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Managing Mining Pollution: The Case of Water Quality Governance in the Transboundary Kootenai/y

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MANAGING MINING POLLUTION: THE CASE OF WATER QUALITY

GOVERNANCE IN THE TRANSBOUNDARY KOOTENAI/Y

By

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Managing Mining Pollution: The Case of Water Quality Governance in the Transboundary
Kootenai/y

Chairperson: Dr. Sarah J. Halvorson

This thesis addresses current water quality management challenges in the transboundary Kootenai/y River Basin, and how these challenges are shaped by historical, economic, political, and social factors. The water quality of this basin, both in the United State and Canada, has been severely affected by coal mining that has occurred in British Columbia over the last hundred years and continues to be threatened by several proposed mining expansion projects. The goals of this research are to uncover the forces shaping water management and to determine the potential for interested and affected parties to participate in crafting water quality protection measures. Through the lens of political ecology, a critical approach is used to analyze the specific dynamics of mining-related water quality issues and to understand the tensions that exist between the underlying structural forces and the power relations concerning water governance. This research draws on data from interviews of interested and affected parties in the basin, observations of water quality and mining-related meetings, and analysis of government and historical documents. A historical perspective provides the foundation for how governance has evolved to the current narrow actions to contain the water quality problem. The study sheds light on the way in which specific actors' choices are constrained by political processes that exist within a river basin-specific context. Finally, recommendations are given regarding the ways in which measures to protect the water quality can better address the needs and concerns of interested and affected parties in the basin.

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CHAPTER I: INTRODUCTION

British Columbia is known for its wild and scenic landscape shaped and enhanced by its awe-inspiring river basins. Hidden within this remote landscape is a history, as well as a present and future, of mining. Mining production within this province consists of coal, copper, gold, industrial minerals, aggregates, moly, silver, zinc, and lead, with both coal and copper making up approximately 76% of the seven-billion-dollar value of mineral production. There are currently eight active metal, six coal, and thirty-five industrial mineral mine and quarry operations throughout British Columbia. In addition to the current operating mines, there are many other proposed mines including a large metal mine project and nineteen other metals mine proposals, five coal mine operations, and four industrial mineral mine projects (Clarke, et al. 2017). With the vast amount of natural resources and flowing water within this province, people rarely think about the risks that human industry poses to this region.

This chapter provides an introduction to the issues of concern in this study. The focus centers on mining pollution, specifically those of the current point source pollution issue in the Kootenai/y River Basin (this spelling is used to include both the U.S. spelling of Kootenai and the Canadian spelling of Kootenay). It then introduces the research questions and approach followed in the research, and the methods used. A conceptual framework is then provided to introduce the elements of political ecology that offer insight into this issue. Finally, an outline of the thesis offers brief descriptions of the chapters to follow.

Purpose of Study

Despite the vast quantities of water that British Columbia is known for, there are serious issues with water quality throughout the province. In addition to drinking water contamination, mining has been recognized to pose a serious threat to human and ecosystem health. This becomes a more significant issue when the system of governance fails to address the pollution of water quality. With its emphasis on industrial production, particularly mining, British Columbia provides an interesting case study in that the interests of economic growth and concern to protect the environment often struggle to be reconciled. The region of southeast British Columbia provides other unique dimensions, which include both its remoteness and the proximity to the international border.

Mining in British Columbia has received increased attention over the last decade not only for its economic potential but due to the threat that it poses to the environment, specifically within river basins (Dogwood Initiative 2011; Province of British Columbia 2016). Public fears have escalated after a breach in the Mount Polley mine tailings pond released toxic mine waste effluent into the Fraser River watershed in August of 2014 (Transboundary Waters Assessment Programme 2016), the effects of which are still being studied (Mining Association of British Columbia n.d.). British Columbia has been a province of environmental quality concern given that there are a significant number of closed mines leaking effluent and twenty-two mine expansion projects (Dogwood Initiative 2011; Mining Association of British Columbia n.d.).

Several mining operations are in transboundary river basins along both the Montana and Alaskan borders with British Columbia, and expansion proposals are underway to further develop along transboundary rivers. A significant factor associated with the effects of mining pollution originating in southern British Columbia is the downstream implications across the

international border with the United States. Given the transboundary nature of the watersheds in which many of these mines are located, the concerns include an international element both regarding pollution flowing across the border and how this issue is addressed on an international level. Currently, there are five open-pit coal mines in the Elk River Valley, in which the water flows down to cross the international border Canada shares with the United States approximately 80 kilometers south of the valley (Figure 1). Elk View Operations, located on the outskirts of the community of Sparwood, British Columbia is currently in the environmental assessment process and the Line Creek Operation expansion, located east of Fernie, was approved in 2015.



Figure 1. Elk River and Valley, facing east (Source: Author)

The water quality in a significant portion of the Kootenai/y River Basin (Figure 2) has been severely affected by the operation of these coals mines. Efforts to manage the water

pollution have consisted of the B.C. Ministry of the Environment requiring an area-based management plan in the Elk River Valley, and the formation of the Lake Koochanusa Working Group to address the development of water quality objectives for selenium concentrations in Lake Koochanusa. Despite these efforts to address the degraded water quality, concerns over management continue to be raised by individuals and groups throughout the basin. The concerns include the narrow focus of the current processes addressing water quality, the limited ability for interested parties to provide input, and the lack of a process for addressing all the issues of concern.

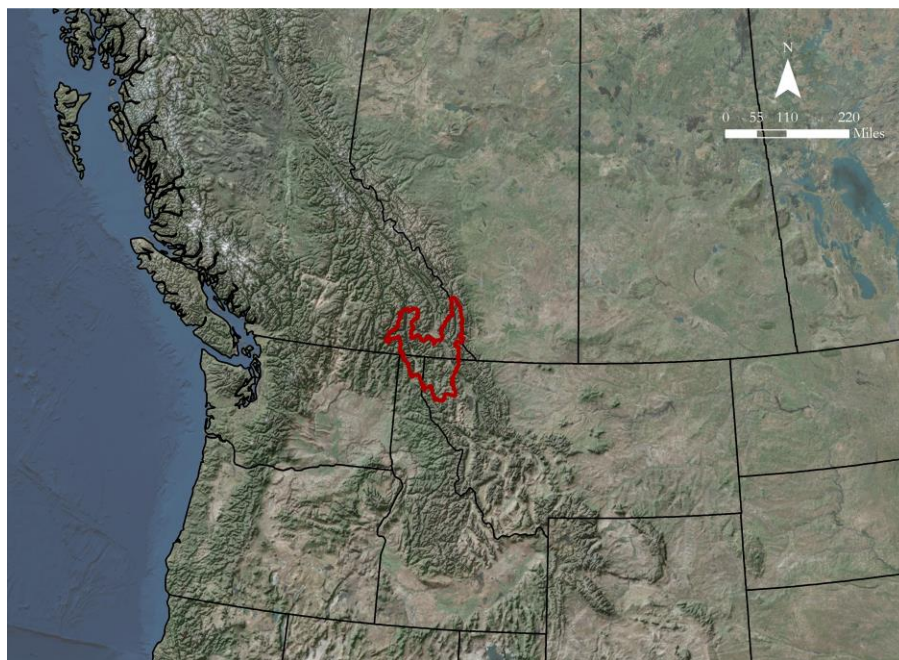


Figure 2. Location of the Kootenai/y River Basin (Source: Author)

Mining has occurred in the Kootenai/y River Basin, concentrated in the Elk River Valley, British Columbia, since the late 1800s (Godkin 2015). The area known as the East Kootenay Coalfields overlaying a significant portion of the northeastern region of the basin contains

varying qualities of bituminous coal (Hauer and Sexton 2012). The use of this type of coal is primarily for steelmaking. Initially, the mining in this region was underground, but open-pit mining began in the 1960s. Currently, there are five active mines in the Elk River Valley with two more proposed mines expecting to start operations within the next few years once they complete the application process (Hauer and Sexton 2012). Teck Coal Ltd. owns all of these mining operations, and the current operations include Greenhills, Coal Mountain, Fording River, Elkview, and Line Creek (Teck Resources Limited 2015). Through market fluctuations and complicated history of a multitude of mining companies and operations, mining has continued unabated in some form since the establishment of the first mine in this region before the turn of the 20th century. The environment in the Kootenai/y River Basin has been significantly affected by the mining operations that have existed over the last 100 years (Hauer and Sexton 2012; Minnow Environmental Inc. 2014; Selch 2015; Teck Resources Limited 2014). Since 2013 concerns have been and are being raised about the effects that mining contaminants in the water have on the ecosystem in addition to the management efforts to address the pollutants. These concerns have been raised primarily by non-governmental organizations (American Rivers 2013; American Rivers 2016; Headwaters Montana 2013; Wildsight 2015; Wildsight 2016a; Wildsight 2016b) and news organizations (Hume 2013; Scott 2013; Scott 2014; Scott 2015a; Scott 2015b; Scott 2016; Tabis 2013a; Tabish 2013b; The Columbia Basin Bulletin 2016). Despite the attention raised regarding this mining effluent, there is no literature regarding the efforts to address the pollution. Additionally, the limited amount of research of the environmental and social elements of water quality issues and the availability and temporal relevance of water quality in the Kootenai/y make the Kootenai/y River Basin a relevant case study for filling this gap in knowledge regarding water quality governance.

Research Questions and Approach

To address this gap in the knowledge about water quality management and governance in the transboundary Kootenai/y basin, my study explored the following broad overarching question: What are the forces that have shaped the current process for addressing water contamination in the Kootenai/y River Basin, and is there a process that could better serve the needs and interests of stakeholders than what currently exists? In addressing this question, I utilized a theoretical framework for establishing how water management practices and water quality governance have developed in the Kootenai/y River Basin. I then determined the perspectives of stakeholders on the current management approaches that are addressing the water quality. I sought to determine how the history of water management has resulted in a specific policy, legal, and institutional framework for addressing water pollution and whether the concerns of the current water quality planning are a result of the perpetuation of this framework. Additionally, I provide recommendations on how to best address the conflict and proceed with water management processes. The objectives of the research were as follows:

- 1) To produce a historical account of the structure of water management in the Kootenai/y River Basin;
- 2) To identify alternative perspectives of water management and water quality in the basin;
- 3) To determine how the current water management addresses varying perspectives of water quality and management; and what processes could allow for a form of management more that serves the needs and interests of stakeholders in the basin.

The following sub-set of questions guided my research and were developed to address the above objectives:

- What is the historical framework of water management in the Kootenai/y River Basin?

- How have historical, economic, political, and social forces contributed to water management?
- What are the other narratives of water contamination in the basin?
 - What are the alternative perspectives of water pollution and management?
 - What are the concerns, needs, interests of the basin's stakeholders?
- How does the current water management approach address these needs and interests?
 - What processes would be able to provide for a more participatory form of water management?

This research was conducted in two phases in order to capture the complex nature and long history of the water quality problems in the Kootenai/y River Basin. The first phase consisted of the development of a framework of water quality management and governance in the basin. This provides the basis for understanding the dynamics of water planning by determining how the problems, scales, and regions are defined historically. Uncovering the framework of water quality and governance allowed for phase two which provides for a comparison of the current water quality planning effects of scale, locale, and concerns to historical water management in the basin.

In the second phase of the research, I identified stakeholder (defined as those with a vested interest in the basin such as individuals who live, work, conduct research, and/or recreate within the basin) perspectives concerning water management in the basin and conducted a conflict assessment to determine the concerns, needs, and interests regarding water management. Additionally, the current dynamics were compared with the historical framework to determine where there is variation in how water management is defined and what processes might help to address the needs and interests of the stakeholders. From this, I was able to determine how actors

negotiate water management within a framework that had been established by previous dynamics.

Methods and Data Sources

The methods that I used for this research include document analysis, semi-structured interviews, and participant observation. Mixed methods allowed for a comprehensive analysis of the dynamics at play in the Kootenai/y River Basin.

Document Analysis

Document analysis provided the foundation for this research to identify the stakeholders with interest in the water management of the basin. This method was utilized in a study on New Brunswick policy debate of forest use conducted by Wallace (2012) and a historical political ecology study of the Camargue Biosphere Reserve in southern France (Mathevet, et al. 2015). The documents analyzed included the following: government documents, meeting reports, and scientific reports. I collected the material was throughout the two phases of the research, and I determined whether or not they were critical components of the water quality planning were identified.

Credible scientific data was identified through two means, both online searches, and interviews. Online databases were first searched using keywords to discover research conducted on the basin. Additionally, searches of online websites of government agencies and Teck Industries allowed for the identification of additional research. I confirmed that the identified research conducted in the basin was comprehensive and complete through interviews and participant observation.

After I initially identified the credible scientific information on the water quality of the basin, I synthesized it to determine what was conclusive and what information gaps existed. The research that I obtained was organized primarily according to the component of water quality it addressed, which included surface water quality, sediment quality, and elements of the biological community consisting of benthic invertebrates, fish, amphibians, and birds. This information was analyzed using a scalar approach. Additionally, I determined whether there was consensus or controversy over the data that had been collected in the basin and is being used to inform the Lake Kooconusa Working Group and other groups that have formed in response to the concerns regarding water quality in the basin.

Semi-structured Interviews

Along with historical analysis, interviews were a primary method utilized for this research. Interviews were conducted to assess both the current dynamics of the planning process and to determine the needs and interests of stakeholders in the basin, accomplished through in-depth semi-structured interviews (see Appendix I). These interviews provided a framework for analyzing the conflict over water management in this transboundary basin by determining how these different stakeholders understand and act in response to overarching narratives, and how actors contest these narratives in various localities throughout the basin. Bixler and Taylor (2012) used this method in their research conducted on community-based natural resource management in Montana.

Interviews were conducted with individuals that were identified either through documents regarding the research subject or by other individuals that were interviewed. This process is commonly known as the snowball method and was utilized by asking the interview participants

if they could recommend anyone else that I should speak with regarding this topic. Initially, through searches conducted on the subject, two key individuals were identified and provided the starting point for the interview process. These individuals were chosen both for their involvement in the Kootenai/y basin and for their accessibility at the University of Montana.

Through the snowball method, I further identified 34 potential participants for interviews. This research followed this method in allowing the actors to identify other potential interview participants. Of the initial 34 contacted individuals, I was able to conduct a total of 14 interviews with representatives of the following stakeholder groups:

1. Local Entity in Canada: Mayor of Fernie
2. Local Entity in United States: Lincoln County Commissioner
3. Local Business Canada: Fishing Guide
4. Non-Governmental Organization in Canada: Wildsight
5. Non-Governmental Organization in United States: Kootenai River Network
6. Academic Research Community: University of Montana
7. State Agency in Montana: Montana Fish Wildlife and Parks
8. State Agency in Montana: Department of Environmental Quality
9. Federal Agency/Scientist: United States Army Corps of Engineers
10. Federal Agency in United States: Department of Environmental Quality
11. First Nation Tribe: Ktunaxa Nation
12. Native American Tribe: Confederated Salish and Kootenai
13. Native American Tribe: Kootenai Tribe of Idaho
14. International Entity: International Joint Commission

I used the interview questions to inform both phases of this research. These interviews were recorded and transcribed. Interviewees included both professionals and individuals from identified stakeholder groups resulting in a total of 14 interviews. The interview data along with the document analysis were used to triangulate the data and produce a substantial framework for water management in the basin (Bixler and Taylor 2012). I continued to identify other relevant stakeholder groups as I conducted this research. This information informed the research in ways that allowed me or enabled me to determine the network of actors and determine the extent to which each actor is involved in the current processes. The transcriptions of the stakeholder interviews were analyzed for themes, relevant information regarding governance, and perspectives regarding the water quality.

With historical analysis and interviews utilizing the snowball method, I was able to determine the framework for water management in the basin and identify the perspectives of different actors. This strategy allowed for an analysis of the range of options for moving forward with other processes of participatory management for the stakeholders both in current efforts and going forward. Determining the dynamics of water management provided a more in-depth review of the socio-ecological conditions in the basin and provided for an informed position from which to address the current conflict.

