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Transboundary Watershed Management in the Fraser Lowlands:  
Bertrand Creek and Fishtrap Creek

By

Ryan Anaka

Accepted in Partial Completion  
Of the Requirements for the Degree  
Master of Science

Kathleen L. Kitto, Dean of the Graduate School

ADVISORY COMMITTEE

Chair, Dr. Patrick H. Buckley

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## **MASTER'S THESIS**

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Ryan Anaka  
November 8, 2012

Transboundary Watershed Management in the Fraser Lowlands:  
Bertrand Creek and Fishtrap Creek

A Thesis  
Presented to the  
Faculty of  
Western Washington University

In Partial Fulfilment  
Of the Requirements for the Degree  
Master of Science

by  
Ryan Anaka  
November, 2012

## **Abstract**

Bertrand Creek and Fishtrap Creek are transboundary watersheds located in the eastern portion of the Fraser Lowlands border region. Population growth, land use practices, and urban development in British Columbia (BC) and Washington (WA) are pressuring surface and groundwater resources. As a result, questions of transboundary watershed management have arisen. Management of transboundary water resources creates dynamic governing scenarios, as mismatched levels of government and regulatory fragmentation both within and between neighbouring nations results in a confusing governing scenario. Consequently, cooperation between nations regarding transboundary resource management may be difficult to formulate. However, this thesis is based on the assumption that successful transboundary resource management can result from the existence of social capital. A research questionnaire was undertaken with watershed management specialists from BC and WA to test four hypotheses pertaining to social capital and cooperative management of small scale transboundary watersheds in the Fraser Lowlands. The four hypotheses are: is there evidence to support the existence of substantial transboundary social capital; is there evidence for a preferred structure for transboundary governance; are there cultural or social differences resulting from the border; and, does the existence of social capital outweigh differences resulting from the border. While it is impossible to directly measure levels of social capital, it is possible to investigate for indicators in support of the existence of social capital, by testing for differences and similarities between BC and WA responses. The research results indicated evidence in support of the existence of social capital. It identified a mixed approach to governance as the preferred structure, and that there are social and cultural differences resulting from the border. Evidence supporting the existence of cognitive and structural social capital within this border region could be interpreted as an indication of a setting open to collective action.

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## **1.0 INTRODUCTION**

The Canadian-American border separating British Columbia and Washington State was placed on the landscape with no regard to the physical or ecological geography. While the border does not directly control ecological features; political, social and economic relations are defined by it. Accordingly, the management and use of ecological landscapes is constrained through these border relations.

Two relatively small watercourses, Bertrand Creek and Fishtrap Creek flow south from British Columbia (BC) into Whatcom County, Washington (WA). These two watercourses represent transboundary ecological entities subject to multiple governing bodies within and between the respective province/state in which they are located. Conflicting governing structures responsible for managing transboundary resources result in a 'scalar mismatch' between governing bodies and a fragmentation of regulatory responsibilities (Norman and Bakker 2005). This scalar mismatch is a consequence of the overlapping and often redundant levels of government and regulatory bodies not only internally within each nation and province/state, but also externally between opposing nations or provinces/states. The resulting management scenario can be one of confusion, both internally within each nation and/or province/state and externally between nations. This research addresses the need for cooperative transboundary watershed management, and the process by which this should occur.

### **Hypotheses**

This thesis is based on the assumption that successful transboundary resource management can result from the development of social capital. It tests four hypotheses related to evidence for or against the existence of substantial social capital. First, I hypothesize that evidence for the existence of substantial social capital is present in this transboundary region,

which this thesis demonstrates. Second, building on the existence of social capital I hypothesize that the respondents have ideas referring to a preferred structure for governance in this region. My research identified the preferred structure to be a mixed approach to governance. Specifically the results show that the respondents believed local/regional based cooperative agreements will prove to be effective; that a single organizational framework may be required for information sharing; and, incentives such as regulatory penalties may be necessary. The third hypothesis is that despite the existence of substantial social capital there is still a border effect. That is, there are substantial cultural and social differences between Canadians and Americans. I demonstrate that these differences are the result of the border. The fourth hypothesis is that there is greater evidence for the existence of substantial cross border social capital than for cultural or social differences resulting from the border. The preponderance of the evidence demonstrates that the border effect does not dominate the discussion, and as a result I am hopeful that transboundary resource management will occur in the near future.

To investigate the above hypotheses a research questionnaire was developed and the results were analyzed. Interviews focused on stakeholder's opinions pertaining to the potential for cooperative management of these watercourses and suggestions as to how such management should be executed. Questions included stakeholder/regulator knowledge of the watercourses, transboundary water management in each country, and whether interviewees believed the existing management frameworks were sufficient or whether new types of frameworks were required.

The results of the questionnaire were utilized to look for evidence of the existence of substantial cognitive and structural social capital. As noted earlier, this thesis is based on the assumption that successful transboundary resource management can result from the development

of social capital. In this paper social capital is understood to be composed of two components, cognitive social capital and structural social capital. Cognitive social capital is the existence or development of parallel norms, values, attitudes and beliefs. Structural social capital is the development of cross border social networks, information paths, and organizational structures focusing on the environmental issues at hand. While it is impossible to directly measure levels of social capital, it is possible to look for the existence of social capital through secondary indicators.

The questionnaire results, when separated by country of informant allow for a comparison of responses and the identification of agreements or differences across the border. These similarities or differences can be used in answering the question of whether or not substantial cognitive or structural social capital exists in this cross border region. It should be noted that while the results do not directly measure social capital, similarities and differences between BC and WA responses can be used as indicators of the degree of the development of social capital within the border region. Thus, evidence of the existence of cognitive and structural social capital within this border region could be interpreted as an indication of a setting open to collective action.

### **Setting**

Population growth and intensified land use in the Fraser Lowland border region has amplified the discourse surrounding the management of transboundary environmental entities. Governing bodies responsible for the management of ecological resources often overlook how impacts of development and resource use within their boundaries will impact the quality of the same resource in the neighbouring province-state. When addressing transboundary resources, such as watersheds, the fluidity of Canadian and American governing systems can impede

international management cooperation, potentially leading to the degradation of the resource in question.

Bertrand Creek and Fishtrap Creek provide a setting for transboundary watershed management as land use and development in the British Columbian portion of the watersheds is negatively impacting the resource south of the border (Figure 1). Residential development in the Canadian headwater areas of both watercourses has negatively impacted associated riparian areas through removal of vegetation and hardening of infiltration surfaces, resulting in increased flows during winter storm events and decreased dry season flows. Further, poor agricultural practices, unregulated hobby farms and industrial land use on the north side of the border has resulted in point source and non-point source pollution, impacting water quality on the south side of the border.

Samples of both Bertrand Creek and Fishtrap Creek within British Columbia and Washington have shown higher than allowable levels of fecal coliform counts and elevated levels of nitrates (Quilty 2003; and WRIA1 2010). Monitoring of the Sumas/Abbotsford Aquifer, over which Fishtrap Creek and its tributaries flow, has shown higher than allowable levels of nitrogen, identified as originating from over fertilization and improper animal waste storage within British Columbia (Mitchell et al. 2003). Development and poor storm water management practices in BC have resulted in high storm flows during the winter, and low flows in the summer months (Doug Allen Pers. Comm. 2008; Kemblowski et al. 2002). Unpredictable flows, and water quality samples outside acceptable parameters, have negative consequences downstream across the border in Whatcom County, impacting agriculture, a main economic driver in northern Whatcom County, due to its dependence on surface and groundwater for irrigation and stock watering purposes. Declining water quality and unpredictable seasonal flows

also impact Washington State's Water Resource Inventory Area (WRIA) planning as base level flows for biological and water licensing purposes are difficult to determine (Doug Allen Pers. Comm. 2008). The negative impacts on the watershed in WA, partially resulting from land use within BC, can be categorized as a transboundary resource management issue. Management of both watersheds as single ecological entities may be a solution to the negative effects that land use and development in British Columbia have within Washington.

The prevalent land use surrounding Bertrand Creek and Fishtrap Creek provides a unique example of the challenges transboundary watershed management presents. The border creates an informational 'void' or 'gap' requiring linkages or bridging between individuals and organizations (Plummer and Fitzgibbon 2006). The international setting of these watercourses creates a situation where a single 'natural' resource, differently valued in separate places and managed by two sovereign governing regimes, generates a lack of communication and knowledge sharing between each state and the stakeholders within.

Discourse surrounding transboundary watershed resource management within the Fraser Lowland Region, and resource management in general, uses themes involving the valuation of nature, as well as individuals' identification with the resource (Daily et al. 2000; Rhoads et al. 1999). How an individual identifies with a resource often dictates how the resource is valued and viewed within 'nature'. One's 'valuation' of a resource or investment into the resource can be a determining factor in the process of preservation or conservation of the resource (Amigues et al. 2002; Kotchen and Reiling 2000).

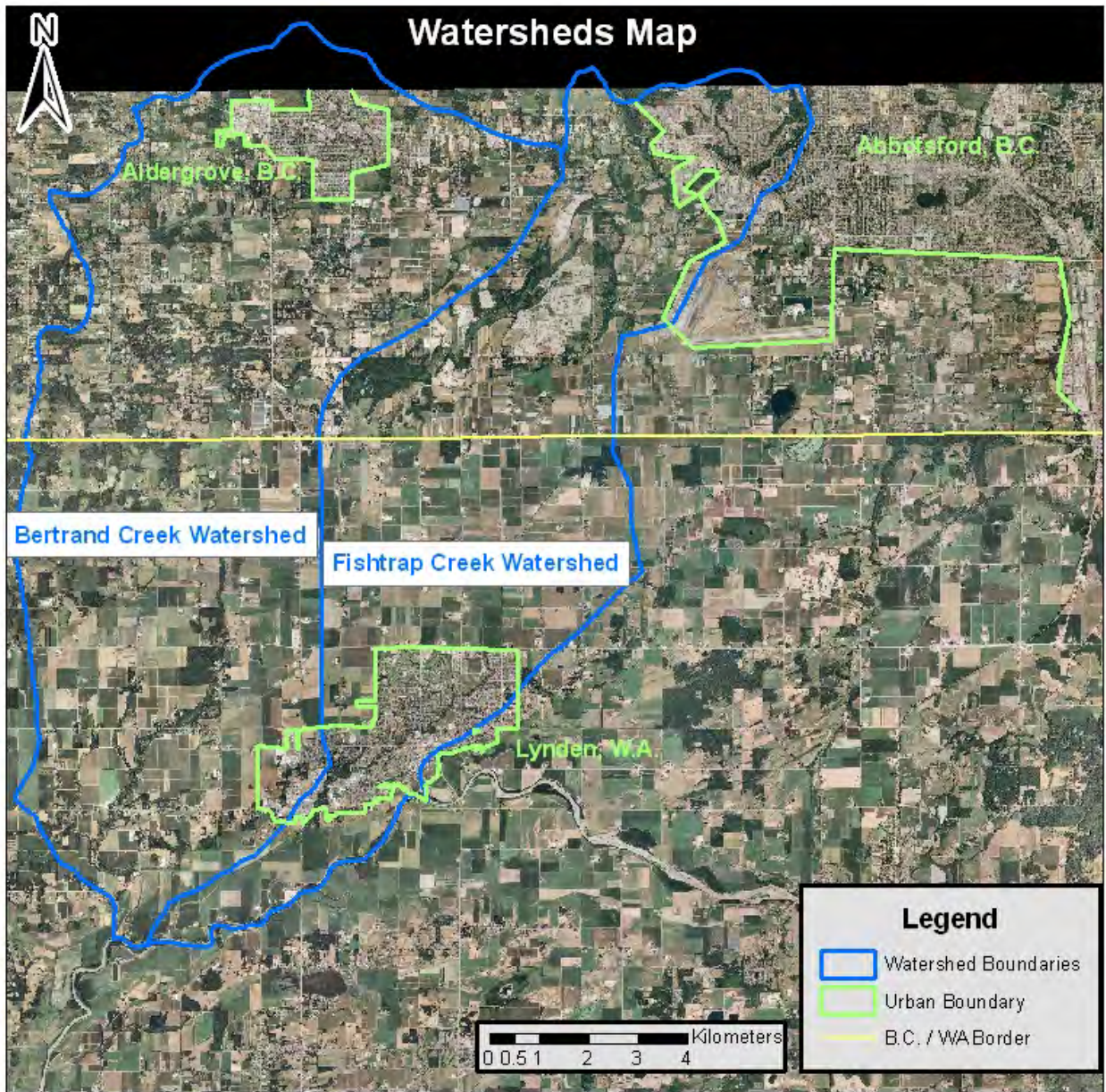


Figure 1. Bertrand Creek and Fishtrap Creek in southwestern BC and northwestern Washington.

Existing transboundary watershed management frameworks such as the International Joint Commission (IJC) at the federal level or the Environmental Cooperation Agreement (ECA) and coinciding Environmental Cooperation Committee (ECC<sup>1</sup>) between British Columbia and Washington do not specifically encompass small resources such as Bertrand Creek and Fishtrap Creek. It is often debated whether top-down, bottom-up, or mixed governance is the most efficient approach to transboundary resource management. The IJC appears to be too distant and overarching, while the ECC, as of yet, has not addressed either watercourse. Because of the complex organization of environmental and political systems, stakeholders and regulatory officials question whether existing management techniques are sufficient for long-term ecological health while still utilizing the resource.

Beyond testing the hypotheses, the research also provides utility as it identifies the opinions and knowledge of pertinent agencies and individuals in British Columbia and Washington relating to transboundary watershed management. By doing so, potential pathways for successful transboundary management may be illustrated for future researchers or regulatory officials undertaking transboundary communications. While the main focus of this research is to explore issues and suggest solutions surrounding small scale transboundary watersheds within a particular region, the general theme of transboundary environmental governance between Canada and the United States may be analogous to other transboundary issues, here and in other borderland regions.

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<sup>1</sup> While this research was being completed the ECC discontinued functioning as a transboundary organization. As it was still in existence during the period when the majority of the research was completed, it is discussed as an existing mode of information sharing and management.



## **1.1 Research Method**

Interviews of regulators and stakeholders involved in transboundary watershed management in the Fraser Lowlands were completed to determine regulator and stakeholder knowledge of, desire for, or preferred method by which transboundary watershed management should occur. Interviews were completed with a mixed design questionnaire that combined qualitative and quantitative research methods for data collection and analysis with the purpose of obtaining knowledge from experts within the field of transboundary watershed management. The questionnaire was designed to test the four hypotheses described in the previous section. This included specific questions in the following areas:

- a) Determine if the issues surrounding these watercourses warrant a transboundary management initiative;
- b) Identify the level of government at which transboundary watershed management should occur;
- c) Identify some of the obstacles to transboundary water management;
- d) Identify the existing local and regional capacity for transboundary watershed management; and,
- e) Identify potential cooperative management options.

The questionnaire consisted of 19 Likert scale questions, one ranking question and seven short answer questions. Of the Likert scale questions two used a six option ranking system while 17 used a five option ranking system to determine the interviewee's level of confidence in the given statement. For comparison purposes, the results of the six option questions were translated into five option questions. Questionnaires were completed either in person, by email, or over the phone. Initial interviewees were identified through contacts involved in transboundary watershed management, while further individuals were identified through a modified snowball approach. The modified snowball approach involved asking interviewees to identify individuals they felt

should be interviewed. Potential sources were then cross referenced with individuals already contacted. If an individual had not been contacted, an indication of interest was sent out by email.

Interview results were analysed with the Mann Whitney U test, and the Wilcoxon Signed Rank test. The Mann Whitney U test was used to test for significance between samples, and the difference between WA and BC results. The Wilcoxon Signed Rank test was used to test for significance between clustered questions. Further explanation of the statistical methodology is located in Section 3: Data Analysis.

## **1.2 Organization of Thesis**

This thesis is arranged in four specific sections; Section 1.0: Introduction, Section 2.0: Situational Review, and Section 3.0: Data Analysis, and Section 4.0: General Discussion.

## **2.0 SITUATIONAL REVIEW**

Transboundary ground and surface water resources present a challenging resource management situation. The British Columbia and Washington border, while porous to environmental features, acts as an informational barrier for regulatory policy and management regimes in relation to environmental resources. A lack of knowledge regarding what the ‘other’ is doing can slow regulatory activity in one’s own region (Doug Allen Pers. Comm. 2009). Accompanying this, divergent government structures and differing levels of regulatory agency control make for a ‘scalar mismatch’ within and between nations sharing watershed resources (Norman and Bakker 2005). This scalar mismatch results from the multitude of interwoven governing bodies and regulatory requirements. Confusion within nations regarding levels of governance and regulatory control is not uncommon, let alone between nations. Differing government structures, such as Fisheries and Oceans Canada, and the BC Ministry of the Environment in Canada, and the Washington State Department of Ecology and the Federal Environmental Protection Agency in the United States, accompanied by insufficient communication networks has contributed to muted dialogue between resource governments and stakeholders within border regions. This lack of communication interrupts and thwarts the development or implementation of international management agreements, potentially leading to the degradation of the resource in question through failure of decisive action.

Historically in this Canadian/American borderlands region transboundary environmental management has originated from the central government, with little stakeholder input (Alper 2004). Communication across the border between stakeholder groups or NGOs could result in

communication pathways through which government agencies<sup>2</sup> could gain information regarding the watershed outside their boundaries (Day and Calbick 2008; VanNijnatten 2006). However, there are multiple views or arguments prevalent when examining transboundary watershed management<sup>3</sup>, as differing approaches to transboundary environmental management often reflect the dominant discourse of an individual's research. Recent literature has discussed the merits of stakeholder input and non-governmental organization's (NGO) partnerships with similar cross border organizations as tools which increase the success of transboundary environmental policy development, which could potentially result in the transition from top-down to mixed arrangement for governance (Alper 2004; Day and Calbick 2008; Kenney 1999; Loucky, Alper D. and Day 2008; VanNijnatten 2006)<sup>4</sup>.

A potential link between borderland regions, and the individuals and organizations within them, can be found in social capital theory. According to the World Bank (1999), social capital encompasses the relationships and norms of individuals and institutions. These relationships and norms guide and shape the quality and quantity of society's interactions, not only moulding but also bonding them (The World Bank 1999). In addition, social capital both results from and creates ties and linkages through exclusive social relationships within homogenous organizations, and to a lesser extent between heterogeneous organizations (Putman 1995)<sup>5</sup>.

Social capital can be recognized as the collective value of social relationships and networks, in

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<sup>2</sup> Governmental regulatory agencies are referred to throughout this document. For the purpose of this paper, regulatory agencies are governmental agencies in charge of policy development and enforcement, at the provincial/state or federal/national scale.

<sup>3</sup> Throughout this document the term 'management' should be read as the formation and implementation of environmental policy, regulation and law.

<sup>4</sup> Within this paper watershed management organizations are assumed to be NGOs made up of various stakeholders, and which convene periodically to examine local watershed issues, develop management plans and promote regulatory policy change.

<sup>5</sup> Organizations involved in management of transboundary environmental issues, specifically watershed management, can be identified as coalitions, initiatives, advisory groups, committees, or task forces made up of non-governmental representatives.

reference to how networks and relationships operate to ‘bond’ or ‘bridge’ between homogenous or heterogeneous, respectively, individuals or groups (Putman 1995). However, the border between British Columbia and Washington acts as a barrier to these institutional relationships. Woolcock (2001) addresses voids between organizations, inferring that social capital creates linkages that can reach externally outside homogenous or heterogeneous organizations to members of international organizations. Transboundary linkages created from social capital then allow for a flow of information between transboundary organizations, resulting in knowledge growth between and within given organizations. Within the Fraser Lowland borderland region, transboundary linkages between stakeholder groups, NGO’s or governing bodies involved in transboundary watershed management could result in increased cooperation, opened communication pathways and strengthened relationships, potentially leading to changes in regulatory policy.

To assist with cooperation between transboundary NGO’s and government organizations, transboundary watershed management research must include an examination and understanding of the ‘other’s’ setting (Browning-Aiken et al. 2004). This section reviews the political and physical setting of transboundary watershed management in the Fraser Lowlands borderland region while also examining research techniques employed by others investigating transboundary resource management. Regardless of the position of NGO’s or government organizations, the following three predominately linked fields should be understood and incorporated into transboundary resource management discourse:

- the physical and political setting of the borderland region;
- the role of sovereignty of the region; and,

- the valuation of the resource by each governing organization and stakeholder unit.

Understanding and incorporating these three points, allows one to begin to understand the political and social setting the transboundary resource is situated in. Knowledge of a region's political and social setting provides knowledge regarding the limitations of an opportunity for transboundary cooperation, or at least conflict avoidance (Uitto and Duda 2002; Blatter and Ingram 2002). By investigating these points within the Fraser Lowlands borderland region, difficulties that stakeholders and governing organizations encounter will become prevalent, and knowledge necessary to support cooperative management will be gained.

Cooperation between neighbouring governing bodies, of a shared watershed, is a common underlying theme within the literature examining transboundary watershed management. Sovereign nations or states have duties and obligations in relation to transboundary watershed management (Draper 1997). According to Draper (1997), when sovereign nations or states enter discussions concerning watershed 'sharing' they are responsible for the following:

- truthful and open negotiations;
- forthcoming data and information exchange;
- equal use of the resource; and,
- prevention of unreasonable harm.

While not explicitly stated in a 'global' document dictating how environmental resources should be managed by international bodies, these duties are guidelines laid out by various international bodies that guide nations when forming international water management agreements (Draper 1997). By following these international guidelines it appears that cooperation would be automatic. However, transboundary resource conflicts are prevalent

worldwide, indicating that more than guidelines are necessary. Draper's (1997) use of 'sharing' appears to imply a friendly agreement over watershed use rather than regulated use driven by conflict. To uphold cooperation in transboundary ecological management, cooperation would likely need to be formulated through memorandums of understanding or constitutions and by focusing on clear regional issues (Pedynowski 2003, Mitchell 2004). Such formalized cooperation should build trust in outcomes, increased information sharing, long-term continuity between stakeholders and regulatory agencies, across borders, and a commitment of government resources to collaborative management processes (Pedynowski 2003).

## **2.1 Theories Surrounding Transboundary Policy and Regulation Development**

To analyze transboundary watershed management between WA and BC, frameworks of interaction between stakeholders, regulators and governing bodies should be identified. It is important to categorize the method by which management is approached, whether it is the result of conflict, or desire to avoid resource degradation. Management of transboundary resources can be separated into three Modes of Interaction: crisis/reactive, state-centric and normative constructive (Alper 2004). Each approach to management is often dictated by the political and social setting of the resource, the pressure on the resource, and the valuation of the resource by stakeholders and regulators (Uitto and Duda 2002).

The crisis/reactive and state-centric methods of interaction are similar in that both realize significant governmental control, i.e. management through legislated organization and regulatory control. A crisis/reactive method of interaction involves a governing body following legislative framework or regulatory guidelines to command resource in response to conflict fuelled by environmental degradation. In contrast, the state-centric mode of interaction is one that realizes national or sub national governments as the guiding force for transboundary environmental

initiatives, in response to perceived future environmental degradation. This mode also recognizes the importance of nongovernmental input into the transboundary regulatory process. The normative-constructive mode of interaction is one that examines and puts value on the discourse, social norms, and ideals of stakeholders involved in transboundary environmental interaction. With normative-constructive interaction the relationship between vested individuals is defined through common ideals and motivation, rather than the material interest of the resource as found in a crisis reactive approach (Alper 2004). A balance of ideals, motivation, and material interest in the resource seems to fit a state-centric mode of interaction.

In a state-centric mode of interaction national and provincial/state governments use their regulatory authority to govern transboundary resources. Government control and protection of resource sovereignty are identified by Scott (1999) as an important reason for successful transboundary environmental management. Federal level regulation and political will should have the political ability to maintain national sovereignty while sharing transboundary resources (Scott 1999; Springer 2007). While the personal relationships, trust and leadership identified by Alper (2004) or Lubell (2004) are not discounted by Scott (1999), the emphasis of a state-centric mode of governance is not based on small scale community interaction and knowledge development of a normative/constructive scenario, but instead at a large scale central or state government regulatory command and control setting. The increased emphasis and acceptance of stakeholder input into policy development and regulation can be identified as a transition from an old to new, state-centric to normative constructive, mode resource of management (Alper 2004; Forino 2006; and Singleton 2002).

Significant pressure on a valued resource and resource degradation usually results in crisis/reactive interaction. Crisis/reactive interaction is the product of negative impacts to the



resource resulting in resource degradation, and usually results in a top down, regulatory control governing scenario. However, it can be driven through ground up stakeholder discourse regarding resource degradation. The role of central government interaction in reaction to resource degradation is touted by Ali (2004), who feels that central governments should have enough knowledge, or the ability to garner knowledge, to realize when resource degradation is occurring.

Knowledge of a potential environmental crisis, when combined with the legislative strength and technical resources of central governments, should be sufficient to mitigate resource degradation and potential for conflict (Ali 2004; Uitto and Duda 2002). Avoidance of resource degradation and potential conflict following central government intervention often requires one user to accept a less than desirable level of resource exploitation (Berkes et al. 2006; Zeitoun and Allan 2008). Knowledge required for central government interaction is sourced from researchers and often stakeholders at the ground level, which create scientific and social ‘epistemic communities’ for knowledge sharing that can lead to convergence on shared resource management (Pahl-Wostl et al. 2011). Within this paper epistemic communities are defined as groups or individuals with similar levels of knowledge and shared norms regarding transboundary watershed management. The shared norms and knowledge originate from common practices within their professional expertise regarding a common resource.

Epistemic communities for knowledge sharing and interaction can often circumnavigate political roadblocks impeding transboundary cooperation and become a catalyst for cooperation (Ali 2004; Alper 2004; Uphoff and Langholz 1998). A normative-constructive approach to transboundary resource interaction is one where (E)NGOs and stakeholders share similar perspectives and social or ecological values (Alper 2004). Networks between transboundary

stakeholders, based on trust and shared knowledge, can act to bridge the void created by political borders allowing for information to be dispensed upwards to governing bodies. In short, community level stakeholder groups can act in an advisory role to regulatory agencies.

The development of community based watershed management groups, involving local residents and organizations, allows citizens and stakeholders to become educated on the ways in which both rural and urban communities impact watershed ecology (Litke and Day 1998). An understanding between rural and urban, as well as other stakeholders, is a crucial aspect for inciting trust and cooperation surrounding transboundary resources (Alper 2004; Lubell, 2004; Singleton 2002; and Norman and Bakker 2005). It is necessary for an understanding between urban and rural, not only to build trust and understanding between stakeholders, but to also assure accountability of government and stakeholders alike. A lack of understanding and trust between individuals can severely hinder collaborative management of shared resources (Singleton 2002). Lubell (2004) argues that ‘trust, networks and other forms of social capital’ must be formed between stakeholders and regulatory agencies. Koontz and Thomas (2006) also emphasize the importance of trust, legitimacy of the cause, and social capital in their examination for successes of collaborative management, in relation to environmental outcomes relative to the ‘old’ state-centric command and control methods of policy development and regulation.

An increased emphasis on collaborative management between like epistemic communities is the result of new (transboundary) environmental management problems that do not appear resolvable through traditional regulatory methods (Koontz and Thomas, 2006). Collaborative institutions offer the ability to overcome “standardized policies (that) have difficulty in taking into account the idiosyncratic nature of problems within a specific area”

(Lubell 2004). Koontz and Thomas (2006), report that a normative approach can be a successful response to regulatory and policy stalemates. The normative, collaborative approach to management can be viewed as more democratically accountable than 'old' adversarial approaches and allow for citizens to feel a greater capacity for self-governance (Webler, 2003).

Increased communication between partners, involving workshops, public announcements and presentations, that include face to face dialogue, feedback between community groups, NGO's and governing bodies increases the level of trust between stakeholders, thus leading to a more holistic management program (Litke and Day 1998). By increasing communication between stakeholders in the periphery and those located within urban areas, a realization of the others views and wants which should allow for adaptive management strategies and cooperation rather than regulatory command and control, a method does not appear applicable when discussing interacting sovereign nations. An emphasis on a normative constructive approach appears to focus more on preventing resource degradation and emphasising social responsibility rather than a reaction to degradation, and includes greater levels of information sharing and lower level stakeholder input, compared to a crisis/reactive approach.

Koontz and Thomas (2006) indicated that a lack of community level results physically appearing on the landscape, in addition to a lack of trust and information sharing between stakeholders, could generate frustration for collaborative watershed groups. In their case study Koontz and Thomas (2006) identified that impacts or outcomes from the organization's work was identified as commonly indirect; occurring only when knowledge gained was filtered up through the regulatory agencies resulting in a dissolved, often less than satisfactory result. So while Koontz and Thomas (2006), much like Alper (2004), found that collaborative management driven by community cooperation and knowledge sharing did lead to successful resource

management outcomes, measured as ongoing interaction and shared resource use, they also identified that an overarching state power was necessary for any changes in policy or regulation of environmental impacts. This appears to indicate, as Alper (2004) suggests, that the evolving framework surrounding transboundary resource management is one in which government actors are increasingly aware of and influenced by “...community based activities supportive of shared ecological beliefs, a common vision and collective identity”.

Ground level activism, stakeholder input, and coalition formation appear to be valuable characteristics of successful transboundary management. This model allows for diffusion of social norms, growth of trust and exchange of knowledge. However, without governmental overview and input, formal policy and regulation policy development guiding the use and protection of a transboundary resource is not possible (Springer 2007). According to Alper (2004), a shortfall of the normative-constructive approach to transboundary resource management is that too much distinction is often made between the regulatory governing body and individual stakeholders. It should be understood that while the majority of the emphasis is on community collaboration and knowledge sharing, central government involvement is necessary for the implementation and regulation of policy. A balance of normative-constructive and state-centric resource interaction is necessary for successful and efficient transboundary resource management (Alper 2004).

## **2.2 Borderland Regions**

Identification and recognition of borderland regions is essential to the idea of environmental transboundary cooperation (Scott 1998). Social structures, communication networks and cultural norms within borderland regions can assist in facilitating transboundary environmental cooperation (Verwijmeren and Weiring, 2007). Morris' (1999) description of

‘borderland regions’ as areas in which borders are not seen as a barrier to information or physical movement creating a like transboundary regional identity, can be applied to a portion of the Fraser Lowland geographical region. The Fraser Lowlands as a whole cannot be defined as a border region, as differing development patterns result in cultural and social differences across the border. For example, the cities of Vancouver and Surrey, BC are far larger than those south of the border, leading to economic, social and cultural differences. However, the eastern portion of the Fraser Lowlands does fall within the border region theory. A comparison of the Abbotsford and Langley BC areas with that of Lynden WA and surrounding areas, identifies similar agricultural based economies and shared historic cultural backgrounds.

