

**USING SOCIAL NETWORK ANALYSIS TO MAKE INVISIBLE HUMAN ACTOR
WATER GOVERNANCE NETWORKS VISIBLE – THE CASE OF THE
OKANAGAN VALLEY**

by

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Abstract

This is a study of water governance in the semi-arid Okanagan valley, British Columbia, Canada. The human dimension of water governance is often overlooked and in this study I use Social Network Analysis (SNA) to gain new insights into the characteristics of the Okanagan water governance network. I explore some of the perceptions held by British Columbia water professionals to pierce the ‘veil’ of opaque decision-making processes – formal and informal – that play a central role in Okanagan water governance. My thesis question for this study is: how does the relationship among actors influence water governance in the Okanagan basin, British Columbia Canada?

This study is a descriptive analysis of the social and institutional characteristics of the Okanagan Basin water governance network as it relates to water scarcity policy and practice. I conducted in-depth interviews with British Columbia water experts involved in water scarcity in the Okanagan. Collected data was analyzed using text analysis and SNA. Prominent themes that emerged from the interviewees included: a need to improve the provincial government’s commitment to water governance, public apathy, a lack of succession planning of senior water professionals, a need to improve communications with First Nations, and the need to address tensions that detract from improving water governance in British Columbia. The influence of the Okanagan Basin Water Board, a unique regional local government body in British Columbia, is shown to exert a significant and positive influence on funding and communication relationships within the Okanagan watershed network. Network data is applied to create benchmark Okanagan water governance network diagrams and these diagrams are compared and contextualized using previously developed network archetypes. Social network diagrams are useful to develop a benchmark or snap shot

in time of the water governance network and provide practical insights into how policy and communication strategies may be applied to improve communication and social learning among actors in the network.

Preface

This study was approved by the UBC Research Ethics Board (UBC BREB number: H12-01725) on August 1, 2012. This thesis is entirely my work; I conducted all of the interviews, data collection and analysis and wrote this study manuscript.

This thesis partially tells a story exploring how one might better describe relationships – both among people and between people and our ecosystem. Social Network Analysis is an exciting method to describe human actor networks and explore the human relationships that are foundational to understanding water governance and its improvement. And as we face some of the most challenging issues including climate change, population growth and ecosystem transformation it is paramount that we better understand the human relationships that govern water – today and in the future. This study illustrates some of the formal and informal relationship networks that are often invisible – attempting to make them visible, and by doing so creating a forum for dialogue that has the potential to support practical improvements to water governance in British Columbia and the semi-arid Okanagan valley.

The journey of writing this thesis has allowed me time to explore Asian, North American colonial and First Nation water governance ideas. And this work has helped me better understand epistemologies and social networks that may be used to improve water governance. Water governance networks are complex and have experienced significant changes over the past 100 years; improving water governance networks will benefit from collective action and collaborative learning.

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"Action expresses priorities." - Gandhi

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All typographic, grammatical and content errors are my own.

This study is dedicated to the search for a better understanding of water governance. The more I learn the less it seems I know.

Good things start with water, light, dirt and intention – ingredients to a happy life.

We dance round in a ring and suppose,
But the secret sits in the middle and knows.

Robert Frost (1942)

Chapter 1: Introduction and background

Water is life. The Okanagan Indigenous people of the Syilx nation have a word, *Tmix^w*, that describes the multitude of threads that connect all living things and recognizes our individual and collective imperative to act – encouraging everyone to appreciate that the choices we make today affect current and future generations' quality of life. All living things are connected in a network of relationships that depend on water. Water governance is defined in this study as *how actors with formal and informal norms, principles, rules and structures...manage water for the well-being of humans and ecosystems* (Gupta 2011). This study explores how social network analysis can help our understanding of water governance in the Okanagan by visualizing and benchmarking different aspects of the current Okanagan water governance network.

How does water governance relate to the epistemology of water? Water governance, often veiled through a complex network of actors, reflects how society relates to and treats the ecosystem within which it lives. The epistemology of water governance in the Okanagan is heavily influenced by colonial decision-making and knowledge systems, and is notably different from indigenous epistemology. Indigenous epistemology often will consider past and future generations on the landscape and highly values the salmon that live in the water - for cultural and subsistence reasons. Over the past 150 years, individuals within the British Columbia government have often made decisions about water on behalf of institutions and civil society without fully considering many utility functions that account for important ecosystem 'features' or attributes that are important for future generations. For example, the damming of the Columbia River and channelization of the Okanagan River for flood control purposes, has contributed to the collapse of Okanagan sockeye salmon (*Oncorhynchus*

nerka), an indicator species of ecosystem functioning. This collapse was further exacerbated by the intentional introduction of exotic species including *Mysis relicta* (Shepherd 2000). Applying contemporary colonial and indigenous governance knowledge systems may help improve water governance in the Okanagan as we look to address complex and difficult challenges associated with climate change and population growth. The epistemology of water is heavily influenced by the power and agency of individual actors within a water governance network and in this study I explore what some of these actor network diagrams look like.

Improving water governance involves developing strategies that address issues of effectiveness, participation and legitimacy (Folke et al. 2005, Kjaer 2004). This study identifies some of the perceptions of the current Okanagan water governance network that is influenced and shaped by formal and informal relationships between and among a range of actors. I apply social network analysis as a means to identify some of the human dimensions of the water governance network and some of the conflict that occurs, or may occur, during water scarcity events. Improving water governance is an imperative. This study identifies some emergent themes of conflict and calls for a new approach based on social network analysis to help us better manage water – connecting our actions to an understanding and appreciation of the ecosystem and our place within it – for today and future generations.

1.1 Thesis question

My thesis question for this study is: how does the network of actors and their relationships, formal and informal, influence water governance in the Okanagan basin, British Columbia Canada? I argue in this study that improvements to water governance are supported by applying social network analysis to help understand and communicate some of the complex formal and informal relationships between the people involved.

Water governance may be hindered by a range of challenges including: tensions between representation and participation, centralized oversight and local preferences, economic factors and environmental imperatives (Bakker 2010). Improving water governance involves social learning and the negotiation of goals and processes at multiple levels to translate goals into action (Pahl-Wostl 2009) and requires collective effort. For example, managing water scarcity events in the Okanagan through an integrated watershed approach (including the development of water use plans) has some distinct advantages over ad hoc and fragmented approaches. Previous studies suggest that

...water service delivery will require the combined commitment of government and various groups in civil society, particularly at local/community levels, as well as the private sector...all networking to support and influence government (Rogers and Hall 2003).

The Okanagan water governance network described in this study is a collection of actors and their relationships and provides insight into the perceived leadership, trust relationships and conflicts that are present today. In this study I report perceptions about the current state of water governance in the Okanagan valley and the relationship between water professionals in a water governance network (see Appendix 1 for a visual representation).

Barriers to improving water governance in Canada have been documented (Bakker 2007: 5-16) in detail and include: the myth of abundance, multi-jurisdictional nature of regulations and property rights, lack of meaningful inclusion of indigenous governments, lack of integrated economic instruments to support equitable and efficient water management, and unclear roles and responsibilities for governments at all jurisdictional levels. Conflicts are also attributed to an increased uncertainty in future Okanagan climate and hydrologic regimes (Cohen et al. 2006, Neilsen et al. 2010, Schindler and Smol 2006) with implications to local government infrastructure and insurance companies struggling with

the loss of stationarity due to climate change. Concurrently, the global population is growing and consequently more people will want to take advantage of the high quality of life available in the Okanagan valley because of its amenable climate and scenic landscape. Population growth will increase the occurrence and severity of Okanagan water conflicts. A collective commitment by the government, residents and citizens of the Okanagan to improve the Okanagan water governance network will be required to manage emerging conflicts caused by climate change and population growth.

Water governance in the Province of British Columbia is often perceived as a black box of decision-making processes and actors. Water governance scholars emphasize that “identifying actors, clarifying their roles, determining how they will be engaged and ensuring that they have adequate capacity to participate effectively are necessary first steps in water governance processes” (De Loe 2009). Moreover, water governance is complicated because cause and effect are not always clearly linked and the water governance network consists of a complex web of nested institutions (see Appendix 2) and individual decision-makers who operate behind institutional veils. I am interested in looking beyond the veil of formal and informal institutional decision-making processes to gain a better understanding of who makes decisions and how the network of actors influences the process of water governance. This study explores the structure of the water governance networks and some of the embedded relationships.

1.2 Geographical context

The geographic context for this water governance network analysis is the Okanagan watershed located in the Province of British Columbia, Canada. The Okanagan is a narrow valley almost 200k long and 8,000km² in area. The Okanagan valley runs North-South and

is located in the interior plateau of British Columbia between the Coast and Southern Rocky mountain ranges. The semi-arid Okanagan is an international watershed with water flowing from the Northern reaches southward through Osoyoos Lake that straddles the Canada-United States border and is an important sockeye salmon tributary of the Columbia River – one of the largest river systems on the West Coast of North America. The hydrology of the Okanagan (Figure 1) is dominated by winter snow pack and subsequent spring run-off, and the Coastal Mountains provide a rain-shadow enhancing the semi-arid characteristics of the valley.

This study focuses on Okanagan water scarcity policy nested in the broader water governance framework of British Columbia.

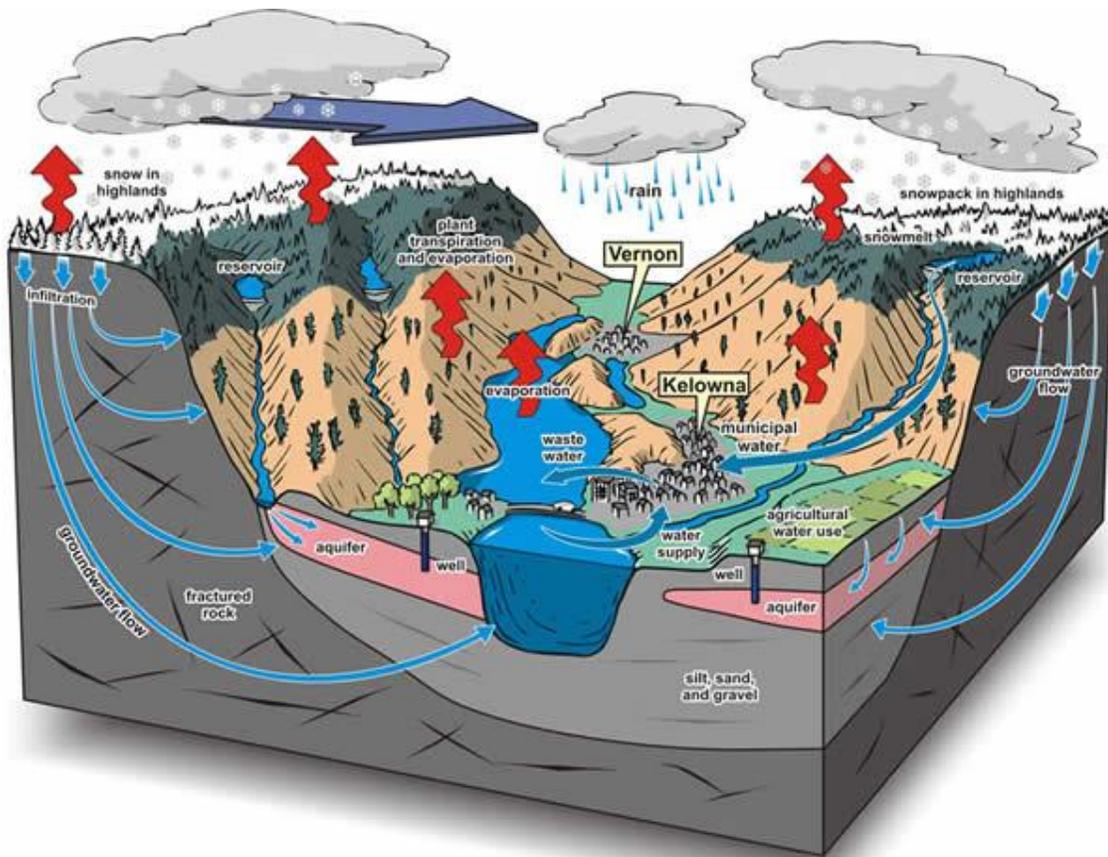


Figure 1 Okanagan water cycle (OBWB 2011).

1.3 First nations and water governance legitimacy

Collaboration and co-management of water among government jurisdictions continues to be a challenge in the Okanagan. Indigenous people's land and water claims remain unsettled in British Columbia; constitutionally enshrined indigenous rights and title for water resources in the Okanagan basin, like most of the Province of British Columbia have not been negotiated by treaty:

Syilx water rights were never abrogated and the 1877 Joint Indian Reserve Commission holds records that acknowledge the existence of these rights prior to the first preemptions in the Okanagan Valley, which occurred in 1867. The *Syilx* oral histories combined with the written narratives of the European settler societies contribute a diverse environmental perspective on Okanagan water systems (Sam 2008:78).

Resolution of legal disputes over indigenous rights will necessarily introduce a degree of legal pluralism into the water governance network. There is notable uncertainty surrounding indigenous rights and the full participation of Indigenous people; an important aspect requiring attention in order to improve the Okanagan water governance network.

Armitage (2008: 24) argues that "an expected benefit of multi-level governance, for example, is the linking of formal science and local or indigenous knowledge systems". The pursuit of a pragmatic approach to improving water governance networks may be well served by utilizing both western and indigenous governance knowledge. The opportunity to benefit from a conceptual pluralism, scientific inquiry and traditional ecological knowledge, which respects the historical context and the rich content from both paradigms, is a means to improve the current water governance networks and decision-making processes.

1.4 Climate and weather in the Okanagan

The Okanagan experiences highly variable annual water supply – ranging from less than 100,000 ML to over 1,300,000ML measured as annual inflow into Okanagan Lake and

is anticipated to intensify due to climate change (Summit Environmental Consultants Inc 2010). The Okanagan is one of Canada's driest watersheds and is compounded in water management challenges by a fast growing population (see Figure 2).

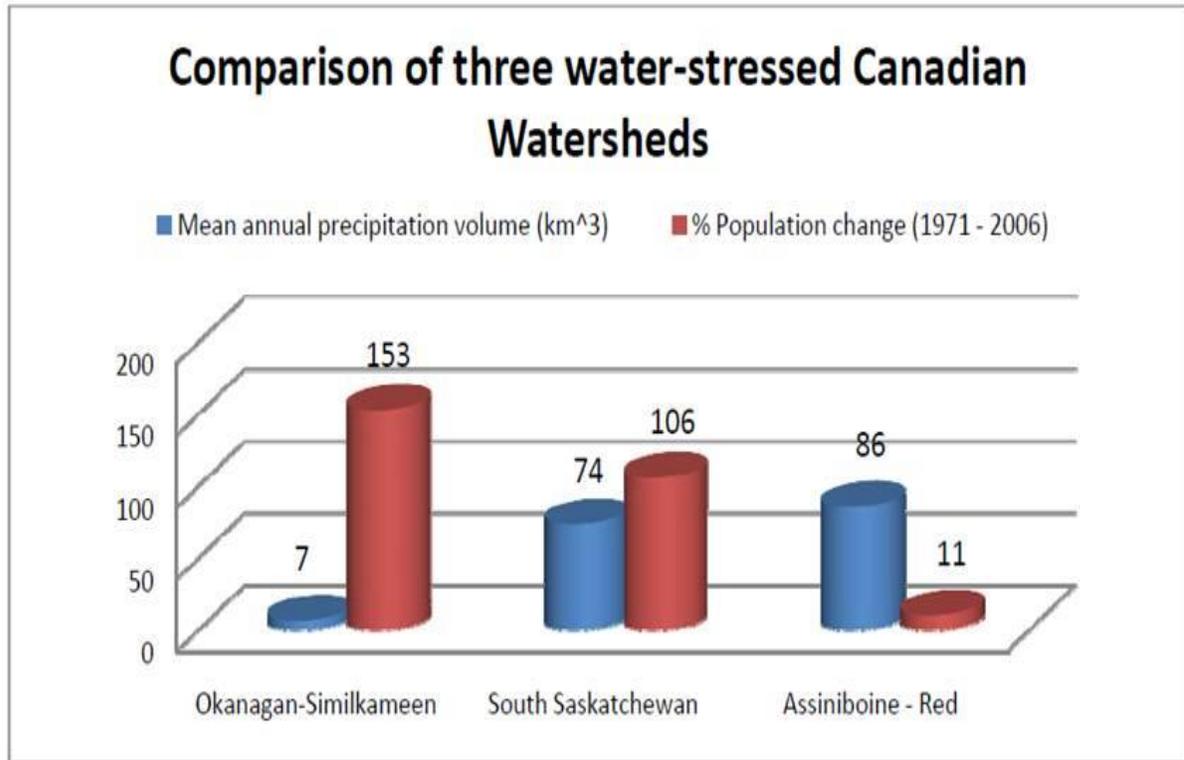


Figure 2 Comparison of three of the most water stressed Canadian watersheds (OBWB 2012).

Climate change introduces increased variability and risk – but more importantly – increases the severity of the consequences of decisions that impact water supplies during drought (and flood) events within a region like the semi-arid Okanagan. A number of studies have been conducted identifying the impacts of climate change on a range of environmental considerations including: agriculture (Belliveau, Smit and Bradshaw 2006); fish (Hyatt, Stockwell and Paul 2003); ecosystem response (Walker and Pellatt 2008); weather forecasting and climate downscaling (Nielsen et al. 2010); and water management (Cohen and Neale 2006).

Water scarcity problems are expected to become more frequent and severe as a result of climate change (Cohen et al., 2006; Hurlbert, Diaz, Corkal, & Warren, 2009; Neilsen et al., 2010; Schindler & Donahue, 2006; Schindler & Smol, 2006) impacting water supply and compounded by regional population growth. Planning for water scarcity events has been a topic of detailed study (Byun & Wilhite, 1999; Carroll, Frijters, & Shields, 2009; M. Fisher & Botterill, 2003; Glantz, 1982; Knutson, 2008; Wheaton, Kulshreshtha, Wittrock, & Koshida, 2008) including the associated significant social and economic costs (Carroll et al., 2009; A. Fisher, Fullerton, Hatch, & Reinelt, 1995; Moncur, 1987).

Planning for water scarcity events is often approached from a narrow and fragmented perspective – sometimes reliant on insurance policies for economic compensation that is rarely adequate to meet the financial losses (Fisher et al. 1995) and does not address any of the associated social or ecological costs. The concept of applying integrated assessments to address and support the management of complex water quantity problems is an important strategy. An integrated assessment of water scarcity challenges links spatial and temporal considerations to support a better understanding and opportunities to optimize decision-making processes. Moreover, a semi-arid region such as the Okanagan may significantly benefit by applying an integrated assessment approach that fully considers the uncertainty of recovery times, temporal scales of water resources, and associated negative implications of a reactive adaptation strategy (Pahl-Wostl 2002a). This study framework considers some of the complex human social networks and decision-making factors that are influenced by changes in water demand due to population growth, and climate change induced variation in water quantity, and timing of available water throughout the year.

1.5 Human population impacts on the Okanagan water supply

Water governance in the Okanagan basin, with a current population of 315,000 people, is complex as it involves multiple actors and multiple levels of government. Significant settler human population growth increasing from 115,000 people to 315,000 people over the past 40 years places additional stress on the Okanagan's shared water. Sprawling low density single home residential land developments with backyards dominated by cedar hedges and green lawns have significantly impacted the Okanagan landscape (Wagner 2008) where backyard lawn watering accounts for 24% of the water consumed (Summit Environmental Consultants Inc 2010) during an average year in the Okanagan. There are some potential silver linings in the current water use trends that include high levels of consumptive outdoor water use by Okanagan residents. Increasing housing density – reducing the amount of per-capita outdoor watering – will realize improvements to water demand. Furthermore, demand management of outdoor residential lawn watering through policy and/or pricing will provide a significant source of water savings that may be used for the ecosystem, agriculture and other essential human needs during times of water scarcity.

Water governance in the Okanagan faces tensions between water availability and timing for ecosystem needs and human needs including water demand for agriculture and residential development (Wagner and White 2009). Most sub-basins within the Okanagan are fully licensed by the Province of British Columbia – whereby all of the 'available' water has been allocated to a beneficial use. This means that statutory decision makers have allocated all available water licenses in a given sub-basin. Water governance in the Okanagan is further complicated by the difficult nature to measure surface-groundwater interactions, the multi-jurisdictional and international aspects of the shared water flowing

through the valley and the reality of demand for water exceeding availability (Summit Environmental Consultants Inc 2010) in some parts of the Basin. As the population of the Okanagan continues to increase, it is of growing importance for there to be serious consideration to improving the current water governance network.

1.6 Decision theory and Okanagan water management

Managing for water scarcity is a complex socio-ecological water problem with the management challenges associated with uncertainty (Nutt 2002, Prato 1999a, Prato 1999b, Vlek 1984) specifically the inability to forecast (Glantz 1982) water supply during late summer an important management task to support the agricultural water sector in the Okanagan. Water supply has three significant indicators in the Okanagan: spring snow pack, spring reservoir levels and spring/summer rain. Figure 3 provides a decision tree illustrating the challenge of implementing water conservation policy throughout the spring and summer months in the snow-pack driven hydrology of the Okanagan.

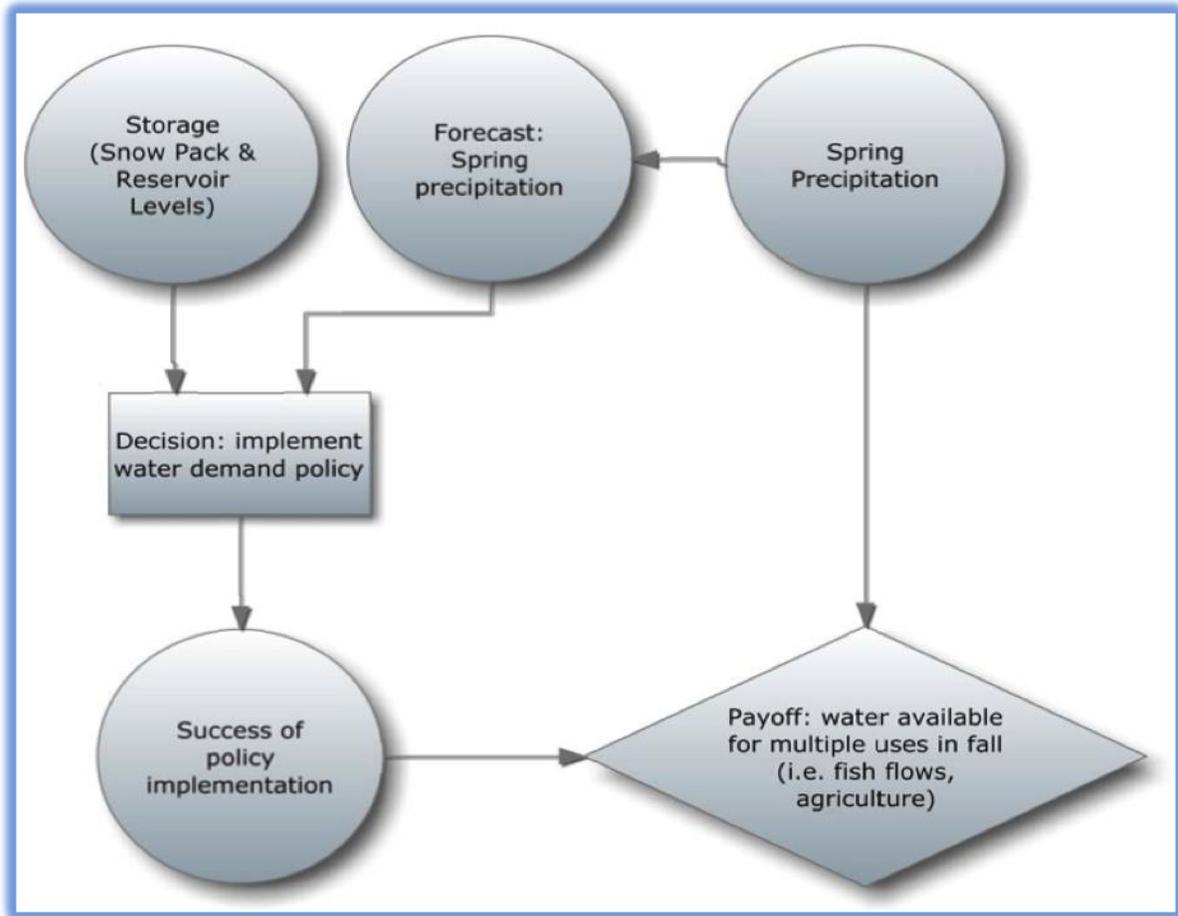


Figure 3 Decision tree diagram for implementing water conservation measures.

Meta-decision making is the process of deciding how to make decisions and is not new; as Wang (2000) points out, about 2300 years ago a philosopher of Taoism, Chauna Tzu, discussed decision procedures in his famous chapter *Tian Hsia* (Land Under Heaven):

1. Assign the task according to the law.
2. Set the criteria according to the situation.
3. Repeat and compare for verification.
4. Examine the decision.

Tzu's verse is reputedly the first formal description of a decision procedure. Water governance in the Okanagan can benefit from many of the water governance and decision making processes that have been previously developed and successfully applied to support

sustainable outcomes. Another ancient, yet locally developed decision making model is that of *En'owkin*, developed by the Okanagan Syilx people.