Participant Observation and Field Visits

I conducted participant observation in three separate processes (processes are defined as an isolated set of actions to address an issue; for this research a specific means by which individuals sought to address and manage the mining pollution) at four individual meetings, two held in Canada and two held in the United States. The meetings included the Flathead Lake

Biological Station meeting, Lake Koocanusa Working Group, and the Kootenai River Watershed Group. For each of these, I attended and observed meetings held by the associated group

The first meeting that I was able to attend was the Flathead Lake Biological Station Workshop in May 2016. This workshop was organized by a professor at the University of Montana, who has both conducted research on the water quality of the Kootenai/y River Basin and has voiced concern over the current Lake Koocanusa Working Group's scale and scope to address the mining constituents in the water.

Through the position of “observer” (observer status was designated to all individuals attending who do not provide water quality expertise), I was able to attend a weekend-long Lake Koocanusa Working Group Meeting and the following Technical Sub-committee meeting. For the Lake Koocanusa Working Group I attended both a Monitoring and Research Group meeting (this is both one of the three committees and the key meeting of the Lake Koocanusa Working Group) and an additional Technical Subcommittee meeting (a sub-group of the Monitoring and Research Group). Additionally, I attended, by conference call, the initial meeting of the Kootenai River Watershed Group. This provided insight into the interactions of individuals within the working group and the dynamics that existed.

As part of this research, I have visited the basin on multiple occasions. One of the trips was to attend a public meeting held in Sparwood, required as part of the environmental certification application review for the Baldy Ridge Extension Project of the Elkview Mine (Environmental Assessment Office 2016). At this public meeting, I was able to meet with representatives of Teck Coal Ltd. and identify some of the key stakeholder groups.

Theoretical Framework

Issues of water governance and management are traditionally approached through apolitical frameworks. While this allows researchers to analyze the policies, plans, actions, and effects of water management, it often fails to provide the means through which to determine how those management schemes have come about and for whom. Political ecology offers a framework through which environmental issues can be seen in their broader context and in relation to political, ecological, and economic forces that exist within and beyond the study site. With the concerns that have arisen about the current processes addressing water quality management in the transboundary Kootenai/y River Basin, this framework provides the means to understand how the forces beyond the basin have influenced actions at this specific site. The concepts of scale, networks of power, dialectics, and knowledge production, which political ecologists engage with to uncover the dynamics of environmental issues, provide the necessary lenses through which to understand water governance. In the context of the Kootenai/y River Basin, the current scales and the functions assigned to these scales are shown to provide only an initial understanding of why the current approach to water quality management exist. This thesis further illustrates how the processes in the basin are a result of gaps and contradictions in scales and the evolution of relational scalar networks which have resulted in a singular process to address water quality which is narrow in both scale and scope.

The political ecology approach has been used to understand issues of water governance, primarily engaging with water quantity issues such as water supply, distribution, and security (Cole 2012; Derman and Ferguson 2003; Johnston 2003; Loftus 2009; Sneddon, Harris, Dimitrov, and Ozesmi 2002; Swyngedouw 2007). This literature has primarily focused on issues of quantity, scarcity, access, and distribution with the emphasis on the social power relations

embedded within the water systems (Swyngedouw 2009). There has been little attention paid to issues of water quality, specifically regarding how broader political and economic factors influence management decisions. Despite this gap in literature, the concepts of the nation-state and scale, networks of power, dialectics, and knowledge production can provide essential lenses through which to understand dynamics of water quality management. Through the lens of political ecology and incorporation of concepts including nation-state dynamics, governmentality, and knowledge production, the story of how entities and policies within the Kootenai/y have formed a specific framework of governance can be analytically understood.

This research seeks to determine how the current water management approach addressing mining pollution in the Kootenai/y River Basin is constrained by historical, economic, political, and social factors, in addition to the relations that exist between the actors in the basin. The goal of this research is to not only uncover the forces in a site-specific approach to water management but to also determine the potential for interested and affected parties to participate in the water management addressing water quality. Additionally, this research seeks to assess the potential for establishing a more participatory form of water management which is not provided for by the current framework. Furthermore, this approach aims to identify how specific entities can achieve the power to represent the issue, and why elements of the conflict are restricted to specific scales or variables, or how material factors contribute to the dynamics of the social relations (Valdivia 2015).

Political ecology arose in response to apolitical approaches to environmental problems including eco-scarcity and modernization. This framework specifically emphasizes the power-laden nature of environmental issues. Stemming from political economy and cultural ecology, political ecology requires researchers to follow chains of explanation to uncover the ecological,

political, and economic forces that exist outside of but influence and are influenced by the local site (Forsyth 2003). This approach calls attention to issues of the broader political and economic context, the outcomes of conservation goals, struggles for access, environmental subjects and identities, and the role non-human actors in social-ecological systems (Robbins 2012). Regarding water governance, this framework has been applied primarily through engagement with concepts such as scale, networks of power, dialectics, and knowledge production.

To understand the current dynamics surrounding water planning in the Kootenai/y River Basin, it is necessary to determine the framework of water quality governance that exists and how that has played out at this location. Political ecology provides the critical approach needed to explain the dynamics of environmental issues in which the duality of nature-society is dissolved, and perceived environmental problems can be seen to be a result of political, economic, social, and ecological forces which vary based on context (Neumann 2005). In addressing the historical and current framework of water governance, the extent to which the current management processes operate within and contribute to this framework can be determined. While this research seeks to understand how water quality planning is shaped within a specific U.S.-Canada transboundary context, it is only possible to understand these dynamics through attention to both macro- and micro-scale power dynamics in both policies and everyday interactions between actors (Li 2005). Through the lens of political ecology, governance can be understood through a synthesis of nation-state politics, knowledge production, and the agency of specific actors. This allows for an analysis of the tensions that exist between the underlying framework and the power relations in the basin surrounding water management. As addressed in the article by Walker and Hurley (2004, 738) defining politics as “the exercise of power as a social relation built on asymmetrical distribution of resources and risks,” this also sheds light on

the way in which specific actor's choices are constrained by political processes that exist within a site-specific context (Robertson 2015). This approach can be used to determine how the current water management approach addressing mining pollution in the Kootenai/y River Basin is a result of factors ranging from state and market forces to the relations between the actors in the basin and between society and environmental resources.

Governance includes the institutions and organizations that make up the structure which shape individuals' action; distributed in formal and informal ways (Robertson 2015). A key component of governance is that it addresses multiple entities and their strategies for environmental management. This can consist of various entities ranging from state government institutions to non-governmental organizations. Rather than analyzing specific environmental issues from the state level, the approach necessitates analyzing how environmental management schemes are developed, by whom and why, and how they play out in specific locations. Critical scholars also emphasize the importance of paying attention to the practices that produce and reinforce rules for managing or governing resources because these governing processes can have power on the actions and mentalities of people (Valdivia 2015). This requires looking at how specific state actors represent the institutions of which they are apart. States are no longer viewed as the autonomous authority that implements specific environmental schemes to benefit the people. This stance or position alternatively allows for understanding how authority is made up of the individuals that choose what schemes to implement and how. The state is better recognized as a site of the contestation of these differing interests, and this includes the various state actors and their choices and actions (Robertson 2015).

In understanding how specific environmental schemes of the state are implemented, it is necessary to look at how authority is achieved. This requires an investigation of how particular

entities can achieve the power to represent the issue, and why elements of the conflict are restricted to specific scales or variables, or how material elements contribute to the dynamics of the social relations (Valdivia 2015). Environmental governance is a matter of how governance frames individuals' actions and what is produced as a result. Practices on the ground that have produced the "authority of the state" should be analyzed to understand from where authority/power comes to influence others and requires an analysis of what schemes do rather than whether they work (Li 2005). This can result in the development of subjects through the internalization of practices and discourses on environmental management and provides a way of analyzing how specific management practices have become normalized in either law or practice in both Canada and the United States.

Through the application of the framework of political ecology, water has been re-conceptualized, most notably through dialectics and materiality. These concepts have been employed to specifically develop an understanding of the relationship between water and society. First, by highlighting that water is inherently political, political ecology provides a means through which to go beyond just analyzing the various ways in water is managed or distributed (Budds 2009). Water is seen to embody the political primarily through development and distribution schemes. Studies have highlighted how unequal distribution results from power differences and therefore it is through the mobilization of water that the distribution of social power relations is revealed (Cole 2012; Swyngedouw 2009). Political ecology further calls for an analysis of how water and society are mutually constitutive, which draws from the concept of the dialectic in which society and nature continually shape and remake one another (Swyngedouw 2009). Through dialectics, water is re-conceptualized as not external to but embedded in social relations (Linton and Budds 2014). This is envisioned through the social-nature of water which

allows for an analysis of its hybridity to understand how water can be material, discursive and symbolic (Boelens 2013; Budds 2009). Through this lens and the concept of materiality, more emphasis is placed on the agency of water in the shaping of social relations (Bakker 2012).

Another layer of concern in the context of society and water relations that political ecology has called attention to is the nation-state dynamics mainly by engaging with the concept of both geographic and temporal scales. Scales are not seen as ontologically given but rather solidified through relational scalar networks (Swyngedouw 2007). Rather than scales perceived as predefined categories such as local, national, and international, relational scalar networks are produced from interactions, actions, and material manifestations which form the dimensions in which actors operate (Mathevet, et al. 2015). These networks are not only composed of the human actors but also include the natural world. It is, therefore, necessary to see how the relations between society and water have forged these configurations; not only because of the struggles between competing claims but also because of the materiality of water.

Governmentality adds a layer to understanding how these networks are materialized and maintained, by addressing the ways in that subjectification occurs through material and discursive constructs (Boelens 2013). The subject is not only made but reinforced through their interactions with the material.

Nation states, through a political ecology lens, no longer retain the autonomous, monolithic character that assumes that a coercive and power-laden entity is responsible for structuring individuals' actions and the policies and laws that affect them as well. The nation-state, as an assemblage of practices at different scales over time, is the site of varying claims (Li 2008). Political ecology literature on governance has addressed this concept of the state as a place of contestation in which there are always gaps and contradictions in state control

(McCarthy 2002; Robertson 2015). These gaps and contradictions provide insight into where there is contestation over environmental schemes and to see how specific entities can gain authority within different jurisdictional areas of the state. Additionally, political ecology literature on the state dissolves the bifurcation of local and state, and local sites are not just seen as the result of outside forces but are understood to be implicit in the production of the state. The reproduction of state claims in localities and by actors reinforce the stability and apparent autonomy of the state (Robertson 2015). Further analysis of how specific state actors have carried out schemes will shed light on how this apparent autonomy has been reproduced. Environmental governance not only consists of the schemes employed by formal entities such as governments to manage the environment but also is the way in which these schemes are accepted and/or internalized and reproduced by other actors by their actions (Robertson 2015). This includes how specific state actors, such as agency representatives, operate within the framework of institutions and policies.

By analyzing the policies and dynamics of Canadian water management, the dynamics including contradictions that exist between various levels and types of state control can be understood. The dynamics of this potential jurisdictional fragmentation or overlap can result in significant inconsistencies that help in understanding what institutions can influence water management.

Another key focus of political ecology is how knowledge is produced and for what purposes, and how it reinforces specific discourses or institutions (Forsyth 2003). The perception that scientific claims are both objective and the lack of attention to the political nature of science ignores the role that science has in making decisions regarding what to study, how funding may influence their topics and methods, and that they may be working on behalf of interests including

the state (Zimmerer 2015). The political nature of science is addressed with engagement with the hydrological cycle analysis of how it has resulted in approaches to water management that ignore the social dimensions of water. In viewing specific knowledge as objective and not recognizing the position from which it was produced and used to inform practices ignores how it is used to privilege specific knowledge. It is through the processes of knowledge creation that relations with water are defined and shape individual subjects.

The politics of knowledge also has implications for not only how knowledge is produced, but how actors use knowledge to reinforce either specific discourses or institutions (Forsyth 2003). Viewing specific knowledge as objective and not recognizing the position from which it was produced and is used to inform practices, does not allow for it to be recognized in how it is used to privilege specific approaches to knowledge. The water management in the Kootenai/y River Basin is currently focused on obtaining scientific data to understand the effects of specific pollutants. This approach to water management is significant in that the knowledge produced from the scientific data will inform policies related to the management of the basin, as well as other water bodies in the future. It is also essential that different perspectives or "truths" concerning environmental problems and solutions in the basin be considered as legitimate forms of knowledge production. Thus, the way in which knowledge is produced and defended or legitimized underlies claims for discovering "truths" surrounding specific environmental management schemes and practices, and for discounting others' views and concerns.

From a review of the literature on the Kootenai/y River Basin, I have determined there is a gap in research on the socio-ecological conditions surrounding water quality management in the basin. The scientific literature on the Kootenai/y River Basin water quality is composed of studies which highlight the effects that the mining pollution has on the ecological system of the

basin (Hauer and Sexton 2013; Teck Resources Limited 2014). This research has been utilized by the stakeholders to determine primary characteristics of the degraded water quality. Despite the importance of the scientific research and literature, it is equally necessary that research is conducted to fill the gap of political ecology research addressing the socio-ecological conditions.

Utilizing this framework to understand the current issues of water quality in the Kootenai/y River Basin provides the necessary tools to uncover the dynamics that exist. This approach will produce the context essential to address the concerns that have been raised about the failure of the management to address the mining contamination adequately.

Outline of Thesis

The following chapters provide a comprehensive look at the issue of water quality management in the Kootenai/y River basin. The analysis begins with "Chapter II: Environmental History of the Kootenai/y River Basin," in which the initial physical and historical context of the basin is provided. This chapter also addresses in detail the current water quality issues in the basin and the effects that it has had on the biota determined through the scientific studies conducted in the basin.

"Chapter III: Water Management and Governance" first introduces the current water quality management processes that are in effect to address the issue of mining pollution in the basin. This section is followed by an outline of the institutional and legal frameworks and policies that exist in relation to water quality, mining, and the international element of this issue. Following the unpacking of this framework, apparent contradictions and conflicts of the current processes and the underlying framework of water governance are addressed. Finally, the implications for current water governance are assessed.

In the next chapter, "Chapter IV: Current Water Management Processes," the stakeholders and their concerns are highlighted. The areas in which there are consensus and conflict in this issue is also addressed through the narratives of the stakeholders. Recommendations for this issue are then provided. The final chapter, "Chapter V: Conclusion," provides a summary and implications of this study. Lastly, the barriers to this research are addressed.

CHAPTER II: ENVIRONMENTAL HISTORY OF THE KOOTENAI/Y RIVER BASIN

This chapter introduces the physical and historical context of the Kootenai/y River Basin. It gives an overview of how the basin has been transformed over time to produce the current water quality-related impacts. Additionally, the chapter addresses proposed actions pertaining to the future of mining in the basin.

Physical Geography

The Kootenai/y River begins in the southeast corner of British Columbia just north of the Kootenay National Park (see Figure 3). It flows south through a glaciated valley where it is met with the Elk River just outside of Elko before it crosses the border in the United States. Before the 1970s, the Kootenay flowed freely across the border, but since the development of the Libby Dam, the Elk River and Kootenay meet in the reservoir Lake Koocanusa. The water escapes, flowing freely again just north of Libby, Montana, where it then flows west into Idaho before turning north and flowing back into British Columbia. It eventually makes its way through Kootenay Lake and then flows west where it joins with the Columbia River.

The Kootenai/y River Basin is a transboundary basin which encompasses parts of southern British Columbia, northern Montana, and northern Idaho (see Figure 4). Of the approximately 50,300 sq. Kilometers that make up the basin, just under 70 percent is within British Columbia (Rockwell 2004). The Elk River is in the northeastern portion of the basin where it flows to the Kootenay River in Lake Koocanusa (Hauer and Sexton 2012).