Morris (1999) introduces the idea of regions sharing a regional distinction; cultural, social and environmental resources across a border as ‘borderland regions’. Within his paper, Morris (1999) examines the Montana-Alberta borderlands region for regional epistemologies and the way in which the border shapes local, national and regional identities. In doing so, the issue of transboundary resource use and management is addressed. For Morris (1999), an important part of realizing borderland regions is the recognition of the political boundary (the border) as an “international divide imposed on local spaces by external forces”. This concept is striking when discussing transboundary environmental management, in that it recognizes the border not as a physical object isolating each nation, but as a political entity that has been placed on the landscape. This political barrier isolates physically connected regions. However the social capital found in these regions, sourced from like cultural norms, shared regional identities and parallel social structures, often bridges the void created by the political boundary creating a borderland region.

In recognizing the similar geographical nature of regions separated by political borders and describing these regions as borderlands, Morris (1999) argues that discourse constructing nationalism can be broken down, allowing for a new method of governance; what he refers to as a post-national approach. A post-national approach will recognize the importance of boundaries in the role of sovereignty, but will allow for the creation of 'bi-national' or 'non-national' geographies distinguishing these areas as unique. As a result, the idea of regionalism is founded on local interpretations as much as national, and that nationalism provides the framework by which borderland regionalism is developed (Morris 1999).

Informal relationships between border regions driven by local identities, regional self-awareness and local epistemologies play a major role in the construction of cross-border regionalism (Scott 1999). Scott's (1999) cross-border regionalism mirrors Morris' (1999) definition of borderland regions or cross border regionalism. Scott (1999) argues that recognition of cross border regionalism can effectively supplement cross border management issues as it operates as 'political regulator' at the individual community or resource level. Movement away from state-centric "...advisory agencies representing national governments..." management has begun to occur with the recognition of cross border regionalism in both North America and Europe (Scott 1999). For this transition to occur, management of transboundary resources within borderland regions should involve actors from local, regional and national stages. These actors must recognize that uneven population expansion and economic growth within a border region will lead to greater impacts on transboundary resources, often impacting one user of the transboundary resource greater than another. Accordingly, increased organization of cross-border regional areas, and further political recognition of informal discussions with cross-border regions is necessary for transboundary environmental management evolution (Scott 1999).

Borderland regions necessitate government interaction between states and nations as ecological, environmental and economic resources are shared (Alper 1996; Widdis 1997; Scott 1999; Sparke 2000). Scott (1999) addresses the idea of cross border regionalism as a new form of governance for borderland regions. The idea of sub-national governments operating at an international level to facilitate cooperative cross border cooperation is also echoed by Alper (1997). It is important to note that cross border regionalism is dependent on the individual variables of a given region and that institutional definition or formation of a cross border region is unlikely to be successful (Scott 1999). That being said, transboundary interaction guided by regional governments, and invested stakeholders can overcome the lack of connection and ineffectiveness that occurs when overarching upper level regulatory bodies attempt to facilitate cooperation on small watersheds mired in regional ecosystem and political issues (Mitchell 2005; Plummer and FitzGibbon 2006; Lubell 2004). Cross border regionalism is the result of regulatory operatives working at regional spatial levels unlike traditional federal level international arrangements. In doing so, local, regional, and central stakeholders become involved.

As mentioned previously the eastern micro region of the overall Fraser Lowlands is a homogenous geographical environment, linked across the border socially, economically and culturally (Alper 1996). The region's distinct identity and strong north south interconnectedness often removes the idea of an international boundary from one's mind (Konrad 1992). Overarching upper level governing bodies designed to facilitate cooperation on small watersheds may be ineffective due to a lack of connection to regional ecosystem issues (Mitchell 2005). However, if communication networks between stakeholder groups and hierarchical level of

governments form, the gap created by the border and differing government levels may be bridged.

### **2.3 Historical Political Differences**

Shared management of transboundary environmental resources between Canada and the United States offers a challenging governing situation. Differing historical foundations of each nation's federal governing system, as well as potentially contrasting social values and cultural identities, influence the governing scenario dictating how transboundary resource issues are perceived and approached (Lipset 1990; VanNijnatten 1999; and Caldwell 1993). With Canada, the parliamentary system led by cabinet and majority government tends to result in benign dictatorships. In contrast, the democratic political structure of the United States, with recalls and initiatives, results in a much more participatory democracy.

Historically, America's individualistic ideology based on antistatism, egalitarian sentiments and populist beliefs led to the creation of a government with a weakened central state and emphasis on laissez-faire economics and egalitarian individualism. In Canada, a strengthened central state government with an emphasis on communitarianism, order and responsibility was derived, not so much from a common ideology, but instead from a common history, a desire for a strong state, and fear of unlimited individual sovereignty (Lipset 1990). This historical base of each nation's governing system may provide an explanation for preferred structures of governance as indicated in my research results.

While historically divergent and originating from differing ideals, the Canadian and American governments are now both decentralized federations, with the responsibility for regulatory control falling to the Provincial or State levels. The fluidity of each country's governing system makes it difficult to compartmentalize the individual structures to compare and



contrast. However, it is apparent that convergence of governing ideals and social traits appears necessary for governing structures and stakeholders to manage transboundary watersheds effectively and efficiently, as a single entity (VanNijnatten 1999; Lemarquand 1993; and VanNijnatten and Boychuck 2004).

Cooperative management occurring at the regional level has not always been the norm. Through the 1970's and 1980's transboundary environmental interaction and policy formation occurred in a state-centric realm. However, in the early 1990's a movement towards regional, state/provincial cross border management occurred (Alper 2004; and VanNijnatten 2003). Three significant elements have supported the move from national level governance to regional level of governance of transboundary water resources. These elements are, the offloading of environmental regulatory responsibility from federal to state levels in the US, increasing urban growth along the border, and increased environmental awareness and potential conflict (VanNijnatten 2006).

Ideological convergence regarding transboundary issues through the organization and cooperation of regulatory and stakeholder individuals, belonging to like epistemic communities is touted as being the strongest driver in the formation of bi-national transboundary institutional frameworks (Alper 2004; Louky and Alper 2008; Fraser 2008; and VanNijnatten 2006). The transfer of responsibility from the federal to the state level, allowing for sub-national participation and policy convergence, was a major key in the success of the ECC, as it allowed for the recognized validation of state/provincial agreements (VanNijnatten 2003; and Alper 2004). Past success in forming the ECA, and resulting ECC, may provide evidence for future success in the formation of cooperative organizations or initiatives.

## **2.4 Regional Overview**

### **2.4.1 Local Level and Governmental Partnership Management**

A ‘scalar’ mismatch is identified as the major problem encountered when attempting transboundary water governance. The term ‘scalar mismatch’ is described by Norman and Bakker (2005) as a result of the different levels of regulatory control in either nation. International transboundary watershed management issues usually arise at the local level, while management mechanisms are a federal entity. In the words of Norman and Bakker (2005), “our systems for governing domestic and shared waters were perceived to inhibit effective transboundary water governance”. The ‘scalar mismatch’ occurring between the federal and provincial level also occurs internationally leading to a breakdown in the transboundary watershed management process. For Norman and Bakker (2005), the idea of cooperation between national and international organizations is of the utmost importance for successful and efficient transboundary watershed management. Drivers for cooperation between nations were identified as sufficient funding, adequate networks, and good interpersonal relationships. These results echo those of Leach and Pelkey (2001), as does Norman and Bakker’s theory that these drivers are best utilized at the local level allowing for issues to properly emerge prior to governmental regulatory agency involvement.

Leach and Pelkey (2001) carried out an empirical review, searching for factors that affect development and management of watershed partnerships. Two main characteristics appear from their work as important for the successful development and operation of NGO watershed management: (1) a balance of the groups’ resources within tasks undertaken and (2) a partnership structure that is “flexible and informal”. Watershed partnerships for Leach and Pelkey (2001) should be distinguished from ‘watershed groups’ as they argue that, watershed partnership

should be promoted as a NGO alternative or resource for government controlled regulatory agencies.

Watershed partnerships, according to Leach and Pelkey (2001), are composed of environmental agencies, industry, commercial and agricultural stakeholders, as well as representatives of governmental regulatory agencies. The presence of regulatory agencies within the partnerships is what leads to success, Leach and Pelkey (2001) believe, as they provide managerial assets, one of the most important steps for a successful partnership. Six accompanying major themes necessary for a successful partnership, as identified by Leach and Pelkey (2001), are: adequate funding, cooperative and committed individuals, effective leaders, coordinators, and the proper allocation of resources within the partnership. If watershed partnerships utilize the above themes, they argue that successful management can be instigated by grass root individuals under the guidance of regulatory agencies.

#### **2.4.2 Local Level Management Guiding Government Policy Development**

Alper (1997) follows a similar vein of thought to Leach and Pelkey (2001), in that the management process should start at the community level with stakeholder input; however he argues that a larger part of the decision making process should also be moved to the regional level. He states that although both British Columbia and Washington are known for environmental activism, and often host some of the largest environmental movements globally, historically there has been a lack of cross border environmental initiative. Environmental issues were dealt with as they appeared, with little sub-national involvement; problems were usually reconciled at the federal level. An increasing emphasis is now being placed on states/provinces and municipalities when addressing trans-boundary environmental concerns, as cultural, economic and environmental interdependence of the region is growing due to 'globalization' and

population expansion. However, due to the current political setting international interaction surrounding transboundary environmental issues and policy development is the responsibility of federal regulatory agencies. In response, it is argued that at the regional level nongovernmental organizations/initiatives for information sharing should be formed (Wernsted 2000). These groups or coalitions would draw upon stakeholders from all levels, empowering communities, individuals and special interest groups (Webler et al. 2003). By doing so, local economic and political needs could be heard at the federal level leading to a bottom up, rather than top down management system (Alper 1997). Within the Fraser Lowlands, bottom up organization could lead to successful transboundary management, as several communities and levels of government are involved, providing opportunities for information and knowledge growth.

For Litke and Day (1998), “Outdated and inadequate modes of community planning and land and resource management at all levels of government...” have led to the impacts and degradation of watercourse and watercourse habitat within the Fraser Lowlands. The development of community based watershed management groups, involving local residents and organizations, would allow citizens and stakeholders to become educated on the ways in which both rural and urban communities impact watershed ecology (Litke and Day 1998). This is much like Alper’s (1997) and, Litke and Day’s (1998) belief that community level stewardship groups could act in an advisory role to regulatory agencies. Successful management programs are often the result of increased communication between community groups, NGO’s and governing bodies. Increased communications can be founded through workshops, public announcements and presentations that involve face to face dialogue and feedback, increasing the level of trust between stakeholders (Litke and Day 1998; Alper 2004; Mitchell 2005).

Kenney's (1999) 'watershed initiatives' involve community group and regulator interaction, similar to that described by Alper (1997) and Litke and Day (1998), at a regional level much like that as described by Morris (1999). According to Kenney (1999) a watersheds' variety of distinct users and uses requires planning to occur at a regional scale. This conclusion was framed by conducting an in depth examination of several hundred interviews pertaining to the western watersheds initiative movement. Interviewees were various stakeholders involved in watershed management in the north-western United States, including resource managers at all levels of government, members of industry, agriculture and concerned citizens. Kenney's (1999) purpose was to determine new strategies in watershed resource management, in response to current improper government led management practices that negated the role of stakeholder opinion and needs in watershed management. While this paper's research scale is much smaller, a similar conclusion could potentially be drawn, especially at the micro regional level.

Cooperation and communication, either horizontal or bottom up, between stakeholders and governmental regulatory agencies is necessary for initiatives such as Kenny's (1999) 'watershed initiatives' theory to be successful. Watershed initiatives are movements designed to properly manage aspects of watershed ecology, with respect to each water-related resource, such as water quality, riparian conditions, and aquatic species existence. Management of the multiple variables within a watershed requires a holistic approach, which most often is not conducive with organizational boundaries or normative governmental regulatory practices. In response Kenney (1999) argues that resource governance regions should be defined through environment, not political settings, while individual watercourse initiatives should be managed through stakeholder input to the government. Recognition of the linkages between stakeholders, communities and watershed resources needs to occur. These initiatives, with stakeholder input,

can then assist regulatory management of the resource while maintaining a connection to the environmentally defined region. As long as there is cooperation between individual initiatives or organizations, a bottom up management process appears to be a promising method for transboundary watershed management.

Communication and cooperation between transboundary stakeholders and regulatory agencies can result in the distribution of knowledge, potentially leading to trust between transboundary entities. NGOs involved with transboundary environmental issues are successful as information gathering, producing and sharing entities. The role they often play is to gather, analyze and distribute information, and in doing so they not only inform government officials on environmental issues, but also inform citizens of a community thereby producing better environmental stewards (Alper 1997). Even though the success of NGOs in transboundary environmental management is documented, a lack of hands on mechanisms for policy construction and environmental management hinders efforts (Litke and Day 1998). A disconnect between governmental regulatory agencies, as well as in many cases a differing of opinions on how a resource should be managed, leads to inadequate management processes (Alper 1997). Accordingly, Alper theorizes that “bilateral planning regimes” should be formed, allowing for cross border collaboration between governmental and nongovernmental entities.

## **2.5 Current Transboundary Initiatives**

The earliest exercise of government convergence between the United States and Canada, regarding transboundary watersheds was the Boundary Waters Act. The Boundary Waters Act is a formal treaty created in 1909 in response to existing and forecasted disputes and apportionment of shared boundary waters arising from rapid economic and population growth in the Great Lakes region (Lemarquand 1993). The International Joint Commission (IJC) was founded

through the Boundary Waters Act, to operate as an autonomous organization that investigates and provides solutions to disagreements over transboundary water resources (Lemarquand 1993; Hildebrand et al. 1997).

The IJC is composed of six commissioners, three from each nation, appointed by the head of each nation, the US President and the Canadian Prime Minister. When requested by both nations' governments, the IJC is responsible for investigating conflicts surrounding transboundary water resources. The IJC's role is to investigate and inform, rather than govern. A resolution can be reached between the nations using the IJC's findings and recommendations. It is important to note that IJC involvement is not always automatic and its recommendations are often not binding. Depending on the requested level of the IJC's involvement, governments have the option of following its recommendations. As a result, the IJC's strength depends directly on either government's confidence in its recommendations (Lemarquand 1993). However, as the 1975 Canadian Senate report on US-Canadian relations noted "the IJC is the oldest, is the most important, has the broadest mandate and the most notable record of achievement" when compared to any bilateral institutions (Lemarquand 1993). While participation and policy styles of nations shift from convergent to divergent, organizations such as the IJC maintain a medium of communication or method by which bi-national convergence can be facilitated when regulatory cooperation is necessary.

When dealing with obstructions or diversions the IJC does have the ability to formulate rulings, as long as there is a majority decision within (Lemarquand 1993). An IJC ruling is also required when a downstream obstruction will raise water levels at or above a boundary. This has been used twice in the Pacific Northwest, between Washington and British Columbia, on the Skagit River (Ross Lake Reservoir) in the 1970's and on the Columbia River

(Franklin D. Roosevelt Lake) in the 1940's (Lemarquand 1993). The international watersheds initiatives are a relatively recent initiative undertaken by the IJC. An integrated ecosystem approach to watershed management has been implemented on four transboundary watersheds. Discussions regarding this were first undertaken in 1997, with pilot implementation occurring on the Red River and St. Croix River in 2005. The success of these initiatives is still under assessment.

During the period of the late 1980's and early 1990's, the Pacific Northwest region of North America was quickly developing and economic integration was becoming more prevalent (VanNijnatten and Boychuk 2004). Accompanying the economic development and population increases, environmental awareness within the region was also growing (Alper 1997). VanNijnatten and Boychuk (2004) argue that with economic integration, environmental policy convergence will follow. Environmental convergence will follow economic integration, as social policy, including economic policy, is linked to economic development. That is, in order to maintain existing economic links, border regions will develop convergent social and environmental policy to maintain an efficient economic relationship (VanNijnatten and Boychuk 2004).

Within the Georgia Basin/Puget Sound region, the first strong incentive for environmental convergence between Washington State and British Columbia occurred following Puget Sound being listed as a priority estuary of concern through the United States Environmental Protection Agency's National Estuary Program (NEP) (Hildebrand et al. 1997). Shortly after this, British Columbia expressed concern over the health of the Georgia Basin, and considered methods by which to manage the Georgia Basin/Puget Sound Ecosystem as whole. It was through these two actions that the idea of 'transboundary' management of the shared



ecosystems came to light (Loucky and Alper 2008). The formation of cross border linkages between British Columbia and Washington occurred due to the efforts of political leaders, scientists, NGO's and stakeholders tied to the shared tidal waters. The ad-hoc interaction of individuals, scientists and organizations belonging to like epistemic communities, concentrating on the ongoing degradation of the Georgia Basin/Puget Sound was the catalyst for the formation of the British Columbia-Washington Environmental Cooperation Council (ECC) (Alley 1998; Fraser et al. 2006). The ECC, and illustration of sub-national convergence, provided a structured, government supported entity to allow for better information sharing and knowledge distribution, as well as cooperation and therefore management of transboundary resources.

Day and Calbick (2008), Alper (2004), Alper (1997), Alper and Loucky (2008), agree that due to the dynamic nature and differing scale of environmental issues within the Pacific Northwest, cross border cooperative agreements and organizations at the sub-national level involves multiple players. As a result, organizations and agreements must have the ability to adapt to the differing geographic and economic scales. This is the advantage of sub-national cross border initiatives relative to the historical state-centric policy approach, as regional, in touch, cross-border mechanisms appear to be more flexible and willing to adjust to change (VanNijnatten 2003). 'Old' state-centric 'end of pipe' regulatory approaches did not provide the flexibility of 'new' collaborative regulations that place emphasis on pollution prevention rather than control (Forino, 2006). The Environmental Cooperation Agreement (ECA) was an example of 'new' methods of regulatory approach as it provided a forum for discussion surrounding transboundary pollution and how to prevent it, rather than strictly limiting amounts of pollution allowed.

The ECA, through which the ECC was formed, acknowledged that “...environmental concerns and impacts respect neither physical nor political boundaries ...”, and that “...complex inter-jurisdictional impacts require coordinated responses from both governments...” (ECA 2008). The agreement also stated that the province and state would “...promote and coordinate mutual efforts to ensure the protection, preservation and enhancement of our shared environment for the benefit of current and future generations” (ECA 2008) <sup>6</sup>. Interestingly, the above quote from the ECA sounds very similar to the definition of sustainability produced during the 1987 World Commission on Environment and Development, the Brundtland Commission. However, the above quote does not refer to development or preservation of resources for economical purposes. Instead it goes the opposite direction and actually uses the term ‘enhancement’, a term that could be read as the restoration of existing damaged environments (that were previously and currently used for economic purposes) as well as ‘preservation’ a term that often infers development or use for economic purposes will be prohibited.

To allow for ‘coordinated action’ and ‘information sharing’ regarding transboundary issues in the Puget Sound/Georgia Basin Region the ECC analyzed current environmental issues deeming some either high priority issues or emerging issues, and formed task forces to ‘engage agencies, stake holders or interested parties in developing solutions’ (British Columbia/Washington ECC). The resulting Task Forces were established to coordinate bilateral efforts in managing issues surrounding these areas;

- The Abbotsford-Sumas Aquifer Task Force,
- Flooding of the Nooksack River Task Force,
- Air Quality in Lower Fraser Valley/Pacific Northwest Airshed Task Force,

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<sup>6</sup> It should be noted that at the time of this research the ECC was still functional as a transboundary organization. However, this is no longer the case. While no exact reason for its demise has been identified, it was likely due to the lack of financial resources required to compensate government staff for their time and involvement with the ECC.

- BC-Washington Coastal and Ocean Task Force, and
- Air and Water Quality Issues in the Columbia River Basin Task Force.

These five Task Forces are managed at the provincial/state level by the Ministry of Environment in Canada and the Department of Ecology in Washington, with input at the federal level from the US Environmental Protection Agency and Canadian Department of Fisheries and Oceans (British Columbia/Washington ECC). According to the British Columbia ECC website such importance is placed on the Task Forces by the ECC that ‘agency managers are keen to commit staff time and resources to transboundary issues’ (British Columbia/Washington ECC). However, the demise of the ECC appears to be the result of a lack of resources available to commit time and staffing to transboundary issues. While there was a desire for regional level cooperation, lack of resources appears to be a barrier for cooperation.

The formation and actions of the ECC contradict Carroll’s (1983) depiction of sub-national governments as being negligible participants in cross border environmental management activities. The positive evaluation of the ECA and ECC by Alper (1997), Fraser (2008) and, Day and Calbick (2008), also challenge Carroll (1983) as they illustrate the positive role that coalitions such as the ECC played in the foundation for policy convergence, and cross boundary environmental cooperation between regulators, researchers and stakeholders. Organizations have transitioned from ad hoc informal information sharing agreements to government supported formal bilateral agreements (VanNijnatten 2006). The ECC can be seen as an example of a formal sub-national organization that had the ability to organize international, regional, sub-national and federal officials to implement ‘preventative’ measures to mitigate against future environmental issues (VanNijnatten 2006).

The ECC was a medium for cross border information sharing through a cooperation framework that filled a void left by uninterested or underfunded federal agencies (Day and

Calbick, 2008). It represented a 'new' approach, bi-national convergence, to environmental issues as it was 'enabling, rather than regulatory' and sought to resolve transboundary issues at the regional level prior to engaging federal level resources or adversarial legalistic resolutions (Day and Calbick 2008). While this council did not have regulatory authority, it provided a type of management framework that is sympathetic to various environmental demands put on individual resources. The scientific knowledge, local understanding, and like epistemic communities allows convergence of environmental policy and regulation regarding shared resources. As a result, shared ecological entities could be properly managed as a single entity rather than divided and mismatched, potentially leading to overall resource degradation and conflict.

## **3.0 DATA ANALYSIS**

### **3.1 Introduction**

A literature review and observational analysis of transboundary watershed management alone would not be an adequate investigation into the social and political setting surrounding transboundary management of Bertrand Creek and Fishtrap Creek watersheds. To test the hypotheses identified in the introduction and flesh out the discourse and theory of transboundary watershed management reviewed in the previous sections, a questionnaire was developed to analyze the current situation relating to transboundary watershed management between Washington (WA) and British Columbia (BC) within the watersheds of Bertrand and Fishtrap Creeks (Appendix 1). The questionnaire was used to gain insight into this cross border decision making milieu by consulting practitioners and stake holders from both the public and private sectors within the political and social setting interrupted by the border.

This study is based upon the assumption that successful transboundary resource management can result from the development of social capital. Social capital can be broken down into two components, cognitive social capital and structural or network social capital. Cognitive social capital is the existence or development of parallel norms, values, attitudes and beliefs. While structural social capital is the development of cross border social networks, information paths, and organizational structures focusing on the environmental issues at hand.

This research, based upon the following questionnaire, investigates the general hypothesis that cognitive and structural social capital can be demonstrated to exist in this cross border region. If cognitive and structural social capital are demonstrated to exist within this region, then based on my assumption, it could be concluded that the setting is ripe for collective action in this region in regards to small scale watershed management.

To be clear since it is impossible to directly measure social capital by analyzing the results of the questionnaire and utilizing its secondary measures, I will be attempting to demonstrate the existence of cognitive and structural social capital is within the WA and BC border in this region. As there is no existing cooperative agreement in this region, this research is looking for precursors of social capital which could lead to cooperative cross border environmental management and collective action.

In regards to networks, the questionnaire explores different possible types by examining the response for a given questionnaire item; where preferred structures receive high value responses, acceptable structures receive neutral values, and undesirable structures receive low values. The cognitive side of social capital implies the existence of a common decision making milieu on both sides of the border. That is, no significant difference between WA and BC respondents indicates a population of individuals with similar norms, values, attitudes and beliefs in how transboundary resources should be managed. Therefore we will be testing for similarities between the responses based upon the border. If there is no significant difference between responses based upon the border then this would indicate a strong potential for the existence of cognitive social capital. Evidence for the existence of both social capital components, structural and cognitive, across the border would indicate the existence of potential mechanisms for transboundary management of these small watersheds. While a lack of such could imply transboundary watershed management of these small watersheds could be difficult.

The following sections are a description of the questionnaire design, use and analysis.

### **3.2 Questionnaire Description and Application**

Prior to completing the questionnaire the respondent was asked to indicate in what country they worked or were involved in. Respondents were asked to indicate whether they

worked in government, including the level, or the private sector, and/or non-profit conservation sector. Following the inquiry into the respondent’s background, the questionnaire began with three preliminary questions that focus on respondent’s involvement in, and ability to affect decisions regarding transboundary watershed management. Specifically the preliminary inquiry section asks the following, what is the respondent’s personal level of involvement; their organization’s level of involvement; and, their ability within their organization, to make/affect decisions regarding transboundary watershed management (Table 1).

Table 1. Preliminary Inquiry Section, Questions 1 through 3.

<b>ID</b>	<b>Questionnaire Statement</b>	<b>Identifier</b>
Q1	Please indicate the degree to which to which you personally have been involved in discussions/initiatives pertaining to transboundary watershed management.	<b>Personal Involvement.</b>
Q2	Please indicate the degree to which your organization has the ability to make/affect decisions that can improve the methods for interaction or actual transboundary solutions.	<b>Organizations ability to affect change.</b>
Q3	What is your ability within your organization to make/affect international cooperation decisions?	<b>Individual ability to affect change.</b>

Following the preliminary inquiry section, the questionnaire consists of two parts; Part 1: Watershed Management Issues, and Part 2: Open Ended Questions. Part 1: Watershed Management Issues Section consists of 16 statements, numbered 5 through 20 on the questionnaire. Due to formatting errors, the questionnaire does not have a Question 4, and Questions 5 and 6 used a six option Likert scale instead of the standard five. As a result, responses to Questions 5 and 6 were translated into a five point scale for analytical purposes. Part 2: Open Ended Questions consisted of six questions numbered 21 through 27 on the questionnaire; due to redundancy Question 22 was omitted.

Original questionnaire numbering has been maintained throughout the response analysis and discussion for consistency between this document and the questionnaire. Part 1 questionnaire statements are identified with the questionnaire number, and identifier as indicated in Table 2. Part 1 questionnaire statements 5 through 16 required respondents to indicate their level of

agreement or disagreement using a five point ascending scale, as noted questions 5 and 6 used a six point ascending Likert scale.

Table 2. Part 1: Questions 5 through 16 Statement Identification Table.

<b>ID</b>	<b>Questionnaire Statement</b>	<b>Identifier</b>
Q5	Improving transboundary watershed cooperation with British Columbia is an important priority facing Washington.	Cooperation as a priority for WA.
Q6	Likewise, improving transboundary watershed cooperation with Washington State is an important priority facing British Columbia.	Cooperation as a priority for BC.
Q7	The size (i.e. volume of water and drainage area) of the transboundary watercourse influences the necessity of transboundary cooperative management.	Influence of size on necessity for cooperation.
Q8	The size (i.e. volume of water and drainage area) of the transboundary watercourse dictates the level of government at which watershed management should occur.	Influence of size of level of managing government.
Q9	An ad hoc approach to managing Bertrand Creek and Fishtrap Creek is preferable to a regulatory approach.	Ad hoc vs. Regulatory approach to management
Q10	Existing transboundary watershed initiatives are sufficient to manage local and small watercourses, such as Bertrand Creek and Fishtrap Creek.	Existing initiatives, sufficient or not?
Q11	Management of Bertrand Creek and Fishtrap Creek through a single bi-national management entity is an approach worth pursuing.	Management through a single bi-national entity.
Q12	The watercourses are separate sovereign resources and should be managed as such.	Management as separate sovereign resources.
Q13	A transboundary watershed initiative/organization for information sharing should be created to manage these and similar scale resources.	New initiative/organization for management.
Q14	The International Joint Commission (IJC) has a role to play in the management of these two small scale transboundary watercourses.	Role of the IJC.
Q15	The BC/WA Environmental Cooperation Agreement (ECA) and Environmental Cooperation Committee (ECC) is an effective organization for the management of these transboundary watercourses.	Role of the ECA/ECC.
Q16	For successful management, it would be necessary for transboundary agreements to be binding with consequences for non-compliance.	A binding agreement is necessary for successful management.

Questions 17 and 18 of Part 1 were broken into four separate levels of government, Federal, Provincial/State, Regional District County and Municipal. The separate levels of government were identified as 17a, 17b, 17c and so on (Table 3). Using a five point ascending Likert scale Questions 17 and 18 required respondents to indicate their level of confidence for four individual levels of government at which he/she believe transboundary watershed management should occur.



Question 19 was separated into three different types of regulatory arrangements based type of governance, Bottom Up, Top Down and Mixed. The three levels of regulatory arrangement were identified as 19a, 19b, and 19c (Table 4). Using a five point Likert scale respondents were asked to indicate their level of confidence in each regulatory arrangement for the governing of transboundary watersheds. Question 20 was broken into two subsections, Drivers and Barriers to cooperation (Table 5). Within the analysis the two subsections of Question 20 are identified as 20D and 20B, D for Drivers and B for Barriers.

Table 3. Part 1: Questions 17 and 18 Identification Table

ID	Questionnaire Statement	
Q17	For Fishtrap Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.	
	Q17a	Federal
	Q17b	Provincial/State
	Q17c	Regional District/County
	Q17d	Municipal
Q18	For Bertrand Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.	
	Q18a	Federal
	Q18b	Provincial/State
	Q18c	Regional District/County
	Q18d	Municipal

Table 4. Part 1: Question 19 Identification Table.

ID	Questionnaire Statement	
Q19	Please indicate your level of confidence in the regulatory arrangement used to govern transboundary watersheds.	
	Q19a	Bottom Up
	Q19b	Top Down
	Q19c	Mixed

Table 5. Part 1: Question 20 Identification Table.

ID	Questionnaire Statement	
Q20	In the relation to the two watercourses of interest please score the listed drivers and barriers from strongest to weakest with 6 being strongest and 1 being weakest.	
	<b>Drivers</b>	
	Q20Da	Crisis
	Q20Db	Leadership
	Q20Dc	Informal Contacts
	Q20Dd	Specific Issues
	Q20De	Established Networks
	Q20Df	Transparency
	<b>Barriers</b>	
	Q20Ba	Lack of Financial Resource
	Q20Bb	Mismatched Government Structures
	Q20Bc	Asymmetrical Participation
	Q20Bd	Lack of Institutional Capacity
	Q20Be	Different Government Cultures and Mandates

Part 2: Open Ended Questions where used to present respondents the opportunity to further build upon ideas presented in Part 1, and communicate any further ideas or themes not raised in Part 1: Watershed Management Issues. Table 6 below identifies the questions of Part 2.

Table 6. Part 2: Short Answer Question Identification Table

ID	Short Answer Question
Q21	In British Columbia what organization(s) do you feel has the most influence over watershed management?
Q23	Do you feel that existing watershed protection legislation, in your own area, adequately protects these watercourses in their respective nations? (If not, please briefly describe why.)
Q24	Are you aware of any grass roots concerns/movements over these watercourses, and if so are they enough to drive political action?
Q25	Are you aware of any existing paths of information sharing between Washington State or British Columbia Regulatory Agencies, besides the BC WA Environmental Cooperation Council? If yes, please list.
Q26	Do you feel either the Canadian or American Endangered Species Act could function as a tool to spur transboundary interaction? If not, do you have any suggestions on how transboundary cooperation could be initiated, at the Federal level?
Q27	If management occurs locally, is there still a necessity for federal oversight due to the international nature of this transboundary scenario?

