How competing narratives influence water policy in the Saskatchewan River Basin

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By
Hayley Katherine Jeanne Carlson
Saskatoon, Saskatchewan

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Head, Johnson-Shoyama Graduate School of Public Policy
University of Saskatchewan
Diefenbaker Building, 101 Diefenbaker Place
Saskatoon, Saskatchewan
Canada, S7N 5B8

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Abstract

The Saskatchewan River Basin (SRB) is a critical water source for the Canadian prairies, but competing stakeholder values and priorities challenge effective policy planning. Competing stakeholder perspectives are relayed through narratives that interpret the meaning of policy problems and outcomes in unique, and often conflicting, ways. The purpose of this research is to introduce a new way of policy planning in the context of the SRB through an investigation of Saskatchewan water narratives and the impacts they have on the way policy choices and outcomes are perceived. An NVivo-assisted narrative content analysis of stakeholder documents is used to explore the narratives of four key stakeholder groups, Industry, Aboriginal, Irrigation Agriculture and Environment. Results include a collection of references corresponding to key narrative elements such as characters, frames and causal theories. Next, key elements from the Irrigation Agriculture and Aboriginal narratives are entered into a water resources model developed for Saskatchewan and used as a lens through which to explore three alternative futures in the SRB – a future with present-day conditions, a future with an irrigation expansion and a future with irrigation expansion and climate change impacts. At least four distinct water narratives are shown to exist in Saskatchewan and results suggest that stakeholder perspectives differ on values and priorities in part because each group holds a different conceptualization of the decision space, and how that space will change in the future. Discussion around desirable policy solutions becomes difficult because advocacy for one policy outcome is associated with the collection of assumptions represented by key narrative elements. Further, each narrative promotes a different perspective on how the future will unfold, exposing decision-makers to real differences in terms of which costs and benefits are highlighted or obscured. Results show there are real costs when one narrative successfully influences the policy outcome but a competing narrative comes to more accurately represent reality. Ultimately, these findings suggest that specific measures to address competing stakeholder priorities around water use are vital to design more innovative and inclusive policy when planning for a future that is forecast to be increasingly challenging for the SRB.

Acknowledgments

I am sincerely grateful for the guidance and expertise offered by my Advisory Committee during the production of this thesis. Thank you to Graham Strickert for support in preparing for qualitative analysis and displaying qualitative results, as well as his knowledge and expertise around the Saskatchewan River Basin. I would like to extend particular gratitude to my supervisor Murray Fulton for encouraging me to look beyond the boundaries within which I first understood the problem and eventually find a more "interesting question."

I would also like to acknowledge support provided by Tim Jardine during the selection of quantitative narrative variables. Tim helped me understand different ways I might model prominent themes observed in the narratives.

And finally, I owe a tremendous amount of gratitude to my colleague and now friend, Elmira Hassanzadeh. Elmira provided permission to use the hydrological model $SWAMP_{SK}$ and set aside time to provide advice, generate flow data and review results. This research would not have been possible without her generosity.

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Table of Contents

LIST OF FIGURES

List of Tables

Chapter 1: Introduction

1.1 Competing stories of the Saskatchewan River Basin

In Saskatchewan, water from the Saskatchewan River Basin (SRB) is in high demand. The basin, serving as the primary water source for most inhabitants of the Canadian prairies, is inherently complex and faces a future of increasing uncertainty. Decisions about how to manage SRB water resources effectively and equitably are not straightforward and are complicated by stakeholders advocating very different and seemingly contradictory policy positions (Gober *et al.*, 2015).

Agricultural interests claim there is ample water and the province is letting it go to waste. Known as the breadbasket of Canada, Saskatchewan is one of the top food exporters in the world and derives a significant portion of its provincial GDP from agricultural production (MoE, 2015). To expand production potential in the province, a campaign led by irrigation interests calls for a massive 400% expansion in irrigation acreage around Lake Diefenbaker, claiming irrigation only consumes 2% of annual inflow into the lake - less than the amount consumed by evaporation - and that a 500,000 acre increase in irrigation would only raise this to 17% (SIPA, 2008; MoA, 2012). The campaign claims that the increased use of the water reservoir could contribute as much as $35 billion to the economy, increase food security and proof against drought (SIPA, 2008). The benefits advertised provide an enticing incentive to development as the province considers the proposal.

Meanwhile, academic and environmental interests assert Saskatchewan is facing severe water security concerns. The "impending crisis" (Schindler and Danohue, 2006, p.1) in what some regard as Canada's most threatened river revolves around emerging pressures from population growth, increased consumption and climate change (WWF, 2009; Martz *et al.*, 2007). The Saskatchewan River Basin (SRB) provides water to almost 70% of Saskatchewan's population (SEN, 2014) and management is shared between the three prairie provinces of Alberta, Saskatchewan and Manitoba. The basin is inherently complex to manage (Gober and Wheater, 2013), and fragmented governance and lack of robust data around water use make planning difficult (Gober and Wheater, 2014; WSA, 2012; Casey, 2010; Diaz *et al.*, 2009). Some have identified expanding irrigation as the primary threat to the province's water quantity and quality (Martz *et al.*, 2007). Research

highlights the vulnerability of the SRB system within which 83% of users depend on surface water; the agricultural sector alone already withdraws 56.3% (Tanzeeba and Gen, 2012; Martz *et al.*, 2007).

Elsewhere, aboriginal groups claim that the impacts of human development in the SRB has resulted in significant environmental degradation, and an erosion of their ability to live a traditional lifestyle (WSA(f), 2012; CCOWC, 2012; Casey, 2013). At the same time, industrial organizations assert their activities have no significant impact on hydrology (Vale, 2012) and that they meet the strict and world-class environmental regulations government has already put in place (PotashCorp, 2014). All groups expect government to act, but public servants say local communities hold contradictory expectations around government assistance and leadership, and don't grasp the big picture (Diaz *et al.*, 2009).

In these discussions of future SRB management, a variety of stakeholders with diverse expertise and perspectives provide evidence to influence decision-making. The Saskatchewan government appears to recognize the challenge posed by water management, and has launched the Water Security Agency in an attempt to consolidate water governance in one organization. The 25 Year Water Security Plan was subsequently released to "provide a sustainable approach to water use that will protect the quality and quantity of water now and for the future" (WSA, 2012, p.0). According to the Minister responsible for the file at the time, "[the] Government, with this Plan, is moving forward to address the challenges of [economic and population] growth" by "strengthening water management." (WSA, 2012, i).

The complexity of the basin, future growth challenges and inadequate governance frameworks are the three primary management challenges that have been identified (WSA, 2012). Traditional methods of policy analysis, featuring scientific and economic modeling, continue to be the norm (Gober and Wheater, 2014). The persistent emphasis on data, and calls for increased research on probable future conditions to address uncertainties, imply an assumption of evidence-based decision-making. In a rational decision-making model – such as the one provided by expected utility theory – the story of SRB water management, and in particular the decision to expand

irrigation agriculture, should be simple. To act in the public interest, understood as the sum of individual interests, decision-makers would act to maximize the gains over the cost (Stone, 2002).

However, contradictory evidence from diverse stakeholders suggests that water management in the SRB cannot be fully understood using a rational decision-making model. As evidence in competing narratives continues to accumulate, there is a lack of recognition that the debate around SRB water management is about more than facts. Rather, the debate is influenced by the ways in which stakeholders structure those facts within ideas about the policy objectives they wish to achieve (Gober *et al.*, 2015). While the discussion around water allocation may be debated in the language of science and economics, it is primed on ideas about what is right, as reflected in policy decisions (Stone, 2002; Flyvbjerg, 2004). Competing stories represent unique interpretations of the decision space that shape the ways in which discourse on future SRB management evolves. While these stories represent opportunities to identify unique policy solutions, they are too often regarded simply as a nuisance complicating the process of policy creation (WSA, 2012).

Even including the new socio-hydrology concept coined by Gober and Wheater (2013), research is only beginning to acknowledge the importance of understanding stakeholder perception and language (Gober *et al.*, 2015; Strickert *et al.*, 2016). Exploring stakeholder perception is critical to undertake recommendations such as making dialogue an explicit tool of management (EC, 2004), ensuring that water decision-making incorporates a range of values and perspectives about the meaning, value and use of water (Gober and Wheater, 2013), and the establishment of a mutual coordinated vision by the many agencies involved in water management (Diaz *et al.*, 2009).

Ultimately, competing stakeholder perspectives suggest a lack of consensus on the reality of the decision space, let alone an agreement on a desirable action. As such, rational methods of policy analysis are likely not sufficient to adequately plan the future of Saskatchewan's water resources. If the perception of reality is different for each stakeholder, and these differences are not pursued, contestation will continue to drift from the fundamental questions Saskatchewan needs to be asking about planning for the future, including a discussion about multiple values, the distribution of gains and losses, and risk in the face of uncertainty (Flyvbjerg, 2004).

1.2 Purpose and research questions

The purpose of this research is to introduce a new way of thinking about policy planning in the context of SRB water management. Research supporting decision-making in the SRB fails to take into account the presence of different realities for different stakeholder group. These realities, as contained in stories or narratives, influence decision-making and resulting policies may omit critical information that is present in a story with less visibility. On the other hand, these realities also contain clues to expand understanding and move beyond outdated methods of water governance. A focus on values and interests of specific groups, and the way these may shape how costs and benefits are represented, challenges the typical rational or modern way of thinking about policy planning.

In current discourse, it appears multiple 'stories' about water management in the SRB exist. Significant decisions and policy initiatives, such as a 400% expansion in irrigation acreage (SIPA, 2008), are likely to be influenced by a dominant story or framing of the issue. This story may have better predictive capacity, or is perceived as somehow more legitimate, sensible, valid or resonates with decision-makers in some way other stories do not (Cornelissen and Werner, 2014). One stakeholder group is likely to control the policy image and venue (Baumgartner and Jones, 1991) and their story will most strongly influence the perception of the decision space by decision-makers (Roe, 1994; Hampton, 2009).

The research in this thesis will seek to describe first, competing stories or narratives in the policy discussion around SRB water management in Saskatchewan and second, explore whether these stories truly present alternative representations of the decision space. This research examines alternative futures from the perspective of competing narratives in a quantifiable manner, with particular attention paid to the stakes when one narrative successfully influences the policy outcome but a competing narrative comes to more accurately represent reality.

Specifically, the research answers two questions:

Research question 1: What are the stories about SRB water management that exist in Saskatchewan?

Research question 2: What impacts do SRB water management stories have on the way policy choices and outcomes are perceived?

To answer these questions, the research proceeds in two phases. Phase I is a qualitative, narrative content analysis of relevant stakeholder documents using NVivo software. Key results of this content analysis are a collection of references corresponding to significant elements found within each narrative, which are used as variables during Phase II. Other results from Phase I research are narrative profiles for four stakeholder groups in the SRB.

Phase II research uses a water resources model to explore the quantitative differences in the focus that the two narratives impose on alternative futures. The water resources model that is used is $SWAMP_{SK}$, developed by Elmira Hassanzadeh (Hassanzadeh *et al.*, 2014), and is used with permission and assistance by the author. Ten narrative elements identified in the qualitative narrative descriptions are selected and transformed into quantitative variables either as-is (in the case of numbers) or derived, using a best proxy to represent the variable (e.g. the concept of decline in wildlife populations represented by deteriorating quality of suitable moose habitat). These quantitative variables are run through a series of simulations representing three alternative futures in the SRB: a future with conditions similar to present-day conditions (S0), a future with an expansion in irrigation acreage (S2) and a future with irrigation expansion and reduced flows due to climate change (S3). For each scenario, two sets of outputs – in the form of streamflows, dollar values and other narrative variables – are produced for each narrative. Outputs are indirectly contrasted to determine the costs and benefits each narrative highlights or obscures. In light of results, water policy implications for Saskatchewan are discussed.

1.3 Positioning the author

It is important to acknowledge the role the author may play in this research, and how the stories of which they are a part may influence interpretation. As MacIntyre (1984, p.216) states, "I can only answer the question 'What am I to do?' if I can answer the prior question 'Of what story or stories do I find myself a part?'" (in Flyvjberg, 2004). My background is in environmental science, and

at the time this research was conducted, I was also employed and engaged in extra-curricular activities involving environmental outreach and policy research. Further, I initially approached this research with concern about how a massive irrigation expansion could affect the ecological health of the Saskatchewan River Basin. Naturally then, there is a sense of shared perspective with environmental interests. To moderate how this could influence this research, I also pursued employment with agricultural interests, and secured a position with Agriculture and Agri-Food Canada monitoring the impacts of climate extremes on agriculture.

Acknowledging these stories, and how my own role within them may influence decisions made in this research, is important to remain transparent. At the same time, this research broadened my understanding of how the groups I have membership in strategically engage in policy problem definition, and has built capacity to critically examine the stories I play a role in perpetuating.

1.4 Outline of the thesis

As a general overview, this thesis provides a profile of the Saskatchewan River Basin (SRB), underscoring key management challenges in Chapter 2. Chapter 3 provides a literature review and constructs a conceptual framework based on work by researchers in the field. A detailed overview of the methodology is provided in Chapter 4. Chapter 5 and 6 detail results of Phase I and Phase II of the research, respectively. Finally, results and policy implications are discussed in Chapter 7.

Chapter 2: Water Management in the Saskatchewan River Basin

2.1 Introduction

Water policy in the SRB must be designed to manage the inherent complexities of the basin into an uncertain and increasingly complex future. Shifting natural and anthropogenic trends, competing stakeholder values and priorities and a fragmented governance framework will all challenge the development of effective water policy.

The sections in this chapter provide an overview of the Saskatchewan River Basin (SRB), with special attention paid in section 2.3 to the history of irrigation development in the area. Current and future water management challenges are explored in section 2.4.

2.2 Profile of the Saskatchewan River Basin

Geography

The Saskatchewan River Basin (SRB) is the fourth largest river system in North America, extending from the Alberta Rocky Mountains to Lake Winnipeg and draining a surface area of 405, 864 km^2 (PSRB, 2009). The North Saskatchewan River begins at the Saskatchewan Glacier in the Columbia Icefields and is fed by the Cline, Brazeau, Ram and Clearwater Rivers. The South Saskatchewan River begins further south in the Rocky Mountains and is fed by the Red Deer, Bow and Oldman rivers. As the NSR and SSR flow east, several additional tributaries add to the flow and the rivers eventually meet to form the Saskatchewan River at the Forks in central Saskatchewan. The SR then passes through the Saskatchewan River Delta (SRD), the largest inland freshwater Delta in North America at 10,000 km^2 and a nationally significant wildlife area (PSRB, 2009). The Saskatchewan River then flows out of Saskatchewan, into Lake Winnipeg and ultimately discharges into Hudson Bay.

The SRB extends through multiple types of land cover including grassland, cropland, mountains, forest and wetland. Winters in the basin are long and cold but typically sunny, while summers are short and warm (PSRB, 2009). Temperatures range from -40 degrees Celsius to +40 degrees Celsius (Gober and Wheater, 2013). Climate extremes are normal for this region, and the basin has a long history of cyclical drought and flood periods (Gober and Wheater, 2014). Most precipitation

falls in the spring and summer, with average annual amounts ranging up to 1500 mm in the mountains to as low as 300 mm in the dry prairie regions (PSRB, 2009).

The basin is supplied primarily by snowmelt as opposed to glacier melt, contrary to popular belief. Typically, the Rocky Mountains supply 80 per cent of snowmelt runoff, except in the spring when runoff from the prairie region is greatest (Pomeroy *et al.*, 2005). Surface water is primarily utilized in the basin, and although groundwater sources exist there is little data on the quantity, quality and location of this water (WSA, 2016). Natural flows in the rivers are highly variable across time – historical records at Saskatoon range from 14.2 m^3/s to 3940m^3/s, with an average flow of approximately 270 m^3/s (PSRB, 2015; WWF, 2009).

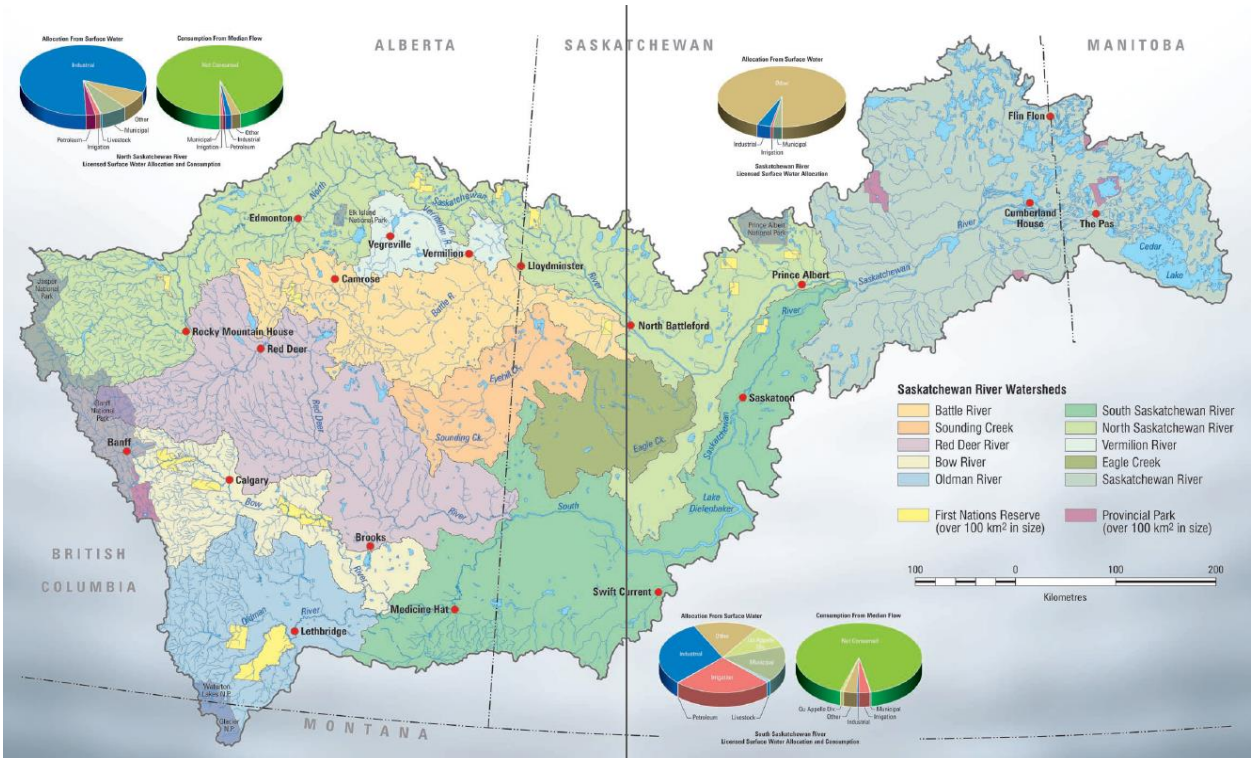

Figure 2.1. Map of the Saskatchewan River Basin and pie charts showing water use values in three sub-basins (PSRB, 2009).

Anthropogenic Elements

Saskatchewan comes from "kisiskâciwanisîpiy," the Cree name for "swift flowing river." Indigenous peoples have inhabited the basin for almost 11,000 years, using both horses and the

waterways to travel (PSRB, 2009). Today, Treaties 4, 5, 6 and 7 span the breadth of the basin. Including Aboriginal groups, the basin holds just over 3 million inhabitants, most of which reside in Alberta, particularly in Calgary and Edmonton (PSRB, 2009). Populations are decreasing in rural areas of the basin, while the urban centers are expanding in population and size (PSRB, 2009).

Water in the SRB supports a vast array of the socioeconomic activities in Alberta, Saskatchewan and Manitoba. Water provides for residential domestic use, municipal commercial and industrial services, industrial mining, oil and gas operations, thermal and hydroelectric energy production by major utilities, recreational uses and tourism, traditional activities of Aboriginal communities and maintains ecosystem integrity instream (Martz *et al.*, 2007; WWF, 2009). The basin is also located in a major food growing region containing 80 per cent of Canada's agriculture, including irrigation activities and livestock watering (Gober and Wheater, 2013).

Several major infrastructure projects along the river support economic growth in sectors such as hydropower generation, irrigation and tourism, and provide flood relief and water to municipalities. There are numerous dams along the river and its tributaries. In Saskatchewan, the Gardiner Dam creates the Lake Diefenbaker reservoir with the capacity to store 9.4 billion m^3 of water (Gober and Wheater, 2013). Downstream on the Saskatchewan River, the E.B. Campbell hydroelectric station has an installed capacity of 288 MW (Gober and Wheater, 2013).

Water Governance

In this thesis, water governance can be understood as "[t]he range of political, organizational and administrative processes through which interests are articulated, input is absorbed, decisions are made and implemented, and decision makers are held accountable in the development and management of water resources and delivery of water services." (Nowlan and Bakker, 2007 in Morgan, Patrick and Bowden (2014)). In the SRB, as in the rest of Canada, the framework for water governance is highly fragmented (Gober and Wheater, 2013; Gober and Wheater, 2014). The geographical basin boundaries overlap the political borders of Aboriginal, federal, provincial, and municipal governments. As per the 1930 Constitution Act, the Provinces and Aboriginal governments have primary control over land and resources but the Federal government may have jurisdiction where water intersects with health, Aboriginal land, and management of fish habitat.

The Governments of Alberta, Saskatchewan and Manitoba are responsible for water licensing, infrastructure, source water protection, the management of water quality and maintenance of drinking water standards (Gober and Wheater, 2013). Municipalities control local public utilities such as those that provide drinking water and wastewater services, and make land planning decisions around water features.

Activities of the Prairie Provinces Water Board, an interprovincial entity that governs flows across the three Prairie Provinces via the 1969 Master Agreement on Apportionment, adds an additional governance layer. This agreement requires Alberta to pass 50 per cent of naturalized river flow to Saskatchewan. In turn, Saskatchewan is required to pass 50 per cent of the flow at the Alberta-Saskatchewan border to Manitoba. Saskatchewan is also required to pass 50 per cent of the flow arising in the province to Manitoba (Prairie Provinces Water Board, 2009). This arrangement has historically worked well in terms of inter-provincial cooperation and information sharing (Gober and Wheater, 2014).

Significant management concerns in the basin include maintaining water quantity for users including the provision of adequate drinking water to the population, maintaining appropriate quality of water, managing risks from natural hazards such as droughts, floods and invasive species, and balancing water use between sectors, between human and environmental uses, and between upstream and downstream users (Gober and Wheater, 2013).

Water Use

Information on water use in the basin varies based on data availability and source, and seemingly corresponds to the nature of a group's interest in water. Some sources advertise ample water availability (PSRB, 2009; SIPA, 2008; MoA, 2012), while others discuss the threat of water scarcity (Gober and Wheater, 2013; WWF, 2009; Gober *et al.*, 2015).

Ultimately, there are many different water users in the SRB and different terms are utilized depending on the appeal being made. In general, water use can be divided into consumptive and non-consumptive uses. Non-consumptive SRB water use includes instream uses like ecosystem preservation, wildlife and recreation, sewage and wastewater breakdown (PSRB, 2015). Water

that is withdrawn from the basin can also be non-consumptive, such as water used during hydroelectric generation. Consumptive uses include drinking water provision, irrigation and industry use (PSRB, 2015). Additional water can also be lost during conveyance and evaporation. (PSRB, 2009). Water use is also discussed in terms of allocation, which includes water that is licensed or registered to a user. The differences between these categories become important when data is used strategically.

There are over 20,000 water licences and registered users in the SRB (PSRB, 2015). Water use data in Alberta, Saskatchewan and Manitoba often is based on these licences and if users do not use all the water that they are licenced to, this data may not reflect *actual* use (Hassanzadeh *et al.*, 2014). In general, more water is used in the South Saskatchewan River Basin relative to the North Saskatchewan River Basin. In the latter, the ratio between water withdrawn and consumed is very low compared to typical water supply (PSRB, 2015). Water withdrawal and consumption is also insignificant along the Saskatchewan portion of the Saskatchewan River, and includes primarily residential and instream uses (PSRB, 2015).

In the South Saskatchewan River Basin, the agricultural sector accounts for 86.5% of the water withdrawn, while the municipal, industrial and thermal sectors account for 8.7%, 1.8% and 3.0% per cent respectively (Martz *et al.*, 2007). The water *consumed* from these withdrawals accounts for about 35% of *average* flow in an *average* year (PSRB, 2009), but this percentage can increase or decrease depending on water supply. The majority of water is used by irrigation districts in Alberta, but in Saskatchewan the agriculture sector still withdraws the majority of water from the Saskatchewan portion of the South Saskatchewan River (Figure 2.2) (Gober and Wheater, 2013; Martz *et al.*, 2007). The World Wildlife Fund (2009) claims 70% of the natural flow is *allocated* in the South Saskatchewan River Basin, the highest amount on any Canadian river. According to this source, maintaining ecosystem integrity means that only 15 per cent of natural flow can be withdrawn from the basin (WWF, 2008). Others suggest that the status of the largest food producing region in Canada has come at the expense of water security (Hurlbert *et al.*, (2009) and Corkal, Diaz, and Sauchyn (2011) in Gober *et al.*, 2015).

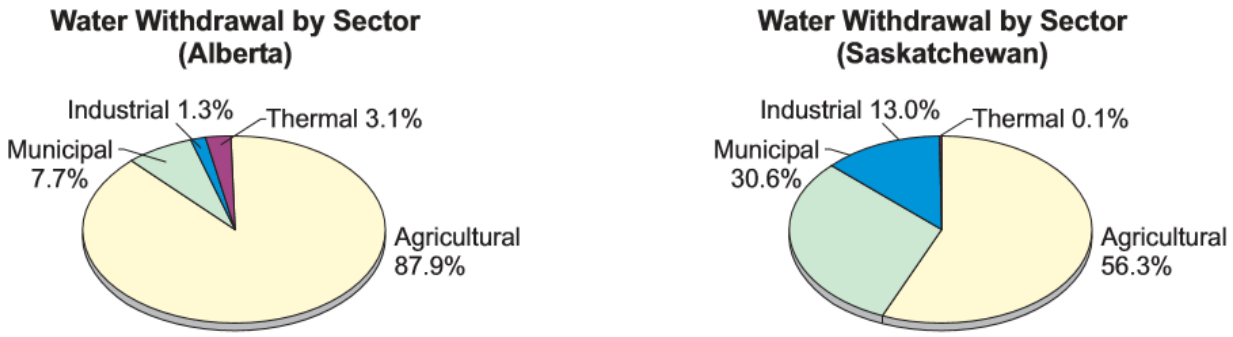

Figure 2.2. Water withdrawal from the South Saskatchewan River Basin by sector in Alberta (left) and Saskatchewan (right) (Martz *et al*., 2007).

Ecology

According to some sources, the SRB has been "profoundly altered by human activity" (PSRB, 2009, p.7). Water quality in the basin is degraded primarily by human activities, including both the use of water and through landscape modifications such as agricultural drainage, forest harvesting, and mining. The presence of fertilizers and other harmful runoff has increased through the 20th century and contributes to poor water quality (Gober and Wheater, 2014). Principle threats to biodiversity include habitat fragmentation from dams, weirs, roads, seismic lines, and loss of habitat (PSRB, 2009). In particular, dams along the river such as Gardiner and the E.B. Campbell modify natural flow patterns and restrict the flow of nutrients downstream, which threatens the health of natural areas (Gober and Wheater, 2014). Ecosystems along the river have evolved to thrive in conditions that depend on these natural flow patterns and require long periods of time to adapt to new conditions without a significant loss of function. Agriculture has significantly modified the natural landscape, turning much of the habitat surrounding the river into grains and forage monocultures (Gober and Wheater, 2014).

2.3 History of irrigation development in the Saskatchewan River Basin

Although the Palliser expedition in the mid-1800s declared the region unsuitable for human settlement and agricultural development, the southern stretches of the SRB are now one of the major, if not the most significant, food producing regions in Canada (Gober and Wheater, 2013). The basin provides water for 75 per cent of irrigated agriculture in Canada, and as outlined in the

section above, the sector is the largest water user in both Alberta and Saskatchewan (Gober and Wheater, 2014).

Although without a reservoir with the holding capacity of Lake Diefenbaker, irrigation is practiced much more extensively in Alberta. The province is home to 60 per cent of all irrigation in Canada (Bjornlund, 2010). More than 1.5 million irrigated acres account for almost 90 per cent of water withdrawn from the basin in Alberta, primarily producing relatively low value crops (GoA, 2015; Martz *et al.,* 2007). Relative to Saskatchewan, this extensive water use and rapid population growth has prompted recent water security concerns in Alberta. In 2006, Alberta closed new water licensing from the Bow, Oldman and South Saskatchewan River sub-basins (Bjornlund, 2010).

In comparison, irrigation development in Saskatchewan has been modest. The earliest recorded irrigation was practiced near Maple Creek by individual farms (SIPA, 2008). After the passing of the Northwest Irrigation Act that regulated the use of water for irrigation, acreage grew by 10,920 acres between 1894 and 1920. Rapid expansion was primarily due to a dedicated advertising campaign targeted at immigrant populations and by ranchers interested in maintaining reliable forage for livestock (SIPA, 2008; Stewart, 2015). Between 1920 and 1940 a stock market collapse, a decade of drought and the onset of World War II slowed development as unemployment, starvation and mass migration set in. Private irrigators added only 9,000 acres (SIPA, 2008).

In response to the difficult conditions of the 1930 “winter years” in Saskatchewan, the Federal Government transferred control over natural resource management to the provinces and developed a long-term assistance and drought alleviation program, passing the Prairie Farm Rehabilitation Act. With a mandate to develop drought proofing measures, the resulting federal Prairie Farm Rehabilitation Administration (PFRA) initiated a number of projects, including the creation of dugouts, wells, shelterbelts, pipelines, irrigation and short and long term storage (SIPA, 2008.) With the assistance of the PFRA, 61,000 irrigated acres were added to Saskatchewan through the 1950s and 1960s.

Through the 1940s and 1950s the PFRA and Province of Saskatchewan, led by Agricultural Minister Jimmy Gardiner, developed a proposal for the South Saskatchewan River Project which

called for the construction of two dams, 455,000 acres of irrigation agriculture and ample provision for municipal water use (SIPA, 2008; Percy, 2012).

The project was found to be not economically feasible. Among other independent studies of the time, a Royal Commission of Inquiry , tasked with reviewing the project in light of present day conditions, made the recommendations below:

> "1. The Commission finds that at present the economic returns to the Canadian people on the investment in the proposed South Saskatchewan River Project (Central Saskatchewan Development) are not commensurate with the cost thereof; though the Project would yield social returns which, while they cannot be measured for the purpose of this Report, would be of great value to the region in which it is situated.
>
> 2. The Commission recommends that, when the time comes that the Project represents the best use of water for irrigation, the present finding should be reviewed in the light of changing conditions." (Hogg *et al., (1952)* in SIPA, 2008, p.38.)

Specifically, the Royal Comission found the project costs, which included main works, reservoir construction, irrigation and pumping systems and land acquisition estimated at $247.9 million, would outweigh the benefits by $310,200 over the 35 years until the end of construction (SIPA, 2008).

Construction of the Gardiner and Qu'Appelle dams, in spite of the Royal Comission recommendation, was linked with the election of John Diefenbaker in 1957 (Percy, 2012.) Development began in 1959 and was completed in 1967 at a cost of $120 million, 80 per cent of which was provided from federal transfers. Another $200 million was spent to develop irrigation services in the years following until 1996 (PPC, 2004). After the completed construction and opening of the Gardiner Dam in 1967 a number of irrigation districts were formed around Lake Diefenbaker and an additional 220,000 irrigated acres were added to the province.

After this period of rapid growth, the expansion rate slowed into the early half of the 21st century. Currently there are over 350,000 acres of irrigation in Saskatchewan, primarily operated by private producers (Figure 2.3) (SIPA, 2008). There are also a series of 31 organized irrigation districts

split into four development areas; 30% of these are contained in the Lake Diefenbaker development area (SIPA, 2008) (Figure 2.4). Despite being a major water user, irrigation efficiency has improved tremendously throughout history in both Alberta and Saskatchewan, from flood irrigation to low-pressure sprinkler systems (Bruneau, Dupont and Renzetti, 2013). These water conservation efforts are not linked with a desire to protect water resources, and rather arise indirectly from cost-saving efforts in other areas such as maintenance of equipment (Bruneau, Dupont and Renzetti, 2013). The incentive to expand irrigation arises from the high productivity and net return on investment relative to the cost of water (Bruneau, Dupont and Renzetti, 2013).

Today, irrigation interests seek to expand irrigation acreage and generate additional profit for the industry. In particular, the Saskatchewan Irrigation Projects Association (SIPA) seeks to fulfill the intentions of the original SSRP proposal, lobbying for a 400% expansion of irrigation agriculture in five project areas around Lake Diefenbaker, increasing irrigation to 500, 000 acres.

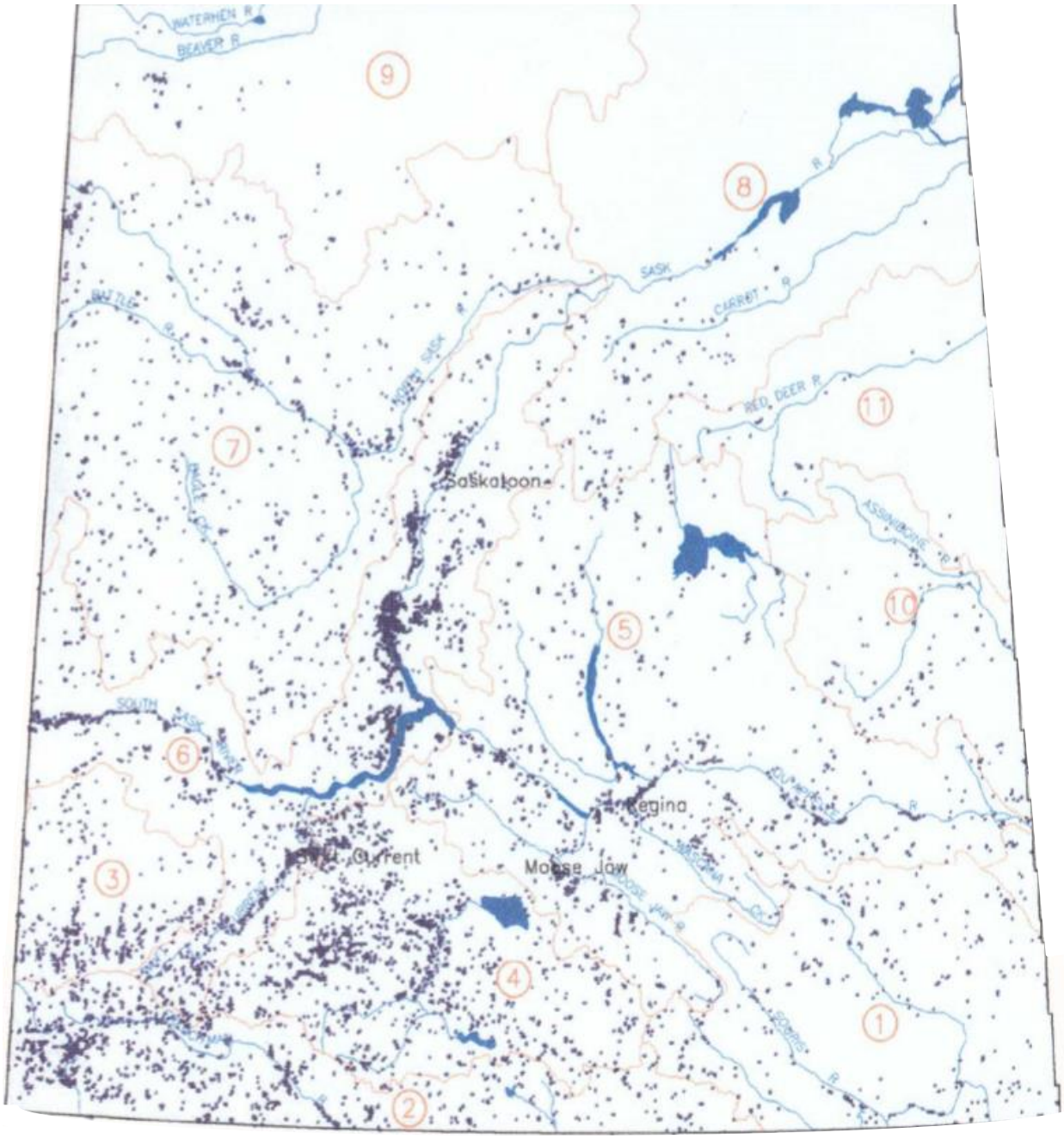

Figure 2.3. Irrigation in private operations across Saskatchewan in 2000 (SIPA, 2008, II p.6).