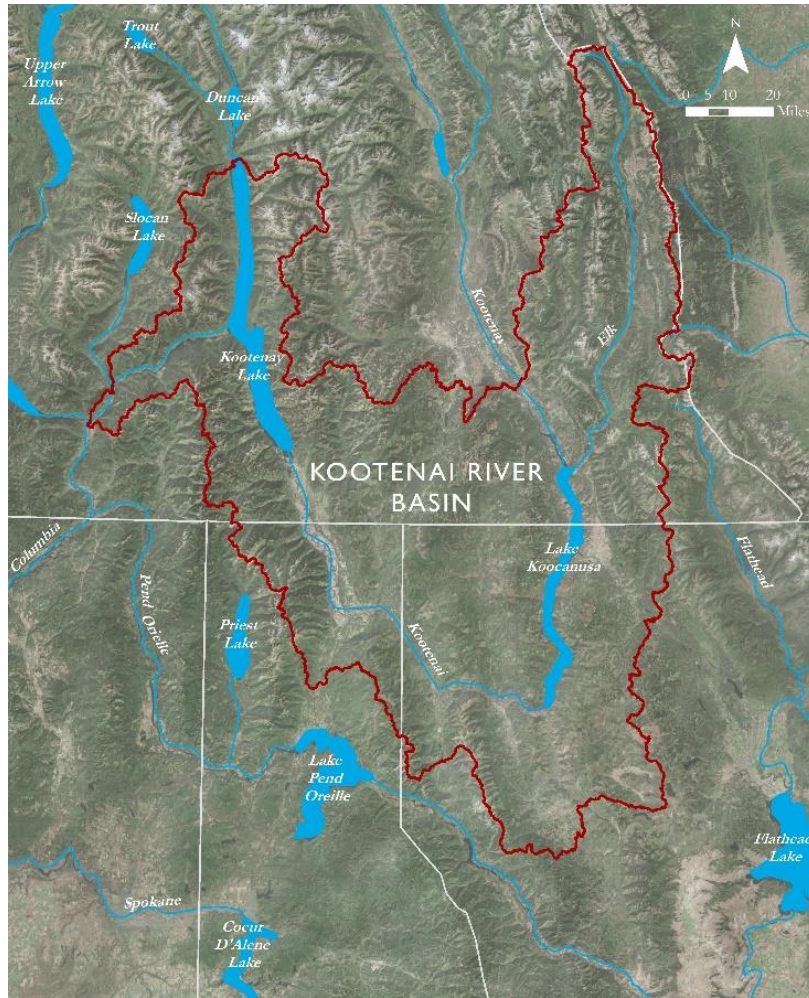


Figure 3. Map of the Physical Geography of the Kootenai/y River Basin (Source: Author)

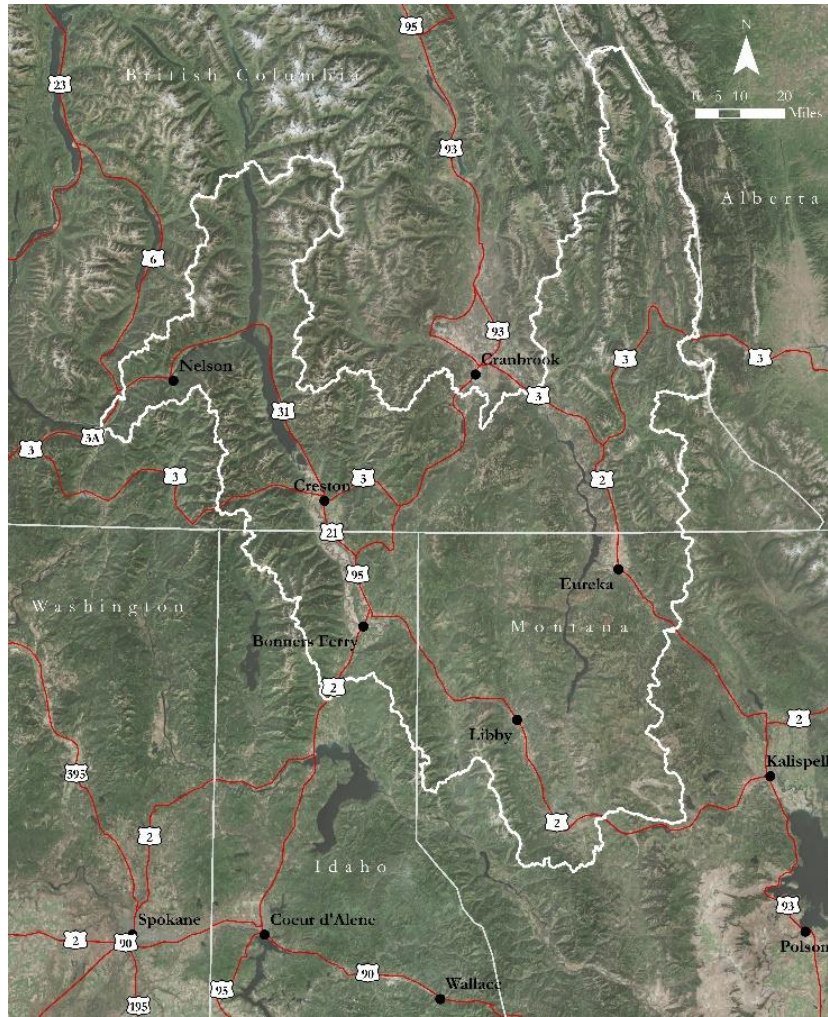


Figure 4. Cultural Map of the Kootenai/ River Basin (Source: Author)

A Basin Transformed

Before the arrival of white settlers in this region, the Ktunaxa People lived throughout the northern portion of this basin. It is believed that the Ktunaxa moved west over Crowsnest Pass as the territorially aggressive Blackfeet armed with weapons from the fur traders (Ferne and District Historical Society 1984). Their traditional territory is known as Qat'muk and includes modern-day southeast British Columbia, southwest Alberta, north Idaho, northwest Montana, and the uppermost northeastern corner of Washington. Ktunaxa is the traditional name for the

Kootenai people. The Ktunaxa Nation, Confederated Salish and Kootenai, and the Kootenai Tribe of Idaho currently have recognized territory within Kootenai/y River Basin.

The early white European settlers to visit the area remarked on the coal seams found within this basin in the southeast portion of British Columbia. The first recorded mention of the area was by Father Pierre-Jean DeSmet who lived with the Kootenay Tribe as a Jesuit missionary. In 1873 Michael Phillips was in the region looking for gold, but in finding extensive coal deposits he sent notice and samples to geologist George Dawson of the Geological Survey of Canada. Dawson headed west in 1883 along with Joseph Tyrell to map and survey the area. His report published in 1887 described the coal as "practicably inexhaustible" (Municipality of Crowsnest Pass 2014; Fernie and District Historical Society 1984) due to his reports on the potential of the region, interest in mining in this region began. The Crows Nest Pass Coal Company formed in the 1890s.

Sawmills were developed in this area beginning in 1887. These mills were initially small operations grew significantly as the railroads expanded throughout this area. Settlement began in the late 1890s as both the coal mining enticed settlers and the railroads made both settlement and mining possible. The railroads at the time sought to both open a route across the Kootenays and recognized the mineral potential of this region. Despite the difficulty of building a transportation network across the pass, an east-west route was deemed necessary to open the area for mining. Despite a turbulent beginning, the Canadian Pacific eventually acquired the rights to build a rail line through the Crowsnest Pass and Elk River Valley area (Fernie and District Historical Society 1984). The Crows Nest Pass Coal Company established many small underground coal mines in the area, and by 1908 the mines of Coal Creek, Morrissey, Hosmer, and Michel/Natal were

actively producing coking coal. From 1909 to the 1960s this area experienced a continuous boom and bust mining economy (Kinnear n.d.).

In the 1960s another significant change occurred in the Kootenai/y River Basin, which is part of the larger Columbia River Basin. In 1964 the Columbia River Treaty was signed resulting in the development of Libby Dam in the United States for flood control and energy production. This dam, built in the late 1960's through the early 1970's, resulted in the development of the reservoir, now called Lake Koocanusa.

The Crows Nest Coal Company began to establish a coking coal market with Japan in the 1960's issuing in a new era of mining in the basin. The first open-pit coalmine was developed on Balmer Ridge in 1968 by Kaiser Resources Ltd. After they negotiated the deal to acquire a significant portion of the Crows Nest Coal Company. The Fording River Operation was another major coal mine which began in 1972 under Fording Coal Ltd. An additional company, Shell Canada, acquired the remaining portion of Crows Nest Coal Company and open Line Creek Mine in 1981. Kaiser Resources Ltd. opened the Greenhills Mine operation in 1983. In 1991 Teck Cominco took over the mines from bankrupt Kaiser Resources, know at this time as Westar Mining. Another mine was reopened in 1992 after Fording Coal Ltd. purchased it (Kinnear n.d.). From this point to present, five mines have been in operation and included the Coal Mountain, Elkview, Greenhills, and Line Creek Operations (see Table 1). Teck acquired these mines in 2008 after they had incorporated into the Elk Valley Coal Partnership (Kinnear n.d.). Additional mining operations are planned and in various phases of the permitting process. Currently, the coal business for Teck Coal Ltd. produced approximately 26.6 million tons of coal in 2017, with a gross profit of 3,044 million dollars (Teck Resources Ltd. 2015).

Table 1: Mines in the Elk River Valley of the Kootenai/y River Basin (Teck Resources Ltd. 2015)

STATUS	MINE OPERATION	COMPANY
Operational and Extension	Elkview (Baldy Ridge-Operational; Natal Ridge-extension)	Teck Coal Ltd.
Operational and extension	Fording River Swift	Teck Coal Ltd.
Operational	Greenhills	Teck Coal Ltd.
Operational and extension	Line Creek	Teck Coal Ltd.
Proposed	Bingay Creek	Centermount Coal Ltd
Proposed	Coal Mountain Phase II	Teck Coal Ltd.
Proposed	Crown Mountain	NWP Coal Canada Ltd.
Proposed	Michel Creek	CanAus Coal Ltd.
Proposed	Coal Mountain	Crowsnest Pass Coal Mining

The Impacts on Water Quality: Types and Sites Impacted

Recently, both water quality and contamination management have become a focus of concern. Studies have shown that there are significantly higher concentrations of specific constituents than would appear under standard conditions (Feldman and McNeil 2014; Hauer and Sexton 2013; Minnow Environmental Inc. 2014). While there are only a few documented adverse effects to the physical environment from the pollution, there is a concern that the high concentrations of selenium, nitrate, sulphate, and cadmium might pose a threat to the freshwater ecological system (Lake 2013; Teck Resources Limited 2014).

A report published in 2013 established evidence to restrict mining on a tributary of the North Fork of the Flathead River, showing the harmful effects of mining on water quality in this basin. This report using data from the Elk River comparing conditions above and below the mines, showed significantly high levels of contaminants in the water (Hauer and Sexton 2012).

The constituents of primary concern (COPC) were identified as selenium, cadmium, nitrate, and sulfate (Lake 2013; Teck Resources Limited 2014).

There are several pollutants identified in the Kootenai/y River Basin, because of the mining activity in Elk River Valley. The increasing trends in the COPCs of nitrate, selenium, sulphate, phosphorus, and chromium is identified north of the international border (Minnow Environmental Inc. 2014). Selenium is perceived to be the most significant pollutant to be addressed regarding the water quality of the Lake Koocanusa as indicated by a representative from Montana Department of Environmental Quality (2015). Additionally, selenium, highlighted as the COPC in all the biotic components addressed in the Canadian portion of the basin, is the focus of the current water planning in Lake Koocanusa.

The credible scientific reports that addressed water quality can be organized into three categories based on the location of the study. These categories include the Canadian portion of the basin (from the headwaters of the Elk River to the international boundary in Lake Koocanusa), the United States portion of Lake Koocanusa (southern half), and the lower Kootenai/y River (from Libby dam to the Columbia River). In each of these areas, the information can be organized further into subject categories of surface water quality, sediment quality, and the biological elements of benthic invertebrates, amphibians, periphyton, fish, and birds.

The Elk River Valley and the Canadian portion of Lake Koocanusa have been addressed in the Aquatic Synthesis Report “Elk River Watershed and Lake Koocanusa, British Columbia” which was prepared by Minnow Environmental (2014) for Tech Coal Limited. This report provides a synthesis of the water quality data available on the Canadian portion of the Kootenai/y River Basin from research that was primarily conducted in compliance with Order

No. M113 from the BC Minister of the Environment. While this report does present a large number of studies conducted for Tech Coal Limited, it did not use data from some additional studies that were conducted independently but did not follow specific sampling criteria.

The results were broken down into the six Management Units that make up the Designated Area for study for the Elk River Water Quality Plan (see Minnow Environmental Inc. 2014). This report addresses various chemical elements for each of the ecosystem parts in the basin including the surface water quality, sediment quality, periphyton, benthic invertebrates, fish, amphibians, and birds. The elements addressed reflect the effects of coal mining on the water quality. The data includes samples taken (number and locations), constituents of primary concern, the effects of pollutants, and how comprehensive the data is.

For each of the seven components analyzed, general sampling information exists. Surface water quality was sampled at 93 stations throughout the designated area. Sediment quality was examined in various locations with 16 samples for metals and 26 for polycyclic aromatic hydrocarbons (PAH). For the benthic invertebrate samples, 36 reference and 56 mine-exposed samples were taken. Periphyton was sampled in several locations. Both the amphibian and bird samples were conducted at several sites in 2012. For more information on sampling see Minnow Environmental's (2014) "Aquatic Environment Synthesis Report." This sampling information shows the inadequate sampling conducted for many of these components, which was recognized in the report, with recommendations for the need for further studies.

Both water and sediments samples contained various constituents that were above the guidelines. In surface water, the COPCs noted were nitrate, selenium, and sulphate for the Elk River Valley, and phosphorus, selenium, and chromium for Lake Koocanusa. Each of these constituents indicates increasing trends. Seven COPCs were identified from the sediment quality

data, including cadmium, nickel, zinc, 2-methylnaphthalene, fluorene, naphthalene, and phenanthrene. Despite these constituents exceeding guidelines in one or more samples, the report states that it is unlikely that these will have an adverse effect on sediment-dwelling organisms.

The COPC for benthic invertebrates, fish, amphibians, and birds were determined to be selenium. For each of these, selenium is of concern due to metabolic toxicity. Concern for direct toxicity was also noted for the benthic invertebrates, fish, and birds, but not for amphibians. For the benthic invertebrates, effects included the reduction in the population numbers of stoneflies, caddisflies, and mayflies. Effects on periphyton were not determined. There is the potential for impact, based on the hazard quotients (the levels at which specific biota are at risk) determined, on fish, amphibians, and birds. The effects of concern for bird species were primarily reproductive capabilities. Additionally, in a report conducted in 2008, Elk River longnose sucker (*Catostomus catostomus*) and peamouth (*Mylocheilus caurinus*) fish sampled just upstream of the confluence with Ram Creek showed significantly higher concentrations of selenium in tissue samples in Lake Koocanusa than Flathead Lake.

The data are not comprehensive in geographic scale or the number of studies conducted, particularly for sediment quality, periphyton, fish, amphibians, and birds. The Minnow Environmental report addressed needs for research as well as noted additional research to be conducted which could fill the gaps that currently exist. Periphyton studies were to be conducted further in 2015, and at the time of the 2014 report, additional fish studies focusing on cutthroat were underway. Other studies are needed to assess direct toxicity to amphibians and the mine-related effects on aquatic bird species.

Information for the United States portion of Lake Koocanusa is even less comprehensive than that of the Canadian part of the basin. Due to the monitoring plans of the Lake Koocanusa

Working Group, information is currently being obtained and compiled. Two sampling projects are in progress for the lake, including both biota and sediment (MT DEQ 2013: 2013a; 2013b).

Water quality sampling was conducted in Lake Koocanusa from 1967 to 2004 by the United States Geological Survey and from 2005 to present by the United States Army Corps of Engineers. The United States Geological Survey collected samples at four locations, three within the basin and one below Libby Dam. United States Army Corps of Engineers have only sampled three sites within the basin (Easthouse 2013; MT DEQ 2013b). The project objectives for continued water quality monitoring are to establish baseline data, determine trends, and compile all data needed to produce a model (Easthouse 2013). The sampling for water quality monitoring has shown that both total dissolved gas and temperatures downstream of the dam are of concern, but the report by the United States Army Corps of Engineers also recognizes that future concerns could include of nutrients, metals, and biological parameters (Easthouse 2013).