Overall the questionnaire tests respondent's satisfaction with current mechanisms of organization such as networking, i.e. indicators of structural social capital, while at the same time assessing alternative methods of organization currently existing or not. Secondly it looks for evidence for the existence of strong cognitive social capital based on similarities between the two groups in regards to their values, goals for transboundary watershed management of Bertrand Creek and Fishtrap Creek watersheds. The questionnaire results identify indicators of structural and cognitive social capital within the current transboundary management regime in the Fraser Lowlands border region.

The results of preliminary inquiry questions and Part 1 of the questionnaire are presented in four separate sections.

- 3.3.1 Level of Involvement and Ability to Affect Change, Questions 1 through 3.
- 3.3.2 Cooperation or Regulation, Questions 5 through 16.
- 3.3.3 Level of Governance, Questions 17 through 19.
- 3.3.4 Drivers and Barriers, Question 20.

The results and discussion of the preliminary inquiry, indicating the respondent's level of involvement and ability to affect change are located in Section 3.3.1. Section 3.3.2 contains the results and discussion of the Cooperation or Regulation analysis, focusing on the present approach and setting of transboundary watershed management between WA and BC. Sections 3.3.1 and 3.3.2 also include an analysis of the results and discussion of the analysis of five individual clusters formed from Statements 1 through 16. Section 3.3.3, Level of Governance focuses on the current and potential level and arrangement of governance. Section 3.3.4, Drivers and Barriers focuses on drivers and barriers to transboundary watershed management. Each

section includes a discussion of the results. The results and discussion of the short answer questions are located in Section 3.4. A general discussion then follows in Section 4.0.

The questionnaire was completed in three different manners; in person, over the phone and through email. Initial interviewees were recommended by known contacts within both WA and BC. Following this, further interviewees were identified through a modified snowball approach. With a modified snowball approach, following the completion of the questionnaire, individuals interviewed were requested to recommend individuals they felt would be beneficial or productive to interview (Johnson 2005; Biernacki and Waldorf 1981). When recommended individuals did not respond, or if the recommendations became circular, randomly chosen individuals from governmental or non-governmental organizations were contacted through email. These 'cold called' individuals were given the option to complete the questionnaire or recommend an individual(s) they felt would be beneficial to be interviewed. Prior to completing an interview, individuals were given a brief one page description of the research topic and an informed consent agreement (Appendix 2).

Statistical analysis was performed on the information gained in Part 1 of the questionnaire to determine if there were significant differences between responses from the individuals interviewed in WA and BC. The Mann Whitney U test was used to determine if there was a significant difference between the samples. The lack of a significant difference was interpreted to indicate that components support the existence of social capital. For small sample sizes as occur here, and when the variables are ordinal, indicating non parametric data, the appropriate test is the Mann Whitney U. The alpha value was set at 0.10, this would indicate that

there was a significant difference between the two things being compared if the alpha value is 0.1 or less and no significant difference between them if it is greater than 0.1<sup>7</sup>.

During questionnaire development several questions were designed in ‘clusters’. The questions within the clusters were organized to give insight into the responses and validate responses to previous questions. The clusters were randomly spread throughout the questionnaire, and not identified. Relationships within clustered questions were examined using the Wilcoxon Signed Rank Test. The Wilcoxon test is designed for use on non-parametric data, and compares the two related samples to test whether their underlying populations differ. The Wilcoxon Signed Rank test results indicate if the responses to issues in a cluster were significantly different.

### **3.3 Data Analysis**

Tables 7 through 16 below contain the WA, BC and combined mean, median and mode responses to the questionnaire, as well as the Wilcoxon Signed Rank test and Mann Whitney U test significance questions 1 through 16. Although the Mann Whitney U test does not use the mean average, for organizational purposes and clarity, I have reported the arithmetic means as a quick and easy way to organize and understand representative values for each group. It should be noted that not all questions received an equal number of responses<sup>8</sup> For example Q1 had a total of 21 respondents, seven for WA and 14 for BC, whereas Q15 had a total of nine respondents, four for WA and five for BC. While the direct result of decrease in the number of respondents is not immediately apparent, a reduced sample size could impact the validity of the results. The

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<sup>7</sup> The significance level of 0.1 was chosen to avoid a Type I Error, that is inadvertently rejecting the null hypothesis (that there is no difference in the samples) when in fact the null hypothesis can be accepted as there is no difference in the samples. This liberal significance level was chosen as this is a preliminary study with a small number of respondents, and I did not want to be too conservative and dismiss a relationship that may exist.

<sup>8</sup> It is important to note that in this analysis as questions begin to focus more on local issues there is a slight drop in individual answers as interviewees excused themselves due to a perceived lack of knowledge.

cause for the decrease in the number of respondents for individual questions is likely the result of respondent's lack of confidence in their knowledge or expertise with the given questions. If this is the case then the lack of response can be interpreted as a result in itself. When examining the discussion of Q1 through Q16, one should remain conscious of the number of respondents for each question.

### **Results presentation**

Sections 3.3.1 and 3.3.2 address the clustered and individual Wilcoxon Signed Rank and Mann Whitney U test results and discussion for Questions 1 through 16, using the mean, median and mode of the combined responses as well as the Wilcoxon and Mann Whitney U significance value. Section 3.3.3: Discussion of Level of Governance provides and discusses the Mann Whitney U test results for Questions 17 through 19, while Section 3.3.4: Discussion of Drivers and Barriers to Cooperation, provides and discusses the Mann Whitney U test results for Question 20. Section 3.4 provides the results to the short answer questions. Section 4.0 General Discussion, is an overall discussion of the Mann Whitney U, Wilcoxon and Short Answer Section results.

#### **3.3.1 Level of Involvement and the Ability to Affect Change**

Cluster one was designed to determine the respondent's feelings towards their level of involvement (Q1), their organizations ability to affect change (Q2), and their personal ability to affect change (Q3). As indicated by the mean, median and modes in Table 7, respondents felt the most positive towards their organizations ability to affect change, indicating that their organization had a medium ability to affect change. Respondents indicated a relatively similar feeling of confidence in their level of personal involvement, and individual ability to affect change. While relatively similar, respondents indicated a slightly greater level of personal

involvement (M = 2.67, Mdn = 3, Mo = 3) than personal ability to affect change (M = 2.52, Mdn = 3, Mo = 3). The Wilcoxon Signed Ranks test was used to determine if the individual questions within the cluster were answered in a statistically similar manner.

Table 7. Cluster 1: Level of Involvement and Ability to Affect Change

					<b>Wilcoxon Signed Ranks</b>		
					Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
Question	Number of Responses	Mean	Median	Mode	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>
<b>Q1 Personal Involvement.</b>	21	2.67	3	3		.106	.567
<b>Q2 Organizations ability to affect change.</b>	19	3.58	4	5			.007***
<b>Q3 Individual ability to affect change.</b>	21	2.52	3	3			
Significance Level, *, P ≤ 0.1; **, P ≤ 0.05; and ***, P ≤ 0.01.							

When testing to determine if respondents answered Q1/Q2 and Q1/Q3 in a similar manner, there was no significant difference, indicating that a commonality exists between responses. The Wilcoxon test result for Q2/Q3 indicated a significant difference in results, an indication that there was a significant difference in how the questions were responded to. While the Wilcoxon result for Q1/Q2 does not indicate a significant difference, the Wilcoxon test statistic is close to the alpha 0.10 cut off point. Figure 3 illustrates the negative skew of the responses to Q2, while Figure 4 illustrates the positive skew of Q3. Figure 1 illustrates the somewhat positive skew of Q1. Looking at these histograms one can understand why Q2 and Q3 are significantly different, while Q1/Q2 and Q1/3 are not significantly different. An examination of Figures 2 and 3 below, as well as the descriptive statistics for Q1 and Q2 in Table 7 indicate that individuals have slightly more confidence in their organization's ability to make or affect decisions regarding transboundary watershed management than their own individual ability. The median and mode for Q2 (Mdn = 4, Mo = 5) compared to Q1 (Mdn = 3, Mo = 3) support this

(Table 7). It should be noted that difference in confidence is very slight, likely a result of the small sample size, indicating that further study is required before a conclusion can be made.

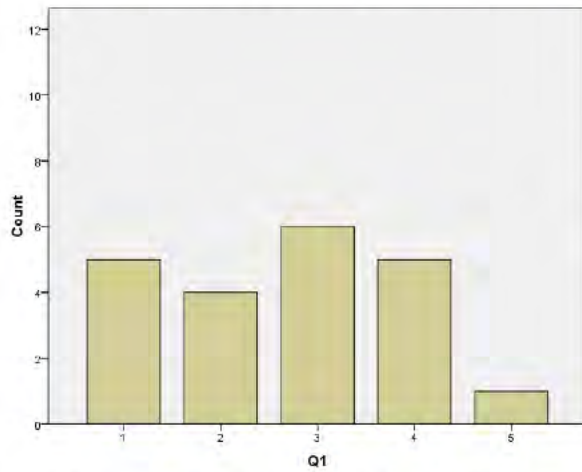


Figure 2. Combined WA and BC responses to Q1.

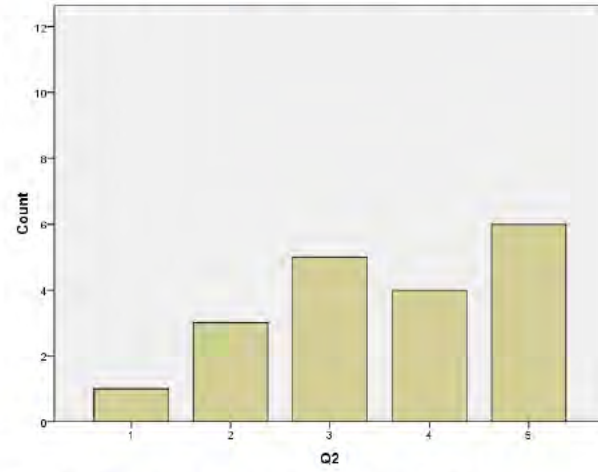


Figure 3. Combined WA and BC responses to Q2.

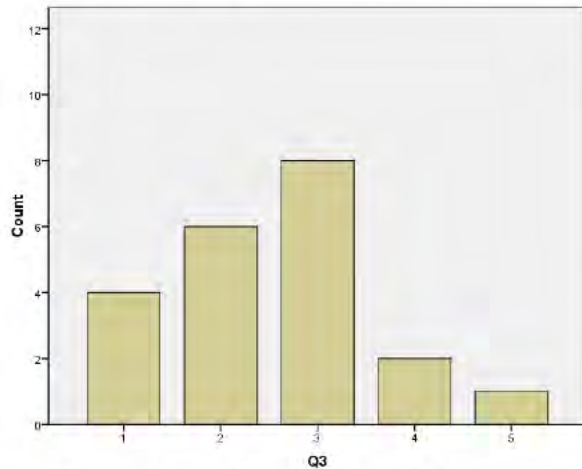


Figure 4. Combined WA and BC responses to Q3.

The graphs and descriptive statistics indicate a commonality between Q1 and Q2, when compared to Q3, in that individuals have slightly more confidence in their organization’s ability to make or affect international cooperation decisions, in comparison to their personal ability to make changes and their ability within their organization to make or affect international cooperation decisions (Figures 2, 3 and 4).



Following an examination of the responses to the statements of Cluster 1 as a whole the Mann Whitney U test was used to determine if WA and BC respondents responded to the individual statements in a statistically significant manner.

Table 8. Results of Level of Involvement and Ability to Affect Change

Cluster 1: Level of Involvement and Ability to Affect Change									
Question	WA				BC				Mann Whitney U Sig.
	N	M	Mdn	Mo	N	M	Mdn	Mo	
<b>Q1 Personal Involvement.</b>	7	3.86	4	4	14	2.17	2	1	0.002***
<b>Q2 Organizations ability to affect change.</b>	7	3.43	3	2,3,5 <sup>a</sup>	12	3.67	4	5	.632
<b>Q3 Individual ability to affect change.</b>	7	2.86	3	3	14	2.36	2	1,2,3 <sup>a</sup>	.227
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ . N = number of responses; M = Mean; Mdn = Median; Mo = Mode. <sup>a</sup> = Multiple modes exist.									

The Mann Whitney U test result for Q1 Personal Involvement indicated there was a significant difference between WA and BC responses (Table 8). WA respondents indicated a greater level of personal involvement than BC respondents. Figures 5 and 6, below, indicate the majority of respondents to Q1 have some to little personal involvement in transboundary watershed management. However, the questionnaire results indicated that WA respondents were more involved in transboundary watershed management than their BC counterparts, enough to trigger a significant difference between the two nations, as illustrated by the WA mean (3.86), median (4) and mode (4) responses in comparison to the BC mean (2.17), median (2), and mode (1) responses. The contrasting WA and BC median and modes further illustrate the difference in personal involvement (Table 8).

There was no significant difference between WA and BC responses for Q2 Organizations ability to affect change or Q3 Individual ability to affect change. For Q2 Organizations Ability to Affect Change, respondents indicated that their organizations had a medium to high ability

(M = 3.58, Mdn = 4, Mo = 5) to make/affect transboundary watershed management decisions. While for Q3 Individual ability to affect change, respondents indicated a medium to low (M = 2.52, Mdn = 3, Mo = 3) personal ability within their organization to make/affect international cooperation decisions.

To further investigate this data a Wilcoxon test was performed independently on the WA responses and BC responses. The results indicated that there was a significant difference in BC's responses to Q2 and Q3 ( $\alpha = 0.016$ ), but no significant difference in WA's responses to Q2 and Q3 ( $\alpha = 0.500$ ) (Figures 7 through 10). However, for WA, if we look at Q1 through Q3, we would see that Q1 and Q3 are significantly different ( $\alpha = 0.062$ ), but Q1 and Q2 are not ( $\alpha = 0.500$ ). For Canadians the Wilcoxon indicated that Q1 and Q3 are not significantly different ( $\alpha = 0.539$ ) but Q1 and Q2 are significantly different ( $\alpha = 0.031$ ). This can be further illustrated by the graphs split by nationality (Figures 5 through 10). The results indicated that the significant difference was due to a significant difference in BC's responses to Q2 and Q3 ( $\alpha = 0.016$ ). There was no significant difference between WA's Q2 and Q3 responses ( $\alpha = 0.500$ ). The differences between WA and BC results identified by the Wilcoxon test emphasize the variation between the nations resulting from the border.

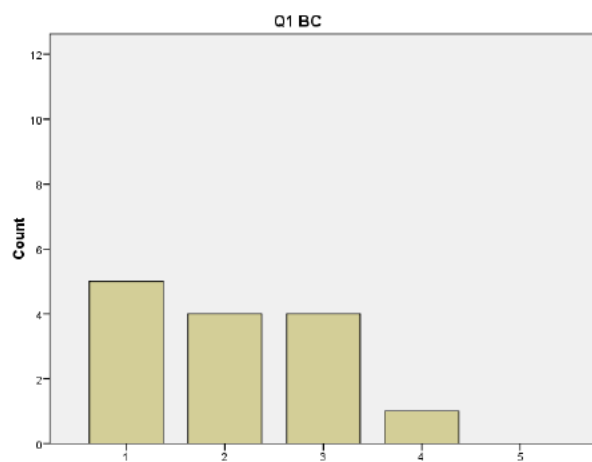


Figure 5. Separated BC responses to Q1.

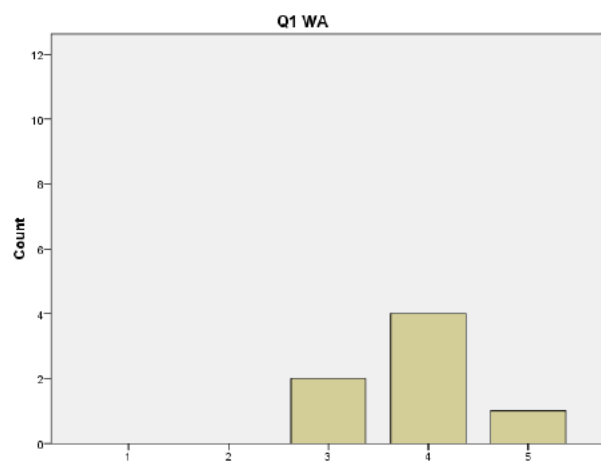


Figure 6. Separated WA responses to Q1.

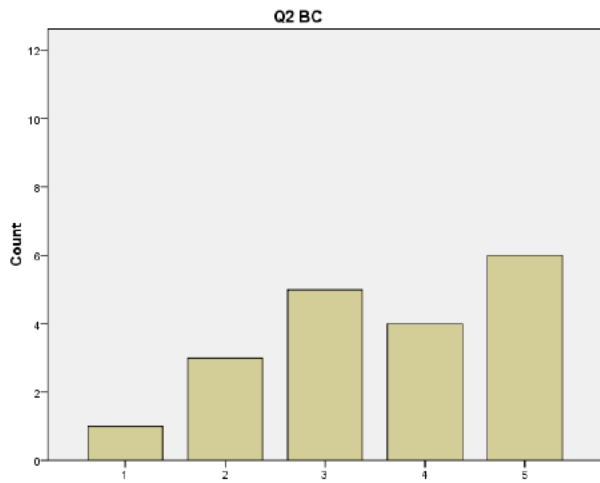


Figure 7. Separated BC responses to Q2.

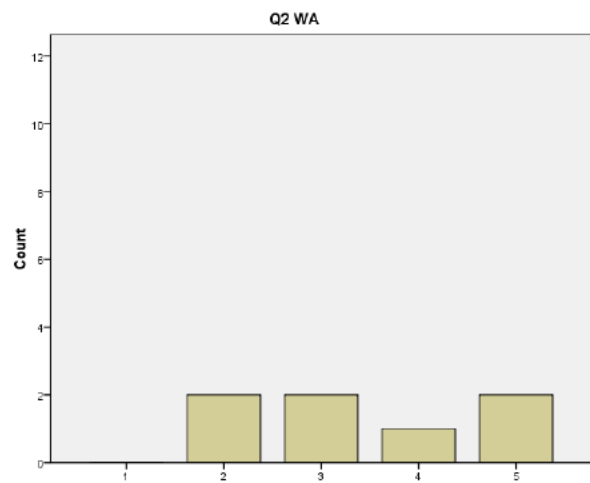


Figure 8. Separated WA responses to Q2.

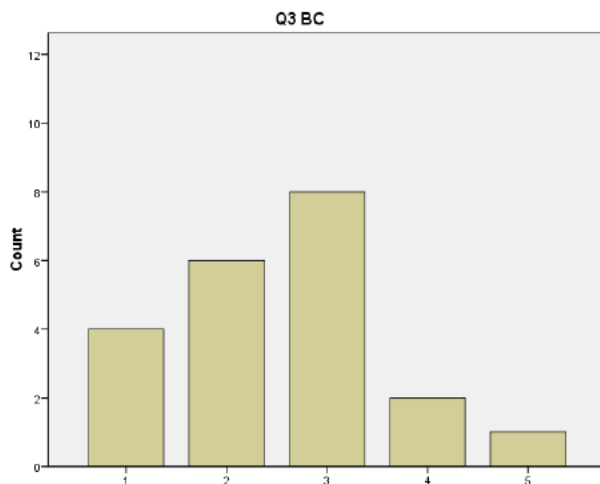


Figure 9. Separated BC responses to Q3.

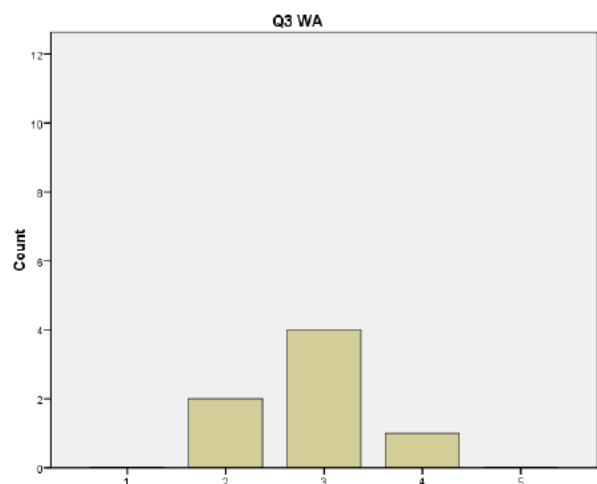


Figure 10. Separated WA responses to Q3.

Why WA respondents are more personally involved in transboundary watershed management should be addressed. A higher level of personal involvement may be the result of WA's downstream location in this specific scenario, or due to governmental organization. Being the downstream user of a watershed would likely result in a higher level of interest and involvement in the overall management of the resource (Lorenz et al 2001; Timmerman and Langaas 2005). A greater personal role for WA respondents could also be the result of a greater demand on the resource within WA, such as irrigation or stock watering, whereas in BC large portions of the watercourses flow through residential to rural residential areas, and are valued for

aesthetic and environmental reasons rather than agricultural. Organizational structure of governing bodies could also influence personal involvement as individuals may not be placed in setting that allows for direct decision making. This may be the case for a traditionally big government setting of BC or Canada in relation to a traditionally small government setting of WA and the US (Caldwell 1993). The significant difference between WA and BC respondents level of personal involvement indicates a cognitive difference between WA and BC respondents and therefore a lack of evidence for the existence of social capital.

It is interesting that WA respondents to Q1 indicated a medium level of personal involvement in transboundary watershed management, while for Q3 indicate a low level of ability within their organization to make or affect transboundary watershed decisions. While WA respondents are involved in information gathering, lobbying and communication, it appears that their role does not extend to the executive decision making process. The same thought could be held for BC respondents; however, not to the same degree as BC respondents indicated a lower level of personal involvement in discussions/initiatives pertaining to transboundary watershed management. This raises questions regarding respondent's roles within their organization, as Q2 indicated that for both WA and BC the respondent's organizations had a medium ability to make/affect decisions that can improve the methods for interaction or actual transboundary solutions. When ignoring the results to Q1 it appears the potential for the existence of cognitive social capital exists between current individuals and organizations involved in transboundary watershed management. However, an individual's personal level of involvement within BC is lacking. While individuals in BC may not be involved, BC and WA's organizational ability to affect change indicated the potential for the existence of structural social capital within this borderland region.

The significant difference between WA and BC respondents for Q1, and the Wilcoxon test results on the separated data, does indicate the influence the border has on the results. The results appear to indicate that there is more personal involvement on the WA side in comparison to BC, a result that is not conducive to the existence of social capital. Unlike Q1, Q2 and Q3 do not indicate that the border is an influence; however the neutral response is not a positive response, indicating that individual and their organizations require structure or measures by which to influence or affect transboundary watershed management. The issue of how the border should be spanned, and how well it can be spanned is raised. It appears that while individuals involved in transboundary watershed management may have the desire and knowledge for cooperative transboundary resource management, the lack of a personal involvement and ability within their organization to make or affect change, and the barrier created by the border indicates that bridging of organizational voids is required (Vannijnatten 2004; Kenney 1999; Plummer and Fitzgibbon 2006; Schuett et al. 2001).

### **3.3.2 Cooperation or Regulation**

#### **Determining Priority**

Following questions 1 through 3, which were designed to determine both respondents and their organization's level of involvement and ability to affect change, Q5 Cooperation as a priority for WA and Q6 Cooperation as a priority for BC were designed to determine the perceived level of priority for the two regions to undertake cooperative management of the watersheds. As discussed above a significant difference between responses indicates a cognitive difference, and therefore a lack of evidence for the existence of cognitive social capital.

Table 9. Cluster 2: Determining Priority Cluster Analysis, Similarity in Response.

					<b>Wilcoxon Signed Ranks</b>	
					Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
Question	Number of Responses	Mean	Median	Mode	<b>Q5</b>	<b>Q6</b>
<b>Q5 Cooperation as a priority for WA</b>	13	4.38	4	4		.500
<b>Q6 Cooperation as a priority for BC</b>	19	4	4	4		
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .						

Questions 5 and 6 were clustered to establish whether respondents would indicate that improving transboundary watershed cooperation was a higher priority for one nation over the other. Overall there was no significant difference between responses to Q5 and Q6 (Figures 11 and 12). It should be noted that there was fewer response to Q5 than Q6. The impact of the smaller number of responses to Q5 is investigated further below.

As indicated in Table 9 the mean response to Q5 was 4.38, and the mean response to Q6 was 4. The median and mode to both responses was 4. The Wilcoxon test statistic for Q5 and Q6 indicated that WA and BC look, on average, at the issue in equal fashion, as supported by both the median and the mode. That is, as a whole respondents feel that improving transboundary watershed management with the other nation is an important priority for both BC and WA.

Table 10. Determining Priority

<b>Cluster 2: Determining Priority</b>									
	WA				BC				Mann Whitney U Sig.
Question	N	M	Mdn	Mo	N	M	Mdn	Mo	
<b>Q5 Cooperation as a priority for WA</b>	7	4.57	5	5	6	4.17	4	4	.302
<b>Q6 Cooperation as a priority for BC</b>	6	4.29	4.5	4,5 <sup>a</sup>	13	3.77	4	4	.032**
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .									
N = number of responses; M = Mean; Mdn = Median; Mo = Mode.									
<sup>a</sup> = Multiple modes exist, the smallest is shown.									

When turning to WA versus BC there was no significant difference between WA and BC responses for Q5 Cooperation as a priority for WA (Table 10). In contrast, there was a significant difference for Q6 Cooperation as a priority for BC. The mean WA response to Q5 was 4.57 (Mdn = 5, Mo = 5), and the mean BC response was 4.17 (Mdn = 4, Mo = 4). While the mean WA response to Q6 was 4.29 (Mdn = 4.5, Mo = 4.5), and the mean BC response was 3.77 (Mdn = 4, Mo = 4).

As illustrated in Figures 15 and 16 the significant difference between WA and BC respondents is the result of BC's decrease in perceived level of priority. Note the number of WA responses was about the same for Q5 and Q6, but for BC only six answers for Q5 versus 13 for Q6, meaning a majority of BC respondents did not answer this question. Investigating the histograms further demonstrates the results of this decline.

The fact that there is a significant difference between WA and BC respondents to Q6, and no significant difference between WA and BC respondents to Q5, when the median and mode to Q5 are more strongly different than those of Q6, appears to be the result of a smaller BC sample size for Q5 (Table 10; Figures 13 through 16). The decrease in the number of BC respondents to Q5 could be the result of the inability of BC respondents to judge WA's level of priority towards establishing transboundary cooperation. BC's lesser level of priority towards transboundary watershed management could be the result of BC's position as the upstream watershed user, or potentially a lesser degree of economic valuation of the watercourses, i.e agriculture. Upstream watershed users often have decreased levels of participation and cooperation in scenarios surrounding water quality and quantity, as negative results from overuse are often viewed as less substantial (AbuZied 2006; Lebel and Iminura 2005).

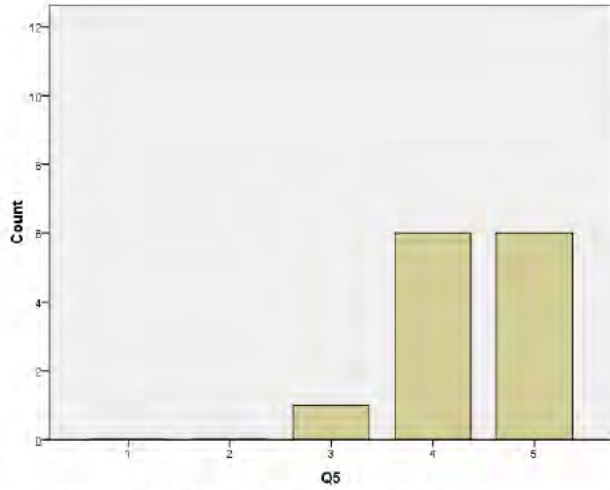


Figure 11. Combined WA and BC responses to Q5.

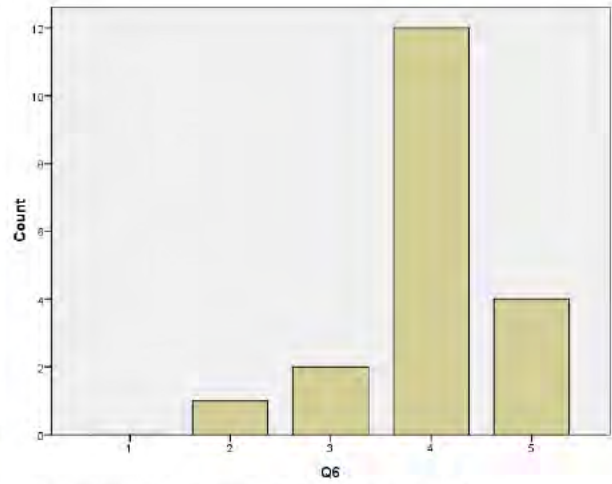


Figure 12. Combined WA and BC responses to Q6.

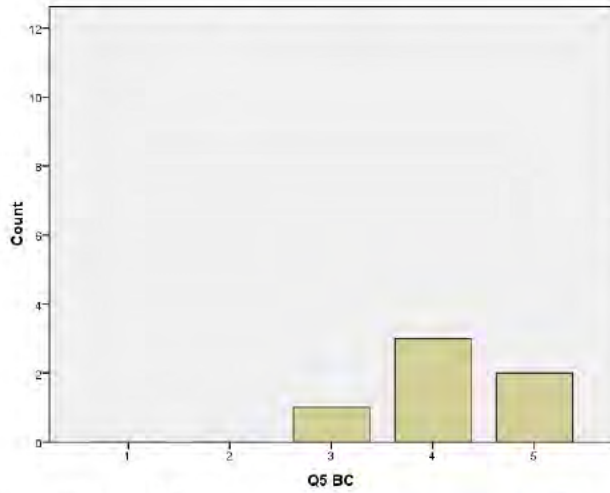


Figure 13. Separated BC responses to Q5.

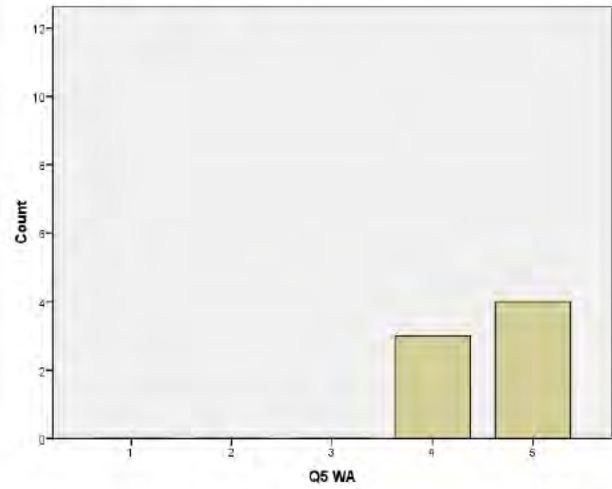


Figure 14. Separated WA responses to Q5.