An elder would ask the people to engage in *En'owkin*, which requested each person contribute information about the subject at hand. What took place was not so much a debate as a process of clarification, incorporating bits of information from as many people as possible, no matter how irrelevant, trivial, or controversial these bits might seem, for in *En'owkin*, nothing is discarded or prejudged (Armstrong 2011).

Decision making in the Okanagan is fragmented across jurisdictional boundaries impairing water governance. Efforts to improve water governance will be well served by applying age-old governance strategies including the systematic decision making approach described by Chauna Tzu and the inclusive process practiced in the Syilx *En'owkin* process.

1.7 Importance of this study

In today's technologically enabled world (Agrawal 2003) and heavily engineered water systems, the impact – rate and severity – of decisions made within the Okanagan's water governance system are amplified. The management of water supply and demand is complex, involves multiple-layers of government and requires trade-offs between individual and institutional human interests, and impacts the ecosystem sometimes incrementally and other times creating tipping points that result in the extinction of species evolved over millions of years that have ecological, cultural, social and economic implications. In the semi-arid Okanagan, the basin experiences water scarcity relatively frequently – on average once every ten years. Recent studies (Summit Environmental Consultants Inc 2010) inform us that the frequency and severity of water scarcity events will increase. This water governance research study seeks to provide new insights into social networks and actor relationships that occur both formally and informally, and provides insight into how the Okanagan water governance network may be improved as a whole, and from the perspective

of individuals within the network – intentionally improving the adaptive capacity of the decision-making water governance network thereby reducing or minimizing human and ecosystem conflict.

There are limited financial resources that are currently committed to managing water in the Province and there is a high degree of sensitivity by Okanagan governments to ‘down-loading’ of Provincial responsibilities to Okanagan government, for example enforcement of water regulations and groundwater management. The Provincial budget in 2013 is approximately \$44 billion where health care costs consist of approximately 44% and are projected to capture more than 48% of the total Provincial budget over the next decade and will limit the amount of resources available for water management. Within the context of limited financial resources for water management, compounded by climate change and population growth, pressure to manage shared Okanagan water has the potential to increase tensions and conflict on the land- and water- scapes of the Okanagan. The distribution of authority, participation and enforcement has been the focus of previous research (Sam 2008, Wagner and White 2009). This study builds on some of the findings from previous contemporary research and explores Okanagan water governance networks and their associated conflicts and identifies water management bottlenecks, conflicts and opportunities.

The British Columbia government in December 2010 proposed a new Water Sustainability Act, replacing the current 100-year old Water Act. With the exploration of improving water governance in British Columbia, this study reports on the perception of current water governance, albeit limited in scope, and provides for a benchmark of water governance before the proposed implementation of significant changes to Provincial water

laws, regulation and enforcement policies occur. One of the considerations identified by interviewees is the complex nature of jurisdictional authority – an issue of ongoing debate in the drafting of the new Provincial Water Act.

The opportunity to influence the British Columbia Water Act reform is unprecedented and enables a pragmatic approach to water management that is flexible, equitable, enforceable, and efficient – where we manage supply and demand and properly account for externalities. Moreover, a new British Columbia Water Act has the potential to integrate expert knowledge (scientific and traditional ecological knowledge) that supports an ecosystem that retains its full regenerative properties (Armstrong 2011).

In addition to the unprecedented water governance changes that are proposed at the Provincial level, the Okanagan valley is of particular interest in studying water governance in British Columbia because of the presence of the Okanagan Basin Water Board (OBWB), a local government collaborative watershed management organization that is unique in the Province (OBWB 2010). The OBWB has been involved in water scarcity planning, water governance development, policy development, and scientific water research; the mandate of the OBWB is “providing leadership to protect and enhance quality of life in the Okanagan Basin through sustainable water resource management”(OBWB 2011). The OBWB, since its inception in 1968 has taken on the mandate by the three regional Okanagan governments to provide a leadership role in water governance in the Okanagan.

In this study’s exploration of emergent conflicts from the current water governance network it is important to appreciate the context for which water supply decisions and trade-offs are made,

...in many circumstances, co-ordination and leadership problems play a dominant role...provided that an effective authority structure exists to provide

the required leadership and sufficient trust is established to countenance optimistic expectations regarding others' intended behaviour (Baland and Platteau 1996:383).

This study hopes to play a supportive roll in benchmarking the attitudes and perceptions of water governance opinion leaders and water experts and proposes 'small solutions' that are effective, enhance participation, and address a range of issues of actor legitimacy.

This study consists of seven chapters. The following two chapters discuss the theoretical underpinnings of the analysis and the methods used to collect and analyze the data from twelve interviews with water professionals who play a leading role in water management and governance in the Okanagan and Province of British Columbia. In Chapters 4 and 5 I report on the results from the collected data. In Chapter 6 I discuss some of the emergent themes and results of the social network analysis. Finally, Chapter 7 provides a summary of this study's conclusions and identifies ideas for future research and exploration.

Chapter 2: Theory and methodology

2.1 Water governance theory

This study applies a multi-disciplinary approach to analyzing water governance networks in the Okanagan. Water governance theories and principles have been described through the lens of a range of disciplines including: anthropology (Orlove and Caton 2010, Wade 1987, Wagner 2008, Wagner and White 2009), economics (Ostrom 1990, Ostrom 2010, Platteau 2008), geography (Bakker 2010), environmental law (Nowlan and Bakker 2010), political science (McGinnis, Indiana University and Analysis 1999, Molle 2004, Neef 2009), and decision theory (Keeney and Wood 1977). A growing number of contemporary water governance theories have been explored in literature over the past decade. De loe (2009a) identifies that contemporary water governance involves a network of actors where Government no longer is “the sole source of environmental decision making authority.” Today, governments are challenged by a number of fundamental water governance issues. Two of these common water governance threads include ballancing multiple objectives in the face of increasing uncertainty caused by population growth and climate change; and effectively integrating land-use and water planning with regulator mechanisms. It is in this new and changing world that water governance and the network of actors involved are challenged to develop practical, adaptive and reilient solutions that address a complex multi-attribute decision framework that often has multiple legal, policy and administrative threads.

A conceptual framework for discussing water governance is a useful starting point in the analysis of the Okanagan water governance network. Such a framework considers the water governance network that involves state and non-state actors. Furthermore, such a conceptual framework would consider the multi-level decision-making nature of water

governance. Water governance is best served when it “takes into account the different actors and networks that help formulate and implement environmental policy and/or policy instruments” (Pahl-Wostl 2009:355). Another important consideration identified in developing a conceptual framework for water governance is the inclusion of informal networks that do not show-up on organization charts yet play an important role in water policy and decision-making. Social learning that supports integrating changing data and information to support better policy advice and decisions in a complex network of actors continues to be a central thread within contemporary water governance frameworks.

Managing during times of change – where stationarity is dead – is a challenging new paradigm that is contrasted by old management practices based on a foundation of “technical approaches to risk management and engineering practices of optimal design under predictable conditions where uncertainties can at least be quantified by probability distribution...Climate change has accelerated the search for more adaptive and integrated approaches” (Pahl-Wostl 2009). The change in water governance networks is one that builds on the theory of governance hybridization that includes state, community and market actors that incorporate a range of strategies including co-management, public-private partnerships and private-social partnerships (Lemos and Agrawal 2006).

Applying an adaptive learning framework provides for a useful starting point to a broader discussion about how to improve water governance. The application of SNA can support the implementation of adaptive learning frameworks and contribute to improving the water governance network that shapes the outcomes of formal and informal decisions. These decisions about water, shaped by the network of actors, have regional and in some cases

global implications in people's livelihood and quality of life, and impact the flora and fauna that populate our ecosystem.

Using an accessible language to better communicate water governance ideas requires improvement. Applying an adaptive learning framework to water governance may be hindered by the jargon and multitude of terms that emerges from different disciplines describing similar phenomena. For example, a significant body of literature has been developed to describe alternate models to centralized governance including: multi-level, nested, distributed, shared, or polycentric depending on the academic discipline. In looking to improve water governance the use of various terms, sometimes perceived as jargon, may hinder the ability for water professionals to communicate water governance norms, principles, rules and structures to their constituents. Communicating more clearly and applying collaborative learning processes are two important ideas to implement if we are to make successful strides in improving water governance.

2.2 Study methodology

To help form a common framework for analysis, two theoretical approaches were used to underpin this multi-disciplinary study: grounded theory and social network analysis.

2.2.1 Grounded theory

This study applies Grounded theory as a core methodology. Grounded theory is an inductive research method where “one begins with an area of study and what is relevant to that area is allowed to emerge” (Corbin and Strauss 2008). This is in contrast to deductive reasoning studies that start with a theory and then attempt to find supporting evidence for its validity. As part of the grounded theory approach used in this study, primary data was collected and analyzed simultaneously providing a method of constant comparative analysis

(Glaser and Strauss 1967) where threads emerge from the analysis of interview texts. It is through such an iterative collection and analysis of data, from interviews and observations, that the perceptions of water experts are collected, analyzed and emergent themes support our understanding of the Okanagan water governance network.

In this study Grounded theory is used to help guide an inductive research process where experts provide important primary data reflecting their perceptions of Okanagan water governance. In Chapter 4, I report a number of threads from interviews with water experts; these emergent threads help in piercing the veiled aspects of a water governance network and support this study's search for a new metaphor that better describes how we can relate to water – especially during times of water scarcity.

2.2.2 Social Network Analysis

How does Social Network Analysis (SNA) help our understanding of contemporary Okanagan water governance and decision-making in times of uncertainty and water scarcity? The most distinguishing features of SNA focuses on relationships among social entities - actors and institutions - and on the patterns and implications of these relationships (Wasserman and Faust 1994). SNA is the study of social relationships between individuals in a society. The society analyzed in this study is that of water governance in British Columbia bounded by those involved in water scarcity policy and management in the semi-arid Okanagan watershed.

the purpose or function of a network is to link members and their resources, facilitate joining action and learning and, in doing so, leverage from these collective interactions to respond in new and innovative ways to issues (Mandell and Keast 2008).

This study explores the linkages between water professionals who are involved in water allocation decisions and the network in which they are embedded. SNA is a technique

of analyzing patterns of relationships and helps us understand the characteristics of operating water governance networks. Moreover, SNA can help our understanding of how individual actors interact and the nature of their relationships within the broader social and political structures that exist – both formal and informal. SNA is applied in this water governance study to provide a new perspective into the complex Okanagan water governance network. SNA is a practical analysis method that helps us qualitatively (and possibly quantitatively) analyze the network of people and the relationships that influence water governance.

SNA has also been used to help our understanding of other complicated issues including: obesity (Christakis and Fowler 2007), social capital (Small 2009) and the influence of networks on getting a job (Granovetter 1995). This study builds on contemporary SNA water governance research (Schiffer, Hartwich and Monge 2010, Stein, Ernstson and Barron 2011) that provides a different perspective on how we may visualize and hopefully improve water governance networks. The application of SNA helps identify network structures – functional and dysfunctional – and actors that are highly central and others who are peripheral (Cross, Borgatti and Parker 2002).

This study also builds on recent water governance research (Schiffer and Hauck 2010, Stein, Ernstson and Barron 2011) and takes a case-study approach applying SNA to explore and help characterize the Okanagan water governance network. Benchmarking the Okanagan water governance network provides an opportunity to better understand the actor relationships, formal and informal, involved in water governance and some of the factors that influence decision making processes applied to water scarcity events in the Okanagan. By applying SNA I explore some of the characteristics of the network including how funds and information are perceived to flow through it.

SNA provides for a useful set of tools to help understand water governance. Networks are patterns of relationships that connect individuals and are particularly useful when: (1) individuals and organizations have multiple levels or complex formal interrelationships, (2) access to information is important to support long-term resilient decision making, (3) coordination, cooperation and trust are key threads for functioning water governance, (4) social learning is an important component to supporting a resilient and adaptive water governance (Pahl-Wostl 2002b), and (5) when informal organizations compete or replace formal institutions.

SNA provides water managers with a useful set of analytical and descriptive tools – although they are not without limitations – to help understand the role of individual actors and the relationships between actors within the context of a broader network of relationships. SNA techniques identify the current state of the network and where a baseline state can be defined and communicated and through strategic policy applications, the network can be improved. It was noted that “any transformation towards more sustainable and equitable water use and management will need to work through the complex webs of social relations” (Stein, Ernstson and Barron 2011). The network characteristics generated using SNA software, for qualities such as density or connectivity, reflect a very narrow part of the broader water governance network but provide a useful starting place for a broader discussion on how networks are currently functioning or may be improved. The network analytics should be treated as one component or indicator within a broader, more nuanced discussion about water governance in the Okanagan watershed and the broader, provincial, national and international context in which it is nested. “Formal social network analysis in combination with the richness of ethnographic description and analysis can significantly

enhance both the validity and the readability of a given work” (Johnson 1994). The combination of text analysis in Chapter 4 with the SNA results reported in Chapter 5 provides a more comprehensive picture of the water governance network and the resulting descriptive analysis is greater than the sum of the parts.

SNA provides a new and practical means to communicate the characteristics of a water governance network and helps in our understanding of individual decision makers within the context of a broader network of people who have different objectives, experiences, understanding of decision theory, and prejudices (Hammond, Keeney and Raiffa 1998). This study using SNA in combination with expert interviews provides new insights into how relationships between actors and their perceived influence and power (i.e. funding, information flow) impact water governance – bounded by policy and geographic constraints.

2.2.3 Network boundaries

Defining the boundaries within any SNA exercise is an important consideration. Whole networks include only those individuals or organizations that interact with one another in an effort to achieve a common purpose. Consideration on who should be included to participate in studies of respondent driven sampling techniques, as used in this study, have been explored in detail (Wagner and Davis 2004). Others have explored the ethical and research problems of designing appropriate specifications for network boundaries.

Because individual behaviour is viewed as at least partially contingent on the nature of an actor’s social relationships to certain key others, or the outcomes of events are seen to be partially dependent on the presence of a specific network configuration, care must be given to specifying rules of inclusion (Laumann, Marsden and Prensky 1989:62).

The respondent driven sampling technique used in this study is described in more detail in the following methods section. Defining the network boundaries, including who is chosen to

participate in the interview process, is one important aspect of developing bounds for this study. One of the interesting aspects of interviewing the twelve professionals was the rate of new names generated in the personal networks identified. As I finished my last two interviews there were significantly fewer new actors identified: this leads me to believe that although the sample of actors may not be perfectly exhaustive, the data collected – in particular the names generated and included within the boundaries of this study – is a reasonable reflection of the current network and relationships that make up the Okanagan water governance network.

2.2.4 Assumptions and limitations to Social Network Analysis

In SNT there are a number of inherent assumptions (Wasserman and Faust 1994) characterized by social, economic, and political patterns of relationships and linkages or relational ties between actors are studied and characterized. Some of the relational ties studied here include: flow of money, flow of information, and the flow of formal and informal advice. SNT, as a complement to other analytical and descriptive analyses, provides a number of useful ‘virtues’ (Boissevain 1979) that include: systematic attention on inter-linkages and interdependency between units of analysis; focus on the content of the relationship; cross-cutting of traditional institutional approaches; exploration of forms of social organization that emerge from interaction including cliques, factions and leader-follower coalitions; and linkage of interpersonal relations to institutions.

SNA is a concept that makes a number of explicit assumptions about actors, their relations, and the resulting structures. Some SNA assumptions applied in this study include: (1) actors and their actions are viewed as interdependent rather than independent, autonomous units; (2) relational ties (linkages) between actors are channels for transfer or “flow” of resources (e.g. money, information, political support, friendship, or respect); (3) network models conceptualize structure (whether social, economic, political, and so forth) are enduring patterns of relations among actors.

Interviewee bias and homophily (McPherson, Smith-Lovin and Cook 2001) in this study requires careful consideration when interpreting and representing any conclusions that may result from SNA. SNA provides one limited lens on how we can visualize and – through the visualization and possible qualification and quantification of the SNA data – gain increased insights into the current state of a water governance network.

In addition to homophily, when evaluating networks there are a number of cautioning factors that need to be kept in mind. Some challenges (Mandell and Keast 2008) that face researchers when evaluating networks include: understanding the extent to which traditional performance measures apply to networks; accounting for interpersonal relationships as a core component of a described network; assessing the development of relationships to explain interaction is intangible, difficult to catalogue, and can be diffuse in its specifications; and not all networks are alike, they function on a number of levels or layers of operation and do not always follow clear linear trajectories of development. These challenges are taken under consideration in the analysis of this study and provide for a useful set of stated limitations to the data collected and the resultant analysis.

It is important to note that although descriptive statistics have been used, the numbers should not be taken out of context – both in place and time – and should not be perceived to have significant statistical significance but rather provide a useful qualitative description of people’s perception of the water scarcity governance network as defined by the study parameters. The described water governance network by senior government bureaucrats and water professionals interviewed captures elements of the Okanagan water governance narrative that, in conjunction with the qualitative text analysis, provides new insights and reinforces some previously identified characteristics of the network.

2.2.5 Water governance archetypes

A SNA archetype may be defined as a network diagram referring to an assumed ideal pattern of the fundamental structure of an actor network. The various characteristics of each archetype may also be quantifiable using SNA tools. Whole network analysis, as reported

out on the Okanagan water governance network in Chapter 5, helps us visualize some of the characteristics of a water governance network. Structural characteristics demonstrate that

... significant differences in governance processes and outcomes can be expected among networks experiencing structural differences in terms of density of relations, degree of cohesiveness, subgroup interconnectivity, and degree of network centralization (Bodin and Crona 2009).

Developing a systematic means to visually compare and assess water governance networks is a reasonable starting point to identify if a given water governance network is functioning well and where there may be opportunities to improve it. A simple archetype framework is proposed here that compares previous research to results found in the Okanagan valley water governance network.

	Polycentric	Fragmented	Centralized
Distribution of formal power	High	High	Low
Multi-level distribution of functions and resources	High	High	Low
Coordination vertical	High	Low	Low
Coordination horizontal	High	Low	Low
Typical countries–cases	Netherlands	India	Uzbekistan

Figure 4 Characteristics of different governance regime types (Paul-Wostl et al. 2012).

Developing an archetypal framework has some noted challenges. Bodin and Crona (2009) observe that “structural characteristics presented do not present a monotonically increasing positive effect on processes of importance in the governance of natural resources.” Describing archetypes that have ‘ideal patterns’ poses a further challenge because of the noted risk of ‘actor homogenization’ that may cause a reduced capacity for effective action to deal with changing conditions (Bodin and Crona 2009). A SNA archetype framework

provides a useful starting point to compare water governance networks – through time and different geographic and political perspectives. Bodin and Crona (2009) describe four categories of whole network characteristics: high cohesiveness, highly centralized, distinguished groups and isolated sub-groups. A similar set of network characteristic ‘types’ are described (Pahl-Wostl et al. 2012) using the qualifiers, polycentric, fragmented and centralized – see figure 4. The comparison of archetypes networks and findings from this study are explored in Chapter 6.

2.2.6 Benchmarking water governance

Previous research (Nowlan and Bakker 2007) developed a conceptual water governance model visually comparing and benchmarking the degree of shared decision making (x-axis) and the degree of centralization (y-axis). In this study, to benchmark the water network I compare the results from two water governance indices: governance process features (IRG 2010) and network density. On the x-axis, I summarize water experts’ perceptions of water governance processes in British Columbia using five indicators. On the y-axis I summarize the statistics of Okanagan water governance networks using the network density values. See Chapter 6 and Figure 21 for more detailed discussion about benchmarking the Okanagan water governance network.

Chapter 3: Methods, data collection and analysis techniques

3.1 Data collection

Data gathering for this study involved interviewing twelve water experts. All interviewees were involved in water governance activities within the Province of British Columbia and with Okanagan water scarcity issues. Interviews were conducted at institutional offices of local and senior government throughout British Columbia.

3.1.1 Interviews

Interviewing water experts in British Columbia was chosen as the preferred means to collect data for this study. Although alternatives such as surveys have been used successfully to gather SNA data, interviews provided an opportunity to gather contextual information as well as support the collection of social network data.

As an introduction to the study an email with a letter of consent was sent to each interviewee describing the research study, procedures and information confidentiality. All interviewees signed the letter of consent before each interview was conducted. Each interview followed an interview script (Appendix 3) that was reviewed and approved by the UBC Okanagan BREB committee. The interviews were approximately 90 minutes long and were recorded using a digital voice recorder. All recorded interviews were then transcribed and data was entered into text analysis software. When interviewing subjects for this study, I was sensitive to important issues including confidentiality, and consent.

The ethical risks for participants in this research project potentially included: work place discrimination and in severe circumstances employment repercussions; political implications; and friction between other employees or work colleagues. Because of the small number of

water professionals in the Province of BC, special attention was paid to ensure respondent confidentiality.

In Chapter 5 some personal data (i.e. photographs) are used to illustrate the actor component of the water governance network. These photographs are presented with full acknowledgement and permission from the actors – in particular Dr. Anna Warwick Sears, executive director of the Okanagan Basin Water Board.

A number of procedural precautions were applied to support the ethical conduct of this research. To help keep subjects confidential, all subjects were referred to by an assigned number [identifying #] throughout the study. For example I might comment on the relevance or implications for information flow between actors where subject [3] who works with the BC Ministry of Environment has a strong-tie (reciprocal) with subject [9], who works with local government.

All files were kept on the researcher's password protected laptop and all confidential materials were kept in a locked safe with restricted access to the primary researcher.

3.1.2 Respondent driven sampling method

Previous research has identified that the quality and impact of data “depends to a large extent on who is identified as “knowledgeable” and whether information is gathered systematically from a large enough group of knowledgeable individuals” (Davis and Wagner 2003). The respondent driven sampling method had 83% of the actors characterized as being very influential within the water governance network identified by 10 or more of the 12 interviewees. The First Nation influence in this network study is underrepresented and requires more careful analysis and inclusion of influential actors.

3.2 Generating social network data using net-map: A new data harvesting technique

Social network data was collected through interviews and subject participation in a new form of data collection called net-maps (Schiffer 2007) where actors generate names of people involved in their water governance network and describe relationships between them.

A net-map (Schiffer & Hauck, 2010; Schiffer & Waale, 2008) is a drawing (see Figure 4) created by the interviewee that may describe a range of relationships including actor influence, connectedness and flow of resources in a defined social network. The net-map data collection technique was developed to address “complex governance issues such as water management...and provides a practical method for analyzing complex governance systems” (Schiffer and Waale 2008). Figure 5 illustrates examples of three net-maps created by interviewees that described their perceived networks and respective actor influences. Line colours represent edges or relationships between nodes (i.e. fund flow, flow of information, etc.). Coloured beads represent institutional connection (i.e. Provincial government, First Nation government, Local government, etc.) and the height of each stack of chips represents a respondent’s perspective on relative influence from each actor.

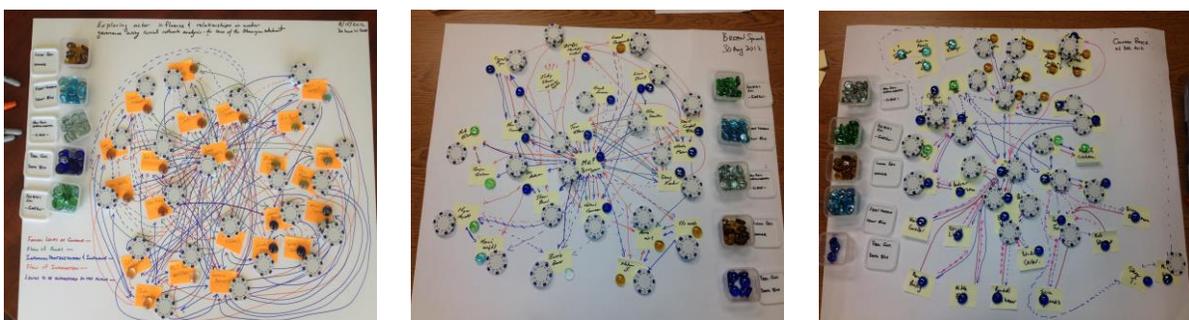


Figure 5 Examples of net-maps developed by interviewees.

Net-map builds on principles of Social Network Analysis and addresses a number of challenges that arise when actors are interviewed as a means to get data to support a better understanding of important questions such as: Who is involved in a given policy network?

How are they connected? Which actors have more influence? How do resources, in the form of information and money, flow between actors? And, where is there a perceived need to strengthen connections between actors? These kinds of questions are difficult to get comprehensive and integrated answers using regular interviews, surveys or other ethnographic data collection techniques and make net-maps particularly effective.

Network data collected using net-maps and reported on in Chapter 5 are generated by combining layers of data organized in five relationships between nodes: information flow, funding flow, informal advice, formal connections and connections ‘to be developed’. Collected net-map data was translated to populate a grid – known as an adjacency matrix – for analysis using SNA software. The adjacency matrix consisted of actors (x and y axis) and the presence or absence of a relationship between them. After completion of the adjacency matrix for each of the five relationships, SNA data analysis and network diagrams were generated using the software packages UCInet/Net-Draw (Borgatti, Everett and Freeman 2002) and Mage (Richardson and Presley 2005).

Figure 6 illustrates how individual actor network data (1, 5, and 7) is coded and represented by a network diagram using the software Net Draw. Next, I combined each of the ego network maps thereby generating a more comprehensive water governance network diagram (see frame 4) with all 134 nodes identified by interviewees. The combined network diagram is more comprehensive and provides for a new look at the water governance network incorporating multiple perspectives. This study applies SNA to support our understanding of a narrow slice of the Okanagan water governance network.