Sediment data in Lake Koocanusa have also been acquired and analyzed by the Montana Department of Environmental Quality. In a report published in 2014, sampling was performed to establish a 2013 baseline (Feldman and McNeil 2014). Feldman and McNeil identified ten constituents including antimony, arsenic, cadmium, chromium, copper, iron, lead, mercury, selenium, and zinc. Concentrations varied significantly for these constituents at the three locations sampled. These locations correspond with the previous areas – the international border, Tenmile, and Forebay – used for sampling in Lake Koocanusa by both the U.S. Army Corps of Engineers and U.S. Geological Survey and additionally include shoreline samples (MT DEQ 2013a). For all the metals, except lead and selenium, concentrations were higher in the benthic samples than the shoreline samples. At the three primary locations, sediment selenium showed increasing concentrations with increasing distance from the border.

Cadmium and arsenic, on the other hand, showed decreasing concentration with increasing distance from the border. The samples from Tenmile had the highest concentrations of chromium, copper, iron, lead, and mercury (Feldman and McNeil 2014). Of all the constituents, arsenic was the only one to exceed Canadian Sediment Quality Guidelines. This report also looked at the potential for mobilization of the metals and found that selenium had the potential for mobilization. Additionally, the redox potential does not vary throughout the lake. Given that metal concentrations are statistically higher in lake benthic samples compared to lake shoreline samples, one could interpret this to mean that are accruing in the lake bed (Feldman and McNeil 2014).

Montana Fish, Wildlife and Parks have researched the concentrations of selenium in fish tissue in two separate sampling years, 2008 and 2013 (Deleray, et al. 2011). The other primary study conducted in the lake was prepared for Teck Industries and included in the Aquatic Synthesis Report, with results referenced in above (Minnow Environmental Inc. 2014). The two sampling events showed selenium concentrations in fish tissue was higher in 2013 than 2008 for bull trout (*Salvelinus confluentus*), longnose sucker (*Catostomus catostomus*), kokanee (*Oncorhynchus nerka*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth (*Mylocheilus caurinus*), westslope cutthroat (*Oncorhynchus clarki lewisi*), and rainbow trout (*Oncorhynchus mykiss*) (Selch 2015). For the burbot (*Lota lota*), selenium concentration in the muscle tissue was 2.9 times higher in the Lake Koochanusa sample than samples taken from a reference stream. Overall, the results show an increase of selenium concentration in Lake Koochanusa fish of 21-70% depending on species, from 2008 to 2013 (Selch 2015).

Based on studies conducted throughout the basin, pollutants from the mining in Elk River Valley are elevated throughout the basin upstream of Libby Dam. Nitrate, selenium, sulphate,

phosphorus, and chromium are recognized to be the constituents of primary concern in the basin north of the international boundary (Minnow Environmental Inc. 2014). In addition to selenium, the metals arsenic, antimony, cadmium, chromium, copper, iron, lead, and zinc are of concern in Lake Koocanusa (Feldman and McNeil 2014). Selenium levels, in particular, have been shown to be in significantly higher concentrations in fish tissue samples in the Kootenai/y River Basin in comparison to comparable rivers and lakes in British Columbia and Montana.

While there is evidence to support elevated pollutants throughout the basin, there is no conclusive evidence of the effects that these pollutants have on the various biotic components. The only data that seemed to support that there are adverse effects is in the population numbers of specific benthic invertebrates (Minnow Environmental Inc. 2014). The hazard quotients presented in the Aquatic Synthesis Report, however, indicate that the potential for effects on the biota is high (Minnow Environmental Inc. 2014).

Industrial development significantly altered the Elk River Valley due to a long history of mining. The boom and bust industry of the early 20th century eventually transformed into the consolidation of mining operations at the beginning of the 20th century under Teck Coal Ltd. While these mines have always posed a threat to the environment of the Kootenai River Basin because of the concerns related large-scale mining operations, scientific study has been conducted and provide evidence of the risks associated with mining effluent. While understanding the condition of the Kootenai River Basin in water quality terms is essential, it is necessary to analyze the framework of water governance that shapes the interactions with the water quality in the basin. The following chapter uncovers this framework and analyzes the way in which current actions being taken to address water quality fits within it.

CHAPTER III: WATER MANAGEMENT & GOVERNANCE

In this chapter, recent efforts to address the issue of water quality in the Kootenai/y River Basin are addressed with the necessary additional historical context. Following the introduction of the current water management process, the framework of water governance that exists is provided first through the institutions, legal framework, and policies that exist. An analysis of the contradictions and conflicts is regarding the water management and governance frameworks is provided. Implications of these dynamics are assessed for what effects they might have on the future of water governance in the Kootenai/y River Basin.

Institutions, Legal Framework, and Policies

In Canadian water governance, jurisdictional decentralization and overlap consist of entities including federal, provincial, municipal, transboundary, First Nation, and other non-governmental organizations (Bakker and Cook 2011). To begin to understand this system of governance since the current water quality management is addressing water quality concerning mining, it is necessary first to assess the institutions that are responsible for regulating water quality.

With regards to water, the decentralized approach has resulted in a significant amount of provincial authority, while there also exists substantial jurisdictional overlap (Bakker and Cook 2011). The federal government does have responsibility for water resources in that its authority consists of navigation, fisheries, and boundary waters (Environment and Climate Change Canada 2016). Regarding water quality, the *Fisheries Act* gives the federal agency Environment Canada the responsibility to protect waters frequented by fish from “deleterious substances”

(Government of Canada 1985). The B.C. Ministry of the Environment, a provincial agency, is responsible for adopting and implementing water quality guidelines. At the international level, the Boundary Waters Treaty established the International Joint Commission (IJC) which can be called upon to investigate transboundary matters of concern and reports to the federal level (University of Nebraska Lincoln n.d.). The IJC has been called upon by both nations for multiple transboundary issues, including the proposal to open the north fork of the Flathead River to mining (International Joint Commission 2016).

Mining

Both federal and provincial agencies and responsibilities regulate mining in Canada. There is both a federal act, the *Canadian Environmental Assessment Act*, and a provincial act, the *British Columbia Environmental Assessment Act* that addresses mining projects. Additionally, there are the similar agencies at both the federal and provincial level which have designated authority over projects that require environmental assessments. At the federal level, the *Canadian Environmental Assessment Act* gives responsibility to the federal government if federal authority, money, or land is a proponent of the project or if federal approval is required (Province of British Columbia 2016). This act defines the process for permitting mines including everything from the length of the process to the level of public participation. The *Environmental Assessment Act* of British Columbia designates the Environmental Assessment Office as responsible for assessing the impacts of proposed mines or expansions that fall under the provincial authority and determining whether an environmental assessment certificate is necessary. The executive director establishes the scope, procedures, methods needed for obtaining the assessment (Environmental Assessment Office 2016). In the case that a specific

project falls under the responsibility of both provincial and federal authority, “the two governments will carry out a single, cooperative environmental assessment while retaining their respective decision-making powers” (Province of British Columbia 2016).

To begin mining operations, under the *Mines Act* of British Columbia the B.C. Ministry of Mines and Energy requires that a company obtain a permit for mining operations. This also requires that any changes to the initial permit must be applied for, before the commencement of those changes (Government of British Columbia 1996). The responsibilities of each agency have been defined and broadly result in the B.C. Ministry of Energy and Mines focus at the mine site, while the B.C. Ministry of the Environment's role is beyond the mine site. The authority of the B.C. Ministry of the Environment additionally includes the ability to require that mining companies take responsibility for mines' effects on the environment. In the *Environmental Management Act*, the Minister of the Environment can designate the parties responsible for preparing a required area-based management plan (Government of British Columbia 2003). In the Elk River Valley, this has resulted in the *Elk River Water Quality Plan* which synthesizes the studies of "baseline" conditions and proposed mitigation strategies. This plan establishes the basis from which the mining operations can affect the water of the basin (Teck 2014).

Water Quality Markers

Both current processes that are addressing mining pollution have focused on determining the acceptable levels of pollutants in the water. These levels are referred to by various institutions as either guidelines, objectives, or standards and various entities address them in multiple ways. The Canadian Council of Ministers of the Environment defines the objective of Canadian Environmental Quality Guidelines as to "provide science-based goals for the quality of

aquatic and terrestrial ecosystems” (Canadian Council of Ministers of the Environment 2014).

While referred to as guidelines, there are multiple agencies, acts, and procedures for establishing some form of “science-based goal.” The *Canadian Environmental Protection Act* is the key piece of national legislation that acknowledges the need for “environmental standards, ecosystem objectives and environmental quality guidelines and codes of practice” (Canadian Environmental Protection Act 1999). Additionally, while the need for guidelines referenced in both federal policy and by the federal agency Environment Canada, the Canadian Council of Ministers of the Environment, is an organization composed of ministers of the environment that establish recommended guidelines for water quality.

While specific guidelines are produced, individual jurisdictions can choose whether they will adopt the recommended guidelines (Canadian Council of Ministers of the Environment 2007). Additionally, in British Columbia, “neither water quality guideline, nor water quality objectives which are derived from them, have any direct legal standing... these limits are set out in waste management permits, approvals, plans, or operating certificates which do have legal standing” (Ministry of the Environment 2012, 8-9). This jurisdictional overlap of federal and provincial agencies, as well as the inclusion of international treaties and organizations in the water governance, is complicated by the decentralization of water governance in Canada (Bakker and Cook 2011; Lands and Parks 1999).

Tribal Consultation

The duty to consult with First Nation Tribes is also a major procedural component required for projects in which there is the potential for adverse environmental, economic, social, heritage, or health effects. The Canadian Constitution defines the fundamental rights of First

Nations Tribes through common law, and in provincial agreements. While the Canadian Constitution (Department of Justice Canada 2013), in British Columbia most of the First Nation Tribes are still in the process of finalizing more specific treaty rights, particularly those that concern rights and access to resources (Environmental Assessment Office 2016).

Three pivotal court cases have resulted in recognition of the Crown's duty to consult First Nations if it "contemplates conduct that might adversely affect [the First Nation]" (Government of Canada 2011). *Haida Nation v. British Columbia* was the first case to clarify this duty (Haida Nation v. British Columbia (Minister of Forests) 2004). The case of *Taku River Tlingit First Nation v. British Columbia* clarified the duty to consult even "before proof of rights or title claims" (Taku River Tlingit First Nation v. British Columbia (Project Assessment Director) 2004). In 2005, another case, *Mikisew Cree First Nation v. Canada*, it was required that the crown engage directly with the applicable First Nation (Mikisew Cree First Nation v. Canada (Minister of Canadian Heritage) 2005). The "Strategic Engagement Agreement Between the Province of British Columbia and the Ktunaxa Nation" in 2013 addressed this duty of the government to First Nations. This agreement was intended to clarify the Province's interest in fulfilling consultation and accommodation especially with the Ktunaxa Nation, who has yet to finalize treaty rights. This agreement acknowledges the interests of both parties, the Ktunaxa Nation in section 3 (1), "(b) acting as stewards of land and resources and being involved at all levels of decision-making to carry out effective land and resource management in accordance with Ktunaxa laws, cultural values, and priorities." The agreement also clarifies the interest of the Province in section 3 (2): "(a) working cooperatively with the Ktunaxa Nation to sustainably manage land and natural resources; [...] (c) fulfilling the duty of the Province to consult and accommodate" (Ktunaxa Nation and British Columbia 2013). Transition statement needed

Non-governmental Organizations

The role of the public to provide input is another essential element with regards to issues related to water quality. In the repeal of the *Canadian Environmental Assessment Act* of 1992 and the revised version released in 2012, there was significant reduction in the ability of the public to provide input, a decrease in input period for scientists, and the ability for other federal departments to issue licenses and permits while the project is still under the review period (Environmental Assessment Office 2016).

International

The *Boundary Water Treaty* of 1909 provides the basis for the relationship between the United States and Canada regarding transboundary river basins. As part of this treaty, the IJC was established to investigate and provide recommendations for transboundary issues. For the IJC to be involved in a specific issue, the governments of both the United States and Canada must submit a reference (International Joint Commission 2016). In the case of the Kootenai/y River Basin, there has yet to be a reference for the involvement of the IJC despite the requests in 2016 to the Secretary of State John Kerry by the Ktunaxa Nation, Confederated Salish and Kootenai, and Kootenai Tribe of Idaho for a reference to be made from the United States.

Subnational

In 2010 a *Memorandum of Understanding and Cooperation on Environmental Protection, Climate Action and Energy* was signed between the MT Department of Environmental Quality and B.C. Ministry of the Environment. This recognizes the shared interest of the State of Montana and the Province of British Columbia to work together to on

transboundary issues that threaten to degrade land or water resources (The Province of British Columbia and The State of Montana 2010). This memorandum of understanding has led to the development of the Lake Koocanusa Working Group and its goal of producing a memorandum of understanding specifically for Lake Koocanusa which will address the issue of water contamination from mining among other water use issues (Compass 2016).

Current Framework of Water Management

To provide a complete overview of the current framework, it is necessary to also address an area just outside of the Kootenai/y River Basin to give the full historical context. In the 1970s and 1980s, a valley to the north of the Elk River Valley was targeted for mining development. A coal mine was proposed in the 1980s on Cabin Creek, a tributary of the Flathead River, by Sage Creek Coal Limited. Given the potential impacts of this mine on the surrounding environment and concerning the Boundary Waters Treaty, the Governments of the United States and Canada requested the involvement of the IJC. In the *Boundary Waters Treaty* established between the United States and Canada in 1909, the IJC was established to investigate and provide recommendations for transboundary river basin issues. The IJC responded to this reference by forming a study board to make recommendations regarding the development of this mine. In completing their assessment, the IJC made the recommendation that a moratorium on mining in the region stays in effect for twenty years (International Joint Commission 1988). In particular, in the 1980s the IJC recommended that coal mining not occur on the North Fork of the Flathead River due to the potential adverse ecological effects (International Joint Commission 1988).

In the 2000s another proposal for mining came up for review. This mining proposal was assessed in part through a report which provided a comparison between the Elk River and the

Flathead River to show what the effects of the mining would be on the Flathead River given the observed effects in the Elk River. A study was conducted in 2013 to determine the impacts metallurgic coal mining would have in the North Fork of the Flathead River; with the Elk River as a reference river (Hauer and Sexton 2012). This report, using data from the Elk River comparing conditions above and below the mines, showed significantly high levels of contaminants in the water. The primary constituents of concern with the coal mining were identified as selenium, cadmium, nitrate, and sulfate (Lake 2013; Teck Resources Limited 2014).

The situation in the Kootenai/y River Basin is unique in that the Internal Joint Commission has not been called on to investigate the current contamination. Specifically, in the Elk River Valley mining operations have been allowed to continue and expand despite evidence that shows the effects of the mining, which have been used to restrict mining in the similar North Fork of the Flathead River.

To determine the effects of the pollution and to address water quality management, the Minister of the Environment of British Columbia required an area-based management plan (Technical Advisory Committee to the Elk Valley Water Quality Plan 2013; Lake 2013). In British Columbia, the *Environmental Management Act* gives the Minister of the Environment authority to designate the party responsible for preparing the area-based management plan to address environmental pollution. In 2013, Minister of the Environment, Terry Lake, issued Ministerial Order No. M113 which required the development of this area-based management plan for the Elk River Valley. The primary reason for the issuing of this order was stated as the concern for ecosystem health. The *Elk Valley Water Quality Plan* was completed in 2014, following a process which required the input of a technical advisory committee, and produced water quality targets for the key constituents of concern identified in the ministerial order. In the

Kootenai/y River Basin, the Minister of the Environment required as part of the area-based management plan that concentration targets be established as part of the plan and with input from a Technical Advisory Committee (Lake, Ministerial Order No. M113 2013).