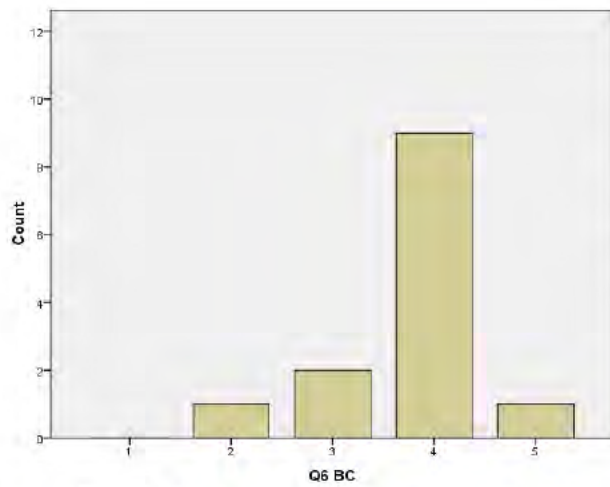


Figure 15. Separated BC responses to Q6.

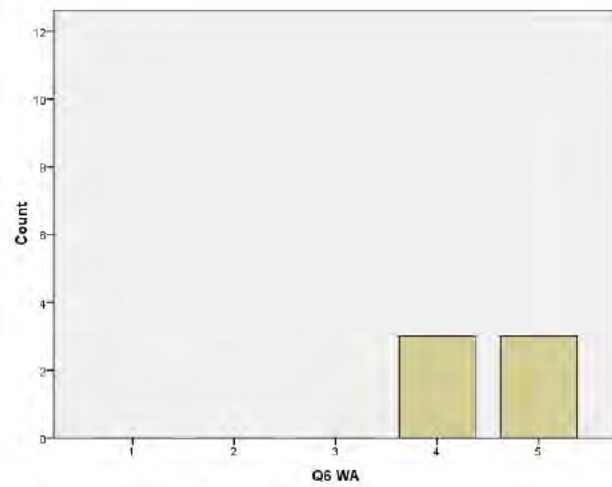


Figure 16. Separated WA responses to Q6.



While the Mann Whitney U test result indicated a significant difference between Q6 WA and BC respondents, and no significant difference between Q5 WA and BC respondents, the Wilcoxon test result indicated that there was no significant difference between how respondents responded to Q5 and Q6. Sample size should be looked at as the a cause for the significant difference between Q6 BC and WA. Responses to Q5 dropped to less than half the number for Q6, that is, only six compared to 13. An indication that seven BC respondents had effectively no opinion on this WA focused Q5. This hints that BC knowledge is stopped by the border. While the BC respondents who did respond, did so in the same manner to WA respondents; the missing seven BC responses can be interpreted as feeling differently, likely in the negative direction, as had they the knowledge they should have answered in a similar manner. This result illustrates the border as a barrier to social capital penetration in regards to this particular issue. This also suggests that a different question is necessary to get a full response to what is occurring.

In future research, to avoid the scenerio of smaller sample sizes for individual questions a secondary or reworded question forcing respondents to have an opinion should have been used. For example, a future follow up question could state “How often within your field of work, or area of resource management dialogue does the issue of cooperation with neighbouring State/Provinces over shared resources come up? This type of question would then allow individuals to provide a response that would qualify a question such as Q6. A response to this type of question would still allow for the idea of downstream users indicating a higher priority to be addressed as a larger or smaller number of times resource cooperation is addressed could be traced to either side of the border.

If one were to ignore the number of responses the results would appear to indicate that individuals from WA feel that improving transboundary watershed management is an important

priority for WA and BC. While BC respondents feel it is an important priority for WA, but not as important for them. The slight lack of priority for BC to cooperate with WA, as indicated by the Wilcoxon results, could be the result of BC being on the upstream side of the watercourse (Blomquist and Schlager 2005; Browning-Aiken 2004). However, the smaller sample size for Q5 should be taken into consideration limiting conclusions that I can draw from these results.

### **Geographic Size and Management Scale**

The purpose of Cluster 3 was to investigate if or how the physical size (i.e volume and drainage area) would influence the necessity for and the level of government at which transboundary watershed management should occur. Question 7 addressed whether the size (volume of water and drainage area) of a transboundary watercourse influences the necessity of transboundary cooperative management. When addressing this question it was understood that larger sized watersheds required more cooperative management. This question was included as multiple transboundary watershed agreements/initiatives exist between Canada and the United States; however typically on larger or more densely populated watersheds. As a result, at least at first glance, it appears that the size of a watershed does influence the necessity for a cooperative transboundary agreement.

To follow Q7 and whether the size of watershed should influence the necessity of transboundary cooperative management, Q8 asked if the size of a transboundary watercourse influences the level of government at which watershed management should occur. When addressing this question it is assumed that larger watershed required the involvement of higher levels of government. As previously discussed in Section 2, and upcoming in Section 3.3.2, there are different theories regarding what levels of government should be involved in or oversee transboundary watershed management.

Table 11. Cluster 3: Geographical Size and Management Scale Cluster Analysis,

					Wilcoxon Signed Ranks	
					Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
Question	Number of Responses	Mean	Median	Mode	Q7	Q8
<b>Q7 Influence of size on necessity for cooperation</b>	21	3.86	4	4		.193
<b>Q8 Influence of size on level of managing government</b>	21	3.38	4	4		
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .						

The mean (3.86) response for Q7 indicated that respondents were slightly below agree towards the idea that the size of a watershed influences the need for cooperation. The median (4) and mode (4) support the respondent’s opinion of agree. For Q8 the mean response of 3.38 was slightly above neutral towards the idea that the size of the watershed influences the necessity for cooperation. While the median (4) and mode (4) indicate that respondents agreed with Q8.

For all responses the Wilcoxon test statistic was used to determine if Q7 and Q8 were responded to in a similar manner, while the mean response indicated the response direction. The Wilcoxon test statistic (.193) was greater than the alpha 0.10 cut off indicating no significant difference between Q7 and Q8. The descriptive statistics for Q7 and Q8 indicated respondents feel the physical size of a watershed does influence the necessity for cooperation, and at what level of government watershed management should occur.

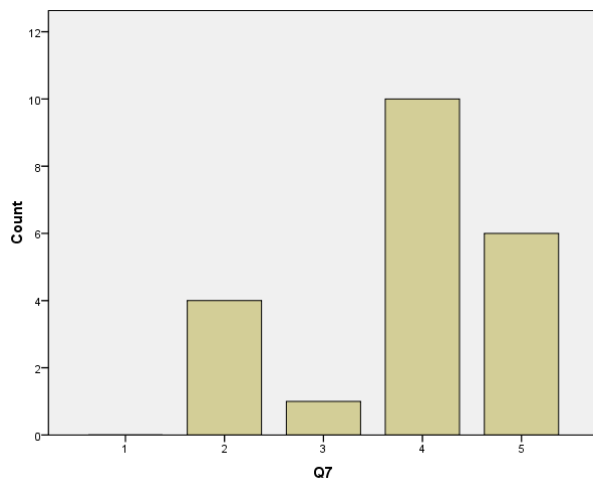


Figure 17. Combined WA and BC responses to Q7.

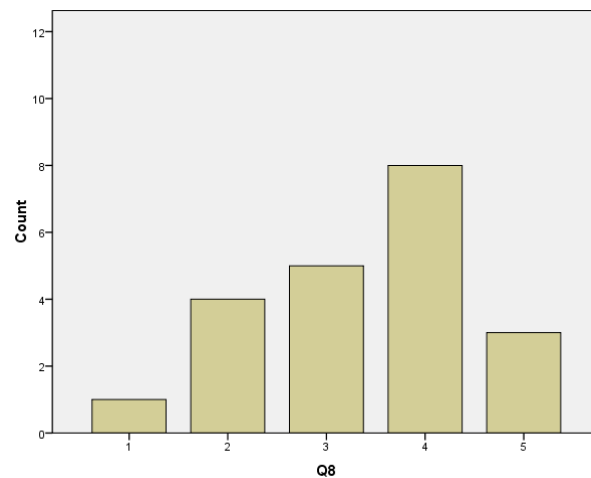


Figure 18. Combined WA and BC responses to Q8.

Figures 17 and 18 illustrate and confirm the results to Q7 and Q8, in that respondents agreed that the size and scale of a watershed does influence the necessity for cooperation and the level at which cooperation should occur.

Next the Mann Whitney U test was used to determine if there was a significant difference between WA and BC responses to Q7 and Q8. The results to these tests are located below in Table 12.

There was a significant difference between WA and BC responses to Q7, as the Mann Whitney U test result was .100, exactly at the alpha 0.10 cut off point. The WA mean responses of 4.29, and median and mode responses of 5, indicate that WA respondents were in strong agreement with the idea that the size of the watershed could influence the necessity for transboundary watershed management (Table 12). In contrast, the BC mean response was 3.64 (Mdn = 4, Mo = 4) indicating that respondents did agree, but not strongly with the statement that the size of the transboundary watercourse dictates the level of government at which watershed management should occur.

In regards to Q8 Influence of size on the level of managing government, there was no significant difference between WA and BC respondents. The WA mean was 3.86 (Mdn = 4, Mo = 4) and the BC was 3.14 (Mdn = 3, Mo = 3).

Table 12. Influence of Geographic Size

<b>Cluster 3: Geographic Size</b>									
Question	WA				BC				Mann Whitney U Sig.
	N	M	Mdn	Mo	N	M	Mdn	Mo	
<b>Q7 Influence of size on necessity for cooperation</b>	7	4.29	5	5	14	3.64	4	4	.100*
<b>Q8 Influence of size on level of managing government</b>	7	3.86	4	4	14	3.14	3	4	.162
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ . N = number of responses; M = Mean; Mdn = Median; Mo = Mode.									

The overall mean response to Q8 was 3.38, with no significant difference between WA and BC respondents. This result indicates respondents were between neutral and agree with the size of the watercourse influencing the level of government at which transboundary watershed management should occur.

Although the Wilcoxon test results showed no significant difference between the responses to Q7 and Q8, the Mann Whitney U test, using the separated WA and BC results, show some agreement and some disagreement. There appears to be a barrier or boundary affect on Q7 as it shows a significant difference, in contrast no significant difference is shown for Q8. Overall, for these two questions there is evidence both for and against the border affecting similar thinking.

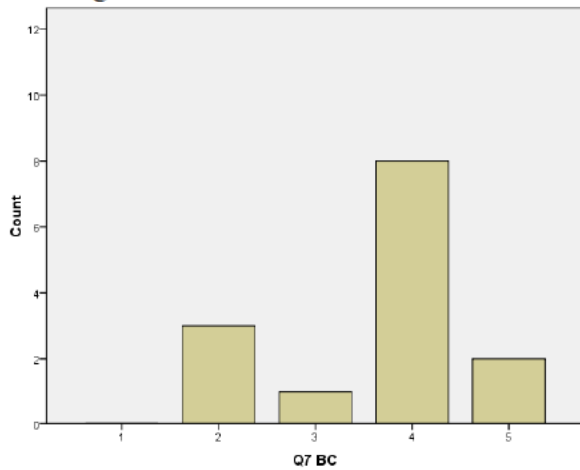


Figure 19. Separated BC responses to Q7.

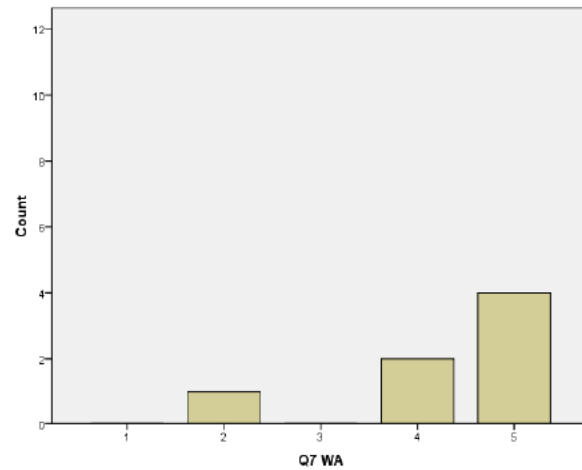


Figure 20. Separated WA responses to Q7.

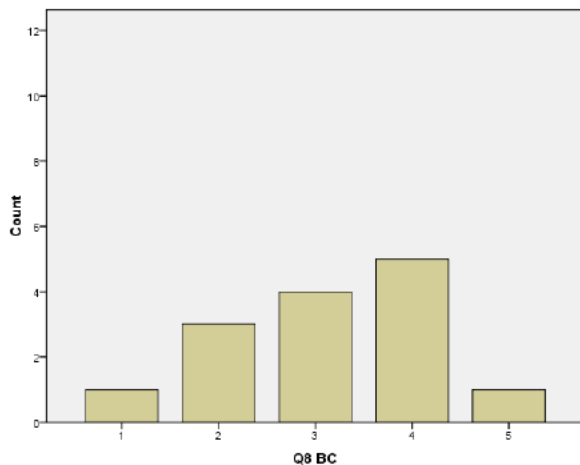


Figure 21. Separated BC responses to Q8.

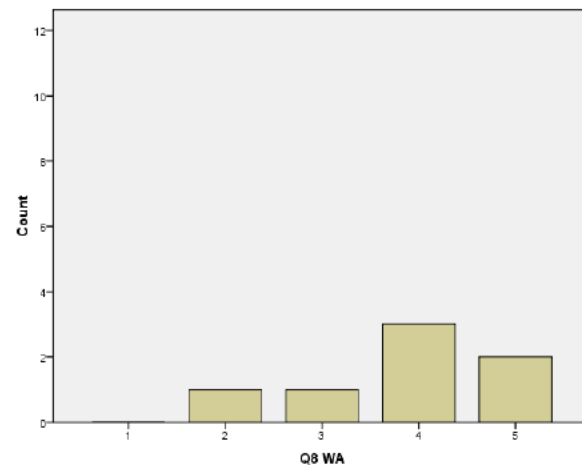


Figure 22. Separated WA responses to Q8.

As shown in Figures 19 and 20 above, there is a clear shift in the mode between BC and Washington, illustrating the significant difference. In contrast, for Figures 21 and 22 the mode is quiet similar, corresponding to no significant difference between WA and BC responses. When looking at BC independently (Figures 19 and 21) there is some difference in the tail, but the mode is roughly the same. While for WA, as indicated in Figures 20 and 22, there is a shift in the mode, which reflects the significant difference for Q7.

Although questions 7 and 8 did not clearly define size (e.g. acres or square miles) or scale (e.g. Federal or local government) a later section deals with scale questions more specifically. Here, as we are dealing with the WA/BC border in the Lower Mainland/Whatcom County area, it is assumed that the respondents understood size to relate to the watersheds of interest. One could assess current cooperative agreements and levels of government for examples of scale influencing the necessity for cooperation, and the level of government at which cooperation occurs. On the United States and Canadian shared border one could view the lack of agreements or cooperation on shared small scale resources, and existing transboundary watershed management agreements or organizations on larger scale resources, as an indication that large scale watershed and upper levels of government are currently the most involved in structured or regulated cross border cooperation. Examples include the Red River in Manitoba and North Dakota, or the Columbia River, in BC and WA. Shared watersheds between the United States and Canada with existing transboundary agreements are typically located in highly populated areas, are watersheds of economic value (e.g. hydro electric or fisheries resources) or watersheds that require co-management to augment seasonal flows (VanNijnatten, 2006). Section 3.3.2 directly addresses scale of government respondents feel should be responsible for management of these watersheds.

One thing that is clear from the responses to Q7 and Q8 is that there is a border area affect, as shown by the significant difference between WA and BC respondents regarding the size of the watershed influencing the necessity for transboundary cooperation. However, respondents were in sync across the border in regards to if the size of the watershed should dictate the scale of government at which management should occur.

### **Management Approach to Local Resources**

Cluster 4 was designed to identify respondent's perception of existing management approaches to small scale transboundary watersheds such as Bertrand Creek and Fishtrap Creek, while identifying measures by which to manage the resources.

The mean response to Q9 was 2.74 (Mdn = 3, Mo = 2) and indicated respondents were slightly below neutral to Q9 An Ad hoc approach to management is preferable to a regulatory approach. The mean response to Q10 was 1.89 (Mdn = 2, Mo = 2) and indicated respondents disagreed with Q10 Existing initiatives are sufficient. The mean response to Q11 was 3.42 (Mdn = 3, Mo = 3) and indicated respondents were slightly above neutral towards Q11 Management through a single bi-national entity. The mean response to Q12 was 2.26 (Mdn = 2, Mo = 2) and indicated respondents disagreed with Q12 Management as separate sovereign resources.

The Wilcoxon test was used to determine if interviewees responded to the questions in Cluster 4 in a statistically significant manner. The Wilcoxon test indicated there was no significant difference in how respondents responded to Q10 and Q12. For the remainder of the questions, Q9 and Q10; Q9 and Q11; Q9 and Q12; Q10 and Q11; Q11 and Q12 the Wilcoxon test statistic indicated a significant difference between the respective questions (Table 13).

Table 13. Cluster 4: Management Approach to Local Watercourses, Cluster Analysis Similarity of Response

					Wilcoxon Signed Ranks			
					Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
Question	N	M	Mdn	Mo	Q9	Q10	Q11	Q12
<b>Q9 An Ad hoc approach to management is preferable to a regulatory approach.</b>	19	2.74	3	2		0.004***	0.071**	0.090**
<b>Q10 Existing initiatives are sufficient.</b>	19	1.89	2	2			0.000***	0.172
<b>Q11 Management through a single bi-national entity.</b>	19	3.42	3	3				0.019**
<b>Q12 Management as separate sovereign resources.</b>	19	2.26	2	2				

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .

The combined mean response can be used to rank respondent's opinion towards the given statement. Respondents looked least favourably towards Q10 Existing initiatives are sufficient (M = 1.89, Mdn = 2, Mo = 2), indicating they disagreed with the statement. Question 12, Management as separate sovereign resources was the second least favorable option of Cluster 4. The Q12 mean response of 2.26 (Mdn = 2, Mo = 2) indicated that respondents were in disagreement with the idea of managing Bertrand Creek and Fishtrap Creek as separate sovereign resources.

The descriptive statistics for Q9 responses indicated that interviewees were not open to an adhoc approach when compared to a regulatory approach to managing the watercourses. The mean response (M = 2.74, Mdn = 3, Mo = 2) Q9 indicated that interviewees were instead cautious, as the responses trended from neutral to disagree. The highest mean response was for Q11 Management through a single bi-national management entity. The mean response was 3.42 (Mdn = 3, Mo = 2), and was the only response above neutral.

Figures 23 through 26 below provide an illustration of the responses to Q9 through Q12. In following the order of the mean rank, for Q10, one can see that the modal peak value is 2



(Figure 24). Figure 24 is positively skewed with a leptokurtic distribution. Figure 26, for Q12, while having the same mode of 2, has limited skewness, and a mesokurtic distribution, confirming why there is no significant difference between Q10 and Q12. Figure 23 illustrates Q9's bi-modal distribution. The bi-modal distribution of Q9 is platykurtic, and slightly negatively skewed, shifted towards a mode of 2 and 3. Figure 25, for Q11, had a slightly negatively skewed bi-modal, platykurtic distribution. The difference in modal shift between Q9 and Q11 illustrates the significant difference between the responses to the two questions.

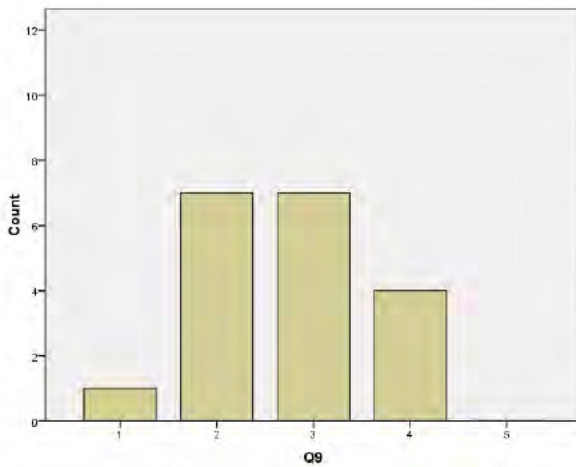


Figure 23. Combined WA and BC responses to Q9.

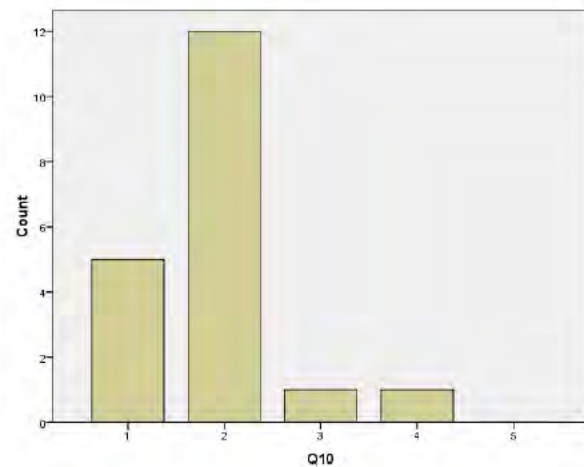


Figure 24. Combined WA and BC responses to Q10.

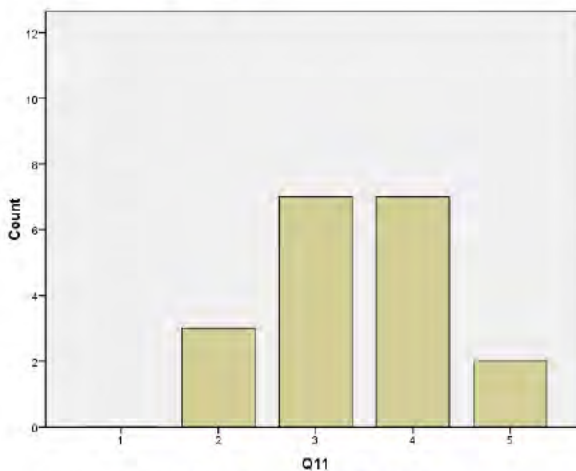


Figure 25. Combined WA and BC responses to Q11.

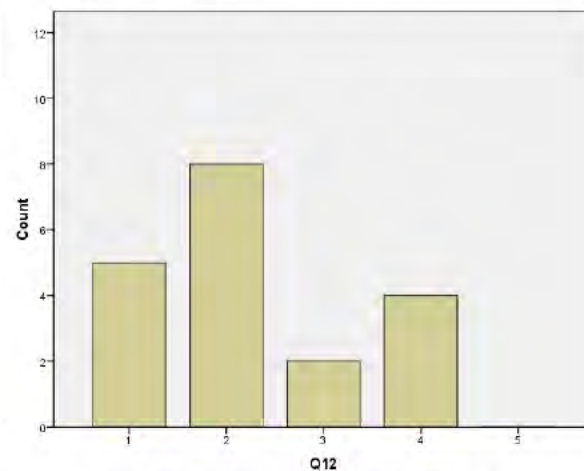


Figure 26. Combined WA and BC responses to Q12.

The rank order of the Q9 through Q12 means provides overall evidence for the existence of cross border cooperation, as Q11 had the highest mean rank (3.42), indicating that respondents were not opposed to the pursuit of management through a single bi-national management entity. This result, as well as the low mean responses to Q9, Q10 and Q12, could be interpreted as an indication that the respondents desire an alternative to the current management framework that includes management of the watersheds in a non-sovereign manner. No significant difference, as indicated by the Wilcoxon test statistic, between the responses to Q10 and Q12 could be interpreted as an indication of evidence for the existence of cross border cooperation, as respondents indicated that existing initiatives are not sufficient (Q10), and that Bertrand Creek and Fishtrap Creek should not be considered separate sovereign resources (Q12). The results to Q10 could be interpreted as indicating respondents do not believe the current structural framework is sufficient to support cooperative management of these resources.

Table 14. Management Approach to Local Resources

<b>Cluster 4: Management Approach to Local Resources</b>									
Question	WA				BC				Mann Whitney U Sig.
	N	M	Mdn	Mo	N	M	Mdn	Mo	
<b>Q9 Ad hoc vs. Regulatory approach to management.</b>	6	3.00	3	2,3,4 <sup>a</sup>	13	2.62	3	2,3 <sup>a</sup>	.404
<b>Q10 Existing initiatives, sufficient or not?</b>	7	2.00	2	2	12	1.83	2	2	.921
<b>Q11 Management through a single bi-national entity.</b>	7	3.57	3	3	12	3.33	3.5	4	.721
<b>Q12 Management as separate sovereign resources.</b>	7	2.14	2	1	12	2.33	2	2	.533

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .  
N = number of responses; M = Mean; Mdn = Median; Mo = Mode.  
<sup>a</sup> = Multiple modes exist.

Following an analysis of the overall response and similarity of response between questions, the Mann Whitney U Test was used to test for evidence for the existence of cognitive social capital by determining if WA and BC interviewee's responded in a statistically significant manner. The Mann Whitney U test results for Q9 through Q12 indicated no significant difference between WA and BC responses (Table 14). These results lend support to the mean rank order discussed above. The mean responses, when placed in rank order, appear to indicate that respondents favour the management of the resources through a single bi-national entity above all other options. The following provides further discussion into the mean, median and mode responses to Q9 through Q12.

Question 9 asked respondents if an ad hoc approach to managing Bertrand Creek and Fishtrap Creek is preferable to a regulatory approach. There was no significant difference between WA and BC responses. As discussed above, the overall mean response was 2.74, indicating that respondents were less than neutral towards an ad hoc approach in comparison to a regulatory approach. An ad hoc approach may not be desirable to respondents as it may not offer enough guarantees for watershed protection or flow management.

As mentioned above, the combined mean response to indicated that Q10 was 1.89, indicating that respondents felt existing transboundary watershed initiatives are not sufficient to manage local and small scale watersheds such as Bertrand Creek and Fishtrap Creek. As indicated in Table 14, there was no significant difference between WA and BC responses. The response to this question can be somewhat misleading as there are only two existing initiatives for information sharing, the ECC/ECA and the Puget Sound/Georgia Basin International Task Force, both of which have not yet directly addressed management of these watersheds. It should

be noted the ECC has a focus group for the Abbotsford/Sumas Aquifer which Fishtrap Creek borders.

The highest mean response of Cluster 4 was 3.42, for Q11. For Q11 Respondents indicated that they were neutral to slightly agree with approaching management of Bertrand and Fishtrap Creek through a single bi-national management entity. No significant difference between WA and BC respondents, in combination with the only above neutral mean could be interpreted as evidence for the existence of cognitive social capital and the potential for experimenting with a cross border network, i.e. the development of structural social capital for the management of small scale watersheds in this borderland region. When examined together the responses to Q10 and Q11 illustrate that respondents were not satisfied with the actions of existing cooperative ecosystem management initiatives, and as a result, they do feel that a single bi-national management entity may be an idea worth pursuing.

Questions 12's combined mean response (2.26) illustrated that respondents did not feel these watercourses were separate sovereign resources and that they should not be viewed as such. This response could be viewed as affirmation of the response to Q11, as if the watersheds are not separate sovereign resources, and they should not be managed as such, then one could posit that management through a single bi-national management entity would be the next step.

When the results of Cluster 4 are viewed concurrently they could be interpreted as lending support to the formation of an initiative/organization for information sharing. Whether the initiative/organization is an offshoot of existing organizations or a completely separate entity is beyond this discussion. However, one would think that use of existing knowledge, social infrastructure, and contacts would be more efficient than formulating an entirely new entity. No significant difference between WA and BC respondents for Q9 through 12 identifies evidence

for the existence of cognitive social capital between BC and WA. The negative response to Q10 Existing Initiative Sufficient or Not, could be interpreted as an indication of a lack of evidence of structural social capital, while responses pertaining to how management should occur, provides evidence for the existence of structural social capital within this borderland region.

### Management Framework

Cluster 5 Management Framework was designed to determine what level of transboundary organization respondents felt should be used to manage this scale of transboundary watercourse, and whether cooperative management could be possible.

The total mean response to Q13 New initiative/organization for management was 4.26, the median was 4 and the Mode was 4 (Table 15). These results indicate that respondents agreed with the statement that a transboundary watershed initiative or organization should be created to manage these and similar scale resources.

For Q13, respondents were slightly above neutral towards the IJC playing a role in the management of these two small scale resources, the mean response was 3.23, the median 3 and the mode 4. The mean, median and mode were all 3 for Q15 Role of the ECA/ECC indicating

Table 15. Cluster 5: Management Framework Cluster Analysis, Similarity in Response

					<b>Wilcoxon Signed Ranks</b>			
	N	M	Mdn	Mo	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
					Q13	Q14	Q15	Q16
<b>Q13 New initiative/ organization for management</b>	19	4.26	4	4		0.008***	0.125	0.004***
<b>Q14 Role of the IJC</b>	12	3.23	3	4			0.805	0.437
<b>Q15 Role of the ECA/ECC</b>	9	3.00	3	3				0.281
<b>Q16 A binding agreement is necessary for successful management.</b>	21	3.57	4	4				

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .

that respondents were neutral towards the potential effectiveness of the ECA/ECC for managing these transboundary watersheds. Respondents indicated an above neutral response to Q16 A binding agreement is necessary for successful management, as the mean was 3.57, median 4 and mode 4.

Before we turn to the Wilcoxon results the reader should be aware that the number of responses dropped drastically for these various questions. For example between Q13 and Q15 the number of respondents declined by nearly fifty percent, from 19 to nine. Accordingly, these Wilcoxon results should be interpreted cautiously. What the opinions were of those who did not respond is unknown. Most likely their response would not have been any higher than those who did respond, but I am unable to fully comment on this.

For all clusters the Wilcoxon test was used to determine if there were significant differences between the combined responses to each question within the given cluster. The Wilcoxon test result indicated a significant difference between Q13 and Q14, and between Q13 and Q16. There was no significant difference in responses to Q13 and Q15, Q14 and Q15, Q14 and Q16 or Q15 and Q16. As discussed above in Cluster 4, for Cluster 5, the combined mean response can be used to rank respondents outlook towards the given statement. One key Wilcoxon result that is surprising is that Q13 and Q15 are not significantly different, even though the mean (4.26), median (4) and mode (4) for Q13 are reported as quite a bit higher than the mean (3), median (3) and mode (3) of Q15. This lack of significant difference can be attributed to the smaller sample size of Q15 (N = 9), relative to Q13 (N = 19). Likewise, one must be cautious about drawing any conclusions about Q14. When comparing Q14 with Q16, where there is no significant difference, one will notice again that Q14's values tending towards 3's, while Q16's values tending towards 4's.

Two steps were taken to further investigate this; first, a discussion of the results in rank order based upon the averages each of these particular responses, and second a review of the graphs to further investigate the variations between these results. Figures 27 through 30, below, illustrate the combined responses, supporting the rank order of the combined means. Again, it should be noted that the number of respondents decreased for Q14 and Q15. The decrease in the number of responses is likely the result of a lack of knowledge regarding the two questions. Future research should provide follow up questions, or further options within the response system to attempt to maintain a constant numbers of responses.