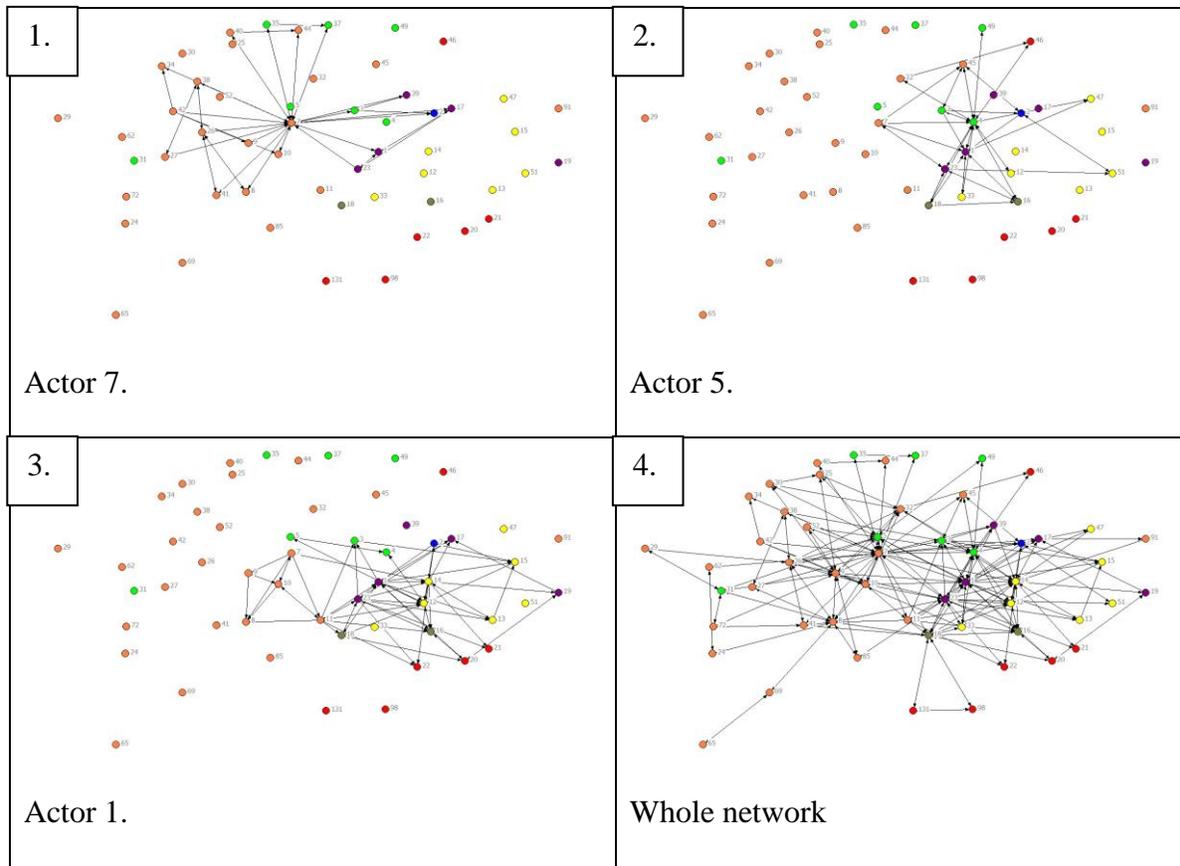


Figure 6 Data collection from net-map exercise.

The net-map data harvesting technique provided a practical tool to help collect complicated data about social networks and provides interviewees with a visual representation describing one’s perception of actors and relationships within a social network that is relatively easy to translate into a gridded framework for analysis.

3.3 Determining perceived influence and power within a network

After completing their net-map interviewees were asked to use stacks of chips to quantify how much influence each actor was perceived to wield within a given described water governance network. Interviewees were asked to do this by stacking chips in piles next to actors’ names where the height of each stack represented the relative perceived influence of an individual actor. The influence variables were normalized within each net-map, providing a number between 0-1 for each actor. A total value for perceived actor influence

(I) was calculated using a simple weighting equation (Figure 7) and this value was used to identify and rank the top 17 actors by influence (normalized).

$$I = \left\{ \sum \chi \times \left(\frac{\alpha}{\beta} \right) \right\} \div \gamma$$

Where

χ = normalized actor perceived influence values (0-1)

α = number of nodes identified as having influence

β = number of egos

γ = max value of actor summed influence value (max = 5.26)

Figure 7 Equation for calculating perceived actor influence (normalized).

Which actors have the most perceived influence in the Okanagan water scarcity policy arena and water governance network? Figure 8 shows the ranking of the top 17 actors as described by interviewees using the net-map (Schiffer 2007) data collection technique.

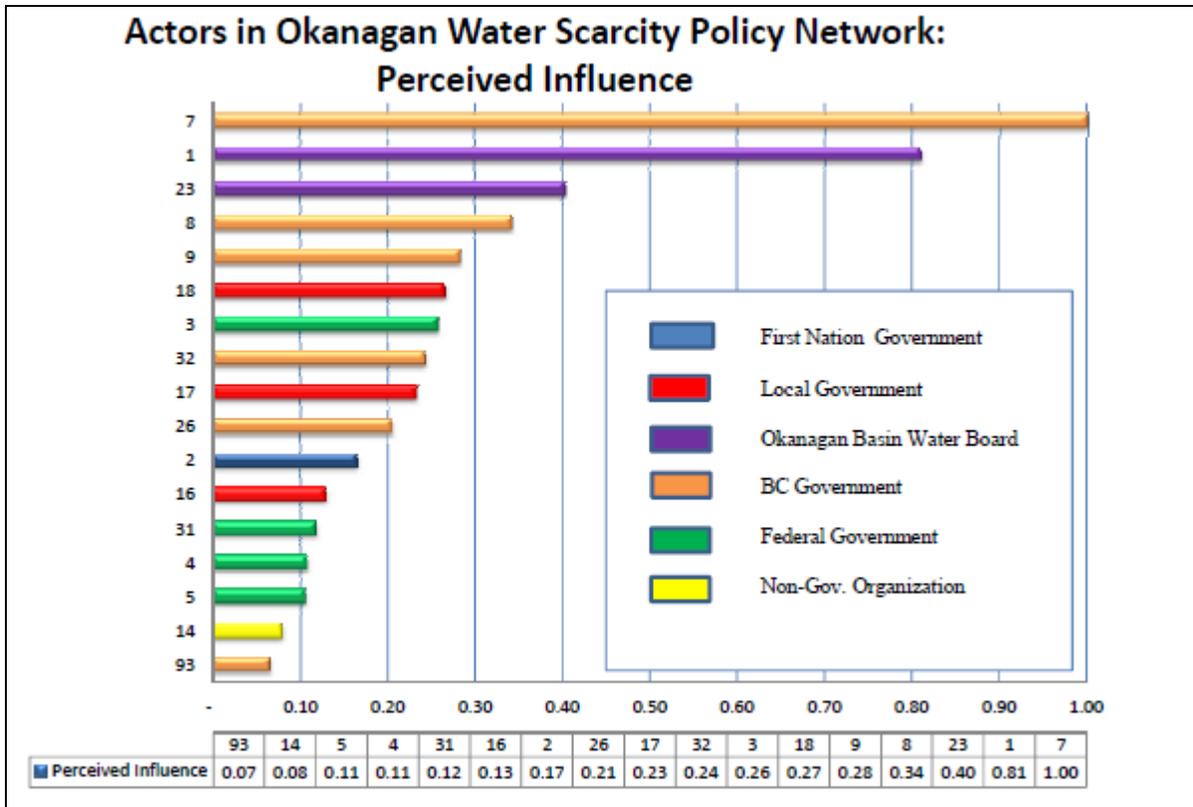


Figure 8 Perceived actor influence in the water governance network.

I also analyzed the data to see if the size (number of nodes) of an individual’s network relates to their perceived influence value within the water governance network. There was no relationship ($r^2 = 0.0002$) to network size – so having a larger network, or more accurately being able to name more people within the given network space – did not indicate that an individual had more perceived influence.

3.4 Handling and analyzing the data and bias

It is noteworthy that my ‘insider’ status as an employee of the OBWB may bias the data. Interviewees may have been more likely to emphasize the position and the influence of the OBWB actors. Moreover, the networks and name generation activities involved during the net-mapping process may have been more likely to emphasize OBWB relationships compared with results collected by another interviewer. I attempted to control for bias by identifying bias potential during the interview process to make the interviewees aware. After analyzing the results, I solicited comment from third party water experts about the degree of bias that may have occurred. The third party experts were not affiliated with the OBWB or the Stewardship Council and were not involved in the study in any way. Based on a presentation of preliminary research data at a conference of the Canadian Water Resource Association, the independent experts agreed that research results appeared reasonable and did not diverge significantly from their own understanding of the situation. I feel confident therefore that the degree of the bias involved is minor.

Two software tools were used to analyze collected primary data: MAXQDA was used to analyze the semi-structured interview data and UCINet was used to analyze the data harvested from the net-map portion of interviews.

3.4.1 MAXQDA

Collected interview data was transcribed and then input and analyzed using the software package MAXQDA. The software package provided a number of tools with which to systematically evaluate, organize and interpret text and emerging themes.

MAXQDA software provided a central location to manage and store interview and observation data. Interview, field notes, and other data were easily coded in the software

environment and "memos" were used to describe and analyze sections of data. Data was then categorized into themes to analyze interview data.

One of the advantages to using a program such as MAXQDA is the ability to provide intuitive and relatively simple summary counts of coded observations. To support the exercise of analysis of interview data, coding is an important part of grounded theory methodology. The exercise of coding information provides the researcher with the opportunity to identify emergent themes.

Higher-level concepts under which analysts group lower-level concepts according to shared properties. Categories are sometimes referred to as themes. They represent relevant phenomena and enable the analyst to reduce and combine themes (Corbin and Strauss 2008).

Coding took place after the interview data was transcribed. The coding of the information was an important part of this research work and helped identify emergent themes or threads. Data from interviews were coded with theme labels that captured the content and context of the conversation. Figure 9 illustrates the frequency of themes identified by interviewees (blue) and the number of interviews that mentioned a given theme (red). Results of the interview text analysis using MAXQDA are reported in Chapter 4.

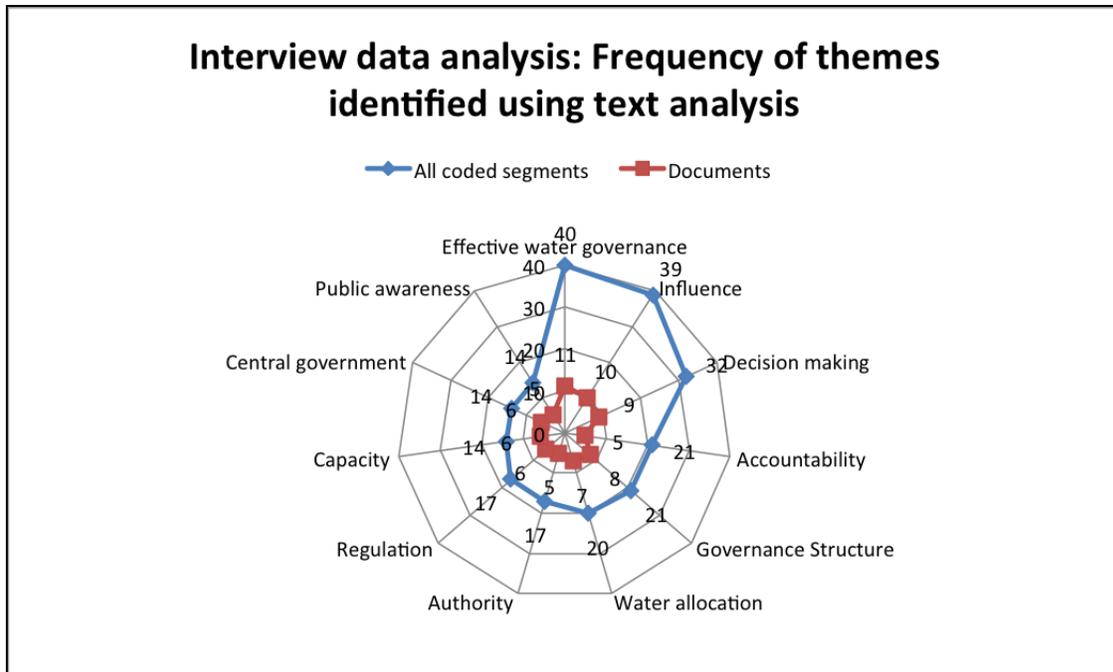


Figure 9 Interview text data analysis showing frequency of identified themes.

3.4.2 UCINet

UCINet (Borgatti, Everett and Freeman 2002) is a social network analysis software that allows for computation and analysis including calculating various measures of primary data as well as hypothesis testing. NetDraw is social network visualization companion software to UCINet. NetDraw allows for graphic representation of networks including relations and attributes.

The UCINet software is a powerful analysis tool that includes analysis outputs such as: centrality, degree, closeness, betweenness, and eigenvectors. The software also provides a useful internal dictionary providing definition of some of the basic SNA terms. Centrality is a measure of how network structure and position contributes to a node's importance. In order to calculate centrality each node needs to have an assigned value. The measure of degrees within a network identify how well connected nodes are and identifies direct influences. Closeness is a measure of how far a node is from all others. In addition to whole

network analysis, the focus of this study, UCINet can be used to calculate ego-network metrics (not reported in this study). Betweenness is a measure of which actors are gatekeeping, controlling information or brokering information or funds. An eigenvector is another measure of being connected or a measure of popularity and power (influence within the network). A further analysis function of UCINet and NetDraw is to help identify 'key players' (Borgatti 2006) or actors who are perceived to have increased influence within the network. Study results based on the UCINet analysis are reported in Chapter 5.

Chapter 4: Text analysis: Results and findings

Qualitative text analysis and results from twelve 90-minute interviews conducted during the fall of 2012 with senior level water professionals and managers who play an active role in water scarcity policy and management in the Okanagan basin are reported in this chapter. This chapter is written in three sections: first I explore perceptions about the current state of water governance in British Columbia and emergent themes identified by interviewee; next I look at some of the ideas that were shared by interviewees about how water governance may be improved from its current state; and finally I discuss and summarize some of the cross cutting themes that emerge from the text analysis.

4.1 Current state of water governance in British Columbia

When interviewees were asked if the current water governance system in British Columbia supported functioning ecosystems the response was evenly split. There was a clear consensus, however, that the Okanagan water governance network was in need of improvement in various ways. A second thread emerging from the data concerned the level of commitment of the provincial government to improve water governance. Commitment in this context means a number of things and includes at a minimum: appropriate funding, human resources, enabling a cohesive network at the watershed level and recognition of the social contract between local citizens and the Provincial Government. Interviewees emphasized that a cohesive network enabled by the Provincial government is an essential thread to improving water governance in British Columbia – which I explore in the next chapter using Social Network Analysis. How strong is the perceived commitment by the British Columbia government towards water governance? One local government bureaucrat [1] stated, “We are not ready at all – we don’t have the governance systems that are robust

enough to deal with all those kinds of crisis...climate change, jurisdictional conflict and First Nation's [water rights and title].”

Several interviewees identified that water governance is currently not adequately structured to reduce conflict during periods of water scarcity. A senior federal bureaucrat [5] stated, Okanagan water governance

is far from perfect. I think there are some gaps in [Okanagan drought response] and we are actually trying to address this more now...there may be gaps in how that information is getting out to the people that need to know and we need to better identify who these people are...we need to think about the communication and how it is done and who it gets to. And then the next step is what they do with the information once they get it. Do they understand it? And what sort of tools do they have available to implement once they have it?

The challenges that face water governance in British Columbia and the network of actors that play a role in making decisions are amplified in the semi-arid Okanagan valley where water scarcity events can have a significant influence on the region's ecology, economy and society. One senior federal bureaucrat [3] noted,

There are a huge number of challenges. One is to get the balance between meeting natural system needs and human-system needs right...the challenge [is] developing either a consensus view or the majority view on what that balance should look like for the near to immediate future...it asks the society at large to weigh different values and to come up with a weighted position that will inform governance. Achieving...objectives needs to be based on the timely assembly and analysis of the information.

This bureaucrat also identified that a disproportionate focus on economic interests occurs while too little attention is paid to social or ecosystem considerations,

The interests that certainly dominate are economic interests and the human system value that is water dependent because those automatically have proponents who speak clearly and repeatedly about those values...but the broader set of non-consumptive values that are not necessarily considered within statutory frame works, and that have non-monetized consequences are often given relatively little weight. [3]

Water governance is further complicated by the tension between individual interests and collective interests – making it difficult to measure and benchmark. In addition to water governance being difficult to benchmark the language used to describe or characterize water governance varies depending on the perspective of the actor or organization, and from study to study. A local government senior bureaucrat [1] stated, “It’s easy enough to talk about a range of problems but those problems are identified differently by different groups and there is no clear decision making authority.”

Developing tools and processes to identify the gaps and benchmark the current state of water governance has been attempted by the International Resources Group (IRG) in their *MENA (Middle East North Africa) Regional Water Governance Benchmarking project* (IRG 2009, IRG 2010). The goal of the IRG project is to “characterize water governance regimes to allow comparison both across countries and over time.”

Figure 10 shows the comparative results between study interviewee responses asked to evaluate the governance system in British Columbia and those from the IRG project. Interviewees were asked the same questions used in the IRG project and asked to assign a score to five water governance criteria scored from 0-4, where 0 indicates a weak score and 4 indicates a very strong score. The raw scores were then normalized on a scale of 0-1 providing a percentage value (raw scores were divided by four). The indicators included: *participation* - all citizens, both men and women, should have a voice, directly or through intermediate organizations represent their interests, through water governance policy formulation and decision making; *transparency* - information should flow freely within a society; *accountability and integrity* - governments, the private sector, and civil society organizations should be accountable to the public or the interest they represent; *rule of law* -

legal framework should be fair and enforced impartially; and *responsiveness* - institutions and processes should serve all stakeholders and respond properly to changes in demand and preference, or other new circumstances.

	Participation Transparency Integrity & Accountability Average (3)				Rule of Law Responsiveness Average (5)		
British Columbia (n=12)	0.5	0.5	0.6	0.5	0.6	0.4	0.5
Egypt	0.7	0.7	0.7	0.7	0.8	0.8	0.7
Jordan	0.5	0.6	0.6	0.6	0.7	0.7	0.6
Morocco	0.7	0.7	0.6	0.7	0.9	0.8	0.7
Oman	0.6	0.6	0.5	0.6	0.8	0.8	0.6
Turkey	0.6	0.6	0.6	0.6	0.8	0.8	0.7
Yemen	0.6	0.5	0.5	0.5	-	-	-
Average	0.6	0.6	0.6		0.8	0.8	0.7

Figure 10 Comparing perceptions of BC Water governance indicators with other countries.

The interview survey results indicate that the water governance regime in British Columbia is perceived to be moderately effective. Although the responses from British Columbia water experts are interesting to compare with the IRG project results, it is important to note that the water governance context in Middle East North Africa is significantly different from that found in British Columbia, Canada. Nevertheless, the survey results and the qualitative text analysis indicate that British Columbia water governance has room for improvement.

Not all watersheds in the province of British Columbia are equal in the application of water governance tools and processes applied on the ground. For example, one senior provincial government bureaucrat [5] identified that during previous drought experiences in

the Okanagan – a functional framework exists to support drought management, “there is a lot of sharing and listening and through the listening a lot of times [drought management] can be dealt with by consensus.” Being prepared to address important water governance issues by the Provincial government is imperative to minimize tensions between people’s interests and a healthy ecosystem. A commitment by the Provincial government (and other senior levels of government) to support appropriate resourcing and water governance structure – legal, financial and moral – may be benchmarked and characterized using standards as developed by the IRG project and can also use important considerations that include: flexibility, effectiveness, efficiency, and enforcement. These additional four qualities are important features that are noteworthy when considering means to improve water governance.

The apparent lack of influence exerted on behalf of the environment compared with short-term economic considerations had some interviewees wondering: where is the accountability of the Provincial government to ensure that decisions protect and enhance a functioning ecosystem? One senior local government bureaucrat [1] stated,

I don’t think that all interests are equal, and I don’t think that they should be...I think it is true that we have to keep a certain amount of water in the landscape to keep the landscape healthy enough so that we don’t have big die backs, or we lose all of our ecosystem services. I don’t think that the landscape has that much clout. You...look at the development on the foreshore and how that’s going to inevitably degrade the lake water quality and how everyone is completely not willing to deal with that.

Water governance in British Columbia was identified to have some challenges and deficits associated with managing tensions in part between short- and long- term interests. And how to best manage the trade-offs that exist between human needs and those of a functioning ecosystem. The next section explores in more detail some of the perceived tensions that exist in British Columbia’s water governance.

4.2 Institutional influence and power

Delegated legal authority – flowing from the British Columbia Water Act – is one of the ways that actors gain influence over the water governance network that includes water scarcity policy in the Okanagan. Interviewees suggest that it is not only the official legal authority that gives actors influence, but also a broader set of informal relationships that are meaningful. A senior provincial bureaucrat [9] commented,

The people who are the most influential are the ones that have the heaviest statutory authority with the pieces of legislation, but that doesn't mean that the other people are not influential.

The Province confers decision making power on regional water managers enabling the planning, management and enforcement of various laws including the BC Water Act and its supporting regulations. A senior provincial bureaucrat [7] commented,

People who are the most influential are the ones that have these [powers] attached to the authority with the pieces of legislation. But that doesn't mean that the other people are not influential. You know they are very influential...You will always go back to your regulatory requirement and that makes it a lot easier...It takes inner personalities and that sort of thing out of it and they just say okay these are my responsibilities and these are your responsibilities. Where there has been conflict is where we haven't heard clear guidance from our attorney so you have to try and feel your way in the dark when you don't have the regulatory tools that you need.

It is the described 'inner personalities' or informal relationships that are often times difficult to qualify and quantify within the broader water governance network and decision making process.

Provincial water laws and regulations help ensure that decisions made about common waters are held to account by those that have been given statutory decision making authority. Tension or conflicts emerge where actors with more power – regulatory for the most part – trump or supersede the interests of those with less power. All of the interviewees working for the Provincial government indicated a strong sense of personal responsibility to ensure

that the ecosystem and future generations who depend on adequate water supplies were treated fairly and equitably.

4.3 Commitment of government to water stewardship

Limited human and financial resources allocated to water governance by the Provincial government were a common thread identified by interviewees. A senior provincial bureaucrat [7] summarized the problem by stating, “We don’t even have an ADM [Assistant Deputy Minister] of water in the whole ministry. In the Province of BC there is not an ADM of water.” A lack of leadership surrounding Provincial responsibilities that are spread-out across different government ministries is apparent. Some interviewees felt that water management wasn’t given the appropriate level of resourcing by the Provincial government given the importance of water to life. Other interviewees identified a lack of senior leadership directed at water governance, decision-making and support for applied water science.

Provincial, healthcare, education, and social services dominate provincial budgets with a Minister, Deputy Minister and entire government departments involved for each of the various Ministries. Water, on the other hand, is managed through senior bureaucrats from at least three Ministries but no ADM is exclusively tasked with water management and governance. Investing in water management to mitigate water scarcity event repercussions is prudent; especially in light of climate change variability and population growth. In British Columbia, there is no one responsible to keep the light on in the water governance ‘house’ – further complicating water management. One clear and practical improvement to water governance in British Columbia is to dedicate at least one ADM responsible for water management and governance.

In addition to improving the management structure of water in British Columbia, interviewees identified the need for a stronger commitment to water stewardship by the Provincial government. One senior federal government bureaucrat [3] noted that

Policies regarding resources upon which all depend on life... [the Province] shouldn't be encouraged [to delegate authority to local governments] in the absence of having better standard practices that are provided as a framework, and a non-discretionary framework, that has necessities that follows because otherwise you balkanize government and provide unique solutions that may not be solutions at all, other than for local interest. So there has to be a core set of practices and standards and outcomes identified as a framework of expectation against which local water stewardship councils would then measure their effectiveness and to some extent can frame their creative solutions.

Strengthened Provincial water stewardship and leadership will help address the voiced concerns about inappropriate downloading of water management and governance authority to local governments.

A strong commitment by the Provincial government in ensuring accountability for water and the ecosystem as well as society and the economy was stated by a number of interviewees. Another senior provincial bureaucrat [7] stated,

You can't just go with the flavour of the month...when you are making these kinds of decisions like water is life, you need to factor everything in so being too responsive could result to short-term decision making...The thing that is really important is to ensure that whoever is making those governance decisions [managing during periods of scarcity], they are making long-term and binding decisions that there is accountability in the decision makers...when you are actually making the big decision that is a forever decision, you need to hold your elected officials accountable.

The need for equity and fairness across the many unique and varied watershed s throughout British Columbia is an important consideration in how to improve water governance. Many of the interviewed water professionals spoke in favour of strengthening the accountability of the Provincial government with a 'non-discretionary' framework to support improved water

governance in the Okanagan. A commitment of government to water stewardship is an important thread for improving water governance in the Okanagan.