Teck Coal Ltd. was determined to be the party responsible for preparing the *Elk Valley Water Quality Plan* and tasked with developing a technical advisory committee composed of representatives from both a provincial, state and federal agency, including Canada and the United States, as well as tribal representatives and third-party scientist (Lake 2013). As part of the requirement of the development of the Technical Advisory Committee, nine representatives were included in the formal process of addressing the contamination through the creation of the Area Based Management Plan. The members of the committee included representatives from (1) industry represented by Teck; (2) the Provincial Government represented by the B.C. Ministry of the Environment, the B.C. Ministry of Energy and Mines and Natural, and the Environmental Assessment Office; (3) the Government of Canada represented by Environment Canada; (4) the U.S. Federal Government represented by the U.S. Geological Survey; (5) the Montana State Government represented by the Department of Environment Quality; (6) First Nations represented by the Ktunaxa Nation Council; and (7) the scientific community represented by a third party qualified professional scientist (Teck Resources Limited 2014).

This plan determined baseline conditions and proposed monitoring and mitigating strategies going forward (Teck Resources Limited 2014). To achieve the water quality targets, the plan outlines the development of water treatment plants at the mining operations (Teck Resources Limited 2014a; Teck Resources Limited, 2014b; Teck Coal Limited 2015; Teck Resources Limited 2016). During the creation of the plan, stakeholders raised concerns that the pollution was not addressed in areas within the United States.

Following the preparation of the plan, the Lake Koocanusa Working Group was established to address specifically Lake Koocanusa and selenium objectives and criteria (Shoemaker 2014). This working group is composed of various committees, including a steering committee, a monitoring and research committee, and a stakeholder committee. Multiple entities and stakeholders are involved throughout and, in the processes, related to the issue of mining contamination in the Kootenai/y River Basin (see Figure 5). Initially, the Province of British Columbia and the State of Montana were the two entities that signed the Memorandum of Understanding and Cooperation to recognize the importance that protecting the Flathead River Basin. These two entities will again be signatories to the memorandum of understanding to come out of the Lake Koocanusa Working Group.

The goal of the working group is to develop a Memorandum of Understanding which provides for "non-binding science-based water quality criteria/objectives that are protective Lake Koocanusa" (Shoemaker 2014, 2). The steering committee is made up of agencies that have the authority to implement the criteria and objectives and include MT Department of Environmental Quality, U.S. Environmental Protection Agency, B.C. Ministry of the Environment, and Environment Canada. The monitoring and research committee is responsible for developing the criteria and is composed of all federal, state, provincial, and tribal nations that take part in the Lake Koocanusa Working Group on a consistent basis (Shoemaker 2014). Following the release of the *Elk Valley Water Quality Plan*, the Lake Koocanusa Working Group formed in 2015. The Lake Koocanusa Working Group developed because of concerns brought up by the Technical Advisory Committee and due to discussions, that paralleled this committee between the Ministry of the Environment in British Columbia and the Environmental Protection Agency in the United States (Compass 2016; Shoemaker 2014a; Shoemaker 2014b). The first

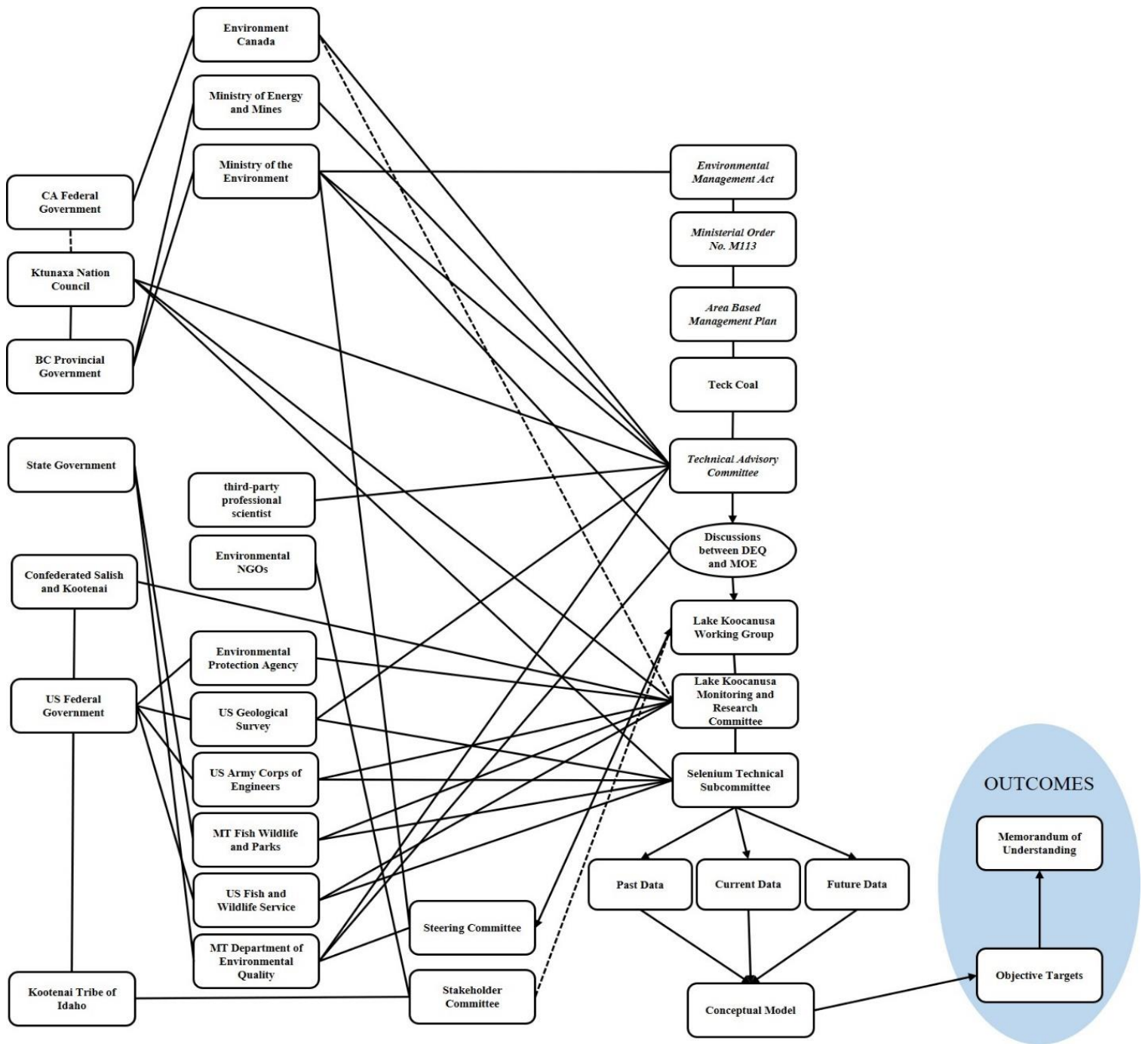


Figure 5. Selenium Related Actor-Network in Lake Koocanusa (Source: Author)

meeting of the Lake Koocanusa Working Group was held on October 2015, and other meetings were held February 2016 and October 2016 (Mavencamp 2016). The Lake Koocanusa working group was formed to “assess whether a selenium target of 2 µg/L at Lake Koocanusa is protective and to provide a forum for discussing other water quality issues relevant to Lake Koocanusa” (Compass 2016). The goal of this working group is to produce a memorandum of understanding between MOE and DEQ which will reflect findings of this working group.

The Lake Koocanusa Working Group is composed of three committees including the Steering Committee responsible for implementation of the memorandum of understanding (the final goal of this working group), the Monitoring and Research Committee tasked with providing recommendations to fulfill the objective of creating the memorandum of understanding, and the Stakeholder Committee for any additional interested groups or individuals to provide input (Work Space 2015). Under the Monitoring and Research Committee, other technical sub-committees can be formed as needed. Currently, only one technical subcommittee has been established thus far and is the Selenium Technical Sub-committee. This committee is specifically tasked "to develop science-based research plans/studies and to provide information for the development of selenium criteria/objectives for Lake Koocanusa" (Lake Koocanusa Conservation Page 2016). Additional stakeholders and entities have been recognized regarding this issue through the Lake Koocanusa Monitoring and Research Working Group. Members of the Monitoring and Research Committee include: (1) B.C. Ministry of the Environment and B.C. Ministry of Forests, Lands, and Natural Resource Operations representing the Provincial Government; (2) Environment Canada representing the Government of Canada; (3) MT Department of Environmental Quality and MT Fish, Wildlife & Parks representing the Montana State Government; (4) U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service,

U.S. Geological Services, and Army Corps of Engineers representing the U.S. Federal Government; (5) Confederated Salish and Kootenai Tribes and Kootenai Tribe of Idaho representing Tribes; (6) Ktunaxa Nation Council representing First Nations; and (7) Teck Coal Ltd. representing industry. The only two specifically identified individuals include Mike Sokal from the B.C. Ministry of Environment and Terri Mavencamp from the MT Department of Environmental Quality. In addition to the organizations above, both universities and consultants are included as organizations that could have membership in the Monitoring and Research Committee, but there is not a specific university or consultant group identified in the working group's documents.

In addition to representation in the Monitoring and Research committee, multiple agencies have representatives in the Selenium Technical Sub-committee. These expert scientists responsible for developing the selenium standard include Joseph Skorupa from the Fish and Wildlife Service, David Naftz and Theresa Presser from the U.S. Geological Survey, Joe Beaman from the U.S. Environmental Protection Agency, Lana Miller from the B.C. Ministry of Environment, and David Janz from the University of Saskatchewan (Lake Koocanusa Conservation Page 2016).

Due to the large scale and scope of issues surrounding the water quality problems, the working group has tried to maintain a narrower focus on creating water quality standards for selenium, based on concentrations in Lake Koocanusa. At the first two meetings of the working group, interested parties voiced concern about the narrow focus of the current management, the limited ability for other stakeholders to provide input, and the current lack of a process for addressing all the issues of concern. The focus of the recent water quality planning in the Kootenai/y River Basin has been on localized areas and has focused on elements including

specific constituents and aquatic species. Primarily these localized areas have consisted of Elk River Valley through the *Elk River Water Quality Plan* and Lake Koocanusa, addressed by the Lake Koocanusa Working Group beginning in 2015. The concerns raised by stakeholders about the water management have highlighted variables consisting of the multiple pollutants from coal mining and the potential ecological and human impacts of the pollution. Despite the overall awareness of all the elements of water pollution, stakeholders have highlighted different spatial scales and pollutants, and have different perspectives on ways to address water management. With the contrasting perspectives on water management and elements that are of primary concern for various stakeholders, there has been conflict with how to proceed on addressing the potential risks of pollution.

During the process established by the Lake Koocanusa Working Group, two other key events occurred. In April of 2016, the Flathead Lake Biological Station Working Group met to address the data gaps that exist for the Kootenai/y River Basin. An academic scientist coordinated this group from the University of Montana.

Additionally, the Auditor General of British Columbia produced a report, *An Audit of Compliance and Enforcement of the Mining Sector*, in May 2016. This report highlighted multiple concerns with the regulatory agencies responsible for mining operations and therefore protecting water quality.

While these two processes and the associated organizations provide insight into the key actors behind this issue, it fails to address other interested stakeholders in the basin. Interested parties outside of these identified organizations include, but are not necessary limited to, local entities and individuals, guide companies, the community of users of this basin for recreational purposes, additional industries who have an interest in water quality issues in the basin, and

NGOs including Backcountry Hunters and Anglers, Columbia Basin Trust, Wildsight, Dogwood Initiative, American Rivers, Wildlife Federation, Elk River Alliance, Flathead Basin Commission, American Fisheries Society, National Parks Conservation, Kootenai River Network, and Headwaters Montana.

In the current process of water planning in the Kootenai/y River Basin, the representation of multiple agencies and stakeholders previews the extent to which water governance is not only decentralized in Canada, but that there is the potential for the involvement of multiple entities in environmental and water planning and management processes (Bakker and Cook 2011).

Contradictions and Conflicts

To understand the environment in which this current situation is unfolding requires specific attention to two key elements; these include the environment surrounding the mining industry in British Columbia including the agencies responsible for addressing issues of water contamination from mining operations, and the relationship between the United States and Canada regarding transboundary waters.

Mining in British Columbia is recognized for its role in economic growth and job creation. Currently, the mining sector in British Columbia accounts for more than 30,000 jobs and estimated in 2013 to have a total value of production of \$7 billion (Bellringer 2016; Bennett 2016). Due to the impact that the mining sector has on the economy of British Columbia, policy, legislation, and regulation often support the development of mining operations.

Both the Ministry of the Environment and the Ministry of Energy and Mines regulate mining operations and have oversight of issues related to industrial water contamination in

British Columbia. The specific responsibilities of the Ministry of Energy and Mines are permitting and reclamation of mining operations (Bennett 2016; Ministry of Energy 2008).

As alluded to above, the Ministry of the Environment is tasked with the regulation of waste from mining operations (Ministry of Environment n.d.). In the report by the Auditor General of British Columbia released in 2016, the regulatory programs of these two agencies are assessed. Additionally, the report addressed the risks associated with mining in relation to water quality. This report outlined how the regulatory and enforcement responsibilities of these agencies have not been robust enough to ensure adequate protection of the environment and people of British Columbia. First, the report critiqued the way in which role of the Ministry of Energy and Mines as a promoter of industry conflicts with its regulatory role. The report also included a set of critiques of inadequate regulatory oversight activities. For example, the report points out the following: little to no coordination between agencies on compliance and enforcement activities; the allocation of resources to permitting rather than to regulatory actions; a permitting approach which does not ensure financial securities for environmental liabilities; failure to promote compliance of industry; inadequate monitoring and site inspections; inadequate evaluation of the effectiveness of their regulatory programs; and failure to notify the public of risks, lack of effective agency oversight and the overall performance of companies (Bellringer 2016). Given these critiques, it is necessary to look at the other options that could address the issue in the Kootenai/y River Basin when there is a failure of management to protect water resources such as recognized in the Auditor General's report.

Unraveling the dynamics of the water quality management in the Kootenai/y River Basin requires engagement with the concepts of scale, networks of power, dialectics, and knowledge production. These provide the lenses through which the ecological, social, and economic forces

beyond the basin connect to the resultant practices and relationships that exist within the Kootenai/y River Basin. An understanding of these forces through engagement with these concepts can provide the basis for knowledge of the historical dimensions, relational scalar networks, and governance offers the critical approach necessary to conceptualize the current management efforts. A key component underlying the practices and relationships of actors in the basin is the scales that overlay this specific hydrological basin. While it appears that despite defined scalar boundaries and responsibilities at various scales this issue has been redefined through relations of power that can be abstracted from the traditionally defined scales. Therefore, it is first necessary to understand the underlying the scales.

The scales that overlap in the Kootenai/y River Basin shed light on the dynamics of scalar mismatch and inconsistency across the international boundary, providing the scalar context in which the relations of the actors at these various levels have played out. Key to these relations is recognizing how the authority in the current working group is made up of the individuals who choose the schemes to implement. This dynamic sheds light on the concept of the state as a place of contestation in which there is potential for "gaps and contradictions in state control" and how the nation-state is a site of varying claims (Li 2005; McCarthy 2002; Robertson 2015). Therefore, to approach the issue of water quality in the Kootenai/y River Basin, the predefined scales must first be addressed and then it is necessary to look at the relations that re-define those scales to understand the dynamics of the management processes.

Overlaying the physical boundary of the river basin are two nations, two states, one province, traditional territories of multiple Tribes, and various other local boundaries including counties and municipalities. Understanding these overlapping boundaries requires identifying the defined responsibilities at multiple scales. First, Canada is a decentralized federation, with part of

the authority delegated to the provinces including the responsibility for managing the water resources (Bakker and Cook 2011). This includes the adoption and development of water quality guidelines that are established as recommendations by the Canadian Council of Ministers of the Environment. This is an intergovernmental forum which has no authority to implement the guidelines; that responsibility is the provinces (Canadian Council of Ministers of the Environment 2007). The United States, in contrast, has established water quality standards through the Environmental Protection Agency which serve as baselines for the states; states are either required to adopt these or establish more strict guidelines.