The highest mean response was for Q13 New initiative/organization for management. The mean response to Q13 was 4.26 (Mdn = 4, Mo = 4). Interestingly, Q13 had the second highest number of responses. The mean, median and mode values for Q13 indicate respondents agreed with the statement that a transboundary watershed initiative/organization for information sharing should be created to manage these and similar scale resources. The second highest mean response was for Q16 at 3.57 (Mdn = 4, Mo = 4). Question 16 had the highest number of respondents. The mean, median and mode values indicated that respondents agreed with the statement that for successful management it would be necessary for transboundary agreements to be binding with consequences for non-compliance. The high number of respondents to both Q13 and Q16 provide a greater level of confidence in the results relative to Q14 and Q15. The next two mean values in the rank order show a lower number of respondents. The mean value of 3.23 for Q14 (Mdn = 3, Mo = 3) was the second lowest mean value for Cluster 5, and coincided with the second lowest number of responses. The mean response to Q14 indicated that respondents were slightly above neutral towards the statement that the IJC has a role to play in the management of these two small scale watercourses. The lowest combined mean response for

Cluster 5 was for Q15 Role of the ECA/ECC. Question 15 also had the lowest number of responses. The mean response of 3.00 (Mdn = 3, Mo = 3) indicated that respondents neutral towards the statement that the ECA/ECC is an effective organization for the management of these transboundary resources. Much like the responses to Cluster 4, the mean responses to Cluster 5 appear to favor an organization or management entity for the management of these shared watersheds.

To contribute to the discussion the following graphs are organized in rank order. Figures 27 through 30 illustrate the responses to Q13 through Q16, while providing support for the Wilcoxon test results. As illustrated in Figure 27, the peak modal value for Q13 was high, and the distribution of results were negatively skewed, and leptokurtic. When viewing Figure 18, the results to Q16, one can see a slight downward shift in the results relative to Q13. While the modal value of Q16 was also 4, the distribution was less negatively skewed, and less peaky. Turning to the next question in our rank order, Q14, which has a smaller number of respondents, continued the downward shift in distribution, and no respondents give a value of 5 (Figure 29). Unlike the responses to Q13 and Q16 the distribution of Q14 is not skewed, and is mesokurtic.

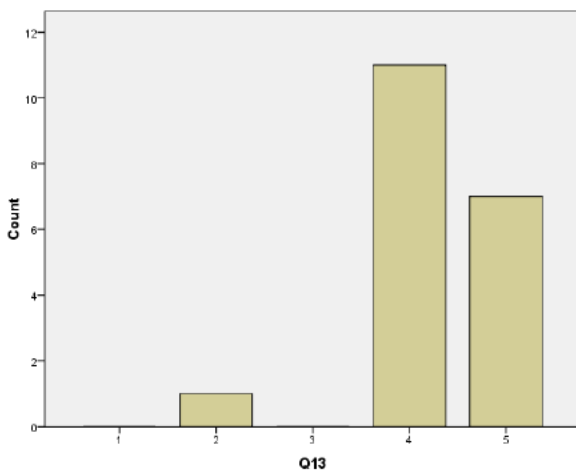


Figure 27. Combined WA and BC responses to Q13.

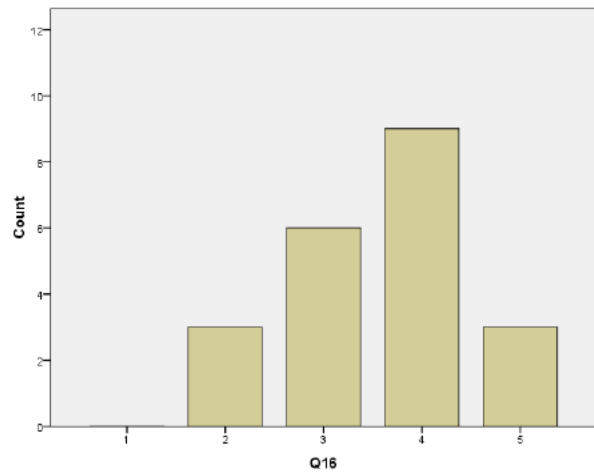


Figure 28. Combined WA and BC responses to Q16.



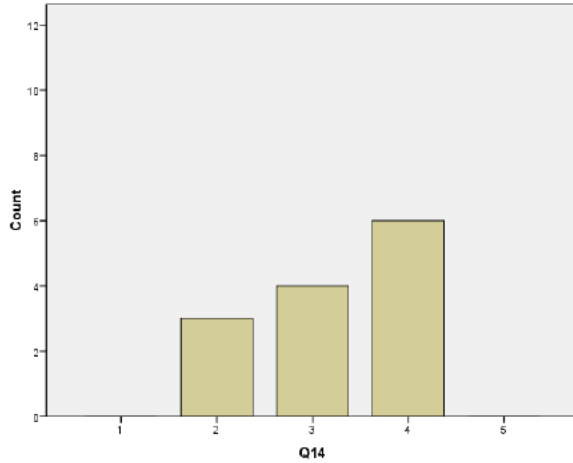


Figure 29. Combined WA and BC responses to Q14.

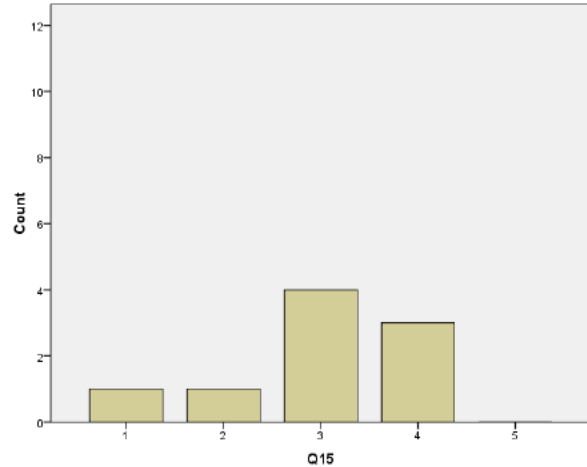


Figure 30. Combined WA and BC responses to Q15.

Finally, for Q15, the downward shift centres on a modal value of 3, the distribution is positively skewed and platykurtic (Figure 30). By combining all of the above knowledge it appears that there is no question that the group favours a new initiative. In addition, there is a lot of support for a binding agreement. The role of the IJC and ECC/ECA remains confused, this may be a result of the fact that most of the respondents are not familiar with these organizations and therefore could not answer the questions. On a future questionnaire it would likely be best to first of all to ask the question are you familiar with the IJC, likewise the ECC/ECA. If individuals respond no, that would be a reason to then not try to compare them to a new initiative or binding agreement.

The Wilcoxon test result for Q14 and Q15 indicated no significant difference between the responses to the two questions. As discussed in the above paragraphs, respondents indicated that a transboundary organization for information sharing and management should be established. However, as indicated by the descriptive statistics and graphs of Q14 and Q15 respondents are unsure or neutral towards the IJC and ECC/ECA. Again it should be noted that for Q14 and Q15, interviewee responses numbers decreased, which could indicate a lack of knowledge of both the

IJC and ECA/ECC and therefore a reluctance to respond to the question. The Wilcoxon test result for Q15 and Q16 showed there is no significant difference in the responses for the two questions. The descriptive statistics and graphs of Q14 and Q15 indicated that respondents were neutral towards the IJC and ECC as the transboundary organization for Bertrand Creek and Fishtrap Creek. Respondents appear to be open to the creation a transboundary organization, and to the IJC and the role it could play, but are not completely convinced it is the best option. It would be beneficial to conduct further research with the interviewees pertaining to the IJC and the current watershed management initiative it is undertaking.

The descriptive statistics and graphs of Q16 indicated that respondents were neutral or in slight agreement with the idea that transboundary agreements should be binding with consequences for non-compliance. The results of Q14, Q15, and Q16 appear to indicate that respondents would be open to the idea of a transboundary organization that has the ability to place binding measures on transboundary watershed management. It is evident that parallel trends of thought regarding the need for and manner by which these watercourses should be managed exists. Shared management of the transboundary watercourses appears to be desired and possible, if channels of communications and organization are made available (Springer 2007; Lubell 2004; Saravanan et al. 2009; Alper 1997; Koontz and Thomas 2006; Schuett et al. 2001).

To investigate for evidence for the existence of cognitive or structural social capital, pertaining to the cooperative management of these two watersheds, the Mann Whitney U test was used to determine if WA and BC responses to the individual questions were statistically similar. As indicated in Table 16 below there was no significant difference between WA and BC responses for Q13 through Q16. It should be noted that the drop off in the number of responses

seems to be fairly equally divided between WA and BC respondents. Accordingly, the discussion above regarding the decrease in the number of respondents holds true for both groups. That is, respondents agree that a new initiative or organization should be formed for information sharing, and above neutral towards the idea that transboundary agreements should be binding with consequences for non-compliance. However, there still seems to be a lack of knowledge towards the role of the IJC and ECC/ECA, as respondents were neutral to less than neutral to these organizations.

Table 16. Management Framework

<b>Cluster 5: Management Framework</b>									
	WA				BC				Mann Whitney U Sig.
Question	N	M	Mdn	Mo	N	M	Mdn	Mo	
<b>Q13 New initiative/ organization for management</b>	7	4.43	4	4	12	4.17	4	4	.560
<b>Q14 Role of the IJC</b>	5	3.40	4	4	8	3.12	3	3,4 <sup>a</sup>	.529
<b>Q15 Role of the ECA/ECC</b>	4	2.50	2.5	1,2,3,4 <sup>a</sup>	5	3.4	3	3	.241
<b>Q16 A binding agreement is necessary for successful management</b>	7	4.00	4	4	14	3.36	3	3	.124
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ . N = number of responses; M = Mean; Mdn = Median; Mo = Mode. <sup>a</sup> = Multiple modes exist.									

The mean response of 4.26 for Q13, with no significant difference between WA and BC respondents, indicated support for the formation of a transboundary watershed initiative or organization for information sharing. In addition, the group mean response to Q16 (3.23) and no significant difference between WA and BC responses indicated that respondents were open to the idea of a new agreement with binding consequences for non-compliance. These results provide evidence for the existence of structural social capital required to bridge the knowledge gap created by the border, as well as evidence for the existence of cognitive social capital necessary for cooperative management.

Question 14 and Q15 furthered the line of questioning relating to potential or existing methods of information sharing. As mentioned above the number of respondents for Q14 and Q15 was less than that for Q13 and Q16. Due to the drastic decrease in the number of respondents the results to Q14 and Q15 should not be overvalued. The mean, median and mode response to Q14, and no significant difference between WA and BC respondents indicated that the group as a whole were neutral towards the IJC. Respondents were neutral towards Q15, the role the ECA/ECC could have in managing these two watersheds, with a mean response of 3.00, and no significant difference between WA and BC. The lack of responses to Q14 and Q15, as well as low mean, median and mode values could be interpreted as a lack of knowledge or faith in the current structure for information sharing.

As a whole, these results indicate that respondents are interested in trying something new for the management of these transboundary resources. The respondents are neutral to the idea of a binding agreement with consequences for non-compliance. However, the group as a whole does not show a great deal of knowledge for the IJC or the ECC/ECA. These results do provide confirmation that the border does not prevent the idea of a new initiative, and the feeling towards a binding agreement is equal on both sides. However, existing initiatives currently in place are somewhat of an unknown to the respondents as a whole.

### **3.3.2 Level of Governance**

Table 17 is composed of two questions, Q17 and Q18, which were designed to identify what level of government respondents believed transboundary watershed management should occur at. A third question, Q19, was designed to identify the manner in which respondents felt the governing organizations should be arranged (eg. Bottom up, Top down or Mixed) to govern transboundary watersheds (Table 22).

Since Q17 and Q18 have identical results this discussion will focus on those as if they were a single question.

Table 17. Questions 17 and 18 combined responses.

	N	Mean	Median	Mode
Q17 For Fishtrap Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.				
Q17a Federal	19	2.89	3	2,3 <sup>a</sup>
Q17b Provincial/State	20	3.30	3	3
Q17c Regional District/County	19	3.63	4	3
Q17d Municipal	20	3.80	4	5
Q18 For Bertrand Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.				
Q18a Federal	19	2.89	3	2,3 <sup>a</sup>
Q18b Provincial/State	20	3.30	3	3
Q18c Regional District/County	19	3.63	4	3
Q18d Municipal	20	3.80	4	5
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ . N = number of responses. <sup>a</sup> = Multiple modes exist				

The highest mean response to Q17/Q18, “For Fishtrap Creek/Bertrand Creek please indicate your confidence in what level of government you believe transboundary watershed management should occur” was for the Municipal level with a mean of 3.80 (Mdn = 3, Mo =1,2). These results indicate that respondents have the most confidence in the Municipal level of government for the management of these watercourses. As indicated in Table 17, responses to Q17 and Q18 were identical. As a result, only figures for Q17 will be provided and discussed.

To further understand the results for Q17/Q18 let us investigate the figures in rank order fashion based upon the mean. The highest modal value was for Q17d, as shown in Figure 31. The results to Q17d were negatively skewed, and mesokurtic. The next highest mean response was for Q17c, which had a modal value of 3, was negatively skewed and leptokurtic (Figure 32). As illustrated by Figure 32, Q17c witnessed a downward migration of the mode relative to Q17d.

Continuing the decrease in mean rank order Q17b maintained the same modal rank as Q17c, but began to become a little less negatively skewed, but was still somewhat leptokurtic. Finally, the lowest mean rank value was Q17a, which had a bimodal (2, 3), positively skewed, platykurtic distribution. This clearly shows that support declines as one moves from the municipal to the federal level of governments.

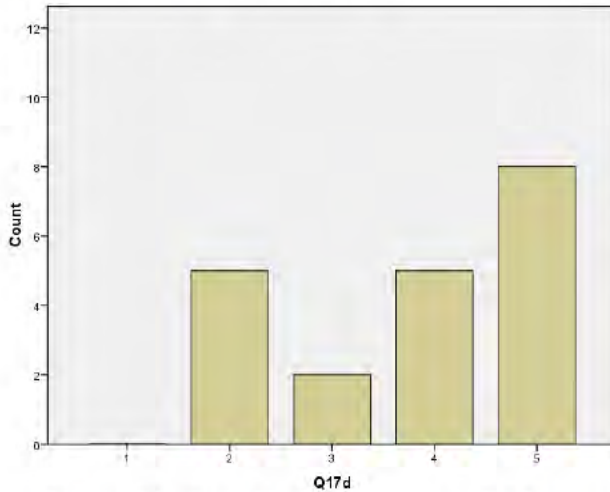


Figure 31. Combined response to Q17d Municipal.

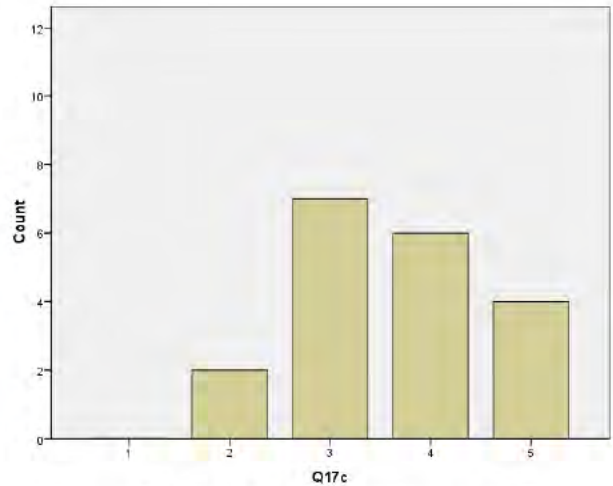


Figure 32. Combined response to Q17c Regional District County.

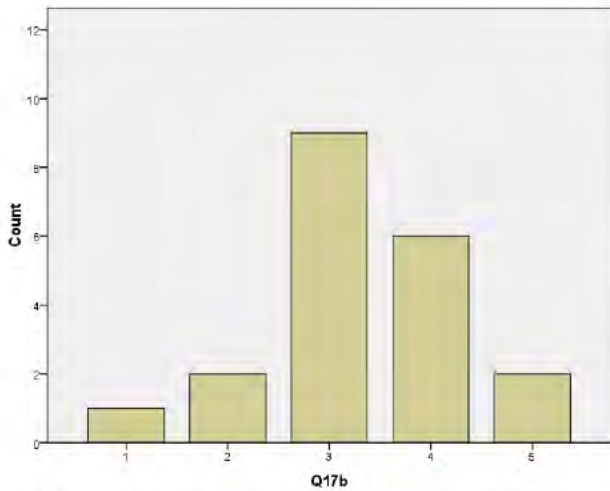


Figure 33. Combined response to Q17b Provincial/State.

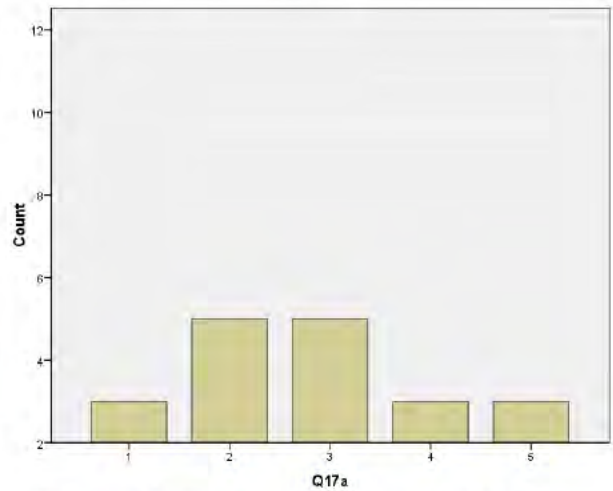


Figure 34. Combined response to Q17a Federal.

I will now investigate further by bifurcating the sample into the two groups, and also look for significant differences among the various questions based upon region.

Table 18. Questions 17 and 18 WA and BC responses and Mann Whitney U Test results.

		Washington				British Columbia				
		N	M	Mdn	Mo	N	M	Mdn	Mo	Mann Whitney U Sig.
Q17	For Fishtrap Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.									
Q17a	Federal	7	1.71	2	1,2 <sup>a</sup>	12	3.58	3.5	3	0.002**
Q17b	Provincial/State	7	3.14	3	3	13	3.38	3	3	0.500
Q17c	Regional District/County	7	4.29	4	4,5 <sup>a</sup>	12	3.25	3	3	0.021**
Q17d	Municipal	7	4.14	5	5	13	3.62	4	4	0.212
Q18	For Bertrand Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.									
Q18a	Federal	7	1.71	2	1,2 <sup>a</sup>	12	3.58	3.5	3	0.002**
Q18b	Provincial/State	7	3.14	3	3	13	3.38	3	3	0.500
Q18c	Regional District/County	7	4.29	4	4,5 <sup>a</sup>	12	3.25	3	3	0.021**
Q18d	Municipal	7	4.14	5	5	13	3.62	4	4	0.212
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .										
N = number of responses.										
<sup>a</sup> = Multiple modes exist										

As indicated in Table 18, for both Q17 and Q18, there was no significant difference between WA and BC responses for the Provincial/State level (Q17/18b), or the Municipal level (Q17/18d). However, there was a significant difference between WA and BC responses for the Federal (Q17/18a) and Regional District/County levels (Q17/18c). BC respondents showed a higher level of confidence in the federal level than their WA counterparts, whereas the WA respondents indicated a higher level of confidence in the Regional District/County than their BC counterparts. While there was a significant difference between WA and BC responses to Q17/18a, and Q17/18c, individually WA and BC responded identically to Q17a through 17c and Q18a through Q18c, as illustrated by the descriptive statistics in Table 17 and 18. As a result, only figures for Q17 are provided, as the interpretation of the result and figures for Q17 hold true for Q18.

Using the histograms to further illustrate the values found in Table 18, I will proceed in a rank order fashion starting with the lowest mean value, based upon the state of Washington. The first figures, Figure 35 and 36 for Q17a, demonstrate quite clearly the difference between Washington and BC, in that Washington did not favour Federal governments, while BC was generally neutral or above. Washington's response to Q17a was bimodal (1,2), platykurtic and positively skewed. While British Columbian's response to Q17a was also bimodal (4,5), and platykurtic, it was negatively skewed (Figure 36). Moving to the State and Provincial level (Q17b), although there was a slight negative skew to the Washington results, they were fairly symmetrical, and likewise for the BC results (Figures 37 and 38). Hence, they were not found to be significantly different. Turning to the Regional District/County there was a definite shift in the upper values for WA, while BC remains firmly anchored within the neutral zone with a modal value of 3. Once again both had a negative skewness, WA more so than BC, likely contributing to the significant difference between WA and BC respondents. These graphs illustrate the significant difference between WA and BC responses to Q17a (Figure 39 and 40). Finally, for Q17c Municipal level of government the WA modal value was in the highest category, but there was a double distribution for WA Q17c (Figure 41). A couple of the respondents actually disagreed, but as a whole the results were on the agreement side. For BC the results were much more mixed, but as noted in Table 18 the Municipal level still received the highest BC average values. This raises an interesting question, with the progression for WA demonstrated through the histograms, can we find significant differences? In contrast, with BC and values clustered much more closely around the neutral value of 3, is there any significant difference between the BC results?



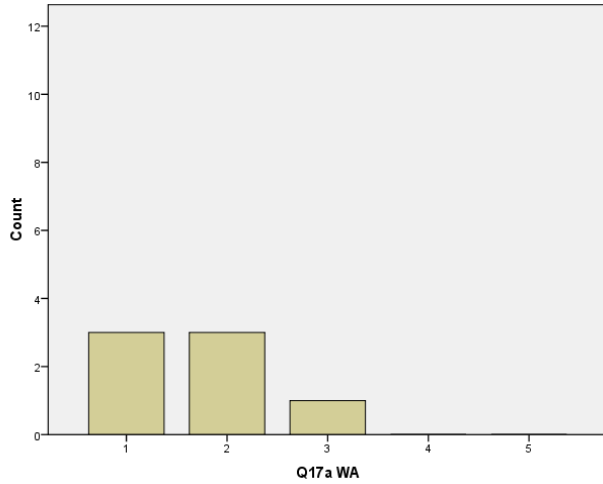


Figure 35. WA response to Q17a Federal.

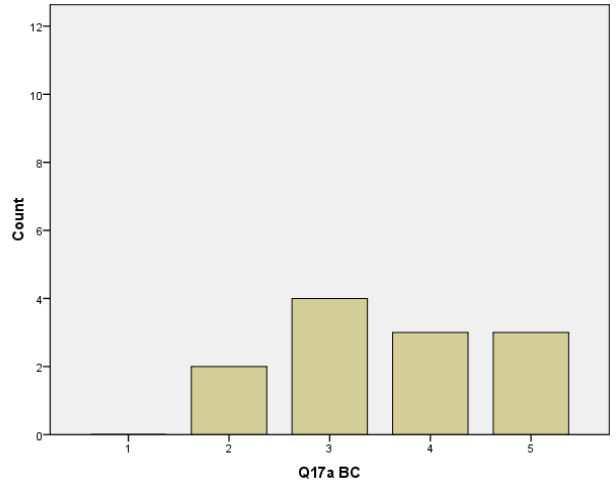


Figure 36. BC response to Q17a Federal.

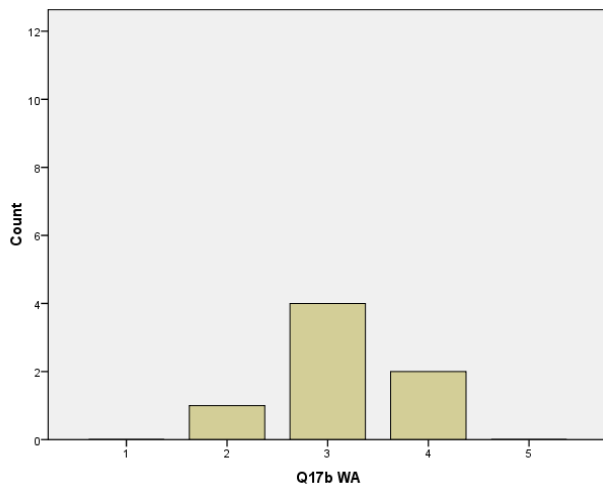


Figure 37. WA response to Q17b Provincial/State.

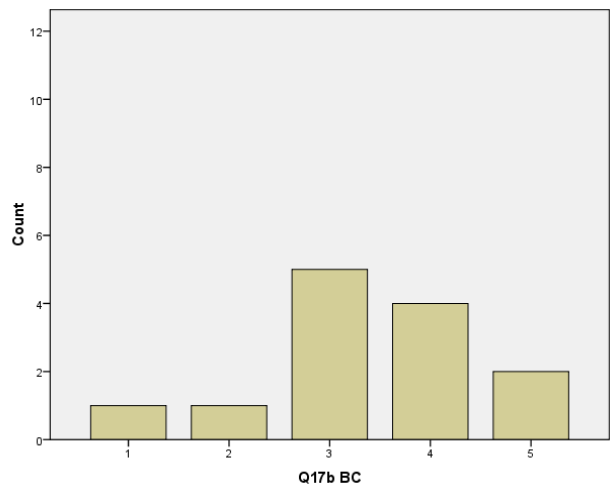


Figure 38. BC response to Q17b Provincial/State.

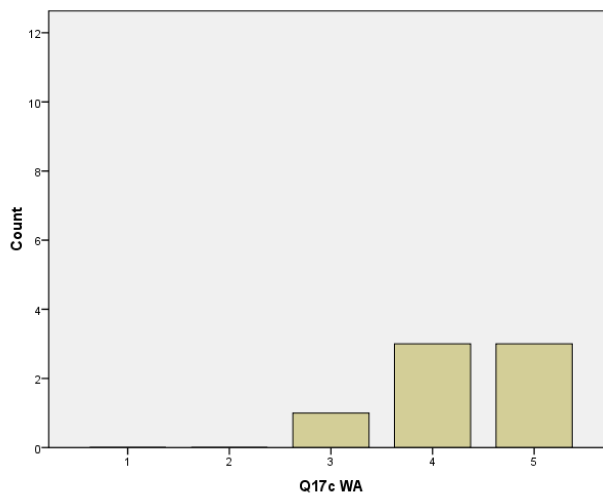


Figure 39. WA response to Q17c Regional District/County.

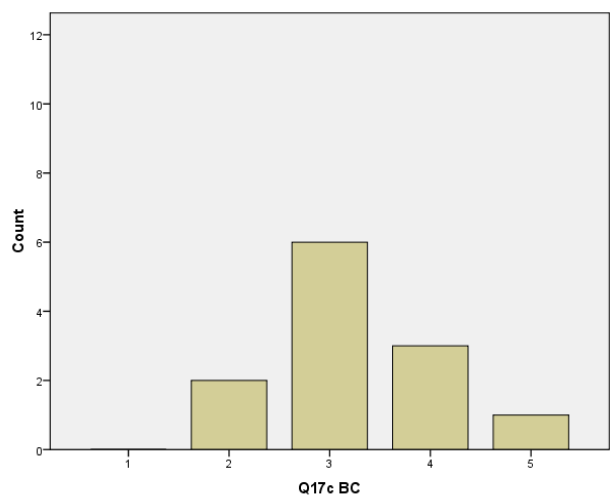


Figure 40. BC response to Q17c Regional District/County.

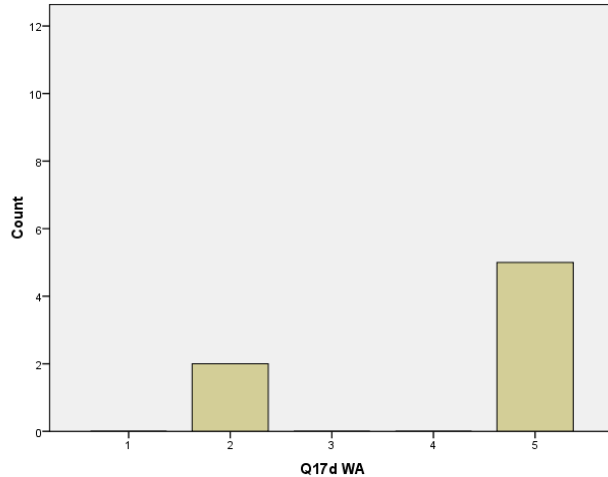


Figure 41. WA response to Q17d Municipal.

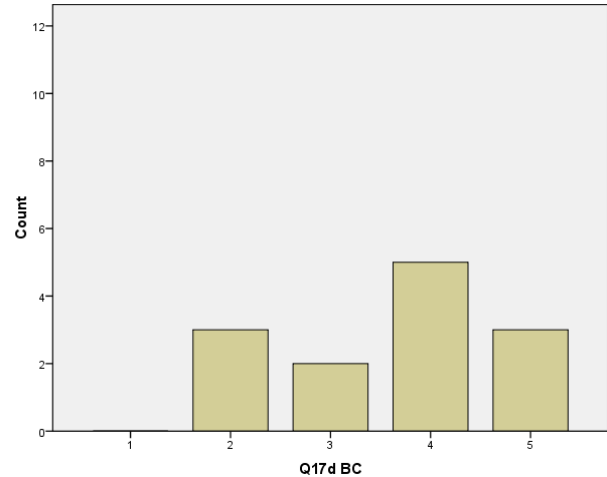


Figure 42. BC response to Q17d Municipal.

The Wilcoxon test was used to determine if the separated WA and BC responses to Q17/18 a through Q17/18c were significantly different. The Wilcoxon test results are provided in Tables 19 and 20.

Table 19. Washington Q17a through Q17d Wilcoxon Signed Rank Test Results

	Wilcoxon Signed Ranks			
	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
	Q17a	Q17b	Q17c	Q17d
<b>Q17a Federal</b>		0.016**	0.016**	0.016**
<b>Q17b Provincial/State</b>			0.078**	0.250
<b>Q17c Regional District/County</b>				0.625
<b>Q17d Municipal</b>				

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .

As indicated in the Table 19 there generally was significant differences between the various levels of government, the only exception being between the Province/State and Municipal, and between Regional District/County and Municipal. These results may further indicate that when we look towards 39 and 41 there is a double distribution at the Municipal level, indicating that as the questions moved towards lower levels of government confidence increased, but support dropped off. This in part might be the result of the fact that on the WA side of the border Municipal governments can be quite small. These results emphasize WA's

lack of confidence in the Federal government relative to the other options, emphasizing confidence in a regional government approach.

Table 20. British Columbia Q17a through Q17d Wilcoxon Signed Rank Test Results

	<b>Wilcoxon Signed Ranks</b>			
	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
	<b>Q17a</b>	<b>Q17b</b>	<b>Q17c</b>	<b>Q17d</b>
<b>Q17a Federal</b>		0.805	0.305	0.984
<b>Q17b Provincial/State</b>			0.789	0.736
<b>Q17c Regional District/County</b>				0.516
<b>Q17d Municipal</b>				
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .				

