

**The Influence of Stakeholder Values on the Acceptance of Water Reallocation
Policy in Southern Alberta**

by

Cameron Parrack

A thesis
presented to the University of Waterloo
in fulfilment of the
thesis requirement for the degree of
Master of Environmental Studies
in
Environment and Resource Studies

Waterloo, Ontario, Canada, 2010

© Cameron Parrack 2010

AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

ABSTRACT

Historically, a great deal of water has been allocated to the agricultural sector in Alberta to support economic development and to contribute to food security. However, demand from other areas has increased in recent years, notably from the environment. Meeting new demands while still satisfying existing users has become a significant challenge. The combination of increased water use efficiency and productivity combined with reallocating water from agriculture to other sectors has emerged globally as a solution to this challenge. Thus, new policies regarding water reallocation need to be developed. Designing policies that are acceptable to the various stakeholders involved poses a considerable challenge. The values held by individuals determine how they will react to new public policies. Hence, to support effective policy making, a better understanding of how the non-irrigator population perceives water reallocation issues is necessary. Using mail-out surveys to collect data from the populations of Lethbridge, Alberta, and the surrounding smaller communities, this research aimed to identify the values regarding water allocation held by domestic, non-irrigator water users, and to determine how these values influence their acceptance of water allocation policies. Findings from the survey reveal how non-irrigators' values influence their opinion of water transfers from the irrigation sector to the urban and environment sectors, and the conditions under which they should take place. A pro-environment value orientation was most prominent amongst the urban sample, while the rural sample was mainly moderate in their value orientation. The large moderate value cluster within the rural sample represented both pro-economic and pro-environment values depending on the focus of the survey item. Statements that would affect the community (irrigation sector) were met

with pro-economic values while statements that involved making a personal sacrifice in order to protect the aquatic environment were strongly supported. Value orientation was found to greatly influence the respondents' perception of water reallocation policy.

ACKNOWLEDGEMENTS

I would like to thank my two advisors, Dr. Henning Bjornlund and Dr. Rob de Loë, for all of their guidance, support and unrelenting patience throughout the research process. I would also like to express my appreciation and thanks to all of the members of the Water Policy and Governance Group, past and present. Your insight and support has been instrumental in helping me get to where I am today.

I would like to thank the key informants involved in this study that gave up their time to meet with me. Each of their unique perspectives proved to be vital in achieving a well-rounded understanding of how water is managed in southern Alberta.

I would like to thank all of my friends for their support over the past few years. You have helped to remind me that there is a world outside of the library. Finally I would like to give my biggest thanks to my Mom, Dad and Brother. You three have always stood by me and whole-heartedly supported all of my dreams and aspirations without question. I would never have achieved this goal or be the person I have become without you.

TABLE OF CONTENTS

AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE INTRODUCTION	1
1.1 PROBLEM CONTEXT	1
1.2 RESEARCH PURPOSE AND OBJECTIVES	4
1.3 STRUCTURE OF THESIS	5
CHAPTER 2 THE ALBERTA POLICY CONTEXT	7
2.0 WATER ALLOCATION IN SOUTHERN ALBERTA.....	7
2.1 HISTORICAL SIGNIFICANCE OF WATER ALLOCATION POLICY	7
2.2 FIRST-IN-TIME, FIRST-IN-RIGHT WATER ALLOCATION	8
2.3 WATER RIGHTS TRADING AND INTERSECTORAL REALLOCATION	10
2.3.1 <i>Supply and Demand in the Oldman River Basin</i>	10
2.3.2 <i>Legislation Enabling Water Rights Trading in Alberta</i>	11
2.4 INCREASING WATER USE EFFICIENCY	15
2.5 KEY WATER ALLOCATION ISSUES IN ALBERTA	17
2.5.1 <i>Vulnerable Communities</i>	18
2.5.2 <i>Protection of Aquatic Ecosystems</i>	19
2.5.3 <i>Water Sharing During Drought Periods</i>	27
2.5.4 <i>Concluding Remarks About Key Water Reallocation Issues</i>	28
2.6 RURAL TO URBAN WATER REALLOCATION - IN THE PUBLIC'S BEST INTEREST?	29
2.7 CHAPTER CONCLUSION	33
CHAPTER THREE RURAL-URBAN DIFFERENCE IN VALUES RELATED TO ENVIRONMENTAL POLICY	35
3.1 THE IMPORTANCE OF STAKEHOLDER VALUES	35
3.2 PROPERLY FRAMING INFORMATION ABOUT ENVIRONMENTAL POLICY	38
3.3 THE FORMATION AND DIFFERENCES BETWEEN RURAL AND URBAN VALUES REGARDING ENVIRONMENTAL PROTECTION.....	40
3.3.1 <i>Differential Exposure Theory</i>	41
3.3.2 <i>Extractive-Commodity Theory</i>	42
3.3.3 <i>Proximity to and Social Ties with Agriculturalists</i>	43
3.3.4 <i>Provenance</i>	45
3.3.5 <i>Demographic Differences</i>	47
3.4 DIFFERING PERCEPTIONS OF NATURAL RESOURCES	50
3.5 RURAL FARM VERSUS NON-FARM RESIDENTS	52
3.6 SHIFTING ENVIRONMENTAL VALUES	53