Another critical component regarding the issue of scale is that of Indigenous Peoples within the scales of the nation-states. In British Columbia, the Ktunaxa Nation claims traditional territory which almost entirely overlays the Kootenai/y River Basin. Because tribal nations in British Columbia are still in the process of establishing treaties with the federal government of Canada, the Ktunaxa Nation relies on an agreement with the provincial government, which recognizes the province's responsibility to consult them on issues that affect their traditional territory (Government of Canada 2011; Ktunaxa Nation and British Columbia 2013). In the United States, on the other hand, the Tribes with interest in the water quality issues, the Kootenai Tribe of Idaho and the Confederated Salish and Kootenai, only have formal agreements with the federal government. In addition to the formal agreements, the United States federal government has a fiduciary responsibility to Tribes, as established in common law (US Department of the Interior 2016).

Of crucial importance to this issue is recognizing the existence of the supranational body that has been established to address the transboundary problems between the United States and Canada. The Boundary Waters Treaty in 1909 defined the role of the IJC as "regulating shared

water uses and investigating transboundary issues and recommending solutions" (International Joint Commission 2016). For the IJC to investigate a transboundary issue, the federal governments of both the United States and Canada must submit a reference. This allows for a study board to be established to provide recommendations on an issue produced. Despite its existence and repeated requests by tribes to the federal governments, in particular to the United States Department of State, there have been no references made for IJC involvement in water quality issues in the Kootenai/y River Basin. While there is an established responsibility of the federal government to acknowledge and act on behalf of tribal interests, this has not occurred in the Kootenai/y River Basin.

Through its current process addressing water quality, the Lake Koocanusa Working Group has strictly limited the scale of this issue to Lake Koocanusa. This "lake" is, in reality, a transboundary reservoir which was formed in 1972 with the building of the Libby Dam as part of the Columbia River Treaty. While the international border runs through approximately the center of the reservoir, the dam has formed an artificial boundary which has defined the scale of the working group as it has maintained its focus on Lake Koocanusa. This artificially constructed body of water not only affects the transportation of the contaminants but has also shaped the actions to contain the contamination. Despite concerns raised over the potential impacts of mining contamination below the dam, there has been a concerted effort to not address that area as part of the process of the working group.

While the scalar element of this issue provides interesting context, it only scratches the surface of the dynamics of the management schemes. Attention must be paid to how specific actors trying to operate within this framework of scales are restrained by the networks of other actors and their actions. In the article on community-based resource management in Nevada

County, California, the researchers suggest that the reason for the failure of a collaborative process to address natural resource planning was the result of political attacks rather than procedural flaws, essentially as a result of an “ongoing struggle for control” (Walker and Hurley 2004, 737). Unraveling the relational scalar networks that exist in the Kootenai/y River Basin and how they have shaped, or reshaped territorial configurations help us to understand the gaps and contradictions that exist (Swyngedouw 2007). While it would be expected that the IJC should address this issue, the nuances of relationships and events that have occurred in basin surrounding the water quality issues show that configurations exist beyond the predefined political scales and subsequent responsibilities. The initial action to address mining contamination through the issuing of the Ministerial order requiring an area-based management plan in the Elk River Valley reveals the embeddedness of the mining industry in the network of actors defining water management. This Ministerial order required that Teck Coal lead the development of the area-based management plan through consultation with representatives from tribal nations and the United States and Canadian government (Lake 2013). The result of this process was the development of the Elk Valley Water Quality Plan which established water quality targets and outlined plans for technological fixes through the building of water treatment facilities.

This water quality plan is embedded within a broader network surrounding mining in British Columbia. In contrast to the water policy is present in British Columbia's Water Protection Act "to foster sustainable use of British Columbia's water resources in continuation of the objectives of conserving and protecting the environment" (Government of British Columbia 1996, 2), the actions of the regulatory agencies responsible for water quality issues show a promotion of the mining industry at the expense of water quality. The result is that these

agencies, the Ministry of the Environment and the Ministry of Energy of Mines, have been heavily criticized in their management of water resources concerning water quality (Bellringer 2016). The Ministry of Energy and Mines' contradictory roles of regulator and promoter of industry has resulted in an increase in permitting with limited enforcement with the concentration of resources to primarily support the role of promoter of the industry. These relations have resulted in the focus on developing technical fixes for the mitigation of the pollution that has occurred rather than restricting mining operations or enforcing prevention.

As Technical Advisory Committee in the Elk River Valley addressed the water quality, the MT Department of Environmental Quality and the B.C. Ministry of Environment were discussing additional ways to address the water quality within a transboundary context (Compass 2016; Shoemaker 2014a; Shoemaker 2014b). The network of subnational governments engaged with this transboundary issue was solidified in the establishment of the Lake Koocanusa Working Group. The MT Department of Environmental Quality and the B.C. Ministry of Environment within the working group forms the steering committee which is defined as the “ultimate decision maker” (Compass 2016). While the working group was initially supposed to consist of three committees, the stakeholder committee has yet to have any significant role in this process. While the initial meeting was supposed to include all three committees and a broad spectrum of interests, the subsequent meetings have specially designed only to include agency representatives involved with water quality monitoring and to address the establishment of a selenium water quality objective for the lake (Compass 2016). This process also is operating without a finalized Memorandum of Understanding giving no guarantee of how the process will influence water management (Compass 2016).

The only current ongoing process addressing water management in the Kootenai/y River Basin, led by Lake Koocanusa Working Group, has been narrowly focused on obtaining scientific data to understand the effects of selenium. In addition to the first monitoring and research committee meeting, a technical subcommittee has been formed and meets as an additional element to further discuss selenium data collection and the development of conceptual site model which is supposed to provide the means through which the water quality objective will be determined (Lake Koocanusa Conservation Page 2016). This model and the data collection for it has been the primary focus of the working group resulting in this process being defined by the need for a water quality objective as the means to adequately protect the "lake." This move is significant in that the knowledge production resulting from the focus on scientific data will come to inform policies related to the management of the basin, as well as potentially other water bodies in the future.

Available Information

The information available can be categorized into scientific data, news releases, and organizational documents. The reliability of the scientific data available is based on the ability of it to be verified through analysis of the methods and results. A significant portion of the data is available in this regard. The remainder of the data specifically used for the determination of water quality targets in *the Elk Valley Water Quality Plan* has been synthesized and the studies, conducted by contracted scientific firms, is unavailable in its original format. This calls into question the reliability of those studies.

The organizational documents including reports on the Lake Koocanusa Working Group and Technical Advisory committee and *Elk Valley Water Quality Plan* must be assessed for the

extent to which they accurately capture the entire context in which they were produced. These should only be reviewed as summaries of the events and processes which they address and assessed with awareness and concern for who created them and for what reason.

The multitude of news releases produced by news organizations, NGOs, and Teck provide insight into the concerns and interests of various interested stakeholders. While this provides an accurate representation of multiple perspectives, it should be read with attention to the biases. In three letters to the editor written by Teck, articles written by Flathead Beacon are critiqued for inaccurate claims or limited context. This highlights the extent to which information provided by organizations regarding the issue can often ignore the entire context of the situation or provide false information.

Gaps in Critical Information Regarding Water Quality

From the reports analyzed there is insufficient information on concentrations of constituents and the effects of the mining pollutants on the biota. There is insufficient information on the Elk River Valley for specific biota. Additionally, there is a complete of lack data in the lower Kootenai/y River (below Libby Dam). The Elk River Valley data for the biota consisting of periphyton, amphibians, and birds severely lack in its spatial extent. The periphyton data was only collected in several areas in the valley, and the data for the amphibians and birds was only obtained in several areas in one year, 2012. The data for the Kootenai/y River downstream of Libby Dam just had water quality data from the samples collected by the U.S. Geological Survey (Easthouse 2013). There are potentially other data available that are not readily accessible or exist in the gray literature.

For the data on the biota of the basin, there were significant gaps in the quantity of the data in addition to the spatial extent. Benthic invertebrates with data from the Elk River Valley portion of the basin included 56 mine-exposed samples which establish a baseline understanding of the effects of the pollutants on the benthic invertebrates but was only conducted over a short time span. Adverse effects were noted for three types of benthic invertebrates (Minnow Environmental Inc. 2014), and given the presence of the impact, more research is recommended both in quantity and extent. For periphyton research was limited only to several areas in Elk River Valley and was noted to be insufficient in quantity and for determining the effects. Since the amphibians and birds just had data reported for several locations north of the international border and only in 2012 (Minnow Environmental Inc. 2014), data collected provides an introduction into the species of concern and beginning baseline information. These data are insufficient and limited though in giving any indication of the effects of pollutants, including the spatial extent of those effects. Information on the concentrations of metals in tissue in fish in the Kootenai/y River Basin has begun to be compiled, but the effects of the concentrations have yet to be understood.

Implications for Current Water Governance

The current approaches to the issue of water contamination in the Kootenai/y River Basin reflect the inconsistent governance of the shared waters between the United States and Canada and water management which fails to implement the policy of environmental protection established in the *Water Protection Act* of British Columbia.

As the historical context outlined above shows, there is an inconsistency with the way in which the governments of Canada and the United States choose to call on the IJC for

transboundary issues. The report used to show the effect that mining would have on the Flathead River draws parallels between the proposed mining in the North Fork of the Flathead and the current operations in the Elk River Valley. While the difference between these two cases is that mining operations have been underway in the Elk River Valley for over 100 years, the similarities in the environment and the risks that mining operations pose to the ecosystem highlight how the IJC is applied only under certain ambiguous circumstances. Despite requests made to John Kerry, Secretary of State during the Obama Administration, from First Nations and Tribes for a reference to the IJC from the United States, the currently limited processes continue to address the situation.

The Auditor General's report highlighted the pressing concerns of the management of water resources in British Columbia specifically with regards to water quality. Starting at the source of the issue, in and around the mining operations, there is a failure of management to implement the water policy in the Water Protection Act. The purpose of the act is defined to "to foster sustainable use of British Columbia's water resources in continuation of the objectives of conserving and protecting the environment" (Government of British Columbia 1996). The different roles expected to be fulfilled by the Ministry of Energy and Mines has resulted in the domination of mining industry interest and a lack of enforcement to protect the environment in British Columbia as the emphasis has been placed on the permitting process rather than enforcement (Bellringer 2016). Additionally, the extensive involvement of Teck Coal in the processes to address mining contamination in one of the ways in which industry interests can be shown to be reflected in water governance in British Columbia.

The actions of both the regulatory agencies in British Columbia and the federal and state governments of Canada and the United States shed light on the extent to which actors can

influence the extent that policy plays out within a specific context. The lack of IJC involvement and limited scale and scope of the current process highlights how specific governmental actors have been able to avoid addressing overarching goals for ecosystem health and water quality. Additionally, the critiques of the Ministry of Energy and Mines and the Ministry of Environment shows how not only their roles often contradict broader water policy, but that how the management frameworks are applied can be manipulated by different actors resulting in serious impacts on water resources.

There are several key elements that shape and influence the ways in which the Ministry of the Environmental and Department of Environmental Quality is able to maintain control over the process to address the mining contaminants in the water. This includes the focus on selenium, scale of Lake Koochanusa, and the development of a Memorandum of Understanding. Around these primary elements, the interested actors in this matter form around a network of connections between them and other key elements. While there have been attempts to extend the discussion to elements beyond these, the links in the network of interactions between these elements and the actors involved in this basin are upheld and strong enough that these discussions are still unable to take place.

In the *Elk River Valley Water Quality Plan*, there are multiple primary constituents of concern that are listed. While these each show increased levels in the Elk River and are a potential threat to the ecosystem. Despite the recognition of this by most of the involved parties, selenium has dominated the conversation of current Lake Koochanusa Working Group and most of the recent concerns articulated by individuals. The Technical sub-committee of the Monitoring and Research Committee utilizing the conceptual model to develop an objective for the level of selenium in the reservoir has continued to shape and limit the conversation to the

single constituent of selenium and the geographic area of the Elk River and Lake Koocanusa. Multiple media articles published on the water quality issue, which continues to highlight selenium articulate the perpetuation of this concern. The issue of this limited scale and scope is both that it shows that the concerns raised by interested parties have not been addressed and that this process has the potential to continue to shape the management going forward resulting in a failure to address the larger ecosystem threat that the pollution poses adequately.

These institutions and organizations operating within the Kootenai/y River Basin provide an initial outline of the framework of water governance. This initial framework provides evidence to the extent in which multiple forces can influence decisions and actions over this specific environmental issue. These forces are necessary to understand the framework and therefore context in which state actors operate. To uncover what is informing the current management process, it is necessary to take a close look at how all the institutions and organizations involved have a role in determining the approach to address mining pollution.

The following chapter addresses the current governance processes and the issue of mining pollution by looking at the stakeholders in the basin and their views regarding this issue. This both sheds light on the ways in which the current process has been shaped by specific actors through which actors exist and their concerns regarding the issue. Based on the stakeholders' concerns and the inconsistencies of the current process with the underlying framework to address water quality issues, recommendations are made as to how the current efforts to address the pollution should move forward.

CHAPTER IV: STAKEHOLDERS AND THEIR VIEWS ON MINING POLLUTION

Current efforts to manage pollution in the Kootenai/y River Basin involve a number of stakeholders. This chapter identifies these key stakeholders and their views and perceptions regarding water quality challenges and governance in the basin. Additionally, this chapter provides recommendations for current processes addressing the mining pollution.

Description of Stakeholders

The stakeholders in the Kootenai/y River Basin are classified into six categories, including Tribes, non-governmental organizations, United States (federal and state) agencies, and Canadian (federal and provincial) agencies. The stakeholders have had various roles in the water quality planning addressing coal mine pollution of the Kootenai/y River Basin.

Indigenous Peoples

The Tribes identified were the Kootenai Tribe of Idaho, Ktunaxa nation in British Columbia, and Confederated Salish and Kootenai Tribe in Montana. Other stakeholders identified these Tribes in the basin as well as through documentation from the Technical Advisory Committee which listed the Ktunaxa Nation Council as a meeting participant (Technical Advisory Committee 2014). The Lake Koocanusa Monitoring Data Quality Objectives listed the Ktunaxa Nation and Confederated Salish and Kootenai Tribes as part of the consultation team (Shoemaker 2014). Another stakeholder also identified the Confederated Salish and Kootenai Tribe, but when the Tribe was first contacted in 2016 they stated that they

did not have involvement with the water management in the Kootenai/y River Basin (Representative Kootenai Tribe of Idaho 2015).

Non-Governmental Organizations

The non-governmental organizations and groups are identified through both stakeholders and publications on the internet regarding the basin. The organizations include the following: Wildsight, Elk River Alliance, Headwaters Montana, National Parks Conservation, and American Rivers. Additional non-governmental groups that are interested stakeholders in the basin include academic scientists who have served in the Technical Advisory Committee and are involved in the Lake Koocanusa Working Group as part of the Stakeholder Committee (Lake Koocanusa Working Group 2013; Technical Advisory Committee 2014).

United States Entities

The United States agencies involvement in the water quality planning and research on water quality included U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Environmental Protection Agency, and the U.S. Forest Service (Lake Koocanusa Working Group 2013; Technical Advisory Committee 2014). The Montana State agencies include MT Fish, Wildlife, and Parks, and MT Department of Environmental Quality. Both the U.S. Geological Survey and the MT Department of Environmental Quality were represented in the Technical Advisory Committee for the Elk Valley Water Quality Plan (Technical Advisory Committee 2014). The Lake Koocanusa Working group has representatives from MT Department of Environmental Quality, MT Fish, Wildlife, and Parks, and U.S. Army Corps of Engineers as decision makers and each of these agencies is represented in the planning team in addition to

U.S. Geological Survey (Shoemaker 2014). In addition to the decision and planning team representatives, the U.S. Environmental Protection Agency and the National Oceanographic and Atmospheric Administration are listed as part of the Lake Koocanusa Working Group as part of the consultation team (Shoemaker 2014).