When one turns to the BC results, interestingly there was no significant difference between all the levels of government. The lack of a significant difference between BC results appears to indicate that the respondents do not have the preference in scale relative to WA respondents. The differing opinion towards scale of government could be the result of the border, which could indicate an ingrained cultural difference between the two regions (Lipset 1990).

Questions 19a through 19c further addressed the issue of scale and governing arrangement by asking respondents to indicate their confidence in three different types of regulatory arrangement, Bottom Up, Top Down or Mixed.

Table 21. Questions 19a through 19c mean, median and mode responses.

	N	Mean	Median	Mode
Q19 Please indicate your level of confidence in the regulatory arrangement used to govern transboundary watersheds.				
Q19a Bottom Up	18	2.72	3	2,3 <sup>a</sup>
Q19b Top Down	19	2.74	3	3
Q19c Mixed	20	4.00	4	4
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .				
N = number of responses.				
<sup>a</sup> = Multiple modes exist				

When asked (Q19) “Please indicate your level of confidence in the regulatory arrangement used to govern transboundary watersheds” the highest mean response ( $M = 4.0$ ,

Mdn = 4, Mo = 4) was for the Q19c Mixed approach, followed by Q19b Top Down (M = 2.74, Mdn = 3, Mo =3) then Q19a Bottom Up (M = 2.72, Mdn = 3, Mo = 2,3) (Table 21). As indicated in Table 21, for all intents and purposes respondents indicated the same low to neutral level of confidence in Bottom up and Top Down.

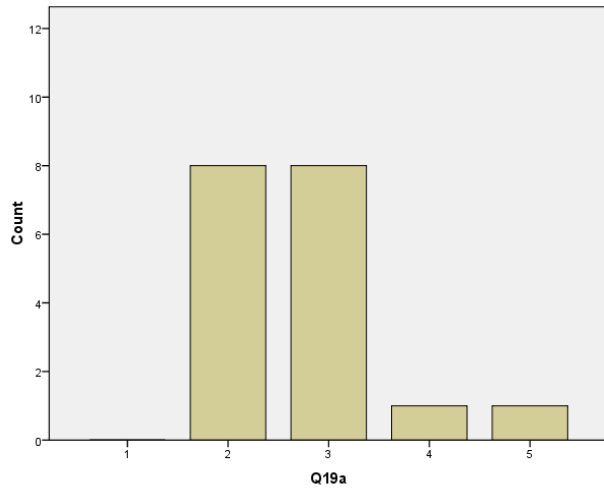


Figure 43. WA response to Q19a Bottom Up.

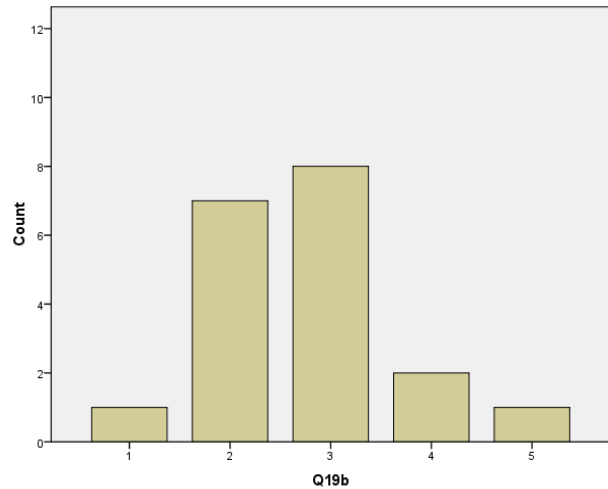


Figure 44. WA response to Q19b Top Down.

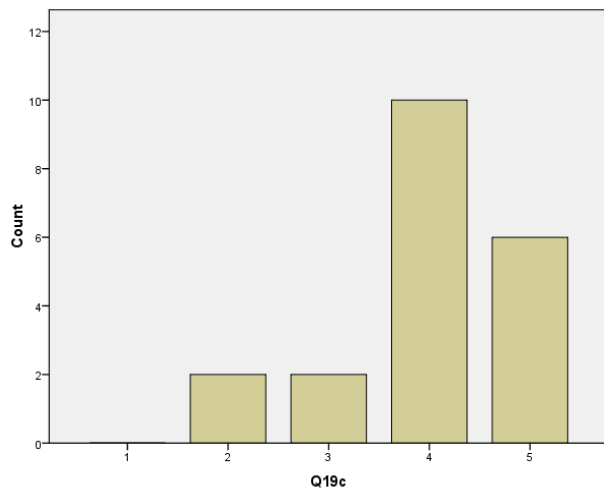


Figure 45. WA response to Q19c Mixed.

Dividing the data based upon the border, as indicated in Table 22, only Q19a Bottom Up produced a significant difference between WA and BC responses, with WA (3.33) indicating more confidence in Bottom Up than BC (2.42) (Figures 39 and 40).

Table 22. Question 19 WA and BC responses and Mann Whitney U Test results.

		Washington				British Columbia				Mann Whitney U Sig.
		N	M	Mdn	Mo	N	M	Mdn	Mo	
Q19	Please indicate your level of confidence in the regulatory arrangement used to govern transboundary watersheds.									
Q19a	Bottom Up	6	3.33	3	3	12	2.42	2	2	0.039**
Q19b	Top Down	6	2.83	2.5	2	13	2.69	3	3	1.000
Q19c	Mixed	6	3.83	4	4,5 <sup>a</sup>	14	4.07	4	4	0.720
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ . # = number of responses. <sup>a</sup> = Multiple modes exist										

For Q19a Figure 46 illustrates the WA modal response as 3, and the distribution as platykurtic and negatively skewed. Figure 47, illustrates the distribution of BC's responses to Q19a as slightly positively skewed, and leptokurtic, with a modal value of 2. These figures illustrate the significant difference between WA and BC responses to Q19a.

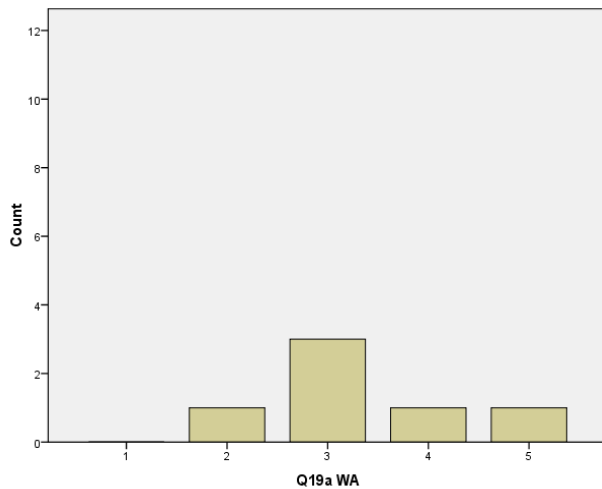


Figure 46. WA response to Q19a Bottom Up.

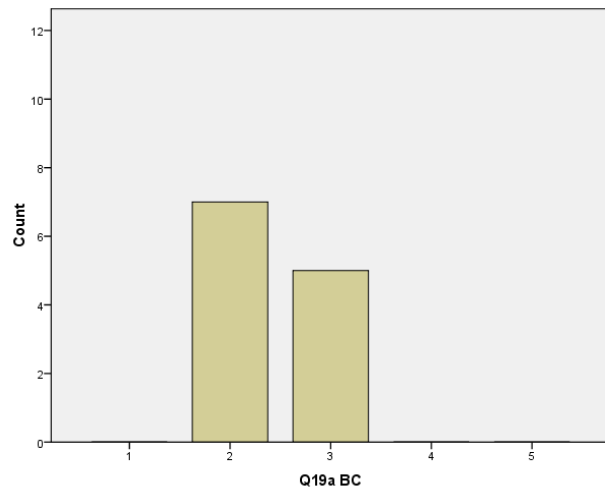


Figure 47. BC response to Q19a Bottom Up.

The modal response to WA Q19b was 2 (Figure 48). The distribution of responses to Q19b was platykurtic, and very slightly positively skewed, almost evenly spread; indicating WA's slightly less than medium level of confidence in a top down regulatory arrangement. In contrast BC's modal response to Q19b was 3, and the kurtosis was mesokurtic, and the

distribution was fairly evenly distributed, with a slight positive skewness. Figure 49 provides illustrative support for the mean response, indicating BC's less than medium level of confidence in a top down arrangement for the management of these two watercourses.

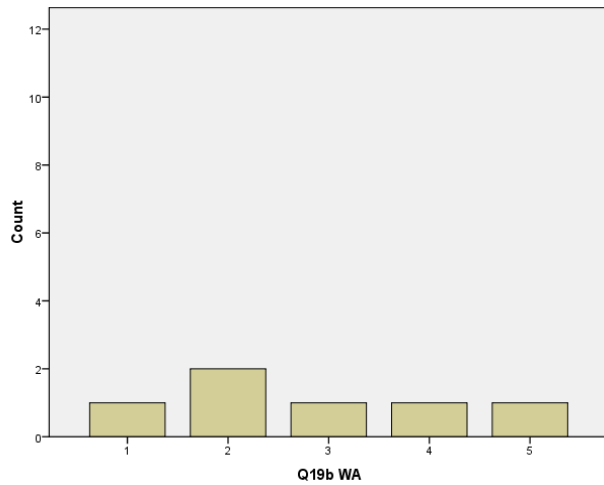


Figure 48. WA response to Q19b Top Down.

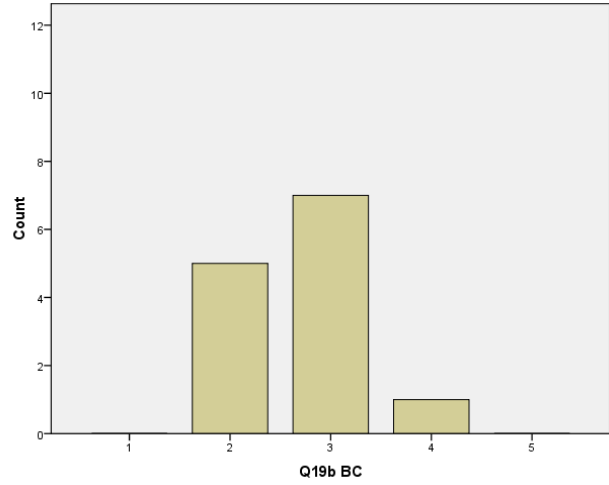


Figure 49. BC response to Q19b Top Down.

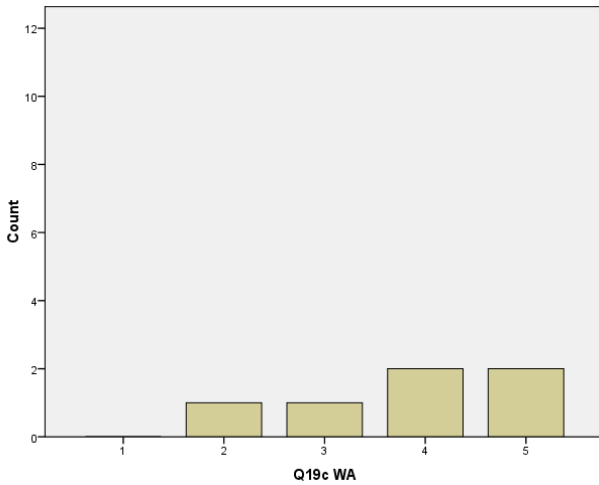


Figure 50. WA response to Q19c Mixed.

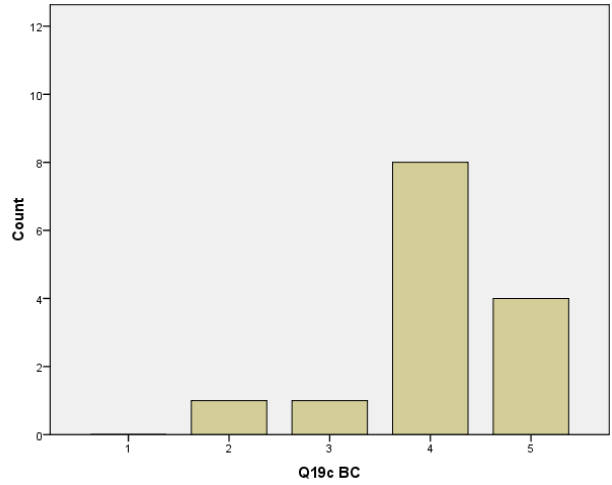


Figure 51. BC response to Q19c Mixed.

As illustrated in Figure 50 WA's response to Q19c was bimodal (4.5), platykurtic and negatively skewed. British Columbia's modal response to Q19c was 4, the distribution was negatively skewed and leptokurtic. Both WA's and BC's distribution and modal response

indicate medium confidence in a mixed regulatory approach to govern transboundary watersheds.

The Wilcoxon test was used to determine if separated WA and BC responses were significantly different. The Wilcoxon test results are provided in Tables 23 and 24.

Table 23. Washington Q19a through Q19c Wilcoxon Signed Rank Test Results

	<b>Wilcoxon Signed Ranks</b>		
	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
	<b>Q19a</b>	<b>Q19b</b>	<b>Q19c</b>
<b>Q19a Bottom Up</b>		0.750	0.500
<b>Q19b Top Down</b>			0.250
<b>Q19c Mixed</b>			
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .			

As indicated in Table 23, there was no significant difference in WA responses to Q19a through Q19c. No significant difference between Q19a through Q19c seems to reflect the platykurtic distributions of the results, indicating WA respondents did not have a high level of variation of response to each question. Accordingly, while WA indicated the highest confidence in a mixed regulatory arrangement, it was not significantly different that the other two regulatory arrangements.

Table 24. British Columbia Q19a through Q19c Wilcoxon Signed Rank Test Results

	<b>Wilcoxon Signed Ranks</b>		
	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
	<b>Q19a</b>	<b>Q19b</b>	<b>Q19c</b>
<b>Q19a Bottom Up</b>		0.563	0.002***
<b>Q19b Top Down</b>			0.001***
<b>Q19c Mixed</b>			
Significance Level, *, $P \leq 0.1$ ; **, $P \leq 0.05$ ; and ***, $P \leq 0.01$ .			

The Wilcoxon test identified a significant difference in BC's responses to between Q19a and Q19c; and Q19b and Q19c (Table 24). There was no significant difference between Q19a and Q19b. These significant differences emphasize BC's mean, median and mode responses to

Q19a through Q19C, in that they indicate that BC's responses to Q19a and Q19b were significantly different than to Q19c. As indicated in Figures 47 through 51, the BC responses had a much more peaked, clustered distribution. These distributions and the Wilcoxon results indicate that for the BC responses the mixed arrangement had a much higher support level.

The responses for Q17, Q18 appeared to indicate that WA respondents favoured the local scale of government to manage these watersheds. In contrast, BC respondents did not explicitly indicate a preferred level of government, as their responses were fairly neutral and did not favour one scale of government over the other. In regards to how to approach the management of these watersheds WA respondents did not strongly favour one approach to the other. While the BC respondents favoured the mixed approach to management, as the values for bottom up and top down were below neutral, while the value for mixed was clearly above neutral.

The border appears to be playing a part in the differing responses, as the overall combined preference to Q19 was for a mixed approach. However, when separated by nation, WA results did not indicate a significant difference between approaches. This contrasted the BC results which clearly indicated a support for a mixed approach. British Columbia's preference for a mixed approach could be the result of the distribution of control over resources, between the Federal and Provincial Governments. Whereas, the lack of a decisive indication by WA respondents to Q19 could be the result of greater agency oversight, i.e. the EPA. While the area is geographically homogenous, it is separated by the border and the evident underlying political philosophies. WA and BC's differing opinion regarding the level of governmental control of the resources could be traced to the historically divergent underlying social and political ideologies of the two nations and their citizens (Lipset 1990; Springer 2007).



### **3.3.3 Drivers and Barriers to Cooperation**

For Question 20 respondents were asked to rank the list of drivers and barriers from strongest to weakest, 6 being strongest and 1 being weakest. For the purpose of this paper drivers are themes that assist with cross border resource management, while barriers are themes that impede transboundary resource management. The drivers and barriers used in this study are those reported by Norman and Bakker (2005), and ordered by frequency reported through a questionnaire completed by water specialists and managers. This study uses the top five of 13 most frequently responded drivers and barriers, with a sixth lower ranked driver used for bracketing purposes. The initial purpose of this section was to compare the mean ranked responses of this study to that Norman and Bakker (2005). Due to a number of technical difficulties this does not seem possible, as it unknown if Norman and Bakker (2005) completed any statistical analysis on their ordinal data or if there was any significant difference between their results. Instead the drivers and barriers results were tested to determine the mean rank order of results, and if there was a significant difference between these rankings, as well as to determine if WA and BC responses were significantly different or not. The driver and barrier results must be viewed with caution, as respondents were not given definitions for the drivers and barriers. Since respondents may have understood the meaning of the individual drivers and barriers differently the results may not be consistent and little emphasis can be placed on rank values.

The following are brief definitions of drivers of cooperation. For the purpose of this section Crisis was defined as watershed degradation issues, such as water quality or quantity issues, causing immediate negative impacts to the resource user. Leadership was defined as an individual or individuals, regardless of the scale, driven to undertake cooperative interaction

across the border. Informal contacts was defined as personal relationships, regardless of scale between stake holders and regulators across the border. Specific issues was defined as exactly that, a specific issue such as fish or wildlife protection, flood protection, or resource use identified as a common issue to both nations users. Established networks was defined as currently functioning organizational or institutional frameworks for information sharing. The outlying driver inserted for bracketing purposes was Transparency. Transparency was defined as openness to divulge information regarding one's plans for, or use of the watershed, regardless of scale of governance.

The following are brief definitions the listed barriers to cooperation. Lack of financial resources was defined as the lack of resources to fund travel or research equipment, therefore limiting the ability to obtain information regarding the watercourse across the border.

Mismatched governing structures is fairly straight forward and reflected the fact that the U.S. and Canada, and Washington and BC have differing government structures. Asymmetrical participation was defined as one side of the border having a greater level of involvement relative to the other, related to the level of urgency felt by the given nation. Lack of institutional capacity was understood to be the managing body's capacity to function across an international border. Different government cultures and mandates were understood to be regulatory bodies within government working from a different starting point towards differing outcomes for a singular issue.

The ranking results are ordered by highest to lowest based upon the mean rank, and were tested with the Wilcoxon Signed rank test, and Friedman test, to determine if there is a significant difference between the ranking of the given drivers and barriers (Table 25). A significant difference between mean rankings indicates if a driver or barrier is truly ranked above

another. Following this, the Mann Whitney U test was used to determine if there is a significant difference between BC and WA respondents.

Table 25. Drivers of Cooperation – Mean Rank

Drivers		N	Total Mean Response	Median	Mode
Q20Da	Crisis	20	4.55	5	6
Q20Dd	Specific Issues	20	4.45	5	5
Q20Db	Leadership	20	4.10	4.5	5,6 <sup>a</sup>
Q20De	Established Networks	20	3.15	3	3
Q20Dc	Informal Contacts	20	3.05	2.5	2
Q20Df	Transparency	20	2.45	1.5	1

<sup>a</sup> = Multiple modes exist

When examining the mean rank order in Table 25, Crisis is identified as the highest ranked mean ranked response, followed by Specific Issues, and Leadership. The lowest three ranked drivers were Established Networks, Informal Contacts and Transparency.

Table 26. Drivers of Cooperation – Wilcoxon results

		Wilcoxon Signed Ranks					
		Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
<b>Q20D</b>	N	Q20Da	Q20Db	Q20Dc	Q20Dd	Q20De	Q20Df
Q20Da Crisis	20		0.512	0.011**	0.856	0.019**	0.009*
Q20Db Leadership	20			0.120	0.574	0.030**	0.022**
Q20Dc Informal Contacts	20				0.017**	0.814	0.353
Q20Dd Specific Issues	20					0.002*	0.004*
Q20De Established Networks	20						0.231
Q20Df Transparency	20						

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .  
N = Number of Responses

When examining the Wilcoxon results it appears as though there are two independent levels of ranking rather than the original 6. As shown in Table 26, there was no significant difference between Q20Da Crisis Q20Dd Specific Issues or Q20Db Leadership, indicating that respondents ranked these at the same level. There was a significant difference between the group of Q20Da/Q20Dd/Q20Db, when compared with Q20Dc, Q20De and Q20Df, except for Q20Db

and Q20Dc. The reason for no significant difference between Q20Db and Q20Dc is unknown as the difference in mean, median and modes are greater than that of Q20Db and Q20De which are not significantly different.

There was no significant difference between Q20De Established Networks, Q20Dc Informal Contacts, and Q20Df Transparency, indicating that respondents ranked these drivers at the same level. As a result, it appears that there were two independent levels of ranking, the higher ranked group of drivers included Crisis, Specific Issues and Leadership, while the lower ranked group included Established Networks, Informal Contacts and Transparency. To further investigate if the result of two individual ranks held true, the results were tested using the Friedman test. The Friedman test indicated that there was no significant difference between Q20Da, Q20Dd, and Q20Db ( $\alpha = 0.477$ ), and no significant difference between Q20De, Q20Dc or Q20Df ( $\alpha = 0.120$ ). When any of one the ranks from the two rank groups was added to the other rank group and tested with the Friedman test, there was a significant difference between results. When reviewing the Wilcoxon and Friedman results the preponderance of evidence indicates that rather than the original six ranks, there are two individual ranks.

The Barrier mean rank results did not show an extreme variation. The highest mean rank barrier to cooperation was Lack of Financial Resources, followed by Lack of Institutional Capacity. The lowest three mean rank responses were Asymmetrical Participation, followed by Different Government Cultures and Mandates, and Mismatched Government Structures (Table 27).

There was a significant difference between Q20Ba Lack of Financial Resources, and the remainder of the responses, supporting Q20Ba as the highest ranked response. There was also a significant difference between Q20Bd and Q20Bb, indicating that the higher ranking of Lack of

Institutional Capacity over Asymmetrical Participation was statistically significant. The Wilcoxon test indicated that there was no significant difference between Q20Bb, Q20Be or Q20Bc (Table 28). The Friedman test support this result ( $\alpha = 0.468$ ).

Table 27. Barriers to Cooperation – Mean Rank

Barriers		N	Mean	Median	Mode
Q20Ba	Lack of Financial Resource	20	4.75	5	5
Q20Bd	Lack of Institutional Capacity	20	4.10	4	3
Q20Bb	Asymmetrical Participation	20	3.10	2.5	2
Q20Be	Different Government Cultures and Mandates	20	2.90	3	3
Q20Bc	Mismatched Government Structures	20	2.80	3	2,4 <sup>a</sup>

<sup>a</sup> = Multiple modes exist

Table 28. Barriers to Cooperation – Wilcoxon results

			Wilcoxon Signed Ranks				
			Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (2-tailed)
	N	Q20Ba	Q20Bb	Q20Bc	Q20Bd	Q20Be	
Q20Ba Lack of Financial Resource	20		0.001***	0.003***	0.076*	0.001***	
Q20Bb Mismatched Government Structures	20			0.372	0.014**	0.873	
Q20Bc Asymmetrical Participation	20				0.045**	0.690	
Q20Bd Lack of Institutional Capacity	20					0.014**	
Q20Be Different Government Cultures and Mandates	20						

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .  
N = Number of Responses

The preponderance of evidence indicates that for these results the best conclusion that I can draw is that the respondent's ranking of Lack of Financial Resources as the highest Barrier, and Mismatched Government Structures as the second highest was statistically significant. The remaining three barriers are equally ranked. The occurrence of the two independent rank groups for Drivers, and the single low rank group for Barriers, originating from the six rank options calls

into question the use of simple ranking as a measure of opinion, as ordinal data does not have equal intervals between ranks.

The ranking of the barriers and drivers was also separated by nation to determine if WA and BC responses were significantly different (Tables 29 and 30).

Table 29. WA and BC Drivers of Cooperation – Mann Whitney U Test Results.

Drivers	Washington				British Columbia				Mann Whitney U Sig.
	N	M	Mdn	Mo	N	M	Mdn	Mo	
Q20Da Crisis	7	4.57	4	4,5 <sup>a</sup>	13	4.54	5	6	.900
Q20Db Leadership	7	4.71	5	5	13	3.77	4	2,6 <sup>a</sup>	.257
Q20Dc Informal Contacts	7	3.00	2	1,2,6 <sup>a</sup>	13	3.08	3	2	.654
Q20Dd Specific Issues	7	4.43	5	5	13	4.46	5	5	.900
Q20De Established Networks	7	3.00	3	3	13	3.23	3	3	.607
Q20Df Transparency	7	1.57	1	1	13	2.92	2	1	.269

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .  
N = number of responses.

Table 30. WA and BC Barriers to Cooperation – Mann Whitney U Test Results.

Drivers	Washington				British Columbia				Mann Whitney U Sig.
	N	M	Mdn	Mo	N	M	Mdn	Mo	
Q20Ba Lack of Financial Resource	7	4.14	5	5	13	5.08	5	5	.139
Q20Bb Mismatched Government Structures	7	3.00	3	2,3 <sup>a</sup>	13	2.69	2	2	.683
Q20Bc Asymmetrical Participation	7	3.14	3	2,1 <sup>a</sup>	13	3.08	3	4	.903
Q20Bd Lack of Institutional Capacity	7	3.86	4	3,4 <sup>a</sup>	13	4.23	5	3,5 <sup>a</sup>	.515
Q20Be Different Government Cultures and Mandates	7	2.86	3	2,3 <sup>a</sup>	13	2.92	3	3	.968

Significance Level, \*,  $P \leq 0.1$ ; \*\*,  $P \leq 0.05$ ; and \*\*\*,  $P \leq 0.01$ .  
N = number of responses.

There was no significant difference between WA and BC responses to the drivers and barriers of transboundary cooperation. The lack of significance indicates that individuals on both sides of the border feel the same way towards what supports and what hinders cooperative

transboundary management. These results then provide evidence for the existence of social capital within the border region.

### **3.4 Part II. Open Ended Questions**

The open ended section of the questionnaire was designed to build upon themes introduced by Questions 1 through 16. Short answer question can encourage a broad range of responses from interviewees (Larossi 2006; Brace 2008). When completing the interview, it became apparent that respondents wanted to provide more input than selecting a number to indicate their knowledge or opinion to closed set of questions allowed them to do. By employing a short answer question, respondents are given the opportunity to further explain their thoughts and knowledge following Part 1 of the questionnaire (Selin et al. 2000). The analysis of the short answer questions is limited to a brief qualitative overview. A detailed quantitative analysis was not completed due the substantial variation in the number on broadness of response.

The analysis of the short answer responses is organized in the following manner. The question is stated, and then followed with a synopsis of the overall trend of the responses. Following the synopsis of responses, the actual the BC and WA responses are listed. Responses for each question are assigned a letter; this letter remains the same for each individual respondent for each question. For example, BC responses 21a, and 22a, 23a, and so on were all given by the same respondent. Grammatical errors may be present within the responses as they have been copied verbatim from the questionnaire.

No respondent stood out by responding to all questions with the most detail and knowledge. As expected, some respondent's answers to individual questions were far better than others. In reviewing the responses for detail, accuracy and breadth of response, respondents B, C, and D from WA appeared to be more knowledgeable regarding the specific issue than their counterparts, while respondents D, F and K from BC appeared to be more knowledgeable than their counterparts. Respondents A and E from WA appeared to have a lesser degree of



knowledge regarding the specific issue compared to their peers, while BC respondents C, H, J and L appeared to be less knowledgeable than their peers.

**21) In British Columbia what organization(s)/level of government do you feel has the most influence over watershed management?**

The most common BC response to this question appears to be branches of the Provincial government, followed by Municipal governments. The Federal government is only referenced in two of the 13 BC responses. WA respondents answered in a similar fashion to BC respondents, indicating they felt the Provincial level of government followed by the Municipal have the most influence over watershed management. BC responses illustrated a greater breadth of opinion regarding the levels of government responsible for watershed management in BC, relative to the WA responses. However, this difference in opinion between WA and BC is to be expected when discussing questions regarding the other's geographical or political setting.

Comparing responses for this question to the responses of Q17 and Q18 identifies a difference between the actual level of government that respondents feel has the most influence over transboundary watershed management and the level of government that respondents have the most confidence in. In Q17 and Q18 respondents indicated they had the most confidence in the Municipal level of government, while in this question most respondents indicated that the Provincial level of government has the most influence. It should be noted that for this question three BC respondents and one WA respondent felt that the Municipal level of government has the most influence.

WA Responses

- a) Not sure
- b) I don't know the BC government intimately. Most of my contact with BC government is with my counterpart and federal government colleagues, while other general understanding of BC government comes from the news. Size of the watershed is a big factor in the level of organization that influences watershed management. Bertrand and

Fishtrap Creeks are not a big item that will be noticed at the larger levels of government, while the Columbia (including Okanogan, and Kettle) has enough watershed area and enough resources and values that it is a significant consideration for State/Provincial and Federal governments and IJC. A crisis (or perceived crisis) can change that, raising the profile of such small creeks for larger levels of government.

- c) I don't really know. It appears the Regional Districts may have the most potential.
- d) DFO > BC Environment
- e) Municipal and Provincial Government
- f) BC Environment

### BC Responses

- a) Municipal governments with backing from federal government agency (Fisheries and Oceans Canada).
- b) The Province through various Acts and planning initiatives
- c) While it should be the Province, I have found inspiration and interest from local and regional government with funding and other resources provided federally.
- d) Local government seems to have the most influence, as it governs land use decisions (i.e. stormwater management, riparian setbacks in non-ALR lands, development density, aggregate extraction approvals, impervious coverage, etc) and conducts most of the instream work. However, both federal and provincial government have a role as they govern pollution of streams, provide approvals for instream work, govern riparian setbacks in ALR (and in non-ALR where a LG doesn't have a bylaw), govern agricultural practices, etc.
- e) Municipal government through land use decision making.
- f) In practical terms municipalities. The Provincial and Federal governments both have mandates and considerable power over watershed management, but are too under-resourced to participate much.
- g) Province, Local Government, Agricultural Sector, Forestry Sector.
- h) It is my understanding that the province has responsibility for water management (licensing, etc)
- i) The answer to this is it depends on the issue. BC is definitely a fan of crisis management when it comes to watersheds. They do not work effectively together even within each level of government.
- j) BC Ministry of Environment , and Environment Canada
- k) Province (various agencies: environment, natural resource, agriculture, forestry, transportation, health, etc.) – Note, some regional districts have greater influence but this is not uniform across BC (e.g. Metro Vancouver/Greater Vancouver Regional District has higher influence than Province in protecting watersheds within its Jurisdiction – this is somewhat unique in BC).

- l) MOE, MNOR, Watershed Watch (CRD water), Water Districts, Outdoor recreation Council.
- m) In general: Provincial. At local scales perhaps municipal in specific locations.

