Reference Guide: The Canada - British Columbia Environmental Farm Plan Program." 2010. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/agricultural-land-and-environment/environmental-farm-planning/efp-reference-guide/full_efp_reference_guide.pdf.

BC Agriculture & Food Climate Action Initiative. 2016a. "BC Agriculture & Climate Change Okanagan Regional Adaptation Strategy."

———. 2016b. “BC Farm Practices & Climate Change Adaptation Summary Report & Additional Findings.”

Berkes, Fikret. 2004. “Rethinking Community-Based Conservation.” *Conservation Biology*. John Wiley & Sons, Ltd. https://doi.org/10.1111/j.1523-1739.2004.00077.x.

Brody, Samuel D. 2003. “Measuring the Effects of Stakeholder Participation on the Quality of Local Plans Based on the Principles of Collaborative Ecosystem Management.” *Journal of Planning Education and Research* 22 (4): 407–19. https://doi.org/10.1177/0739456X03022004007.

Campbell, Lisa M., and Arja Vainio-Mattila. 2003. “Participatory Development and Community-Based Conservation: Opportunities Missed for Lessons Learned?” *Human Ecology* 31 (3): 417–37. https://doi.org/10.1023/A:1025071822388.

Charmaz, K. 2014. *Constructing Grounded Theory*. SAGE Publications. https://books.google.ca/books?hl=en&lr=&id=v_GGAwAAQBAJ&oi=fnd&pg=PP1&dq=Constructing+grounded+theory&ots=YXTwJ4FBi5&sig=z3nu1RYYVDsWxVYUPaE3lc0-Dq0.

Clewell, Andre F., and James Aronson. 2006. “Motivations for the Restoration of Ecosystems.” *Conservation Biology*. John Wiley & Sons, Ltd. https://doi.org/10.1111/j.1523-1739.2006.00340.x.

Dunlap, Riley. 2008. “The New Environmental Paradigm Scale: From Marginality to Worldwide Use.” *Journal of Environmental Education* 40 (1): 3–18. https://doi.org/10.3200/JOEE.40.1.3-18.

Dunlap, Riley E., Kent D. Van Liere, Angela G. Mertig, and Robert Emmet Jones. 2000. “Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale.” *Journal of Social Issues* 56 (3): 425–42. https://doi.org/10.1111/0022-4537.00176.

Dwyer, JC, and ID Hodge. 1996. *Countryside in Trust: Land Management by Conservation, Recreation and Amenity Organisations.* John Wiley & Sons, Ltd.

Eccel, Emanuele, Emanuele Cordano, and Giambattista Toller. 2016. “ClimClass: Climate Classification According to Several Indices.”

Environment Canada. 2021. “Historical Data.” 2021. https://climate.weather.gc.ca/historical_data/search_historic_data_e.html.

Glaser, Barney G. 2002. “Conceptualization: On Theory and Theorizing Using Grounded Theory.” *International Journal of Qualitative Methods* 1 (2): 23–38. https://doi.org/10.1177/160940690200100203.

Glicken, Jessica. 2000. “Getting Stakeholder Participation ‘Right’: A Discussion of Participatory Processes and Possible Pitfalls.” *Environmental Science and Policy* 3 (6): 305–10. https://doi.org/10.1016/S1462-9011(00)00105-2.

Higgs, Eric S. 1997. “What Is Good Ecological Restoration?” *Conservation Biology*. John Wiley & Sons, Ltd. https://doi.org/10.1046/j.1523-1739.1997.95311.x.

Irvin, Renée A., and John Stansbury. 2004. “Citizen Participation in Decision Making: Is It Worth the Effort?” *Public Administration Review*. John Wiley & Sons, Ltd. https://doi.org/10.1111/j.1540-6210.2004.00346.x.

Kaplan, Simon, and R Kaplan. 1983. *Cognition and Environment*. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.687.5986.

Landman, J. P. 2004. "Social Capital: A Building-Block in Creating a Better Global Future." *Foresight*. Emerald Group Publishing Limited. https://doi.org/10.1108/14636680410531525.

Maslow, A. H. 1943. "A Theory of Human Motivation." *Psychological Review* 50 (4): 370–96. https://doi.org/10.1037/h0054346.

Mertz, Ole, Cheikh Mbow, Anette Reenberg, and Awa Diouf. 2009. "Farmers' Perceptions of Climate Change and Agricultural Adaptation Strategies in Rural Sahel." *Environmental Management* 43 (5): 804–16. https://doi.org/10.1007/s00267-008-9197-0.

Miles, Irene, William Sullivan, and Frances Kuo. 1998. "Ecological Restoration Volunteers: The Benefits of Participation." *Urban Ecosystems* 2 (1): 27–41. https://doi.org/10.1023/A:1009501515335.