Canada Entities

The Canadian stakeholders in the basin include the Canadian agency Environment Canada and the British Columbia agencies of the Ministry of Environment, Ministry of Energy and Mines, Ministry of Forest Lands and Natural Resources, and the Environmental Assessment Office. In the Technical Advisory Committee, the Ministry of Environment, Ministry of Energy and Mines, Environmental Assessment Office, and Environment Canada were represented (Technical Advisory Committee 2014). The Working Group has representatives from the Ministry of Environment and Environment Canada as decision makers. Along with the Ministry of Forest Lands and Natural Resources, those agencies are also represented in the planning team. Additionally, there are representatives from Environment Canada and the Ministry of Forest Lands and Natural Resources in the consultation team (Shoemaker 2014).

Narrating the Effects of Water Quality

Areas of Consensus

There is a significant consensus with water quality regarding constituents of primary concern within the basin. All the stakeholders seem to recognize that the increased concentrations could have adverse effects on the biota and health of the watershed, “the selenium, heavy metals, nitrate, they all have consequences not just as they enter a particular

population, but they have consequences as they travel through entire food web” (R. Hauer 2015). This also includes the agency representatives who have been tasked with maintaining the focus on selenium and Lake Koocanusa. They continue to recognize that the identified constituents of cadmium, sulphate, selenium, and nitrate. Additionally, there seems to be consensus on the issue of water quality standards, in that the current water quality standards might not provide adequate protection for human health and aquatic life. A representative from the Department of Environmental Quality remarked on this and the concern of U.S. agencies if the water quality guideline is low enough. They stated that this was a primary driver for the development of a working group.

Areas of Conflict

Multiple areas of conflict were revealed through the interviews and participant observation at the Lake Koocanusa Monitoring and Research Committee, Kootenai Watershed Group, and Flathead Biological Station Meeting. The key elements of conflict consisted of the involvement of interested parties in the current processes, the representation of Tribes particularly within the United States, the availability of scientific data, and the scale and scope of the Lake Koocanusa Working Group. A representative of the Confederated Salish and Kootenai Tribe addressed this concern stating, "I have yet to go to a meeting where all of the necessary people are represented, and an objective process is clearly taking place" (Sexton 2015).

Interested Parties

The conflict regarding the involvement of interested parties focused primarily on the organization of the Lake Koocanusa Working Group. Of the three committees, the stakeholder

committee was meant to provide a role for all other interested parties. While this committee did exist in the "Terms of Reference - Draft," (the guiding document of the Lake Koocanusa Working Group that defines committees, purpose, and goals) there was no defined role for other interested parties to provide input to the process, and multiple groups expressed that they were not invited to the working group. This included one representative for a non-profit in Canada who voiced concern over the fact that they had received notification of the Lake Koocanusa Monitoring and Research Working Group only days before it took place. Representatives from the Kootenai Tribe of Idaho spoke about their involvement with the working group expressing concern with their water quality representative's role as follows: "She's observing, but it's still limited to an observer status" (Representatives of the Kootenai Tribe of Idaho 2017).

Additionally, those that have tried to find a role in the working group, including local businesspeople do not feel that their involvement makes a difference, as one individual articulated, "they're gonna do what they want to do, and I have discovered that" (Local Fishing Guide 2016). The difficulty of involvement despite many attempts to be part of the current process has resulted in many parties having a limited role or choosing not to be a part of it.

Representation of Tribes

A key area of concern that was expressed by individuals was the role of the Tribes in the process and the failure of the federal governments to represent the Tribes in the process. The interviews with individuals from academia, the Tribes, and other entities as well indicated this. All the Tribes in this region, the Confederated Salish and Kootenai, the Ktunaxa, and the Kootenai Tribe of Idaho have openly stated their desire to be involved in this process, but that it would require the involvement of the federal government on behalf the Tribes. These three

nations also have come to work together on this issue to have their voices heard. This has included the joint appeal to former Secretary of State John Kerry at the U.S. Department of State, which has remained unanswered. The result has been the limited coordination with other entities, as voiced by the Kootenai Tribe of Idaho water quality experts, "we'd like to coordinate more with Teck and with B.C. and Montana, and we hope that they will wish to coordinate with us" (Representatives of the Kootenai Tribe of Idaho 2017). The lack of involvement of the federal government and the restricted scale of Lake Koocanusa Working Group has resulted in limited participation for the particularly the U.S. Tribes.

Available Scientific Data

The availability of data has been raised as an issue in two ways. First, a portion of the data on the Elk River Valley was collected through contracted firms for Teck Coal. There was a lot of concern raised over the issue of access to the data collected for Teck Coal when producing the *Elk River Valley Water Quality Plan* (Sexton 2015). These reports for Teck Coal Ltd. have not been released to the public, and the data are provided only in the Aquatic Synthesis Report (Minnow Environmental Inc. 2014). This information was also requested in the Lake Koocanusa Monitoring and Research Committee Meetings held in Cranbrook on October 25th-26th, 2016. While Tech Coal Ltd. representatives continue to assure that the information is available, multiple individuals stated that the information was insufficient in its currently available form and requested that the raw data be made accessible (Juric 2016). Despite this concern being brought up numerous times, there was no indication that Tech Coal had any intention of releasing their data in its entirety.

The other major issue raised regarding the data for Lake Koocanusa was that the available information was not sufficient to produce a water quality objective through the conceptual model that the Selenium Technical Subcommittee is utilizing. This conflict primarily unfolded within the working group meeting with various representatives expressing their concern that the existing data was done so with different methods and therefore did not have similar enough parameters to be input into a model. The key individual responsible for the development of the conceptual model continued to defend the potentiality of the developed, and despite protests, the Selenium Technical Subcommittee continued with its planning of inputting the previously collected data into this model.

Scale and Scope of Current Processes

There has also been significant conflict over the extent to which the agencies in Lake Koocanusa Working Group are addressing broader water quality issues (Sexton 2015). There has been a call for the agencies to immediately begin to focus on the water quality basin-wide and to include all the pollutants that are of concern. MT Department of Environmental Quality has expressed that currently the main constituent of concern is selenium, as agreed upon by the experts, and wishes to maintain the focus of the working group on Lake Koocanusa. This was expressed by their lead representative in the working group emphasizing that it is critical that they focus on selenium and that if they lose focus on that, “we don’t do our resource justice” (Urban 2015). They believe that there is the need to address other issues but that should be done outside of trying to determine water quality standards (Urban 2015). This scope is perceived by the majority of stakeholders to be limited, including the academic scientists, Tribes, and other representatives of the agencies involved in the water quality in the basin. Particularly individuals

spoke to the need for an approach that addresses, as Hauer (2015) describes, “international aquatic ecosystem and the terrestrial components that happen to get involved with that aquatic ecosystem.” One of the main biological components that were repeatedly addressed was that of the white sturgeon, an endangered species in this basin. Both the Kootenai Tribe of Idaho and a representative from the U.S. Army Corps of Engineers highlighted the need to increase attention of this species and the effects that the mining pollution might have on it. Not only do interested parties feel that the scope needs to include more elements of the ecosystem, but that it also needs to be broadened to include more elements of concern than just selenium. Specifically, there is a significant concern related to the other high levels of constituents of concern, particularly nitrates, something that the Kootenai Tribe of Idaho has been addressing downstream of the Libby Dam for fifteen years (Representatives of the Kootenai Tribe of Idaho 2017).

Limiting the scope and scale to Lake Koocanusa in the current process of Lake Koocanusa Working Group has also raised a significant amount of conflict. The Department of Environmental Quality and the Ministry of the Environment continue to emphasize the need to limit this issue to the “most sensitive points within the ecosystem” (Urban 2015). Other key actors feel that this does not completely address the issue and it just trying to maintain the focus on the international element, the reservoir that straddles the border. This has created conflict and concern in that it is not only perceived to be insufficient but that it also does not include additional groups. The Kootenai Tribe expressed concern that "we have a nitrate problem downstream of the dam, so where we're not even included in the scope of their project" (Representatives of the Kootenai Tribe of Idaho 2017). Additional individuals expressed that the pollution can affect all elements of the food chain and therefore is not limited to the area of and surrounding Lake Koocanusa, but rather includes the entire aquatic ecosystem (R. Hauer 2015;

Sexton 2015; Representative of the U.S. Army Corps of Engineers 2016; Representatives of the Kootenai Tribe of Idaho 2017).

How Concerns Have Been Addressed by Current Processes

Concerns over the increase in mining constituents in the Kootenai/y River Basin have been underscored by recent scientific studies. Additionally, state agencies have published documents that show the potential for serious consequences to result with an increase in selenium loading in the Kootenai/y River Basin and particularly Lake Koocanusa. Significantly, the primary focus of the studies and concern in the basin have been on the constituent selenium (Selch 2014).

Multiple concerns have been raised over the water quality of the Kootenai/y River Basin and the effect of the pollutants from the mining in the Elk River Valley. The most prominent stakeholders in the basin to raise concerns over the water quality and the planning to address it have been those involved in the steering committee and academic scientists, involved in the Technical Advisory Committee and the Lake Koocanusa Working Group. Representatives of MT Department of Environmental Quality and the academic scientists have voiced different approaches to addressing water quality planning. The MT Department of Environmental Quality has interest in the Lake Koocanusa Working Group as a way of determining water quality standards for selenium (Urban 2015). The structure of the group is designed to implement research to identify the level and trends of selenium in the water, sediment, and biota (Shoemaker 2014). After establishing baseline data and trend data, the working group plans to develop a model for determining standards to support beneficial uses. MT Department of Environmental Quality's primary interest in the Lake Koocanusa Working Group focuses on

deciding what these safe concentrations are and whether the current water quality standards are sufficient (Urban 2015).

The academic scientists involved suggest that this working group should address the issue of water quality on a watershed scale with attention to all the pollutants resulting from mining activity (Sexton 2015). While MT Department of Environmental Quality recognizes that more could be accomplished regarding water quality planning. As such, the department wants the Lake Koocanusa Working Group to stay focused on selenium concentrations as was the original plan for this group (Urban 2015). Currently, the working group plans on addressing the concerns for a basin-wide approach that was brought up at the first meeting held in October 2015 to determine the purpose of the group moving forward. As of now, it appears that MT DEQ would like to proceed with the narrow focus of selenium concentration and water quality standard determinations (Urban 2015).

The Kootenai Tribe of Idaho was contacted in November 2015 and stated that they had no concerns at present that they wished to put forth, but they were continuing to monitor the situation (Representative Kootenai Tribe of Idaho 2015). In an interview in January of 2017, the individuals associated with water quality as part of the Kootenai Tribe of Idaho expressed their concern for the current processes only addressing the water up to the Libby Dam. They also addressed the lack of interest by the Lake Koocanusa Working Group to look at the Tribe's water data collected from below the dam. Additional stakeholders noted that the Tribes are primarily concerned with human health concerning drinking water and concentrations of metals in fish (Sexton 2015). Regarding the non-governmental stakeholders, mainly the non-profits of Wildsight and American Rivers, the concern identified through publications on their websites is the overall health of the basin's ecosystem.

Pollution from mining in the Elk River Valley in British Columbia is believed to threaten the ecology of the transboundary Kootenai/y River Basin significantly. In response to concerns raised regarding this water contamination, two processes have been developed to address water quality management. The Lake Koocanusa Working Group is leading the most current process, established in 2013, to develop water quality guidelines for selenium in Lake Koocanusa. This group was formed in response to discussions between Montana and British Columbia and remains the primary process for addressing the pollution which flows across the international border into the United States. Significant features of this process have raised questions and concerns about how water quality is managed in transboundary river basins and the extent to which these management efforts reflect broader water policies. Additionally, the water quality issues in this context raise questions regarding our relationship to water; who defines that relationship, how broader narratives shape that relationship, and how the management of water is shaped by forces beyond the specific site of interest. While water is approached through multiple frameworks, political ecology allows for a deeper understanding of the dialectical relationship with this vital resource.

Recommendations to Support Collaborative Water Quality Governance

From the data and information obtained through this synthesis and the identified concerns of stakeholders, I propose that specific steps be taken to improve the water quality planning in the basin. These recommendations are centered on the organization and the management and ways to address areas of conflict and ensure more effective stakeholder involvement.

Additionally, I make these recommendations based on my analysis of the data and observations undertaken as part of this study. One major observation from this analysis is that a process and

an environment in which it is possible to address all stakeholders' concerns is needed. Ideally, through such a process, consensus around a range of actions can be found. Additionally, these actions provide a means of adaptive governance that can work within the current institutional framework. The ability for adaptive governance to be operationalized within rigid law is discussed in research regarding the implement of the Endangered Species Act in the Klamath Basin (Gosnell, et al. 2017). The processes occurring in the Kootenai/y River Basin show that the framework lacks the rigidity that exists with the Klamath Basin research and therefore can be seen to also have the potential for a both collaborative and adaptive process. The recommendations that follow are composed of guidelines for establishing that process and environment and meant to be a way of resolving any future conflict to ensure both a comprehensive and adaptive way of moving forward.

Approach to collaborative water quality management

The water quality planning of the Kootenai/y River Basin has undergone significant steps in addressing the issue of water pollution resulting from mining in the Elk River Valley. Through the development of the Elk Valley Water Quality Plan and the recent establishment of the Lake Koocanusa Working Group initial steps have been taken, but these continue to be narrow in focus both on the spatial scale, focusing on specific portions of the basin, and in the elements addressed, the recent focus being selenium in Lake Koocanusa (Teck 2014; Pipp 2015). Additionally, it is apparent that there has been controversy over the elements these efforts have chosen to address (Urban 2015). By eliminating these specific interests in the planning, there is the risk of increased conflict in the planning process. Based on stated concerns, it is my recommendation that a collaborative process is established alongside the Lake Koocanusa

Working Group, to develop a collaborative approach to the water quality planning of the Kootenai/y River Basin so that efforts going forward thoroughly address all elements of this issue. A collaborative approach will position the current working group as a side committee with its role in the collaborative process determined by those involved in that process. The establishment of a comprehensive, collaborative process will allow the stakeholders to have the necessary structure for addressing the concerns that the narrow focus of the working group is not providing.

The committee groups that have formed to address water quality in the Kootenai/y River Basin, the Technical Advisory Committee, and the Lake Koocanusa Working Group have been ineffective in addressing the concerns of all the stakeholders in the basin. Additionally, the process structure of both the Advisory Committee and the Working Group inhibited the participation of many stakeholders. The result has been frustration with the efforts on the part of the government agencies of both the United States and Canada. Continuing the current trajectory, where stakeholders feel that the processes are not addressing their interests, has the potential of further polarizing this issue and resulting in an increased conflict that will be difficult to resolve at a later point. It is my recommendation that the current structure and goals of the Lake Koocanusa Working Group are evaluated and modified.

Given the transboundary aspect of this issue, I believe some methods can be developed to satisfy both nations' interests while providing the space for public involvement and interested stakeholders. The recommendation for this working group is the development of a collaborative process in which all interested parties will be able to produce water quality plan recommendations. The development and structure of the collaborative process are detailed below with specific recommendations on critical components to building an effective process.

To produce an effective collaborative process, it is my recommendation that five key components be addressed.

1. Ensure full participation of all the interested parties.
2. Engage the participants in designing the process.
3. Develop consensus on the scientific information used in the process.
4. Assure that all information and data are obtained with the agreement of the participants.
5. Create a plan for adaptive management.

Each of these components is discussed below to identify how they address the concerns raised by interested stakeholders.

The current structure of the Lake Koocanusa Working Group is a concern for the roles of stakeholders in the decision-making process. A representative from the Kootenai Tribe of Idaho stated that they are not involved in the current working group, but they are engaged with other stakeholders in monitoring (Representative Kootenai Tribe of Idaho 2015). Allowing for a collaborative committee to propose water quality planning options will provide a means for those stakeholders that feel disempowered to be able to work with the those involved in the decision-making process so that these stakeholders are endowed with a sense of agency in the current process. Therefore, it is my recommendation to restructure the current working group to include all interested parties with the elimination of the current structure of the three separate committees of the Steering Committee, the Monitoring and Research Committee, and the Stakeholder Committee (Work Space 2015).