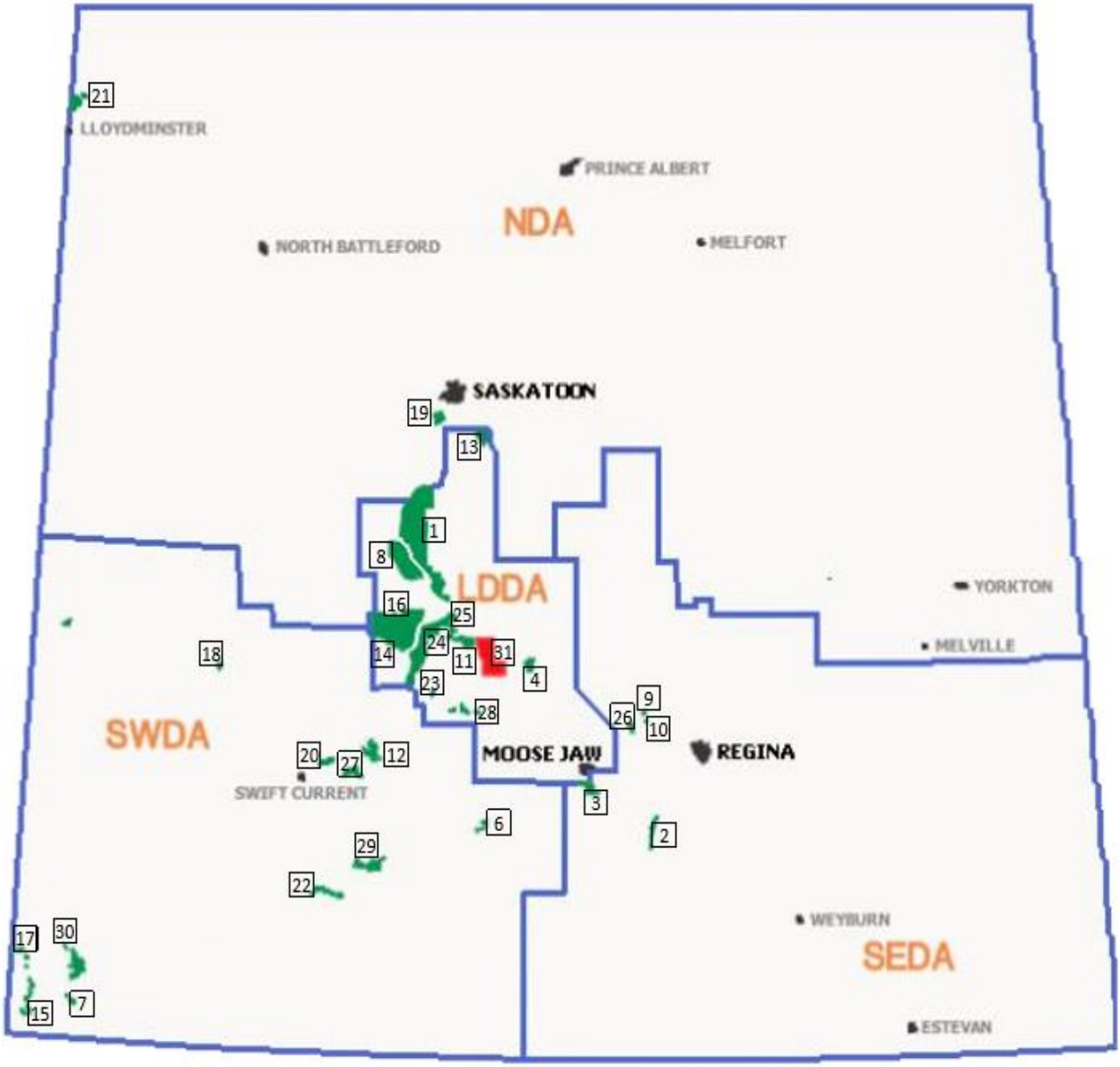

Figure 2.4. Irrigation in organized development areas and districts across Saskatchewan in 2000 (SIPA, 2008, II p.7).

2.4 Challenges and contention over water management

Globally, water decision-makers are facing escalating pressure to manage increasing demand, population and economic growth, and intense competition for resources (Bjornlund, 2010). Arguably, present-day conditions in the Saskatchewan portion of the SRB are less dire than this description implies. Water supply under *current conditions* meets most user needs with room for expansion, and the low level of development and population relative to Alberta places less pressure on the river system. However, equity and power dynamics under current conditions could be improved, and water quality or quantity issues are already present in some areas of the basin. In the future, however, Saskatchewan is posed to face major water security challenges from growing uncertainty and complexity inherent to the SRB (Gober and Wheater, 2013; Gober and Wheater, 2014). Source water supply from the province of Alberta is already under stress, and future changes in natural and anthropogenic trends will interact to put increasing pressure on decision-makers in Saskatchewan.

Climate change will contribute to both gradual changes in natural conditions and changes in the frequency, severity and timing of climate extremes. Changes in the processes of precipitation accumulation and melt, alterations in the timing of flow, a general decrease in water availability, shrinking mountain glaciers and a highly active precipitation cycle will contribute to water insecurity in the SRB (Martz *et al.,* 2007; Demuth and Pietroniro (2003), Comeau *et al.,* (2009), Moore *et al.,* (2009), Marshall *et al.,* (2009), Bonsal and Prowse (2003) all in Gober and Wheater, 2014). Future climate models generally forecast a moderate increase in both precipitation and temperature (by 1.5°C to 2.8°C), increased rates of evapotranspiration, and a decrease in water supply by an average of 8.4% across all basins in the South Saskatchewan River Basin (Martz *et al.,* 2007). This equates to an annual reduction of 546,000,000 m^3 of water (between 1996 and 2046), with the impacts spatially distributed across SRB sub-basins (Martz *et al.,* 2007). Climate extremes in the form of cyclical periods of flooding and drought have long played a role in the basin, but records show the 20th century demonstrated milder conditions relative to the paleoclimate record. A return to prolonged periods of drought or flooding, and perhaps even an increase in the severity of these climate events is expected in the 21st century (Bonsal *et al.,* (2012) in Gober and Wheater, 2014).

Population growth and development will add to water security concerns in the SRB. Saskatchewan's population in projected to increase to as much as 1.5 million inhabitants by 2040 (Statistics Canada, 2009). Simultaneously, the "enterprise-oriented" Saskatchewan Government is pursuing "economic growth that builds on…people, resources, and innovation to sustain Saskatchewan's place among Canada's economic leaders" (GoS, 2012, p.2). While this might increase the rate of industrial development, modelling by Martz *et al.,* (2007) suggests that even under high growth conditions, increased water withdrawals and consumption from other water use sectors will not be significant in the future. Rather, research suggests irrigation expansion will place the most intense pressure on water supplies (Martz *et al.,* 2007; Gober *et al.,* 2015). The irrigation sector is by far the largest consumptive water user, and capacity is currently underutilized in Saskatchewan, providing incentive to expand. Martz *et al.,* (2007) expects that only 50 per cent of river flow in the SSR Basin will remain for instream needs by mid-century, including pollution and wastewater breakdown, recreation and tourism, provision for the environment and room to absorb any additional demands that may arise from the uncertainty and variability of flows.

To add complexity, water policy must develop under a fragmented governance framework. While there are several advantages to fragmented governance in the basin, lack of basin-wide governance, miscommunication, lack of monitoring and consistency, and lack of support for stakeholder group involvement are among the disadvantages of the current governance structure (Morgan, Patrick and Bowden, 2014; Gober and Wheater, 2014). Multiple levels of government overly complicate the process of developing effective policy and there is often a lack of coordination, communication and respect between the actors involved (Gober and Wheater, 2014; WSA(m), 2012). Fragmented governance involves "too many ministries and agencies….in water management" and raises "the potential for conflicting or inconsistent decision making." Addressing this fragmentation was a key theme in the creation of the Water Security Agency; its creation has been labelled an attempt to "consolidate government's core water management expertise" (WSA, 2012, p.2). The performance of the Master Agreement on Apportionment in situations of non-stationarity – where changes in the natural system fluctuate outside of a previously anticipated range of variability – remains untested (Gober *et al.,* 2015; Gober and Wheater, 2014). There is concern Alberta would not be able to meet its 50 per cent quota under situations of extreme drought due to over allocation

of the South Saskatchewan River Basin and water trading (Gober and Wheater, 2013). Policy development will be further hampered by poor water use data for decision support; data is highly fragmented, not always collected and does not always reflect actual use (Gober and Wheater, 2014; Martz *et al.*, 2007; Hassanzadeh *et al.*, 2014).

Perhaps the most difficult challenge for future water policy in the SRB, and one less documented, is bridging the divide between competing stakeholder perspectives. On the surface, competing demands and priorities appear to register as recognized problems across all stakeholder groups and decision-makers (WSA, 2012). Gober *et al.*, (2015) and Strickert *et al.*, (2016) observe a wide range of discrepancy around the meaning of water security, sustainability and the barriers to achieving it among stakeholder groups in the SRB. For example, "sustainability" means the pursuit of economic development without a substantial change in business-as-usual practices for some groups, while for others the term relays concern for the environment, future generations, and social equity (Gober *et al.*, 2015). Similarly, some groups feel that trade-offs in water use are inevitable, while others feel that the water needs of all human and non-human users should be always met (Strickert *et al.*, 2016). Priorities are obviously different across groups and location upstream or downstream in the SRB. Industry representatives are more concerned with competing demands and quantity, while government and non-governmental organizations prioritize quality over both these factors (Gober *et al.*, 2015). Further, water users upstream in Alberta tend to hold a more pragmatic view of sustainability emphasizing reliability, compared to downstream users in Saskatchewan that hold to an idealized view of sustainable water use (Strickert *et al*., 2016). But as this thesis hypothesizes, these perspectives may not only differ in terms of values and the best course of action, but also in conceptualizing the reality of the decision space and how it will change in the future. Stakeholders not only have very different ambitions for the future, but also different ideas about the future conditions that policy will operate under. That "poverty, human greed, human values" (p.65) were among the listed barriers to achieving water security in research by Gober *et al.*, (2015), suggests a connection to deeper conceptualizations of reality that move beyond questions of water, let alone the themes that traditionally dominant water management such as quantity, quality and reliability (Rayner, Lach, and Ingram (2005); Gober *et al.*, 2013).

Ultimately, Gober *et al., (*2015) and Strickert *et al.*, (2016) suggest successful water policy in the SRB will have to integrate and balance competing concerns and find points of mutual interest. To collectively plan in a way that can bridge the inherent complexities of the basin, while managing increasing complexity and uncertainty, stakeholders will first be required to work through competing values and priorities.

Chapter 3 provides a literature review that suggests this challenge posed by competing policy stories, or narratives, is best understood through a post-modern model of political decision-making. This model suggests policy planning turn from questions of probabilities and technical expertise to questions of values, risks and power dynamics.

Chapter 3: Background and Existing State of Knowledge

3.1 Cognitive foundations

Discussions around SRB water management are primarily focused on planning for the future. A key part of policy is planning, and in cases where the future is uncertain, stakeholders seeking to influence policy require a cognitive model to predict what the future will look like. Where uncertainty and complexity reside, such as in the SRB, there are more likely to be "contests" as stakeholders each try to present a viable model of the future which both aligns with their values and promotes their interests (Kaplan, 2008). The 'winner' of these contests usually promotes a model with better predictive capacity, legitimacy or resonance with other stakeholders or decision-makers (Cornelissen and Werner, 2014). However, what may be a gain for one stakeholder group may entail a very real loss for another. In this sense, there is no "view from nowhere" in policy planning, as success and failure depends on perspective (Flyvbjerg, 2004, p.290).

Perceptions, their origins and implications, have only recently been recognized as important in policy planning processes. Beginning mid-way through the 20th century, research began to analyze how power, structure and cognitive limitations affect the policy process. As Kaplan (2008) writes:

> "Early models of policy making, such as multiple rationalities (Diesing 1962), muddling through (Lindblom 1965), the clinical approach (Archibald 1970), or garbage can (Cohen *et al.*, 1972)…highlighted the importance of both cognitive and political forces in shaping strategic choices [.However,] they left open questions about the sources of interpretations, the process by which certain meanings came to prevail in the organization and the ways in which politics played out over time." (p.731)

Kaplan (2008) envisions a delicate balance between the agency to act based on knowledge and purpose, and the structural forces, like a frame, that constrain political actors and organizations. In turn, structural forces are shaped by political actors and organizations, presenting and acting according to their ideas about a likely future. In this way, the policy analyst also has a role in subjectively defining the problem and setting the policy agenda (Flyvjberg, 2004).

3.2 Phronetic planning and postmodernism

Fundamentally, this research will draw on a perspective largely absent from discussion around SRB water management, but also the wider view of policy in general. This perspective rejects the "rational planning paradigm" of modernism and seeks to incorporate values and interests with particular attention paid to power relations. This approach is what Flyvbjerg (2004) calls phronetic planning. Based off of the Greek term "phronesis," phronetic planning is more than just scientific or technical know-how and incorporates ethics, context and practicality into the policy discussion. As Flyvbjerg (2004) explains, Aristotle and many other Greek philosophers saw this type of planning as necessary and the most vital part of successful social organization. Values, interests and power relations are of interest and the focus of analysis is on answering four value-laden questions: "(1) Where are we going with planning? (2) Who gains and who loses, and by which mechanisms of power? (3) Is this development desirable? (4) What, if anything, should we do about it?" (Flyvbjerg, 2004, p.290)

Along these lines, research and analysis in this thesis will be loosely guided by a postmodern constructivist ontological and epistemological perspective and draw a distinction between a modern and postmodern perception of political decision making. As Flyvbjerg highlights, modernity or realism is currently the most-widely used model to describe the political world. Whether labeled modernity, (Miller, 2002) rational choice (Schmidt, 2011), the rationality project (Stone, 2002), or consensus paradigm (Scolobig, Thompson and Linnerooth-Bayer, 2016), all models include the same basic tenets. Modernity, which began as a philosophical concept and gradually influenced the political world, is the assignment of reason to events, the view of history as a progression and the adoption of rationalization and secularization. Modernity defines our present culture, marked by hierarchical structures, institutions, bureaucracy, a mean-ends mental predisposition, the pursuit of progress and an incorporation of predictability and standardization (Miller, 2002). As modernity premises our understanding of how the world works, many political scholars view the current field of public policy, which is often full of contradictions, "as an unfortunate obstacle to clear-headed, rational analysis" (Stone, 2002, p.10).

In a more post-modern perception of public policy, the world is not rational. In general, postmodernism is critical of the way in which the current political world is imagined – a world in

which autonomous agents use freely available, all-encompassing information to agree on the facts of a situation and to decide what to do fairly and adequately through current representative political institutions (Miller and Fox, 2007). Postmodernism also rejects the current reliance on "instruments of universal truth" during policy analysis, as truth is contained in perception (Miller and Fox, 2007; Stone, 2002). Instead, the political world is envisioned as one of interpretation, in which the debates of political actors are based around the meanings of political values such as security, equity, efficiency and welfare (Stone, 2002). Stone (2002) for example, dubs this world as the *Polis* and contrasts it with the *market world*, the more widely accepted model of reality. The Polis is marked by concepts such as collective effort, simultaneous self-interested and altruistic motives, public interest, influence, cooperation, loyalty, passion and power – all of which challenge the assumptions of the market world perspective. In the market world, competition leads to overall societal well-being and information is accurate, complete and freely available. But in the Polis "interpretations are more powerful than facts" and political actors strive to control these interpretations using strategic manipulation (Stone, 2002, p.30).

Decision-making literature widely suggests that even in a modern world, decisions that are made are often not 'rational' in the way modern models of policy-making predict. Empirical evidence suggests that behavior deviating from the rational model drives society (Simon, 1985; Jones, 2003; Starmer, 2000). As Simon (1985) states, "we may deem [behavior] irrational because the actor is proceeding on incorrect facts…[or] has not drawn the correct conclusion…[or] has failed to consider important alternative courses of action…[or has not used] the best method…for adapting to uncertainty" (p.291). Limits to human cognition or "bounded rationality" (Simon, 1985) creates the possibility of conflicting perspectives and interpretations on evidence used to influence policy. In reality, a variety of ways of making choices interact during decision-making processes and action is constrained on multiple levels by individuals, institutions and ideas. Thus, interpretive schema are important to take into account even from the perspective of modernity.

Despite this recognition, however, the modern and postmodern model of policy planning approach competing perspectives in different ways. The rational model remains focused on reaching consensus, where stakeholders move from rigid policy positions to one optimal solution they can all agree on **(**Scolobig, Thompson and Linnerooth-Bayer, 2016). Conversely, the post-modern

model stresses compromise in complex decision spaces, recognizing the tendency for stakeholder groups to become entrenched in policy positions rather than be persuaded to change their minds (Scolobig, Thompson and Linnerooth-Bayer, 2016). Scolobig, Thompson and Linnerooth-Bayer (2016) argue the search for an optimal solution is a form of hegemony since policy solutions "will satisfy just one set of 'definition-holders' and reject the rest." (p.8).

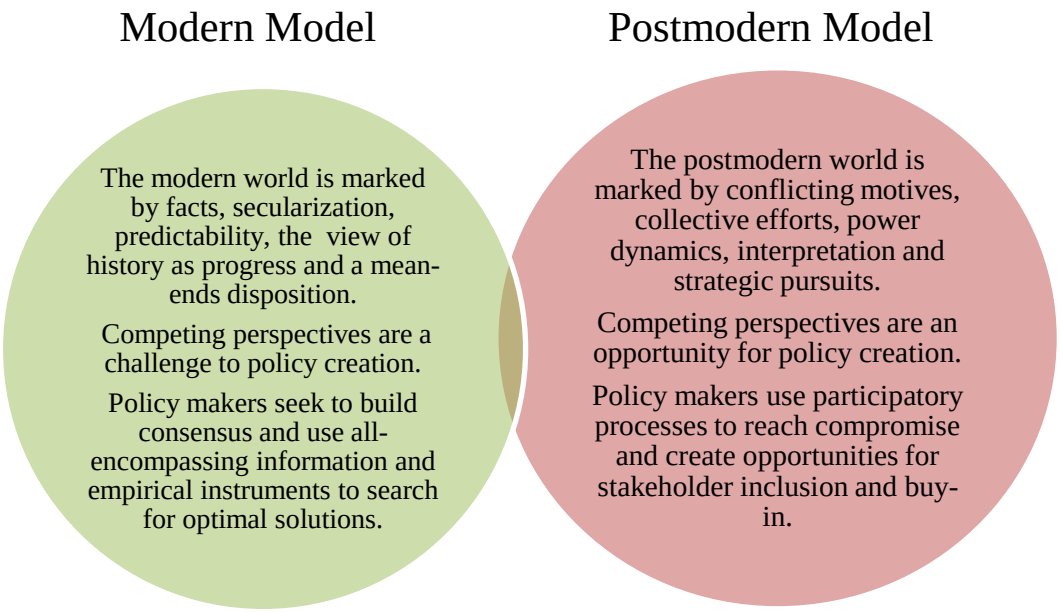

Figure 3.1 Differences between the modern and postmodern model of political decision-making.

Differences between the modern and postmodern lens of policy-making are summarized in Figure 3.1. This loose distinction between the models of political decision-making premises the discussion of SRB water management on new foundations. This decision space can now be envisioned as a world in which reality is created through interpretation by key stakeholders and knowledge is constructed through discourse. Information is limited, individuals act from within organizations to which they are generally loyal and there is a fine line between influence and coercion (Stone, 2002). Decisions are often not based on rational analysis and can be influenced by a variety of factors.

3.3 Narratives and narrative policy analysis

The postmodern conceptualization of the political world emphasizes ideas over facts and narratives as the means by which ideas are conveyed. Narratives are stories that connect ideas. As models of the future, narratives relay what will happen if the story events unfold (Roe, 1994), and help political actors anticipate events before they occur and imagine alternative futures (Flyvjberg, 2004). Typically, these stories contain similar elements such as a setting, a temporal sequence of events, characters, causal mechanisms, and morals (Roe, 1994; Jones and McBeth, 2010). Analysis of these narratives provides clues about power relations and values in a particular decision space, and how these could be changed to move in an alternative policy direction (Flyvbjerg, 2004). Uncovering the stories that political actors view as their reality is the first step to understanding how society can start to move in new directions (Flyvbjerg, 2004).

Jones and McBeth (2004) and Flyvjberg (2004) note many researchers consider narratives the earliest and most fundamental form of attaching meaning to experience. Jones and McBeth (2010) present persuasive empirical evidence from a variety of researchers in the social and neuro sciences that demonstrate narratives are the primary means by which individuals process and convey information. For instance, neuroscience researchers have shown that damage to the portion of the brain responsible for narration is more problematic then damages to other kinesthetic, mathematical, or linguistic cognitive functions (Jones and McBeth, 2010).

In decision-making, narratives underlie assumptions and typically are more visible in contexts with uncertainty, interdependence and disagreement (Roe, 1994; Hampton, 2009), such as water management in the SRB. Information used to participate in policy discussions are relayed in narratives, and thus "[t]he pretended privilege of the real world over the world of ideas is nothing more than the privilege of one discursive order over another" (Tribe (1978) in Apthorpe, 1996, p.18). Political actors use narratives to share ideas during discourse using a variety of techniques including words, symbols and numbers (Schmidt, 2011). Some of these techniques are explored in more detail in Section 3.4 below. While narratives may be used strategically to advance a policy position, the techniques used to express ideas within a narrative may not hold the same meaning to all those in a decision space, and narratives may hold different meanings across stakeholder groups (Miller, 2002).

Where narratives are present in a particular decision space, a dominant narrative controls decision-making, while other narratives exist as counter to the dominant narrative or as "non-stories" (Roe, 1994; Hampton, 2009). A dominant narrative is made successful by its ability to match with the external environment, the status of the story-teller, and the degree to which it is palatable to political actors, particularly powerful ones (Jones and McBeth, 2010). Within an organization, dominant narratives can be understood as contributing to the related concept of institutional logics. Institutional logics are socially constructed and repeated practices, assumptions and rules that guide how a group interprets, organizes and acts (Thornton and Ocasio, 1999). The term *logic* is useful as it reinforces how a narrative can be accepted as common-sense, particularly in a space where it is dominant. Institutional logics also influence the dynamics of power in and across groups by providing rules that shape levels of power, emphasizing certain issues and not others, and defining the 'rationality' and availability of policy solutions (March and Olsen (1989), Ocasio (1997), March and Olsen (1976) in Thorton and Ocasio, 1996). Across groups, it is clear how institutional logics could contribute to the type of conflict observed in the SRB. Indeed, Thorton and Ocasio (1999) note that the institutional logics embedded in the major institutions such as religion, the state and the family, are often contradictory and generally form the basis of most political conflicts.

Research techniques

Narrative policy analysis is the methodology used to investigate and record narratives in a particular policy space. In general, this process involves identifying the dominant narrative around a specific policy problem, and then identifying counter narratives and non-stories that exist in the same decision space (Roe, 1994). As a concept emerging from postmodern literature, narrative policy analysis tends to be post-structuralist in nature. As Flyvjberg (2004) asserts, "narrative inquiries into planning do not, indeed cannot, start from explicit theoretical assumptions. Instead, they begin with an interest in a particular phenomenon in planning that is best understood narratively" (p.299). As such, the approach taken towards narrative policy analysis is almost always inductive and qualitative, and is typically challenging to replicate and falsify (Jones and McBeth, 2010).

In general, research in this thesis pursues an approach less popular, and at times, vehemently opposed in the literature. The methodology employed is structuralist in nature and is thus primarily deductive, using a combination of qualitative and quantitative techniques to categorize and compare narratives. Closely related to the concept of modernity explored in the subsequent section, positivists emphasize the existence of an objective reality that can be uncovered through scientific method, and thus employ transparent and systematic methods in their research (Jones and McBeth, 2010). Post-modern scholars reject this methodology, as narratives contain interpretations difficult to isolate from the context within which they arise. These scholars assert positivist methods ignore subjective normative values underlying the decision space, attempt to generalize interpretations only comprehensible in the micro, and exclude marginalized groups (Fischer (2003) in Jones and McBeth, 2010). As such, much of the narrative policy analysis literature is modeled on early work by postmodern scholars (Jones and McBeth, 2010), particularly influential authors such as Fischer (2003), Roe (1994) and Stone (2002).

Positivist methodology however, may be beneficial to better integrate narrative analysis into the study of public policy. Jones and McBeth (2010) argue the use of a single methodological approach undermines the important role the narrative should play in public policy analysis. The narrative can be better integrated if empirical methods were used alongside poststructuralist methods (Jones and McBeth, 2010). Communications, marketing, neuroscience and psychology have a long history of narrative analysis in which the positivist approach is often employed (Jones and McBeth, 2010). In this methodology, research is deductive, the narratives are defined and demonstrated to have shared characteristics, and the researcher attempts to operationalize the structure of the story. Jones and McBeth (2010) advance one option for positivist-oriented narrative analysis they call the Narrative Policy Framework (NPF), in which they define narrative characteristics, and explore implications of different units of analysis. The authors further suggest anchoring narratives in a larger context, such as a cultural theory, partisanship or ideology, against which to measure narratives and deconstruct them for analysis (Jones and McBeth, 2010).

Borrowing these ideas from Jones and McBeth (2010), this research employs a mixed method structuralist approach to the poststructuralist concept of the narrative. In this approach, narratives are categorized and generalized, removed from individual interpretations and context. Narratives

are not anchored against a larger cultural or ideological concept, rather they are compared against a larger context of the "narrative", constructed from postmodern literature and elements borrowed from the NPF by Jones and McBeth (2010). In this sense, research techniques reflect a newer and emerging type of narrative analysis.

3.4 Framing, naming and numbers

The methods encompassed in policy narratives or stories are widely discussed in the literature under a variety of names. Apthorpe (1996) calls these "framing, naming, numbering and sense-making codes," while Stone (2002) refers to them as "symbols, numbers and causes," and Miller (2002) as "words, symbols and signs." However termed, these methods are utilized to advocate for one cause above another cause during strategic pursuits. These techniques are connected to interpretations of policy problems, and are used to express and defend specific conceptualizations of the decision space (Stone, 2002). To influence the *image* of the policy, actors attempt to strategically control the dominant interpretation of the policy problem through the use of rhetoric, symbols and policy analysis (Baumgartner and Jones, 1991). These techniques are present in all stages of policy production, and policy documents themselves have to be critically examined based on structure, function and performance (Apthorpe, 1996). While these techniques can be used in strategic manipulation they are also linked to the political actor's epistemology or how they conceive reality (Miller, 2002; Kaplan 2008). In other words, stories can be used to impact decision-making in both a subconscious and conscious sense as stakeholders actively try to influence decisions while drawing on legitimate conceptions of reality.

Techniques of interest in this research include words, numbers and frames. Words are important to tell stories and as symbols of overarching concepts (Stone, 2002). In the SRB for example, SIPA employs a narrative to symbolically represent the state of irrigation in Saskatchewan. Irrigation history is presented as a story of an unrealized dream (Stone, 2002) where the original promise of 500,000 acres from the SRB was never achieved and if expansion is not pursued, an era of climate change and food insecurity means a return to the hard times of the 1930s (SIPA, 2008). The Ministry of Agriculture reinforces this story, using words such as "unfinished business", "the

promise" and catchphrases such as "Saskatchewan has water, Saskatchewan has choices" (MoA, 2012).

Similarly, numbers are important techniques that Stone (2002) says can be used to simplify complexity, create the illusion of authority or excluded/included advantageously. For example, SIPA limits their analysis to water withdrawal at Lake Diefenbaker, stating consumption for irrigation agriculture is only at 2% and a full irrigation expansion would only drive consumption to 17% (SIPA, 2008). If the analysis is expanded to include the entire Saskatchewan portion of the SRB, it becomes clear that irrigation agriculture withdraws 56.3% and in Alberta, where irrigation expansion has already occurred, this number is well above 80% (Martz *et al.*, 2007). While the modernist perspective views numbers as objective and credible, postmodernity illustrates that measurement is subject to interpretation and manipulation.

Framing is another technique used in policy narratives of interest in this research. The construct of framing is widely discussed in the literature of many disciplines, most significantly social movement research by Erving Goffman in the 1970s. Frames are analyzed on the micro, meso and macro level of decision-making. Drawing a distinction between these levels of analysis is somewhat arbitrary as a micro-level cognitive frame or "knowledge structure that directs and guides information processing" could certainly contribute to a strategic frame as a "jointly constructed cognitive representation" at the meso level (Cornelissen and Werner, 2014, p.184). For the purposes of this research, framing will be analyzed on a meso level while recognizing its interdependence with framing on a micro and macro level. Furthermore, although framing will be examined in a discursive sense, there is an acknowledged link between cognitive and discursive framing that can prime actively constructed frames in a particular context (Cornelissen and Werner, 2014).

At the meso level, frames are constructed from the bottom-up, through cognitive interpretation and symbolic language (Cornelissen and Werner, 2014). Goffman (1974) describes frames as "principles of organization which govern the subjective meanings we assign to social events" constructed through interactive dialogue and negotiation across a group (Cornelissen and Werner, 2014, p.174; Kaplan, 2008). This definition of frames as interpretive systems that guide how actors

construct reality is useful as it highlights the subjective nature of meaning construction and interpretation. Kaplan (2008) draws a further distinction between diagnostic and prognostic frames that shape the understanding of the problem and correct solution, respectively. In this way, the act of "framing" refers to a process by which outcomes are constructed and "frames" are the resources through which actors can gain influence (Kaplan, 2008). While often invoked in discussions of strategy-making, frames do not necessarily solely exist at the conscious and purposeful level that is often explored in social movement research. Deliberately constructed frames are limited and facilitated by cognitive worldviews at the micro-level or taken-for-granted realities at the macro-level (Cornelissen and Werner, 2014; Kaplan, 2008).

Research in this thesis will draw on two definitions of framing: (1) the use of linguistic techniques to mobilize support and (2) an organization's understanding of their boundaries, the competitive rules of the sector and their relationship with the environment (Cornelissen and Werner, 2014).

Frames influence strategy-making at the organizational-level and are used to notice and interpret signals from the environment during uncertain times (Kaplan, 2008). Frames used in strategy-making are influenced by other frames present in an organization. Thus the frame that comes to dominate and change the power balance within an organization is a product of "framing contests" (Kaplan, 2008). In times of change and uncertainty, frames as schema of interpretation can help or hinder an organization. For example, rigid knowledge structures can bind organizations to a particular action path and blind them to alternatives (Cornelissen and Werner, 2014). However, frames can be more successful by incorporating the legitimate concerns of outside organizations (Kellogg, 2009). Ultimately, framing, as encompassed in the over-arching concept of a policy narrative, is a more useful model of decision-making than alternatives such as the garbage-can or muddling through models proposed by Cohen, March and Olsen (1972) and Lindblom (1959), respectively (Kellogg, 2009). Framing takes into account both agency and structure in decision-making, incorporates complexity, considers context and implicates purposeful action (Kaplan, 2008).

Thus, within this thesis, narratives will be examined with particular attention paid to how the use of words, numbers and frames contribute to unique perceptions of the reality of water management

in the SRB. The debated issues in the SRB can thus be understood as "contests over which frame should guide the understanding of an ambiguous environment and of choices about how to respond to it." (Kaplan, 2008, p.730).

3.5 Water management

Decisions around water management tend to be incremental, rendering water management organizations inadequately prepared for an uncertain future (Lach, Ingram and Rayner, 2005; Gober, 2013). Organizational and cultural differences are described as contributing to a divide between resource managers (Gober *et al.*, 2012). These differences could be described as water management frames that make cooperation unlikely between organizations with diverse interests and leave those in charge of water management poorly equipped to deal with uncertainty. Irrigation organizations, for example, have particular identities and ideologies that prime perspectives of water management. Although not often recognized as such, these organizations are key political actors influencing policy and are particularly motivated by legitimizing their existence in areas where irrigation opportunities have been used up (Suhardiman and Giordano, 2013). In their study of irrigation organizations, Suhardiman and Giordano (2013) suggest infrastructure development is pursued as both an end in itself and a way to maintain power. Common frames of these organizations involve acting for the common good of man and employing all water use for the benefit of man (Suhardiman and Giordano, 2013). Publications usually involved technical expertise and high-level information that reduce the issues to a technical matter more than one of human values (Suhardiman and Giordano, 2013).

In Canada and Saskatchewan, water management has traditionally relied on rational analysis and centralized decision-making, searching for silver bullet solutions (Gober and Wheater, 2014). Gober (2013) urges policy-makers to move beyond outdated methods of water management and pursue more innovative management strategies, such as envisioning multiple futures and designing flexible policies that work over a wide range of conditions (Gober, 2013). Several authors have argued adaptation efforts would be more successful if they incorporated place-based solutions and local knowledge, and meaningfully included a wider range of perspectives (Gober and Wheater, 2014; Roy, 2013).

In Saskatchewan, irrigation organizations have a long history as underdogs in the policy debate around irrigation expansion. Since the initial and unexpected building of the Gardiner Dam in 1957, SIPA and other agricultural interests have been petitioning the government for a credible commitment to irrigation development to no avail (Diaz *et al.*, 2009). This knowledge implies that SRB water management policy has been driven by other priorities, likely under the influence of an alternative, dominant policy paradigm.

Ultimately, the background and existing state of knowledge outlined in this Chapter suggests the best way to understand contention between stakeholder groups in the SRB is through the postmodern model of political decision-making. In this model, the reality of the decision space is shaped through interpretation, and contention is about meaning rather than facts. Narratives convey ideas about meaning using narrative techniques such as characterization, causal theories, metaphors and a strategic use of numbers. The subsequent Chapter outlines the approach used in this research to uncover the nature of these narratives in the context of the SRB.

Chapter 4: Methodology

4.1 Introduction

In the SRB, stakeholders tell stories that shape the reality of the decision space and complicate discussion around water management. As explored in Chapter 3, narratives are one means through which political actors communicate ideas about the meaning of particular policy problems and goals. These narratives influence decision-making around
water, and may obscure or highlight stakes associated with policy outcomes. This research seeks to discover what water policy narratives are present in Saskatchewan and how these may influence the perception of policy outcomes.

To answer these questions, research in this thesis proceeded in two phases:

I) Phase I research employs an NVivo content analysis of relevant stakeholder documents to test for the existence of multiple narratives around SRB water management in Saskatchewan, and to analyze their content. Four narratives are identified and profiled in Chapter 5.