3.7 VALUE ORIENTATIONS TOWARDS ENVIRONMENTAL ISSUES	55
3.8 CONCLUDING REMARKS AND IDENTIFYING THE KNOWLEDGE GAP	58
CHAPTER FOUR METHODOLOGY.....	60
4.1 OVERVIEW	60
4.2 HYPOTHESES	61
4.3 OLDMAN RIVER BASIN, ALBERTA, CANADA.....	63
4.4 SURVEY DEVELOPMENT.....	65
4.5 SURVEY STRUCTURE.....	66
4.6 SEMI-STRUCTURED INTERVIEWS.....	69
4.7 VALUE ORIENTATIONS INDICATED BY KEY INFORMANTS.....	70
4.7.1 <i>Intrinsic / Bequest</i>	71
4.7.2 <i>Conservation / Lifestyle</i>	73
4.7.3 <i>Basic Needs / Family</i>	75
4.7.4 <i>Economic</i>	77
4.8 DEVELOPING THE VALUE STATEMENTS	79
4.9 RURAL-URBAN DIFFERENCES	86
4.10 DEVELOPING THE POLICY STATEMENTS.....	88
4.11 COLLECTING DEMOGRAPHIC INFORMATION	101
4.12 DISTRIBUTING THE QUESTIONNAIRE	101
4.13 RESPONSE RATE.....	103
4.14 DATA ANALYSIS	104
4.15 CONCLUDING REMARKS.....	107
CHAPTER FIVE RESULTS	108
5.1 OVERVIEW	108
5.2 OMITTED VALUE STATEMENTS.....	108
5.3 LABELING THE CLUSTERS	110
5.3.1 <i>Rural Sample:</i>	116
5.3.2 <i>Urban Sample</i>	119
5.3.3 <i>Cluster Labeling Conclusion - Hypothesis 1 Confirmed</i>	124
5.4 COMPARING SIMILAR VALUES CLUSTERS BASED ON VALUES ORIENTATION	125
5.4.1 <i>Similarly Oriented Cluster Size - Rural versus Urban Dimension</i>	126
5.4.2 <i>Pro-Environmental Value Clusters</i>	127
5.4.3 <i>Pro-Economic Values Clusters</i>	131
5.4.4 <i>Moderate Values Clusters</i>	137
5.4.5 <i>Concluding Remarks - Hypothesis 2 Partially Confirmed</i>	143
5.5 DEMOGRAPHIC ANALYSIS.....	144
5.5.1 <i>Gender Characteristics</i>	144
5.5.2 <i>Age Statistics</i>	146
5.5.3 <i>Education Statistics</i>	148
5.5.4 <i>Income Statistics</i>	151
5.5.5 <i>Provenance and Setting Where Respondents Have Mainly Lived</i>	152
5.5.6 <i>Demographic Analysis - Major Conclusions</i>	154
5.5.7 <i>Hypotheses 2a and 2b Confirmed</i>	155
5.6 RESPONSES TO THE POLICY STATEMENTS	156
5.6.1 <i>Responses to the Policy Statements - Summary</i>	179