Upon confirming the representation of all interested parties in this collaborative process, the designing process should be established collaboratively to ensure a process that is agreed

upon by all involved parties. This will follow the format of engagement in which the parties are involved in both decision-making and collaborative action (Work Space 2015). The designing process will help to avoid issues that could potentially derail the process at a later time. This process should include a focus on determining the roles of the participants, developing ground rules, and producing a work plan (McKinney 2015). Additional focus should be on the timeline and frequency of meetings, to ensure that constraints such as distance and cost do not affect the ability of specific stakeholders to participate and to retain all interested parties throughout the entire process. Alternatives to in-person meetings should be explored, such as online conferences to allow for easier participation potentially. This process should also include the development a plan for joint fact-finding for compiling the information needed to proceed to the decision process.

It is necessary for there to be a focus on joint fact-finding for this process given the scale of the issue and the concerns voiced by some of the stakeholders. An academic scientist stated that there was a lack of sufficient information to implement an effective water quality plan and that the information that does exist has yet to be fully compiled and analyzed on a basin-wide scale (Sexton 2015). This emphasizes the importance for the establishment of a joint fact-finding process in which all stakeholders can agree upon what information that is available and determines what information to acquire along with the timeline and methods for acquiring that information (Karl, Susskind and Wallace 2007). This process is necessary for establishing an agreement in which all stakeholders have the necessary information to come to an agreement. The gaps in information noted in this research should be addressed and plan to begin filling those gaps can be formed during this process.

Following the design of the structure of the process, the decision-making process should allow for a creative environment. It is my recommendation that after defining each stakeholder's interests, that the subgroups work on brainstorming solutions for water management. For coming to a decision, the design process will provide the space for deciding whether full census is desired. Additionally, I recommend that the plan established should include a program for adaptive management including monitoring and a means of further collaboration if determined that management changes are needed (Scarlett 2013). This proposed collaborative process will allow for the involvement of all the interested stakeholders which has been called for and will produce a framework for establishing a water quality management which addresses both the concerns of stakeholders and the ecological conditions of the basin. While this could provide effective and adaptive solutions to water quality problems in the basin, there are some concerns which need addressing. First, the costs associated with this process could be high given the extent of the issue. Given the potential future costs of environment and relationship damage that could result if this issue is not appropriately addressed, these costs of collaboration should be outweighed by the benefits. Second, there is the potential for specific stakeholders to refuse this process or withdraw if they feel that their interests are not being addressed. I think that if full involvement and collaboration exist throughout the process, the stakeholders will not feel it is necessary to take this action. Additionally, the alternatives for affecting policy that stakeholders have outside of a collaborative are insufficient in this case, which should promote their involvement as the only means of representation in formulating water quality planning policy and action. Given the costs and benefits of a collaborative process, I recommend this as the best option for reducing controversy and future damage in the basin.

CHAPTER V: CONCLUSION

This thesis presents a case study of water quality governance in the transboundary Kootenai/y River Basin. The goal of this research was to look at current processes that exist in this basin for addressing water quality issues. Additionally, it sought to determine whether and if so how these current processes fit within the framework of water governance that exists.

Implications of this Study

The implication of this research includes both the analysis of the water quality governance in the Kootenai/y River Basin and the application of key elements of political ecology to a transboundary point source water pollution issue. As the process of the Lake Kooocanusa Monitoring and Research Committee move forward, as any process related to water quality, it is necessary to assess the extent to which the current efforts fit with the framework of water governance that exists and for the contradictions and conflicts to be made visible. This assessment is possible through elements in political ecology which call attention to more specific dynamics that exist. As entities and experts continue to create institutions, laws, and policies that are meant to shape the management of water quality, it is necessary to continue to assess how effective are these institution, laws, and policies. This framework must be analyzed both for its ability in producing effective water management and shaping the actions of agencies and processes in the management of water policy. This research shows that in a well-established system for water management in and between two nations, there still exists contradictions and conflicts, both between stakeholders and the policies and laws that are present. Finally, the

theoretical approach used in this research shows the potential for elements of political ecology to be applied to water quality governance issues.

This thesis provides a methodological contribution by drawing on mixed methods to present a view of the situation through interested individuals and groups in the region. It draws from interviews and participant observation the narratives of the issue, highlighting both areas of consensus and conflict. Not only does this address the concerns of the stakeholders but allows for recommendations to be put forth. These recommendations call for the inclusion and agreement of all stakeholders moving forward in this process in addition to the development of an adaptive management plan, which is necessary given the potentially dynamic situation of this issue.

Empirically, this thesis fills a gap in the literature on U.S.-Canada transboundary water governance. An analysis of the environmental history and current institutions, legal framework, and policies for water quality that overlap this basin, shows the framework for how issues related to water quality such as the mining pollution in the Kootenai/y River Basin. In addition to this framework, the current processes are highlighted to show how water quality governance plays out within this specific case study.

While the empirical implications provide an interesting analysis of both the framework of water quality governance in addition to the current processes of water quality management, without a critical approach it fails to address why events have unfolded in the specific way in which they have. An important theoretical implication is in using key elements of political ecology including nation-state politics, knowledge production, scalar dynamics, and the agency of specific actors, this thesis shows the extent to which the management of the water quality issue does not reflect the structure of water governance that exists, but instead is the result of multiple dimensions.

The overlap of scales with the agency of specific actors has led to a dynamic in which an international water quality issue is being addressed by sub-national entities, states, and a province. First, the lack of oversight of water quality guidelines by federal environmental agencies in Canada has resulted in the failure of provinces to enforce these guidelines. In British Columbia, this is due to the emphasis on industry and the inconsistency in the role of specific agencies such as the Ministry of Energy and Mines. Additionally, the mismatch of scales has resulted in inconsistencies of the agency representation and involvement in the issue of water quality in the basin. While specific agency regions are active in this issue, other regions, while they still overlap with the basin, such as Idaho Fish, Wildlife and Parks' absence from the current issues. This is also a reflection of the mismatch between river basins and other political scales, which results in isolation of specific entities based on arbitrary boundaries. An additional scale that has been developed, the portion of the river basin above of the Libby Dam, has also resulted in shaping the involvement of stakeholders such as the Kootenai Tribe of Idaho. The scalar concept is essential when trying to understand why the current processes have developed and what elements result in creating the gaps in which networks of actors achieve the power to shape the processes.

Through interviews, document analysis, and participant observation specific key actors were identified as central to the current processes to address water management. These principal actors formed a network which through concentrated connections, excluded other individuals who voiced alternative opinions of how to address the high level of constituents and the effects that they posed. The primary actors were consolidated and established dominance through their role in the dominant water management process of the Lake Koocanusa Working Group. This working group established specific committees to designate involvement of actors to particular

realms of influence. Through actions taken by the principal actors, as articulated by interested parties, exclusion was established secretly/outside of politics through the delay of invitation to the working group meetings and the unclarified and limited role of stakeholders (i.e., other interested parties) that did not qualify to be part of the other two committees (Juric 2016; Meeting Notes 2014; Work Space 2015).

Through the networks and coalitions of individuals, specific actors have continued to keep this issue from being addressed by the supranational entity – the IJC – that is designed to handle transboundary issues such as this. Through the development of coalitions during the Elk Valley Water Quality Plan, specific agencies have developed a network supported by material goals such as the Memorandum of Understanding and development of water quality objectives. Each of the elements of the Lake Kootenai Monitoring and Research Committee continue to reinforce the network that allows for the actors to maintain power in the process. As meetings, the formation of databases, and funding continue to support this process, the key actors of both the Montana Department of Environmental Quality and the Ministry of the Environment maintain the power necessary to shape the water quality management in the Kootenai/y River Basin. These actors have also been able to maintain a narrow focus in both scale, limited to Lake Kootenai, and scope, limited to the constituent selenium. Despite protests, that this approach is too limited, raised by other interested parties, the current Lake Kootenai Monitoring and Research Committee continues as the primary process to address the water contamination as the actors maintain and reinforce their power through the network of both additional actors and material elements.

As part of this network and the Lake Kootenai Monitoring and Research Group, the key actors continue to take part in knowledge production which further shapes the processes. Not

only are the key actors producing information that continues to reinforce the scale of Lake Koocanusa and the scope of selenium, but the development of the network surrounding this process and these elements results in more information developed that supports this network with further reinforces and so forth. The research conducted dam removal in New England also addressed scientific knowledge production in the emphasis on how the multiple discourses characterize the action of dam removal (Fox, Magilligan and Sneddon 2016). Importantly, by framing the issue in this specific context and with the power achieved through the formation of the working group, the actors continue to gain power over the issue and the production of knowledge on the issue. While many stakeholders clearly articulated the concern for other mining constituents and geographic locations beyond the reservoir the concerns highlighted in the meetings and media continue to reflect limited scale and scope set by the working group process.

Not only does this knowledge production demonstrate the dialectic of knowledge production and the network of the working group, but also alludes to how other material elements have shaped and continue to shape the processes to address the water quality. In particular it is necessary to recognize the ways in which water and society are not separate, but continue to shape one another, such as how the development of the reservoir has shaped how the water quality issue is addressed. This includes both the scale and scope of the issue in that the way in which selenium acts in a lentic versus a lotic environment. As society shapes water, it then reshapes society and our ways of dealing with water. The Lake Koocanusa reservoir was initially built to address water quantity issues (specifically related to flooding and energy produced), and now it has altered how a water quality issue is being addressed. This clearly shows how the political is embedded within the river basin environment, including water. We do not act on

water, but rather, what is a continuous process in which water and society shape and reshape each other.

Political ecology allows for an analysis which not only recognizes the underlying institutions and ecologies but also how individuals have agency over environmental schemes. Approaching the current processes in the Kootenai/y River Basin through this lens requires all the forces implicit in the ongoing management process to be addressed, and that close attention is paid to the individuals involved in shaping the management schemes.

While it is important to understand the apolitical facts of an issue, they only provide a slight insight into the dynamics of the water quality governance in the Kootenai/y River Basin. Utilizing political ecology, which calls for the application of different lenses to analysis an issue, provides more information understanding the forces that exist. Not only does this allow for a more in-depth analysis but provides the means to recognize how specific management schemes develop, who develops them and why, and how this varies depending on the context. This approach shows the reinforcement of specific schemes, such as the Lake Koocanusa Working Group, and how this occurs by the consolidation of power and application of the resulting authority, and how in the case of the Kootenai/y River Basin this does not fit within the framework of authority that has been established through institutions, legal frameworks, and policies.

Barriers Encountered in the Research Process

While conducting this research, I experienced multiple barriers through participant observation, interviews, and ironically the scale and scope of the study. There were a significant number of individuals who were not only helpful but encouraging of my involvement in the

current processes. Had it not been for these individuals I might not have had the opportunities to attend specifically the Lake Kooconusa Working Group. Not only was it challenging to access information on the working group, but attendance as an interested party was challenging in that there was little effort to extend an invitation to individuals outside the agency representatives. A vital element of the working group was the side discussion that appeared to occur between different individuals. I observed these interactions but had no facts to support the assumptions that other individuals and myself made regarding their purposes. Additional data and information was provided to me as I attended events in the basin. In maintaining respect for the assumed confidentiality of the discussions, because the individuals most likely were unaware of my position as a researcher, I have chosen not to include that information.

Positionality

My role in water quality governance in this transboundary basin as both a researcher and participant provided a unique position from which I was able to conduct my research. While I was upfront about my role as a researcher, there were times, specifically when attending the meetings, that I was unable to communicate my position to other individuals. This resulted in access to information that might not have been made available readily to me if my position was known. Additionally, being a researcher restricted what was communicated to me and who specifically spoke to me at break times during the meeting. Being a researcher, I was included in groups that did not approve of the current Lake Kooconusa Working Group process, and those that were driving this process had limited contact with me. I assume that this indicates their belief that I would be approaching the process critically.

There were multiple issues with conducting interviews including distance to individuals and the willingness of individuals to participate in a study. On numerous occasions, despite repeated attempts to contact specific involved parties, I was unable to speak with certain individuals either for an interview or any form of comment. In multiple interviews, the interviewees carefully structured their responses and even remarked that they did not want to speak on specific elements. Finally, the extent to which I had to focus this research on one specific area of water quality was a limitation that I feel needs to be addressed. While this research does unveil many of the dynamics around selenium pollution and mitigation, there were many elements beyond the scope of this research. These elements are addressed in a call for further research.

Potential Future Research

The application of the framework of political ecology in the Kootenai/y River Basin provides an initial engagement with the concepts; therefore, the limited scope of this thesis is itself a call to further research. To further address the issue of water quality management in the Kootenai/y River Basin there are three recommended elements to be further investigated.

While this thesis provides an initial introduction into the agency of specific actors operating in a relational network surrounding water management in this basin, further investigation through the lens of political ecology could reveal more on this issue. First, a brief introduction into the network of actors is provided, and what is revealed calls for more attention into the specific network dynamics and the claims and objectives of actors, which could provide more insight on the gaps and contradictions in the "state."

As part of nation-state dynamics, the framework of political ecology can provide a way of analyzing how specific management practices have become normalized in both Canada and the United States. This normalization or governmentality can result in the development of subjects through the internalization of practices and discourses on environmental management. This calls for engagement with the material and dialectical nature of water, as well as the formation of subjectivities. The way in which water transports chemical components and subsequently the way in which society has come to regard water as a means of disposal for waste might be of significant relevance to this issue (Bakker 2012). The subjectivities and perceptions of water and water quality present in the basin and how that has affected involvement in water management should, therefore, be further investigated.

This thesis provides an introduction into the history of the recent efforts to address water quality, but a more extensive historical account would allow a deeper understanding of the issue. First, this could provide the means to understand the formation of the relations of specific actors in the basin and how or why their actions are contradictory to broader policies related to water, national, and international. Additionally, this could provide a deeper understanding of the historical economic, political, and ecological forces which have shaped the interactions between water and society.

As mining operations continue and expand in the Kootenai/y River Basin, it is necessary that there is sufficient protection for the water resources. As the effects of the water contamination from these mining operations continue to be documented and become public knowledge more interest parties are beginning to express their perspectives on this issue. It is essential then to understand how the current processes to address this issue operate to not only

determine whether they are appropriate to address this issue adequately, but whether there is the opportunity for actors beyond the organizations involved to have a voice.

Further research needs to address the extent to which not only the water contamination is affecting the ecosystem but assess the extent to which management and government actions reflect policy. This needs to include the extent to which policy related to Tribes and First Nations influences the actions of governmental actors. This requires specific attention regarding the how Tribal requests have been ignored by the State Department in the United States and how the rights of First Nations being established in the treaty negotiation processes in British Columbia are incorporated into the efforts to address this issue. Additionally, research on this issue is needed to determine what the interests and concerns are of all interested parties in the basin. For there to be good governance, it is necessary that first common goals be established. From a shared vision the deficiencies and inconsistencies of water governance of the United States and Canada, as well as the water management primarily in British Columbia can then begin to be tackled.

In addition to these areas for further investigation, this framework also elicits one to question why the purpose of this research. As political ecology is a normative approach calling for social and environmental justice, additional attention must always be given to the role of the research beyond the confines of academia. While social and environmental justice is called for in this framework, the unveiling of the networks of power in environmental issues often does not leave a clear opening for implementing change. This thesis, therefore, concludes with a call for research into how to affect change once the dynamics within a study site have been revealed.

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APPENDIX I: INTERVIEW GUIDE

1. What is the significance of the Kootenai/y River Watershed to you?
 - What has been your involvement with processes to address the water contamination?
2. What are your concerns regarding water in the basin?
 - What people or groups are affected by or interested in this issue?
 - How much pressure do you think is there for addressing this issue?
3. How have your concerns been addressed by the current management processes?
 - If this situation were to continue on its present course, what do you think would be the most likely outcome?
 - What do you see as the role of government in this international issue?
4. What would a successful outcome look like to you?
 - Are you likely to get more from a consensus-building forum than from another method of addressing the situation and resolving the dispute?
 - What is your best alternative to a negotiated agreement?
5. What are the constraints, if any, to convening a consensus-building forum?
 - In your opinion is there a potential commitment for decision makers to listen to and respect the input from a consensus-building forum?
 - What other information do you think is needed to address this issue?
6. Who else would you recommend I speak to regarding this?
7. Is there anything else you would like to add?