II) In Phase II, a water resources model is used to model narrative elements to show the different perspective they offer on alternative futures, and explore the difference between the ways in which these stories may influence decision-making. Two primary narratives (*Environmental Decline* and *Stymied Irrigation Progress*) are selected for modelling based on their uniqueness, significance in terms of impact on water resources, and feasibility of variable extraction. *Narrative variables*, or variables representing key characteristics of each narrative, are then drawn from Phase I content analysis and added as inputs during Phase II into $SWAMP_{SK}$, a Saskatchewan water resources model developed by Elmira Hassanzadeh (Hassanzadeh *et al.*, 2014 and Hassanzadeh *et al.*, 2015). With $SWAMP_{SK}$ river flows for the South Saskatchewan River, North Saskatchewan River and Saskatchewan River are simulated for a 31 year period in three future scenarios. Scenario S0 simulates flows in a future in which conditions are similar to present-day conditions, and scenario S2 and S3 simulate flows in a future in which conditions are altered by irrigation expansion and/or climate change. Final outputs in the form of hydrological flows, water supply, dollar values and other narrative variables are compared to determine what kind of policy outcomes these narratives present to decision-makers.

A period of informal research was conducted up to a year prior to commencing research. This time was useful to gain insight into the decision space, and inspired the research questions. Efforts included attending several SRB water management workshops, informal discussions with stakeholders and several meetings to discuss usage of the $SWAMP_{SK}$ water resources model as well as previous findings. As noted in Chapter 1, employment and volunteering with two stakeholder groups (Agriculture and Agri-Food Canada and the Saskatchewan Environmental Society) was pursued to immerse in the "culture" of both organizations. Both contracts were part-time student positions focused on climate and weather monitoring communications (Agriculture and Agri-Food Canada) and public outreach around climate change impacts (Saskatchewan Environmental Society).

During this period of informal research, a variety of newspaper articles, technical reports, bulletins and presentations on the SRB from various stakeholder groups were collected. A thorough literature review was also conducted to orient knowledge collected during the informal research stage.

4.2 Phase I research: content analysis and narrative descriptions

To explore the types of water management narratives present in the SRB, Phase I research included assembling a catalogue of relevant stakeholder documents, content analysis with NVivo and detailed narrative profile development.

An initial list of SRB stakeholder groups was developed to begin assembling a catalogue for content analysis. The eleven stakeholder groups ultimately included in the catalogue include; Academia, Agriculture, Environment, Aboriginal, Industry, Recreation, Municipalities, the Prairie Provinces Water Board, Utilities, Water Advisory Groups and the Saskatchewan government. The final list is similar to the list of stakeholders derived through self-identification in Gober *et al.*, (2015). It should be noted that these general stakeholder groups are largely composed of several smaller sub-groups. Further, these groups are considered "stakeholders" only in the sense that they have an interest in the outcome of water policy in the province and tell a story about water. The

identification of stakeholder groups in this research is not intended to imply status of any group or equality between groups in terms of their relationship to water.

Using key word searches and stakeholder websites, a catalogue of 134 documents was compiled. Catalogue material encompasses eleven stakeholder groups in the Saskatchewan portion of the SRB. Documents are largely materials produced by the stakeholder groups including annual reports, studies and website materials. Other documents contain secondary data from published interviews, news articles and transcribed videos. Stakeholder groups, sub groups and associated material included in the document catalogue are detailed in Table 4.1 and Figure 4.1 shows a screenshot of the catalogue.

Coding was used only to provide a framework to guide additional qualitative analysis; documents were left to speak for themselves as much as possible. Coding was completed using the qualitative data analysis software NVivo to identify unique narratives and key characteristics of those narratives. A coding guide (Appendix A) was developed to direct the coding process, drawing on work by Jones and McBeth (2010) and Stone (2002) that outlines elements of policy narratives.

The coding guide is composed of series of questions designed to ease the process of identifying key narrative elements, and assist in the extraction of valid and reliable data. Of interest during the content analysis is the policy narrative, and the units of analysis are words, phrases, symbols and numbers.

Each stakeholder document was perused for filing purposes and then read to develop a sense of the content and story-line. Then documents were coded by main story elements (Questions 1 through 5 in Appendix A), followed by secondary story elements (Questions 6 through 10 in Appendix A). In an iterative process, codes were then used to draft a profile for each stakeholder group (Appendix C) and profiles were further summarized and compared across groups. This analysis formed the basis of Chapter 5, with section 5.4 and 5.5 serving as both an extension and validation of this process as documents were re-read and quotes were selected to illustrate the themes identified. A similar process for narratives not selected for modeling would serve as an extension and validation for these narratives as well.

Results were a series of parent nodes corresponding to ten narrative elements (Figure 4.2). Typically each document was coded for one or more main story element, where they were present. Additional references were coded multiple times in one document where quotes and themes stood out (in total 661 references were coded). Coding was primarily intended to gain a "feel" for the story and organize ideas; it was not intended as a rigid process. Not all story elements were present in all documents and in some cases documents coded for more than one story element. Coding was done rigorously for the main story elements where pre-defined categories existed, and selectively for secondary story elements. Not all documents from the catalogue were used during the coding process, and not all stakeholder groups have an identified a narrative. Stakeholder groups selected for final analysis were chosen for several reasons, including the relationship of their group to water resources in terms of impact and legal status, their relationship to other groups selected and the prominence of their story elements for analysis. Ultimately, any of the 11 stakeholder groups could have been selected for analysis; each would have served to illustrate the concept of competing narratives and highlighted new areas of consensus and divergence between groups.

Table 4.1. Type of material collected for each of the eleven SRB stakeholder groups in the document catalogue

Stakeholder	Sub-Group	Material Type	Documents	Total
Aboriginal	Cumberland House Residents	video, media, interviews	5	8
	General	consultations, studies	3	
Academia	Bioresources and Irrigation	articles	6	26
	Innovation, Technology and Commerce	articles	2	
	Engineering	articles	2	
	Science	articles	8	
	Global Institue for Water Security	articles, presentations	8	
Agriculture	Canada-Saskatchewan Irrigation Diversification	publications, web	4	25
	Saskatchewan Irrigation Projects Association	publications, web	3	
	Irrigation Crop Diversification Corporation	publications, reports	6	
	Media	media	10	
	Government and Academic	consultation, studies	2	
Environment	Canadian Parks and Wilderness Society	web	1	10
	Ducks Unlimited Canada	web	1	
	Nature Saskatchewan	report	1	
	Saskatchewan Environmental Society	web, publication, media	4	
	Saskatchewan Eco Network	web	1	
	World Wildlife Fund	report	1	
	General	consultation	1	
Industry	PotashCorp	web, reports	2	7
	Vale	presentations	1	
	Saskatchewan Mining Association	web	1	
	Media	media	1	
	General	consultations, studies	2	
Municipalities	Saskatoon	publications, web, presentations	3	5
	SK Government Water Use Study and Consultation	consultations, studies	2	
Prairie Provinces Water Board	PPWB	reports, studies	3	4
	General	interview	1	
Recreation	Lake Defienbaker and Saskatchewan Tourism	presentations, consultations	2	9
	Meewasin Valley Authority	presentations, reports	3	
	Sturgeon Management Board; First Nations Canoeing	web	2	
	General	consultations	2	
Saskatchewan Government	Mininstry of Agriculture	publications, web, interviews, studies	5	20
	Ministry of Environment	reports, interviews	2	
	Water Security Agency/Saskatchewan Water Authority	presentations, reports, consultations, int	11	
	General	consultation, media	2	
Utilities	Saskpower	presentations, web, studies	3	6
	SaskWater	reports, interviews	3	
Water Advisory	Partners for the Saskatchewan River Basin	reports, web	9	14
	South Saskatchewan River Watershed Stewards	web	4	
	General	interview	1	
			Total	134

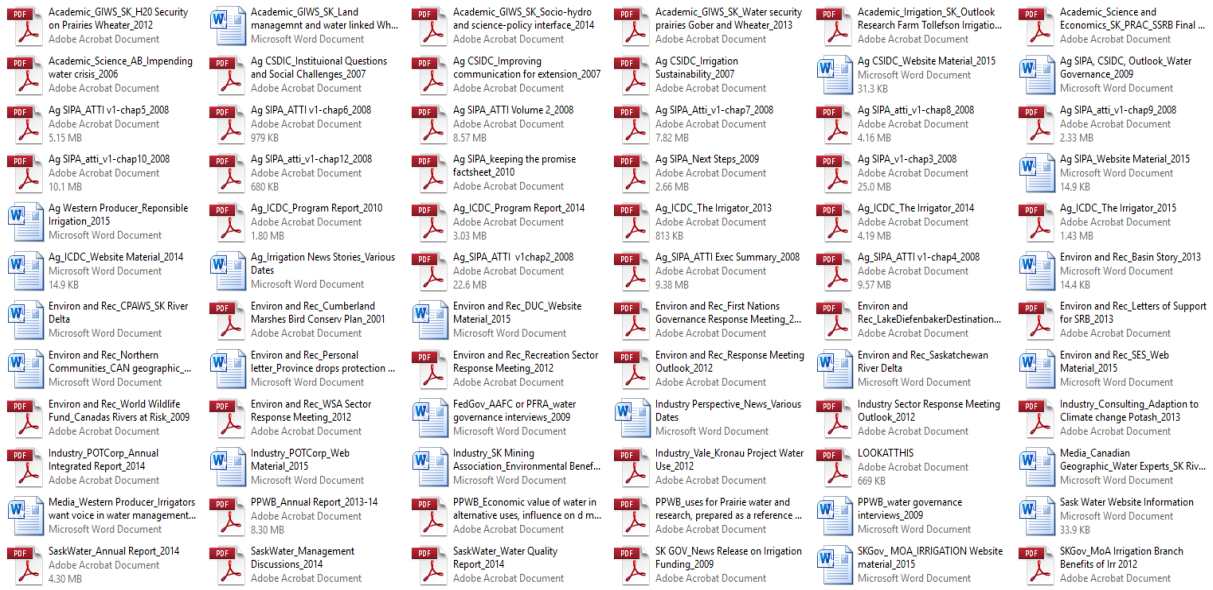

Figure 4.1. Screenshot showing a section of the 134 document catalogue of relevant stakeholder documents.

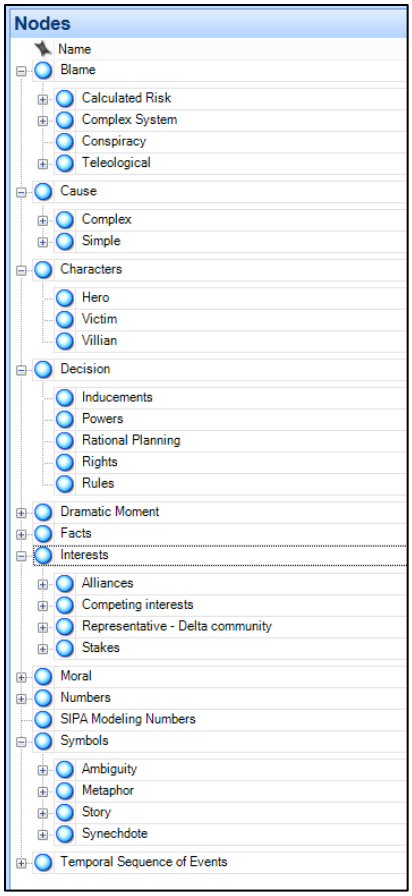

Figure 4.2. Screenshot showing ten parent nodes created in NVivo.

4.3 Phase II research: $SWAMP_{SK}$, variable selection and scenario analysis

To examine the ways in which SRB policy narratives may influence decision-making around water, Phase II research explores how two narratives assign costs and benefits in three alternative futures for the SRB. This process involves narrative variable selection and linkage to outputs from the water resources model $SWAMP_{SK}$.

$SWAMP_{SK}$

SWAMP, or the Sustainability-oriented Water Allocation Management and Planning model, was developed by former University of Saskatchewan PhD student Elmira Hassanzadeh and is described in detail in Hassanzadeh *et al.,* (2014) and Hassanzadeh *et al.,* (2015). $SWAMP_{SK}$ is a water resources model developed to simulate water resource system behaviour under a range of changes in water availability, demand, and water allocation policies.. The model draws on a systems-dynamics approach to water modelling that is widely used in the water resources literature and highlights the feedback loops inherent in water systems (Hassanzadeh *et al.,* 2014). Data for input into $SWAMP_{SK}$ was obtained from provincial authorities in Saskatchewan and Alberta. Inputs include apportioned South Saskatchewan River (SSR) and North Saskatchewan River (NSR) flows from Alberta, precipitation, temperature, industrial and municipal water demands, agricultural area, and the prices and costs associated with hydropower production, agricultural activities and potash mining (Hassanzadeh *et al.,* 2014). Water withdrawals are based on issued water licenses as opposed to actual or historical water demands, and operation of key reservoirs (e.g. Lake Diefenbaker) is based on target criteria for ideal release and storage to meet all water demands (Hassanzadeh *et al.,* 2014). $SWAMP_{SK}$ outputs take the form of river flows and water supply as well as net revenue from hydropower production, irrigation and potash mining (Hassanzadeh *et al.,* 2014). Permission to use $SWAMP_{SK}$ for the purposes of this research, including variable modification and addition, was obtained prior to modelling and Hassanzadeh provided continuous guidance and assistance in using the model and interpretation of outputs.

$SWAMP_{SK}$ models streamflows along the Saskatchewan portion of the SRB, and allocates water to agriculture, utilities, industry and municipalities along the river. Hassanzadeh *et al.,* (2014) find that $SWAMP_{SK}$ models observed values as well as the Water Resources Management Model, the model officially used by water management experts for decision-making in Saskatchewan and

Alberta. Discrepancies between modeled and observed values occur primarily because data is based on issued licenses, rather than actual historical withdrawal (Hassanzadeh *et al.,* 2014).

Note that some modifications were made to $SWAMP_{SK}$ between Hassanzadeh *et al.,* (2014) and Hassanzadeh *et al.,* (2015). These updates were made due to changes in how water demands were accounted for in the Water Resources Management Model by the province of Alberta (pers. comm. Hassanzadeh, Aug. 10th, 2016). In this research, scenarios from Hassanzadeh *et al.,* (2014) are utilized, but the irrigation acreage in these scenarios reflects changes made in Hassanzadeh *et al.*, (2015). Specifically, under the current conditions scenario, acreage is 40,000 ha in Hassanzadeh *et al.*, (2014) and is 21, 400 ha in Hassanzadeh *et al.*, (2015).

Narrative variables

Two narratives from Phase I are selected for modelling based on uniqueness, significance in terms of extent and type of water use in Saskatchewan, and for reasons of feasibility. Of interest within these narratives are elements of strategic representation – including words, stakes, numbers and frames. As explained in Chapter 3, stakeholders use a number of strategies within narratives to influence policy outcomes. For example, words are used symbolically to support the "plotline" of the narrative and numbers are manipulated to bolster authority, simplify complexity or create boundaries (Stone, 2002). Frames can be understood as boundaries on the policy problem or a focus area within the narrative, as the stakeholder group interprets their environment and their relationship with other elements in that environment (Cornelissen and Werner, 2014). Stakes assert what is at risk, and who will be impacted by a certain outcome (Stone, 2002).

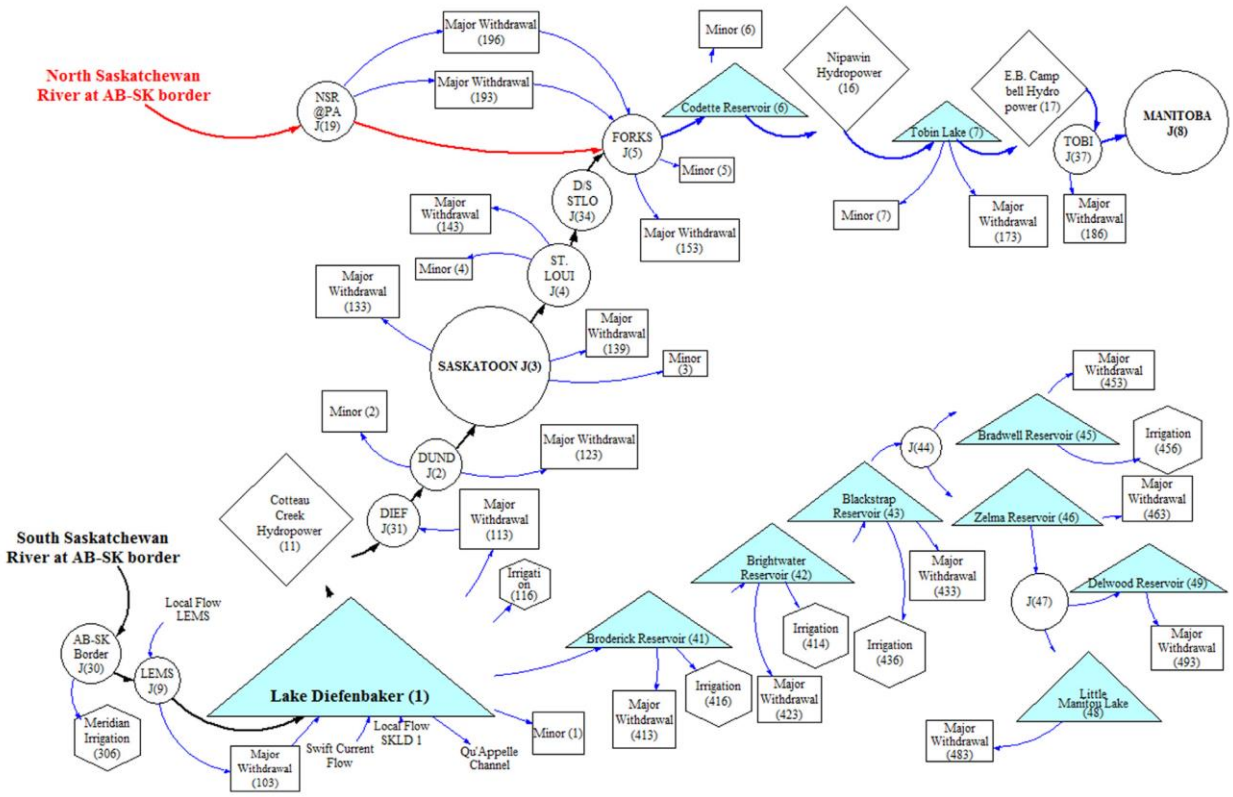

Figure 4.3. Simplified schematic of the $SWAMP_{SK}$ water resources system from Hassanzadeh *et al.*, (2014). The main flow of the SRB system (SSR, NSR and SR) follows the path of the thick black lines.

In Phase II, words, numbers, stakes and frames that encompassed major themes within both narratives are selected to serve as "narrative variables," and then linked with $SWAMP_{SK}$ outputs. These variables are either used directly as found in the text or a close proxy was found to represent them. For example, a 'word' selected as a narrative variable may have been a term used frequently within a narrative, such as "water quality." Thorough reading of the stakeholder documents may have revealed water quality was typically discussed in terms of nitrogen levels, and thus nitrogen would serve as a good proxy or indicator for "water quality" during modelling. In terms of frames, a frame can be anything that serves as a boundary for the stakeholder group's involvement with water in the SRB. A frame selected as a narrative variable could be geographical, such as flows into a major municipality, or temporal, such as flows measured during a particular decade or on a weekly basis. Framing could also be a variable modelled as a "loss" or "gain" of a certain asset based on water supply.

To successfully model the selected and derived *narrative variables*, each variable had to be linked to one or more of the inputs or outputs from $SWAMP_{SK}$, namely hydrological flows, water supply, revenue or irrigated acres. In the case of the "water quality" example above, nitrogen levels could be associated with either irrigated acres (as fertilizers) in Saskatchewan, or increased water flows from Alberta (where intense farming requires high levels of nitrogen inputs). For each narrative variable, the appropriate relationship with a $SWAMP_{SK}$ input or output is determined either from within the stakeholder documents or from supporting literature.

Other variables used in modelling include *stochastic variables* (fluctuating randomly based on probability) and *market and policy parameters* (variables that characterize water regulation and provision). Thus the final modelled narratives are a combination of stochastic, market and policy, and narrative variables (Table 4.2). All variables remained constant between modelled narratives except the five unique narrative variables.

Modelling

Elmira Hassanzadeh carried out the $SWAMP_{SK}$ modelling that simulates the data for this thesis. Hassanzadeh received specific instructions for the generation of raw flow data after several consultations with the author of this thesis, implemented them within $SWAMP_{SK}$ and then provided the simulation outputs to the author. Narrative variables were not physically incorporated into the $SWAMP_{SK}$ model, but were instead manually calculated subsequent to the generation of raw flows by the author.

Flow data is generated for three scenarios, simulating three different kinds of futures for the SRB. These scenarios were originally developed by Elmira Hassanzadeh (detailed in Hassanzadeh *et al.*, (2014) and modified in Hassanzadeh *et al.*, (2015)) and modelled in this research with only slight modifications in terms of time period and the addition of narrative variables. In the first scenario, S0, flows are generated 31 years into the future assuming future conditions will be similar to present-day conditions.

Table 4.2 The three types of input variables to $SWAMP_{SK}$ used during Phase II modelling.

Variable Type	Variables	
	SRB water narrative 1	SRB water narrative 2
Stochastic Variables	Apportioned South Saskatchewan River and North Saskatchewan River flows (monthly and annual from 1980 to 2010) Precipitation Temperature Evapotranspiration rates	
Market and Policy Parameters	Industrial and Municipal water demands Agricultural area (irrigated acres) Lake Diefenbaker operating policies 2012 prices and costs associated with hydropower Revenues and costs associated with potash mining (in 2012)	
Narrative Variables	Narrative 1 words, stakes, numbers and frames	Narrative 2 words, stakes, numbers and frames

Note: Table is listed with final narrative variables in Chapter 6.

In the next two scenarios, S2 and S3, flows are generated 31 years into the future assuming future conditions will change due to irrigation expansion and/or reduced flows due to the impacts of climate change (Table 4.3). Scenario 'S1' from Hassanzadeh *et al.*, (2014), representing only reduced flows from climate change, was not included.

Outputs from modelled narratives are assessed on a narrative variable basis. First, results from the S0 scenario are analyzed and assessed against the qualitative description of each narrative in Chapter 5. Then, results from modelling in the two alternative future scenarios S2 and S3 are assessed.

Table 4.3 Baseline and future scenarios employed during narrative modelling.

Scenario	Characteristics
S0 *No Change*	Historical flows SSR and NSR (1980 to 2010) 21,400 ha of irrigation
S2 *Irrigation Expansion*	Historical SSR and NSR flows (1980-2010) 107,000 ha of irrigation (expanded from 21,400 ha)
S3 *Irrigation Expansion and Climate Change*	Historical flows SSR and NSR (1980 to 2010) 107,000 ha of irrigation (expanded from 21,400 ha) 5% drop in historical flows for the NSR 8.5% drop in flows for the SSR

The subsequent two Chapters detail results from the two phases of research. Chapter 5 explores the content of narratives in the SRB and provides additional details around Phase I research and the narrative coding process. Chapter 6 describes scenario analysis, specific narrative variables selected for each narrative and the two sets of outcomes for each alternative SRB future.

Chapter 5: Narrative Analysis

5.1 Introduction

As explored in Chapter 3, policy narratives are one means by which political actors strategically attempt to control the conceptualization of a decision space. Political decision-making becomes a process of interpretation as political actor's debate over the meaning of values rather than facts (Stone, 2002). Actors with power control the interpretation, "guide[ing] the understanding of an ambiguous environment and choices about how to respond to it" (Kaplan, 2008, p.730).

Policy narratives imply choices exist and inspire a call to action (Stone, 2002). They unfold like a story - with a beginning, middle and end - and provide a glimpse into the future if events develop according to the plot (Roe, 1994; Stone, 2002; Jones and McBeth, 2010). These narratives are linked to subconscious conceptions of reality, and are employed in a conscious and strategic sense (Miller, 2002; Stone, 2002; Jones 2003; Kaplan, 2008). Thus there is a fine line between story and reality, as a political actor can be simultaneously aware and unaware of the narrative of which they are part. During strategic pursuits, stakeholders actively attempt to influence decisions by representing the world in such a way as to make their existence, services and preferred course of action appear to be the best option (Stone, 2002).

This chapter presents the results of Phase I research, exploring policy narratives that political actors and groups use to influence the decision space of the Saskatchewan River Basin (SRB). Preceding chapters explain the complex nature of management discussions in the basin, and list some of the stakeholders involved in these discussions. Eleven stakeholder groups, listed in Chapter 4 and in section 5.2, are included in the initial document catalogue built for content analysis.

Multiple narratives were detected during preliminary analysis. The narratives of four groups (Irrigation Agriculture, Aboriginal, Industry and Environment) are selected for more detailed analysis in section 5.3. An "Administrators" group, representing the combined documents of the Prairie Provinces Water Board and Saskatchewan Government, is also constructed for comparison purposes. Rational for narrative selection and the selection process are detailed in section 5.2

An in-depth description of the Irrigation Agriculture narrative, *Stymied Irrigation Progress* and the Aboriginal narrative, *Environmental Decline*, is provided in section 5.4 and 5.4. Both of these narratives were selected for modelling in Phase II research, explored in Chapter 6.

Narrative coding in NVivo was completed according to a coding guide (Appendix A) constructed using narrative elements described by Stone (2002) and Jones and McBeth (2010). Primary narratives elements coded included characters, interests, solutions and the assignment of blame and cause, while secondary story elements coded included symbols, dramatic moments, and the moral. Coding is intended as a tool through which to initially explore narratives, providing a framework to guide a more qualitative in depth analysis of the narratives in section 5.4, and particularly sections 5.5 and 5.6. As such, coding in NVivo is not intended to be exhaustive.

5.2 Selection of stakeholder groups and preliminary analytics

Narrative Selection

As detailed in Chapter 4, documents from eleven SRB stakeholder groups were included in the initial 134 document catalogue for content analysis. These groups include Aboriginal, Academia, Downstream Users, Environment, Irrigation Agriculture, Industry, Environment, Municipalities, the Prairie Provinces Water Board, Recreation, Utilities, the Saskatchewan Government and Water Advisory Groups. Initially this research sought evidence to examine the dominant water policy narrative in Saskatchewan. It was quickly recognized that the magnitude of this task was outside the scope of what could be accomplished within this research, considering the additional interest in modelling narratives. The narratives of government decision-makers would be the primary targets of such a task, and the document catalogue does not contain materials that would be best suited to this type of investigation. Further, many of the relevant stakeholder groups - the Prairie Provinces Water Board and three ministries in the Saskatchewan Government (Environment, Agriculture and the Saskatchewan Watershed Authority/Water Security Agency) – represent bureaucrats that support decision-making through administration and expertise, rather than exercising true decision-making power. Research techniques that push beyond publically available information, such as interviews or ethnographic research, are better suited to uncovering the narratives of actual decision-makers.

One document, a report by the Prairie Adaptation Research Collaborative (Diaz *et al.*, 2009), contains approximately 192 pages of interview excerpts from groups such as the Saskatchewan Watershed Authority and Saskatchewan Ministry of Environment around the capacity of their organization to address the challenges posed by climate change and water resources management. These excerpts provide unedited opinions of government bureaucrats not available in official public documents that make up much of the 134 document catalogue in this research.

Given this constraint, an "Administrators" group was constructed using 21 documents from the Prairie Provinces Water Board and the Saskatchewan Government group and is used for comparison purposes during preliminary analytics. Then, preliminary coding was completed on interview excerpts only, and is summarized in section 5.4, and further used to support discussion around theories of the dominant narrative in Chapter 7. A full analysis of this group is excluded due to limited information.

Other narratives are selected for full analysis because their documents were compelling, story elements appeared prominent, their group was believed to have a significant impact on water and each group's narratives appeared to favour contrasting causes and solutions. Preliminary analytics, including word frequency analysis and preliminary coding, helped guide the selection process. Ultimately, from the eleven SRB groups, four stakeholder groups (representing 41 documents) – Aboriginal, Environment, Irrigation Agriculture and Industry – are selected for detailed analysis. Ultimately however, any four groups could have been chosen and analyzed to illustrate the concept of competing narratives.

Despite similar concerns and content, Environment – with representation from groups like the Canadian Parks and Wilderness Society, Nature Saskatchewan and Ducks Unlimited Canada – is selected instead of Water Advisory. Environment appeared to employ a more intentional, advocacy-based strategy rather than advisory-based strategy that lends itself to this type of analysis.

Table 5.1. The ten most frequent words used in the document collection from four SRB stakeholder groups selected for primary analytics.

Primary Narratives Analyzed				For Comparison
Aboriginal	**Irrigation Agriculture**	**Industry**	**Environment**	Administrators
nations	irrigation	company	water	water
water	development	costs	saskatchewan	demand
first	project	plans	plan	saskatchewan
river	saskatchewan	total	use	basins
saskatchewan	farm	value	river	river
house	area	report	dams	use
delta	crop	potashcorp	report	total
concern	production	annual	conservation	2060
going	water	production	development	estimated
rights	use	income	flow	scenario

Economic | Natural and regional elements | Human footprint or consumption | Planning

Note: Words are arranged with the most frequent at the top of the least and the least frequent at the bottom. Colours are used for convenience to group words by orientation,

Although not explored in this analysis, some stakeholder groups appear to contribute to more than one narrative, or align more closely with another stakeholder group's narrative. For example, the Ministry of Agriculture theoretically falls into the Administrators stakeholder group but aligns more closely with the Irrigation Agriculture narrative.

Preliminary analytics

After selection of the four stakeholder groups for detailed analysis, preliminary analytics were completed on these groups to develop initial impressions and to gain a contextualized understanding of content. Results from a simple word frequency (Table 5.1) begin to show differences and similarities across groups, and are compared against a word frequency of the "Administrators" group. A colour scheme is added to this initial word frequency analysis to coarsely organize and compare the most frequent words used by each stakeholder group. The colour scheme represents words with orientation around natural or regional elements (blue), planning (purple), human footprint (orange) and economy (green). Words that do not fit into one of these four categories are left white to highlight which groups may have views that diverge from these categories.

Industry documents, followed by Irrigation Agriculture, contained the highest frequency of words with an economic orientation. Environment documents are concerned with the human footprint on natural or regional elements whereas Irrigation Agriculture focuses on natural or regional elements for human use. Environment documents contain words with a planning orientation, similar to the Administrators group results shown for comparison.

Notably, "water" was the most frequently used word in every stakeholder group (including those not pictured in Table 5.1) except Aboriginal, Irrigation Agriculture and Industry. Results suggest each of these groups most frequently employs self-referencing words in their materials. In other words, within their document collections, Aboriginal groups most frequently refer to their nations, Irrigation Agriculture to irrigation and Industry to their companies. Further, the list of top ten words for both Aboriginal and Irrigation Agriculture includes a place of residence, namely a farm and a house, indicating these groups may be more concerned with livelihood on a smaller scale relative to other stakeholder groups. Aboriginal documents also contain the most words that do not fit into the coarse color scheme developed, perhaps indicating that their concerns fall outside a view shared between other SRB stakeholder groups.

Although simple, this initial analysis narrows the focus for Phase 1 research and lays the groundwork for the narratives explored in more detail in the sections below. Industry and Irrigation Agriculture emerge as groups focused on operations and the use of water for human development. Environment is attentive to the consequences of human impacts on the environment, while Aboriginal groups appear concerned with their nations and livelihoods.

For comparison, Administrators appear concerned with predicting the future and planning to meet impending demands, leaving the impression of being less personally involved in the outcomes of the decision-making process. As mentioned above, this group is excluded from a full analysis but initial coding results are presented near the end of section 5.4, and these results are referenced during discussion of the dominant narrative Chapter 7.

5.3 Narrative analysis

Narrative analysis reveals that multiple stories about SRB water management exist, which may influence decision-making around allocation of water resources. As detailed in the previous Chapters, the future of water management is uncertain in the Saskatchewan portion of the SRB, and conflicts remain about the current status of water and how to manage the resource into the future. From a narrative analysis perspective, these conflicts can be understood as several contradictory, competing stories. Each narrative interprets the reality of the decision space and SRB water management problems in a unique way. Thus, "[w]hat often appears as a conflict over details is really disagreement about the fundamental story" (Stone, 2002, p.138).

In this section, overall narratives are briefly described. Next, raw coding frequencies are presented and briefly discussed. Then these results are interpreted and compared across stakeholder groups.

Four SRB Narratives

Stone (2002) isolates two general stories particularly prevalent in policy and then breaks these down into a number of variations. The first is a 'Story of Decline' where conditions were ideal in the past, have since degraded and if something does not interfere in the current decision space, a collapse will result. The second is a 'Story of Helplessness and Control' in which the decision space was previously considered out of control and can now be influenced.

Narrative analysis reveals all stakeholder groups employ a variation on the Story of Decline except for Environment (Table 5.2). *Environmental Decline* (Aboriginal) is a simple, but vivid story of a past paradise and traditional lifestyle given way to declining environmental conditions that have put an end to the traditional activities of indigenous peoples. *Stymied Irrigation Progress* (Irrigation Agriculture) begins with non-ideal conditions which temporarily improved due to development, and now continue to decline due to neglect. *Development Change is-an-illusion* (Industry) challenges the assumption that any significant changes will result from industrial activity and emphasizes continuous improvement - and less social and environmental impacts - into the future. *Development Conspiracy* (Environment), the single story of helplessness and

control, contends non-ideal conditions exist due to secret control by a group that has interfered for self-gain.

Coding results

NVivo was used to examine coding frequencies in the documents associated with each stakeholder group. These are shown by main story elements (outlined in Appendix A) in Table 5.3. For example, in the case of Aboriginal, 40 to 75 per cent of documents from that stakeholder group coded as a story of decline with an environmental theme, whereas less than 15 per cent coded as a Conspiracy story. It is important to note that Table 5.2 provides only an initial sense of where these stakeholder groups may fall relative to a main story element. For example, a document may have coded for one element and have been found to have multiple references to that element during re-reading. On the other hand, another document may have been coded for one element and only been found to have one reference. This is the case of "Solutions" for Environment. Data in Table 5.2 appears as if the narrative equally invokes inducements, rational planning and rules, but after a thorough reading of the documents with selected quotes, it emerges that there are many more references to rules than inducements and planning.

Although Table 5.2 only provides an initial understanding around main story elements within SRB water policy narratives, dominant frequencies of certain elements do emerge. However, it is also evident that there is considerable overlap between stakeholder groups,

Table 5.2 Four SRB stakeholder group narratives and main narrative elements.

	Stakeholder			
Story Elements	**Aboriginal**	**Irrigation Agriculture**	**Industry**	**Environment**
Story	*Environmental Decline* Cultural Decline Conspiracy	*Stymied Irrigation Progress*	*Development Change, is an illusion*	*Development Conspiracy*
Characters	Villain-Victim story	Villain-Hero story	Hero-story	Villain-Victim story
Interests	Competing interests (utilities, valid needs) Alliances (academia) Stakes	Competing Interests (government and environment) Alliances (producers, industry)	Alliance-oriented (environment, government, municipalities)	Competing Interests (irrigation,industry, 'development')
Cause	Intentional Mechanical	Intentional Mechanical Unintentional/Natural Institutional	Mechanical Unintentional Natural and Intentional	Intentional Natural Mechanical and Unintentional
Blame	Teleological*	Teleological*	Calculated Risk	Conspiracy Teleological*
Solutions	Powers Rights Rational Planning	Inducements Rational Planning Rules and Powers	Rules Rational Planning Inducements	Rules Rational Planning Inducements

*Assumes the unfavorable effects of the action taken were the intended effects of the actor.
Note: Larger text size indicates this element plays a more dominant role in the narrative based on

Table 5.3. Coding frequencies for the main narrative elements, arranged by the four SRB stakeholder groups selected for modelling.