4.4 Public apathy towards water

Tensions exist at many levels within the broader water governance network. Good water governance requires engaged citizens; today water in British Columbia is perceived to be largely ignored by citizens. The people, and as a consequence the governance, are often disconnected from the landscape and the water that flows through and over it.

Many of the interviewees felt that the public does not fully engage with water governance issues making it difficult to rationalize increasing government resources to ensure a functioning and proactive governance network in British Columbia. The lack of interest by the general public translates into funds allocated to other competing interests including health care, education, and roads. One senior provincial bureaucrat [7] summarized public apathy by stating, “I just don’t think that people are all that interested in [water] decision making.” It may be the lack of interest by the general public that influences the reduced levels of government resources invested in senior level leadership – like an Assistant Deputy Minister responsible for water. This is an interesting circular argument that detracts from improved water governance.

The old saying that the world is run by those that show up is equally as relevant to water governance. But there appear to be impediments and disincentives for some actors who wield significant amounts of influence within the water governance network to participate in dialogue and informal discussions that support trust building and political or social good will. Although there appears to be a significant level of collaboration among multiple levels of government, many interview subjects felt more needs to be done to

strengthen the water governance network. A senior local government bureaucrat [1] identified the need for some to participate more fully in the collaborative water governance process, “we could make a lot of progress if he [senior provincial bureaucrat] chose to be more participatory because he is a very smart guy and has a lot of influence.” Independence in decision-making was identified as being an important aspect of applying the law fairly and serving the greater interests of society. A senior provincial government bureaucrat [8] stated,

If you are asking me as a statutory decision maker I have by law to be independent. If I have any vested interests in something I have to declare myself as being biased and excuse myself from the decision whether it’s an order or a water license...we are bound within the Water Act...and it’s based on priority rights. It’s very black and white.

Although independent, senior provincial staff identified challenges to handle trade-off decisions about water scarcity when affluent private interests are part of a complex decision making process. Finding appropriate incentives to support increased participation within the water governance network will be an important thread in improving water governance. One senior provincial bureaucrat [7] stated, “it is really hard to make decisions and not be influenced by some of those stakeholders because they can be very persuasive.” Informal influence was also indicated to play an important role in Okanagan water governance. One senior provincial bureaucrat [9] said, “if you are going to influence the way water is managed, you just can’t tell it to people. But you have to stand-up and be counted and take responsibility.”

Many of the interviewees identified that participation in the process of water scarcity management is an important factor in establishing informal influence within the water policy network. A senior provincial government bureaucrat [10] stated, “those that speak the loudest tend to get heard and decision get made accordingly.’ And further noted that,

You have people who are actively participating in the sort of exercises going on with the Okanagan and those people who are participating are going to have influence and the people who are choosing not participate for one reason or the other – First Nations comes to mind – who probably should have more influence and may eventually have legal rights that will really do away with everybody else's.

Two additional important groups were noted to be often absent from water governance discussions: local government planning staff and members of the property development community. A senior federal government bureaucrat [4] noted,

I think there is a third group of people who are not actively participating in the...process who are influenced indirectly water management and water use...I do not see the development community really participating...I do not see the planning community fully participating in this. We have this push and pull between those people who are trying to solve a problem and those people who are...on the sideline...But when we fight requiring commitment of either existing water resources that are allocated in one way or another or non-allocated water resources [there is a gap].

The lack of participation by the development community may reflect that current needs are met by one-off negotiated agreements that maximize individual interests. Planners on the other hand, seem to be under resourced and not able to participate in collaborative planning exercises that involve a larger geographic area than prescribed by their local government mandate. Many local government planners seem to be unable to participate in watershed level exercises that often cross through multiple jurisdictions.

Actor participation in the water governance network is an important attribute to personal or organizational influence. And yet some actors intentionally do not participate in the broader water governance network for a variety of reasons. The paradox of needing to be independent and yet participate in formal and informal networks is a complex balancing act.

4.5 Succession planning of senior water professionals?

The Province of British Columbia is facing a potential institutional crisis in the water governance arena. The lack of succession planning for retiring water professionals is alarming. Succession planning for senior water bureaucrats and water professionals is an important thread in improving water governance in British Columbia. As the BC government loses influential and knowledgeable staff and does not adequately focus on succession planning and transferring knowledge and experience to capable bureaucrats, the Province may lose an entire generation of experience and knowledge that is invaluable to maintaining and improving the next generation of water managers.

There appears to be little or no succession planning at any government level; potentially contributing to a loss in institutional memory and with it a loss of expert knowledge, personal and professional networks, and management skills obtained over the past four decades. Transferring information and experience to the next generation of water managers is invaluable as we face complex challenges with climate change.

In addition to a lack of succession planning, recent large changes to how water is managed have occurred for example – splitting water management staff into two Ministries – the Ministry of Environment and the Ministry of Forest, Lands and Natural Resource Operations. One provincial government bureaucrat [10] stated,

A lot of the strategy depends on the people involved and when government for example goes through a major reorganization and people's jobs change....So where I might have had more influence five years ago, I now have zero influence.

As part of an enhanced commitment of government, resources would be well invested through appropriate succession planning to support lasting organizational memory; this does not appear to be a current priority of the British Columbia government.

4.6 Tensions in water governance

Tensions exist at many levels within the broader British Columbia water governance network. The following section reports on some emergent threads of tension identified by interviewees.

4.6.1 Agriculture and urban tensions

The agriculture sector was identified by many of the interviewees as having significant influence in the Okanagan water governance network. Some felt that the interests of the agriculture community were sometimes poorly organized and disparate as a result of internal fighting and lack of consensus around a long-term vision for agriculture in the Valley and yet the collective group of agriculturalists would be significantly impacted by a multi-year water scarcity event. Previous studies (Wagner and White 2009) note that “water supply systems in many locations in the Okanagan are barely sufficient to meet existing irrigation and domestic needs, and that in years when drought, fire or other high risk events occur, [the water supply systems] will be insufficient.” One local government elected official [17] stated, “The farmers have that water voice and rightly so, however they don’t do much to help themselves.”

In the Okanagan, tension exists between agriculture producers and urban centres. This tension is exacerbated by the pressure to develop agriculture land for real-estate development. Previous studies (Wagner and White 2009:381) note that “The Okanagan orchard industry is also in crisis, not because of water shortages, but because of escalating land prices that bear no relationship to the price of fruit.” Food security is becoming an important factor in regional planning, and managing water in parallel with land-use planning that supports agriculture production in the Okanagan is an important policy consideration.

Municipal governments were identified as playing an important role, although sometimes understated, in water governance. A senior local government bureaucrat [1] stated that, “the municipalities are much stronger than they realize. They are really representing the interest of all the many common people and I think that they do a good job at it.” Local governments have significant influence in the water governance network. In other instances it seems that local governments may overstep their legal and social license boundaries when it comes to water governance. One senior federal bureaucrat [5] identified that some urban centres will occasionally push and possibly exceed their boundaries of influence.

Urban interest dominates and they just seem to think they have a right. I have seen a community that thought that they could shut down a river if they needed it for their own supply even though there maybe others downstream that would be severely impacted.

Local governments have a responsibility to serve their constituents. A narrowly defined geographic mandate – often compounded by competition with other local governments for limited senior government funding – creates challenges both from a perspective of managing shared water within a watershed and prioritizing shared water needs.

Influence exerted by third party lobby groups advocating for their own self-interests is another challenge with the application of water governance at the watershed level. One senior provincial bureaucrat [9] stated, “I saw some bad decisions made, simply because...one lobby group was really vocal and the media was involved and it was the flavour of the month.” Some local lobby organizations are well organized and have the potential to impact elected decision makers within the water governance network. Local government elected officials are required to weight a number of short- and long- term

interests within their decision-making process. A senior BC government bureaucrat [9] noted,

Local government tends to be more responsive to lobbies and to local citizenry...the whole secret to good governance is to have elected officials that have very knowledgeable support people and that they are getting good advice.

Interestingly, it was observed that the people that are most involved in day-to-day management at the water utility are the ones that feel least engaged or least able to be engaged in water governance and its reform in British Columbia. One water manager [18] commented,

The problem that exists with the utility and the water governance is that they usually are the most hands-on in the watershed, most active and most visible to the public – and they have the least time usually to get into these [water governance] discussions.

Focusing efforts on the commitment by the Provincial government towards water governance is well placed and requires continued attention and resources. With projections of steady population growth in the Okanagan and fewer financial resources made available by senior levels of government, the influence of local governments is anticipated to increase in the water governance network.

4.6.2 Money talks: Influence in water governance networks

Wealthy landowners in the Okanagan also provide for a source of influence in the water scarcity policy network. A senior local government bureaucrat [1] noted,

People don't want to tangle with the wealthy land owners, say particularly along the lakeshore because what is the Province supposed to do if somebody comes back with a lawyer...the fee [fine] is so minor...5,000 dollars, 10,000 dollars, it doesn't really affect somebody who has built...a three million dollar home. So it's a cost of doing business and so for various reasons, either because of ideological reasons or...really practical reasons I think a lot of times, the big business and wealthy people interest predominate.

In addition to wealthy actors having substantive influence within the water governance network, it was noted by one senior provincial government bureaucrat [10] that actors who have political connection also achieve a level of influence within the policy network, “The loudest voice tends to influence political connections kind of influence.” The influence of affluent actors challenges the water governance system to ensure that there are checks and balance to ensure equity is applied appropriately to decision making and the social license to manage water on behalf of societies current and future interests is upheld.

4.6.3 Water for fish: Bringing back the fish, restoring the river.

Another emergent theme from the text analysis related to the theme of fish, water governance and ecosystem viability. Water for fish and fish habitat plays an important role in the water governance network – connecting people, policy and the ecosystem. One important community of actors who have influence in the water governance network is the Department of Fisheries and Oceans (DFO). DFO was identified as wielding significant influence. One senior provincial bureaucrat [9] stated, “DFO was the king of the heap here.”

Recently the Federal government has significantly reduced the reach of the Fisheries Act, and as a result reduced the influence DFO has in protecting fish – most notably by removing the language that refers to fish ‘habitat’ from the new Canadian Fishery Act. This change is anticipated to negatively affect the influence that DFO has over water scarcity issues and environmental protection in the Okanagan water governance network.

One of the most important success stories of collaborative action to improve the aquatic ecosystem – targeting sockeye salmon habitat – involves Okanagan Nation Alliance Fishery Department (ONAFD) leadership (Alliance 2004). In collaboration with multiple senior government departments, the ONAFD have worked diligently to re-establish and

enhance strategic sockeye salmon habitat (Hyatt, Stockwell and Rankin 2003, Long et al. 2003). To support the efforts of the ONAFD partnership a Fish Water Management Tool was developed to provide decision support and help manage water flows and levels throughout South Okanagan. One senior government bureaucrat [3] stated,

In the last ten years the application of that decision support system which is used by multiple parties from First Nations to industry to provincial government water managers and federal government and fisheries and habitat managers...So it was not the lack of intent that was frustrating achieving those objectives in the past, it was a lack of timely information processes, efficient information processing and agreements.

The Fish Management Tool provided a 'gaming' environment where water managers and fishery biologists could identify and better manage the trade-offs associated with various flow regimes managed by water control structures.

Another cause for tension between people and fish is the Provincial water licensing system. During times of conflict due to water scarcity, water is allocated according to the principle of First-in-time, First-in-right (FITFIR). The concept of FITFIR is limiting as a means to manage (or avoid) conflict during times of water scarcity and dealing with conflicting priorities. A senior federal bureaucrat [3] succinctly identified some of the challenges associated with FITFIR and the implications that First Nation's constitutional rights and title to fish and by extension water,

...FITFIR in isolation is non-functional and refers to principles that were established in the past century, and those principles have become increasingly dysfunctional within the social and cultural context...eventually the court will rule that if FITFIR is a principle then First-in-time will ultimately pertain to First Nation's entitlement. First Nations are obviously entitled directly to consumptive use of water, but First Nations are entitled directly to consumptive use of fish and fish need water, so First-in-time would be what the fish need and is what the First Nation's need.

The efforts of re-establishing the Okanagan fish stock has changed how managed water flows through the Okanagan river system – influencing the re-establishment of one of the most important cultural and ecological salmon species on the Pacific west coast.

4.7 Indigeneity and water governance

In analyzing network maps generated through the interview process, interviewees emphasized the need to increase communication with First Nation actors within the water governance network. Interviewees recognized the importance of indigenous water rights, and general recognition by a senior level government bureaucrat [1] that “First Nation title and rights is not yet resolved” was expressed by a number of interviewees. One senior provincial bureaucrat [9] identified that “recently First Nations interests have been taking a higher priority in the decision making matrix” and many of the water governance questions are analyzed through a senior government lens that asks the question “Are First Nations’ interests going to be impacted?”

One senior provincial bureaucrat [10] observed, “I think there is a weakness in connectivity with First Nations and I am not sure if that is real or not but this is certainly evident from my line drawings here.” There was a strong sense among interviewees that negotiating the long standing water rights and title is an essential ingredient to improving water governance in British Columbia. As noted in previous research (Sam 2008) about water governance and the Syilx (Okanagan) Indigenous people,

British Columbia followed the legal principles established in the American Far West by creating sub-department agencies that managed the provinces’ water that benefited miner and settler interests, while ignoring indigenous interests.

Successfully negotiating water rights and title has the potential to support principles of equity and flexibility and provide certainty in water related management issues for both aboriginal and non-aboriginal peoples.

A number of interviewees voiced their preference for solving conflict through negotiation over legal processes. One senior government bureaucrat [3] stated,

I would hate to see this become a legalized process. So the longer we can keep these sorts of issues out of the court and use dialogue as a means of solving problems before they really become serious. I think that the desire to mitigate is a barrier to good water governance.

Moving forward with a process that is fair and equitable requires attention and serious commitment by the Provincial government – recognizing current and historic realities.

Alternatively, water rights may be determined in the courts instead of through a negotiated treaty process.

The opportunity to negotiate water through treaty processes and integrating concepts of indigeneity support the goal of improving the Okanagan water governance; providing a significantly better process than one of litigation in the court system. The lack of negotiated treaties continues to be a source of tension that requires timely consideration.

4.8 Improving water governance: The Okanagan Basin Water Board

In this section I explore some thematic threads that were identified by interviewees that provided suggestions, observations or guidance for improving (or impeding) the water governance network. One significant thread that was identified by interviewees about the future of water governance in the Okanagan was the importance of the Okanagan Basin Water Board in the water governance network.

Interviewees indicated that the Okanagan is a special case for water governance in the Province of British Columbia, and several characterized it as more ‘functional’ and resilient

than some other parts of the Province where there was an absence of grass roots, local government institution, such as the Okanagan Basin Water Board (OBWB) and their technical advisory committee, the Water Stewardship Council (Council). The OBWB and Council were created by local government to support the management of common water problems – most notably nutrient addition and invasive aquatic species (OBWB 2010). The OBWB has the potential to be a model for other watersheds throughout British Columbia that enables collaborative learning and trust building. One senior provincial bureaucrat [9] stated,

The OBWB's been quite a pioneering organization. You've had the governance structures in the Okanagan that have enabled this sort of thing. If you didn't have the OBWB, if you didn't have the Okanagan Water Stewardship Council, it [the network map] probably wouldn't look like this.

One of the traits of the Council is the focus on collaboration. A water utility manager [18] stated,

I think there is mistrust between some organizations sometimes because they do not talk enough and so communication and direct face to face meetings are good that way. The OBWB has been good...in terms of getting MLA's and MP's and all those people in the same room talking about that [managing common Okanagan water] is usually valuable...So the communication on that takes some of the barriers down.

The OBWB provides resources – both staff and funding to support a range of costs including travel and guest speakers – that enable improved communication, networking opportunities and institutional memory. A senior provincial bureaucrat [7] commented,

Water Stewardship Council is fantastic...there are minutes, they are open to the public...people are part of the discussion...how many other institutions like the Water Stewardship Council are there around [British Columbia]? The problem is not very many.

When asked how the Okanagan handles conflict, the Council was identified as playing a leadership role in developing a framework that supports conflict resolution through communication and collaborative learning. One senior federal bureaucrat [4] stated,

There [are] linkages between all of the potential contenders...it really indicates the techniques [of water governance] in the Okanagan is doing a pretty good job of trying to diffuse situations before they arise and [the Council] allows other people to see other perspectives so one of the people in this map was always saying we have fish people talking on behalf of farmers and farmers talking on behalf of fish people.

The Council, a group of 27 volunteer members meet monthly to discuss Okanagan water issues, provides a vehicle for inter- and intra Okanagan basin communication and collaborative learning; monthly presentations and dialogue support trust building and collaborative learning at the OBWB hosted Council meetings. A senior federal bureaucrat [5] commented,

Awareness is going to be a big part of [conflict avoidance] and I know...the Water Board really takes that on as a challenge and tries to do a lot of that education and I think that is great...a lot of that needs to happen in the Okanagan [and] other parts of the Province probably because the Water Board'sbeen a leader in the area and hopefully other areas can learn from that...in times of crisis and having hostility that will be able to have people understanding the issues and having forums where they can discuss issues – rather than happening through the press.

Most other watersheds throughout the large and diverse topography of British Columbia do not have the same kind of multi-level network cohesion because there is no catalyst to strategically enable continued meetings to discuss water issues – supporting collaborative learning and trust building. A senior provincial bureaucrat [9] noted,

If I was to consider what the Okanagan Basin Water Board does right now, I would call it collaborative governance...it works extremely well...where it acts as a catalyst to make all the different partners, whether or not they are federal governments, provincial governments, local governments and a whole other range of stakeholders working effectively together to solve whatever problem.

The OBWB and the Council were identified as providing a governance 'vehicle' to support conflict resolution and avoidance during times of water scarcity. One senior provincial bureaucrat [10] commented,

There is good communication between most of the individuals on the provincial side and the Okanagan Basin Water Board side to all those [water governance conflict resolution] objectives to be discussed and potentially resolved.

The collaborative learning and trust building that occurs at the monthly Council meetings is valued by the Council members and is one of the significant reasons for the OBWB's success connecting people and resources benefiting the Okanagan water governance network.

4.9 Text analysis: Results and findings

This collection of text analysis provides a qualitative account that captures some of the thoughts and feelings of senior water professionals in British Columbia. Interviewed water professionals identified that water governance in British Columbia was only moderately effective in the categories of transparency, participation, accountability and integrity, rule of law and responsiveness. Both formal and informal influences are important factors in the Okanagan water governance network and decision making process leading-up to and during water scarcity events.

Tensions in water governance arise from a range of complex issues that include institutional, private and public actors. These tensions often are further complicated by formal institutional arrangements including FITFIR and informal issues of public apathy and wealthy actors influencing policy for self-interests. The observation by one interviewee that water – despite its importance to our ecosystem, society and economy – does not have a senior manager (Assistant Deputy Minister) that is solely responsible for British Columbia water warrants action. The implementation of an Assistant Deputy Minister of Water may be the first step, and is a critical thread in efforts to improve water governance, and demonstrates an important commitment of government that enables improved water governance.

Looking forward, interviewees commented on the value of the Okanagan Basin Water Board as a model to support conflict resolution, build trust and support collaborative learning. Challenges that limit the effectiveness of water governance in British Columbia include the lack of succession planning of senior water professionals in the Provincial government and the effects of splitting staff that manage water (and land) issues into multiple departments that are poorly networked and not cohesive.

This chapter describes an important emergent thread that is embodied in the concept of ‘commitment of government’; this translates into a responsibility by the provincial government to create wise water laws, enforce them, and create, support and participate in a network of actors that integrate local and senior levels of water policy and management as well as account for long term decision making. Strong coherent networks are an important component of the commitment of government to ensure good water governance. In the next chapter I explore the Okanagan water network by applying social network analysis – providing a benchmark of the current water governance network.

Chapter 5: Social network analysis: Results and findings

In this chapter I report on the social network data collected from interviewing twelve senior water professionals. Social Network Analysis (SNA) is a technique of analyzing the relationships (referred to as links) among individuals and institutions (referred to as nodes) enhancing our understanding of patterns of relationships (Wasserman and Faust 1994). SNA can provide visual measures, benchmarks and characteristics of a water governance network. When combined with a commitment by government to improve water governance, it has the potential to improve how we communicate and develop strategic policy.

The total Okanagan water governance network consisted of 134 identified nodes (people). For this study, each node within a given network map represents an individual decision maker with different perceptions, beliefs and information. Figure 11, which describes an informal advice network, illustrates that each node in the developed network diagram has a sampling unit of one person – a decision maker within the broader network of actors.

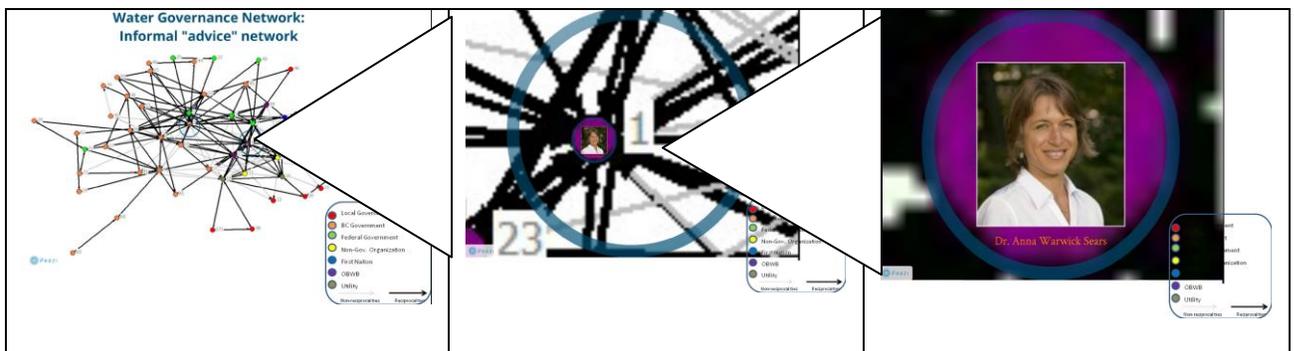


Figure 11 Each node in a network diagram is a single actor.

5.1 Whole network data and analysis

SNA provides a useful set of tools to help visualize and communicate water governance in the Okanagan. In this section I explore the results of data collected from interviewees about five relationships: information flow, funding flow, informal connections,

formal connections and future (yet to be established) connections. Data was collected from interviewees generating descriptive net-maps (Schiffer and Hauck 2010) visually describing an individual's network (see methods section for more details and some of the identified limitations of using the net-map data collection techniques).

Whole network analysis provides another perspective to better understand whole populations where the 'texture' of the relationships that constrain individual actors (Hanneman and Riddle 2005) can be analyzed and communicated. I apply a graphical and quantitative-descriptive technique for this SNA study, and through the use of SNA software develop descriptive network diagrams. These network diagrams provide a new and practical perspective on the water governance network in the Okanagan – a snap shot in time as perceived by interviewed senior water professionals in British Columbia who are directly involved with water scarcity policy development and implementation.

Whole Network Data – Table

	Information		Funds		Informal		Formal		Future	
	With pendants	No pendants								
Size (# nodes)	113	70	49	27	23	22	63	12	21	11
Ties (#)	316	260	74	52	84	83	78	23	43	27
Avg. Degree	2.36	1.94	0.55	0.39	0.63	0.62	0.58	0.17	0.39	0.25
Density	0.018	0.015	0.004	0.003	0.005	0.005	0.004	0.001	0.004	0.002
Fragmentation	0.625	0.824	0.982	0.988	0.976	0.978	0.969	0.997	0.973	0.991
Transitivity (%)	5.3		4.3		15.8		3.0		0	
Centralization (outdegree) %	34.1		11.1		6.5		6.4		4.3	
Centralization (indegree) %	10.4		5.0		6.8		4.9		5.2	

Figure 12 Summary statistics of Okanagan water governance whole network data.

5.2 Network diagrams

In this section I report on the visual diagrams reflecting the perceived relationship characteristics of the Okanagan water governance network. Network diagrams consist of nodes and links as illustrated in Figure 13.

The degree of a node (which in this study is an individual actor) is defined as the number of links or ties that connect to a given node.

For example the degree of node 'D' is two.

If a node has a degree of one (node 'e') it is called a pendant. Study results are reported with and without pendants.

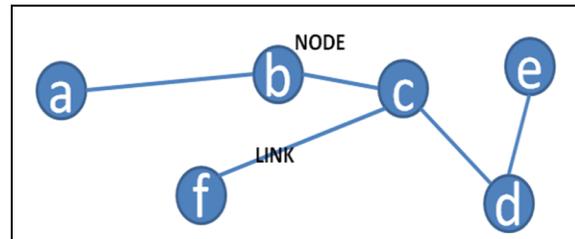


Figure 13 Components of a network diagram.

5.2.1 Network density

Network density refers to the total number of ties divided by the total number of possible ties. Fragmentation is the proportion of pairs of nodes that cannot reach each other through a relationship tie. Density is simply the proportion of all possible ties that are actually present.

The density of the Okanagan network maps is small (see Figure 12), with the information network ranking highest (0.018 with pendants and 0.146 without pendants) and all of the other relationships showing network densities between 0.005-0.002.

SNA research on water governance networks in other water basins has also reported network densities. Comparing network data between different watersheds is complicated and should be treated with care because significant variations in culture, laws, actors involved and management practices provides a context that does not translate into the simplified SNA analysis characterization data. For example, network density data from the Mkindo

catchment of Tanzania (Stein, Ernstson and Barron 2011) demonstrates network density for the relationship of collaboration for the aggregated basin community to be 0.138 with network densities reported to be 3-5 times higher within individual communities in the Tanzania watershed. Comparing Tanzania water governance network data to that collected for the Okanagan network provides for the start of a comparative analysis but must be treated with sensitivity to the other variables and context that describes water governance networks.