CHAPTER SIX DISCUSSION.....	181
6.1 SHARED VALUES OF THE ENTIRE POPULATION	181
6.2 CHARACTERISTICS OF THE VALUE CLUSTERS	184
6.2.1 <i>The Rural Clusters</i>	185
6.2.2 <i>The Urban Clusters</i>	187
6.2.3 <i>Rural-Urban Differences Summarized</i>	189
6.3 COMPARING THE SIMILARLY ORIENTED CLUSTERS	192
6.3.1 <i>Pro-Environment Value Orientation</i>	193
6.3.2 <i>Pro-Economic Value Orientation</i>	195
6.3.3 <i>Moderate Value Orientation</i>	201
6.4 GENERAL COMMENTS ABOUT THE SURVEY RESPONDENTS	206
6.5 DISCUSSION CHAPTER SUMMARY	207
CHAPTER SEVEN CONCLUSIONS	210
7.1 KEY FINDINGS AND CONTRIBUTIONS	210
7.2 RURAL-URBAN DIFFERENCE IN VALUE ORIENTATION.....	211
7.3 DEMOGRAPHIC CORRELATIONS TO VALUE ORIENTATION	214
7.4 POLICY IMPLICATIONS	215
7.5 FUTURE RESEARCH	219
REFERENCES.....	221
PERSONAL COMMUNICATIONS.....	231
APPENDIX A SOUTHERN ALBERTA WATER ALLOCATION AND STAKEHOLDER VALUES SURVEY.....	232
APPENDIX B KEY INFORMANT INTRODUCTION LETTER	243
APPENDIX C KEY INFORMANT CONSENT FORM.....	245
APPENDIX D KEY INFORMANT INTERVIEW QUESTIONS.....	247
APPENDIX E KEY INFORMANT FOLLOW-UP LETTER.....	249
APPENDIX F LIST OF KEY INFORMANTS.....	250
APPENDIX G SURVEY RESPONDENT INFORMATION LETTER	251
APPENDIX H SURVEY RESPONDENT PRIZE DRAW ENTRY FORM.....	252
APPENDIX I SURVEY RESPONDENT REMINDER LETTER	253
APPENDIX J CANADIAN FEDERAL CENSUS DATA - COMMUNITY PROFILES.....	254

LIST OF TABLES

TABLE 4.1 HYPOTHESIS 1	61
TABLE 4.2 HYPOTHESIS 2	62
TABLE 4.3 HYPOTHESIS 3	63
TABLE 4.4.1 CREATION OF THE VALUE STATEMENTS - INTRINSIC / BEQUEST.....	80
TABLE 4.4.2 CREATION OF THE VALUE STATEMENTS - CONSERVATION / LIFESTYLE	82
TABLE 4.4.3 CREATION OF THE VALUE STATEMENTS - FAMILY / BASIC NEEDS	83
TABLE 4.4.4 CREATION OF THE VALUE STATEMENTS - ECONOMIC.....	84
TABLE 4.5 CREATION OF THE POLICY STATEMENTS	88
TABLE 4.6 QUESTIONNAIRE DISTRIBUTION.....	102
TABLE 5.1 VALUE AND ATTITUDE STATEMENTS NOT USED FOR CLUSTER ANALYSIS	109
TABLE 5.2: VALUE STATEMENTS - CROSS-TABULATION WITH CLUSTER ANALYSIS SOLUTION	111
TABLE 5.3 RURAL CLUSTER SIZE COMPARISONS.....	116
TABLE 5.4 URBAN CLUSTER SIZE COMPARISONS	119
TABLE 5.5 SIMILARLY ORIENTED CLUSTER PAIRS - SIZE COMPARISON	127
TABLE 5.6 PRO-ENVIRONMENT CLUSTER DIRECT COMPARISON - VALUE STATEMENTS .	128
TABLE 5.7 PRO-ECONOMIC CLUSTER DIRECT COMPARISON - VALUE STATEMENTS	133
TABLE 5.8 MODERATE CLUSTER DIRECT COMPARISON - VALUES STATEMENTS.....	138
TABLE 5.9 WITHIN SAMPLE (RURAL-URBAN) GENDER CHARACTERISTICS.....	144
TABLE 5.10 COMPARING SIMILARLY ORIENTED CLUSTERS - GENDER	146
TABLE 5.11 AGE DISTRIBUTIONS FOR RURAL AND URBAN SAMPLES	146
TABLE 5.12 RURAL AND URBAN AGE – DISTRIBUTION BY CLUSTER GROUP.....	147
TABLE 5.13 SIMILARLY ORIENTED VALUES CLUSTERS - AGE	148
TABLE 5.14 WITHIN SAMPLE (RURAL-URBAN) EDUCATION CHARACTERISTICS	149
TABLE 5.15 SIMILARLY ORIENTED CLUSTERS - EDUCATION	150
TABLE 5.16 WITHIN SAMPLE (RURAL-URBAN) INCOME CHARACTERISTICS.....	151
TABLE 5.17 SIMILARLY ORIENTED CLUSTERS - INCOME CHARACTERISTICS	151
TABLE 5.18 - PROVENANCE AND SETTING WHERE RESPONDENTS HAVE MAINLY LIVED DATA	152
TABLE 5.19 - RURAL AND URBAN ‘MAINLY LIVED IN’ AND ‘RAISED IN’	153
TABLE 5.20 LIKE-CLUSTERS - PROVENANCE AND ‘MAINLY LIVED IN’ - STATISTICAL SIGNIFICANCE (PEARSON CHI-SQUARE TEST).....	154
TABLE 5.21 VALUE CLUSTERS CROSS-TABULATION WITH POLICY OPTIONS.....	157
TABLE 5.22 SIMILARLY ORIENTED VALUES CLUSTERS - SIGNIFICANCE TESTS	159