Main Story Elements		Irrigation Agriculture	Aboriginal	Industry	Environment
Story	Decline: Environmental				
	Decline: Stymied Progress				
	Conspiracy Stories				
	Change-is-only-an-illusion				
Characters	Hero				
	Victim				
	Villian				
Cause	Unintentional				
	Natural				
	Mechanical				
	Intentional				
	Complex				
Blame	Calculated Risk				
	Complex System				
	Conspiracy				
	Teleological				
Solutions	Inducements				
	Powers				
	Rational Planning				
	Rights				
	Rules				

(%)
0
<15
15 to 39
40 to 75
>75

Note: coding frequencies refer to number of documents coded for this narrative element

suggesting that groups are using similar strategies to pursue policy goals. Further, is appears that the narrative of one stakeholder group is not discrete; one group may tell multiple stories, or a hybrid of stories, or engage in multiple techniques to achieve their policy goal. The "narrative" is thus difficult to discuss as a distinct concept. This is in line with the school of thought that asserts the narrative does not lend itself neatly to a structuralist methodology (Jones and McBeth, 2010).

Some of these results are partly related to the limited nature of the document catalogue. Not all of the materials these stakeholder groups produce are the document catalogue and the results represent a specific snapshot of time. Narratives can of course evolve over time as conditions and interpretations change.

Comparing narratives

The nature of each narrative suggests that Industry has adopted a narrative strategy that attempts to minimize the negatives of the status quo while Environment, Aboriginal and Irrigation Agriculture pursue the offensive, seeking to change the status quo. Although intended to mobilize for different purposes, *Environmental Decline*, *Stymied Irrigation Progress*, and *Development Conspiracy* commonly invoke feelings of anxiety, moral condemnation and a sense that 'something needs to be done.' Stone (2002) argues the explicit or implicit assumption that things used to be better than they are now gives these stories dramatic tension. This tension may be partially explained by Prospect Theory, which asserts that framing options as a loss provokes stronger emotions and more risk-seeking behaviour (Kahneman and Tversky, 1979). Loss aversion, as well as emotional appeals that stimulate fear, anger, panic, distrust, or a desire for justice are all commonly invoked in policy narratives (Mercer, 2005:10).

On the other hand, *Development Change is-an-illusion* provides assurances that any negative externalities as a result of development are firmly under the control of industry professionals. "Change-is-only-an-illusion" is a variation on the *Story of Decline*, which attempts to mitigate the perception that certain activities are getting worse or more prevalent (Stone, 2002). Quotes illustrating the pattern of Industry's narrative are illustrated in Figure 5.1 – and in Figures 5.2 to 5.4 for the remaining narratives – and were selected from Industry documents in the catalogue.

These quotes emphasize that actual resources are under public control via government ownership and regulation. For example, Vale assures the concerned public that certain water infrastructure at the site of their project will be "owned and operated by SaskWater, which will be responsible for addressing any environmental concerns associated with those works" (Vale, 2012). In this way, the responsibility for proper regulation around environmental and social concern is assigned to a party other than Industry.

"gaining approval for any sort of mine is not easy, nor should it be"
"improve the safety record" *"extensive regulations"* "helping nature provide"
"no significant change" *"safest resource companies in the world"*
"overall effects…are not significant."
"operations are subject to numerous environmental requirements"
"regulations and permit requirements are becoming increasingly stringent"
"sustainable growth and responsible stewardship is embedded in everything we do – and it is a commitment that we take seriously" "we feel that we have a responsibility to the future"
"potash mining industry, which employed 5,041 Canadians and contributed $6.7 billion to Canadian exports in 2011"
"commitment to making a difference in the communities in which we operate"
"plan in place to minimize or, ideally, eliminate any adverse environmental effects and impact on the community"
"high corporate standards" "effective measures for dealing with these issues"
"Life matters most. Value our people. Prize our planet."
"the mining industry invests considerable human resources and millions of dollars every year in environmental stewardship"
"well-thought-out, scientifically based, effective plans for dealing with the potential effects"
"is not likely to cause significant adverse environmental effects" *"minimize our impact on the land"*
"continually look for ways to reduce the footprint"
"mining is a temporary use of the land that only uses 0.1% of available land in the province"
"SaskWater… will be responsible for addressing any environmental concerns associated with those works"

Figure 5.1. Quotes from Industry's narrative, *Development Change is-an-illusion* selected from Industry documents in the catalogue assembled. Colour and font effects are added for visual appeal only.

Characterizations add substance to the story-line. Relative to the policy problem, the heroes (protagonists and allies) have the ability to correct it, the villains (antagonists or opponents) are responsible for it, while the victims are harmed by it. Strategic characterization succeeds when addressing the problem appears to be in the interest of the public (McBeth *et al.*, 2005; Jones and McBeth, 2010).

To achieve this goal, both *Environmental Decline* and *Development Conspiracy* focus on villains and the victims they take advantage of. The actual villains are similar in both stories and include

Saskpower, dams and government planners, but in line with their conspiracy narrative, Environment targets all those interested in 'exploiting' water resources (Hughs, 2005). The Aboriginal narrative is more nuanced, citing "another way of life" in general as an antagonist (CCOWC, 2012). Victims are "the public" in both narratives, with a focus on Aboriginals peoples and Delta residents in *Environmental Decline* and downstream users for *Development Conspiracy*.

Development Change is-an-illusion orients around heroes, where corporations such as PotashCorp and Vale are "helping nature provide" and spending millions on conservations projects (PotashCorp, 2014; PotashCorp, 2011) (Figure 5.1). Alliance-seeking with Environment, government and municipalities strengthens this strategy. *Stymied Irrigation Progress* portrays "visionary" past leaders and irrigation development as heroes, but puts more emphasis on villains such as politicians and failing government frameworks. As quotes such as "you've been talking about it for years" (AECOM, 2009) in Figure 5.2 illustrate, villains are almost passive in this narrative, portrayed as antagonists primarily due to idleness, unpreparedness or ignorance rather than actively obstructing progress.

To round out the policy problem definition, each narrative assigns cause and blame. As Stone (2002) asserts, "policy debate is dominated by the notion that to solve a problem, one must find its root [] causes…" (p.188). In the rational world of policy creation, causes are objective, verifiable, usually singular and can be effectively addressed and eliminated through policy. In the postmodern political world, assigning cause means assigning responsibility, "placing [the] burden[] on one [group] over another" (p.189). Stone (2002) focuses on four types of causal theories which she distinguishes based on unguided versus purposeful action and intended versus unintended consequences. Narrative analysis reveals most SRB narratives contain at least partial elements of each of the four causal theories presented by Stone (2002), but certain theories emerge as dominant.

"the twentieth century will be characterized as an age of irrigation" "the time has come!"
"at the time visionary Canadian and Saskatchewan leaders" "leadership prevailed"
"the pace of irrigated development again slowed dramatically"
"unlike Alberta…progress towards…irrigation has been inconsistent and irregular"
"expanding acreage…was followed by…eventual decline"
"the promise of over half a million acres of irrigated farmland has remained unrealized"
"less than one fifth of the suitable lands have been irrigated"
"people don't realize we have plenty of water…in Saskatchewan we don't use enough of our water"
"we are consuming less than 5% of the annual inflow…in most jurisdictions that number is 80%"
"the people promoting the conservation and the wise use of water….are much more organized than us. So all we hear through the media….is we are going to be running out of water here, which is far from the truth"
"we are working well within the resource base"
"agriculture is our best chance for economic growth"
"87% of the benefits went to society as opposed to directly to the irrigation farmer"
"any irrigation expansion is going to be good for the province"
"irrigation development should be a no-brainer"
"Someone has to decide. Every time we delay this a few years with more studies or more investigations, the cost goes up. We need to make a start and a commitment."
"to the Politicians: you have been talking about it for years"
"the governments ability or inability to implement such a major undertaking should not impact the project"
"without a firm commitment with adequate funding, nothing will move forward"

Figure 5.2. Quotes from Irrigation Agriculture's narrative, *Stymied Irrigation Progress.* selected from Irrigation Agriculture documents in the catalogue assembled. Colour and font effects are added for visual appeal only.

In *Environmental Decline*, *Stymied Irrigation Progress* and *Development Conspiracy* the dominant causal theory is intentional which includes oppression, conspiracies and programs that cause harm. Stone (2002) calls this the "most powerful offensive position to take" (p.190) because it accuses a party of knowingly causing harm. The mechanical causal theory – purposeful action with unintended consequences - is equally as dominant in the *Environmental Decline* narrative, as there is an acknowledgement of competing needs, Aboriginal participation in dam development and dam operation proceeding as designed, but causing harm. These three narratives use a teleological strategy to assign blame in their causal theories – in other words they assume the harmful impacts were intended by the responsible party. As the name suggests, *Development Conspiracy* also assigns blame using a conspiracy theory, where consequences were *secretly* intended. Figure 5.3 shows quotes to this effect, as representatives from Environment ask if "industrial use of the floodplain…[is] a right or a privilege," (WSA(e), 2012, p.2) speculate that information presented is manipulated (Hughs, 2005) and question the transparency of water management decisions (WSA(e), 2012).

"water is fundamental to human life and the ecosystems that support that life"

"most Saskatchewan citizens view access to water as a human right and our rivers as public trusts"

"we lose 28 acres of wetlands per day in Saskatchewan"

"numerous dams and reservoirs and extensive withdrawals have substantially altered flow regimes in the South Saskatchewan system"

"climate change is threatening the future of the South Saskatchewan River"

"individuals downstream of Gardiner Dam are drastically impacted"

"as river flow is decreasing, water use is increasing. Canada uses more water per person than any other nation"

"construction of four more major dams…would effectively "drown" the river under a series of artificial reservoirs"

"how is development in the floodplain allowed"

"would like to understand the priorities affecting the water management decisions of the reservoir"

"how are ecological needs of the system determined and used in management decisions"

"there needs to be communication with users on what a water allocation license means"

"what will happen to this agreement in a much drier and hotter world? Will Saskatchewan honour its commitments?"

"which user gets priority when there is a water shortage"

"is industrial use of the floodplain…a right or a privilege?"

"ensure a constant supply of water for development, "use it or lose it" for more gas and oil, more mining, more intensive cropping…"

"private ownership of Saskatchewan's drinking water"

"commercial attitude about water"

"dismayed by the manipulation of information"

"selective nature of the information presented"

Figure 5.3. Quotes from Environment's narrative, *Development Conspiracy* selected from Environment documents in the catalogue assembled. Colour and font effects are added for visual appeal only.

Distinct from the other narratives, *Development Change is-an-illusion* encompasses mechanical and unintentional causal theories. Mechanical is dominant and emphasizes environmental incidents on site are due to fixable performance errors and the increasing difficulty of negotiating regulations and agreements (PotashCorp, 2014; Eggerman, 2014). The unintentional causal theory highlights that development inevitably causes some impacts. In this story, risk is the factor implicating blame – Industry is aware there is a possibility of unfavorable consequences but asserts that the benefits are worth the risk. Calculated risk allows for the tolerance of harm (Stone, 2002).

Notably, all narratives draw on what Stone (2002) calls "simple" causes, which are simple in that they assign responsibility to one actor or entity for causing one result. In contrast, "complex" causes - encompassing systems, institutions and history - work in complex ways to produce many results and advance a type of blamelessness, as no one actor can be entirely responsible. Politics tends to favour simple causes while social scientists favour complex causes (Stone, 2002). In this research, initial content analysis revealed complex causal theories were favoured by Academia, Water Advisory and the academic division of Irrigation Agriculture. For example, in recognition

of the institutional challenges of decision-making, irrigation researchers attribute limited irrigation expansion to increased public awareness of environmental and social issues, organizational challenges and bureaucracy, and realignment of government wealth (Hill and Tollefson, 2007).

The final and perhaps most significant main narrative element is the proposed solution to the problem that has been defined and assigned. The postmodern model shows political decision-making is a result of bargaining and voting as opposed to cognition as asserted by the rational model (Stone, 2002). Solutions are the forms of authority invoked to change and coordinate behavior. Usually more than one solution is promoted at once. In the postmodern world, authority is dispersed and disputed and goals are a means of gathering political support – portrayals of a future meant to enlist the aid of others in bringing it about (Stone, 2002, p. 243).

To address their policy problems, *Development Conspiracy* and *Development Change is-an-illusion* advocate for rules to be implemented or remain in place. Ironically, both narratives promote the same solution to a problem they often have opposite stances on, namely the impact of development on natural resources. Inducements – in the form of the "carrot" rather than the "stick" – is by far the most dominant solution touted in the *Stymied Irrigation Progress* narrative, especially in informal interview documents. In more official material such as websites and reports, *Stymied Irrigation Progress* also calls for rules in the form of 'sensible' food policies and stable frameworks representing a long-term commitment to irrigation development (SIPA, 2015). Inducements are demanded less commonly in *Development Change is-an-illusion* and *Development Conspiracy* and are commonly framed as a re-direction of funds or a donation of funds on behalf of the stakeholder group.

Environmental Decline is the most unique and interesting narrative in its proposed solutions, focusing on powers and rights. Quotes from the bottom of Figure 5.4 illustrate how this group asserts they are decision-makers in their own right. Rights imply special privilege to water, as enshrined in laws and policies, and in the case of *Environmental Decline*, sovereignty of the indigenous peoples of Canada. Powers seek to alter the decision-making body in some way, such as through an acknowledgement of Aboriginal sovereignty and inclusion of indigenous communities at a strategic level during planning. Interestingly, all four narratives call for some

degree of rational planning. This may indicate that stakeholders view the decision space as one that is modern and rational, in which decisions are planned and executed using freely available and whole information.

There are a number of supporting elements that contribute to the main narrative of the four stakeholder groups identified above (Table 5.4). In consideration of space, these narrative elements will be explored in more detail in section 5.4 and 5.5 below for only the two narratives selected for modelling. Some of these elements, namely a dramatic moment or synechdoche, are not recorded for Industry or Environment. These results should not be exclusively interpreted to mean these elements are not a part of the larger narrative of these groups. Instead, the absence of these elements are likely more related to the limited types of materials in the Industry and Environment document collection.

"everything on the land is alive, the water is alive" *"water is sacred"*
"the Delta is a gem and it's the 8th wonder of the world"
"and the land gave us so much more" "my identity comes from the land"
"it doesn't take science to know the delta is dying, but without science, the government won't listen"
"blames SaskPower's upstream dams for the delta's problems, particularly the nearby E.B.Campbell Dam"
"most of begins from when the Campbell Dam was built"
"we created a monster"
"hydroelectric dams kill downstream wildlife by turning natural flow patterns upside down"
"that lifestyle has changed quite a bit" "they cannot live off the land, that's the reality"
"decline in water quality" "cumulative impacts that continue to go unaddressed"
"numbers of muskrats dropped dramatically" *"disturbed and desecrated sacred sites"*
"mourns the trapping livelihood the dam cost him"
"struggle for most basic amenities that many Canadians take for granted"
"we've become victims of another way of life"
"we are pushed politically, economically, culturally to extinction"
"does not respect the First Nations Treaties and Traditional Rights or Teachings"
"there is no respect" "insulted by being called stakeholders"
"these are their rights that are being discussed"
"at the decision making table prior to the consultation"
"true consultation has to be at community level" "political and non-political people"

Figure 5.4. Quotes from Aboriginal's narrative, *Environmental Decline.* selected from Aboriginal documents in the catalogue assembled. Colour and font effects are added for visual appeal only.

In the following two sections the *Stymied Irrigation Progress* and *Environmental Decline* narratives are explored in more depth before modelling results are presented in Chapter 6. Section

5.4 and 5.5 are included to deepen understanding of the narrative content, demonstrate how the narratives connect directly to material from the stakeholder document library and provide a basis for variable selection in Chapter 6. Although each of the four SRB narratives above offer different and interesting perspectives, the Irrigation Agriculture and Aboriginal narratives were chosen for modelling for several key reasons. With regard to *Stymied Irrigation Progress*, agriculture is the largest water user in the SRB and if this narrative was to succeed strategically to influence policy decisions, this would have major implications for the future of water security in Saskatchewan. Further, in terms of feasibility this narrative contains many numbers useful for quantitative modelling purposes. On the other hand, *Environmental Decline* is a particularly unique narrative in that it embodies a non-western worldview absent from all other narratives. It also incorporates some of the environmental concerns and conspiracy elements present in *Development Conspiracy* but proposes unique solutions to these problems. Further, *Environmental Decline* represents concerns and voices that would otherwise be marginalized in this policy debate.

Table 5.4 Four SRB stakeholder groups and supporting narrative elements**.**

Story Elements	Stakeholder			
	Aboriginal	Irrigation Agriculture	Industry	Environment
Dramatic Moment	Frozen Muskrat - used to illustrate human (dam) impacts and loss of traditional lifestyle	"Shit or get off the pot" – used to illustrate the frustrating nature of government delays and lack of commitment	None recorded	"Shocking statistics;"deliberate manipulation of information from decision-makers/development advocates
Facts	Emphasize value of nature (Delta) that supports a traditional lifestyle, declining environmental quality, negative relationships with settler society and invisibility of Aboriginals in general.	Climate change used in whatever way is beneficial; water is regarded as an economic resource; the public will benefit most from expansion; development is delayed by government and economics.	Emphasizes the fragility of natural resources – water scarcity & climate change; industry role in stewardship and largely, only the positive aspects of development, mitigation and regulation-following.	Focus on the increasing scarcity of water; communicate sense of urgency/situation is bad; water is fundamental and owned by public; importance of ecological integrity.
Moral	A spirit of love, morality and respect; water as a human right and not 'owned'; need for protection of remaining spaces with indigenous and western knowledge.	the answer for threats to ag and rural populations as well as emerging security pressures is irrigation. Expansion will provide large societal benefits and is the rational thing to do.	We have a responsibility for sustainability and are meeting all the rules	Water is a human right and river public trusts; we should protect ecological integrity and develop with caution and supporting research
Metaphors	Water as sacred; Mother Earth; Delta as paradise; Development as a monster; government planning as schemes by "puppet masters"	Development like a call to arms to overcome delay – keeping the promise! The Time has come! Making SK grow!';SK a "sleeping giant" when it comes to production.	Operations as footprint – industry reducing this so it's as if they were never there (change is an illusion)	Big development plans in a "pink bubble;" Call to development is like a call to war; benefits of development dangled like fine jewels; water as a "public trust"
Synecdoche	Desecration of spiritual sites and muskrat decline	Almond growers in California used as an illustrative example of how much water Ag uses and other producers "Taking the fall"	None recorded	None recorded

Administrators

As stated above, only a preliminary content analysis was completed on the 'Administrators' group (Prairie Provinces Water Board and the Saskatchewan Government) and thus coding results are not presented in the tables of the above sub-sections. This sub-section will make note of some initial findings for this group, to support a discussion exploring dominant narratives in Chapter 7.

Preliminary results indicate the major theme from this group appears to be about locating control and responsibility in other groups. Stone (2002) calls this technique a "blame-the-victim" narrative. This narrative assigns control to the very people suffering from a problem, and asserts they have the responsibility to improve their own faulty behavior (Stone, 2002).

In the interview excerpts used for initial analysis, there is limited acknowledgment of the shortcomings of government response to climate change and water management issues (Diaz *et al*., 2009). Where acknowledged, this group appears to assign cause mechanically. Administrators are unable to perform up to the standards they should because their hands are tied through legislation, or they lack the legislation to make an impact, or the task falls outside of their organizations mandate, or they are not provided the resources they need to complete the task.

For example, a Saskatchewan Water Authority representative remarks, "the watershed authority was given no new legislation around source water protection….so really legislative responsibilities in terms of controlling pollutants to the stream are handled elsewhere in environment and agriculture" (Diaz *et al*., 2009, p.116) while Ministry of Environment representatives emphasize that responsibility to protect source water is *shared* between government agencies, particularly the Saskatchewan Watershed Authority. Or, in another instance, a Ministry of Environment representative remarks, "our role is to…allow development to proceed provided that there are adequate environmental safeguards…so it is not up to me to decide whether we should have oil and gas extraction. It's not up to me whether or not we should have a new reservoir built." (Diaz *et al*., 2009, p.158)

Where communities fall short however, it is usually intentional and a result of their attitude or lack of initiative or know-how. There is a "sense of entitlement" (Diaz *et al*., 2009, p.314) in communities that the government should provide financial support. One Administrator's representative asks, "who's responsibility is it when the rain doesn't fall, I guess it is the government's" (Diaz *et al*., 2009, p.33). At the same time, these communities are portrayed as hypocritical for displaying reluctance to have government involved in planning prior to a crisis in the community. According to this group, communities also do not take into account the big picture and lacked expertise (Diaz *et al.,* 2009)

Administrators appear to most frequently invoke solutions like rules and power under a general theme of proactive rational planning. Representatives from each organization in this group spoke about the need for a more streamlined management approach and integrated governance (Diaz *et al*., 2009). The Watershed Authority and Ministry of Environment mentioned public consultation, but in all cases it was assumed these consultations would be adjudicated by government officials and that the power to make final decisions would remain with government. There was also an expectation that community groups, like watershed advisory groups, would take on more of a leadership role – which exists as a contradiction to the general incompetence Administrators assign these groups.

This description could be expanded upon with further coding. At this stage however, it is useful to note that Administrators appear to engage in a narrative strategy unique from Industry, Environment, Aboriginal and Irrigation Agriculture. If a parallel between one of the four narratives examined in this research existed, it would provide clues as to the relative dominance of that group in the decision space. The fact that no parallel exists however suggests, as was stated earlier, that the material in the document catalogue assembled for this research is not adequate to explore the which water policy narrative is dominant in the SRB.

5.4 The *Stymied Irrigation Progress* narrative

According to Stone (2002), "Stymied Progress" is a variation on the Story of Decline and follows the general storyline, "[i]n the beginning things were terrible. Then things got better, thanks to a

certain someone. But now somebody or something is interfering with our hero so things are going to get terrible again" (p.142). Box 5.1 renders the coded *Stymied Irrigation Progress* into a story using the same formula.

Box. 5.1. The *Stymied Irrigation Progress* narrative written according to the formula provided by Stone (2002).

Due to a long-term drought, things were terrible for producers in Saskatchewan during the 1930s, prior to any water development (FACTS). But when the Prairie Farm Rehabilitation Administration was formed, and visionary leaders prevailed over the negative recommendations by the Royal Commission to build the Gardiner Dam, the situation began to improve for farmers (CHARATERS: Hero). Deliberate lack of initiative and leadership, inadequate funding and food policies (BLAME: Teleological; CAUSE: Intentional) from government (CHARACTERS: Villains) meant that irrigation around Gardiner Dam has developed far less than the original 500,000 acres envisioned and further development has been stalled, only occurring in phases (TEMPORAL SEQUENCE OF EVENTS; STORY; FACTS). There is potential that has not been realized and if rational planning took place, it would be clear that irrigation will bring wide-reaching benefits and increase our self-sufficiency (FACTS; SOLUTION). Thus, development should be pursued (MORAL). To realize this potential, the government must create a stable environment for development, primarily by committing to long-term funding arrangements (SOLUTION: Inducements). In the mean-time, producers will partner with industry for funding (ALLIANCES).

The interests of Irrigation Agriculture in *Stymied Irrigation Progress* are primarily represented by the Saskatchewan Irrigation Projects Association (SIPA), the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) and the Irrigation Crop Diversification Corporation (ICDC), with input from some smaller producer groups, the Saskatchewan Ministry of Agriculture and the Agrivision Corporation. Much of this narrative focuses on the past, placing the present in a domain of loss. The 20th century is characterized as an "Age of Irrigation" where world acreage doubled between 1900 and 1950 (Hill and Tollefson, 2007). Progress was made in Saskatchewan after the 1930s drought spurred development of new infrastructure, but growth declined to single digits beginning in the late 20th century (ICDC, 2014) and development since then has been inconsistent and irregular. As SIPA (2008) explains, "[a]fter an early start at the beginning of the 20th Century there have been stops and starts in expanding irrigation acreage, including the rejection of the South Saskatchewan River Project in 1952 only to see it start again in the 1960s. Expanding

acreage in the 1970s and 1980s was followed by a slowdown and eventual decline." (SIPA, 2008, I, ch.2)

Stymied Irrigation Progress is a clarion call to development. The call to expansion is reminisce of a call to arms, a metaphor which implies a specific remedy (Stone, 2002). To take up arms is to overcome great obstacles, ignore costs, persevere and "keep[] the promise" (MoA, 2012). "Even the Royal Commission of Inquiry…that recommended against the Gardiner Dam in 1952 believed [] there would be a time when irrigation could make the project worthwhile," says SIPA, "[and] [t]oday, that *time has come*." (AGCanada, 2008, emphasis added). Saskatchewan is a "sleeping giant" (Simes, 2014) and irrigation is a "no brainer" (Briere, 2014), "unfinished business" and an "[unfulfilled] promise" (MoA, 2012).

Water scarcity is not regarded as a constraint to growth in *Stymied Irrigation Progress*. In fact, "Saskatchewan has [many] choices" because of abundant water resources (MoA, 2012). Producers rail against agriculture's reputation as a large and wasteful water user, represented widely by the media in symbols like the California "almond farmer" who uses 4.6 litres to grow a single almond (Dyck *et al.*, 2015). SIPA maintains Saskatchewan irrigators are working well within the resource base; in most jurisdictions irrigation uses 70 to 80 per cent of flow whereas in Lake Diefenbaker, less than 3.5 per cent of mean annual flow is consumed (Diaz *et al*., 2009). Agricultural news outlets report only 2 per cent of available water is used to irrigate 110,000 acres (Lazruko, 2014). Saskatchewan Agricultural Minister Stewart insists the public doesn't realize how much available water Saskatchewan actually has. "In Saskatchewan we don't use enough of our water," he says, "and if we don't, someone else will." (Lazruko, 2014) Increasing irrigation to 500,000 acres, which would require 20 per cent of annual flow into Diefenbaker, is assumed not to jeopardize other water uses (Pratt, 2015).

In *Stymied Irrigation Progress*, water is an economic resource and a wasted opportunity if not used. This mentality is rooted in the history of development, as water was historically viewed as a vital component to settlement and progress (Hill and Tollefson, 2007). Stewardship of water involves putting it to good economic use and there is an expectation that water can be controlled. There are plans to "put water" onto the west side of the river, increase the "total water captured,"

"get extra water" by building a dam, "divert" some water from one system into another to "add flow" to southern Saskatchewan (Diaz *et al.,* 2009). But irrigation has been overlooked as other water demands have increased. Pederson of SIPA argues the public needs a history lesson on the Gardiner Dam. "The dam got constructed for irrigation. Period." He says, "It was the main and only purpose for it originally" (Pratt, 2015).

Irrigation Agriculture draws heavily on facts and numbers to make their case in *Stymied Irrigation Progress*. Under the rational model, if individuals are reasoned and educated the facts should "speak for themselves." Stone (2002) argues this model presupposes neutral facts – facts that simply describe the world and don't serve interests - exist. Yet a fact cannot exist separate from an interpretive lens, or the words and numbers it accompanies (Stone, 2002). Information is rarely pure and the people doing the interpretations aren't necessarily rational. For example, the concept of climate change in *Stymied Irrigation Progress* is presented both as justification for expansion and as propaganda generated by government and Environment. SIPA and the Ministry of Agriculture cite climate change as a reason for expansion in the event of both water and food insecurity (SIPA, 2008; MoA, 2012.) The CIDC indicates that climate change may actually increase the viability of irrigation and that irrigation would help provide stability in an era of variability (Diaz *et al.,* 2009). On the other hand, there are pervasive doubts that climate change will imperil the SRB, that climate change is 'man-made' and that climate change is even occurring. Government is described as being "in need of some education" and if the climate does change, the net benefits are believed to be positive (Diaz *et al.,* 2009). Some in favour of development suspect the warming climate is "more normal cycle than it is manmade" and that climate change may "cease…or go into a period of calm or…cooling" (Diaz *et al.,* 2009). The mention of the benefits of climate change but neglect of the negatives is characteristic of what Stone (2002) calls "issue framing," where a boundary is created that forces examination of one part of the policy problem while neglecting its other aspects.

Other facts drawn on in *Stymied Irrigation Progress* are less inconsistent and employed strategically. According to the narrative, irrigation would save rural populations and increase Saskatchewan's self-sufficiency. Success in jurisdictions with more established irrigation infrastructure demonstrates that "rural populations can stabilize and grow" under irrigation and

provide livelihoods that will retain populations (SIPA, v. 1, 2008). Irrigation is the reason for the high self-sufficiency rates of Alberta (33 per cent) and Manitoba (57 per cent) compared to Saskatchewan (10 per cent) (Simes, 2014). Further, what is good for irrigators is good for Saskatchewan, as the prime beneficiaries of irrigation are the public. An 1980 Alberta study identified that 87 per cent of measurable irrigation benefits go to society as opposed to the irrigator directly (Diaz *et al.*,, 2009; SIPA, 2008), and others have demonstrated the economic spinoffs for agriculture, industry and employment (Lazruko, 2014). In fact, some Irrigation Agriculture representatives argue most of the public is agreeable to more development on the rivers, especially grassroot organizations and educational institutions. Development would mean more infrastructure providing water to rural locations and economic benefits that would "trickle down" (Diaz *et al.*, 2009). Individuals are only reluctant to get involved because of the lack of commitment on the part of the government.

Irrigation is advertised as bringing economic, social and environmental benefits. Broad reaching benefits, the details of which are buried in a lengthy cost-benefit analysis, quells resistance from key sectors like Environment. Ambiguity creates room for consensus (Stone, 2002), as different interpretations can be read into the phrase "economic, social and environmental benefits." In SIPA's 2008 cost-benefit analysis of irrigation expansion, economic benefits are listed in great detail, followed by social benefits in terms of job provision, until environmental benefits are listed solely as the "water intensive ecology created by the irrigation economy that provides for and finances wetlands and wildlife development" (SIPA, 2008, p.4). Adverse effects are not listed until the authors note in their conclusion, "the social, economic, and environmental costs of irrigating an additional 1.5 million [hectares] would be significant, however, the feasibility of the proposed expansion was never fully examined (SIPA, v. 1 ch 2)." As one Irrigation Agriculture representative states, "development will have conflicts, but we need development and cannot impair it." (WSA(a), 2012)

Stymied Irrigation Progress culminates in a moral that lends support to the preferred solution of Irrigation Agriculture. Morals of policy narratives, understood as the meaning the audience is supposed to derive from the plot, makes the proposed solution appear necessary and feasible, and spurs prompt action (Jones and McBeth, 2010). *Stymied Irrigation Progress* declares irrigation as

the answer for threats to agriculture and declining rural populations as well as emerging food and water security pressures. Expansion of irrigation infrastructure appears the only rational course of action and will provide large societal benefits. The narrative lays cause and blame primarily on the delay and inaction of government, which has both failed to provide a long-term policy framework for expansion as well as adequate funding. The frustration around this point is highlighted by dramatic moments within the narrative, such as the exclamation of "shit or get off the pot" directed at government officials (AECOM, 2009). Thus what is required is a stable long-term institutional framework for expansion, long-term coordinated planning, and long-term public and private financing.

5.5 The *Environmental Decline* Narrative

According to Stone (2002) a "Story of Decline" follows the general sequence of "[i]n the beginning, things were pretty good. But they got worse. In fact, right now, they are nearly intolerable. Something must be done" (p.138). The narrative typically concludes with a prediction of crisis unless action is taken. With respect to Aboriginal, the story follows a similar pattern, as illustrated in Box. 5.41.

Box. 5.2. The *Environmental Decline* narrative written according to the formula provided by Stone (2002).

In the beginning, the environment was healthy with ample stocks of fish and wildlife (STAKES). The Aboriginals people lived in relative harmony with this environment, following natural patterns and cues, harvesting within their means and sharing between communities (FACTS). Due to oppression and conspiracies (CAUSE: Intentional) as well as development - which worked as designed and even employed some Aboriginals peoples, but ultimately caused environmental degradation (CAUSE: Mechanical) - industries like Saskpower, the government and another "way of life" in general (CHARACTERS: Villians) were able to take advantage (BLAME: Intentional) of impoverished and disempowered Aboriginals peoples (CHARACTERS: Victims). The environmental decline is ultimately a symbol for the decline of Aboriginals people, and has taken away the ability to live a traditional lifestyle and degraded their ability to engage in their history and cultural legacy (STORY: Cultural Decline). To address this decline then is not a simple environmental reform, but a new way of engaging with Aboriginals peoples that centers on respect, inclusion and attention (MORAL). Although planning and rights are important, a recognition of Aboriginals sovereignty will allow these communities to influence decision-making (SOLUTION: Powers).

Aboriginal interests in *Environmental Decline* are represented by indigenous groups with traditional land in and around the Saskatchewan River Delta and Diefenbaker Lake, many of which retain a connection to a traditional lifestyle. These groups include, but are not limited to, the Metis Nation of Saskatchewan, the File Hills Qu'Appelle Tribe, the Opaskwayak Cree Nation, Carry the Kettle Aboriginal, Shoal Lake Aboriginal, One Arrow Aboriginal, Prince Albert Grand Council, and residents of Cumberland House and The Pas in Manitoba.

Environmental Decline holds nature in a spiritual regard and champions it as critically important. Unlike *Stymied Irrigation Progress*, water is not perceived as a resource or associated with monetary terms. Powerful imagery and metaphors describe water as "critical to life" (WSA(f),

2012) "life giving" and "sacred" (CCOWC, 2012; WSA(m), 2012). The environment is described as a precious and alive, valued for both its intrinsic value as well as its ability to support AB culture. The earth is a "mother" (CCOWC, 2012), the river delta is a "paradise" (The Saskatchewan River Delta, 2009), "a gem and [] the 8th wonder of the world" ("wonder", 2010) and the delta is "dying" due to human influence (Casey, 2013). Aboriginals peoples are caregivers and stewards of the land from which they derive their identify (WSA(f), 2012; CCOWC, 2012). Like *Stymied Irrigation Progress*, *Environmental Decline* frames the present in a domain of loss, frequently referencing a more ideal past state that contained a pristine and largely undisturbed environment. As one individual states, "[t]he environmental damage that has [now] been done to the earth, we have yet to feel the full impacts of what this will do to our future and our children. The way we are living is not the way of the future" (CCOWC, 2012).

In stark contrast to *Stymied Irrigation Progress*, *Environmental Decline* relays significant concern around water quality and quantity in Aboriginal communities. Economic growth is perceived to be the primary agenda of Government, trumping even the provision of safe drinking water in Aboriginal communities (WSA(f), 2012; CCOWC, 2012). "The government doesn't care," says one individual, "I think there are people who are simply detached from morality…from respect for [life], land [and] water." (CCOWC, 2012). Government is described as scheming puppet-masters, foolishly trying to administer programs in areas they don't understand or appreciate (Carriere, 2004; WSA(f), 2012). The E.B. Campbell Dam is a "monster" preying on the lifeblood of the Delta by reversing the natural flow patterns of the Saskatchewan River (Casey, 2013).

Environmental Decline is not heavily grounded in facts or numbers. Limited numbers are used to support the decline story and are usually referenced from those used by Environment, Government or Academia. Instead, stories involving personal experiences are drawn on to demonstrate knowledge. These take the form of dramatic moments or synecdoche's – a figure of speech in which one part of the policy problem is used to represent the whole (Stone, 2002). In one story, a young woman relates a vivid moment of wildlife decline:

> *"The muskrat is a delicacy in the Delta, and it's a very healthy animal. It eats a lot of the vegetation, all the roots and it even eats the medicine from the roots of the aquatic*

vegetation. So, eating the muskrat is something that gives your body a bit of the health kickstart and not only for the meat, but also for the fur as well. But the numbers of muskrats dropped dramatically after the building of the E.B Campbell Dam. And my dad has told me the last time he went out…the water levels on the lake he was on had dropped so dramatically that when winter came, the ice froze all the way down to the bottom of the lake - which is not that deep, it's only two or three feet deep at the most. And these muskrat families, which in the past there had been over three hundred muskrat homes on the lake he was on, the last time he went there was only about thirty. He opened a house in the winter and as he opened it he found a family of five muskrats frozen together. He couldn't trap anymore." (Mika Carriere in "wonder", 2010)

In addition to being a dramatic moment, this instance is used to represent the overall decline in the environmental quality of the Saskatchewan River Delta, particularly where it relates to traditional lifestyle activities. The land no longer supports life and traditional activities such as fishing and hunting cannot support families in the area ("wonder", 2010; Casey, 2013).