The Okanagan network density data indicates that the described water governance network is not very dense and therefore the speed of information diffusing through the network may be slow and the current network impedes effective water governance. This suggests that further efforts are required by all levels of government to enable improved collaboration in the Okanagan.

5.2.2 Network centralization

Network centralization is a measure of the relationship between the most central node in the network compared with other nodes.

The Okanagan water governance network has a significant range of network centralization depending on which relationship is analyzed. The values for network centralization (out-degree) range from 34% in the information flow network to 4% in the future connections network.

In previous research by Stein et al. (2011) analyzing collaboration between actors they observed that the degree of centralization for the aggregated communities was 23%, significantly lower than the individual communities (ranging from 50-80%). In this study the comparative analysis did not measure perceived collaboration (formal or informal) between actors but I do look at information flow and informal advice networks that may provide

useful components to collaboration in the Okanagan. Standardizing questions to support whole network data comparisons will be useful in future studies. At the whole network level, the Okanagan network degree centralization for the information flow relationship network was 34% compared with 23% degree centralization in Stein et al's (2011) Mkindo basin collaboration data. This reinforces the observation that water governance networks in the Okanagan are relatively centralized.

The comparison of information flow in the Okanagan and collaboration in the Mkindo provides a limited but valuable opportunity to explore and compare descriptive analysis between two SNA water governance studies.

5.2.3 Network transitivity

Some argue that many of the most interesting and basic questions of social structure relate to triads whereby triads allow for a much wider range of possible sets of relations (Hanneman and Riddle 2005). A strong transitivity is one in which there are connections AB, BC, and AC, and the connection AC is stronger than the minimum value of a strong tie. For example, the relationship defined as 'informal advice' between actors had the highest transitivity of all the relationships explored in this study. Figure 12 provides a summary of the transitivity of the five relationship diagrams describing the Okanagan water governance network.

Data analysis indicates that water governance network transitivity in the Okanagan is low, ranging from 0 – 16% depending which relationship lens is being explored. The data suggests that transitivity reflected in the relationship described by informal advice was the highest at 15.8%. Information flow, fund flow and formal connections all had very low transitivity ranging from 5.3 – 3.0%. The low transitive values are consistent with the

network density data and suggests that the Okanagan water governance network may be well positioned to implement strategies that improve the network fundamentals.

The network transitivity analysis complements the following water governance network relationship descriptive analysis: applying social network diagrams to describe the Okanagan water governance network and the whole network. In the next section, I explore some of the potential applications of whole network analysis to communicate the state of the network.

5.2.4 Okanagan water governance network: Information flow

Information flow can be critical to the ability for distributed governance actors to collaborate. "Mapping the pattern of information flow (or, more frequently, lack of flow) across functional barriers can yield critical insight into where management should target efforts to promote collaboration that will provide strategic benefit" (Cross, Borgatti and Parker 2002). Information flow reflects the direction of perceived information flow between actors within the water governance network. Figure 14 illustrates how information flows through the described network map of the water scarcity slice of water governance – who receives and gives information.

Information flow network

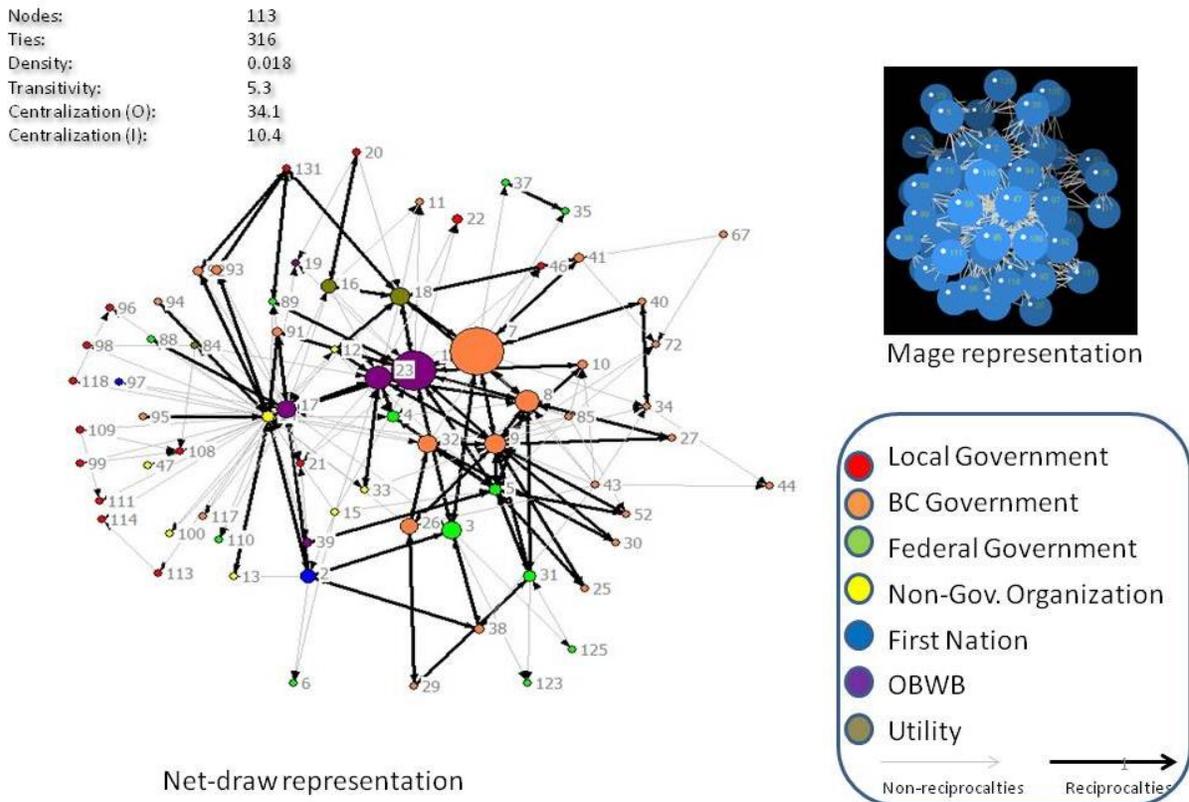


Figure 14 Network diagrams of information flow.

The information flow map in Figure 14 shows a limited number of actors at the centre of the network providing a dense clustering. The network – without pendants – consisting of 70 nodes and 260 ties has a calculated density value of 0.015. The network – with pendants – with 113 nodes and 316 ties has a calculated density value of 0.018; this is the highest density of the five analyzed relationship maps.

Although this relationship network of information flow has the highest density of the five analyzed relationships, it is a relatively low density. At the centre of this network are members of the Okanagan Basin Water Board and the Provincial government – in the absence of OBWB actors the density of the communication network would be desperately

low. I provide a further analysis of the OBWB's role in the Okanagan water governance network in a later section.

5.2.5 Okanagan water governance network: Informal advice

Informal connections (Figure 15) are those relations that exist between actors where advice – formal and informal – is transferred between actors. The density of the informal Okanagan connections network is low. The network density without pendants is 0.005 composed of 22 nodes and 84 ties. The network density with pendants is 0.005 with 22 nodes and 83 ties. The informal advice network shows little difference between network maps with- or without- pendants.

Informal connections may be an indicator of 'trust' relationships since the interaction is largely voluntary and may be an indicator of a functioning network that is well connected and resilient to changing conditions. Networks that are highly centralized may be influenced by information being coordinated for a variety of reasons and the OBWB plays a central role in informal advice networks in the Okanagan. Coordination of water information through informal advice networks may provide Okanagan local governments with an increased resilience to water scarcity events as a result of improved communication channels compared with other parts of British Columbia.

During the interview process there was confusion as to the difference between informal advice and information flow. Future interview instruments would benefit from more clarity in delineation between these two categories.

Informal advice network

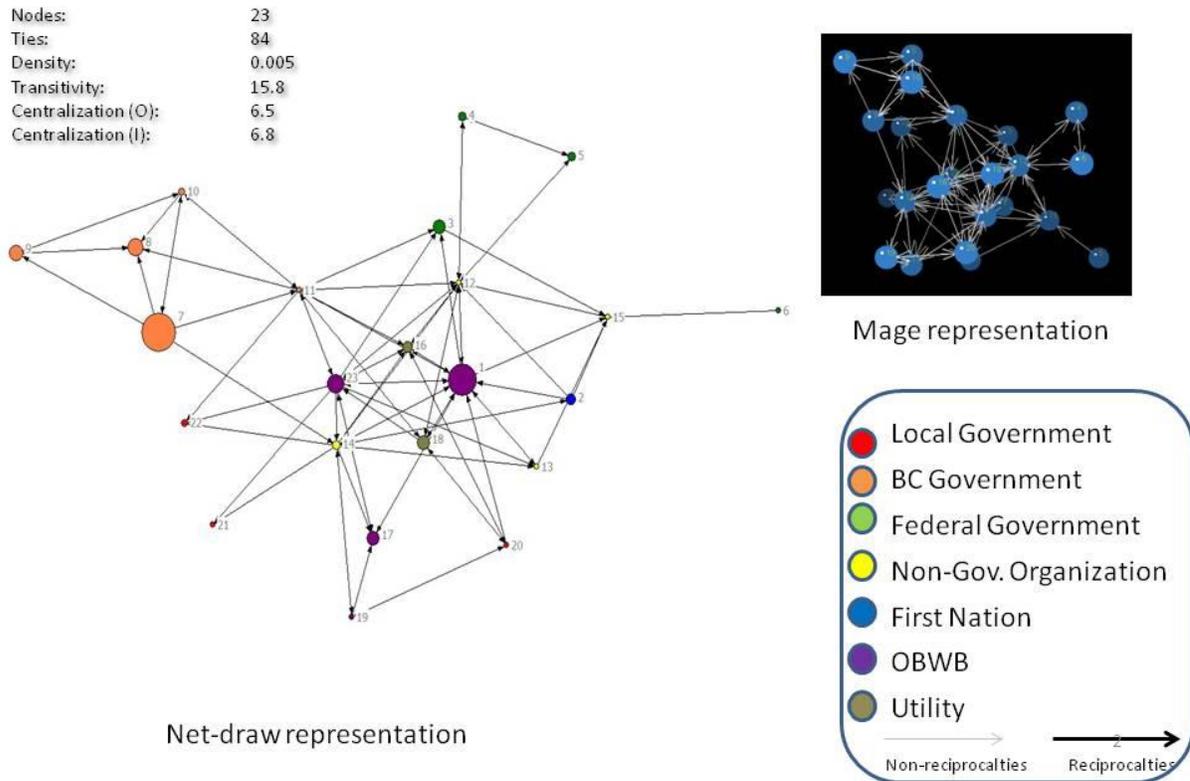


Figure 15 Network diagrams of informal advice.

The informal advice relationship networks suggest that the OBWB plays a significant and central role in Okanagan water scarcity policy and governance network. The network diagram of informal advice reinforces this important role of the watershed level activity played by the regional local government entity.

5.2.6 Okanagan water governance network: Funding flow

Funding flow illustrated in Figure 16 describes how funds are perceived to flow through the Okanagan water governance network. This was one of the more difficult maps for most interviewees to draw and in many cases there was no data provided on perceived flow of funds.

The density of the fund flow network is low. The network density without pendants is 0.003 composed of 27 nodes and 49 ties. The network density with pendants is 0.004 with 49 nodes and 74 ties.

Funding network

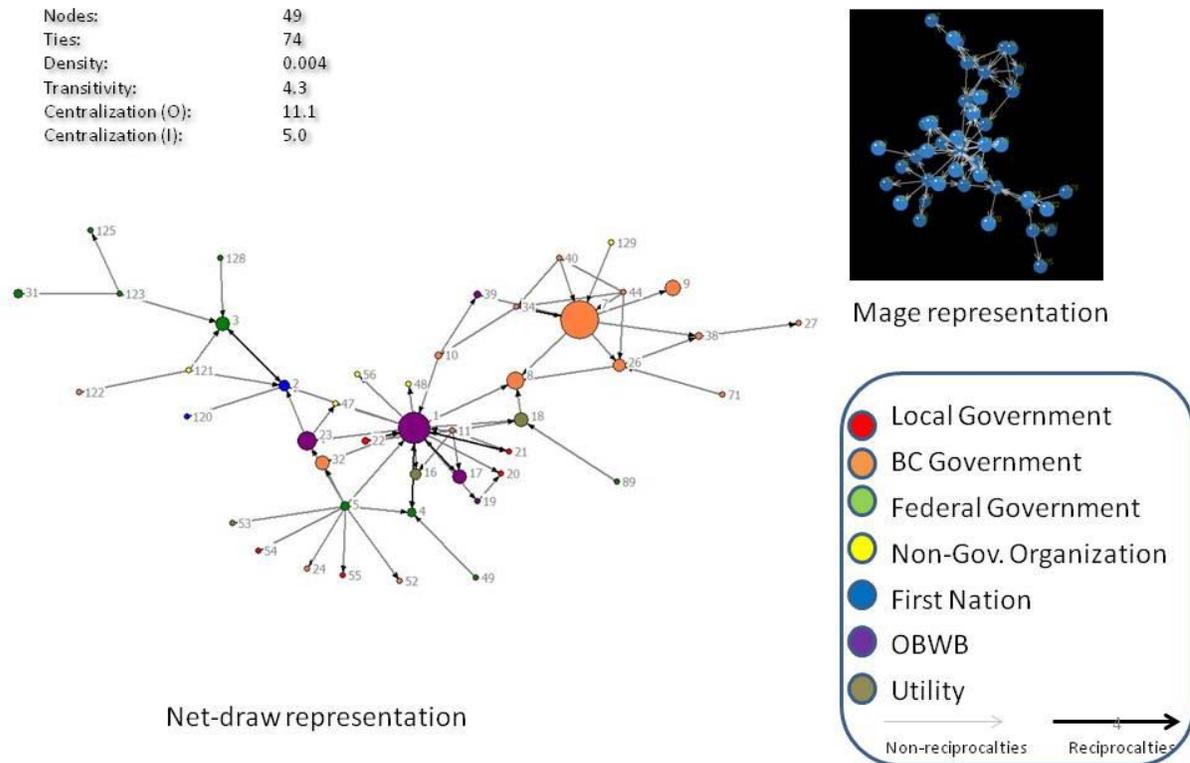


Figure 16 Network diagram of funding flow.

The fund flow network appears to have distinct clusters. These sub-groups are centered largely on Okanagan Basin Water Board and Provincial government staff. The funding flow network in the Okanagan is not well connected. This may be a reflection of how funds originate and are transferred from government departments to grant recipients and other complex funding agreements.

5.2.7 Okanagan water governance network: formal connections

Formal connections (Figure 17) are described as those relations that are either prescribed by a work relationship, for example boss and employees or captures relationships that are prescribed by legal agreement. For example the British Columbia-Canada Okanagan Watershed Agreement prescribes discussion between a number of federal and provincial bureaucrats to support water and fish management in the Okanagan. And the density of the formal connections network is the lowest of the relationships analysed.

Formal network

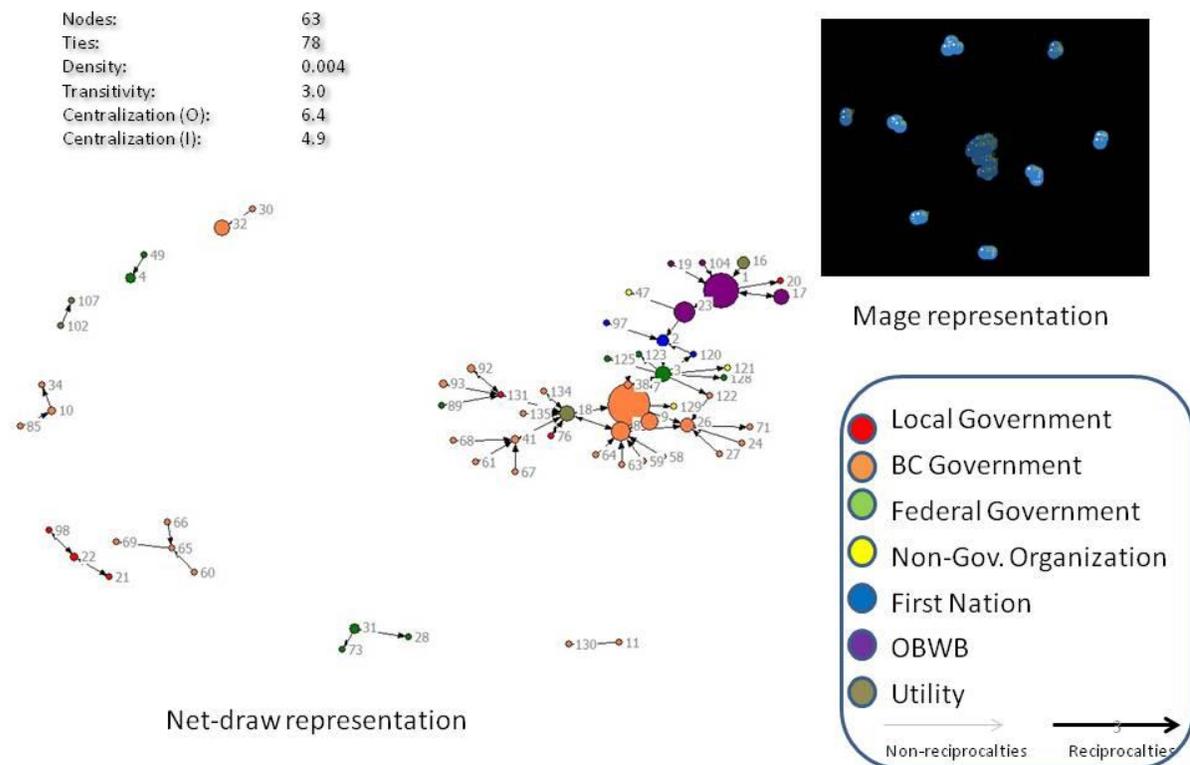


Figure 17 Network diagrams of formal connections.

The network density without pendants is 0.001 composed of 12 nodes and 23 ties. The network density with pendants is 0.004 with 63 nodes and 78 ties. This network diagram is the most segmented of the five relationships analyzed.

The Okanagan water governance network diagram describes what appears to be a group of silos, a highly fragmented configuration of relationships with the Provincial government forming the centre of the main clustering of actors. This fragmented diagram may indicate that the current formal water governance network is somewhat dysfunctional and there is an opportunity to improve the network through activities that intentionally increase linkages between strategic actors in the network.

5.2.8 Okanagan water governance network: future ‘to be determined’ connections

The relationship diagram for future connections is illustrated in Figure 18 and the density of the future connections network is low. This network diagram of future connections describes interviewees’ perception of relationships (ties and nodes) that do not currently exist or are weakly defined within their network map. The network density without pendants is 0.002 composed of 11 nodes and 27 ties. The network density with pendants is 0.004 with 21 nodes and 43 ties. This network has the fewest nodes identified of the five networks.

Future 'TBD' network

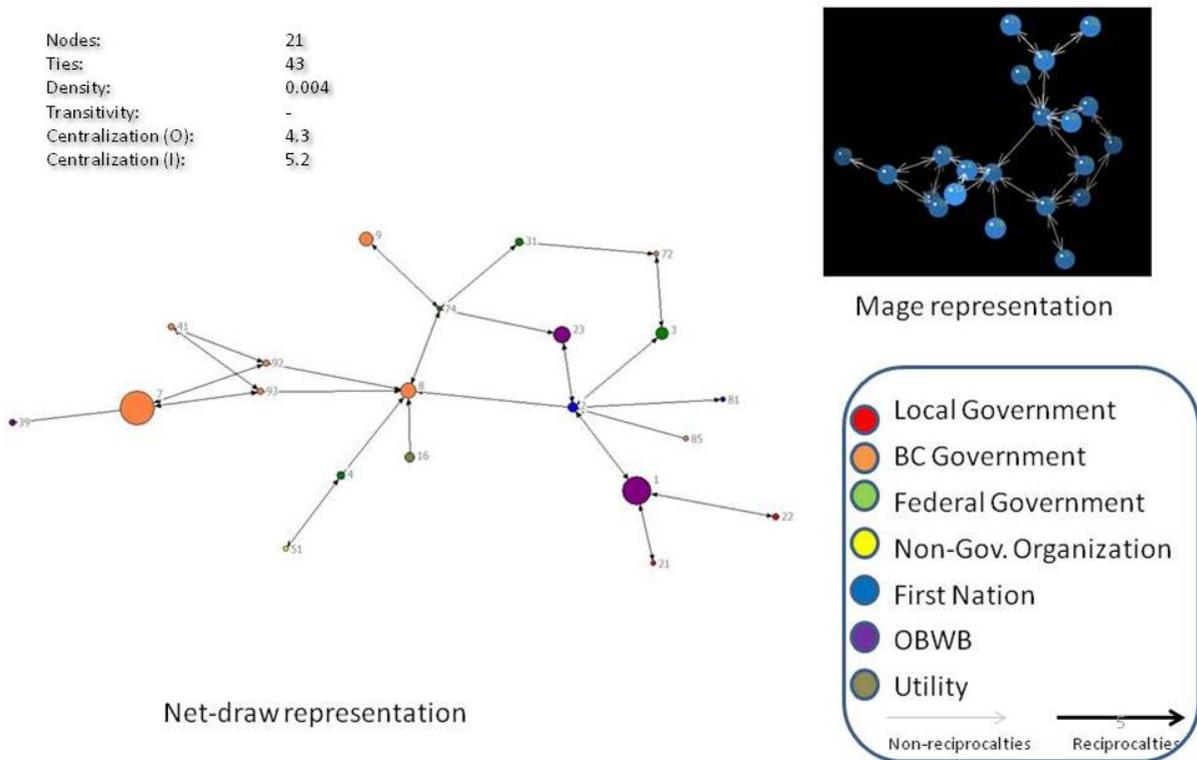


Figure 18 Network diagrams of future 'TBD' relationships.

The above network diagram provides the least amount of whole network information – largely because of the small number of nodes identified. This network relationship diagram illustrates who is currently not perceived as influential in the Okanagan water governance network, but should be more involved and influential. First Nation representatives and Provincial employees factor heavily in this diagram map. This tells us that there is a need to develop a strategic communication and policy strategy that engages with missing strategic actors and strives to have them meaningfully included in the Okanagan water governance network.

5.3 Okanagan Basin Water Board: Role in water governance network

In this section I use SNA to explore the water governance network benchmarked in this study, comparing two scenarios, one with and the other without the presence of the Okanagan Basin Water Board. A comparison of scenarios provides some insight into the significance of OBWB within the water governance network. Using some of the analysis and graphing tools available in UCINET I compare three relationships with- and without OBWB actors involved: funding flow, information flow, and informal advice.

The role of the OBWB in the water governance network						
OBWB	Fund flow		Information flow		Informal advice	
	with	without	with	without	with	without
Whole network						
Avg Degree	0.34	0.15	1.94	1.54	0.62	0.37
H-Index	3.00	2.00	9.00	7.00	5.00	4.00
Density	0.003	0.001	0.015	0.012	0.005	0.003
Connectedness	0.012	0.002	0.176	0.155	0.022	0.013
Fragmentation	0.99	1.00	0.82	0.85	0.98	0.99
Avg Distance	2.25	1.41	2.60	2.73	2.48	2.79
SD Distance	1.06	0.49	0.82	0.87	1.21	1.57
Diameter	5.00	2.00	5.00	5.00	7.00	7.00

Figure 19 Comparison of data for networks with and without OBWB actors.

This presence/absence analysis suggests that the Okanagan Basin Water Board actors play an important role in fund flow and also enhances informal advice and information flow within the Okanagan water governance network. The data in Figure 19 and network diagrams in Figure 20 supports the text analysis that identified the importance of the OBWB

in the Okanagan water governance network – most noticeably with respect to fund flow in the water governance network.