**22) In Washington State what organization(s) do you feel has the most influence over watershed management?**

In contrast to the knowledgeable WA responses to Q21, for Q22, BC respondents indicated a general lack of knowledge regarding the level of government with most influence over watershed management in WA. Only four of the 13 BC respondents provided an answer. Washington responses to Q22 indicated that State level departments have the most influence over watershed management, followed by either County level government or the Federal government.

Similar to responses to Q21, the most common response to Q22 differed to that of Q17 and Q18. As discussed, for this question respondents indicated that the State level has the most influence over watershed management. For Q17 and Q18 respondents indicated they had the most confidence in the Municipal level, followed by the County, for the management of Bertrand Creek and Fishtrap Creek.

Some argue that successful cooperative management within and external to borders has been proven possible when organization and planning has been downloaded to the Municipal or Regional level (Barnham 2001; Browning-Aiken et al. 2004; Quon 2001; Webler et al. 2003). While Municipal and Regional governance of watershed appears attractive, it can often overlook the legislated responsibilities of Federal and Provincial/State governments to manage ecological resources. The downloading of management responsibly to the Regional and Municipal level is hindered by Federal and Provincial regulatory requirements and therefore rarely successfully implemented (Blomquist and Schlager 2005; Saravanan et al. 2009).

WA Responses

- a) County
- b) County land use planning influences land use in the watersheds of rural areas in Washington State and is governed by state laws (such as the Growth Management Act, Shorelines Management Act) as well as county ordinances. Water quality and quantity are regulated by the Department of Ecology. Treaty Tribes (Nooksack, Lummi) have rights that are often poorly defined but potentially large, and these rights give the treaty tribes considerable power at all levels of government.
- c) The State through the Departments of Ecology and WDFW. There is growing realization that the County through its land use decisions also has a dramatic influence on watershed management but this is not well understood yet. The County also has a large influence on the Nooksack River Flood Management Efforts.
- d) State agencies > federal agencies.
- e) Watershed Improvement District, County, WDFW
- f) Department of Ecology

#### BC Responses

- a) Whatcom County with backing from federal government agencies (EPA, Fish and Wildlife)
- b) Don't know
- c) No Idea
- d) I'm not familiar enough with Washington's organizations to comment.
- e) Unknown.
- f) Whatcom County Conservation District, Washington Fish and Game Dept.
- g) *No response*
- h) No idea
- i) Do not know
- j) Ecology
- k) State - Dept. of Ecology and other resource departments, closely followed by County level.
- l) ?
- m) Don't know

**23) Do you feel that existing watershed protection legislation, in your own area, adequately protects these watercourses in their respective nations? (If not, please briefly describe why?)**

Of BC's 13 responses, 10 replied with a definite no, while two other respondents indicated that while the legislation is adequate, enforcement of the legislation is lacking. One respondent indicated that they did not have sufficient knowledge to respond to the question.

Interestingly, the majority of WA respondents (four of six) also indicated that legislation does not adequately protect water resources in their region. Similar to BC, WA respondents indicated that there is legislation in place; however, it is not effectively enacted or regulated. If adequate legislation is in place and it is enforcement or the lack of information that is lacking, the potential for NGO involvement exists, in a role of infraction monitoring and reporting to regulatory agencies, or in a role as educator to resource users.

#### WA Responses

- a) Somewhat, although enforcement of existing law/ordinances such as CAO is a weak area of farm planning.
- b) Both nations have representative governments at all levels that often have considerable inertia and diverse responsibilities. They are generally responsive, but only when there is considerable agreement on a priority, thus so. Response may even be an assessment that priority does not justify pre-emption of another priority, particularly given finite fiscal resources. Another factor that slows response is that governments in both nations must provide due process – evaluating competing interests, values and claims.
- c) No. The lack of coordination and integration of land use between and water policies is very problematic. More respect needs to be given to landowners in these areas but along with this deference must be an expectation of accountability to produce improved quality, quantity and habitat.
- d) Lack of groundwater regulations in BC, until recently, has been a major hindrance to watershed protection. Other BC problems include lack of growth- and shoreline-management acts, albeit its agricultural land-reserve system provides some land-use protection. In WA, the major problem is lack of enforcement vs. illegal water uses, which is now being addressed through innovative partnerships in the Nooksack and Walla Walla WRIs. But unfortunately, Nooksack negotiations have been slow, notably to implement flow restoration in Bertrand Creek, as federal-agency involvement has been minimal.
- e) No, there are existing regulations (federal, state and local) that would offer protection if there was adequate and effective enforcement.
- f) No, primarily because B.C. does not regulate, or adequately regulate water use. Particularly groundwater use.

#### BC Responses

- a) No, there is no mechanism to enforce regulations, habitat may be lost with no consequences. There needs to be greater oversight in regards to water licences to ensure adequate flows remain for aquatic life. Stormwater management needs improving. Non-point source pollution is a major contributor to water quality in both watersheds. Need better ability to protect or replant riparian areas, voluntary measures are not working.
- b) While the legislation exist, there may not be adequate resources, planning and emphasis on watershed protection to provide effective protection.
- c) No – largely because of lack of data (particularly with respect to groundwater and long-term environment trend data).
- d) No I don't feel that the watercourses are currently protected well enough. In terms of riparian protection, watercourses in Abbotsford and Langley are protected well outside of the ALR, as both LGs have adopted more conservative bylaws than the RAR. However, within the ALR, streamside protection requirements are not clearly defined. If setbacks are more clearly defined it's just limited to building setbacks, not setbacks for farming practices. Further, groundwater is not protected well either. This can impact baseflows in these watercourses.
- e) Provincial and federal legislation is in place (e.g. provincial Water Act, federal Fisheries Act, provincial Environmental Management Act, federal Species-at-Risk Act etc) to protect watersheds, but compliance and enforcement of these statutes is lacking. As such, the legislation isn't adequate.
- f) Absolutely not in Canada.
  - a. BC has no groundwater legislation
  - b. No minimum instream flows for these watersheds
  - c. No riparian setbacks are required on farm land.
  - d. Municipalities are largely forbidden from regulating on farmland.
  - e. Essentially no enforcement of existing legislation is occurring in Canada See <http://wcel.org/resources/environmental-law-alert/bc-fails-halt-collapseenvironmental-enforcement-2009>
- g) No, Groundwater use is not licensed. City of Sumas has a well protection program, Abbotsford nothing.
- h) No. We have no groundwater protection legislation, and it is my understanding that many streams are oversubscribed.
- i) No, Right to Farm act is often treated as if it trumps Fisheries Act and there has been longstanding disagreements between agriculture and Department of Fisheries and Oceans. Then bring in the Gravel operations and Mines Act and you have less than zero protection. Why, because there is no watershed protection legislation. And while there is riparian protection where you have conflict it does not have any equality as to how it is enforced across the region or within the watersheds often pitting landowners against one another and everyone eyeballing the lowest bottom line which with the introduction of RAR by the provincial government could be as low as 5 meters. In fact a DFO rep was

recently heard to say that if they could get 5 meters from everyone they could be very happy.

- j) Don't know. Would defer to our regional MoE staff to answer this.
- k) Generally, no (with the exception of the MetroVancouver watersheds). There is not specific watershed protection legislation but rather a weak mosaic of Provincial and Federal legislation that protects various aspects of the watershed but often conflicts with other legislation for agriculture & forestry. Urban expansion impacts on watersheds are generally not subject to legislation until there are acute impacts (depending on nature of impacts)
- l) No, LAM → Mechanism to protect fish in water act.
- m) In some cases there is excellent legislation with poor enforcement. A specific weakness in the BC Water Act is no provision explicitly for core allocation of stream flow for fish before other licensing/allocation occurs.

**24) Are you aware of any grass roots concerns/movements over these watercourses, and if so, are they enough to drive political action?**

For the most part, WA and BC responses indicated some knowledge of grass root organizations in their area. Only one respondent from BC indicated knowledge of an NGO operating in WA, and one WA respondent indicated knowledge of any NGO's operating in BC. WA respondents appear to feel that the NGO's mentioned in their area have a minor role in political action. In BC respondents indicated that NGO's could have a role in local politics and a potential minor role in mid level politics; however, agriculture and development lobbyists are more commonly vocal.

While there are active grass root organizations in both WA and BC, it appears that the Bertrand Watershed Improvement District (WID) and Fishtrap WID are more active specifically on Bertrand Creek and Fishtrap Creek. The Fraser Valley Watershed Coalition and Langley Environmental Partners Society are both very active in the Bertrand Creek and Fishtrap Creek areas, but are involved in multiple watersheds and projects and do not have the fine degree of focus as their cohorts to the south. The social capital for cooperation exists in these grass root NGO's; however, the informational void between them remains to be bridged. As indicated in

the responses to Q 25 efforts to bridge the gap have been made through the organization of cross border tours and meetings conducted by Western Washington University's Border Policy Research Institute (BPRI). The tours organized by the BPRI brought WA stakeholders and regulators to BC to tour the watershed area of both Bertrand Creek and Fishtrap Creek, and to meet with BC stakeholders and regulators. For many of the participants it was the first time interacting with individuals regarding the watercourses from "the other side of the line".

Contacts made from these meetings have "proved valuable and are ongoing".

#### WA Responses

- a) There has been a pretty good effort on the US side via work of the CD and NSEA but this effort really had not led to an apparent response on the Canadian side re: farm buffers, water use. I get the sense from Canadians the US has a lot more resources to implement conservation practices on Ag land than in Canada.
- b) I am aware that there are some grass roots watershed interests that seem to be driving some political and legal (litigation) action, but I am not closely involved in the details.
- c) Certainly. On both sides of the border. The Langley Environmental Partner's group and the Nooksack Salmon Enhancement have played important roles in helping these systems. The two WID's in Fishtrap and Bertrand have provided opportunities to address issues in a holistic and systematic manner rather than cases by case opportunism.
- d) NSEA's restoration efforts are helping on the WA side of the border, and their collaboration with BC environmental groups and consultants should help with cross-border management, to improve riparian intactness and (perhaps) instream flows.
- e) WID boards; they may actually try to drive politics in direction of reduced regulation and enforcement.
- f) No

#### BC Responses

- a) I am aware of grassroots concerns and action for these watersheds, but overall I have not seen political action inspired from current initiatives.
- b) Not aware of any
- c) Species at risk presence (Salish Sucker, Nooksack Dace) have been getting a lot of local attention, but has yet to become a "movement".

Response from DFO regarding critical habitat designation and implication is still pending.



- d) I am aware of the Bertrand Creek Enhancement Society (not sure if this is the correct title), but I think that they are not very active. As such, they will not drive political action.
- e) Not aware of any.
- f) Local groups in Canada working in these watersheds include:
  - i. Langley Environmental Partners Society (LEPS)
  - ii. Fraser Valley Watersheds Coalition
  - iii. Pepin Brook Streamkeepers
  - iv. Bertrand Creek Enhancement Society
- g) Somewhat aware; however they are not enough to drive political action. It should be a political issue locally. Individuals should be sold an ethic, i.e in BC Universal health care is an understood responsibility or ethic. This hasn't been done for water, maybe as the region is seen as water rich. This idea has to be overcome philosophically.
- h) There are local stewardship groups (eg Langley environmental partners) and some activities associated with species at risk. However, there other stakeholders (e.g. local farmers who need water for irrigation) who likely have stronger political lobbies.
- i) If they had some partnerships and backing then yes. Langley Environmental Partners Society and Fraser Valley Conservancy are two organizations. But still you have agriculture that is good at stating its case and carrying all its sticks, they also never forgive or forget past wrong doings so they remain a large obstacle. The trick is to not get caught up in the industry line and work with those that are cooperative. With enough partnership the industry will come on side. By industry it is Agriculture.
- j) I have no local knowledge for these watercourses. Best to contact the Surrey office of BC MoE
- k) Yes, there are local grass-roots efforts and they can drive action if they are able to influence local political representatives and media, etc., but usually they are up against political backing of land development initiatives, etc.
- l) No
- m) I am not aware of groups for Bertrand and Fishtrap Creeks; they are west of my jurisdiction. There are streamkeeper/stewardship groups and societies in my region who have influence over decisions.

**25) Are you aware of any existing paths of information sharing between Washington State or British Columbia Regulatory Agencies, besides the BC WA Environmental Cooperation Council? If yes, please list.**

Only six of the 13 BC respondents indicated they were aware of any existing paths of information sharing between WA and BC regulatory agencies. In contrast, four of the six WA respondents indicated knowledge of different avenues for information sharing. Of the WA

responses, David Davidson and the efforts of the BPRI were the most commonly referred path for cross border information sharing. As mentioned above, the BPRI, through David Davidson, organized informational cross border meetings and tours for WA and BC Bertrand Creek and Fishtrap Creek stakeholders.

#### WA Responses

- a) No
- b) I am aware of some cross-boundary information sharing, but I have not been aware of the name of the organization, so it may be the one named. A member of my staff follows it much more closely than I do and would be able to answer this.
- c) The BPRI at WWU has helped to foster communications through the “Shared Waters” initiative. This is a good first step but it remains unclear how we move beyond this.
- d) We’ve had two cross-border field trips, one in BC and the other in WA, which included state, provincial, and local agency staff; and professors, consultants, farmers, and other local citizens. We learned that Langley, BC is working towards reducing groundwater withdrawals, which should enhance summer-base flows in Bertrand Creek.
- e) No
- f) David Davidson’s Cross-border program at WWU has made some progress, but there is still very little communication

#### BC Responses

- a) Shared Waters Roundtable/ Shared Waters Alliance
- b) No
- c) No
- d) No.
- e) Not aware of any.
- f) A few municipal staff and staff from a number of US agencies have participated in several cross-border tours or open houses over the past 10 years.
- g) No, when we call individual staff we talk to them not committees.
- h) *No response*
- i) No
- j) Georgia Basin / Puget Sound
- k) Direct contact between government agency staff at federal, provincial and municipal levels.
  - a. Cooperation through research projects.

- b. Response to specific incidents or issues of concern in proximity to the border.
  - c. Transboundary conferences, workshops, etc. (e.g. Georgia Basin/Puget Sound Ecosystem Conference, etc.).
  - d. Consultation through legislative requirements or agreements, e.g. Boundary Waters Treaty Act (Canada), Int'l River Improvement Act (Canada), BC-WA memorandum of agreement on Environmental Assessments.
- l) Instream Flow Council (Hal Beacher)
  - m) There are informal contacts, workshops between and among regional fish biologists. The Upper Columbia White Sturgeon Technical Working Group. American Fisheries Society Chapters (not all) and annual meetings.

**26) Do you feel either the Canadian or American Endangered Species Act could function as a tool to spur transboundary interaction? If not, do you have any suggestions on how transboundary cooperation could be initiated, at the Federal level?**

A trending thought identified in WA and BC responses is that both the Endangered Species Act (ESA) and the Species at Risk Act (SARA) could be used for motivating transboundary cooperation; however, action would be slow as the both the ESA and SARA occur at the Federal level. One respondent indicated that neither the ESA nor the SARA has the ability to act as a tool to assist in the management of the watersheds, and that management has to occur through a treaty or cooperative agreement at the watershed level irrespective of the border. This sentiment appeared to be supported by several of the responses which indicated while one species was recognized by either ESA or SARA on their respective side of the border they were not recognized on the other side of the border. If an overarching treaty or cooperative agreement was formed recognizing species on both sides of the border it could function as an avenue for cross border cooperation. An inherent danger of using a protected species to garner protection of a watercourse is that other watershed users, such as agricultural or industrial, could lose their current or future rights to water resources (Gravell 2005; Milman and Scott 2010).

WA Responses

- a) We have listed Steelhead on the US side and Salish Sucker and Nooksack Dace on the BC side, yet these facts have not influenced interaction much to date.

- b) Although SARA or ESA could function as a tool to spur transboundary interaction, the populations would have to be fairly significant to survival and recovery. I am not well versed in SARA, but Chinook Salmon and Steelhead are both listed in the Nooksack and its Tributaries (and the rest of the Puget Sound Basin). Both species occur in the Bertrand and Fishtrap, but these streams are not mainstays of the populations of either species. Consequently the focus there is on avoiding obvious harm, but these are not (to my knowledge) priority streams for recovery. Indeed, Chinook Salmon are predominantly a larger stream fish. Major threats would of course generate interest and action from the Federal Government. The treaties with Nooksack and Lummi tribes are Federal treaties that include considerable emphasis on fishing rights; impairment of those rights is probably more than likely ESA to bring Federal involvement to the Washington/USA side of the border.
- c) They certainly can contribute to the momentum to begin to address these streams in a more proactive and systematic manner. I would hope we would avoid using the ESA as The prime motivator. It does not seem very effective to me to “force” landowners and agencies to take steps, but a gentle nudge is helpful.
- d) Yes for both countries, notably for (a) Nooksack dace and (perhaps) Salish suckers in BC and (b) Chinook and steelhead in WA.
- e) I believe the ESA could be a strong driver, especially if there is similar regulatory emphasis from BC.
- f) Yes, particularly for Nooksack Dace, and Salish Sucker. Possibly also for Chinook and Steelhead.

#### BC Responses

- a) Yes, Federal legislation may provide a tool, although there are some weaknesses in the Canadian SARA act.
- b) I don't think that these Acts can function as a tool since they only provide direction on their particular side of the border. I think Treaties between the two nations such as the Boundary Water Treaty are more effective tools in enabling this type of co-operation.
- c) Potentially, but not sure how.
- d) I don't think that the SARA is strong enough legislation to spur transboundary interaction. However, DFO may have interest in participating in transboundary issues. I think that the Recovery Teams for Nooksack Dace and Salish Sucker would also be interested in participating in transboundary issues. I'm not very familiar with the American ESA, so can't comment on whether or not it would spur interaction. Having said that, it seems to me that it's stronger legislation, so it may be enough to cause DFO to take notice and become more committed to participating in transboundary projects/initiatives.
- e) No, because legislation with respect to Species-at-Risk/Endangered Species differs too much between countries. For example: In Canada, the Townsends Mole is "listed" as populations in Canada represent the northern extent of its range and, as such, the populations are at risk. However, in the US the Townsends Mole is not protected and is considered a pest by many. There has to be a recognition by decision makers at the

federal level that effective watershed management encompasses the entire watershed, irrespective of a political boundary.

- f) Possibly, No fish found in these watersheds is listed in both countries, although both countries do list fish. In Canada, Nooksack dace critical habitat in Fishtrap and Bertrand Creek was the subject of a precedent setting lawsuit, which the government lost. As a consequence CH was identified in these watersheds and must be protected according to the Act. This includes significant riparian buffers (20-30 m) in many areas. It is unclear at this point what the implications of this are.
- g) What the Feds may want to do is set some goals at the transboundary level and organize help for the capacity. Feds could provide the 'science' to operators.
- h) Possibly, No
- i) I don't know. At every succeeding level of government the action gets slower and slower. We are all a twitter in Canada this year with possible Federal and Provincial elections as well as Municipal this fall so politicians are even slower to make decisions than normal.
- j) *No Response*
- k) Yes (mapping critical habitat and recovery strategies, etc.)
- l) Yes, Nooksack Dace, Riffle Dependent. Coastal Cutthroat Trout abundance in the Nooksack area highlight for concern. Underscores the importance of surface water, ground water, and water quality.
- m) Yes we already have interactions for White Sturgeon recovery and Kootenay Lake Koolenai R. Burbot recovery.

**27) If management occurs locally, is there still a necessity for federal oversight due to the international nature of this transboundary scenario?**

As indicated in the responses to Q17, Q18 and Q19, both WA and BC respondents indicated that management of these resources should occur locally, either at the Municipal or the County/Regional District level, followed by the Provincial level of government. This question allows respondents to build upon their responses to Q17, Q18 and Q19 by further clarifying why they may or may not feel Federal levels of government should be involved.

Dominant BC responses include that Federal oversight is only welcome in situations that are warranted. This includes situations where Federal legislation is triggered, where transboundary watersheds are the focus, or when Federal permits are required to authorize a given activity.

For Q17 and Q18, WA responses had a lower mean response to Federal involvement than BC responses. However, for this question, WA responses appeared to be as open to Federal oversight as BC. Four of five WA respondents indicated that Federal oversight would be useful, while 12 of 13 BC respondents were somewhat open to Federal oversight. The remaining WA responses indicated that Federal would probably be necessary, but that Federal involvement often slows the process down.

#### WA Responses

- a) Suppose, although the feds do not seem to help movement forward.
- b) I am not a legal expert, but my impression is that cooperative management that does not involve clear violation of either Nation's rights and/or laws will require, at most, passive Federal oversight. Agreement that is developed locally provides a great opportunity for politicians at the Federal level to get credit for facilitating local agreement without ruffling to many feathers. Only if the management is contentious, with local governments on the opposite side of the border being at odds, would higher levels of government be needed.
- c) Yes, I don't see that we can avoid the federal nexus. We just don't believe that it should be initiated or coordinated at that level.
- d) Both DFO (in BC) and U.S. federal agencies (NOAA-Fisheries and USFWS) should be more involved with Nooksack and Fraser River management of cross-border tributaries, to achieve better fisheries benefits.
- e) Yes
- f) Yes, oversight and cooperation – at least work to be less restrictive in cross boundary travel.

#### BC Responses

- a) Yes
- b) While not necessary it may be helpful.
- c) Yes
- d) Yes, because some of the work may involve federal permits/approvals. They also have expertise in this area and have responsibility for species at risk issues within the streams.
- e) Yes, as international issues would require federal government involvement (and endorsement) to make it successful.
- f) Yes.
- g) Probably as they should be, or are accountable.

- h) Only in the broadest sense – i.e. federal govt has ultimate responsibility for transboundary issues, so they should set a consistent framework/policy environment, but it makes sense for management to have greater local involvement (unless federal resources are available).
- i) I don't agree to federal oversight, government is good at control, and will easily take power and abuse it. I think federal cooperation would be better idea. Yes everyone has to be at the table all stakeholders especially considering the legislation that we have is either provincial or federal so they need to be there.
- j) Yes, oversight and audit are a requirement for an open process.
- k) If the issue triggers federal legislation on transboundary waters then there would be a role for oversight, otherwise federal “involvement” or “participation” may be a better way to describe it. There is typically more of a research capacity at the federal level if the nature of the issues warrants that level of involvement (although this capacity is in decline). There may also be federal funding programs to support local level activities.
- l) Yes
- m) Yes, at least to the extent that Federal decision makers have the invitation to participate and opportunity to delegate participation or decisions to others.

#### **4.0 GENERAL DISCUSSION**

This research is based off the assumption that successful transboundary watershed management can result from the existence of social capital. The key hypothesis demonstrated by this study is that social capital appears to be growing within the Fraser Lowlands transboundary watershed management setting. From the evidence for the existence of social capital I posit that the Fraser Lowlands border region is poised for collective action. From the questionnaire results emerge suggestions towards the actual structures for collective action or cooperative management preferred by the respondents. While some questions indicated preferred structures for management, and others evidence for the existence of social capital, some questions simply illustrate basic differences between WA and BC, such as differing knowledge bases, or cultural/political backgrounds.

The following discussion of the questionnaire results in relation to the above hypotheses maintains the cluster arrangement and order previously established. Discussion of the short answer results is included within the appropriate cluster discussions.

##### **Cluster 1**

Cluster 1 investigated individual and organizational involvement and ability to affect change. The results show a great deal of agreement in regards to respondent's confidence in their organizations ability to make or affect change within the realm of transboundary watershed management. The lack of significant difference between WA and BC respondents for Q2 Organizations ability to affect change and Q3 Individual ability to affect change shows that watershed users are working from the same framework, and that they have a similar disposition towards how the structure on their side of the border works. However, there is a difference between WA and BC respondents for Q1 when asking about their personal involvement, as the



results to Q1 indicated that WA respondents were more involved than their northern counterparts (WA M = 3.86, BC M = 2.17). This significant difference and the results of the Wilcoxon test of the separated responses indicate the border does influence the regional responses. As discussed in the data analysis section this difference could be the result of WA being on the downstream end of the watershed, therefore demanding a greater level of involvement (Blomquist and Schlager 2005; Browning-Aiken 2004).

## **Cluster 2**

Cluster 2: Determining Priority was composed of two questions, Q5 Cooperation as a priority for WA and Q6 Cooperation as a priority for BC. This cluster was designed to determine if one nation felt a higher level of priority than the other towards improving transboundary watershed cooperation. As a whole, there was no significant difference ( $\alpha = 0.500$ ) between responses to Q5 and Q6, as respondents indicated they agreed that improving transboundary watershed cooperation was a priority for WA and BC (Q5 M = 4.38 and Q6 M = 4). However, when the results were divided by the border the Mann Whitney U test indicated a significant difference between WA and BC responses to Q6, as WA responses indicated a higher level of agreement than BC. Turning to Q5, while there was no significant difference reported for Q5, the average values were so far apart that this suggested a difference, its cause could be the fact that the number of respondents decreased drastically for Q5. This drop in the number of respondents was sourced from a decrease in BC respondents. Further, the lack of BC responses to Q5, a question that addressed the priority for WA, indicated that there was a lack of knowledge or understanding on the part of BC respondents, indicating that the border plays a role. From this we draw the conclusion that there is difference between our two groups of respondents, regarding Q5, based upon the fact so many from BC have no opinion. Not only that but the

average values on the BC side for those who did respond, are lower than on the WA side. The combination of those with no opinion and those that offered a very low level of agreement with Q5 appears to show BC at the low end.

In summary, these results indicate that WA has a greater level of agreement with the proposition that improving cooperation with BC is an important priority for both WA and BC than BC respondents. The difference in priority further emphasizes the upstream and downstream scenario, likely the result of WA being the downstream user and bearing more of the brunt of negative impacts on the Watershed. Upstream users can be less likely to become involved in cooperative management of watersheds with downstream users due to lack of knowledge, distance and disconnect to the negative impacts (Blomquist and Schlager 2005; Browning-Aiken 2004). The differences in priority could become a road block in regards to the creation of a structure for managing resources, as the watershed managers/users do not have a common understanding or knowledge on both sides of the border. The lack of priority, indicated by the lower averages of BC responses is interpreted to mean that the border is an important issue for this issue. These results indicate that this is an area where there is a lack of evidence in for the existence of social capital.

### **Cluster 3**

The purpose of Cluster 3 Geographical Size and Management was to investigate the respondent's level of agreement to the size (i.e volume of water and drainage area) of the transboundary watercourse influencing the necessity of transboundary watershed management (Q7), and if the size dictates the level of government at which management should occur (Q8). When addressing Q7 it was understood that larger sized watercourse would have an increased necessity for cooperation. With this understanding in mind Q7 was designed to determine if

respondents felt that a lack of attention is given to small scale watersheds. When addressing Q8 it was understood that as a watershed increases in size so does the level of government at which the watershed should be managed.

As a whole, for Cluster 3 there was no significant difference between responses to Q7 and Q8. Respondents agreed that the size of a transboundary watercourse influences the necessity for transboundary watershed management, and that the size somewhat influences the level of government at which management should occur. That is respondents agreed that as the size of the watercourse increases so does the necessity for cooperation, and may possibly influence the level of government it should be managed at. When testing for regional difference in response, there was a significant difference between WA and BC responses to Q7, but not for Q8. For Q7, WA (M = 4.29) respondents agreed more strongly than BC (3.64) with the size of the watershed influencing the necessity for cooperation. The results can be interpreted to mean that WA respondents felt that larger watersheds increase the necessity for cooperation, whereas BC respondents were closer to neutral. The significant difference between WA and BC responses to Q7 identify a difference resulting from the border, and therefore a lack of support for the existence of cognitive social capital. In contrast, no significant difference between WA and BC's responses to Q8 indicate a common understanding across the border regarding the structure required for management, and therefore evidence of for social capital. The mean response to Q8 indicated respondents marginally felt that as the size of the watershed shifts so should the level of government that should manage it, but were somewhat unsure. One could posit then for these small scale watercourses management should occur from the lower levels of government, as these are small scale watercourses and would likely not require upper level governance. If the

results of Q7 were also applied to these small scale watersheds one could posit that WA respondents felt cooperation was not a priority, while BC respondents were unsure.

#### **Cluster 4**

Cluster 4 was composed of four questions designed to determine the respondent's perception of existing management approaches to small scale transboundary watersheds such as Bertrand Creek and Fishtrap Creek, while identifying measures by which to manage these resources. The first question of Cluster 4 was Q9, which asked if an ad hoc approach to managing Bertrand Creek and Fishtrap Creek would be preferable to a regulatory approach. Question 10 asked respondents if existing initiatives are sufficient to manage local and small scale watercourses such as Bertrand Creek and Fishtrap Creek. Question 11 asked if management of these watercourses through a single bi-national entity is an approach worth pursuing. Question 12 asked if these watercourses are separate sovereign resources, and if they should be managed as such.

The mean rank of the combined responses to Q9 through Q12 indicated that respondents looked least favorably to Q10 Existing initiative are sufficient ( $M = 1.89$ ), clearly indicating that respondents did not feel existing initiatives are sufficient for the management of these watersheds. This was followed by Q12 Management as separate sovereign resources ( $M = 2.26$ ), which indicated that respondents disagreed with managing these watersheds as separate sovereign resources. While the means for Q10 and Q12 were different, the median (2) and mode (2) was the same for both, indicating the same level of disagreement. The third lowest mean response was for Q9 which asked if an ad hoc approach to management would be preferable to a regulatory approach ( $M = 2.74$ ,  $Mdn = 3$ ,  $Mo = 2$ ). The combined mean results to Q9 indicated that respondents were below neutral towards the idea that an ad hoc approach is preferable to

regulatory for the management of these watersheds. The highest mean rank was for Q11 Management through a single bi-national entity ( $M = 3.42$ ), indicating that respondents were neutral towards managing these watersheds through a single bi-national agreement. The neutrality of the response was supported by the median and mode which were both three. With these responses one can conclude that respondents were in disagreement with Q9, Q10 and 12, but potentially open to Q11 Management through a single bi-national entity.

The Wilcoxon test result indicated that there was a significant difference between all results, except for Q10 and Q12. No significant difference between the responses to Q10 and Q12 indicates that respondents disagreed with Q10 and Q12 at a similar level. Holistically, of the options provided, the combined results to Cluster 4 identify the respondent's preferred structure for shared management through a single bi national management entity (Q11). However, respondents were only neutral to this option, indicating that while they were open to the idea they are unsure if it is the correct framework for management. While the response for Q11 was only neutral, the negative support for the other questions (Q9, Q10, and Q12) may be more telling as the negative results indicated what respondents did not support. Respondents were definitive in their aversion towards existing initiatives, and indicated their unease towards managing the watersheds as separate sovereign resources through an ad-hoc relative to a regulatory approach.

The Mann Whitney U test results indicated that there was no significant difference between WA and BC responses to Q9 through Q12. These results provide evidence for the existence of social capital within the border region, pertaining to watershed management, as individuals on both sides of the border think alike. Overall, the mean rank order of the responses within Cluster 4 provide evidence for the convergence of opinions which could be an indicator of

the existence of cross border cooperation or the existence of social capital, while suggesting the potential willingness to attempt management through a bi-national entity.