Cultural and Historical Decline is a subset of the decline theme that also appears in the Aboriginal narrative. These stories focus on the desecration of spiritual sites such as the Mistusinne rock near Elbow, the Batoche National Historic Site, or the inability to engage in cultural activities (WSA(f), 2012; WSA(m), 2012). Settler society is described as having "killed the spirits of [the] elders, because they bought the land and sold it off" and "destroy[ed] mother earth" (CCOWC, 2012). Aboriginal peoples are suffering under the weight of "another way of life" (CCOWC, 2012). In many areas Aboriginal communities struggle for the basic amenities settler society takes for granted.

Environmental and cultural decline, as well as the gaps between the status of Aboriginal communities and settler society, generates significant tension between Aboriginal and government. As one individual states, "we are being denied the land and its resources; we are pushed politically, economically, culturally to extinction…We can't fit within the structure placed on us." Another adds, "there is no respect for the land, there is no respect for indigenous people of the land. Otherwise we would not be living at the bottom of the socio-economic ladder of this

country." (CCOWC, 2012). In Saskatchewan, Treaty Four Aboriginals assert the Saskatchewan Government does not acknowledge inherent treaty rights and refuse to participate in a "meaningless" consultation process (WSA(f), 2012). Aboriginals believe they should be included in decision-making prior to consultations, that information should be shared at the strategic level and that traditional knowledge should be incorporated into policy frameworks (WSA(f), 2012).

There is limited acknowledgment of competing demands and Aboriginal participation in terms of cause and blame. Some participants in consultations indicate the importance of other interests in water use, including hydropower generation and recreation (WSA(m), 2012). Another individual states, "most [changes] begin from when the Campbell Dam was built. [] My grandfather on my mother's side was actually one of the men who helped build the dam. They were also a family that lived off the land, and it's funny to see him being a part of something that almost destroyed the Delta" ("wonder", 2010).

As in other SRB narratives, *Environmental Decline* presents certain concepts as facts. The Saskatchewan River Delta is an area rich and vital to Aboriginal traditions and ways of life but is relatively invisible to settler society and other SRB stakeholder groups. The land will no longer support animal, plant and human populations like it used to ("wonder", 2010; Carriere, 2004; Casey, 2013). Water scarcity is a significant concern, as water is increasingly used for human needs at the expense of the environment (WSA(f), 2012; WSA(m), 2013; Casey, 2013). Like *Stymied Irrigation Progress*, there are some inconsistencies and discrepancies around facts, especially where *Environmental Decline* meets other narratives. Declining wildlife populations in the Delta, for example, are sometimes attributed to overhunting, but Aboriginal maintains this is not true (Carriere, 2004; Casey, 2013). In terms of operation of the E.B Campbell Dam there seems to be some tension in the relationship between Delta residents and Saskpower – Aboriginal indicates this relationship is strained while Saskpower maintains the two have a good relationship (Casey, 2013). *Environmental Decline* leaves a sense that if the policy problem is meaningfully addressed, the past can be reclaimed. Some Aboriginal representatives imply this element of the narrative is not realistic, that change and adaptation will have to occur to move forward successfully into the future and that Aboriginal will have to embrace change to survive ("wonder", 2010; Casey, 2013).

Ultimately, *Environmental Decline* encourages an alternative view of water and highlights the need to protect remaining spaces using a combination of indigenous and western knowledge. Respect, morality and love must be applied to the decision space. The assignment of cause and blame in this narrative suggest the responsibility to address a policy problem lay primarily with Government. To effectively address the gap between Aboriginal communities and settler society, and to relieve the tension between Aboriginal groups and Government, a shift in power relations must occur. Aboriginal communities have distinct rights associated with water use and their inclusion at a strategic level would shift the composition of the decision-making body around SRB water use to the advantage of Aboriginal objectives.

As a summary of the themes discussed in Sections 5.5 and 5.6, Table 5.5 below offers a snapshot of the themes explored in this chapter. Results from the Phase 1 narrative analysis are drawn on in Chapter 6 to validate variable selection during Phase 2 modelling.

Table 5.5 A comparison of narrative elements in *Environmental Decline* and *Stymied Irrigation Progress*.

Story Element	Aboriginal	Irrigation Agriculture
Story	ENVIRONMENTAL DECLINE and Conspiracy	STYMIED IRRIGATION PROGRESS
Temporal Sequence of Events	Drastic change in lifestyle, causes of degradation	Phased growth, need and opportunity for irrigation, grand potential
Metaphors	Sacred, Mother Earth, Paradise Puppet-master governments, monster development	Keeping the promise, growth Call to arms for development, sleeping giant
Synechdote	Desecration of spiritiual sites and muskrat decline	Almond growers in California
Ambiguity	None recorded.	About environmental and social benefits; about economic, social and environmental costs
Facts	Natural environment vital to life Land at carrying capacity Aboriginal are hidden; bad relations	Water is an economic resource The public will benefit most from irrigation and want development Government and economics are the main hindrance to development. Element of invisibility, industry has more prority (cautious about this type of development)
Moral	Respect, inclusion and attention to aboriginal peoples.	Irrigation development is the rational choice: will bring wide-reaching benefits and increase self-sufficiency.
Alliances	SCIENTISTS	INDUSTRY and Producers
Characters	VILLIANS/VICTIMS Villians: Industry, Government, Victims: Cumberland Delta residents, Aboriginal	HEROES/Villians Heroes: Ag and Irrigation Leaders Villians: Government, esp. politicians
Solutions	POWERS/RIGHTS/Rational Planning	INDUCEMENTS/Rational Planning/Rules/Powers

Chapter 6: Scenario Analysis

6.1 Introduction

In the subsequent chapter, multiple narratives are identified and shown to have competing ideas about water management in the SRB. These narratives interpret the decision space in unique ways and influence the way policy choices and outcomes are perceived. In this chapter, scenario analysis serves as one way to visualize three alternative SRB futures from the perspective of two narratives. The process involves a translation of select elements from the qualitative description of narratives in Chapter 5 into quantitative 'narrative variables' for modelling. Then simulations for three alternative futures are produced, and 'narrative variable' results are examined for each narrative. Results are intended to:

i) provide a quantitative visual of two of the narratives described in the preceding section; and

ii) provide an example of potential outcomes if each narrative had an influence over the analysis used to guide decision-making, and to explore differences in resulting priorities and stakes.

It is important to note each modelled narrative is not intended to directly compare to the other, although indirect comparisons can be made. Instead, modelled narratives allow a view of each scenario from a different perspective, and highlight how narratives emphasize some elements and downplay others. Further, these modelled narratives are not exhaustive; only five variables are selected for each, to demonstrate the technique and explore initial differences.

6.2 Scenario Description

As detailed in Chapter 4, the hydrological model $SWAMP_{SK}$ (Hassanzadeh *et al.*, 2014 and Hassanzadeh *et al.*, 2015) is used to generate three SRB water scenarios. $SWAMP_{SK}$ models hydrological flows along the Saskatchewan portion of the SRB, including major water withdrawals by agriculture, utilities, industry and municipalities along the river.

The three SRB water scenarios ‘S0’, ‘S2’ and ‘S3’ originally designed by Hassanzadeh *et al.* (2014) and refined in Hassanzadeh *et al.*, (2015) are used for analysis in this chapter. In all three scenarios, historical flow data from 1980 to 2010 are used to simulate flows 31 years into the future in the Saskatchewan portion of the SRB. Across this particular 31-year period, annual inflows to Saskatchewan increased.

In the sections below, results for scenario S0 are examined first. S0 is the baseline scenario and represents future flows for the next 31 years *if conditions remained similar to present-day conditions*. In this scenario, annual flows at the Saskatchewan border during the 31-year period average 192 m^3/s for the SSR and 225m^3/s for the NSR. Among other demands, irrigated hectares in this scenario totaled 21,400 (approximately 59,550 acres). This acreage includes primary sources of water withdrawal from the South Saskatchewan River, primarily around Lake Diefenbaker, but omits irrigated acres around the Qu’Appelle region.

Next, results for scenarios S2 and S3 are examined. Scenarios S2 and S3 represent future flows for the next 31 years *if conditions in the future change*. Scenario S2 is an agricultural expansion scenario in which the 21,400 ha (approximately 59, 550 acres) of S0 are expanded to 107,000 ha (approximately 264,000 acres). As a consequence, the irrigation agriculture sector subsequently withdraws more water from the SRB system. Scenario S3 is an agricultural expansion and climate change scenario, where inflow from the Saskatchewan border is reduced due to climate change impacts in Alberta. Specifically, the historical flows used to simulate future flows are reduced by 5% in the North Saskatchewan River and 8.5% in the South Saskatchewan River. As in S2, irrigation is expanded to 107,000 ha (approximately 264,000 acres).

Modelling results, described in sections 6.4 and 6.5 below, show how these three different futures are viewed through the lens of the *Stymied Irrigation Progress* narrative and the *Environmental Decline* narrative.

6.3 Final variable selection and modifications to $SWAMP_{SK}$

As specified in Chapter 5, the *Environmental Decline* and *Stymied Irrigation Progress* narratives are selected for modelling in $SWAMP_{SK}$. Five "narrative" variables are chosen - either as extracted from the narratives or as appropriate proxies - to represent main elements of each narrative. Except for these modifications, operation and data inputs for $SWAMP_{SK}$ remain identical to the version used by Hassanzadeh *et al.*, (2014) (with irrigation acreage modified as in Hassanzadeh *et al.*, (2015)) discussed in Chapter 4.

As outlined in Chapter 4, three kinds of variables are used to generate results and are listed in Table 6.1 (completing Table 4.2).

Stymied Irrigation Progress

To model *Stymied Irrigation Process* using $SWAMP_{SK}$, five narrative variables are procured to represent elements of a major focus within the narrative. As Chapter 5 details, *Stymied Irrigation Progress* is the story of a Saskatchewan irrigation expansion that never was. Water is considered an economic resource and a wasted opportunity if not used rather than a constraint to growth.

To represent the **irrigation focus** in *Stymied Irrigation Progress*, only flows values spatially relevant to irrigation demands are reported and used during analysis. Where SRB water is concerned, Irrigation Agriculture is interested exclusively in irrigation and frames their argument geographically around Lake Diefenbaker and surrounding irrigation districts with little mention of downstream users. During modelling, this framing is represented by reporting values before Saskatoon, just after the last irrigation demand is withdrawn from the system within $SWAMP_{SK}$.

Table 6.1. The three types of input variables to $SWAMP_{SK}$ used during modelling.

Variable Type	Variables	
	Stymied Irrigation Progress	*Environmental Decline*
Stochastic Variables	Apportioned South Saskatchewan River and North Saskatchewan River flows (monthly and annual from 1980 to 2010) Precipitation Temperature Evapotranspiration rates	
Market and Policy Parameters	Industrial and Municipal water demands Agricultural area (irrigated acres) Lake Diefenbaker operating policies 2012 prices and costs associated with hydropower generation Revenues and costs associated with potash mining (in 2012)	
Narrative Variables	**Annual average**: Annual historical flows from 1980-2010 (m^3/s)	**Seasonal variation**: Monthly historical flows from 1980-2010 (m^3/s)
	Irrigation focus: Flows values (SSR) reported before Saskatoon	**River Delta focus**: Flow values (SR) reported into the SRD
	Direct **on-farm economic benefit**: Profit of $186.34 per irrigated acre	Impact to **habitat:** Surface water coverage area (km^2) $=1.76x^{0.63}$where x is discharge at the entry to the SRD
	Direct, Indirect and Induced **societal economic benefit**: $851.2 in sales, $485.7 to GDP, $307.4 in income per irrigated acre	Impact to **wildlife:** Habitat Quality for moose (between 5 and 10 % surface water coverage)
	Direct **employment benefit**: 9.1persons employed per 1000 irrigated acres.	Impact by **human development:** Flows with and without the E.B. Campbell Dam in an 'environmental flow gap'

Note: Table 6.1 completes Table 4.2 by listing narrative variables in detail.

In direct parallel to the seasonal variation focus within *Environmental Decline*, *Stymied Irrigation Progress* favors **annual averages**. Water is discussed in terms of an annual mean (587,921 dam^3) or upper decile (723,921 dam^3) when assessing availability for three expansion projects adding an additional 454,620 acres of irrigation (AECOM, 2009). Or alternatively, water is discussed in terms of average annual flows (e.g. "Alberta consumes about 22 per cent of the flows, and passes 81 per cent to Saskatchewan" (MoA, 2012, p.4)) or annual consumption (e.g. "900,000 acre-feet per year in consumption" (MoA, 2012, p.4)). Thus annual average flow values from 1980 to 2010 are used to generate future flows.

To represent the benefits of irrigation to producers and society, economic returns are calculated based on acres irrigated in each $SWAMP_{SK}$ simulation. As envisioned by *Stymied Irrigation Progress*, the future is one in which Saskatchewan economically benefits from a massive expansion in irrigation acreage. According to the narrative, the struggling rural population will benefit from increased income, but the prime beneficiaries will be the public. Upwards of 80 per cent of the benefits of irrigation go to society as opposed to the irrigator directly (Diaz *et al.*, 2009; SIPA, 2008; Lazurko, 2015). To model these benefits, an **on-farm economic benefit** of $186.34, a **societal benefit** of $1,644.30, and increased **employment** was calculated per acre of farmland irrigated. These numbers were the same ones used in the Saskatchewan Irrigation Project Association (SIPA)'s 2008 cost-benefit analysis on an irrigation expansion in Saskatchewan. SIPA (2008) estimates a direct economic return to an irrigator of $186.34 per acre (based on the Saskatchewan Ministry of Agriculture's Annual Crop Budget in 2008), a value nearly $190 per acre greater than the returns from dryland farming under "average climatic conditions" (SIPA, 2008, II., p.34). In the same analysis, SIPA (2008) estimates societal benefits, separating them into direct, indirect and induced impacts to sales, GDP, income and employment per 1000 acres. During non-drought years, SIPA (2008) estimates each irrigated acre would add a total of $851.2 to sales, $485.7 to GDP, $307.4 to income. They also estimate every 1,000 acres irrigated would employ 3.5 people (SIPA, 2008, II, p.37).

Environmental Decline

To model the *Environmental Decline* narrative in $SWAMP_{SK}$, five narrative variables are procured from the narrative in a similar style to *Stymied Irrigation Progress.* Explored in Chapter 5, the

Environmental Decline narrative relays the gradual decline in the environmental health and Aboriginal communities in the SRB, with a particular focus on the Saskatchewan River Delta (SRD). Good quality and quantity of SRB water contributes to a healthy environment, valued both intrinsically and for the resources provided for Aboriginal groups. According to this narrative, decline in environmental health is due to human development such as the E.B. Campbell Dam, which is in turn a result of the infringement of "another way of life" on the Aboriginal way of life (CCOWC, 2012). In this way, the decline of the environment is analogous with the decline of Aboriginal culture and history, degrading the ability of these communities to engage in a traditional lifestyle.

To represent the **River Delta Focus** in *Environmental Decline* during analysis, flows are reported at the entrance to the Saskatchewan. From an *Environmental Decline* perspective, Saskatchewan River flows matter most in the Saskatchewan River Delta – described as a "paradise" (Saskatchewan River Delta, 2009), "a gem and [] the 8th wonder of the world" (wonder, 2010). In many ways, the Saskatchewan River Delta is a last frontier where many Aboriginal communities still live a traditional lifestyle and remain connected with scared aspects of the land. Much of the *Environmental Decline* plot is framed around the activities in this area – functioning as a frame, the geographical location defines Aboriginal group's understanding of the boundaries in their relationship with water and their environment (Cornelissen and Werner, 2014). This variable indirectly parallels the Irrigation Focus of the *Stymied Irrigation Progress* model.

To represent the **impact to habitat** discussed within *Environmental Decline*, surface water coverage area is added as a narrative variable to $SWAMP_{SK}$. Changes in water flows, particularly flooding events such as avulsion and seasonal fluctuations, historically have played a large role in creating a biodiverse and ecologically robust area for many species of wildlife, fish and vegetation in the Saskatchewan River Delta (Wilson and Kowal, 2004). To analyze trends in habitat using $SWAMP_{SK}$, surface water coverage area (SWCA) is used as a proxy for habitat change, borrowing work by Sagin *et al.*, (2015). These authors developed a regression relationship between SWCA and discharge at Saskatchewan River flow gauges to examine how SWCA has changed over time in the Saskatchewan River Delta. Within $SWAMP_{SK}$, simulated monthly flow averages at the station below Tobin Lake (Station ID #05KD003) are used to generate monthly estimates of

SWCA over a 31 year period. Monthly SWCA in kilometers squared is generated using the equation $SWCA=1.76x^{0.63}$ ($r^2=0.76$) where x is discharge in meters cubed per second from station ID 05KD003, the River below Tobin lake (Sagin *et al.,* 2015).

To represent the **impact to wildlife**, a key interest in *Environmental Decline*, habitat suitability for moose is calculated using SWCA. Moose is a significant animal to Aboriginal communities, particularly in the Saskatchewan River Delta. Moose select for semi-aquatic habitat for thermal protection, hiding cover and availability of ideal forage such as willow, spruce, fir, aspen and birch (Wilson and Kowal, 2004; Allen, Jordan and Terrell, 1987). To analyze moose habitat suitability in $SWAMP_{SK}$, SWCA as a percentage of total wetland is calculated by dividing SWCA by the total study area of 1,315km^2 from Sagin *et al.,* (2015). According to work by Allen, Jordan and Terrell (1987), wetland areas with 5 to 10 per cent of surface water coverage is ideal habitat for moose – below 5 per cent habitat suitability declines very rapidly, while above 10 per cent habitat suitability declines gradually (Figure 6.1).

To examine the impact by **human development** and **seasonal variation** in flows, a monthly 'environmental flow gap' is created by comparing flows with and without the E.B. Campbell Dam. *Environmental Decline* causal theories are intentional and mechanical in nature, suggesting deliberate oppression and development that works as designed but causes harm (Stone, 2002). The narrative views the E.B. Campbell Dam as a particular threat to the environmental health of the Saskatchewan River Delta, as the dam reverses the seasonal flows that would occur in absence of human development (Casey, 2013).

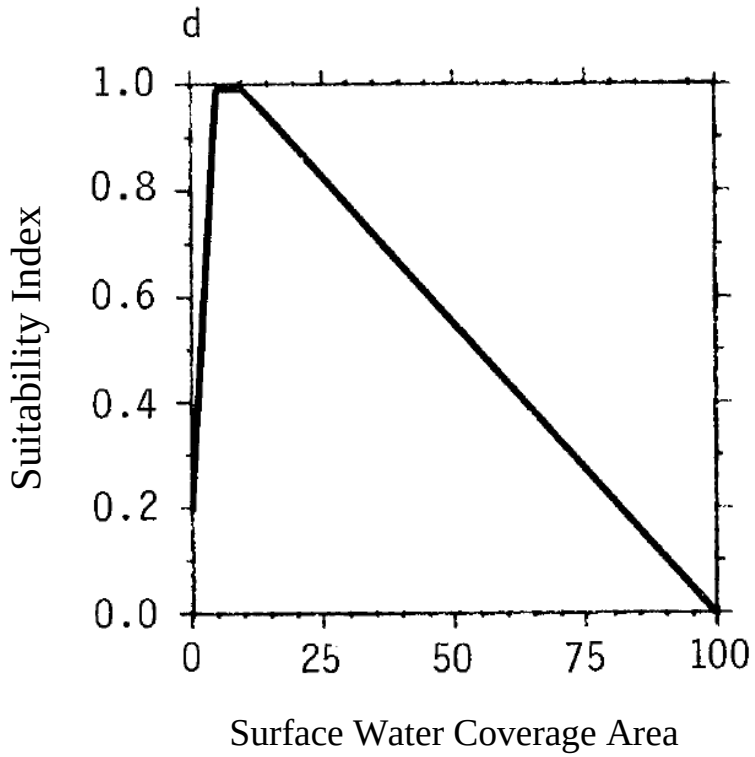

Figure 6.1. Moose habitat suitability index (Allen, Jordan and Terrell, (1987). Ideal habitat is described as wetlands dominated by 5 to 10 per cent open water or aquatic vegetation.

During modelling, all *Environmental Decline* variables are measured upstream from the E.B. Campbell Dam. Thus scenarios with a "D" indicate the inclusion of the dam and those with an "N" indicate no dam is present (note there are no "N" scenarios in the *Stymied Irrigation Progress* model). Seasonal variation plays a significant role in supporting the traditional activities that are identified as significant in *Environmental Decline*. During modelling, simulated monthly average flow values over the 31-year period were used to mimic seasonal flow patterns. Each scenario is then run with and without the E.B. Campbell Dam to create an 'environmental flow gap' and examine the difference in flows with and without the dam across years, on a best-proxy 'seasonal' basis (with a focus on winter and spring months).

6.4 Narrative perspectives of a future with present-day conditions (Scenario S0)

Scenario S0 simulates flows for 31 years in a future where conditions are similar to present-day conditions.

From the perspective of *Stymied Irrigation Progress*

Flows emphasize the average and increasing water availability

The *Stymied Irrigation Progress* simulation shows a gradually increasing trend with five 'high' flow years and four 'low' flow years across a 31-year period (Figure 6.2). Values reported on an annual basis, representing an aggregate of monthly flows, are inherently less volatile and obscure the extremes more easily discernible from the perspective of *Environmental Decline*.

From the perspective of *Environmental Decline*

Flows highlight seasonal extremes

The *Environmental Decline* lens produces a complex flow pattern, with dozens of 'high' and 'low' flow periods across the same 31 year period (Figure 6.3). It is not immediately clear if annual inflow to the Saskatchewan River Delta is increasing across the 31-year period, as it is with *Stymied Irrigation Progress*. The range in flows within the *Environmental Decline* narrative are much pronounced than those in *Stymied Irrigation Progress*, ranging from 'lows' of 150 m^3/s (compared to 85 m^3/s) to nearly 1300 m^3/s (compared to 350 m^3/s).

Seasonal flow patterns are more discernable, with high flows in spring and early summer. As expected, flows are slightly more variable in absence of the dam (S.D. = 200 (S0D); S.D. = 203 (S0N)).

Human development alters flow patterns

Percentage change in flows without the dam (S0N) relative to flows with the dam (S0D) suggests the presence of the dam alters flows. Flows with the dam tend to be less in the

winter (Mean =317(S0N); 334(S0D)) and greater in the spring (Mean= 513(S0N), 499(S0D)) relative to flows with the dam.

For example, in the first ten simulated years, flows range from 1.5 to 18 per cent higher with the E.B. Campbell Dam in winter (January, February and March) (Figure 6.4). This is particularly true for the month of February. In spring (April, May and June) flows tend to range from 0 to 12 per cent less with the E.B. Campbell Dam, with some exceptions (Figure 6.5). The lowest percentages in spring tend to occur in May.

Human development has a significant impact on natural flows

The following equation was built to test if a real 'environmental flow gap' exists between flows with and without the dam:

$$E = \alpha + \beta_1 January_T + \beta_2 Feburary_T + \beta_3 March_T + \beta_4 April_T + \beta_5 May_T + \beta_6 June_T + \beta_7 August_T + \beta_8 September_T + \beta_9 October_T + \beta_7 November_T + \beta_8 December_{T+} \mu \qquad (1)$$

In this equation, the 'environmental flow gap', E, is the difference between flows with and without the E.B. Campbell Dam (S0D-S0N). Other variables in the equation are 1 if the flow value falls during that month and 0 if the flow value does not. July is used as a reference month. The equation was estimated using statistics software developed by Wessa (2016) and results are shown in Table 6.2.

The value for July, which is not included as a variable, is captured by the intercept. As shown in Table 6.2, the estimated intercept value is not statistically different from zero (t(1.96)=0.21; p=0.05) and thus coefficients on other months can be interpreted as differences from zero. Results for S0 show the 'environmental flow gap' is statistically different from zero in every month. The strength in significance ranges from August (t(1.96)=2.182, p=0.05) to February (t(1.96)=24.24; p=0.05). Coefficients on the winter months (January, February, March), and also August through November, indicate the dam increases flows, while negative coefficients for spring (April, May, June) and December indicate the dam decreases flows.

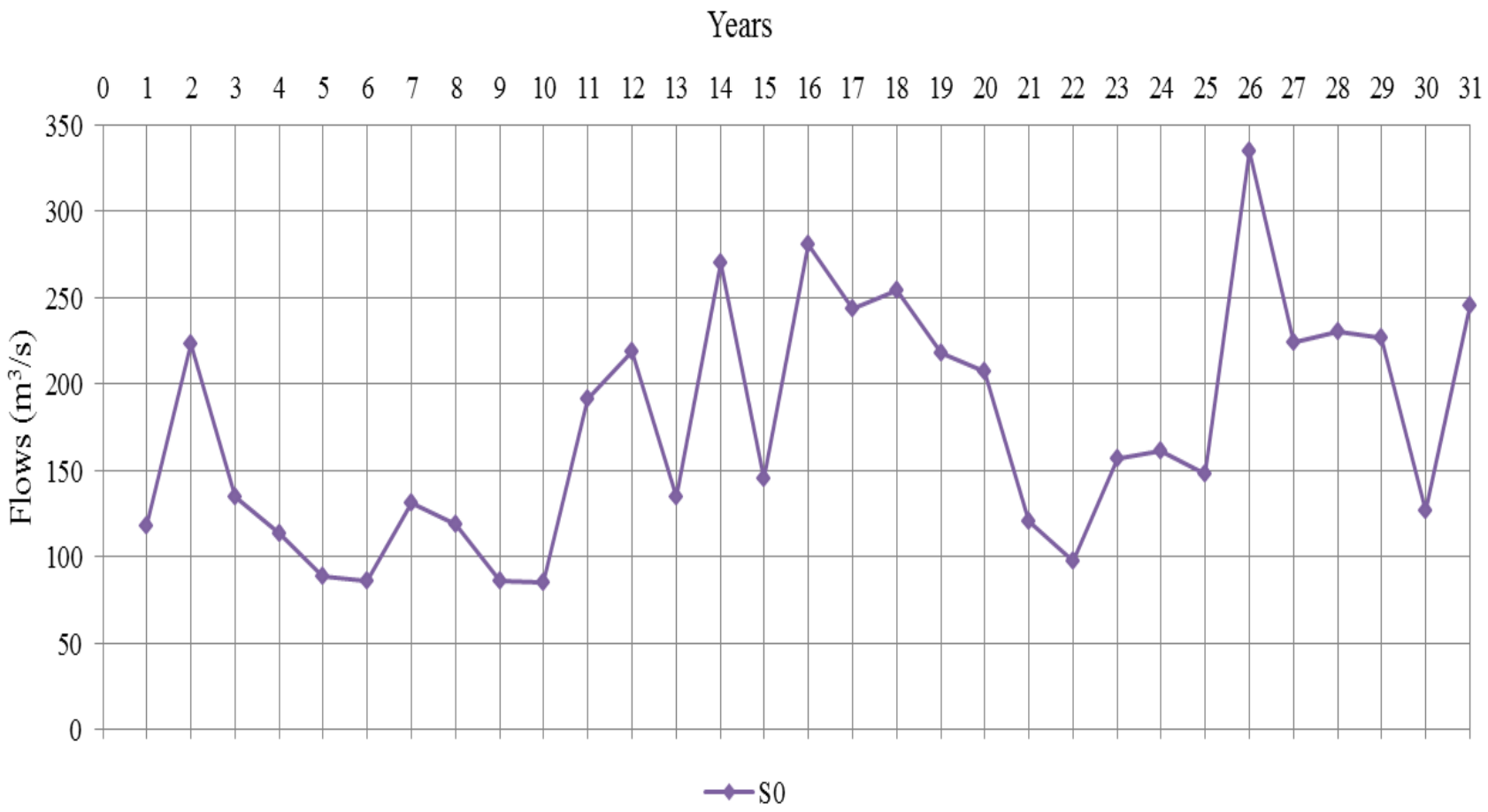

Figure 6.2 Annual flows (m^3/s) before Saskatoon in the *Stymied Irrigation Progress* S0 simulation.

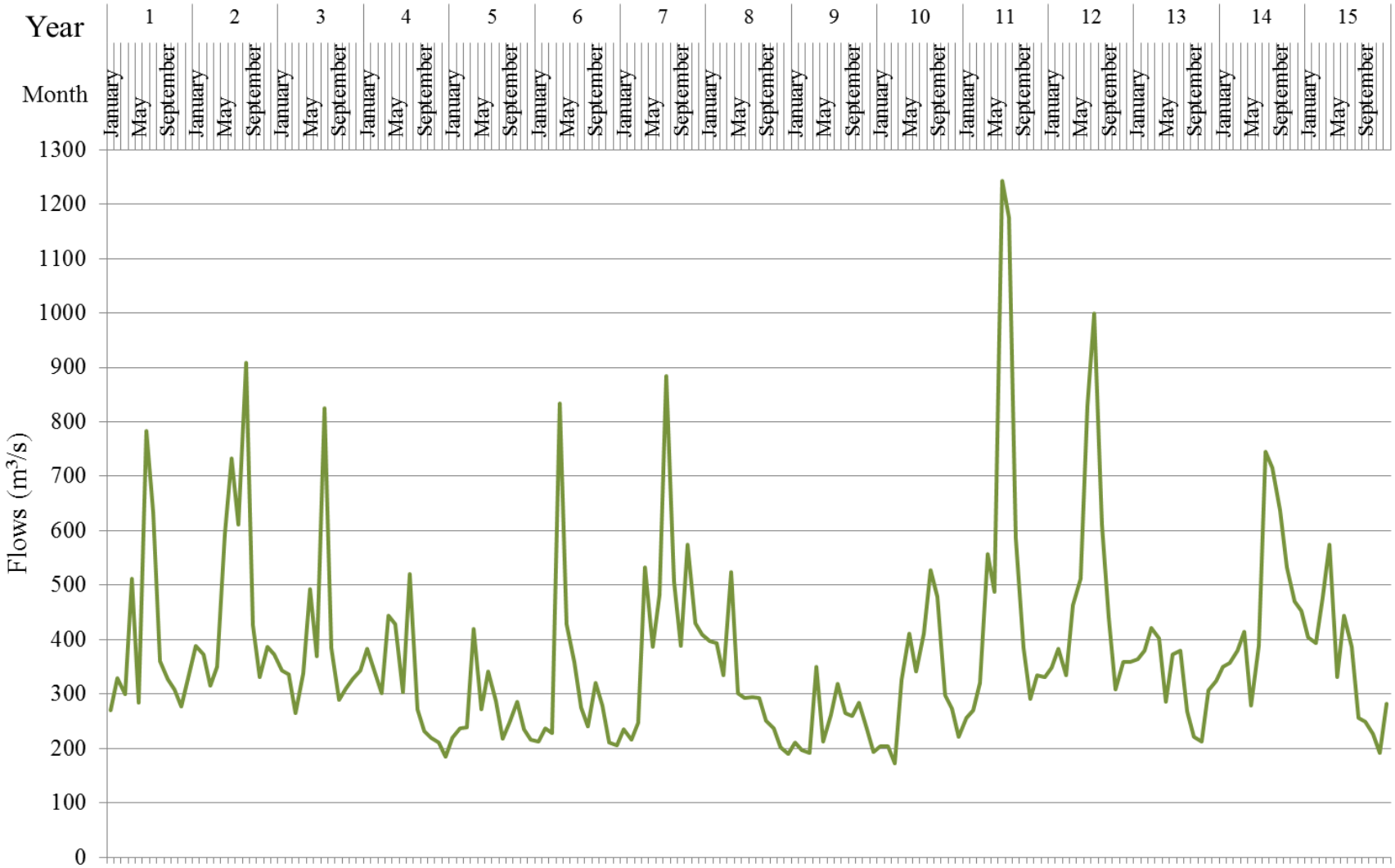

Figure 6.3. Monthly flows (m^3/s) below Tobin Lake with the impact of human development in the *Environmental Decline* S0D simulation for years 1 to 15.

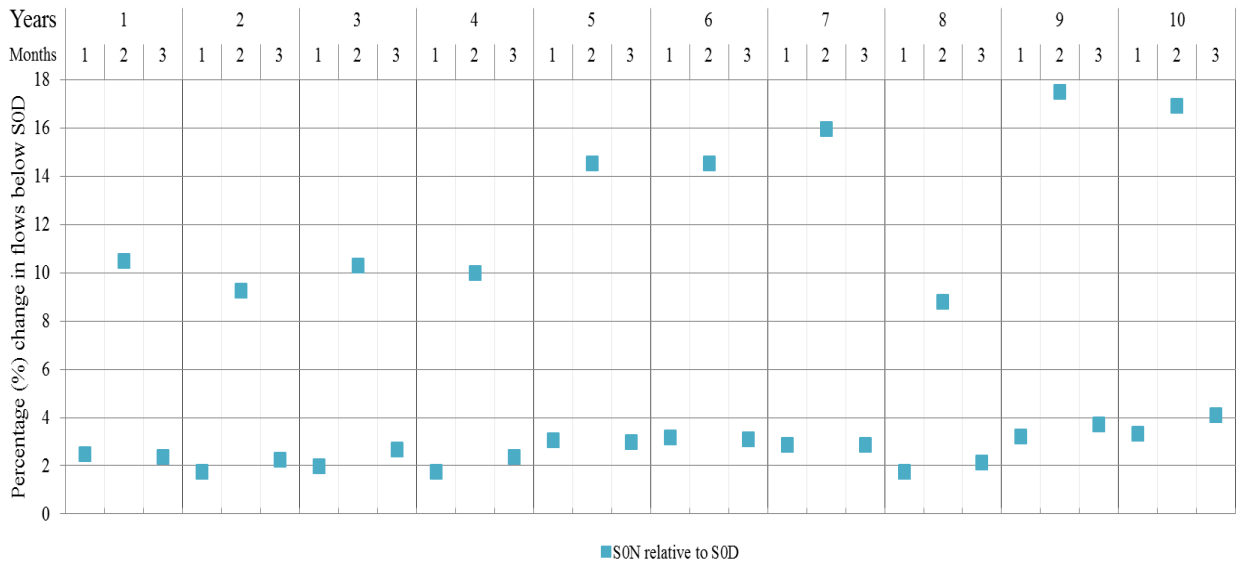

Figure 6.4 Percentage change in winter monthly flows (m^3/s) below Tobin Lake with the impact of human development (E.B. Campbell Dam) for years 1 to 10 in the *Environmental Decline* S0D and S0N simulations. Winter months include January (1), February (2) and March (3).