Morse, JM., Richards, L. 2002. *Read Me First for a Users Guide to Qualitative Methods*. *2002*. Vol. 10. Royal College of Nursing Publishing Company (RCN). https://go.gale.com/ps/i.do?p=AONE&sw=w&issn=13515578&v=2.1&it=r&id=GALE%7CA95844895&sid=googleScholar&linkaccess=fulltext.

Niles, Meredith T., Mark Lubell, and Margaret Brown. 2015. "How Limiting Factors Drive Agricultural Adaptation to Climate Change." *Agriculture, Ecosystems and Environment* 200 (February): 178–85. https://doi.org/10.1016/j.agee.2014.11.010.

Olson, Mancur. 1965. "The Logic of Collective Action: Public Goods and the Theory of Groups." https://doi.org/10.2307/446187.

Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.

———. 1998. "The Institutional Analysis and Development Approach." In *Designing Institutions for Environmental and Resource Management*.

Ostrom, Elinor, and T. K. Ahn. 2008. "The Meaning of Social Capital and Its Link to Collective Action." In *Handbook on Social Capital*, edited by Gert T. Svendsen and Gunnar L. Svendsen. Edward Elgar.

Peel, M. C., B. L. Finlayson, and T. A. McMahon. 2007. "Updated World Map of the Köppen-Geiger Climate Classification." *Hydrology and Earth System Sciences* 11 (5): 1633–44. https://doi.org/10.5194/hess-11-1633-2007.

Pike, R.G., T.E. Redding, R.D. Moore, R.D. Winkler, and K.D. Bladon, eds. 2010. *Compendium of Forest Hydrology and Geomorphology in British Columbia, LMH 66, Volume 2 of 2*. *Geomorphology*. Vol. 2. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.721.8426&rep=rep1&type=pdf.

Pinna Sustainability, Regional District North Okanagan, Regional District of Central Okanagan, and Regional District Okanagan Similkameen. 2020. "Climate Projections for the Okanagan Region." http://www.rdno.ca/docs/200303_OK_ClimateReport_Final.pdf.

Pretty, Jules, and Hugh Ward. 2001. "Social Capital and the Environment." *World Development* 29 (2): 209–27. https://doi.org/10.1016/S0305-750X(00)00098-X.

Province of British Columbia. 2014. *Water Sustainabilty Act*. Canada. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/14015.

Putnam, Robert D. 2000. "Bowling Alone: America's Declining Social Capital." In *Culture and Politics*, 6:223–34. Palgrave Macmillan, New York. https://doi.org/10.1007/978-1-349-62965-7_12.

R Core Team. 2020. "R: A Language and Environment for Statistical Computing." Vienna, Austria: R Foundation for Statistical Computing,.

Raymond, Christopher M., Ioan Fazey, Mark S. Reed, Lindsay C. Stringer, Guy M. Robinson, and Anna C. Evely. 2010. "Integrating Local and Scientific Knowledge for Environmental Management." *Journal of Environmental Management* 91 (8): 1766–77. https://doi.org/10.1016/j.jenvman.2010.03.023.

Reed, Mark S. 2008. "Stakeholder Participation for Environmental Management: A Literature Review." *Biological Conservation*. Elsevier. https://doi.org/10.1016/j.biocon.2008.07.014.

Rhoads, Bruce L., David Wilson, Michael Urban, and Edwin E. Herricks. 1999. "Interaction between Scientists and Nonscientists in Community-Based Watershed Management: Emergence of the Concept of Stream Naturalization." *Environmental Management*. Springer. https://doi.org/10.1007/s002679900234.

Rydin, Yvonne, and Mark Pennington. 2000. "Public Participation and Local Environmental Planning: The Collective Action Problem and the Potential of Social Capital." *Local Environment* 5 (2): 153–69. https://doi.org/10.1080/13549830050009328.

Stringer, Lindsay C., Andrew J. Dougill, Evan Fraser, Klaus Hubacek, Christina Prell, and Mark S. Reed. 2006. "Unpacking 'Participation' in the Adaptive Management of Social-Ecological Systems: A Critical Review." *Ecology and Society* 11 (2). https://www.jstor.org/stable/26266023.

Sullivan, Shannon. 1996. "Farmers' Attitudes about Farming and the Environment: A Survey of Conventional and Organic Farmers." *Journal of Agricultural and Environmental Ethics* 9 (2): 123–43. https://doi.org/10.1007/BF03055298.

Wandersman, Abraham. 1981. "A Framework of Participation in Community Organizations." *The Journal of Applied Behavioral Science* 17 (1): 27–58. https://doi.org/10.1177/002188638101700103.

Whatcom County. 2021. "Whatcom County Property Tax Reduction Programs." 2021. https://www.whatcomcounty.us/DocumentCenter/View/7038/Open-space-information-sheet.

Wyant, James G, Richard A Meganck, and Sam H Ham. 1995. "A Planning and Decision-Making Framework for Ecological Restoration." *Environmental Management* 19 (6): 789–96. https://doi.org/10.1007/BF02471932.