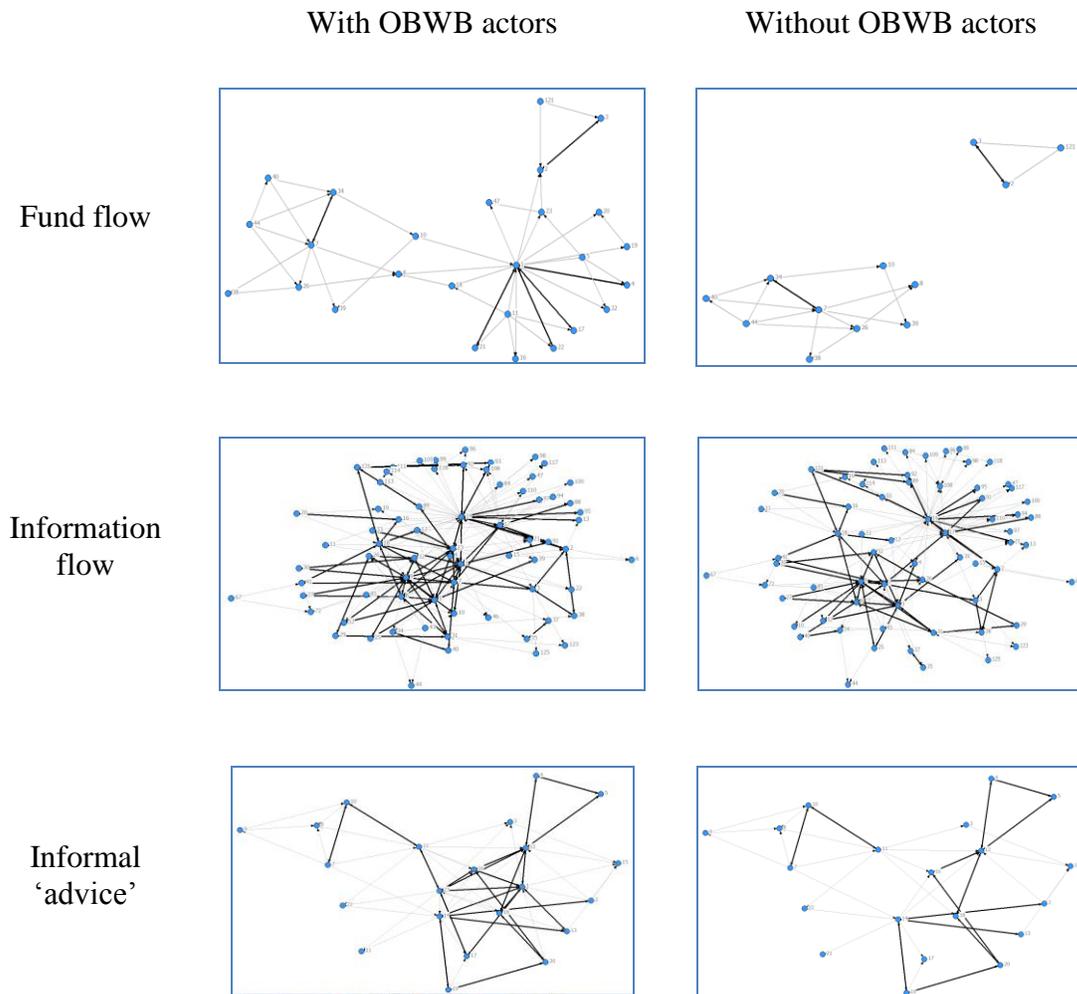


Figure 20 Comparing Okanagan water governance network diagrams.

5.4 Summary of chapter section findings

This SNA study identifies that the Okanagan water governance network has a relatively low density for all of the relationships analyzed including: information flow, informal advice, fund flow, formal connections and future connections. This low network density may reduce opportunities for individuals within the network to take full benefit and advantage of the social learning potential that exists among network actors. I also identify that when

comparing the Okanagan network graphs to work assessing water governance networks (Bodin and Crona 2009, Pahl-Wostl et al. 2012) there appears to be a relatively centralized and low cohesiveness compared to the whole network archetypes described in the literature.

I also applied quantitative-descriptive analysis methods to compare the Okanagan water governance network with and without actors from the watershed management organization, the Okanagan Basin Water Board. Findings indicate that the OBWB plays an important role in fund flow, information flow and informal advice flow within the network – with the most influence arising in the flow of funds throughout the network.

Chapter 6: Discussion

Contemporary water governance in the Okanagan has room for improvement. But how do we benchmark water governance? And how can we improve it? SNA is one technique that helps describe the current water governance network; and it helps answer questions about how formal and informal relationships between actors influence water governance. Examples of questions that we can ask of whole networks using SNA include: What is the cohesiveness of the network? What is the degree of centralization of the network? And how does network structure relate to effective communication or collaboration? Findings reported in Chapter 5 answer some of these questions using five relationship lenses to describe aspects of the Okanagan water governance network: information flow, fund flow, formal connections, informal advice, and future connections yet to be established. SNA provides a practical technique for supporting a discussion of water scarcity policy issues within a complex water governance network.

Water scarcity is a clear and present problem facing the semi-arid Okanagan basin; it has a historic frequency of occurring once every 10 years with a consecutive multi-year drought occurring once over the past century. It is only a matter of time before the next severe drought occurs in the Okanagan, and the opportunity to ensure that policy is not implemented ‘on the run’ or during the time of such an event will pay dividends reducing conflict – both among people and between people and the ecosystem. Water scarcity policy involves a range of communication challenges.

Water governance involves a range of important considerations including actor agency, the appropriate role of senior levels of government including First Nations and the Province of British Columbia, and considerations of succession planning for retiring water experts.

The Okanagan, like many semi-arid valleys around the world, is additionally complex because of the multi-jurisdictional and international elements of the watershed. The current 315,000 residents of the Okanagan who share the same water are, for the first time, faced with chronic water shortages in some sub-basins. Most of the Okanagan water is fully licensed meaning that all of the ‘available’ water has been allocated to a beneficial use by the Province of British Columbia although many licenses are not fully used in any given year. This study connects the physical water realities, water available for a range of uses and ecosystem functioning, with the decision making network that frames water governance – see Appendix 1 for a visual representation.

To help answer the question – how does the relationship between actors influence water governance – I use SNA to help visualize the relationships that influences the Okanagan water governance network as reported by water experts. SNA generated network diagrams are one technique that helps researchers and practitioners explore and understand the relationship between actors and how the network characteristics influence water governance in the semi-arid Okanagan Basin.

6.1 Emerging themes and context in the Okanagan water governance network

This study’s findings indicate that there is an expressed need to improve the water governance framework that includes aspects of: participation, transparency, integrity and accountability, rule of law and responsiveness (for survey results see Figure 10). Moreover, there is a need to address other challenges including public apathy towards water governance and an appreciation and respect by all Okanagan residents that our long-term water governance successes – social, cultural and economic – are closely tied to a functioning ecosystem. Interviewed water experts identified the importance of the provincial government

enabling water governance that is practical, actionable and supports a common-sense approach to ongoing improvements.

Many experts agree that water governance in British Columbia is lacking coherent policy and legislation on key issues and is deficient in an overall provincial water strategy (Nowlan and Bakker 2007:10). This study's findings – both from the social network analysis and identified through water experts interviews – reflect similar fragmented and ad hoc governance network characteristics in the Okanagan. The best example of this is illustrated in Figure 17 highlighting the institutional silos that are evident in the formal connections network diagram. If the governance framework is fragmented, ad hoc and reflects the 'wild west' where there are few rules and/or no enforcement, the opportunity to apply strategies that are focused on collaboration and social learning are significantly hindered. When the rules are clear and enforced by the Province, and the appropriate resources are in place, all actors and users of water are enabled and the opportunities to apply collaborative solutions emerge. Some of these collaborative solutions are not new.

In Chapter 4 I report on some of my interviewees' perceptions about tensions that influence the Okanagan water governance network. Based on the data collected from water experts, improved water governance in British Columbia requires attention at two levels: leadership to support a stronger centralized provincial water authority, and simultaneously attention and resources to support enabling watershed networks (a focus on polycentric governance, collaboration, and policy input at the watershed level). Interviewees noted the need for improved water stewardship efforts by the provincial government, most notably enforcing the water act; and they simultaneously called for a stronger connection to local water users. This duality in water governance should be actively and intentionally managed

and will strengthen opportunities for social learning and grass roots inputs into decisions that support the management of water during times of scarcity.

Immersed actors, meaning all the individuals who play a formal and informal role in the water governance network, in the Okanagan have tried to implement improvements to Okanagan water governance: *The Kelowna Courier and Okanagan Orchardist*, for instance, reported on May 29th, 1930 that there was a need for a resident administrative officer to support water governance in the Okanagan,

...someone who would work out the details of the different schemes in the fifteen different [Okanagan] Districts and take them to the Government, obtain their approval and then come back and see them carried out... The problems of each District would be carefully discussed with him and he would supervise the expenditure of the Conservation Funds loaned (Staff 1930) .

In addition to improved water stewardship by the BC Government, the need to work together as a region to manage the shared Okanagan water also has been documented for many years. In discussions about creating a new water management position in 1930 to support Okanagan water governance it was noted that “*goodwill*” was a required thread to help improve Okanagan water governance across a multi-jurisdictional governance-scape.

His was not an easy task, and goodwill and consideration would be required of all sides if the hoped for success was to be achieved. The District problems would now be considered right on the spot and if they were financially and engineering possibly, they would receive attention (Staff 1930).

Water governance today faces similar issues and continues to struggle with age-old themes relating to collaboration, trust building, and complex decision trade-offs. Improvements to water governance in the Okanagan over the past century have been limited by a range of policies and practices, and many of the same problems persist today. This study identifies a number of ongoing tensions that exist in the Okanagan water governance network that

include: public apathy, unresolved First Nation water rights and title, and an apparent lack of succession planning for retiring water experts.

Interviewees identified the lack of succession planning for retiring water experts as a serious problem in British Columbia. Senior water professionals, some of whom have been involved in water governance for the past 50 years, have a unique understanding of policy history that supports making wise water decisions that consider multiple utility functions. Today, nothing is actively being done to mentor new young professionals tasked with making difficult water policy choices and who do not have the benefits of the history, experience or established networks to help inform them. Developing increased opportunities for mentorship, and generating an internal network that is intentionally tasked to support and enable the transferring of information from senior to junior water managers would yield significant benefits to water management and governance throughout British Columbia and in the Okanagan in particular.

In the competitive environment of local and senior government policy makers, where resources in the form of people, time and funds that are dedicated to water governance are limited, water is often under-represented and undervalued. Dr. Anna Warwick Sears, Executive Director of the Okanagan Basin Water Board reminds us that, “we collectively need to do better and do more regardless”. Human and financial resources are likely to continue to be stretched and challenged by other important competing interests such as the need to provide increased levels of health care to an aging population in British Columbia. Moreover, the impacts of increased water demand and increased supply variability will influence future conflicts between humans and between humans and our ecosystem. The provincial government can and should do more to ensure water governance is better

resourced as the stakes involved in improving water governance are high and worth additional attention.

BC Water Governance: Water Scarcity in the Okanagan

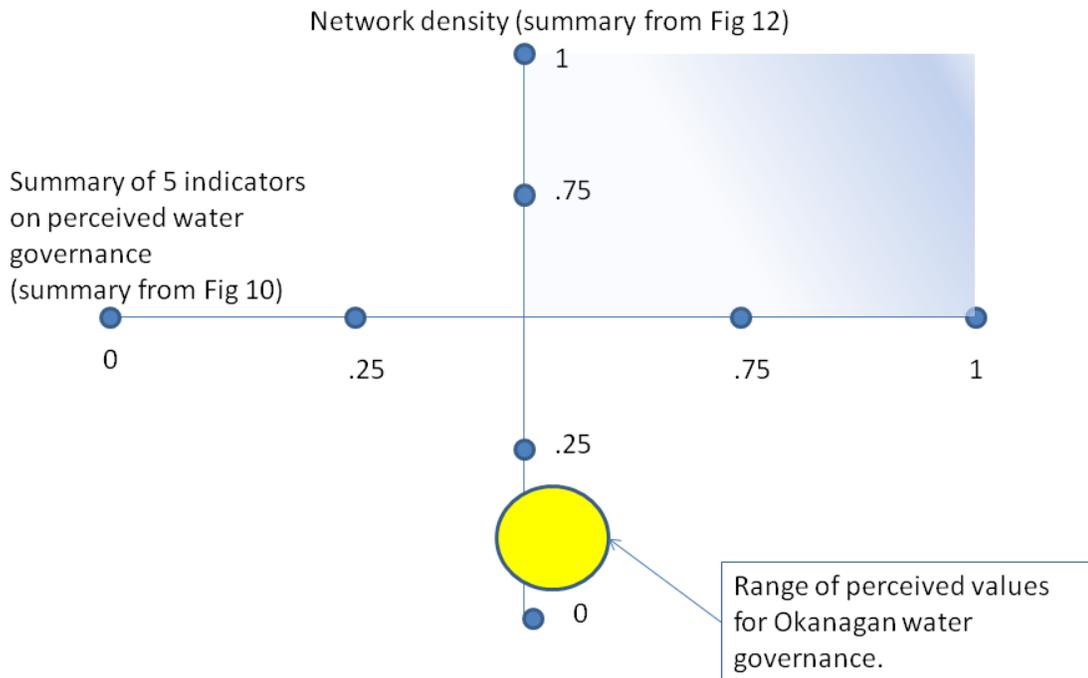


Figure 21 Mapping perceived British Columbia water governance attributes (normalized). This figure compares interviewee perception about: participation, transparency, integrity & accountability, rule of law and responsiveness (x-axis), and network density from generated network maps (y-axis).

Figure 21 graphically illustrates two indicators of water governance: governance process features (IRG 2010) described in Figure 10 and network density described in network map analytics (Chapter 5). Graphing these two indicators may help benchmark water governance, and also act as a road map for what aspects of Okanagan water governance may need attention. The top right quadrant of the graph is the winner's quadrant, indicating that the networks are dense and cohesive and the underpinnings of water governance were ranked

highly by water experts. The two indicators used in Figure 21 summarize the state of Okanagan water governance and identify where two significant water governance threads identified in this study knot or meet; they also indicate that water governance in British Columbia requires due and timely attention in order to support important fundamental improvements.

Once a network has been described, previous case studies (Cross, Borgatti and Parker 2002) demonstrate that it is possible and useful to compare the water governance networks to archetypical networks – or at least identify what are the characteristics of a functioning network given the various limitations that exist within the context of the situation. And such a comparison may help identify potential management strategies that support improving a network structure (Cross, Borgatti and Parker 2002). Combining an assessment of governance process features and whole network mapping of the Okanagan water governance network provides an opportunity for policy makers to assess the current status of a network - this was a central part of this research as I looked to better understand how water governance is applied to water scarcity policy in the Okanagan.

Water governance network data – and the illustration of data similar to that presented in the previous section – have generated a number of practical water governance questions. Previous studies have asked some important first order questions about what does an ‘improved’ network mean including: how can SNA provide an approach to mapping out the social complexity that underpins water resource governance (Stein, Ernstson and Barron 2011)? How can we capture the unique characteristics of networks that have an impact on outcomes (Mandell and Keast 2008)? How can an organization better support work occurring in informal networks (Cross, Borgatti and Parker 2002)? And how does the

structural pattern of relations (the topology) of a social network impact actor behavior (Bodin and Crona 2009)? We can use SNA to ask, and answer, some of these important questions in a unique and practical way.

The various water governance threads described in this qualitative study support some practical and strategic improvements to water governance in the Okanagan, and at the centre of this study is a dialogue about the need for networks to support collaborative learning and better decision making – between generations of water professionals, and actors involved in the Okanagan water governance network.

Social networks are ubiquitous in our personal and professional lives. Today, there are a range of technologies like *Facebook* and *LinkedIn*, which support networking opportunities with colleagues and friends around the planet. It is within this context where we are familiar with the benefits of networking that this study looks to identify and harness new and innovative ideas that may help improve water governance in the Okanagan.

This study identifies the value of water governance network archetypes and their role to support the Okanagan water governance network. To that end, in the following section I examine some of the collected data about the current state of the Okanagan water governance networks, formal and informal, and compare them to network archetypes described in the literature.

6.2 Whole network descriptive analysis

Whole network analysis explores how every actor is connected with every other and looks at how the whole pattern of individual choices gives rise to more holistic patterns (Hanneman and Riddle 2005). Chapter 5 reports on the findings from this study on one

aspect of social network analysis, whole networks (ego networks are another SNA perspective available for analysis but are not used extensively in this study).

Whole network analysis also provides researchers with the opportunity to better understand benchmark and characterize the complex interaction between actors within a water governance network. Successful communication and policy strategies that reduce harm to humans and the ecosystem during times of water scarcity need to be contextualized within a complex political, philosophical and technical institution-building exercise that is multidimensional (Tortajada 2010) and involves multiple actors. Collaboration is one harm reduction strategy for the Okanagan water governance network, and may be analyzed and improved using SNA.

Network analysis provides us with the means to understand where collaboration is and is not occurring...and can be an invaluable tool for systematically assessing and then intervening at critical points within an informal network (Cross, Borgatti and Parker 2002).

In Figure 22 I compare the Okanagan water governance networks with network archetypes described in previous research studies. Applying a qualitative 'archetype' framework that supports the characterization of common network forms is one new method developed in this study that supports a dialogue on improving water governance. Researchers have identified several network archetypes, such as centralized and polycentric networks that capture a number of network characteristics.

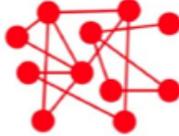
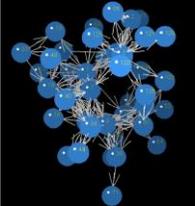
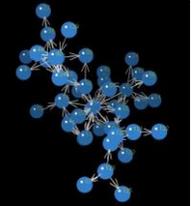
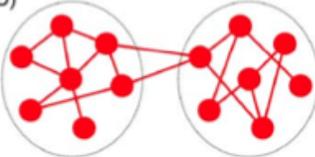
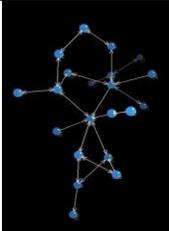
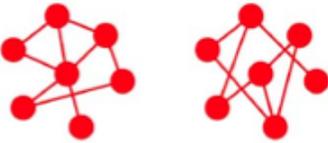
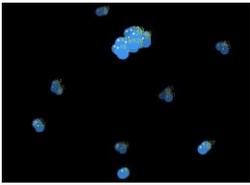
		Bodin & Crona (2009)	Pahl-Wostl et al. (2012)	Okanagan Water Governance Networks (Mage Graphic representations)	
Network description	A	(A)  High cohesiveness	Polycentric		
	B	(C)  Highly centralized	Centralized	 Information	 Funds
	C	(D)  Distinguished groups	Fragmented	 Informal advice	 'to be developed'
	D	(B)  Isolated sub-groups	centralized	 Formal connections	

Figure 22 Comparing Okanagan whole network results with SNA archetypes.

The comparison of the Okanagan water governance networks diagram with previously described network archetypes indicates that the Okanagan water networks have a relatively

low density – and may be improved by increasing cohesion. The Okanagan water governance network diagrams describing the actor linkages for information and informal ‘advice’ are reasonably similar to the Bodin and Crona (2009) highly centralized description of networks and Paul-Wostl’s centralized network archetypes. The other three water governance relationships described in this study seem to be fragmented centralized and have characteristics of distinguished groups and isolated sub-groups to varying degrees. None of the Okanagan water governance network maps appear to be highly cohesive and their low density values corroborate a fragile water governance network.

There is no panacea for organizing or categorizing network archetypes and they are context specific, requiring careful consideration of local differences in: culture, geography, actor participation, and political context. Different governance contexts operate optimally using different archetype structures, for example a military organization may benefit from a highly centralized governance structure. But in this context, a water governance network with multiple actors involved in decision making would be well served at the watershed scale by a highly cohesive or polycentric water governance archetype diagram. The application of a strategic communication and policy exercise using SNA network archetype comparisons may support improvements to the water governance network; and in particular utilizing water governance network diagrams such as the ones explored in this study may be used to help improve Okanagan water governance in practical and measurable ways – such as network density.

One measure for whole networks is density: network density provides insight into general group cohesion (Wasserman and Faust 1994). There is debate in the literature as to the appropriate interpretation of network density. For example, having an increased density

suggests in some studies that transmission of information among actors supports collaborative learning and enhances the opportunity to build trust relationships (Stein, Ernstson and Barron 2011). Similarly, other researchers identify that the density of a network helps our understanding of the speed at which information diffuses among the nodes and the extent to which actors have high levels of social capital and/or social constraint (Hanneman and Riddle 2005). In contrast, some researchers suggest that higher density networks – especially those that are not inclusive of multiple sector actors – have been identified as leading to challenges with the homogenization of ideas (Bodin and Crona 2009) and have led to some significant common-pool resource challenges.

In contrast to individual learning, social learning refers not only to cognitive and behavioral changes in individuals within a network, but also to the process in which individual changes in cognition and action lead to modification in collective rules or institutions, either by consensus or by some other mode of decision making (Bodin and Prell 2011).

The characteristics of a network provide insight into the extent to which actors are collaborating and taking advantage of social learning. In this study, the characteristics of the information flow between actors have a relatively low density. This would indicate that the capacity for social learning within this network policy space is limited and may be significantly improved by paying attention to policies and strategies that enhance the network density and cohesiveness.

6.3 How can we improve water governance?

“If you don’t know where you’re going, any road will get you there.”

(Widely attributed apocryphally to Lewis Carroll in *Alice’s Adventures in Wonderland*)

As noted by Pahl-Wostl (2002) “any strategy must start from an analysis of the coupled human-technology-environment system and aim at improving the design of it.”

Benchmarking the current state of the water governance was completed in this study looking to integrate interviewee perceptions of the current state of water governance in British Columbia and their social network maps. Interviewees in this study identified that water governance has significant opportunities for improvement in a number of categories including: participation, transparency, integrity and accountability, rule of law, and responsiveness (see Figure 10 for the survey results on five water governance indicators and a comparison to other regions around the world). Moreover, the results from the Social Network Analysis of Okanagan water governance suggested that the current networks that exist, although improved in their: density, communication and fund flow as a result of the presence of the Okanagan Basin Water Board, also require attention and could be significantly improved.

Some researchers (Schiffer and Hauck 2010) have looked at the whole network framework to support improved water management during times of change and others are looking to better understand governance networks. SNA is being applied to identify existing social networks, to support strategic intervention and to increase the problem solving capacity of a defined social network (Cross, Borgatti and Parker 2002). It is the pattern of relationships that can reveal a number of strategies to improve a water governance network.

At the most rudimentary level, we have found that visually assessing the pattern of relationships that hold a certain group together can reveal a number of interesting and actionable points (Cross, Borgatti and Parker 2002).

Whole network analysis is a powerful communication and policy support tool for senior management within a complex corporate structure. In Figure 23, two diagrams illustrate the pre- and post- network map that reflects the opportunity to intentionally improve a network structure as depicted by Cross, Borgatti and Parker (2002). The top diagram illustrates the

initial state of the network – demonstrating characteristics of a fragmented and centralized network with distinguished groups. The bottom diagram was developed after intervention using a communication strategy and policy changes with an apparent affect of producing a more highly cohesive network – one that is more resilient to change. Applying a similar technique as demonstrated by Cross et al. (2002) to the water governance network is a clear opportunity for senior managers and policy makers to improve the Okanagan water governance network.

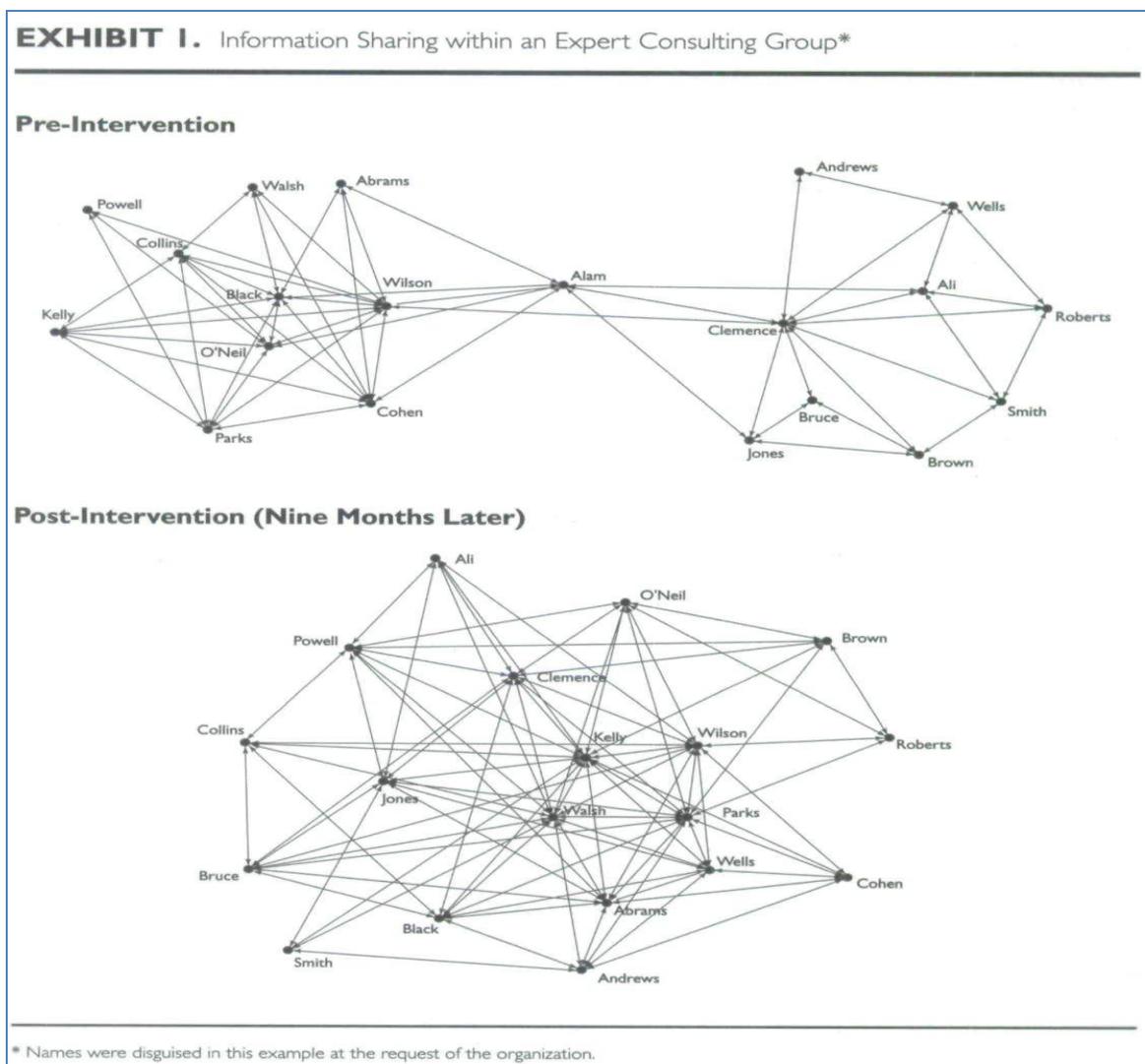


Figure 23 An example of SNA applied to support strategic collaboration.