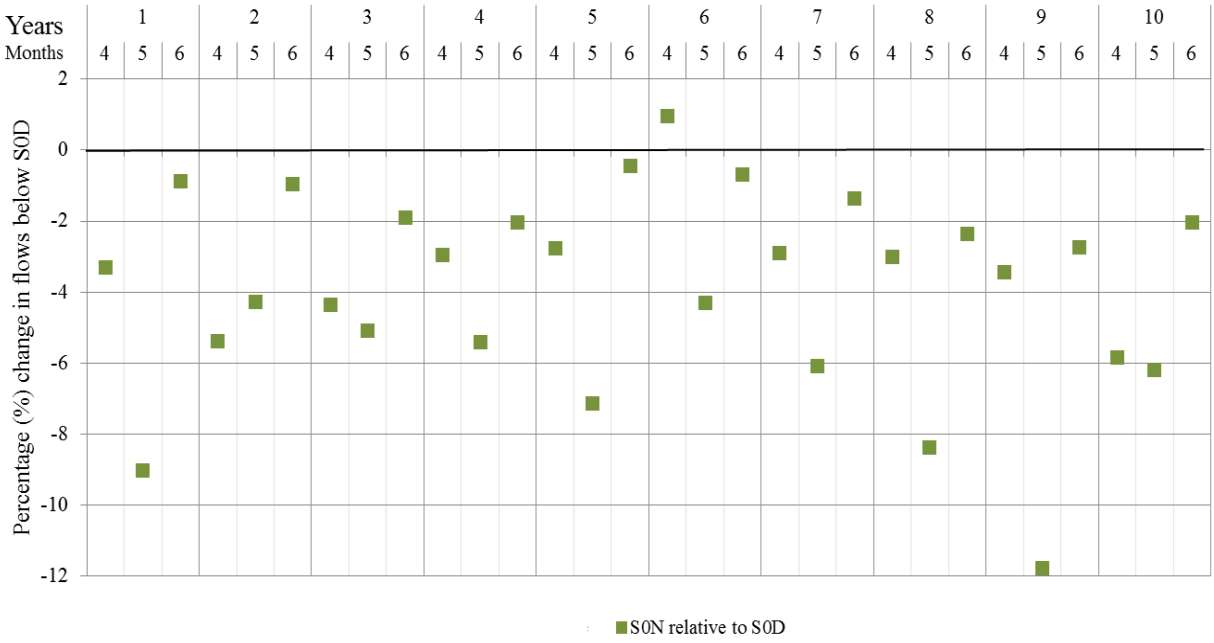

Figure 6.5. Percentage change in spring monthly flows (m^3/s) below Tobin Lake with the impact of human development (E.B. Campbell Dam) for years 1 to 10 in the *Environmental Decline* S0D and S0N simulations. Spring months include April (4), May (5) and June (6)

Table 6.2. 'Environmental flow gap' regression results in three future scenarios

	Dependent Variable: Difference between flows with and without the E.B. Campbell Dam		
	S0	**S2**	**S3**
Variables	(S0D-S0N)	(S2D-S2N)	(S3D-S3N)
(Intercept)	0.21*	1.0*	0.6*
	(-0.21)	(-1.05)	-0.8
January	6.5*	5.7*	6.2*
	(-4.61)	(-4.06)	(-6.54)
February	34.3*	33.5*	33.0*
	(-24.24)	(-23.86)	(-35.94)
March	7.1*	6.2*	6.7*
	(-4.98)	(-4.44)	(-7.1)
April	-12.2*	-13.0*	-10.6*
	(-8.59)	(-9.26)	(-11.19)
May	-21.7*	-22.5*	-23.9*
	(-15.31)	(-16.03)	(-25.28)
June	-7.4*	-8.2*	-7.1*
	(-5.20)	(-5.81)	(-7.51)
August	3.1*	1.3	1.8
	(-2.18)	(-0.96)	(-1.91)
September	8.2*	7.3*	7.8*
	(-5.78)	(-5.26)	(-8.28)
October	10.3*	9.5*	10.0*
	(-7.28)	(-6.77)	(-10.55)
November	4.5*	3.7*	4.2*
	(-3.21)	(-2.66)	(-4.45)
December	-23.5*	-24.4*	-23.9*
	(-16.61)	(-17.34)	(-25.27)
$\mathbf{R^2}$	0.88	0.88	0.88
N	372	372	372

From the Perspective of *Stymied Irrigation Progress*

Ample water exists for irrigation activities

Across the 31 years of simulated flows there is adequate inflow every year to meet all irrigation demands, providing water for approximately 59,550 acres.

Irrigation provides economic and employment benefits

Annual economic benefits associated with irrigating nearly 60,000 acres are approximately $11 million in direct on-farm benefits, and approximately $98 million in direct, indirect and induced societal benefits (Figure 6.6). 32,273 new jobs are associated with the total acreage.

From the perspective of *Environmental Decline*

Human development changes flooding patterns

The E.B. Campbell dam alters flows so that there is less flooding in the spring and more in the late summer and early fall. Fluctuations in surface water coverage area (SWCA) – shown for the ice-free months of April to October in years 1 to 10 (Figure 6.7) – range from approximately 50 km^2 to 170 km^2, which is approximately 4% to 13% of the 1315km^2 study area from Sagin *et al.* (2015). Percentage of change in SWCA (S0N relative to S0D) tends to be negative in the earlier half of the ice-free months and gradually increases to positive values as the year progresses, ranging between 4% and -7%. Specifically, values tend to be negative from April to July and positive from August to October. Results in the above sub-section show a real 'environmental flow gap' exists between flows with and without the dam; by extension, as SWCA is derived from these flow values, there is a real difference in SWCA between S0D and S0N.

Percentage of change in SWCA is on average negative (Mean = -0.30%), showing that SWCA tends to be less with the dam overall, but not by much. These discrepancies seem small, and are even invisible on an annual basis, but ultimately mean important changes to

ecosystems historically adapted to certain patterns of flooding (Wilson and Kowal, 2004). These results do not show how prolonged changes to the natural water regime will ultimately alter the Saskatchewan River Delta landscape.

Human development interferes with habitat suitability for wildlife

Results show that habitat is unsuitable for moose in 80 months (37%) across the 31 simulated years (Figure 6.8). In Figure 6.8, data over (10%) and below (5%) the red dashed lines indicate habitat is less suitable for moose. Habitat suitability - measured by percentage of SWCA in the wetland - ranges from 3.8% to 12.9% in S0D and 3.7% to 13% in S0N. There is not a large difference between dam (S0D) and no dam (S0N) simulations in terms of habitat suitability, although results show habitat is less suitable about one month more with the E.B. Campbell Dam.

Of significance, when habitat is outside of the 5 to 10 per cent suitability range, 85% of the time it falls below 5 per cent. Allen, Jordan and Terrell (1987) suggest suitability decreases quite rapidly under the 5 per cent range, relative to the gradual decrease in suitability over 10 per cent open water or aquatic vegetation range.

Overall, results from modeled narratives align with the qualitative narrative descriptions from Chapter 5 in a future with conditions similar to present-day conditions.

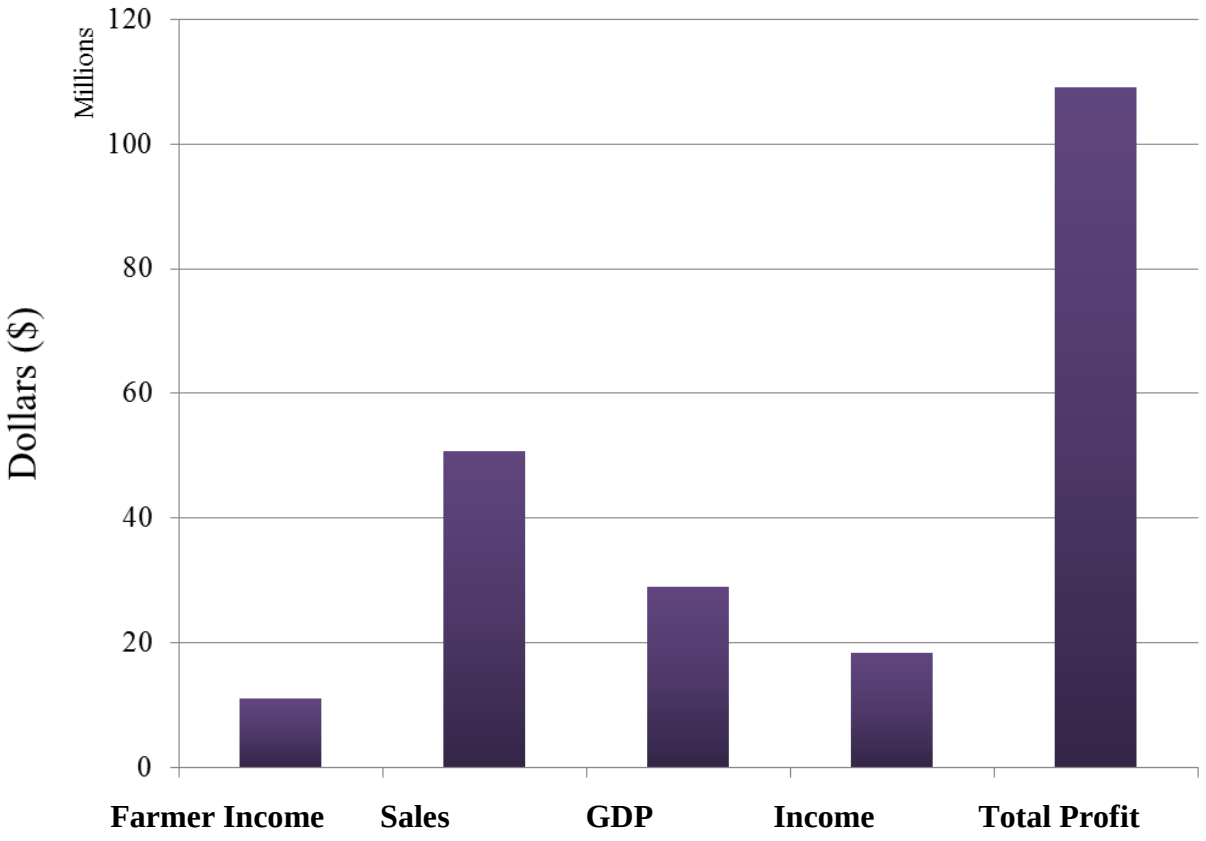

Figure 6.6 Direct on-farm and societal irrigation benefits in the *Stymied Irrigation Progress* S0 simulation. Benefits are depicted on an annual basis for 59, 552 acres in S0.

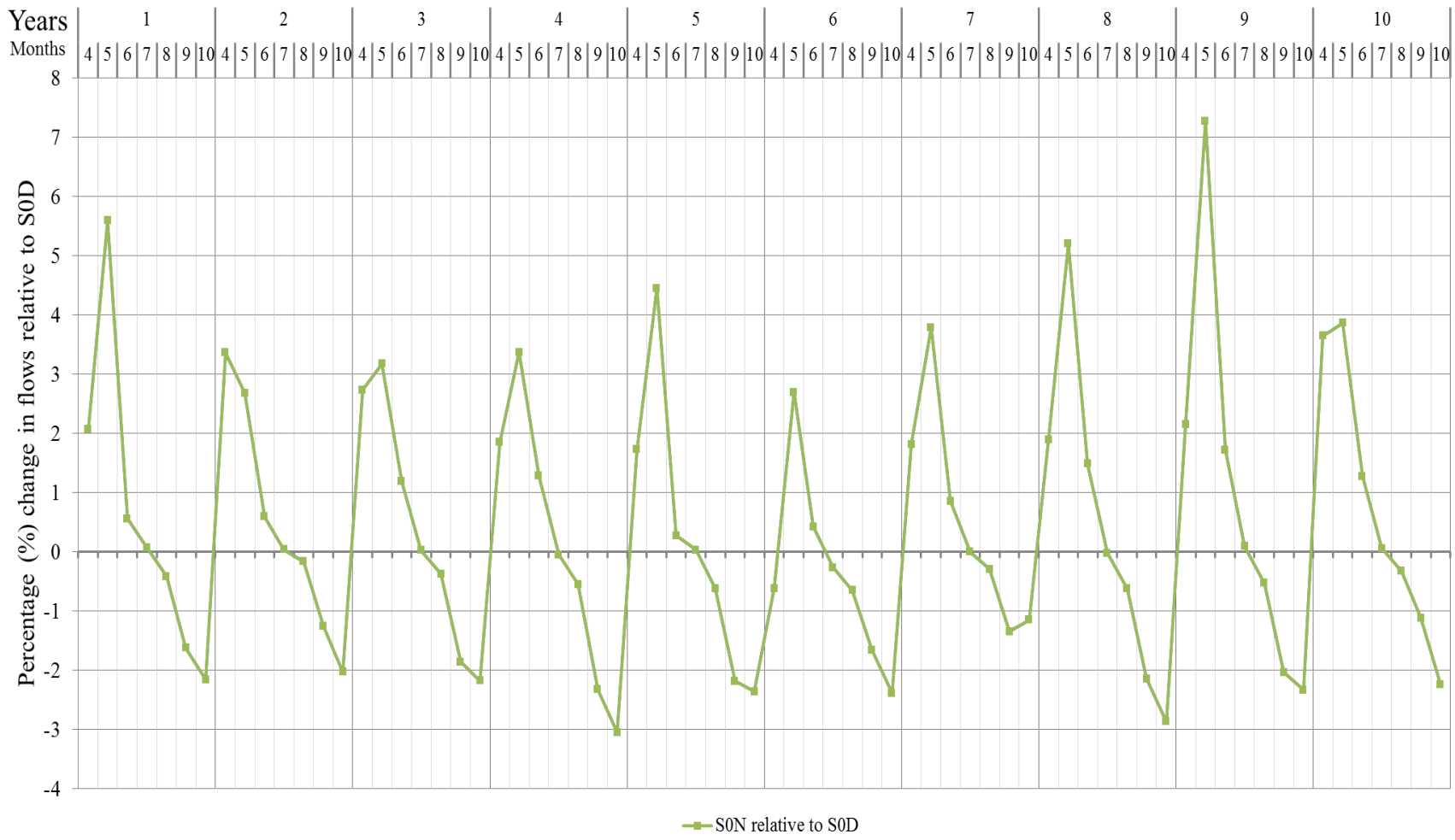

Figure 6.7. Impact to habitat with human development for years 1 to 10 in the *Environmental Decline* S0D and S0N simulations. Values depicted show percentage change in surface water coverage area (SWCA) been dam (S0D) and no dam (S0N) scenarios during the ice-free season (April to October).

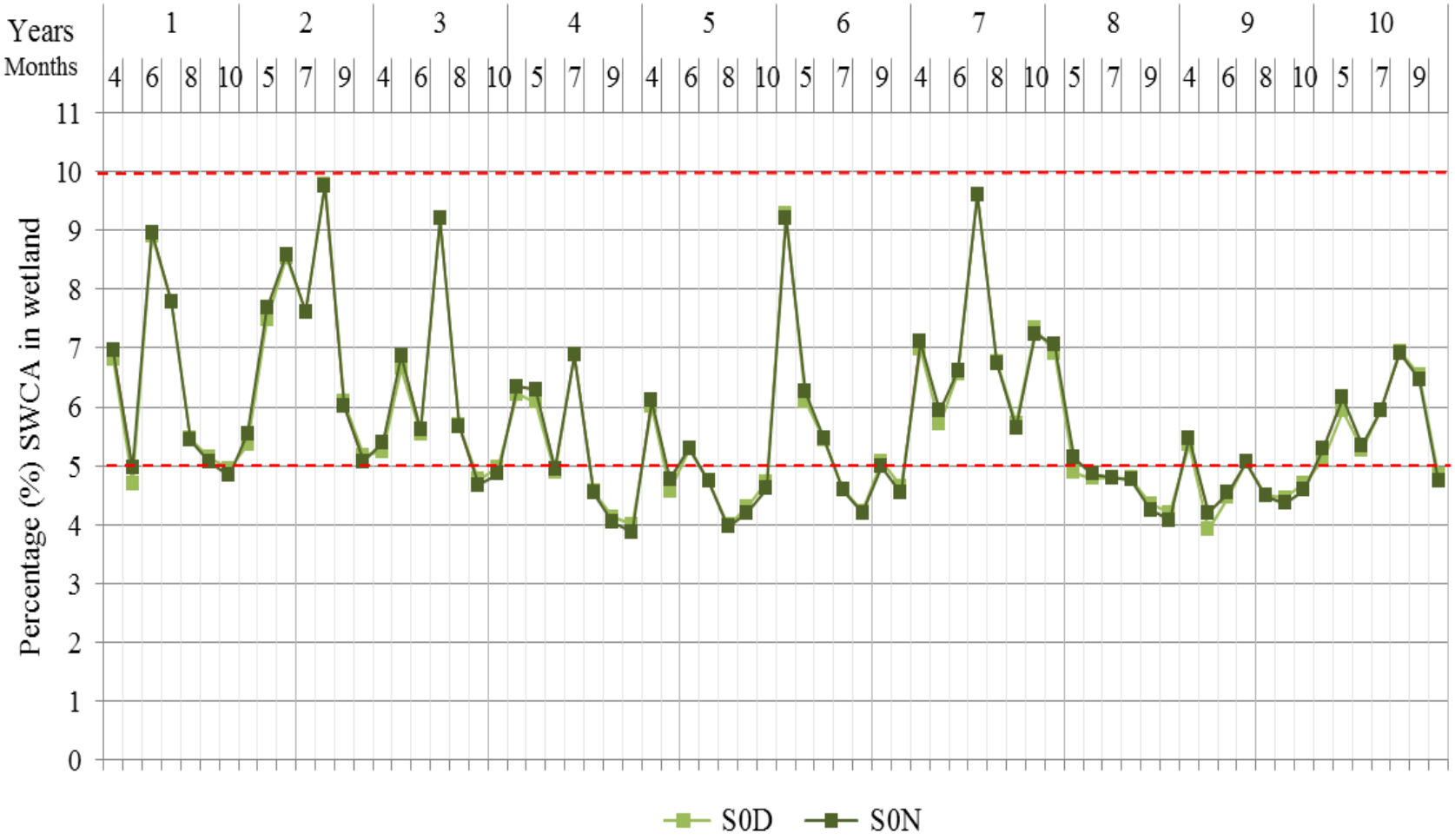

Figure 6.8. Wildlife habitat suitability with (light green) and without (dark green) the impact of human development in the *Environmental Decline* future scenarios S0D and S0N. Values show the percentage of SWCA over the total study area (1315km^2).

6.5 Narrative perspectives of a future when conditions change (Scenarios S2 and S3)

Scenario S2 simulates flows 31 years into the future in the event of an irrigation expansion while scenario S3 simulates flows 31 years into the future with reduced flows due to climate change and irrigation expansion. Results in this section suggest how each narrative may interpret these futures changes.

From the Perspective of *Stymied Irrigation Progress*

Less water is available, but more than enough for irrigation expansion

Average annual flow patterns from S2 and S3 are similar in pattern to S0 (Figure 6.9) but are lower on average by 7 and 15 per cent respectively (Figure 6.10). Despite decreased flows, all irrigation demands are met in each scenario simulation – 24,100 ha (approximately 59,550 acres) in S0 and 107,000 ha (approximately 264,000 acres) in S2 and S3.

From the perspective of *Environmental Decline*

Less water is available and variability is moderated

Through the 31 years, flow volumes and variability decrease as more water is withdrawn from the SRB across the three scenarios. Range, minimum and maximum values, mean and standard deviation generally decreases across scenarios S0D (Range=1248; Mean=405; S.D.=200), S2D (Range=1176; Mean=393; S.D.=192), and S3D (Range=1040; Mean=367; S.D.=175).

Extreme low flow periods are visible

While average monthly flows are below S0 flows by 3% in S2 and 10% in S3, the average obscures the variability that is a key feature in *Environmental Decline*. For example, in many S2 months, flows show no difference from S0 flows, for simulations both with (S2D) and without (S2N) the E.B. Campbell Dam. In other months however, flows are reduced by as much as 40% in S2 and 44% in S3.

When less water is available in S3, extreme low flow periods are more visible. In simulated flow data for the first ten years into the future for example (Figure 6.11), months of low flow periods are visible in S3 (in red) that are not present in S2. In Figure 6.11, this occurs in year 5, 6, 9 and 10.

Human development interferes with natural patterns

Results suggest the E.B. Campbell Dam moderates variability in natural flows to the Delta. While flows are reduced compared to a future with present-day conditions (S0), the 'environmental flow gap' in S2 and S3 is much more pronounced when simulated flows without the dam are *below* those with the dam. This is the case for most of the year except spring and December. This is shown in Figure 6.12. When – relative to S0 flows - S3N flows (non-dashed) are greater than S3D flows (dashed), the difference is hardly noticeable. When the opposite is true however, the gap between the dashed and non-dashed red lines is much more evident (Figure 6.12). Although the dam is often considered flood control, results show that in a future with less water, that the presence of the dam moderates flows in extreme dry years in a future with less water.

Human development has a significant impact on natural flows

The 'environmental flow gap' resulting from the difference in flows with and without the dam is more important at the seasonal level. The same equation (1) used to test the statistical significant of the 'environmental flow gap' in an S0 future was used to test the gap in S2 and S3. July is again used as the reference month and results are shown in Table 6.2.

July is again used as a reference and represented by the intercept; the estimated value is not statistically different from zero for both scenarios (S2: $t(1.96)=1.05$; $p=0.05$; S3: $t(1.96)=0.8$, $p=0.05$) and coefficients can again be interpreted as differences from zero.

In both S2 and S3, the gap between flows with and without the dam are shown to be statistically significant for all months except August (S2: t(1.96)=0.96; p=0.05 and S3: t(1.96)=1.94; p=0.05). Coefficients indicate the same pattern observed in S0 flows holds true for S2 and S3, namely that the dam increases flows during the winter and fall and decreases flows during the spring.

> On a seasonal basis, results also suggest the 'environmental flow gap' does modestly increase and become more variable as more water is withdrawn from the SRB across S0 to S3. In the winter this is more pronounced across S0 (Mean=5.1; S.D.=4.4.), S2 (Mean=5.2; S.D. 4.5) and S3 (Mean=5.6; S.D.= 4.9).

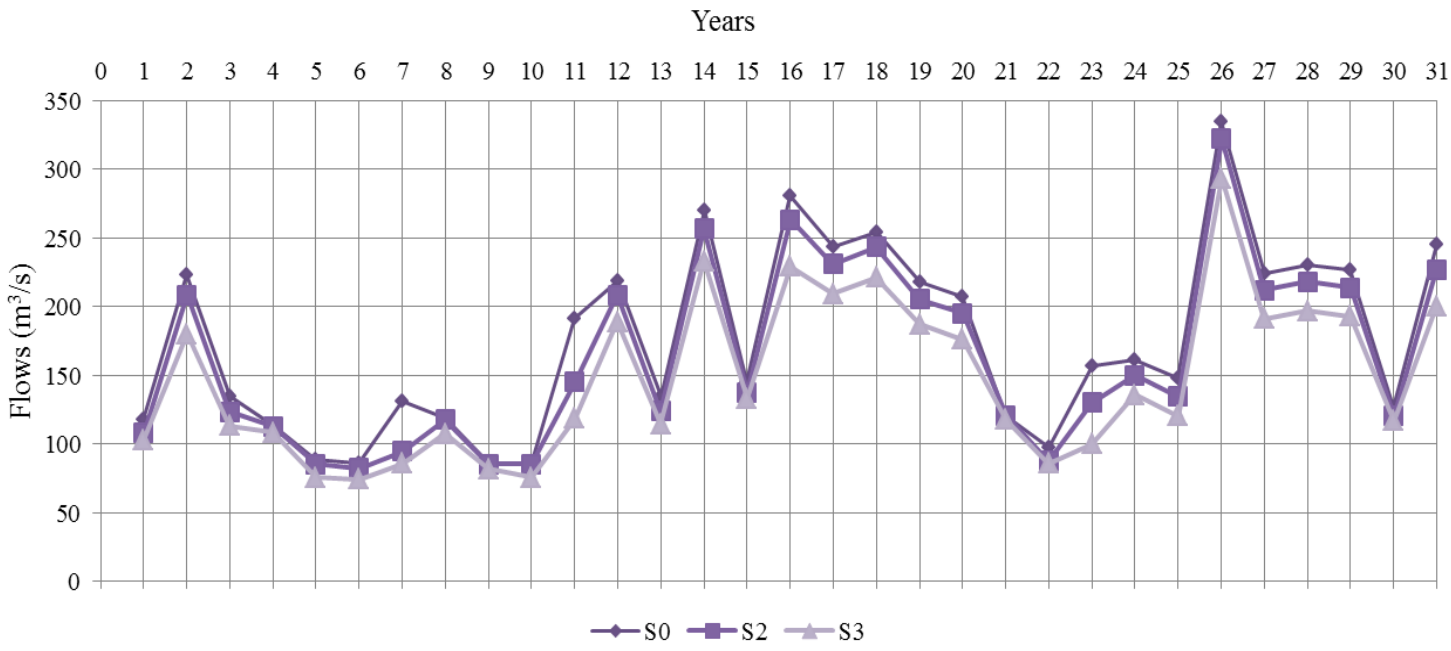

Figure 6.9 Annual flows (m^3/s) before Saskatoon in the *Stymied Irrigation Progress* S0, S2 and S3 simulations.

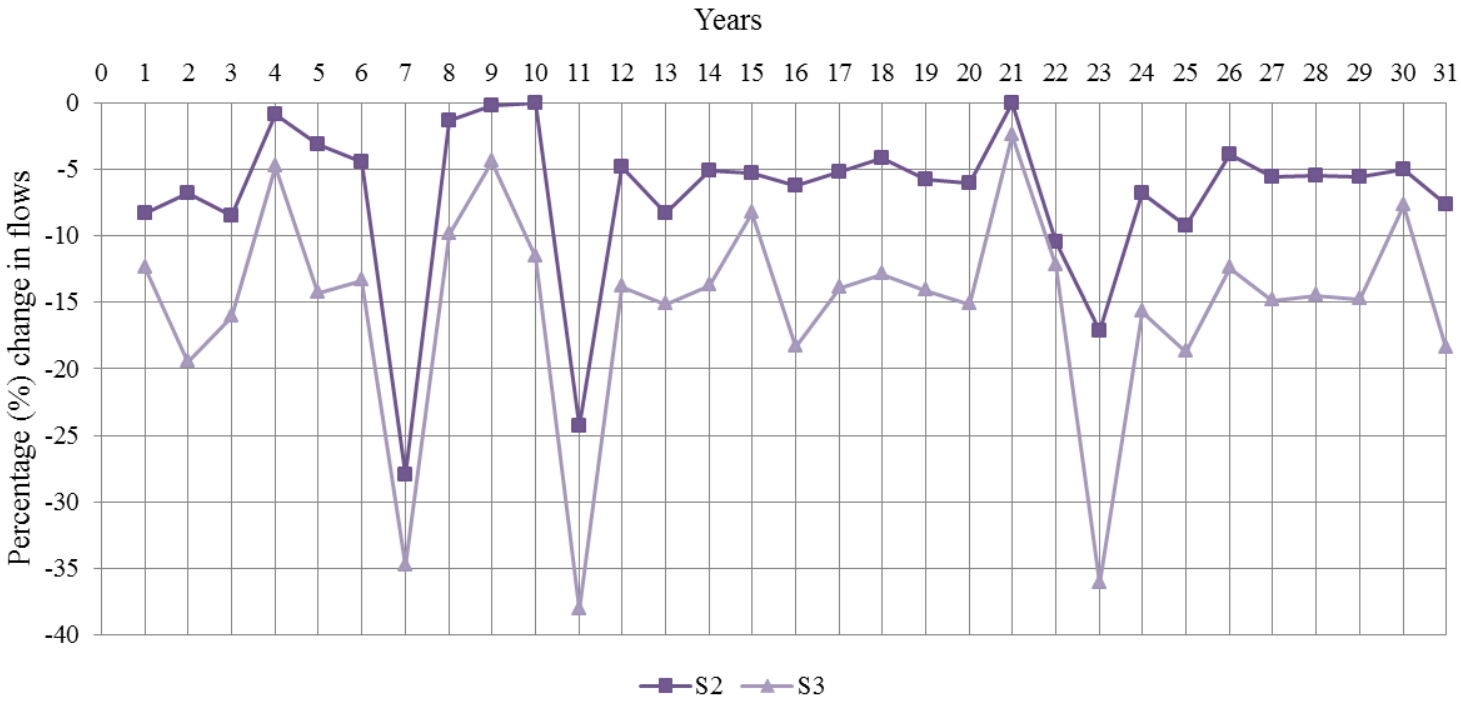

Figure 6.10 Percentage change in annual flows (m^3/s) below Saskatoon in the *Stymied Irrigation Progress* S2 and S3 simulations, relative to S0.

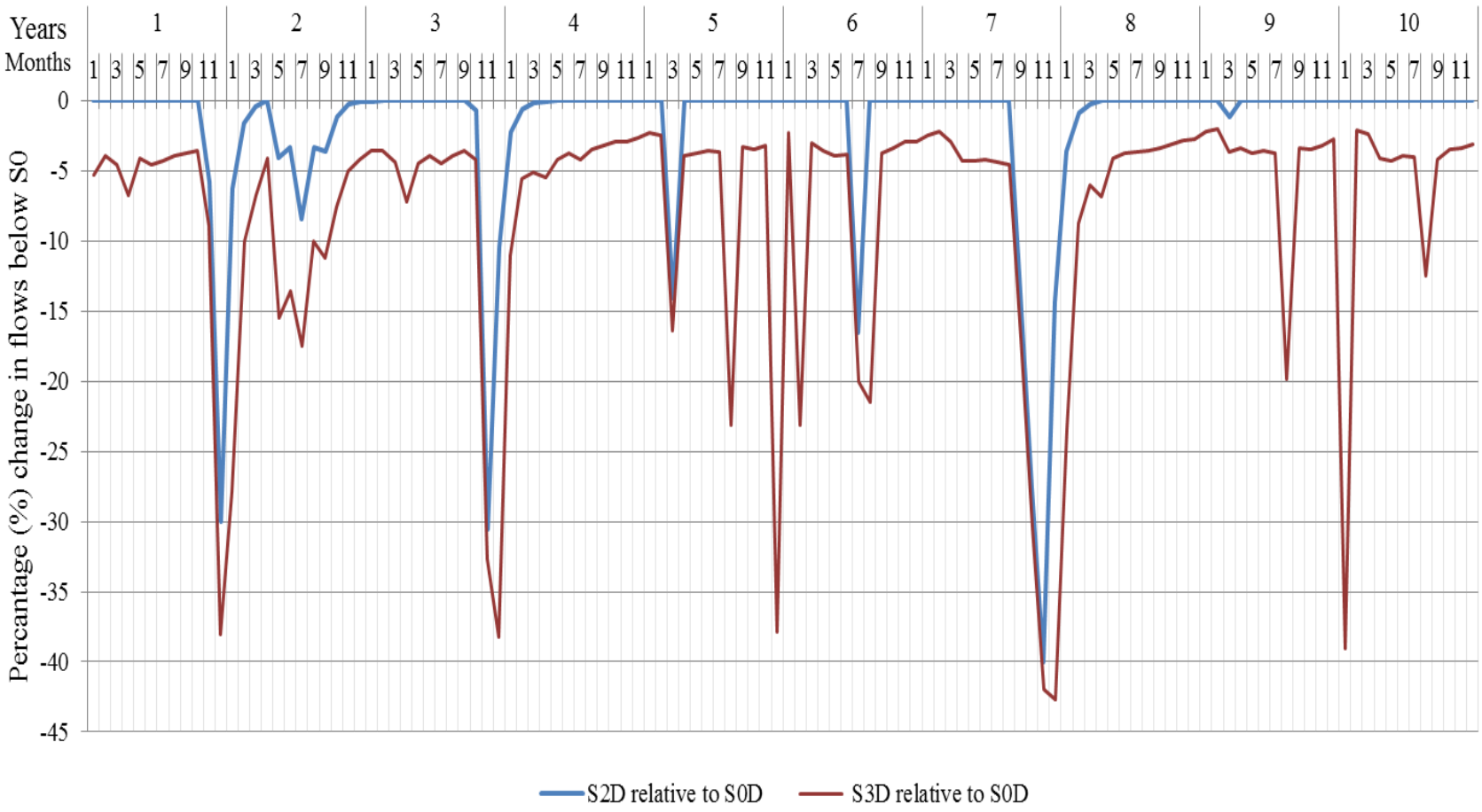

Figure 6.11 Percentage change in monthly flows (m^3/s) below Tobin Lake with the impact of human development in the *Environmental Decline* S2D and S3D simulations, relative to S0D.

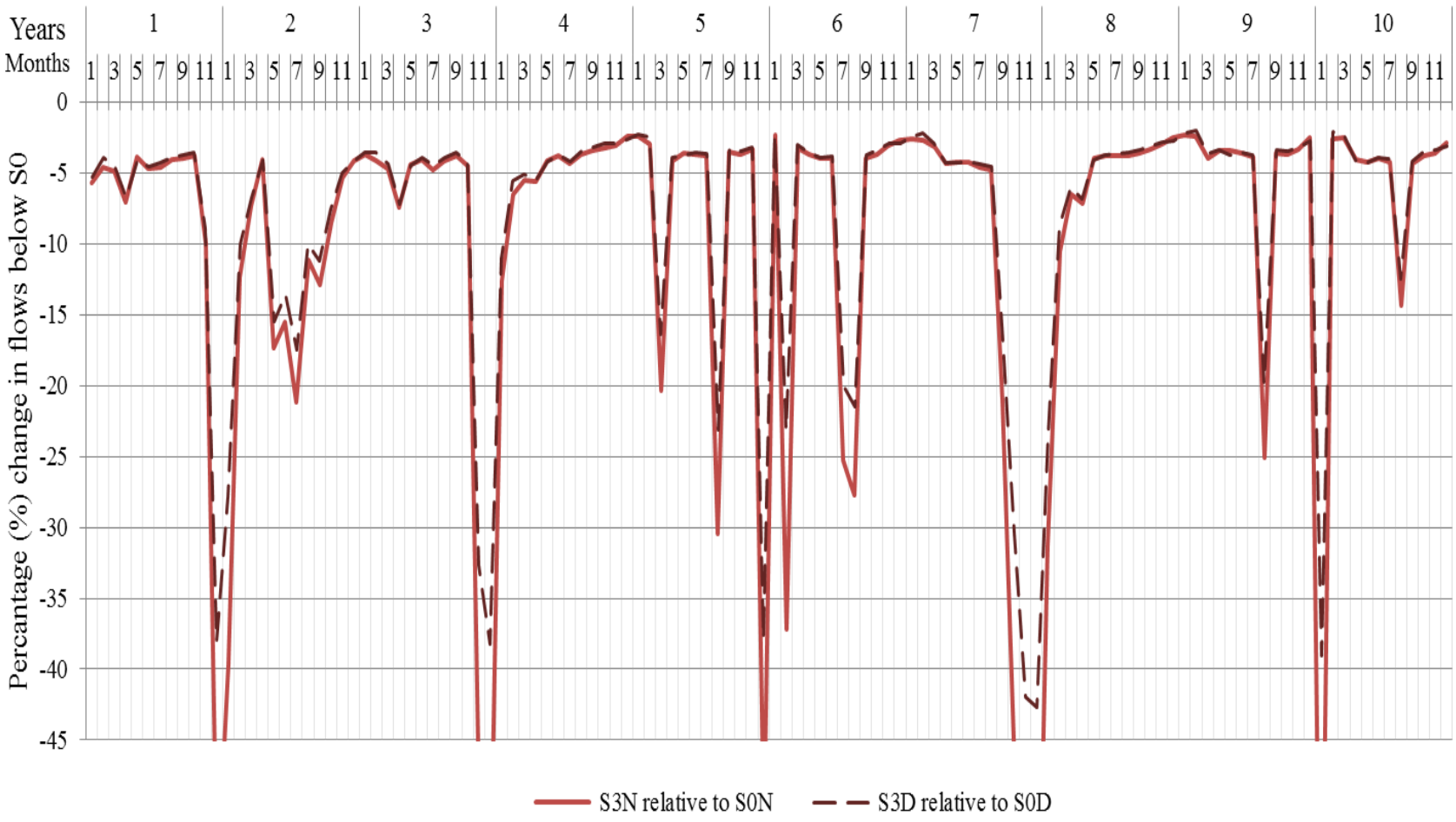

Figure 6.12 Percentage change in monthly flows (m^3/s) below Tobin Lake with and without the impact of human development, in the Environmental Decline S3D and S3N simulations, relative to S0D and S0N respectively.