### **Cluster 5**

The final cluster, Cluster 5, further addressed structures for transboundary watershed management through four questions. The first question of Cluster 5 was Q13 New initiative/organization for management, followed by Q14 Role of the IJC, Q15 Role of the ECA/ECC and Q16 A binding agreement is necessary for successful management. The purpose of Cluster 5 was to investigate opinion pertaining to current organizations for transboundary watershed management, or if new initiatives or organizations would be preferred. Because the response rate for Q14 and Q15 was so low, sometimes less than fifty percent of the total respondents, these two questions are removed from the current discussion as it shows a lack of opinion. Those who did respond were close to neutrality and for the others that didn't respond, no opinion. As a result these should not be compared with Q16 and Q13.

Noting the decline in responses in Q14 and Q15, and the fact that those who did respond caused me to remove this from the current discussion, at best, individuals were open to the IJC and ECC/ECA, but others were not fully aware of them. Further investigation, and perhaps education, would be necessary before these could be fully considered in this watershed. When looking at only Q13 and Q16 the descriptive statistics for combined responses indicated that for Q16 ( $M = 3.57$ ,  $Mdn = 4$ ,  $Mo = 4$ ) respondents almost agreed with the idea that for successful management a binding agreement with consequences for non-compliance would be required. While, for Q15 ( $M = 4.26$ ,  $Mdn = 4$ ,  $Mo = 4$ ) respondents agreed that a transboundary watershed initiative/organization should be created for the management of these and similar scale resources. The Wilcoxon test results indicated that there was a significant difference between Q13 and Q16,

supporting preference for Q13 over Q16. These results indicate respondents clearly feel that a transboundary watershed initiative/organization for information sharing should be created to manage these and similar scale resources, and that it may be necessary for transboundary agreements to be binding with consequences for non-compliance.

The Mann Whitney U test indicated that there was no significant difference between WA and BC respondents for Q13 through Q16. No significant difference between WA and BC respondents provides further evidence for the existence of social capital within this border region, as it indicates similar knowledge levels across the border. As a whole, the responses indicated that respondents were on common ground and the border does not act as a barrier. This common ground provides evidence for the existence of social capital, while the clear support for the creation of a watershed organization plainly indicates a setting ripe for collective action. Respondents' openness to the formation of a binding transboundary agreement is a further indicator of the potential for social capital, as an agreement would require shared norms and values regarding the management and use of the watersheds. The structure by which management should occur is hinted at, a new structure or structure that is potentially binding with consequences for non-compliance.

### **Level of Governance**

For Q17 and Q18 respondents were asked to indicate the level of government at which they believe transboundary management should occur. The responses to Q17 and Q18 were identical. For Q19 respondents were asked to indicate the overall method of governance they preferred, either Bottom Up, Top Down or Mixed. The purpose of these questions was to determine the organization for governance.

When looking at the combined mean rank responses to Q17/18 it was apparent that respondents favoured the municipal level of government for the management of these watersheds (M = 3.80). This was followed by the Regional District/County (M = 3.63), the Provincial/State (M = 3.30) and the Federal (M = 2.89).

When the responses were separated by country there was a significant difference between WA and BC at the Federal level and at the Regional District/County level. It was clear that Washingtonians did not favour the Federal level, while the British Columbians indicated a medium, to slightly above medium level of confidence. Washington respondents indicated that they didn't want the Federal Level, while BC respondents were open to it. At the Provincial/State level there was no significant difference, with both WA and BC responses indicating a medium level of confidence, or openness, to this level of government. At the Regional District/County level there was a significant difference between WA and BC respondents, BC respondents remained at a medium level of confidence, whereas WA indicated a medium high level of confidence. The reason for this difference could be that County's are built into the American political structure and play an integral role in governance of WA, whereas Regional Districts have far less governance impact within BC due to the province's political structure. There was no significant difference between WA and BC regarding the Municipal level of government. Both Washingtonians and British Columbians indicated a medium high level of confidence in the Municipal level of government.

BC respondents indicated a preference to the higher levels of government while WA indicated a preference to the lower levels of government. There was no significant difference between WA and BC responses for the Provincial or Municipal levels of government. When the separated responses were tested with the Wilcoxon test to see if there was a significant difference



between how WA or BC responded individually, it became apparent that BC did not have a preference in the scale of government, whereas WA did, as there was no significant difference between BC's responses to 17/18a through d, while there was for WA.

The border appeared to have an effect on the respondents when looking at the Federal level, as WA respondents indicated low confidence, while BC respondents indicated medium confidence. There was no border affect for the Provincial/State as both respondents indicated a medium level of confidence. However the border did impact the results at the Regional District/County level of government, with WA indicating a higher level of confidence than BC. As mentioned above, this is likely the result of the historical and current political role that Counties play in regional governance within the WA, whereas Regional Districts have limited governance influence other than municipal like operations outside rural areas of BC. There was no border affect for the Municipal level of government, with both WA and BC indicating a medium high level of confidence. As a whole, these responses identify Americans traditional inclination for small government and Canadians openness with upper levels of government. There is a point of agreement regarding the local level, and hints regarding the management structure respondents would like to see emerge. These results indicate that the Municipal level of government has a role to play in the management of these resources, providing evidence for the existence of social capital regarding municipal governance.

The most important result reported from Q19 was from the comparison of WA and BC responses. It is clear from this comparison that the two groups agreed in regards to the Top down and the Mixed, but there was some disagreement regarding the Bottom Up. The greatest level of confidence, which both groups agreed to, was for Q19c Mixed, with respondents indicating a medium high level of confidence. Next highest was the Top Down approach which indicated a

medium to low level of confidence, and showed no difference between WA and BC responses. The lowest level of confidence was in Bottom Up, which had contrasting results between WA and BC respondents. Washingtonians indicated a medium level of confidence, whereas the British Columbians indicated a medium low level of confidence. The lower BC response may further the idea of Canadian deference to authority.

These results indicate that the only real support is for some sort of mixed approach, with which both sides of the border agree. Respondents indicated little confidence in both Top Down and Bottom Up, with the border having an effect on the responses to Bottom Up. These results appear to hint that a mixed approach structure is preferred. The fact that WA and BC respondents to Q19b and Q19c are not different provides evidence for the existence of social capital. While the difference for Bottom Up identifies BC's reluctance to move from under the wing of upper levels of government. While the responses to Q17/Q18 indicated a desire for the Municipal level of government to be involved in management of these watersheds, that result is somewhat muted as here a mixed approach was indicated as preferential. The resulting nuance in the preferred structure for governance hints that while respondents would prefer municipal contribution they are not willing to forgo upper level involvement, resulting in the preference for a mixed approach

Local and regional governed cooperative/collaborative resource management is a popular concept with successful results (Rickenbach and Reed 2002; Alper 1997; Kenney 1999; Browning-Aiken et al. 2004; Plummer and Fitzgibbon 2006; Schuett et. al. 2001; Singleton 2002; and Webler et al. 2003). Responses to short answer Q24 indicated that there is stakeholder involvement on both sides, but input in BC is far more limited. While the theory is popular, practical application with successful results can be difficult (Blomquist and Schlager 2005). Often upper levels of government are required to direct the overall initiative growth, as well as

the formation and activation of regulations (Springer 2007). These results indicate that the border does have a part to play in forming the approach to managing these watersheds, as the respondents have somewhat differing underlying theories on how it should be carried out. However as a whole respondents do agree on the structure for management, that is a mixed organization.

### **Drivers and Barriers**

Question 20, ranking of drivers and barriers, set out to compare results of this analysis to that of a previously completed study. However, due to multiple unforeseen technical errors a comparison was not possible. As a result the drivers and barriers rank results were tested in the same manner as the data above, to obtain evidence for the existence of social capital, determine if there is an emerging structure, and to see if the border has an impact.

Respondents were asked to rank a provided list of drivers and barriers from strongest to weakest, 6 being strongest and 1 being weakest. The highest ranked driver was Crisis ( $M = 4.55$ ), followed by Specific Issues ( $M = 4.45$ ), Leadership ( $M = 4.10$ ), Established Networks ( $M = 3.05$ ) and Transparency ( $M = 2.45$ ). A definition of these Drivers is located in the Drivers and Barriers section of the results. As there did not appear to be great variation in rank, the results were tested with the Wilcoxon Signed Rank test and the Friedman test to determine if there was a significant difference in the results, which would indicate if the ranking was significant or not. The Wilcoxon and Friedman test result indicated there were two independent rank groups, rather than the original six ranks. There was no significant difference between Crisis, Specific Issues, or Leadership; and there was no significant difference between Established Networks, Informal Contacts and Transparency. However, there was a significant difference between the two groups.

The highest ranked barrier was Lack of Financial Resource (M = 4.75), followed by Lack of Institutional Capacity (M = 4.10), Asymmetrical Participation (M = 3.10), Different Government Cultures and Mandates (M = 2.90) and Mismatched Government Structures (M = 2.80). A definition of these Barriers is located in the Drivers and Barriers section of the results. The mean rank results for barriers also showed limited variability, and the Wilcoxon and Friedman test were used to determine if the ranking was significant. The Wilcoxon and Friedman results indicated that there were three independent rank groups. There was a significant difference between Lack of Financial Resource, and Lack of Institutional Capacity, and a significant difference between the above two and the remaining three options. These results indicate that respondents did in fact rate Lack of Financial Resource as the highest barrier, and Lack of Institutional Capacity as the second highest barrier. However, Asymmetrical Participation, Different Government Cultures and Mandates, and Mismatched Government Structures were not ranked statistically different.

The barrier and driver mean rank results were separated by nation to determine if the border influenced the ranking. There was no significant difference between WA and BC responses to Q20 Drivers or Barriers. These results indicate that there is common knowledge or understanding across the border regarding drivers and barrier, the border is not a barrier. No significant difference between WA and BC provides evidence of the existence of social capital.

The short answer questions results were not further discussed in this section due to the substantial variability in the breadth of response and number of respondents from each nation. The variability of the number of respondents made it difficult to quantify and analyze the responses. They were included within this thesis for reader interest only.

## 5.0 CONCLUSION

As identified in the introduction, the purpose of this thesis was to test four hypotheses pertaining to the cooperative management of small scale transboundary watersheds in the Fraser Lowlands. To reiterate, the first hypothesis examined the existence of social capital, where I hypothesized that evidence for the existence of substantial social capital in this transboundary area was present. Evidence for the existence of social capital was tested through the use of the questionnaire examined the differences in responses by study members based on nationality. The second hypothesis tested if respondents had preferred structures for the transboundary governance of Bertrand Creek and Fishtrap Creek. Hints towards a preferred structure were identified through the questionnaire responses. The third hypothesis looked for evidence of social or cultural differences resulting from the border. I hypothesized that there are social and cultural differences between countries, a result of the border. The fourth hypothesis was that there is greater evidence of the existence of transboundary social capital than for differences resulting from the border. I hypothesized that the preponderance of evidence would indicate differences do not dominate the discussion, and as a result identify a setting poised for collective action.

The results indicated support for the existence of social capital, lending evidence to the idea of a borderland region in which shared values and theories surrounding resource management may transcend the international boundary (Konrad and Nicol 2010; Alper 1996; Loucky and Alper 2008; Cold-Ravnkilde et al. 2004; Sparke 2000). However, the significant differences between WA and BC responses on individual subjects, as well as the decrease in the number of responses to certain questions did identify the border as a barrier to the transfer of knowledge, resulting in differing levels of knowledge, norms and values. In addition, the results

did provide an indication of a preferred structure for transboundary governance. As a whole, the clustered questionnaire results provided evidence for the existence of social capital (Table 31). Questions 2, 3, 8, 9 through 12, 13, 14, 17/18Bb and d, and 19b and d provided such evidence. In contrast, questions 1, 5, 6, 7, 17/18a and c, and 19a provided evidence against the potential for the existence of social capital, and instead indicated the border effect.

Table 31. Questions that provided indicators for or against the existence of social capital.

<b>ID</b>	<b>Identifier</b>	<b>Result</b>
Q1	Personal Involvement.	0
Q2	Organizations ability to affect change.	1
Q3	Individual ability to affect change.	1
Q5	Cooperation as a priority for WA.	0
Q6	Cooperation as a priority for BC.	0
Q7	Influence of size on necessity for cooperation.	0
Q8	Influence of size of level of managing government.	1
Q9	Ad hoc vs. Regulatory approach to management	1
Q10	Existing initiatives, sufficient or not?	1
Q11	Management through a single bi-national entity.	1
Q12	Management as separate sovereign resources.	1
Q13	New initiative/organization for management.	1
Q14	Role of the IJC.	1
Q15	Role of the ECA/ECC.	1
Q16	A binding agreement is necessary for successful management.	1
Q17/18a	Level of government – Federal	0
Q17/18b	Level of government – Provincial/State	1
Q17/18c	Level of government – Regional District/County	0
Q17/18d	Level of government – Municipal	1
Q19a	Regulatory arrangement – Bottom Up	0
Q19b	Regulatory arrangement – Top Down	1
Q19c	Regulatory arrangement – Mixed	1
1 = Evidence for the existence of social capital.		
0 = Evidence against the existence of social capital		

Preferred structures for transboundary governance were identified by questions 2, 8, 10 through 12, 13 through 16, 17, 18 and 19 (Table 32). While a border effect was identified in questions 1, 5, 6, 17/18a and c, and 19b, and evidence of ingrained cultural differences were identified by questions 17 and 19 (Table 33). It should be noted that a far fewer number of questions indicated the border as an issue, relative to those that provided evidence of the

existence of social capital. As a result, one can posit that the border does not appear to have a dominant affect on the transboundary management of these watercourses.

Table 32. Questions that provided indicators of potential structures for management.

<b>ID</b>	<b>Identifier</b>
Q2	Organizations ability to affect change.
Q8	Influence of size of level of managing government.
Q10	Existing initiatives, sufficient or not?
Q11	Management through a single bi-national entity.
Q12	Management as separate sovereign resources.
Q13	New initiative/organization for management.
Q16	A binding agreement is necessary for successful management.
Q17/18a	Level of government – Federal
Q17/18d	Level of government – Municipal
Q19b	Regulatory arrangement – Top Down
Q19c	Regulatory arrangement – Mixed

Table 33. Questions that provided indication of border effect.

<b>ID</b>	<b>Identifier</b>
Q1	Personal Involvement.
Q5	Cooperation as a priority for WA.
Q6	Cooperation as a priority for BC.
Q7	Influence of size on necessity for cooperation.
Q17/18a	Level of government – Federal
Q17/18c	Level of government – Regional District/County
Q19a	Regulatory arrangement – Bottom Up

To look for hints regarding the preferred structure for governance the thesis questionnaire addressed the following areas:

- Whether the small scale of these watersheds limits the ability of existing national scale agreements to act as effective management frameworks for the watersheds.
- What type of framework would be required to facilitate cooperation.
- If a local/regional based cooperative agreement would result in long-term ecological health and economic use of the watershed.
- Whether incentives such as grants or regulatory penalties for non-cooperation may be necessary for cooperation to occur on both sides of the border.

The questionnaire responses indicated that respondents felt that existing watershed initiatives are not sufficient to manage these small scale watersheds, whether at the Federal or Provincial level. When directly asked if current initiatives are sufficient, respondents indicated that they were not. In addition, the number of responses to questions addressing the IJC, and the now defunct ECA/ECC declined substantially. This decline in responses was interpreted as a lack of knowledge, which further strengthened the argument against the effectiveness of current initiatives, since respondents should be aware of them if they were sufficient.

The preferred governance structure was indicated as mixed, with municipal government involvement. In doing so, differing underlying political ideologies were identified by WA and BC responses; as WA respondents avoided upper level government and indicated a preference for lower levels of government, whereas BC respondents indicated deference to upper level government and a preference to a mixed approach. Upper level institutional involvement, especially at the Federal and Provincial level, is viewed as a necessity for successful transboundary management due to political and legal encumbrances brought forth by management of transboundary resources (Springer 2007; Vannijnatten 2004). That being said, individuals within the institutions or organizations are often seen as the catalyst for successful collaboration, providing the impetus for transboundary cooperation requiring regulatory oversight (Webler et al. 2003; Lubell 2004; Plummer and Fitzgibbon 2006).

While respondents indicated that the watersheds should not be viewed as separate sovereign resources, they were somewhat neutral, but open to governance of these watersheds through a single bi-national entity. In addition, respondents indicated support for the formation of a cooperative initiative for knowledge sharing. Although WA respondents indicated an aversion to upper levels of government, respondents were open to a binding agreement with



consequences for non-compliance, with no significant difference between WA and BC respondents. Upper level government would likely have to be involved to implement consequences in a transboundary setting (Vannijnatten 2004). If management occurred through a single bi-national entity, incentives or consequences could be written into the memorandum of understanding or constitution of the said organization. Management through a single bi-national entity and potential consequences are interesting propositions, but they do bring up the question of sovereignty. However, respondents indicated opposition to the idea of managing the watersheds as two separate sovereign resources. These results provide evidence for the existence of structural social capital, and a potential framework for future information sharing. Interestingly while there was no difference between WA and BC for the above two points, there was for the perceived level of priority. The results indicated that WA felt a higher level of priority for cooperative management than BC, likely resulting from WA being the downstream resource user (Blomquist and Schlager 2005; Browning-Aiken 2004). The level of perceived priority for transboundary management felt by the neighbouring users may be the determining factor in bridging the information and organization void (Browning and Aiken 2004).

The geographical setting and scale of the Bertrand Creek and Fishtrap Creek watersheds allows for users and regulators to physically observe changes and/or issues on both sides of the border with minimal effort. This capacity, when combined with grass roots initiatives for information sharing, provides a setting for the informational gap to be bridged. If opposite regulatory groups or stakeholders at any organizational level have parallel objectives, confidence in the ability of one's organization will lend strength to the argument for a mixed management approach (Alper 2004; Browning-Aiken 2004; Rickenbach and Reed 2002). The questionnaire

results indicated evidence for the existence of cognitive and structural social capital required to bridge the organizational voids.

Local and regional cooperative/collaborative governance of resources is a popular concept with some successful results (Rickenbach and Reed 2002; Alper 1997; Kenney 1999; Browning-Aiken et al. 2004; Plummer and Fitzgibbon 2006; Schuett et. al. 2001; Singleton 2002; and Webler et al. 2003). However, while the theory is popular, practical application with successful results can be difficult (Blomquist and Schlager 2005). Often upper levels of government are required to direct overall initiative growth, as well as the formation and activation of regulations (Springer 2007). These results indicated that the border does have a part to play in the formation of the governance approach for management of these watersheds, as the respondents had somewhat differing underlying theories on how it should be carried out. However, as a whole, respondents did agree on the structure for management that is a mixed organization.

If a bi-national cooperative management initiative for information sharing could be formed, would stakeholder and resource user 'toeing the company line' result, or would incentives for cooperation be required? One could argue that a successfully managed resource or ecologically sound resource would be incentive enough. However, a counter theory is that without incentives for conservation or consequences for negative resource use, resource overuse and eventual collapse is inevitable (Hardin 1968; Ali 2003; Uphoff and Langholz 1998). Within the theory of cooperative resource management and social capital theory, educational, information sharing and resource user relationships are sufficient to avoid complete resource degradation and conflict arising from inequitable use (Plummer and FitzGibbon 2006; Uphoff and Langholz 1998; Grootaert and van Bastelaer 2001; Ohno et al. 2010; Pretty 2003; Singleton

2002). The preferred path to shared management, as indicated by the questionnaire responses, would be through a cooperative agreement that involves information sharing and communication, and mixed involvement of government. In this scenario the agreement could be binding, with consequences for non-compliance, allowing for a level of confidence that one's positive actions will not be offset by the other user's negative actions.

Overall, this study indicated a greater level of evidence for the existence of social capital than for differences resulting from the border, indicating the Fraser Lowlands border region is ripe for collective action. This all sounds feasible on paper, but is it applicable on the ground? Some argue that while, in theory, cooperative and integrated management works to avoid political differences, land use challenges or resource distribution, it is rarely put into practice due to the previously mentioned complexities which should be avoided (Saravanan et al. 2009; Springer 2007; Singleton 2002; Blomquist and Schlager 2005). While a cooperative and integrated management process may be difficult to facilitate and successfully employ, it is a process that encourages increased participation and information sharing for decision making and can result in a dispute resolution partnership and collaborative management with overall positive benefits for both the resource and the user (Schuett et al. 2001; Uitto and Duda 2002; Leach and Pelkey 2001; Lubell 2004).

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## **Appendix 1**

### **Transboundary Watershed Management Questionnaire**

## Transboundary Watershed Management Questionnaire

The purpose of my research is to investigate the perspective and knowledge of regulators surrounding the management/governance of transboundary watersheds, specifically Bertrand Creek and Fishtrap Creek shared by British Columbia and Washington. The questionnaire consists of two parts. Section One is a closed response section used to determine one's level of activity and opinion regarding the transboundary management of the above mention watercourses. Section Two is an open ended interactive questionnaire intended to uncover any further information pertinent to binational management of Bertrand Creek and Fishtrap.

My questionnaire has been designed with the purpose of obtaining knowledge from experts within the field of transboundary watershed management. In particular the questionnaire is aimed at:

- a) Determining if the issues surrounding these watercourses are sufficient to warrant a transboundary management initiative;
- b) Identifying at what level of government experts believe transboundary watershed management should occur;
- c) Identifying some of the obstacles to transboundary waters management cooperation;
- d) Identifying the existing local and regional capacity for transboundary watershed management; and,
- e) Identifying potential cooperative management options.

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### **Preliminary Inquiry**

- 1) Please indicate the degree to which to which you personally have been involved in discussions/initiatives pertaining to transboundary watershed management.

Little to none	Low Involvement	Some	Involved	Very Involved
1	2	3	4	5

- 2) Please indicate the degree to which your organization has the ability to make/affect decisions that can improve the methods for interaction or actual transboundary solutions.

Little to None	Low	Medium	High	Don't Know	
1	2	3	4	5	○

- 3) What is your ability within your organization to make/affect international cooperation decisions?

Little to None	Low	Medium	High	Don't Know	
1	2	3	4	5	○

**Part 1: Watershed Management Issues**

**For the following questions please indicate your level of agreement or disagreement.**

5) Improving transboundary watershed cooperation with British Columbia is an important priority facing Washington.

Strongly Disagree	Disagre	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	6
					○

6) Likewise, improving transboundary watershed cooperation with Washington State is an important priority facing British Columbia.

Strongly Disagree	Disagre	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	6
					○

7) The size (i.e. volume of water and drainage area) of the transboundary watercourse influences the necessity of transboundary cooperative management.

Strongly Disagree	Disagre	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	6
					○

8) The size (i.e. volume of water and drainage area) of the transboundary watercourse dictates the level of government at which watershed management should occur.

Strongly Disagree	Disagre	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	6
					○

**Bertand Creek and Fishtrap Creek Management Issues**

9) An ad hoc approach to managing Bertrand Creek and Fishtrap Creek is preferable to a regulatory approach.

Strongly Disagree	Disagre	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	6
					○

10) Existing transboundary watershed initiatives are sufficient to manage local and small watercourses, such as Bertrand Creek and Fishtrap Creek.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	○

11) Management of Bertrand Creek and Fishtrap Creek through a single bi-national management entity is an approach worth pursuing.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	○

12) The watercourses are separate sovereign resources and should be managed as such.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	○

13) A transboundary watershed initiative/organization for information sharing should be created to manage these and similar scale resources.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	○

14) The International Joint Commission (IJC) has a role to play in the management of these two small scale transboundary watercourses.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	○

15) The BC/WA Environmental Cooperation Agreement (ECA) and Environmental Cooperation Committee (ECC) is an effective organization for the management of these transboundary watercourses.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	<input type="radio"/>

16) For successful management, it would be necessary for transboundary agreements to be binding with consequences for non-compliance.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
1	2	3	4	5	<input type="radio"/>

**For the following questions please indicate your level of confidence with the accompanying statements.**

17) For Fishtrap Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.

	Low	Medium	High	Don't Know
Federal	1 2	3 4	5	<input type="radio"/>
Provincial/State	1 2	3 4	5	<input type="radio"/>
Regional District/County	1 2	3 4	5	<input type="radio"/>
Municipal	1 2	3 4	5	<input type="radio"/>

18) For Bertrand Creek, please indicate your confidence in what level of government you believe transboundary watershed management should occur.

	Low	Medium	High	Don't Know
Federal	1 2	3 4	5	<input type="radio"/>
Provincial/State	1 2	3 4	5	<input type="radio"/>
Regional District/County	1 2	3 4	5	<input type="radio"/>
Municipal	1 2	3 4	5	<input type="radio"/>

19) Please indicate your level of confidence in the regulatory arrangement used to govern transboundary watersheds.

	Low		Medium		High	Don't Know
Bottom Up	1	2	3	4	5	<input type="radio"/>
Top Down	1	2	3	4	5	<input type="radio"/>
Mixed	1	2	3	4	5	<input type="radio"/>

**For the following question, in relation to the two watercourses of interest, please score the listed six drivers and barriers, from strongest to weakest, with 6 being strongest and 1 being weakest.**

20) The following drivers and barriers to transboundary watershed management were identified through extensive research by Norman and Bakker, (2005).

<b>Drivers of Cooperation</b>	<b>Rank</b>
Crisis	
Leadership	
Informal Contacts	
Specific Issues	
Established Networks	
Transparency	

<b>Barriers to Cooperation</b>	<b>Rank</b>
Lack of Financial Resource	
Mismatched Government Structures	
Asymmetrical Participation	
Lack of Institutional Capacity	
Different Government Cultures and Mandates	

Drivers and Barriers adapted from Norman and Bakker (2005).

<b>Other</b>	<b>Rank</b>

<b>Other</b>	<b>Rank</b>

## Part II. Open Ended Questions

21) In British Columbia what organization(s)/level of government do you feel has the most influence over watershed management?



21) In Washington State what organization(s) do you feel has the most influence over watershed management?

23) Do you feel that existing watershed protection legislation, in your own area, adequately protects these watercourses in their respective nations? (If not, please briefly describe why?)

24) Are you aware of any grass roots concerns/movements over these watercourses, and if so, are they enough to drive political action?

25) Are you aware of any existing paths of information sharing between Washington State or British Columbia Regulatory Agencies, besides the BC WA Environmental Cooperation Council? If yes, please list.

26) Do you feel either the Canadian or American Endangered Species Act could function as a tool to spur transboundary interaction? If not, do you have any suggestions on how transboundary cooperation could be initiated, at the Federal level?

27) If management occurs locally, is there still a necessity for federal oversight due to the international nature of this transboundary scenario?

**Appendix 2**

**Transboundary Watershed Management Short Description  
and  
Informed Consent Agreement Form**

## **Research in Transboundary Watershed Management: A Short Description**

My thesis addresses the issue of cooperative transboundary watershed management, and the best process by which this should occur. It examines current transboundary cooperative agreements between Canada and the United States, as well as regulatory officials in British Columbia and Washington for their opinions pertaining to the cooperative management of these watercourses. It focuses on the valuation of the watercourses by each region's regulatory officials and whether they believe the existing management methods are sufficient or whether a formal cooperative agreement is necessary. It addresses the question of, under what framework can cooperation be facilitated and if cooperation without external incentives is probable.

The process by which transboundary watershed management can occur, either in a top down, bottom up, or horizontal regulatory framework is of interest. Whether a management regime is top-down, bottom-up, or horizontal, appears to depend on the level of responsibility and power differing governing or regulatory bodies, as well as grass root community organizations have. Researchers and regulators opinions differ when discussing a management approach. However trends appear to indicate a preference with a bottom-up or horizontal approach, as indicated through the IJC Watersheds initiative and downloading of regulatory power to the provincial and municipal levels.

My hypothesis is, that due to the small scale of these watersheds existing national scale agreements are not sufficient to effectively manage these watercourses and that the British Columbia / Washington Environmental Cooperation Committee is better designed to successfully promote transboundary environmental cooperation. For long-term ecological health and economic use surrounding these watercourses, a more regional based cooperative agreement will prove to be effective. However, for cooperation to occur incentives for British Columbia to cooperate may be necessary.

I believe that this research will provide utility as it will identify the pertinent agencies and individuals in British Columbia and Washington relating to transboundary watershed management, in so, that future researchers and/or regulatory officials may access the information when undertaking transboundary communications. While the main focus of this research is to identify issues surrounding small scale transboundary watersheds within a particular region, the general theme of environmental governance between Canada and the United States may be analogous to other transboundary issues.

# Informed Consent Agreement Form

## Transboundary Watershed Management: Bertrand Creek and Fishtrap Creek

### Purpose and Benefit:

The purpose of this study is to understand the regulatory management setting surrounding two small transboundary watercourses, Bertrand Creek and Fishtrap Creek. Specifically it will identify the similarities and differences between British Columbia (Canada) and Washington (U.S.A), regarding regulatory organization and approach. It focuses on regulators knowledge of the watercourses, transboundary water management in each region and whether they believe the existing management frameworks are sufficient or whether a formal cooperative agreement is necessary. It raises the question of, under what framework can cooperation be facilitated and if cooperation without transboundary regulation or external incentives is probable.

### I UNDERSTAND THAT:

- (1) This study will involve a questionnaire consisting of two sections. Section 1 contains twenty closed questions used to determine ones level of activity and opinion regarding transboundary watershed management. Section 2 is an open ended interactive questionnaire and contains seven open ended questions. Section 2 is intended to uncover further information pertinent to binational management of Bertrand Creek and Fishtrap Creek. The interview process is expected to take between 20 and 40 minutes per interviewee.
- (2) There are no anticipated risks or discomfort associated with participation.
- (3) Benefits to you the interviewee(s) are expected from this study as it is an opportunity for you express your opinions on transboundary watershed management and ways to make it better. Following analysis of the data you will be able to use the results to better understand the opinions and issues confronting your neighbouring regulators. Therefore, potentially facilitating more effective interaction between you and your neighbouring regulators.
- (4) This experiment is conducted by Ryan Anaka at Western Washington University. If you have any questions or concerns regarding this research please do not hesitate to contact him.  
  
Ryan Anaka, Masters Candidate  
Phone: (778) 808-4885  
Email: anakar@students.wvu.edu
- (4) My participation is voluntary, I may choose not to answer certain questions or withdraw from participation at any time.
- (5) All information is confidential. My signed consent form will be kept in a locked cabinet separate from my responses which will be kept anonymous and will only be labeled as a Canadian or American response. My name will not be associated with any of my responses at any time.
- (6) My signature on this form does not waive my legal rights of protection.
- (8) A copy of this form will be provided to you.

In the USA, if you have concerns or questions about your rights as a participant, you can contact Geri Walker, Western Washington University Human Protections Administrator (HPA) at (360) 650-3220. In the event that you suffer any research related injuries or adverse effects as a result of participating in this study, please contact the HPA and Ryan Anaka.

**I have read the above description and agree to participate in this study.**

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant's PRINTED NAME