Although this study provides for only a benchmark of the Okanagan water governance network –the results indicate that the current network is highly centralized and fragmented. Developing a strategy that uses the initial benchmark state to identify the challenges within the current network in combination with a new communication strategy and policies that support improved collaboration and cohesion may provide for significant improvements to the Okanagan water governance network. It is hypothesized here that the result – assuming that the intervention is successful – will generate a network with higher cohesiveness and density. Such an improved water governance network may support a more resilient network of actors thereby reducing the ecological, economic and social impacts of water scarcity events in the Okanagan.

SNA has been used in the corporate management arena (Cross and Parker 2004) as a decision support tool for over a decade. Recently whole network (and ego network) analysis has been applied as a useful research technique to describe and benchmark water governance (Schiffer, Hartwich and Monge 2010, Stein, Ernstson and Barron 2011) and identify ways to improve collaboration and social learning. This study reports on some of these emergent themes identified by British Columbia water professionals and the results of SNA. This study also provides some new insights into network diagrams describing actor relationships. These network diagrams may be used to influence and possibly improve water governance policy and collaborative communication strategies in the Okanagan. With the benchmarked water network completed, and through an engaging communication strategy, I believe that network actors will better understand the formal and informal norms, principles rules and structures involved in the management of water for the well-being of humans and ecosystems (Gupta 2011) in the Okanagan.

The opportunities to identify a present state of networks and to use archetypes to suggest improved states are one useful means to apply network data analysis and improve water governance in the Okanagan. The concept of developing a structured methodology – benchmarking, comparing with archetypes and then strategically applying resources to improve a water governance network – is a promising and emerging technique in SNA water governance research. Previous studies have asked a number of foundational questions that may be supported through the application of a means to identify network archetypes and develop a practical solution to improve a given water governance network including: What are the basic character governance archetypes (Silvia and McGuire 2010)? How can social network analysis provide an approach to mapping out the social complexity that underpins water resource governance (Stein, Ernstson and Barron 2011)? How can an organization better support work occurring in informal networks (Cross, Borgatti and Parker 2002)? How do we capture the unique characteristics of networks that have an impact on outcome (Mandell and Keast 2008)? And how does one assess the most favorable level and mix of different network characteristics, where most of the positive governance effects are obtained while undesired effects are minimized (Bodin and Crona 2009)? Using some of these questions to guide future Okanagan social network analysis studies will provide additional insights into how the relationships between actors influence water governance in the Okanagan basin.

6.4 Decision making and the water governance network

Complex problems are often characterized by a lack of differentiation between 'means' and 'ends' and are known as 'wicked' problems (Camillus 2008, Rittel and Webber 1973, Scholz and Stiftel 2005). Water governance scholars have noted that,

...scarce resources should not be controlled solely by core groups of elite interests who are able to influence policy-makers so as to create policies, which work disproportionately to their advantage. Instead, policies regarding resources upon which all depend for life and livelihood must be made from reference to what benefits society at large (O'Brien 1996:263).

Water scarcity and questions that relate to equity and fairness contribute to the wicked nature of water governance.

Adapting to changing situations is a management challenge facing governance of all institutions, both private and public. This SNA study supports a developing body of research that uses, and critically looks at, the structure of networks to provide guidance on how descriptive network analytics may support immersed actors as they adapt to inevitable water scarcity events in watersheds that receive low annual precipitation.

Adapting to water scarcity in the Okanagan is a challenge, as described in the decision tree diagram - Figure 3, because spring rainfall is unpredictable. Developing appropriate drought triggers as part of a drought plan is one important management tool that is relatively simple to develop and yet has not been implemented by most water suppliers in the Okanagan. The development of individual water utility drought plans and a coordinated basin drought plan are important Okanagan basin water management strategies, and if implemented, would generate material benefits including: increased certainty for individual users, more resilient community drinking water supplies, and fewer negative ecosystem and economic consequences during future multi-year water scarcity events. How water governance professionals apply water restriction rules that benefit society is a challenge, especially when there are a range of utility functions that in some cases are complex and have varying degrees of special interest groups advocating on their behalf. Decisions that are optimized to benefit society require some level of metrics including measures of equity,

efficiency, enforcement and flexibility, and could benefit from ideas that are embedded in both colonial and indigenous water governance approaches. In the next section, I explore in greater detail opportunities to apply different water governance perspectives.

One of the challenges with addressing wicked problems is that solutions benefiting today's citizens, or a segment of them, may disadvantage future generations or have unintended consequences downstream; how water governance provides a framework to manage some of these trade-offs is important. It is noteworthy that SNA has a practical role to play in helping manage difficult trade-offs by supporting a process that is inclusive of enhancing communication, and understanding, between immersed actors.

One example of a wicked problem expressed in the Okanagan is the case from the early 1950s when Okanagan water managers, responding to flooding and agricultural production needs, decided to channelize the Okanagan River in the South end of the valley. The concept that we can simply 'engineer' solutions that meet narrow utility functionality (i.e. flooding and agricultural production but not fish habitat or future generations' experience of valley bottom wetlands) has fallen short in the past. An almost extirpation of Okanagan sockeye, making-up over 80% of the Columbia Basin stock (Schell 2012) and a keystone indicator for a healthy ecosystem, demonstrates the limitations of the old western metaphor – or suggests that traditional engineering and economic techniques may be improved in their application with greater attention to the inclusion of a broader range of externalities.

Although the engineered solution of channelizing the Okanagan River provided significant benefits to residents living in the flood plain, the resultant loss of sockeye salmon spawning habitat was evidence that the decision making process was too narrowly scoped thereby harming a regional ecosystem providing cultural, social and economic services uses

by current and future generations. It is this type of challenging decision-making environment where water professionals continue to struggle to improve water governance in the Okanagan.

In contrast, strategic leadership by the Okanagan Nation Alliance Fisheries Department in partnership with Columbia River power utility companies and senior levels of government has produced one of the most important water governance and water decision-making success stories; with the implementation of the Fish Management Tool and successful Columbia River hydroelectric dam fish passage projects, Okanagan sockeye salmon survival has significantly improved. The impacts of these water management and governance efforts have resulted in significant improvements to the survival of Okanagan sockeye, which were close to extinction. The return of the Okanagan ‘desert’ salmon is emblematic of a new and improved water metaphor. The return of the desert salmon is the result of an improved and functioning actor network that was successful at accomplishing significant improvements to Okanagan water through collaboration and partnerships; enabling a higher level of ecosystem functioning benefiting us all today – and in the future.

6.5 Searching for an improved metaphor

Building on the pragmatic SNA work, in this section I explore an important theme or thread identified in Chapter 4; emphasizing the importance of improving water governance by considering indigenous and colonial water governance concepts.

A focus on financial and engineering solutions – sometimes at the expense of the ecosystem and marginalized user groups – was identified by some interviewees as part of the current metaphor for water governance. A predominant metaphor depicts the ecosystem and water as a machine, a resource that can be controlled and engineered; this 20th century

metaphor has often served a narrow purpose, one that is focused on a very limited set of utility functions that do not always adequately take into account the value of a functioning ecosystem that is more than the sum of human-centric needs. This old ‘colonial’ metaphor suggests that water is another resource and is part of a technical, mechanistic and controllable system (Pahl-Wostl 2002b). It is in improving the old metaphor for water, how we relate to water, and how we govern it that we may better understand the current limitations and conflicts that exist and explore how to improve them. Moreover, by improving the old metaphor our water governance may more appropriately reflect the value of water and the ecosystem that it depends on.

The Okanagan First People’s concept of Tmix^w introduced earlier in this study describes a concept that helps contextualize and describe the place based nature of the Okanagan water governance network. Improving water governance in the Okanagan is well served by integrating concepts of indigeneity and colonial water management. Based on the evidence presented in Chapters 4 and 5, I feel that there are significant benefits that can be realized through allying colonial and indigenous ideas that inform improvements to the Okanagan’s water governance network. We all have a lot to learn from each other and the opportunity to improve water governance through the consideration of dual perspective – indigenous and colonial water governance ideas – reflects the fact that as neighbors we are all here to stay in the Okanagan. The consideration of both water governance perspectives will benefit all concerned to manage the shared and limited Okanagan water.

The search for a new paradigm does not require us to throw out the old one but instead look for ways to improve it given the richness of epistemology that exists in both colonial and indigenous cultures. Society has seen significant advantages because of

engineering of our ecosystem and that includes reduced flooding, expanded arable land and increased water storage for agriculture and ecosystem flows. The search for a new metaphor is about taking the best parts of colonial culture including engineering, natural resource economics and decision theory and integrating them in a new metaphor that integrates traditional ecological knowledge and indigeneity.

From a philosophic and practical perspective, moving forward, as part of a negotiation framework to resolve equitable treaties between the colonial and indigenous governments, concepts of Tmix^w and indigeneity – a lens to view humans’ place within the ecosystem – may provide some additional context for successful negotiations. Indigeneity “describes a state of living within an environmental ethic based on the knowledge of what the local ecology requires of human behavior to maintain its full regenerative capacity in perpetuity” (Armstrong 2011). Collectively, society would be well served by adopting a new relationship with the world that sustains us (Suzuki, Mason and McConnell 2007). The concept of indigeneity, as a lens to support negotiated water agreements between communities, has the potential to support a new “relational sustainability as the logic of engagement” (Langdon 2007). Moreover, Armstrong (2011) observes,

It is clear a paradigm shift is needed in which human beings embed values consistent with an intelligent recognition of the necessity for conforming human institutions to the requirements of behavior wherein the local ecology they occupy sustain its full generative capacity...the contemporary context requires “collaborations” between Indigenous peoples currently living their Indigeneity and those “indigenizing” themselves into local ecologies shaping old knowledges into new practices.

An improved water governance paradigm involves an open mind, respect for different cultural water governance perspectives and a willingness to collaborate. It is in this search for an improved metaphor – integrating indigenous and colonial governance – that we may

create communication strategies, including SNA diagrams, and policies that improve water governance in the Okanagan.

6.6 Water governance and agency

This study looks both at the formal and informal arrangements that exist within the water policy actor network. Building on research that explores wise decision-making (Keeney and Raiffa 1976) in situations that are characterized by uncertainty from a complex changing ecosystem and a social network, this descriptive SNA study accounts for a valuable component of actor agency and a better understanding of how agency contributes to our understanding of an improved water governance network.

Agency, the act of an individual engaging with the social structure, is an important aspect of this study's exploration to better understand water governance. The networks analyzed in this chapter used data that reflects individuals and not institutions. Each node in the network diagrams represents a person with agency that involves complex norms, perceptions and bias. Social perceptions such as the 'myth of abundance' (Bakker 2006) that have been observed in interviews with actors in Okanagan society (Wagner 2008), provide additional complexity to improving water governance and require further exploration in various public and policy forums about the roles and responsibility of individual citizens and residents in the Okanagan and their agency. SNA diagrams are useful in helping describe the imbedded nature of actor agency within a complex water governance network. Previous studies on socio-ecological resilience and social learning (Armitage et al. 2008, Pahl-Wostl 2002b) have identified the benefits of implementing strategic and intentional management strategies that support, foster and enable collaboration and learning in complex social networks. Agency and ecosystem stewardship can be discussed and explored in new ways

using SNA diagrams and help provide a context nested in a sense of place, culture and respect for the ecosystem (Suzuki, Mason and McConnell 2007).

6.7 Discussion summary

This study focuses on identifying some of the contemporary themes that contextualize water governance in the Okanagan. Moreover, the application of SNA provides a new look into the structure of the Okanagan water governance network. The opportunity to benchmark and develop new strategies to improve the current network structure have been shown (Cross, Borgatti and Parker 2002) to make the invisible networks visible and yield practical and tangible improvements to governance networks. With a renewed level of stewardship by the provincial government and a broader public appreciation for the ecosystem or *Tmix*^w, the opportunity to reduce and overcome water scarcity conflicts is ripe for the picking.

Through the voices and network diagrams of water experts, I explore a number of whole network characteristics that may be helpful in supporting future management strategies enabling wise choices within British Columbia's policy actor network. An improved water governance network has the potential to enable future collaboration and the transfer of information, supporting a resilient decision making framework where the provincial government provides adequate water stewardship and fulfills their social contract to protect shared Okanagan water today and for future generations. A functioning network enables the embedded actors to more effectively address uncertainty in decision-making around issues such as water scarcity. It is within the context of socio-ecological resilience and a new water governance paradigm that SNA may support improvements to water governance form and function.

The data analysis in this study recognizes the importance of local government, like the cooperative governance model of the Okanagan Basin Water Board that was formed by three local governments to address water basin issues; and suggests that water governance in the Okanagan will benefit from leadership that focuses on enhancing the collaborative learning network that exists today.

The need to ensure the context in which any given network is embedded is of critical importance, and any initiative to improve water governance using whole networks as a systematic analytic measure may be able to address some of the critical issues of trust building, managing shared goals (Chow and Chan 2008), credibility, and accountability. Water governance research across multiple jurisdictions – including British Columbia – suggests that we need to actively work on expanding “ecological knowledge” through initiatives of intentionally developing networks of organizations (De Loe 2009:10). This study builds on the rich, yet developing foundations, of social network analysis applied to improving water governance.

Chapter 7: Conclusion

Water governance in the Okanagan has a number of important threads that are analyzed in this study. One important thread described in Chapter 4 was the need to have the provincial government implement new policy that results in an ADM level manager being appointed to oversee provincial water. The need to pay attention to succession planning for strategic retiring water professionals in the provincial government was another important observation made by many of the interviewees. Only marginal improvements have been implemented to improve water governance over the past 80 years, and with the modernization of the BC Water Act provincial politicians and policy makers have an unprecedented opportunity to improve the water governance network. Figure 21 provides a visual summary of water governance in British Columbia and illustrates the perception of both the Okanagan water governance network (y-axis), and the perception of important water governance attributes: participation; transparency; integrity and accountability; rule of law; and responsiveness (x-axis). This study also describes a number of tensions between humans and humans and the ecosystem that include issues as diverse as food security, inclusion of Indigenous people in decision making and public apathy towards water governance. How we choose to collectively move forward and improve the governance of our shared water in the Okanagan depends largely on the relationships and network functionality that exists today and the shape that the Okanagan water governance network takes in the future.

Researchers have been exploring and characterizing water governance networks for over a century. Over the past decade new social network analysis (SNA) tools have been developed and applied to water governance networks. Some of the applications of SNA that I explore in this study are: how to visually map Okanagan water governance networks

providing a network benchmark; a comparison of Okanagan water governance networks with literature described archetype networks; and a methodology to apply benchmarked network findings to support new communication and policy strategies to visually assess relationship patterns in order to support improvements to water governance.

This study identifies a need to improve and enhance the central authority of the BC Government tasked with making difficult trade-off decisions while understanding the nested nature of those decisions. Moreover, using SNA as a practical communication strategy to support future improvements in water governance in the Province and in the Okanagan in particular is supported by the evidence from this study.

This study also identifies the importance of the unique local government organization, the Okanagan Basin Water Board, and illustrates the value of the watershed organization in supporting the financial and communication threads of water governance. SNA was used to illustrate some of the actor network relationships that are enhanced as a result of the Okanagan Basin Water Board's activities. Further improvements to the Okanagan water network will be well served through enhancing OBWB efforts of collaborative learning. Moreover, the new British Columbia Water Act provides an unprecedented opportunity to improve water governance on issues including equity, enforcement, efficiency, and flexibility.

Future research applying SNA to characterize, benchmark and develop practical strategies for enabling and improving water governance networks throughout the Province of BC is supported by this study's findings. The value of longitudinal SNA studies – a level of analysis not undertaken in this study – would provide for further understanding of the relationships within the network and how water governance and policy networks changes

over time. This study describes the perceptions of interviewed water experts about actor relationships that characterize the Okanagan water scarcity network. SNA is a practical and useful descriptive method to encourage increased collaborative learning, wise decision making, and making effective management choices in a complex and uncertain decision context of water governance. This thesis argues that the present state of collaboration, communication and fund flow, benchmarked using social network analysis (see Chapter 5), may be improved if the provincial government plays an increased leadership role that simultaneously provides a framework for strengthening a polycentric social network; enabling social learning and the application of local knowledge to emerging wicked problems such as climate change. The opportunity to apply an improved water governance metaphor embracing legal pluralism and agency by all concerned, and embracing a duality of western and Indigenous governance frameworks are important threads to addressing resilient water governance and water scarcity in the Okanagan valley. Lots has been done to improve water governance, and lots more remains to do!

Literature Cited

- Agrawal, Arun. 2003. "Sustainable Governance of Common-Pool Resources: Context, Methods, and Politics." *Annual Review of Anthropology* 32:243-62.
- Alliance, Okanagan Nation. 2004, "Okanagan Nation Alliance - Fisheries Department". Retrieved February 22, 2013, 2013 (<http://www.syilx.org/naturalresources-fisheries.php>).
- Armitage, D.R., R. Plummer, F. Berkes, R.I. Arthur, A.T. Charles, I.J. Davidson-Hunt, A.P. Diduck, N.C. Doubleday, D.S. Johnson and M. Marschke. 2008. "Adaptive Co-Management for Social-Ecological Complexity." *Frontiers in Ecology and the Environment* 7(2):95-102.
- Armstrong, Jeannette C. 2011. "Indigeneity: A Necessary Social Ethic to Take Us Beyond Sustainability." Pp. 45-57 in *Beyond Sustainability: Contributions to Tedx Okanagan College*, edited by B. Hughes. Penticton: Okanagan Institute in association with Okanagan College.
- Bakker, K. 2010. *Privatizing Water: Governance Failure and the World's Urban Water Crisis*. New York: Cornell University Press.
- Bakker, Karen, ed. 2006. *Eau Canada the Future of Canada's Water*. Georgetown, ON: UNIPresses.
- Bakker, Karen. 2007. *Eau Canada : The Future of Canada's Water*. Vancouver: UBC Press.
- Baland, Jean-Marie and Jean-Philippe Platteau. 1996. *Halting Degradation of Natural Resources: Is There a Role for Rural Communities?* Oxford: Oxford University Press and FAO.

- Belliveau, Suzanne, Barry Smit and Ben Bradshaw. 2006. "Multiple Exposures and Dynamic Vulnerability: Evidence from the Grape Industry in the Okanagan Valley, Canada." *Global Environmental Change* 16(4):364-78.
- Bodin, Ö. and B.I. Crona. 2009. "The Role of Social Networks in Natural Resource Governance: What Relational Patterns Make a Difference?". *Global Environmental Change* 19(3):366-74.
- Bodin, Örjan and Christina Prell. 2011. *Social Networks and Natural Resource Management: Uncovering the Social Fabric of Environmental Governance*. Cambridge, UK ; New York: Cambridge University Press.
- Boissevain, Jeremy. 1979. "Network Analysis: A Reappraisal." *Current anthropology* 20(2):392-94.
- Borgatti, S.P., M.G. Everett and L.C. Freeman. 2002. "Ucinet for Windows: Software for Social Network Analysis." Harvard. MA: Analytic Technologies.
- Borgatti, S.P. 2006. "Identifying Sets of Key Players in a Network." *Computational, Mathematical and Organizational Theory* 12(1):21-34.
- Camillus, John. 2008. "Strategy as a Wicked Problem." *Harvard Business Review* 86(5):98-106.
- Chow, Wing S. and Lai Sheung Chan. 2008. "Social Network, Social Trust and Shared Goals in Organizational Knowledge Sharing." *Information & Management* 45(7):458-65.
- Christakis, Nicholas A. and James H. Fowler. 2007. "The Spread of Obesity in a Large Social Network over 32 Years." *New England Journal of Medicine* 357(4):370-79.
- Cohen, S. and T. Neale. 2006. "Participatory Integrated Assessment of Water Management and Climate Change in the Okanagan Basin, British Columbia." Vol. Vancouver.

- Cohen, Stewart, Denise Neilsen, Scott Smith, Tina Neale, Bill Taylor, Mark Barton, Wendy Merritt, Younes Alila, Philippa Shepherd, Roger McNeill, James Tansey, Jeff Carmichael and Stacy Langsdale. 2006. "Learning with Local Help: Expanding the Dialogue on Climate Change and Water Management in the Okanagan Region, British Columbia, Canada." *Climatic Change* 75(3):331-58.
- Corbin, Juliet M. and Anselm L. Strauss. 2008. *Basics of Qualitative Research : Techniques and Procedures for Developing Grounded Theory*. Los Angeles, Calif.: Sage Publications.
- Cross, Rob, Stephen P. Borgatti and Andrew Parker. 2002. "Making Invisible Work Visible: Using Social Network Analysis to Support Strategic Collaboration." *California Management Review* 44(2):25-46.
- Cross, Robert L. and Andrew Parker. 2004. *The Hidden Power of Social Networks : Understanding How Work Really Gets Done in Organizations*. Boston, Mass.: Harvard Business School Press.
- Davis, Anthony and John R Wagner. 2003. "Who Knows? On the Importance of Identifying "Experts" When Researching Local Ecological Knowledge." *Human ecology* 31(3):463-89.
- De Loe, R. C. 2009. *Water Allocation and Water Security in Canada: Initiating a Policy Dialogue for the 21st Century*: Guelph Water Management Group, University of Guelph.
- de Loe, R.C., D. Armitage, R. Plummer, S. Davidson and L Moraru. A. E. Alberta Government, Environmental Stewardship, Environmental Relations. 2009. "From Government to Governance: A State-of-the-Art Review of Environmental

- Governance." Vol. *Final Report*. Guelph, ON: Prepared for Alberta Environment, Environmental Stewardship, Environmental Relations.
- Fisher, Anthony, David Fullerton, Nile Hatch and Peter Reinelt. 1995. "Alternatives for Managing Drought: A Comparative Cost Analysis." *Journal of Environmental Economics and Management* 29(3):304-20.
- Folke, Carl, Thomas Hahn, Per Olsson and Jon Norberg. 2005. "Adaptive Governance of Social-Ecological Systems." *Annual Review of Environment & Resources* 30(1):441-73.
- Glantz, Michael H. 1982. "Consequences and Responsibilities in Drought Forecasting: The Case of Yakima, 1977." *Water Resources Research* 18(1):3-13.
- Glaser, B. and A.L. Strauss. 1967. *The Discovery of Grounded Theory: Strategies of Qualitative Research*. Chicago: Aldine.
- Granovetter, Mark. 1995. *Getting a Job: A Study of Contacts and Careers*: University of Chicago Press.
- Gupta, Joyeeta. 2011. "Principles of Good Governance at Different Water Governance Levels." Pp. 5-11 in *An Essay on Global Water Governance and Research Challenges*, edited by M. van der Valk and P. Keenan. Delft, the Netherlands: UNESCO.
- Hammond, John S, Ralph L Keeney and Howard Raiffa. 1998. "The Hidden Traps in Decision Making." *Harvard Business Review* 76(5):47-58.
- Hanneman, R.A. and M. Riddle. 2005. "Introduction to Social Network Methods." University of California Riverside.

- Hyatt, Kim D., Margot M. Stockwell and Rankin D. Paul. 2003. "Impact and Adaptation Responses of Okanagan River Sockeye Salmon (*Oncorhynchus Nerka*) to Climate Variation and Change Effects During Freshwater Migration: Stock Restoration and Fisheries Management Implications." *Canadian Water Resources Journal* 28(4):689-713.
- Hyatt, Kim D., Marot M. Stockwell and D. Paul Rankin. 2003. "Impact and Adaptation Responses of Okanagan River Sockeye Salmon (*Oncorhynchus Nerka*) to Climate Variation and Change Effects During Freshwater Migration: Stock Restoration and Fisheries Management Implications." *Canadian Water Resources Journal* 28(4):689-713.
- IRG. 2009. "Mena Regional Water Governance Benchmarking Project - Concept and Approach Framework." Vol. Washington: U.S. Agency for International Development.
- IRG. 2010. "Mena Regional Water Governance Benchmarking Project Final Report." Vol. Washington: U.S. Agency for International Development
- Johnson, J.C. 1994. "Anthropological Contributions to the Study of Social Networks." Pp. 113-51 in *Advances in Social Network Analysis: Research in the Social and Behavioral Sciences*, edited by S. Wasserman and J. Galaskiewicz. Thousand Oaks, CA: Sage Publications Inc.
- Keeney, Ralph L. and Howard Raiffa. 1976. *Decisions with Multiple Objectives: Preferences and Value Tradeoffs*. New York: John Wiley & Sons.