From the perspective of *Stymied Irrigation Progress*

Irrigation expansion leads to large economic gains

Results show expansion in irrigation (from S0) provides yearly direct on-farm economic benefits of nearly $55 million (compared to $11 million in S0) (Figure 6.13). Economic benefits associated with expanded irrigation acreage are identical between S2 and S3 as each scenario contains the same total acreage (approximately 264,000 acres).

Society receives 90 per cent of the gains from irrigation expansion

Irrigation expansion in S2 and S3 generates approximately $490 million in direct, indirect and induced societal benefits (compared to $98 million in S0) (Figure 6.13). The expanded acreage in S2 and S3 is associated with 806,824 employment opportunities – hiring an additional 774, 551 people relative to S0.

From the perspective of *Environmental Decline*

The Delta becomes increasingly arid

The most important observation regarding SWCA is the difference across scenarios. SWCA during the ice free season (April to October) decreases across S0 (Mean=82), S2 (Mean=80) and S3 (Mean=77). Relative to S0D, SWCA decreases on average by 2 and 6 per cent for S2D and S3D respectively (Figure 6.14), but ranges from as much as 20 to 30 per cent below S0D in some months.

Variability in SWCA shrinks across scenarios, as range decreases from 120 km^2 to 106 km^2 and standard deviation falls from 25 to 22 between S0D and S3D.

Human development degrades wildlife habitat

As irrigation expansion withdraws more water from the system, less suitable habitat is available for moose. Results show there is less suitable moose habitat (SWCA percentages below 5% and 10%) with S2 and S3 relative to scenario S0 (Table 6.2). Scenario S2 shows

the percentage of SWCA in wetland values above 10 per cent and below 5 per cent about 39 per cent of the time (compared to 31 per cent in S0). For S3, this percentage is even higher at approximately 43 per cent. On average, percentage of the SWCA in wetland habitat is -1.6 per cent and -5.6 per cent below scenario S0D, for S2D and S3D respectively (S2N and S3N show similar averages).

There is not a large difference between dam and no dam scenarios for either S2 or S3; scenarios with simulations including the dam (S2D and S3D) were more unsuitable about 3 months more than no dam scenarios.

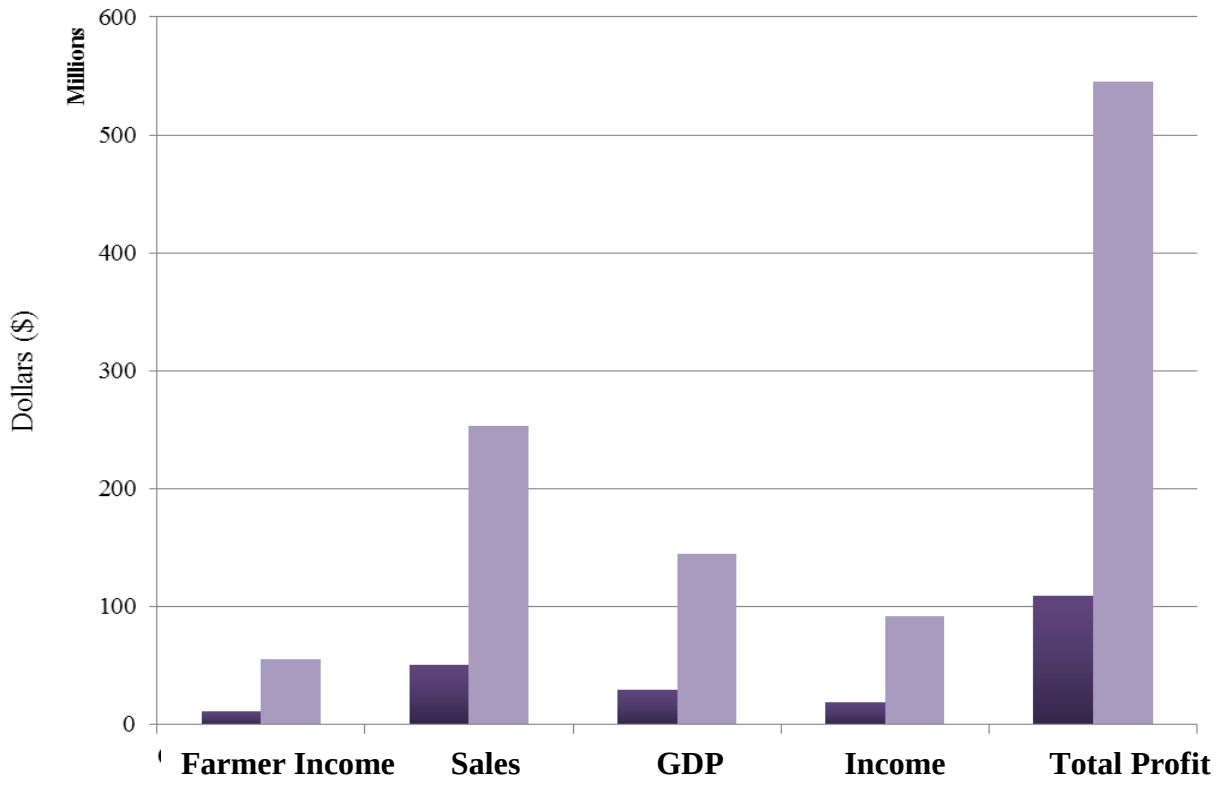

Figure 6.13 Direct and societal irrigation economic benefits in the *Stymied Irrigation Progress* S0, S2 and S3 simulations. Benefits are depicted on an annual basis for 59, 552 acres in S0 (dark purple) and 297, 761 acres for S2 and S3 (light purple), combined in this graphic.

Table 6.3. Impact to wildlife in Environmental Decline S0, S2 and S3 simulations.

	S0		**S2**		**S3**	
	D	*N*	*D*	*N*	*D*	*N*
Number of months percentage of SWCA falls below 5%	68	67	73	71	86	84
Number of months percentage of SWCA falls above 10%	12	12	11	10	7	6
Total months unsuitable (%)	80 (37%)	79 (36%)	84 (39%)	81 (37%)	93 (43%)	90 (41%)

Notes: SWCA is calculated as a percentage of wetland areas (a representative study area of 1315 km^2 is used) for the ice-free season (April to October) for 31 years (N=217). Percentages over 10% and below 5% are considered less suitable for moose.

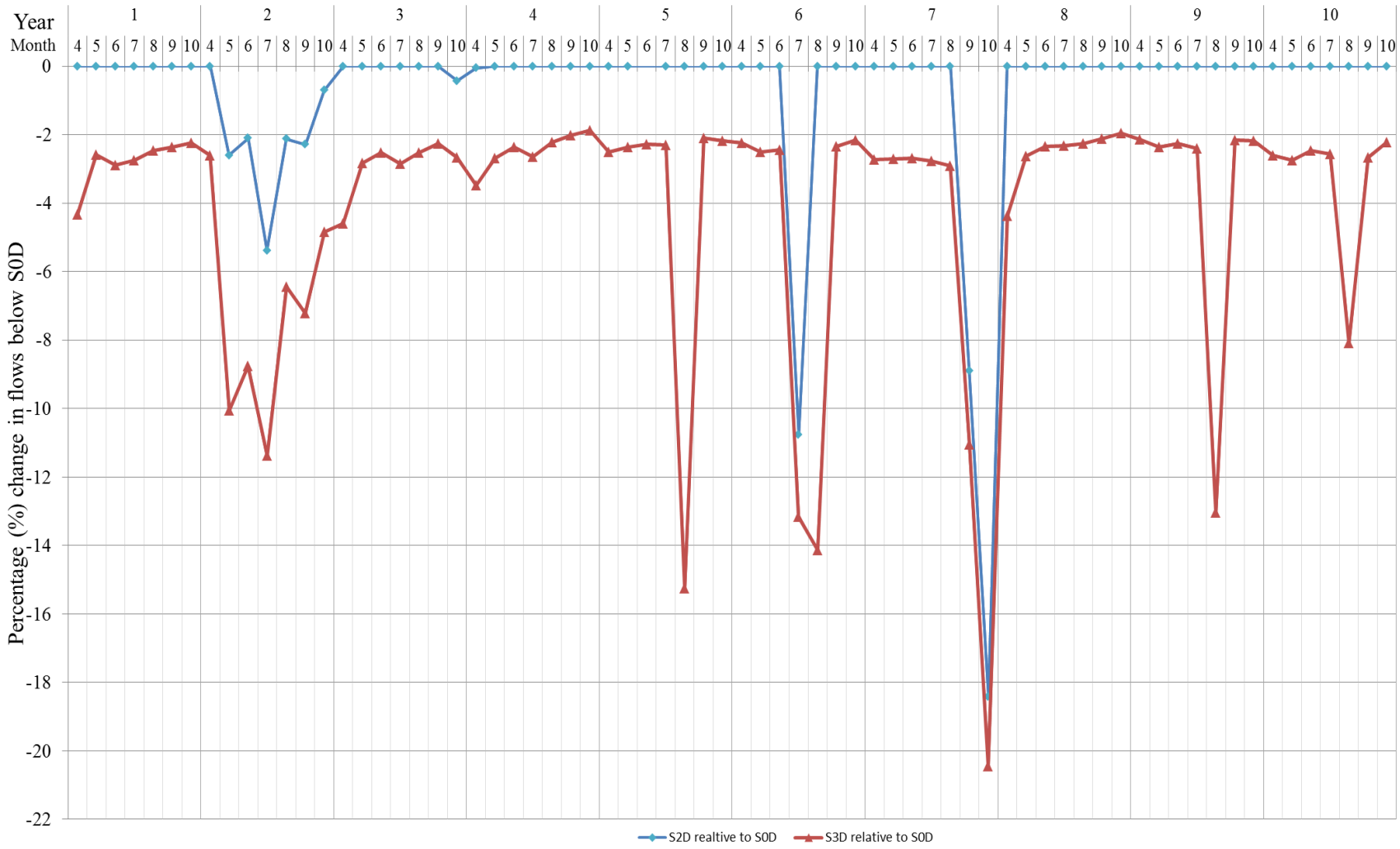

Figure 6.14 Impact to habitat in *Environmental Decline* S2D and S3D simulations, relative to S0D . Impact to Habitat is represented by percentage change in SWCA for S2D and S0D, relative to S0D.

6.6 Results discussion

Stymied Irrigation Progress

As results in this section show, *Stymied Irrigation Progress* simulations in all three future scenarios conform to the qualitative description of the narrative. According to this narrative, increased water withdrawal for an irrigation expansion will greatly inflate profits and contribute to increased employment in Saskatchewan, as was shown in Figure 6.11. On an annual basis, there is ample water available to meet this increased irrigation demand, even in the case where effects from climate change reduce flows by 5% to 8.5% in the North Saskatchewan River and South Saskatchewan River respectively. Overall, results as modelled show a perspective on three alternatives futures that match those relayed in the qualitative Stymied Irrigation Progress narrative.

Irrigated acres in the future scenarios with irrigation expansion, S2 and S3, do not reflect the entirety of the expansion in acreage as envisioned by irrigation interests. SIPA for example, envisions a series of infill and development projects – in the South Saskatchewan River, Lucky Lake, Riverhurst, Westside and Qu'Apelle regions - that would bring irrigation acres up to approximately 600,000 (SIPA, 2008). S2 and S3 include a maximum of 297,762 acres, roughly half of the idealized expansion. It remains unclear if model results would parallel the qualitative narrative so well in the case where $SWAMP_{SK}$ included all 600,000 acres.

It should be noted that net revenues calculated in the above sections are simple calculations based on multipliers gathered from a cost-benefit analysis on irrigation expansion by SIPA (2008). As the variables were intended to reflect the interests of the narrative, as relayed in words, numbers or frames, this was appropriate. It is rational to assume irrigation interests would employ numbers that would make irrigation expansion appear the most appealing option. Crompton (2006) remarks, "most economic impact studies are commissioned to legitimize a [predetermined] political position rather than to search for economic truth" (p.67). In particular, multipliers are often exploited via the inclusion of local residents, emphasizing sales and misrepresenting quality of employment (Crompton, 2006). The extent to which the numbers used in this analysis are exploited in the manner described by Crompton (2006) is outside the scope of this analysis. For comparison

however, it is worth noting that $SWAMP_{SK}$ analysis by Hassanzadeh *et al.* (2016) showed annual net benefits from irrigation ranging from between $10 and $65 million – comparable to the $11 million and $55 million calculated for direct on-farm economic benefits in this research. However, contrary to the claim by irrigation interests that the revenue generated by irrigation agriculture would increase in dry years (SIPA, 2008), Hassanzadeh's *et al.* (2016)'s analysis found net benefits become negative in years when the water supply declines, particularly in cases where there is more irrigated acres as a result of expansion. In other words, the promise of great returns is accompanied by the threat of equivalent losses in years where supply cannot meet all irrigation demands.

Hassanzadeh *et al.* (2016)'s analysis also does not include the hundreds of millions in societal benefits SIPA (2008) and others argue is a major benefit of irrigation.

Environmental Decline

The model results and qualitative narrative description match fairly well for *Environmental Decline*, and results suggest some additional trends not reflected in the narrative. According to both the model and the narrative, increased withdrawal associated with human interference in the SRB will reduce flows and decrease the variability in flows entering the Saskatchewan River Delta. These changes in flows will contribute to further habitat and wildlife degradation in the Saskatchewan River Delta and, according to the narrative, will lead to a continued decline in the traditional lifestyle of Aboriginal communities in the area. The E.B. Campbell dam contributes to important changes in flows, particularly in the winter and spring, but according to model results, the impact of the dam does not increase in significance as more water is withdrawn.

As mentioned once before, these results should be interpreted in light of the data used to simulate flows. Between 1980 to 2010, an increasing flow trend was observed and thus flow simulated into the future will exhibit a similar increasing trend over the 31-year period. However, if a different period of time was chosen results would change accordingly, and in this way the period of time selected to simulate flows functions inherently as a temporal frame. In general, a decreasing trend in discharge, and surface water coverage area in the Saskatchewan River Delta, has been observed since the beginning of the 20th century, due in part to the presence of the dams downstream (DUC 2011 in Sagin *et al.* 2011).

The model suggests the impact of reduced flows from climate change is greater than increased withdrawal from irrigation. Relative to S2 and S0, observed trends are more pronounced between S3 and S2 after the impact of climate change was added as a future condition. In stark contrast to the plot of *Environmental Decline*, this distinction suggests that a change in natural conditions will have a greater impact on flows than direct human influence on the system. However results should not be exclusively interpreted as such, as a reduction in flows at the border could also come from increased withdrawal from Alberta, where a larger population and developed irrigation system creates a much higher demand for water relative to Saskatchewan. Further, it is widely recognized human activity exacerbates the greenhouse effect that contributes to rapid climate change.

Results also suggest a future with reduced flows due to irrigation expansion or climate change has a larger impact on habitat and wildlife in the Saskatchewan River Delta than the impact of the E.B. Campbell Dam. This is unexpected, given the focus on the dam within the narrative. These results may be due to the simplicity of the modelling, where impacts on key Saskatchewan River Delta resources and finer-scale flow data was absent from the analysis.

Further, in contrast to *Stymied Irrigation Progress* which strongly asserts a vision of the future, the *Environmental Decline* narrative focuses on the past and present, emphasizing the difference in conditions between these two states. As such, the narrative doesn't directly deal with predicting the future under particular changing conditions and it is unclear if model results - namely the influence of climate change and other changing future conditions - are outside the scope of the *Environmental Decline* narrative as described in this research.

6.7 Modelling implications

Modelled results suggest how the lens of two water policy narratives – such as *Stymied Irrigation Progress* or *Environmental Decline* – can view the same future in a different way. As narrative variables represent narrative elements of substantial interest, modeled results show priorities within two water narratives in the SRB. These priorities can be considered stakes, or the benefits and costs associated with different decisions, according to each narrative. For example, if a future policy decision was to include irrigation expansion as was modeled in future scenario S2, *Stymied Irrigation Progress* focuses on the benefits of economic gains and increased employment, while *Environmental Decline* associates the same decision with a cost to wildlife and habitat.

Results from Chapter 6 suggest that under the same future conditions, unique narratives highlight different stakes while disregarding others. This further implies that if a narrative gains salience to the point where it influences decision-making or becomes the narrative that prevails in an organization after contestation (Kaplan, 2008), such as in the case where is becomes dominant or common-sense (Krebs, 2015), it will highlight some costs while hiding others. In other words, if decision-makers make policy decision in accordance with the narrative, there will be disregarded costs and benefits associated with those decisions. This begs the question, what will happen to the interests of one narrative in the case where another narrative comes to more accurately represent reality or where another narrative successfully influences the policy outcome or the method of policy analysis?

Modeled results from this chapter begin to suggest some possibilities within the context of the SRB.

Consider the interests of *Environmental Decline* – habitat, wildlife and by association, the Aboriginal traditional lifestyle – in the case where *Stymied Irrigation Progress* is dominant. In line with the modelling of the previous sections, decision-makers may use annual averages, which obscure important seasonal fluctuations, and fail to consider flows downstream in the Saskatchewan River Delta. This method of analysis may hide costs such as the environmental flow gap resulting from dam activities, or the increasing aridity of the SRD, or the decline of the moose

population. For example, when plotted on an annual basis relative to S0, flows with and without the dam look the same for both S2 and S3 (Figure 6.15).

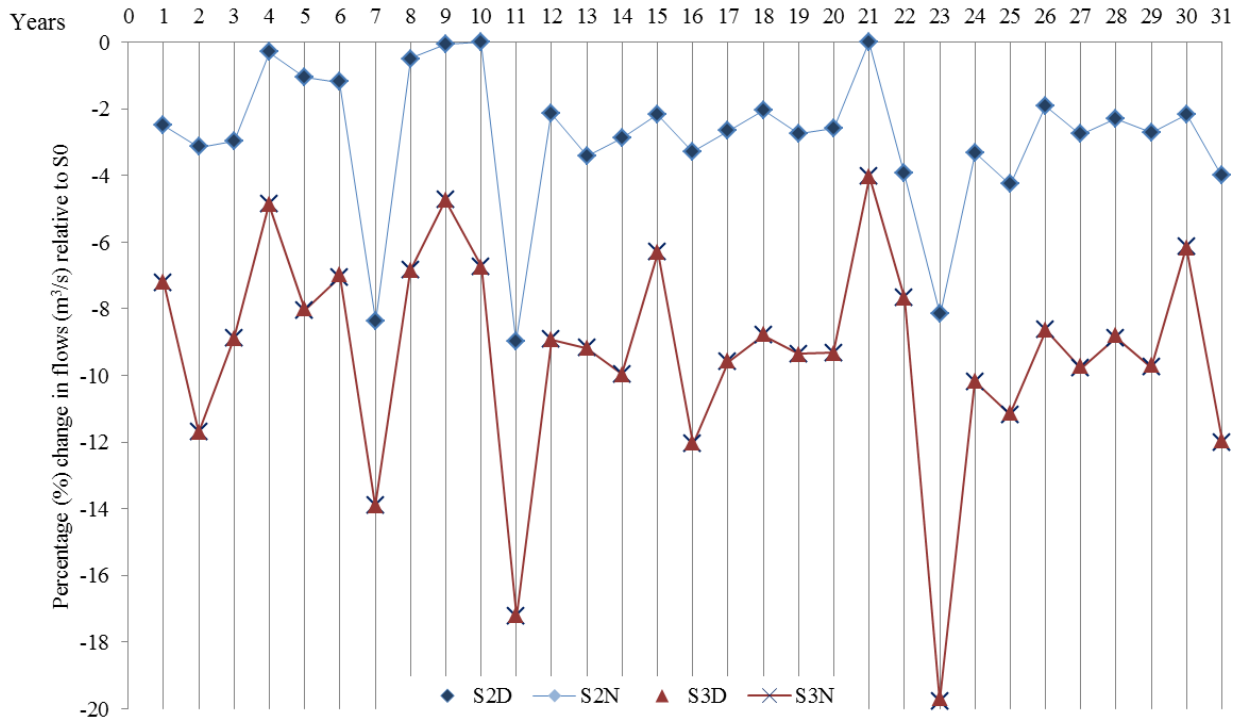

Figure 6.15. Annual flows (m^3/s) below Tobin Lake relative to S0, with (S2D and S3D) and without (S2N and S3N) the E.B. Campbell Dam.

The focus would instead would be on gains such as increased profits and spin-off economic benefits, and the influence of the *Stymied Irrigation Progress* narrative would likely lead to an expansion in irrigation acreage. As results from S2 indicate, this would lead to a further decline in the traditional activities of Aboriginal groups, at least in the case of the Saskatchewan River Delta. The effects are likely to be even more pronounced in the case where an irrigation expansion to the extent envisioned by SIPA (2008) was realized – in this case the irrigation demand would be almost double of that included in S2 and S3 in this analysis. The distribution of economic gains from expanded irrigation may or may not benefit these northern Aboriginal groups. If this expansion was accompanied by changes not envisioned in the *Stymied Irrigation Progress* narrative, such as a reduction in flows due to climate change included in S3, results indicate this could come at an even greater cost to the interests of *Environmental Decline*.

Alternatively, results allow a consideration of the priorities of *Stymied Irrigation Progress* - upstream monetary benefits to farmers and society – in the case where *Environmental Decline* dominantly influences decision-making. Decision-makers would likely use a fine lens to examine flows, particularly attuned to seasonal changes and the impact of human development on the river in areas of traditional significance to AB groups. At this scale, it becomes clear that during some weeks there would be a shortage of water for irrigation activities in a future with decreased flows, and it is unlikely a policy of full or even partial expansion would be pursued (Hassanzadeh *et al.*, 2015). However, as the lens of analysis *Environmental Decline* would obscure the economic gains that would result from an expansion of irrigation infrastructure. According to *Stymied Irrigation Progress*, the economic losses from this lost opportunity are large and this decision would come at a very real cost to Saskatchewan (visually depicted in Figure 6.15 above).

6.8 Discussion of modelling limitations

Narrative modelling should be understood as an exploration rather than an exhaustive, accurate depiction of the narratives, as they are described in Chapter 5 or as they may exist outside this research. Assessment of modelled narratives against their qualitative description served as an approximation, and calibration of the model against a source external to this research is outside the scope of this thesis.

Narrative variables do not represent a quantitative and thorough assessment of the narratives, other than the results presented in Chapter 5. Selection was based on a subjective assessment of theme relevance and was limited by the feasibility of obtaining appropriate proxy variables. The use of five variables for each narrative limits the complexity of the results and the ability of the model to emulate the narrative. Ultimately this limits any resulting analysis.

There are certain limitations inherent to $SWAMP_{SK}$, listed in Hassanzadeh *et al.*, (2014), and additionally in Hassanzadeh *et al.*, (2015) and Hassanzadeh *et al.*, (2016), and will not be detailed in this research. However, it is useful to note that the climate change scenarios used to generate S3 only represent the *average* expected reduction in annual flow volume and the impact of climate change on irrigation demand was not considered (Hassanzadeh *et al*., 2014). There are also several particular limitations to the construction of modeled narratives. Within construction of the

Environmental Decline model, the relationship used to generate SWCA was derived originally in Sagin *et al.,* (2015) using daily flow values between 1913 and 2012, whereas in this research monthly average flow values from 1980 to 2010 were used. Despite this, resulting values appear to closely mimic those in Sagin *et al.,* (2015). Further, the threshold established to assess moose habitat suitability was originally designed to encompass areas "in wetlands dominated by open water, emergent vegetation, or submersed/floating-leaved hydrophytes" (Allen, Jordan and Terrell, 1987, p.32). As only SWCA was used to assess suitability thresholds in this research, this neglects emergent vegetation that may also add to the percentage of suitable habitat for moose. As such, suitability thresholds are only represented approximately in this research.

In the 31-year historical flow period (1980-2010) used to generate results for S0, S2 and S3 there has been a general increase in average flows to Saskatchewan (Figure 6.31). This is significant because it frames the data within a window of time that provides a strategic advantage for *Stymied Irrigation Progress* (i.e. not only is ample water available, but water availability is general increasing). If the range of historical flows was extended to 100 years, a general decrease in average inflows would be observed and this would be a strategic advantage to *Environmental Decline*.

Chapter 7: Policy Implications

7.1 Introduction

As Stone (2002) says, narratives are important because "we often make policies based on examples believed to be representative of a larger universe" (p.138) when in fact, they are more reflective of one perspective. In the preceding chapters, the role of narratives in the SRB was explored using a qualitative content analysis and quantitative scenario analysis. Results indicate narratives play a significant role in the basin. The purpose of this chapter is to explore the implications of these narratives for policy planning and water management.

7.2 Management challenges and research contributions

As outlined in Chapter 2, challenges for the development of effective water policy in the SRB are many. Generally, these can be grouped as follows:

1) Challenge one: inherent complexities and cross-scale dynamics (e.g. arid climate, many stakeholders or transboundary management);
2) Challenge two: the management of future uncertainties and changing trends, including the effects of climate change and climate extremes, and population growth and economic development;
3) Challenge three: the inadequacy of the current governance framework and tools to develop balanced policy to manage future changes and;
4) Challenge four: competing stakeholder perspectives around values and priorities.

This thesis extends the argument made by Gober *et al.*, (2015), Strickert *et al.*, (2016) and others in challenge four above, suggesting that stakeholder perspectives differ on values and priorities in part because each group holds a different conceptualization of the decision space, and how that space will change in the future. Results from this research suggest that at least several distinct stories about SRB water management exist in Saskatchewan. Discussion around water planning becomes difficult because advocacy for one policy outcome is associated with the baggage of assumptions represented by the *narrative variables*. These findings are similar to the ambiguity

around “water security” discussed by Strickert *et al.*, (2015) which can prove problematic during water planning due to the unexamined wide range of beliefs and assumptions associated with the term. Further, this thesis also suggests why these divergent views matter for water policy and planning. Each narrative presents a different perspective on how the future will unfold, exposing decision-makers to real differences in terms of what is at stake. Results also suggest there are real costs in the case where one narrative successfully influences the policy outcome but a competing frame comes to more accurately represent reality. In this sense, this research begins to reveal the information gaps and limitations associated with different perspectives, as suggested by Strickert *et al.*, (2016).

By extension, these results also have implications for challenge three above, governance. Whatever the content, policy will be developed by collectives or organizations that use ‘interpretative systems’ (Daft and Weik (1984) and Loasby (2001) in Fulton, Pohler, and Fairbairn, 2015) such as a narrative or frame to process information and plan for the future. As shown in this research, narratives play a role in defining the boundaries used to process information and assign importance to some criteria over other criteria. To develop effective policy for future changes in the SRB, organizations will have to address the limitations that current cognitive framings may place on governance, along with strategic interdependencies and legitimacy issues (Fulton, Pohler and Fairbairn, 2015).

Unequal power relations implied by the presence of multiple, asymmetrical narratives in the SRB (Roe, 1994) will further complicate governance. Although this research does not explore dynamics between political actors and groups in the SRB in depth, it is important to remain mindful that competition between narratives takes place within a context of power dynamics. Power is a key question of phronetic planning research (Flyvbjerg, 2004) and is important because power is a vehicle through which to change the political and economic institutions that lead to general societal well-being and the distribution of resources within a society (Acemoglu and Robinson, 2012). Systems of power that are extractive (designed by societal elites to extract resources from society) and political institutions that allow societal elites to act in their own self-interest lead to worse economic outcomes for society (Acemoglu and Robinson, 2006). These systems of power also tend to be self-reinforcing due to large set up costs, learning and

coordination effects and expectations and are thus very difficult to change (Pierson, 2004). As suggested by this research, if these systems of power contribute to the selection of one narrative above another in the SRB, non-optimal outcomes for society can result from neglected costs and benefits.

These challenges all add additional layers of complexity to the development of good water policy in the SRB, and perhaps most significantly, signal that a shift is required from the traditional, modern focus of water management to the more complex challenges posed by governance, power and stakeholder relations. Results, and research by others, suggest that solutions for good water policy in the SRB cannot be imposed, and must emerge from those who participate in narrative development and benefit disproportionately from power relations (Fulton, Pohler and Fairbairn, 2015; Scolobig, Thompson and Linnerooth-Bayer, 2016). This appears a daunting task when viewed from the lens of the modern model of water management, but facing these issues directly also offers an opportunity to move forward into the development of more effective policy.

7.3 Implications for Saskatchewan water policy: developing a new metanarrative

To effectively and equitably manage our resources into the future, water policy cannot develop on the trajectory it has in the past. Gober (2013) urges policy-makers to get outside of the "water box" (p.955), and move beyond conservative, technical and other outdated methods of water management. Innovative water policy must be designed mindful of the important decisions about water often made in other spaces in which policies are shaped, and must create linkages between these decision-making groups (Gober, 2013). To address increasing uncertainty and complexity, decision-makers must envision multiple potential futures and develop flexible policies and robust solutions that will work over a wide range of conditions (Lempert *et al.*, (2003) in Gober, 2013).

As Gober (2013) states, moving beyond the traditional management does not mean determining the most likely future for Saskatchewan, but rather involves deciding what kind of future we collectively desire. The concepts of phronetic planning research poses similar questions: "[w]here are we going? Who gains and who loses by which mechanisms of power? Is this development desirable? What, if anything, should we do about it?" (Flyvbjerg, 2004, pp. 290). Undoubtedly, adopting a new paradigm of water management moves beyond the technical details and expertise

involved in development of policies of the past, and involves instead a frank discussion of values and power.

Saskatchewan is currently engaged in re-imagining its planning around water. The creation of the Water Security Agency (WSA) in 2012 consolidated most water governance in the province within one organization (WSA, 2012). The WSA is mandated to design and operationalize the 25 Year Saskatchewan Water Security Plan, which was drafted by WSA experts with input from members of the public and 56 organizations representing a wide range of stakeholders (WSA, 2012). The Plan has seven goals under which specific milestones are to be completed within 25 years (WSA, 2012). Goals include the maintenance of sustainable water supplies, provision of safe drinking water, protection of water resources, safe dams, flood and drought damage reduction, adequate data and effective governance and engagement.

In general, it remains unclear if this Plan moves Saskatchewan away from traditional management and towards more innovative policy planning that Gober (2013) describes. Encouragingly, there is at least a clear link between the goals of the Plan and challenges one through three listed in section 7.2 above. Challenge four (competing demands, priorities and values) however, is notably absent from the Plan. Presently, it remains unclear how the Province plans to address this challenge as it moves to create better water policy. The only external assessment completed on the 25 Year Saskatchewan Water Security Plan appears to support this observation. Roy (2013) evaluated the Plan based on the ability of its policies "to contribute to the planned and autonomous adaptability to anticipated and unanticipated uncertainties" (pp.iv) and identified that there was limited support for stakeholder adaptive capacity and limited planning in terms of continuous stakeholder involvement and input. It is suggested the Plan should create forums for information sharing, provide resources for self-organization among stakeholders, increase decentralization and provide a way to continually engage stakeholders in reviews of progress (Roy, 2013).

In light of the results of this research, it is concerning that Saskatchewan has specified no policy to address and incorporate competing priorities and concerns around water use. The results indicate that narratives, which speak to conflicting priorities and values, pose a real challenge to good water management. Results also suggest there are costs associated with privileging one narrative and as

a result, choosing a strategy that does not match well with (or equitably with) the external environment. Ultimately, these narratives have the power to influence the political or economic institutions that can lead to non-optimal outcomes for Saskatchewan's water resources and the people that depend on them.

For Saskatchewan, the way forward may come in the form of the challenge itself. As this research and the literature shows, each water narrative is valid and contains knowledge and experience that is missed in other perspectives (Scolobig, Thompson and Linnerooth-Bayer, 2016). If these narratives are, as Kaplan (2008) describes them, a method of imaging the future and winnowing down successful strategies in the face of uncertainty, competing narratives provide an opportunity to innovate and disrupt the path dependence of current political institutions. The supporting literature generally suggests two ways that narrative policy analysis can be employed to generate change: challenging the dominant narrative and developing a new meta-narrative. These are discussed separately below.

In general terms, the supporting literature suggests the best way to close or highlight the unexamined gaps created by alternative conceptualizations of the decision space is to facilitate discussion (Kaplan, 2008; Miller, 2002). The more these narratives exist separated within competitive lobbying groups, with vertical communication the only form of input into policy development, the more difficult policy creation will undoubtedly be. Lateral lines of communication can build conversations to create new stories that can foster change (Jones and McBeth, 2010). Communication must be laden with willingness to listen and openness to the other, cultural sensitivity, and be built of norms such as sincerity, intentionality and substantive contribution (Miller, 2002). Further, lateral lines of communication can reduce collective action problems so that stakeholder groups can more effectively exercise *de facto* political power to change political institutions (*de jure* political power) (Acemoglu and Robinson, 2006).

Challenging the dominant narrative

This research does not identify the (dominant) narrative primarily responsible for guiding decision-making. Results however, suggest several possibilities.

Dominance could be inferred from the similarity between a stakeholder groups narrative and that of decision-makers. As explored in Chapter 5, the assembled "Administrators" group is the closest in nature to a decision-makers group, yet this group is only a best proxy, as true decision-making occurs in a context inaccessible to this research. Instead, the group of documents that make up the "Administrators" group primarily reflects the lens employed by bureaucratic public servants who provide expertise. Although only a preliminary content analysis was completed on the Administrators group, results indicate this group engages in a unique "blame-the-victim" narrative in which victims themselves are responsible for the problems that afflict them (Stone, 2002). No other narrative examined in this research appears to parallel this narrative.

Out of the remainder of the stakeholder groups examined, Industry remains the only group with a position that appears to favor the current state of affairs. Jones and McBeth (2010) postulate that groups which hold a privileged power position will employ narrative elements to contain the policy issue and maintain the status quo. The defending, hero-oriented story-line of Industry may indicate their narrative is influencing decision-making, as this group appears to be benefitting from the current state of affairs.

Ultimately, it may be possible that the dominant narrative around water use in Saskatchewan is not a water narrative at all, but a dominant narrative guiding decision-making in a different space that has implications for water use, such as the energy sector. In fact, Acemoglu and Robinson (2006) suggest that the presence of natural resources, such as the mineral resources that contribute to the Saskatchewan economy, promote bad economic practices because they generate large rents without requiring the development of good political or economic institutions. The rents generated from these resources can contribute to lowering the opportunity cost associated with extractive systems of power.

The creation of the WSA and the 25 Year Plan suggests Saskatchewan and its water stakeholders have to some extent acknowledged and acted on the need to re-envision water management. As acknowledged in the Plan, there was a wide agreement among stakeholders in the first round of consultations that governance around water wasn't working (WSA, 2012). Whether or not this will lead to a meaningful challenge to the dominant narrative or the fundamental change required to

disrupt the path dependency of political institutions remains to be seen. In fact, if the establish of the WSA and the Plan do not lead to a shift away from modern models of policy making, research suggests that efforts will continue to be directed towards searching for optimal solutions and consensus building that reinforces hegemony in the decision space (Scolobig, Thompson and Linnerooth-Bayer, 2016). At a minimum, the recent launch of the WSA provides an opportunity window to challenge the dominant narrative as the relatively new organization settles into its new regime and improves the Plan through several iterations.

Kaplan (2008) suggests contesting frames, and narratives by extension, is a way to change current power structures as new coalitions become important. Narratives can be challenged by purposeful action on the part of political actors, either by replacing key decision-makers (Tushman and Rosenkopf (1996) and Virany *et al.*, (1996) in Kaplan, 2008), granting more decision-making capacity to additional actors (Burgelman (1994) in Kaplan, 2008) or actors taking individual initiative (Kaplan, 2008). When new coalitions form, stakeholder groups gain the ability to exercise more *de facto* political power to challenge existing political and economic institutions (Acemoglu and Robinson, 2006). Specifically, *de facto* political power can be used to pressure decision-makers into power sharing and creating more checks and balances in the political system (Acemoglu and Robinson, 2006). Societal elites have an incentive to give up power when they face increasing pressure because they incur costs from attempting to subdue discontent and risk losing their privileged position completely (Acemoglu and Robinson, 2006). In the SRB this can be understood as the costs decision-makers might incur from public relations campaigns or compensation, or the risk they may lose in a political election.

There is also an opportunity to challenge a prevailing narrative in the case where there is a clear mismatch between the narrative and the external environment. Kaplan (2008) suggests that a truce formed over a "collective" frame can work to break down the prevailing frame (see the section below). In Saskatchewan, this mismatch has been addressed partially with the creation of the WSA and the Plan. As this research suggests however, the reality of the water situation in the province complicates taking advantage of this opportunity. As institutions are well established and self-reinforcing (Acemoglu and Robinson, 2006; Pierson, 2004) fundamental changes are rare and tend to happen only at "critical junctures" (Acemoglu and Robsinson, 2006, p. 683; Baumgartner and

Jones, 1991). For many stakeholders in the province and especially elites, it could be that the water situation is not yet dire enough to call attention to discrepancies between the dominant narrative and the external environment. Further, the conceptualizations of the decision space are so dissimilar (in the snapshot of time captured by this research) that developing a truce over a collective frame would be complex, even in the event the venues were provided for doing so.

Developing a new Meta-narrative

A meta-narrative is a narrative that encompasses and links the narratives and counter-narratives in a particular decision space. Hampton (2011) and Roe (1994) argue the creation of a meta-narrative reconciles to some extent the dominant and counter narratives. Maintaining opposing views within a meta-narrative is key – the coexistence of these views highlights the priorities and values of the counter narratives (Hampton, 2011; Roe 1994) which may otherwise be obscured. Metanarratives can contribute to policy solutions that represent a compromise, which "respect[] and respond[] to all the contradictory certainties…maximize organizational learning [and] husband consent" (Scolobig, Thompson and Linnerooth-Bayer, 2016). The creation of a new meta-narrative may serve as a challenge to the dominant narrative in and of itself, as stakeholders willingly rally behind a more inclusive conceptualization of the decision space. By extension then, a meta-narrative can ultimately challenge the existing political and economic institutions that are leading to non-optimal outcomes for Saskatchewan.

A top-down or bottom-up approach can be taken to pursue the creation of a meta-narrative. A policy analyst can derive a meta-narrative through narrative policy analysis and the comparison of stories, non-stories and counter stories (Hampton, 2009). This metanarrative can then be presented to stakeholders for consultation. Alternatively, joint deliberation between involved stakeholders has the potential to intentionally or unintentionally create a meta-narrative which can then be used by policy analysts to develop equitable decisions (Hampton, 2009; Van Eeten (2007) in Hampton, 2011).

Stakeholder inclusion is important regardless of the strategy pursued during the creation of a meta-narrative. Stakeholder inclusion is important to anchor discourse at the level of the problem rather than at the level of elite experts or decision-makers (Miller, 2002). This is in line with concepts of

phroentic planning, which emphasize experience and context over universals and theory (Flyvbjerg, 2004). Local and expert knowledge should be simultaneously provided, with the acknowledgment that expert knowledge is likely to be privileged and that local knowledge will be contained in counter narratives (Hampton, 2011). Ideal opportunities for stakeholder inclusion involve the opportunity for iterative interaction with experts (Hampton, 2009; Scolobig, Thompson and Linnerooth-Bayer).

Hampton (2009) further emphasizes different kinds of stakeholder inclusion, namely the distinction between consultation and meaningful participation. Meaningful participation guarantees some public influence on final decisions, rather than a simple consideration of perspectives (Roberts (1998) in Hampton, 2009). When a meta-narrative is constructed with stakeholder input, buy-in is created and the meta-narrative becomes particularly effective at distancing each stakeholder from their original position (Hampton, 2009). This is not to suggest that stakeholder perspectives will transform; in fact, research suggests that when stakeholders are confronted with competing perspectives they entrench in their original positions and may even narrow their point of view (Scolobig, Thompson and Linnerooth-Bayer, 2016). Rather, participatory processes can distance stakeholders from their original policy position in the sense that they can respect and build on conflicting narratives to reach a point of compromise (Scolobig, Thompson and Linnerooth-Bayer, 2016). The role of the policy analyst remains significant too, as the process is more successful when deliberately facilitated (Hampton, 2009; Scolobig, Thompson and Linnerooth-Bayer, 2016).

Research by Greg Hampton provides a number of practical examples where the construction of meta-narratives led to a shift in the policy position of stakeholder groups. One such example, as detailed in Hampton (2009), revolves around water quality in an Australian town in the late 1990s. Hampton (2009) describes a situation in which a residential area was experiencing significant water quality problems. In response the public utility decided it was to embark on the construction of a centralized water treatment plant to improve water quality across the region. A dominant narrative emerged that there was significant water quality problems that required the construction of a water treatment plant in a specific location, based on best practice engineering and cost-effective design. A counter-narrative emerged from a concerned group in the residential area where

the new water treatment was to be built. The counter-narrative maintained water quality concerns were not significant, that the construction of the water treatment plant in their community would be dangerous and that the preferred solution was cleaning and upkeep of the current system.

When opposition emerged, the public utility determined the final decision would lie with the public, based on the results collected from a series of workshops. During the workshops, presentations were given by residents experiencing water quality issues, residents opposed to the construction of a centralized water treatment system, and experts presenting their assessment of the best solution to a water quality issue. As residents and experts had a chance to hear from each other, a significant shift in initial policy positions occurred. Residents from the second community acknowledged the significant water quality issues experienced by resident of the first community, of which they were previously unaware. Residents from the first community acknowledged the safety concerns of those from the second community. As Hampton (2009) relays, "(t)he meta-narrative, which developed within the workshop was that the treatment plant was necessary for the region but that it should not be located within close proximity to any residential community" (p.231). Ultimately, a majority vote led to the construction of a water treatment plant in a zone some ways away from the residential community.

In a more guided, top-down approach to meta-narrative creation, Hampton (2011) describes a participatory approach to policy development in an Australian university, navigating tensions between the university, employers and faculties as well as the tensions between faculties. Aiming to create a relevant Graduate Attributes Policy that meets the needs and has buy-in from all parties, Hampton (2011) creates two meta-narratives based on the interaction between the university and employers and the university and the disciplines. Then in a series of iterative consultations, Hampton (2011) proceeds to meet with faculties and potential graduate employers to incorporate new ideas and narrow down a list of Attributes included in the final policy.

These two instances provide tangible examples that could serve to guide similar participatory policy approaches in the SRB. Decision-making power could be extended to non-government entities. Venues for iterative discussion could be provided with access to expertise and meta-narratives could be constructed with the assistance of policy analysts. Research by Hampton (2009,

2011) suggests that these aspects alone are enough to decrease competition between stakeholder policy positions, creating space for government to pursue other challenging aspects of managing water resources in Saskatchewan.

To improve water policy in Saskatchewan then, differences cannot be hidden or neglected. To challenge the dominant narrative and build an alternative meta narrative - that can both incorporate portions of these stakeholder narratives and incorporate new concepts of what water policy needs to become - Saskatchewan must regard competing stakeholder values and perspectives as more than just a nuisance in the way of rational policy creation. Within these stories, the opportunity exists to resolve differences and move actors from seemingly rigid policy perspectives. New ideas, previously excluded from policy discussions, can improve political institutions and move decision-making forward to effectively plan for a future that could prove very challenging for the SRB.

7.4 Policy Recommendations

This section lists distinct policy recommendations for Saskatchewan in light of the results of this research. The purpose of this research is to introduce a new way of policy planning in the context of SRB water management. With that purpose in mind, these recommendations are provided from a postmodern lens of policy planning, where competing perspectives are regarded as an opportunity to develop better policy options while giving stakeholder "more of what they want, and less of what they do not want" (Strickert *et al.*, 2016, p.68). Recommendations are directed at 'Saskatchewan' which refers to those in government with both decision-making power and government agencies involved in water governance, specifically the Water Security Agency. Recommendations are as follows:

1. Saskatchewan should specify a policy that transparently articulates the approach they will take to the water management challenge and that will address and incorporate competing priorities and concerns around water use.
2. Saskatchewan should look for opportunities to disseminate and decentralize decision-making power around water resources outside of government departments. Resources should be provided for stakeholder groups to support self-organizing efforts.

3. Saskatchewan should seek iterative involvement of stakeholders in the policy making process, by creating opportunities for continuous stakeholder involvement and input.
4. Saskatchewan should provide venues for and support efforts to create lateral lines of communication between stakeholders during water management and planning. This could include the provision of forums for information sharing. Particular attention should be paid to extending the direction of knowledge flow between decision-makers, experts and stakeholders, specifically allowing for dialogue between stakeholders and experts.
5. Saskatchewan should establish communication norms that govern dialogue between stakeholder groups in government-led forums, and between government agencies and stakeholder groups. Communication should seek to increase empathy, and establish norms such as authenticity, willingness to listen and openness to new ideas, practical contribution, and cultural and historical sensitivity.

Implementing recommendations such as these in a decision space that stresses rationality is challenging, and requires a new way of thinking – not only about water policy, but about the process of policy creation in general. In effect this research, and other current research around socio-hydrology and policy planning, is a signal that the time has come for a new narrative around water policy in Saskatchewan, and around the world. From a new narrative perspective, it becomes possible for policy makers to employ participatory processes to reach compromise between competing stakeholder groups, and maximize opportunities for stakeholder inclusion and buy-in. Resulting policies will be more democratic, robust and legitimate in the eyes of the public, improving the overall management of water in the Saskatchewan River Basin.

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Appendix A: Coding Guide

Question 1: Does the material have symbols - stories, synecdoches, metaphors or ambiguity (Stone, 2002)? **Categorize**.

- Chapter 6 of Policy Paradox describes all of these elements in detail and the qualifications for correct categorization.
- Note that stories are similar to temporal sequence of events but Stone (2002) outlines 8 specific stories within which each narrative can be categorized.

Question 2: Does the material have 'characters' – heroes, victims, villians (Jones and McBeth, 2010)? **Categorize**.

- Identify the protagonist and antagonist if possible. Note, these 'characters' can be inanimate objects or systems of thinking.
- A villain/antagonist is whatever is harming victims or is at odds with the heroes.

Questions 3: How have the narratives assigned cause (Stone, 2002)? **Categorize**.

- **Simple Causes** can be identified as:
  - Accidental (nature, weather, earthquakes, machines that run amok – action is unguided);
  - Intentional (oppression, conspiracies that work, programs that work as intended but cause harm – action is purposeful);
  - Unintended consequences (intervening conditions, unforeseen side effects, carelessness, omission – action is purposeful); or
  - Mechanical (intervening agents, brainwashed people "doing their job," machines that perform as designed but cause harm – action is unguided)
- **Complex Causes** can be identified as:
  - Complex System (the accused blame the cause of malfunction on a system that is so complex and is, at times, unmanageable. It is hard to anticipate every problem);
  - Institutional System (social problems are created by a web of large longstanding organizations with ingrained patterns of behaviours); or
  - Historical System (social problems reproduce themselves, elites maintain power.)

Question 4: How is blame assigned – what strategies are used to assign blame (Stone, 2002)? **Categorize.**

- Blame will be described as:
  - A Conspiracy (action was a plot or secret plan to cause harm);
  - Teleological (action was intended);
  - Risk (action was a calculated risk); or
  - Complex System (action was a result of complexities or complications)
- Please categorize incidences of No Blame also.

Question 5: How are solutions invoked (Stone, 2002)? **Categorize**.

Question 6: How are interests defined? (To define an issue is to make an assertion about what is at stake and who is affected, and therefore, to define interests and the constitution of alliances (Stone, 2002)). **Categorize** and **describe**.

- Interests can be categorized as:

- Alliances/Disalliances (union for mutual benefit or similar interests; vice versa); or
- Stakes (something of value that may be lost or gained following a certain outcome)

Question 7: Does the material include a temporal sequence of events (or otherwise, a 'plot')? **Describe** them (Jones and McBeth, 2010; Stone, 2002).

- In a temporal sequence of events there will be a beginning, middle and end. You must be able to identify clearly each.
- A plot indicates that the events will relate to each other: in a pattern, through cause and effect, or through coincidence. You must be able to identify the 'plot'.

Question 8: Does the material have a moral (Jones and McBeth, 2010)? **Describe**.

- Right and wrong behaviour or decisions (a lesson) will be indicated.
- Proper conduct will be outlined.
- The moral must be able to be simply named and described.

Question 9: Does the material have 'dramatic moments' (Jones and McBeth, 2010). **Describe** them.

- A dramatic event will be - striking, effective, emotional, startling, surprising, over the top, emphasized - in some way. Must be able to outline why it is dramatic (may depend on context).

Question 10: What numbers does the material include? Identify how they are used (Stone, 2002)? **Identify**.

- Stone (2002) outlines a number of ways in which numbers can be used in narratives including boundaries, stories, reducing complexity, norms, bolstering authority, creating communities, aiding negotiation/compromise. Categorizing numbers used in the narrative in one of these categories depends on context – could be different between coders.
- Categories are not mutually exclusive.
- The most important goal for this question is to simply identify the numbers used; some may be added *as is* during modelling (Phase 2). The ways in which the numbers are used can be discussed in more detail during the description of Phase 1 on a case by case basis.

Appendix B: Long Descriptions of Stakeholder Narratives

Aboriginal

Temporal Sequence of Events

- Past youth with traditional lifestyle - lifestyle change from development - modernize youth to compete in changing world (moral: combine traditional and modern knowledge to help Delta (i.e. remaining sacred spaces for AB)

Moral (a spirit of love, morality and respect; water as a human right and not 'owned'; need for protection of remaining spaces with indigenous and western knowledge**)**

- a spirit of love, morality and respect
    - "no respect for the land, there is no respect for indigenous people of the land; the way we are living is not the way of the future; Shame on you that you are benefitting from the richness of this land, where is your spirit of love, where is your spirit of respect; The government doesn't care, I think there are people who are simply detached from morality, from respect for life; need teaching."
- Combine traditional and modern knowledge to save remaining places;
- Respect, inform and understand competing interests;
- Water as a human right (and our rivers as public trusts);
- Government must help protect delta.

Dramatic Moment (used to illustrate human (dam) impacts and loss of traditional lifestyle)

- Frozen muskrat discovery (shocking moment in story when muskrat family was found dead from dam flooding during winter).

Characters (Villain-Victim story**)**

- Villains
    - Saskpower and upstream dams (particularly E.B. Campbell);
    - Government planners – shutting down department;
    - Another "way of life" in general.
- Victims
    - impoverished citizens/families of Cumberland holding entire burden of stewardship, struggle for basic survival, loss of traditional way of life;
    - Aboriginals in general.

Story (Decline; Conspiracy)

- Conspiracy
    - Government purposefully ignoring AB and not treating them with due respect.
- Decline
    - Environmental decline (dominant) – may be tied in with cultural decline because culture is so dependent on being able to live as they traditionally have; when the environment declines, so does the culture. It's a physical representation about

what's happening to AB peoples; it gets to the root of the problem – where water is concerned.
    - Cultural decline.

Synechdoche

- Desecration of spiritual sites– symbol of AB culture/sacred sites being destroyed
- Muskrat decline– environmental decline

Metaphors

- Water as sacred – demand will increase;
- Mother earth;
- Delta as paradise – but hidden;
- Dam development as a monster;
- "highways" of SK rivers and lakes - traveling by story;
- Government planning as schemes; puppet masters; removed from location.

Numbers (noticeably absent from this narrative, except for use in specific stories like the muskrat decline**)**

- Minimum flow of 75 cubic meters per second – but even with that the dam traps nutrient rich sediments upon which the delta ecosystem depends; no easy solution to that…

Cause

- Intentional: Simple Cause
    - Suspects consultation with AB always an afterthought –govt does not acknowledge AB issues or Rights;
    - Government taking away resources (department closure) from Delta stewardship, refused to do a health assessment of contaminated water;
    - Pushed politically, economically and culturally to extinction by taking land, ceremonies and life as a AB people;
    - Government doesn't care.
- Mechanical: Simple Cause –unguided; intervening agents, brainwashed people "doing their job," machines that perform as designed but cause harm)
    - E.B. Campbell Dam – functions as it's supposed to but does harm (disrupts normal flow patterns and harms wildlife/vegetation). Also employed ppl in the area and they participated.
    - Gardiner Dam – functions as it's supposed to but causes harm(erosion)

Blame

- Teleological: Assuming the outcomes are the intended
    - Govt side-stepping responsibility – closing departments despite mandates/avoided water issues on AB places of residence. Won't listen without science – but it doesn't take science to know the Delta is "dying," thus the govt is intentionally letting it die, motivated by money;
    - "Taking" the life of the AB people through political, cultural and economic extinction;
    - Government "doesn't care;"

    - Government chooses not to fully disclose info at a strategic level;
    - Building things like the Dam purposely

Interests

- Competing interests
    - Saskpower v. Cumberland residents (bad relationship from residents perspective; good from company perspective);
    - An acknowledgement of many needs in competition for resources.
- Alliances
    - AB working with scientists.
- Stakes
    - Traditional lifestyle;
    - Vegetation, fish, wildlife.

Decision

- Rational planning
    - Metis Nation appreciated the design of the engagement process.
- Powers
    - Inclusion of certain political AB people (changing decision-making body);
    - Feel they should be at the table before consultation – they are sovereign, they are not a stakeholder;
    - Consultation needs to be on Treaty 4 land.
- Rights
    - Have a right to be consulted;
    - Not a stakeholder when it is their rights being discussed.

Facts

- Delta an area rich and vital to traditions and ways of life
- AB not responsible for overhunting
- Bad relationships between SaskPower/Govt
- People don't know about the Delta (unimportant – not registered. Public, Canadian government, even Canadian researchers late to the gamee)
- The land will no longer support populations
- Water scarcity – increasingly used for human needs at the expense of the environment

Irrigation Agriculture

Temporal Sequence of Events

- Irrigation developed in phases – peaked in the 1980's – now mostly private and needs funding;

- Irrigation has a long history – legacy of poverty alleviation and food security – future population growth will require this;
- Royal commission-unrealized-todays potential;
- Rural needs not met – more development and opportunity – we have extra water.

Moral (the answer for threats to ag and rural populations as well as emerging security pressures is irrigation. Expansion will provide large societal benefits and is the rational thing to do**.)**

- Irrigation development should be a no-brainer and is the rational thing to do;
- Agriculture is under threat and irrigation is necessary;
- Big (economic) benefits from irrigation;
- Cannot "impair" development, need a balance with environmental concerns;
- Irrigation mostly benefits society (only 15-20% goes directly to the farmer) and farmers should 'sell' this message;
- Irrigation will increase our self-sufficiency;
- Irrigation is vital to food security and rural population revitalization;

What's good for irrigators is good for SK

Dramatic Moment (used to highlight the frustrating nature of an unclear commitment from government**)**

- "Sh#t or get off the pot" directed at government/politicians

Characters (Villain-oriented; setting past leaders up as heroes. Not as clear as other narratives.**)**

- Hero
  - 'Visionary' leaders who developed water infrastructure in the past, and not only for irrigation, but for the public in general – for things like municipal water supply, tourism and power generation;
  - These leaders "prevailed" over the negative recommendations by the 1952 Royal Commission of Inquiry;
  - The ability of irrigation to save the rural population;
  - The importance of irrigation is assumed, almost treated as a holy grail.
- Villain
  - Politician's;
  - Government frameworks, lack of money and profitability. Read full-list on SIPA website but these are only marketed as "constraints" and extend right down to the producer level;
  - Note: Characters for AG are not as clear as for other narratives (AB and Enviro for example).

Story

- Stymied Irrigation Progress
  - 20th Century was an "Age of Irrigation" and world acreage doubled between 1900-1950. Since then, new projects have diminished.
  - Development will have conflicts but we need development and cannot impair it.

- Less than 3.5% of mean annual flow into Diefenbaker is consumed – in most jurisdictions irrigation takes 70-80%. We are working well within resource base and the opportunity to irrigate is there.
- "Starting in the southwest of the Province during the initial settlement, irrigation projects developed…the "Dirty Thirties" created a wider interest in a large number of drought proofing measures. Irrigation expansion continued slowly, and with intermittent growth, through the 20th Century to approach 350,000 acres. By the 1990s irrigation expansion had almost halted."
- Progress in SK has been inconsistent and irregular "…including the rejection of the South SK River Project in 1952 only to see it start again in the 1960s. Expanding acreage in the 1970s and 1980s was followed by a slowdown and eventual decline."

Synechdoche

- Almond growers in California – used as illustrative example of how much water ag uses.

Metaphors

- "Keeping the promise" (x3) "Irrigation makes SK grow!" (2) "The time has come!" (x2)
- SK is a "sleeping giant" when it comes to vegetable production
- Call to arms for development

Ambiguity

- Advertised as great economic, social and environmental benefits. List economic ones in a lot of details and some social, in terms of job provision. Only environmental benefits mentioned is "water intensive ecology created by the irrigation economy that provides for and finances wetlands and wildlife development."
- Adverse effects are missing/not listed.

Numbers – reduce complexity, story, ambiguity, norms

Cause – why there has not been irrigation development

Simple

- Unintentional/Natural
  - Rapid population growth and the pressure this puts on our natural resources (resistance to development)
- Intentional
  - Food policy and government regulations sheltering ag from market forces
  - No firm commitment or adequate funding
  - Delayed with investigations instead of a show of initiative by leadership
- Mechanical
  - Cost of building irrigation capacity.
  - The lack of experience and insight people in government have.
  - No capacity federally or provincially to undertake a massive capital project.

Complex

- Institutional
    - Closer attention to environmental and social issues slowed development
    - Prolonged recession, public dollars not available
    - Organizational inertia and short-sightedness from government planners (4 year cycle)
    - Had to coordinate between all the different organizations involved in governance (within and between organizations – constant debate and dialogue)
    - 4-year election cycle presents problem for long term planning.

Blame

Teleological

- Government food policy and government regulations shelter irrigation from market forces. Prevents irrigation from being sustainable
- Not adequate monitoring from government agencies (regarding water quality in lake defienbaker)
- Irrigation economically makes sense and politicians are delaying and refuse to commit (big blame).
- Government and academics have reduced funding for research and other responsibilities (equipment provision) so irrigators will have to increasingly rely on the private sector.

Interests

Competing interests

- Irrigation agriculture v. government
- Irrigation v. environmentalists

Alliances

- CICDC and Producers
- Farmers and Industry
- Irrigation and private sector/industry

Decision

Rules (x3)

- Appropriate institutional framework, policies and a forum to discuss with MOU.
- Stable public policy frameworks that will outlast electoral cycles.

Rational Planning (x4)

- MOU to bind parties together to same purpose
- Long-term coordinated planning, specifically development of a SK Irrigation development Strategy, Plana and Vision (to 2050)

Powers

- Favourable “institutional framework” in place

Inducements

- Water user's ability to pay depends upon the price they receive for their products, which is greatly influenced by international market prices and government food policies (before they are expected to pay for the development themselves).
- Governments need to design policy that reflects the cost of irrigation and the benefits it provides to society.
- Rule of thumb is that main funding needs to be provided by the federal government, the province playing a supporting role on smaller developments
- Financing is a long term barrier to development. SIPA wants a MOU between SIPA and SK Gov't for a long term on-farm irrigation capital funding program as well as long term public and private capital funding over a forty-year period for major projects and a Federal Provincial Irrigation Capital Funding Agreement.
- Hope government is exploring financing options such as public-private partnerships and lone term debentures where people could invest.

Facts (Climate change used in whatever way is beneficial; water is regarded as an economic resource; the public will benefit most from expansion; development is delayed by government and economics.)

- Climate change will benefit irrigation;
- Climate change is a reality with impacts;
- Climate change is not a reality – isn't man-made;
- Water is for the economy (the key to economic growth, funded by the government historically). Water is a resource (Environment calls this a "use it or lose it" mentality);
- Good water management means good economic use;
- The public benefits most from irrigation (study from Alberta in the 1980's , 87% of benefits went to society);
- Most people in the public want more development on the rivers (especially institutions like the university; except the SK Green Party);
- Irrigation would save rural populations;
- Barriers to irrigation development are economic;
- Irrigation would have a significant cost ("the social, economic, and environmental costs of irrigating an additional 1.5 million ha would be significant, however, the feasibility of the proposed expansions was never fully examined");
- Government delays are a hindrance to development. The government has other priorities;
- Must be cautious about oil development around lake Diefenbaker and potential spills.

Industry

Temporal Sequence of Events

- Economic growth of industry - water supplies under pressure - innovative tech and discussion key to the future;
- The mining process as a story - Planning, Production, Reclamation;
- Neglected land - industry money - conservation destination for future stewards.

Moral

- Have a responsibility for sustainability: "As a key player in helping to feed the world, we have a responsibility to consider how our actions and decisions impact our long-term performance and affect the people, places and resources associated with our operations. We strive to meet this responsibility by taking a sustainable approach to all aspects of our business."

- Negative impacts of business are minimal.

Characters

- Hero (PotashCorp, Vale)
    - Long history and recent raised profile of the industry (recent multi-billion dollar expansions);
    - Helping nature provide – nature can't provide without their help;
    - Spends large amounts on conservation projects;
    - Values emphasize morality – life matters most. Value people. Prize planet. Do what is right. Improve together. Make it happen.

Story

- Change-is-only-an-illusion: An industrial process or project will be put in place but the changes you fear will not occur as a result. We have state of the art environmental, safety and social programs in place to ensure no detrimental impacts. And when we do leave an impact, we will reclaim the land so it's like we were never there.
    - Enhancing existing safety systems and industry/company best practices.
    - Operations subject to numerous and increasingly stringent federal, provincial, state and regional environmental requirements.
    - Sustainable growth and responsible stewardship embedded in everything that is done. Committed to "making a difference" in communities in which they operate. Sustainable and beneficial to the community in which they operate and ultimately, the world.
    - Gaining approval for mining operations is "not easy." Extensive regulations.
    - We will withdraw water but there will be "no significant change" to the hydrology. We leave waste, but we've developed effective ways to deal with them.

Metaphor

- Operations as a footprint – industry working to reduce this so it seems like they were never there.

Ambiguity

- Sustainability – a key goal, but what does it mean?
- Adverse effects are not listed; it remains ambiguous what they specifically are – adverse effects listed as "not significant" with no indication what they are or how they were found to be insignificant. Where impacts are found to be negative, they are not described in detail while the positive effects are described in detail.

Cause

- Unintentional: Simple Cause –**secondary dominant**
  - Development unavoidably causes some impacts on environment and local communities: gaining approval for any project is not easy and shouldn't be.
- Mechanical: Simple Cause – **dominant**
  - Water supply agreements are becoming more difficult to negotiate – water availability is a risk to business. (wether or not this is mechanical objectively is debateable, but it is presented as mechanical, as just the nature of the business environment – water scarcity is just a reality)
  - Environmental incident ½ in 2014 due to process design issues.
- Intentional: Simple Cause
  - Self-examination of environmental impacts and industry activities that contribute to degradation in order to mitigate risks.

Blame

- Calculated Risk
  - continuously looking for ways to reduce the footprint of operations and preserve nature;
  - Realize the pros and cons/realities of business;
  - Government (like Saskwater or Environmental impact statement) responsible for building infrastructure and ensuring good environmental practice with the operations. Have to obtain this approval and meet these standards;
  - Understand the role industry plays in environmental issues such as climate change.
  - The government owns the resources so they have the ultimate responsibility for them.

Interests

- Alliances
  - Enviro and industry: partnership between Ducks Unlimited Canada and Potashcorp to work on key sustainability area (for f-ing PR lol)
  - Farmers and industry – wouldn't say this is an alliance, they are just talking
  - Industry and government – control and regulation fo water will remain firmly in the hands of the provincial agency WSA (scapegoating)

    - Industry and municipalities - Western Potash Corp.'s new potash mine in Milestone, SK recently received environmental assessment approval for the facility, including the use of City of Regina treated effluent as the industrial water source for its solution mining process

Decision

- Inducements
    - To mitigate water scarcity allow municipalities to sell treated wastewater to companies
    - Looking for revenue-generating opportunities in the merging regulatory framework around environmental/water regulations
    - Development results in primary and secondary job creation, tax and royalty revenue, increasing training opportunities
- Powers
    - Protecting the company's reputation as an environmental steward
- Rational Planning
    - Discussion between farmers and extractors of natural resources will continue, innovative technologies and agreements providing a way forward
    - Healthy discussion – scientifically sounds facts, diverse perspectives, transparent processes
    - Input largely from scientific experts, government but also consider concerns/comments from public and other stakeholders
- Rules
    - Regulatory standards (fed, province, local, complying with current future by monitoring discussion and participating in public discussions around carbon emissions
    - GHG regulations monitoring to maintain compliance with applicable rules and ensure that new rules are based on science and protect food security.
    - Not just outside sources – companies regard themselves as having a strong environmental corporate framework and reputation
    - Environmental impact statement – central component of getting permission for mining
    - Storage and handling of hazardous materials meets legal requirements
    - Province required credible decommissioning and reclamation plan, company has to put up insurance to make sure this happens despite change in ownership or financial hardship
    - Reliance on scientific expertise

Facts

- Climate change is a reality with impacts
- Industry values sustainability and conservation – sustainability is key goal, responsible stewardship embedded in everything they do and a serious commitment

- Industry believes in connecting with the land that sustains the population and understand the key role nature has in providing the right conditions for crop growth
- The SK government view ag expansion as a major opportunity for economic growth and to attract investment
- Emphasizes positive aspects of development and reclamation/mitigation
- Water is a natural resource that belongs to everyone in SK
- Water scarcity a reality and represents a serious risk to business

Environment

Temporal Sequence of Events

- 'Agrivision' Plan – holes in argument – more attractive alternatives and caution (Plans of dams and additional water infrastructure are 'drought proofing schemes' that are 'unaffordable and unnecessary.' There is a need to envision a different future and alternatives that are socially, environmentally and economically superior).

Moral

- Water is a human right and our rivers are public trusts;
- Discourage disruption of the ecosystem; protection of ecological integrity;
- Cautious development with supporting research (Polluter Pays and Precautionary Principles);

Dramatic Moment

- The use of "shocking" statistics. For example, "In 2000, diversions from the Bow River for irrigation took over 95 per cent of the river's flow on some days, causing significant fish kills."
- Deliberate manipulation of information in the Diefenbaker consultations or presentations of the Agrivision plan and the success of Alberta's irrigators. For example, "He alluded to neighbouring farmer's being unhappy with the tremendous amount of water used by the Reserve but he shrugged and carried on with his presentation."

Characters

- Victim
  - Downstream users;
  - Taxpayers who fund big projects;
  - SK residents who view access to water as a human right and rivers as publically owned and responsibly managed.
- Villain
  - Hydroelectric power dams upstream (from Delta) and peat extraction;
  - Those interested in exploiting SK water resources - SK Agrivision Corporations – Wayne Clifton and Graham Parsons, SK Forest Centre, Farm Credit Corp., the Blood Tribe from southern Alberta, Tourism SK, SK Mining Association., SK Power, the Minister of Rural Revitalization.
  - Government, particularly provincial.

Story

- Story of Conspiracy (dominant)
  - Private control of water – state SK water is not for sale but buyers will soon be approaching; private investors ready to buy SK water; commercial attitude; the SK Water Council's mandate to "optimize development of SK's ample water resources."
  - Information manipulation, evasion to answer, lack of transparency;
  - Industry special privileges – is their use a right or privilege over others?

- Story of Decline
    - AB already using significant water in the south, how will SK honour the Master Agreement on Apportionment in a future with less water?
    - Waste disposal and population reducing water quality.

Metaphor

- Water as a 'human right' or 'public trust;'
- Dangled like fine jewels to tempt into development– images of the "Tennessee Valley authority, SK as a significant electricity exporter, sail boats on beautiful lakes, as well as the potential to copy the wealth of Alberta's livestock and meat-packing industry were dangled before conference participants."
- Call to development likened to a call to war;
- Development vision (Agrivision) like a pink bubble.

Cause

- Unintentional: Simple
    - Potentially inaccurate information when using allocation versus actual water use for decision-making purposes.
- Natural: Simple
    - Increasing human demand and combined climate change is making freshwater scarce in many areas;
    - Management is difficult because the SRB is a transboundary river.
- Mechanical
    - Dams (13 hydropower and hundreds of smaller dams along ARB system) fragment flow.
- Intentional: Simple (dominant)
    - <u>Development is still planned and encouraged</u> despite there already being social/environmental problems, unknown and infrastructure not fully used. For example, the Agrivision 50-year plan is to realize the full benefits of water development by building 15 dams and reservoirs for a constant supply of water for development –for more gas and oil, more mining, more rural development, more intensive cropping, more value added processing, and more ILOs for SK's "Green and Prosperous Economy." There is a "use it or lose it" attitude.
    - <u>Industry privilege</u> and given free rein to use resources as they will;
    - <u>Insufficient data</u> – not enough data is collected to address management issues over the next 20-25 years, don't know instream flow needs and environmental impacts, not enough info on how management will impact the individuals downstream or on what water needs and uses in the system even are.
    - <u>Lack of transparency</u> - stakeholders don't understand who gets priority in a water shortage, data is kept away from public, decision-making isn't transparent.

Blame

- Conspiracy

    - Stakeholders don't understand the priority affecting water management decisions (lack of transparency) particularly how the biodiversity/ecological needs of the system are determined and used in management decisions;
    - Industry has special privileges.
    - Discussion about what a water allocation license means; and
    - Elements of conspiracy in the Water Wealth conference – report for sale at $100 each, "let's get going," "optimize development of SK's ample water resources," pre-recorded video message from PM and Finance Minister Goodale.
- Teleological
    - People use too much water - Canada higher per capita water user than anyone except USA. Water allocations in SRB are the highest for any Canadian River (70% of natural flow in basin is allocated.) Less than 1% of water is usable freshwater and humanity has come to play a significant role in global hydrological cycle – worldwide humans use 54% of accessible run-off water; and
    - Additional development (dam the river) deliberately proposed (Water Wealth).

Interests

- Competing interests
    - environment v. irrigation/industry "development"

Decision

- Inducements
    - In favour of both "carrot and stick" approach for quick changes for conservation; and
    - Take the money planned for "moisture managing" infrastructure and instead invest in another direction – for example, farmers. Building co-operative processing plants over which farmers could gain minimally-subsidized ownership.
- Rational Planning
    - Planning needs to take place to make sure wise development is taking place. For example, why are we developing more infrastructure for irrigation when irrigators are still not making full use of the existing infrastructure.
    - Need more information and research before taking action. For example, there is little data on water quality or location and size of underground aquifers.
    - Priorities and allocations should be made according to a water management plan; we need to have some idea of what we're doing.
- Rules
    - Certain agree-upon principles should guide our development and use of resources such as the Polluter Pays and Precautionary Principles
    - Water management decisions should be made according to transparent priorities;
    - Rules needs to be made about allocation during times of shortage; rules need to be adjusted where allocations aren't reflecting actual use; rules need to be adjusted to reflect future changes in the system; these rules need to be clearly communicated;
    - Biodiveristy and ecological needs need to be taking into account when making

decisions around water (set aside water specifically for the environment);
  - Research and information need to be done to support this rule-making;
  - Rules need to be legally enforceable.

Facts (facts focus on how our water will be increasingly scarce in the future; there is a sense of urgency about the threat to our water resources)

- The watershed matters most, not the river; preserving ecological integrity means managing the 'whole.'
- Healthy rivers provide many goods and services that we tend to take for granted: a reliable water supply, fish and other foods, water purification, and cultural, spiritual, and recreational values;
- Climate change is a reality with impacts;
- Demand for water will increase;
- Development harms natural spaces;
- SRB and SK wetlands are the most threatened in the country;
- Water is fundamental to human life and the ecosystems that support that life; and
- Water scarcity is present and going to increase.