- Keeney, Ralph L. and Eric F. Wood. 1977. "An Illustrative Example of the Use of Multiattribute Utility Theory for Water Resource Planning." *Water Resources Research* 13(4):705-12.
- Kjaer, Anne M. 2004. *Governance*. Cornwall: Polity Press.
- Langdon, Stephen J. 2007. "Sustaining a Relationship: Inquiry into the Emergence of a Logic of Engagement with Salmon among the Southern Tlingits." Pp. 233-73 in *Native Americans and the Environment: Perspectives on the Ecological Indian*, edited by E. M. Harkin and D. R. Lewis. Lincoln and London: University of Nebraska Press.
- Laumann, Edward O, Peter V Marsden and David Prensky. 1989. "The Boundary Specification Problem in Network Analysis." *Research methods in social network analysis* 61:87.
- Learning in the Real World. Center for Ecoliteracy. 2000. *Ecoliteracy : Mapping the Terrain*. Berkley, Calif.: Learning in the Real World, Center for Ecoliteracy.
- Lemos, M.C. and A. Agrawal. 2006. "Environmental Governance." *Annual Review of Environment and Resources* 31:297-325.
- Long, Karilyn, Steve Matthews, Deana Machin, Okanagan Nation Alliance Fisheries and BC Penticton. 2003. "Okanagan Region Fish Species at Risk Status Report."
- Mandell, M.P. and R. Keast. 2008. "Evaluating the Effectiveness of Interorganizational Relations through Networks." *Public Management Review* 10(6):715-31.
- McGinnis, MD, Bloomington. Workshop in Political Theory Indiana University and Policy Analysis. 1999. *Polycentric Governance and Development: Readings from the Workshop in Political Theory and Policy Analysis*: University of Michigan Press.

- McPherson, Miller, Lynn Smith-Lovin and James M Cook. 2001. "Birds of a Feather: Homophily in Social Networks." *Annual review of sociology*:415-44.
- Molle, Francois. 2004. "Defining Water Rights: By Prescription or Negotiation?". *Water Policy* 6:207-27.
- Neef, Andreas. 2009. "Transforming Rural Water Governance: Towards Deliberate and Polycentric Models?". *Water Alternatives* 2(1):53-60.
- Neilsen, D, G Duke, W Tayler, J Byrne, J Kienzle and T Van der Gulik. 2010. "Development and Verification of Daily Gridded Climate Surfaces in the Okanagan Basin of British Columbia." *Can. Water Resources J.* 35(2):131-54.
- Nowlan, L.; and K. Bakker. 2010. "Practising Shared Water Governance in Canada: A Primer." Vol. Vancouver: University of British Columbia.
- Nowlan, L.; and K. Bakker. 2007. "Delegating Water Governance: Issues and Challenges in the Bc Context." Vol. *Program on water governance*. Vancouver, BC: University of British Columbia.
- Nutt, Paul C. 2002. "Making Strategic Choices." *Journal of Management Studies* 39(1):67-96.
- O'Brien, Rory. 1996. "Normative Theory and Public Policy." in *Thinking About the Environment: Readings on Politics, Property, and the Physical World*, edited by M. A. Cahn and R. O'Brien. New York: M.E. Sharpe Inc.
- OBWB, Okanagan Basin Water Board. 2010. "Okanagan Basin Water Board Governance Manual." Retrieved: 01 April 2011
(http://www.obwb.ca/fileadmin/docs/obwb_governance_manual.pdf).

- OBWB, Okanagan Basin Water Board. 2011, "About Us: Who We Are", Kelowna.
Retrieved 01 April 2011, 2011 (www.obwb.ca/about/).
- Orlove, Ben and Steven C. Caton. 2010. "Water Sustainability: Anthropological Approaches and Prospects." *Annual Review of Anthropology* 39(1):401-15.
- Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, United Kingdom: Cambridge University Press.
- Ostrom, Elinor. 2010. "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." *American Economic Review* 100:641-72.
- Pahl-Wostl, C., L. Lebel, C. Knieper and E. Nikitina. 2012. "From Applying Panaceas to Mastering Complexity: Toward Adaptive Water Governance in River Basins." *Environmental Science & Policy* 23:24-34.
- Pahl-Wostl, Claudia. 2002a. "Polycentric Integrated Assessment." *Integrated Assessment* 3(2-3):220-32.
- Pahl-Wostl, Claudia. 2002b. "Towards Sustainability in the Water Sector - the Importance of Human Actors and Processes of Social Learning." *Aquat. Sci.* 64:394-411.
- Pahl-Wostl, Claudia. 2009. "A Conceptual Framework for Analysing Adaptive Capacity and Multi-Level Learning Processes in Resource Governance Regimes." *Global Environmental Change* 19:354-65.
- Platteau, Jean-Philippe. 2008. "Managing the Commons: The Role of Social Norms and Beliefs." Pp. 25-45 in *The Contested Commons: Conversations between Economists and Anthropologists*, edited by P. Bardhan and I. Ray. Malden, MA: Blackwell Publishing Ltd.

- Prato, Tony. 1999a. "Multiple Attribute Decision Analysis for Ecosystem Management."
Ecological Economics 30(2):207-22.
- Prato, Tony. 1999b. "Multiple Attribute Decision Analysis for Ecosystem Management."
Ecological Economics 30:207-22.
- Richardson, David and Brent Presley. 2005. "Mage Software (Version 6.44)." Durham, NC:
Little River Institute.
- Rittel, Horst W. J. and Melvin M. Webber. 1973. "Dilemmas in a General Theory of
Planning." *Policy Sciences* 4(2):155-69.
- Rogers, Peter and Alan Hall, W. 2003. "Effective Water Governance." Vol. 7. *TEC
background papers*. Sweden: Global Water Partnership.
- Sam, M. 2008. "Okanagan Water Systems: An Historical Retrospect of Control, Domination
and Exchange." MA thesis, University of British Columbia - Okanagan, Kelowna.
- Schell, Jennifer. 2012, "Okanagan Sockeye Salmon the Dream of Returning Home Comes
True": Wine Trails British Columbia. Retrieved March 16, 2013, 2013
[http://www.winetrails.ca/features/news/Features/12/09/05/Okanagan_Sockeye_Salm
on_The_Dream_of_Returning_Home_Comes_True#.UUTUrDctdxM](http://www.winetrails.ca/features/news/Features/12/09/05/Okanagan_Sockeye_Salm_on_The_Dream_of_Returning_Home_Comes_True#.UUTUrDctdxM).
- Schiffer, Eva. 2007, "Net-map Toolbox: Influence Mapping of Social Networks":
International Food Policy Research Institute. Retrieved June 12, 2012, 2012.
- Schiffer, Eva and Douglas Waale. E. a. P. T. Division. 2008. "Tracing Power Influence in
Networks: Net-map as a Tool for Research and Strategic Network Planning." Vol.
Discussion paper 00772. 00772. Washington, DC: International Food Policy
Research Institute (IFPRI).

- Schiffer, Eva, Frank Hartwich and Mario Monge. 2010. *Who Has Influence in Multistakeholder Governance Systems?: Using the Net-Map Method to Analyze Social Networking in Watershed Management in Northern Ghana*: International Food Policy Research Institute (IFPRI).
- Schiffer, Eva and Jennifer Hauck. 2010. "Net-map: Collecting Social Network Data and Facilitating Network Learning through Participatory Influence Network Mapping." *Field Methods* 22(3):231-49.
- Schindler, DW and JP Smol. 2006. "Cumulative Effects of Climate Warming and Other Human Activities on Freshwaters of Arctic and Subarctic North America." *Ambio* 35:160-68.
- Scholz, John T. and Bruce Stiftel, eds. 2005. *Adaptive Governance and Water Conflict: New Institutions for Collaborative Planning*. Washington, DC.
- Silvia, C. and M. McGuire. 2010. "Leading Public Sector Networks: An Empirical Examination of Integrative Leadership Behaviors." *The Leadership Quarterly* 21(2):264-77.
- Small, Mario Luis. 2009. *Unanticipated Gains: Origins of Network Inequality in Everyday Life*: Oxford University Press, USA.
- Staff. 1930. "Sanford Evans Meets Water Officials." in *The Kelowna Courier and Okanagan Orchardist*, Vol. 26. Kelowna, British Columbia.
- Stein, C., H. Ernstson and J. Barron. 2011. "A Social Network Approach to Analyzing Water Governance: The Case of the Mkindo Catchment, Tanzania." *Physics and Chemistry of the Earth, Parts A/B/C* 36(14,Äi15):1085-92.

- Summit, Environmental Consultants. 2000. "Final Report - Review of Water Stewardship in the Okanagan Valley." Vernon: Okanagan Basin Water Board.
- Summit Environmental Consultants Inc. 2010. "Okanagan Water Supply and Demand Project: Phase 2 Summary Report." Vol. *Report prepared for the Okanagan Basin Water Board*. Vernon, BC: Okanagan Basin Water Board.
- Suzuki, D.T., A. Mason and A. McConnell. 2007. *The Sacred Balance: Rediscovering Our Place in Nature*: Greystone/David Suzuki Fdtn.
- Tortajada, Cecilia. 2010. "Water Governance: Some Critical Issues." *Water Resources Development* 26(2):297-307.
- Vlek, Charles. 1984. "What Constitutes 'a Good Decision'? : A Panel Discussion among Ward Edwards, István Kiss, Giandomenico Majone and Masanao Toda." *Acta Psychologica* 56(1-3):5-27.
- Wade, Robert. 1987. *Village Republics: Economic Conditions for Collective Action in South India*. Cambridge: Cambridge University Press.
- Wagner, John and Anthony Davis. 2004. "Property as a Social Relation: Rights of "Kindness" and the Social Organization of Lobster Fishing among Northeastern Nova Scotian Scottish Gaels." *Human Organization* 63(3):320-33.
- Wagner, John, R. 2008. "Landscape Aesthetics, Water, and Settler Colonialism in the Okanagan Valley of British Columbia." *Journal of Ecological Anthropology* 12:22-38.
- Wagner, John, R. and Kasondra White. 2009. "Water and Development in the Okanagan Valley of British Columbia." *Journal of enterprising communities: People and places in the global economy* 3(4):378-92.

Walker, I.R. and Marlow G. Pellatt. 2008. "Climate Change and Ecosystem Response in the Northern Columbia River Basin - a Paleoenvironmental Perspective." *Environ. Rev.* 16:113-40.

Wang, Zhongtuo. 2000. "Meta-Decision Making: Concepts and Paradigm." *Systemic Practice and Action Research* 13(1):111-15.

Wasserman, S. and K. Faust. 1994. *Social Network Analysis: Methods and Applications*, Vol. 8: Cambridge University Press.

Appendices

Appendix 1. Representation of the Okanagan Basin watershed

A network of social actors and pathways relevant for decision-making in the Okanagan.

Diagram adopted from variety of sources (OBWB 2011, Pahl-Wostl 2002b, Stein, Ernstson and Barron 2011).

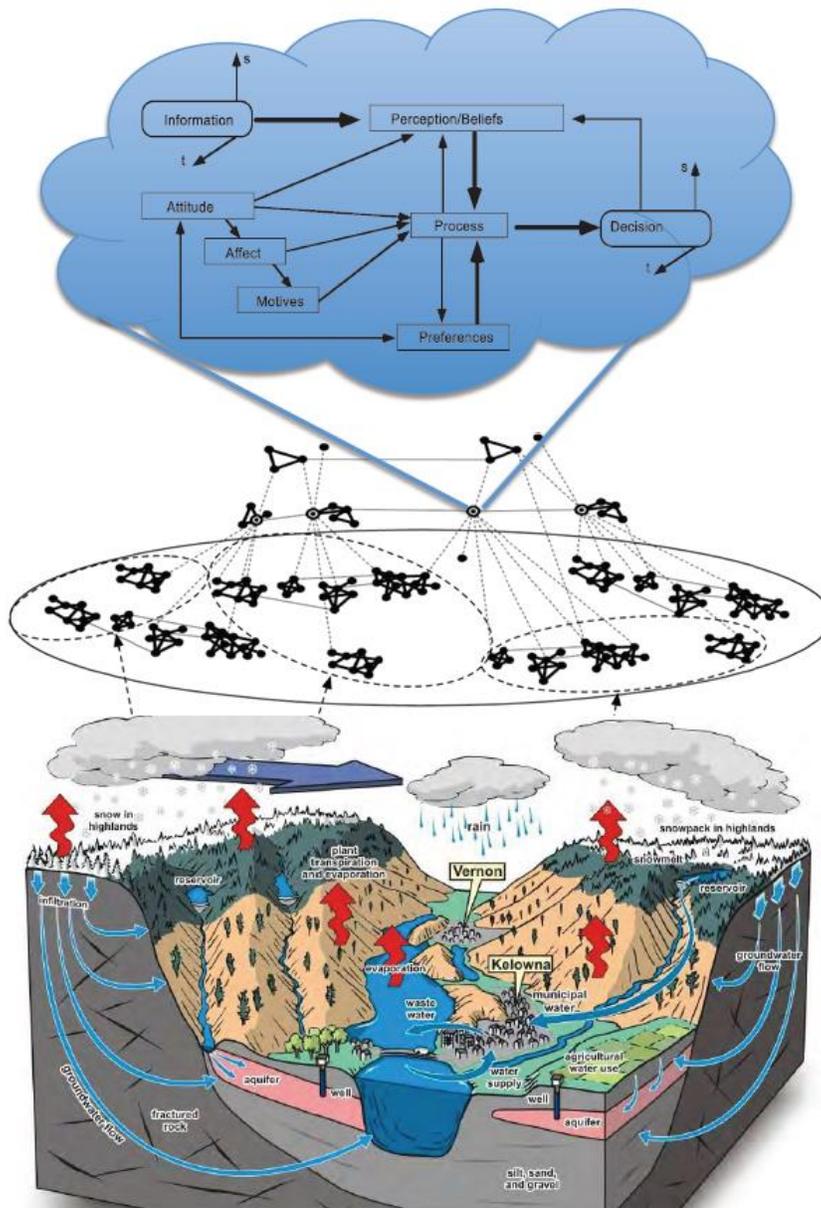


Figure 24 Representation of the Okanagan basin watershed.

Appendix 2. Complex web of water management in BC

(Summit 2000)

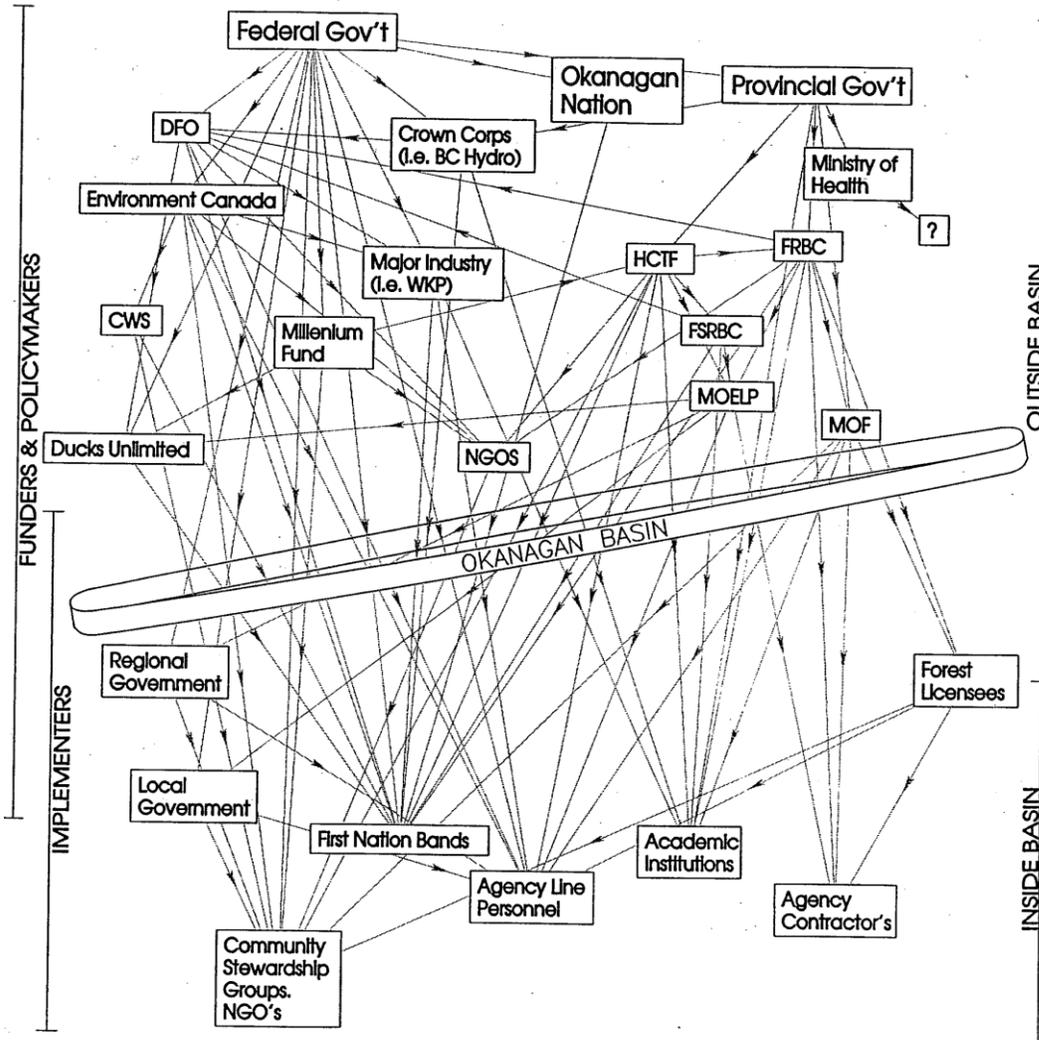


Figure 4 Water Stewardship Program Funding and Implementation Agencies.

Figure 25 Water stewardship program funding and implementation agencies.

Appendix 3. Net-map interview instrument

Introduction of process:

Over the next 90 minutes we will be engaged in two activities.

After discussing some preliminary questions about your ideas on effective water governance, I will be walking you through a process of developing a Network Map - identifying different actors involved in managing water during periods of scarcity in the Okanagan basin and the connectivity between actors that we are looking to characterize how individual actors are connected to you and the broader water governance network of decision makers. The Network Map will help explore relationships that shape and affect your work but are not necessarily reflected in formal hierarchies.

Second, after we have completed the net-map we'll have an opportunity to discuss your net-map that we create and discuss your thoughts about water governance in BC with some questions (previously supplied).

We will be audio recording this session.

Note: Ensure interviewee has their microphone and the recorder is on.

Preliminary Interview Questions:

1. What does effective water governance mean to you?
2. What are your thoughts on the following definition of effective governance:

“the capacity of the governance system to simultaneously accomplish the goals of ecological sustainability, equitable distribution of the resource, and economic efficiency. This approach is taken in order to ensure that both short- and long-term environmental costs can be accounted for when decisions are made, and that no single user group, or coalition of groups, can dominate the decision-making process to the disadvantage of others” (Wagner and White 2009).

3. What are your thoughts on the following quote:

“Scarce resources should not be controlled solely by core groups of elite interests who are able to influence policy-makers so as to create policies, which work disproportionately to their advantage. Instead, policies regarding resources upon which all depend for life and livelihood must be made from reference to what benefits society at large” (O'Brien 1996:263)

Interview introduction [*Define the area of analysis*]:

Water governance is often poorly understood in BC and is sometimes perceived as an opaque ‘black box’ of processes and decision makers. This interactive interview process will focus on building a map of social actors that you are connected with. We will be focusing on those people and institutions that are involved in governance and management that you work with and who affect and impact the management of water scarcity in the Okanagan valley. For this exercise we will require a table to work on for the duration of the interview. For this research project, I am using the following definition of water governance: “Water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society” (Global Water Partnership 2002) and "describes the different ways in which societies can organize themselves to accomplish a goal such as sustainable use of water resources" (de Loe et al. 2009:1).

Step 1: Identify Actors

The goal in this step is to identify as many of the actors as possible involved (or perceived to be involved) in water governance in British Columbia. For the purpose of this research we will be examining a thin slice of the broader networking focusing on the management during times of water scarcity in the Okanagan basin. You can add additional actors at any time throughout this interview process.

Think about and identify all individuals that impact water governance and managing water scarcity in the Okanagan Valley. We are interested in identifying the individual actors involved in decision-making and negotiation processes.

Q. Who are the actors (local, regional, national and international) that can influence the management of water scarcity in the Okanagan Valley? [Interviewer writes down names including that of interviewee) Actors can be added at anytime throughout the process.

Note to interviewer: Write the names of identified actors on the provided sticky notes Use the different coloured beads to differentiate between the following categories of actors:

- *Federal Government (green)*
- *Provincial Government (blue)*
- *First Nation Government (black)*
- *Local Government (orange)*
- *Non Government Organizations / Individuals (red)*

Step 2: Define different links and draw networks

The goal of this step is to collect data on how actors are linked within this policy map looking at water governance and how effectively we manage during times of water scarcity. In this step you will identify the **connections that exist today between actors involved in managing water during times of scarcity in the Okanagan and how strong they are**. In this step we will be connecting the actors with different colored arrows according to their links. There are 5 categories of actor linkage that we will be exploring. For the purpose of the first 4 categories please indicate your perception about the existing links now, not about those that should or will exist in the future.

Note to interviewer: write out the linkage categories one at a time in an index section on one of the corners of the board and have the interviewee identify the linkages before moving onto the next category:

- *Formal lines of command [red][Identify power/influence relationships]*
 - *Who is a formal connected to you? (line direction from boss to subservient) [Review this]*
 - *What formal (boss, colleague) connection between listed actors?*

- *Flow of funds [green]*
 - *Who do you give money to?*
 - *Who do you receive money from?*
 - *Perceived money flow between actors? [review this]*
- *Informal support, advice or guidance [blue]*
 - *Who do you give support, advice or guidance to?*
 - *Who gives you support, advice or guidance?*
 - *Perceived flow of support, advice or guidance between actors?*
- *Flow of information [orange]*
 - *Who do you give info to?*
 - *Who do you receive info from?*
 - *Perceived information flow between actors? [review this]*
- *Links to be established in the future [purple]*
 - *People who are not connected now, but should be to you in this network?*

Linkages (coloured lines) can have one of three values between actors:

_____ A solid line indicates a strong linkage between actors for a given attribute.

- - - - - A dashed line indicates a weak linkage between actor for a given attribute.

No line indicates no linkage for a given attribute.

Step 3: Define “influence/power” - influence towers

The sources of influence/power can be diverse, ranging from legitimate decision-making capacity through giving advice or providing incentives to bending or breaking the rules. This is not about formal hierarchies but about the ability of the actors to influence the management of water during periods of scarcity in the Okanagan valley.

In this step we are looking for your perceptions on the following question: Who can influence whether and how water is managed during times of scarcity in the Okanagan basin? Water governance is strongly influenced by which actors are involved in a given policy issue and how the overall network of actors functions. With your help, we can better understand of how actors involved in water governance perceive their role and the roles of other actors in

this policy question. For the purpose of this exercise and your perception about individual actor's power or influence over managing during times of water scarcity.

For this exercise, make piles of the provided chips. The height of the stack reflects your perception of the influence of a given actor within this policy network map. In other words, how much influence does this actor have in this specific context? How strongly can actor 'A' influence managing water during times of scarcity in the Okanagan basin?

Rules for this part of the exercise are:

- The more influence an actor has the higher the tower.
- The towers can be as high as interviewees want.
- Two actors can have towers of the same size.
- If an actor has no influence at all, the figure is put on the ground level without an influence tower.

Note to interviewer: After the interviewee sets up the influence towers - review what is being described (highest towers) and encourage the interviewee to make changes as they see necessary.

Step 4: Goals

Compare perception of effective water governance using the ReWab determined assessment criteria. Please rank the following criteria for effective water governance in British Columbia today using a ranking (4 - 0) identifying your perception of water governance attributes in BC - from very strong / very influential to no linkage / no influence (see interview data collection worksheet for more details):

- **Transparency.** Information should flow freely within a society.

- **Participation.** All citizens, both men and women, should have a voice, directly or through intermediate organizations represent their interests, through water governance policy formulation and decision-making.
- **Accountability and Integrity.** Governments, the private sector, and civil society organizations should be accountable to the public or the interest they represent.
- **Rule of law.** Legal framework should be fair and enforced impartially.
- **Responsiveness.** Institutions and processes should serve all stakeholders and respond properly to changes in demand and preferences, or other new circumstances.

This concludes this portion of the interview process.

Semi-Structured portion of interview

According to the identified specific goals of good governance in BC and managing periods of water scarcity in the Okanagan discussed in our net-map exercise, what are your thoughts about:

- (1) What does this network map mean for your organization's water governance or management strategy?
- (2) Looking at the net-map that we have just created, what happens in case of conflicting goals?
- (3) What are the challenges to improving water governance in BC?
- (4) In your opinion, how effective is the BC Drought Management Strategy in terms of protecting ecosystems from excessive water taking?
- (5) Do you feel that all interests are equally influential in decision around water allocation and water use? What interests generally prevail (dominate)? Why?
- (6) What do you think is an appropriate balance between watershed level and provincial management decision-making? Should the province delegate more power to local governments or other local NGOs? Why?
- (7) Do you think that the water governance framework that is in place today is adequate to support sustainable water management? For future generations?
- (8) How does the new BC Water Act change the influence of current water right holders? Strengthens or weakens their tenure to water resources?
- (9) Do you have anything else to add?
- (10) Who else would you recommend I speak with?
- (11) Is there anything that I have forgotten to ask you that you think is important for me to know about water governance in British Columbia?

This concludes the interview. Thank you for participating.