LIST OF FIGURES

FIGURE 4.1: OLDMAN RIVER BASIN..... 64

LIST OF ABBREVIATIONS

AENV	Alberta Environment
EID	Eastern Irrigation District
FITFIR	First in Time, First in Right
MAG	Minister's Advisory Group
MD	Municipal District
OWC	Oldman Watershed Council
SMRID	St. Mary's River Irrigation District
SSRB	South Saskatchewan River Basin
WCO	Water Conservation Objective
WID	Western Irrigation District
WPAC	Watershed Planning and Advisory Council
WSRP	Water Shortage Response Plan

CHAPTER ONE

INTRODUCTION

1.1 Problem Context

Historically, a great deal of water has been allocated globally to the agricultural sector for social, political, and economic reasons such as settlement of remote areas, food production for export earning, and resettlement of returning soldiers (Bjornlund and McKay, 2000). This has led to a situation where many rivers, particularly in semiarid regions of the world, have become over-allocated with, in many places, significant environmental impacts. Many basins such as the South Saskatchewan River Basin (SSRB) in Alberta and the Murray Darling Basin in Australia have now been closed and no new licences to extract water will be issued. While no new licences can be issued, demand still increases due to population and economic growth; environmental awareness is also increasing resulting in growing demand to leave more water in the rivers to increase water quality and to improve the condition of aquatic ecosystems. There is therefore a growing need for new mechanisms to reallocate water from existing users to new users. Since around 80% of water extraction in many of these basins has been for irrigation it is inevitable that most of the demand from new users, including the environment, will have to be reallocated from the irrigation sector. However, since most economic activity in irrigation communities is derived from the use of water the reallocation of water out of this sector can potentially have serious socioeconomic impacts. New water reallocation strategies therefore need to be developed in regions worldwide where the volumes of water allocated amongst the various sectors do not reflect current demand. Intersectoral reallocations are possible in theory, but the policy

and legislation that enables or encourages this process must be deemed acceptable by those stakeholders who will be affected by newly enacted reallocation strategies.

An excellent study region where this problem can be examined is southern Alberta, a semi-arid region whose economy is dominated by irrigated agriculture. Presently, there are a variety of sectors in Alberta that are in constant competition for water. Thus, conflicts have arisen among and between sectors regarding the allocation of this valued resource. During the 20th century, population growth, economic development, and expansion of irrigated agriculture have led to dramatic increases in water use; the population of Alberta will only continue to grow in coming decades (Fitzhugh and Richter, 2004; AENV, 2005). The consequences of such growth include serious environmental degradation and the possibility of rivers running dry (Bjornlund, 2010). This leads to the realization that water needs to be reallocated from existing users, such as the irrigation sector, which accounts for 71% of the all water withdrawals for consumptive use in the South Saskatchewan River Basin (AENV, 2002).

Intersectoral water transfers may be an appropriate way to satisfy the water demands of growing southern Albertan municipalities as well as the environment. However, rural to urban water transfers in Alberta have in many instances been met with opposition from different sectors of the community including the irrigation sector. While the irrigation sector is concerned about losing control of water resources, opposition from other sectors is caused by at least two different concerns: i) concern about the socio-economic impact on the region (irrigators and their communities); and ii) environmental concern (D'Aliesio, 2007; Christensen and Droitsch 2008; Bjornlund, *et al.*, 2009; Bjornlund, 2010). Water transfers between users are not a new practice, both globally and

in the province of Alberta, but traditionally only transfers among users of similar uses of water have taken place (e.g., farmer-to-farmer and municipality-to-municipality) (Levine *et al.*, 2007). Intersectoral transfers are now necessary to meet the needs of growing municipalities and the environment (Bjornlund, 2010). However, the participation in formal market activity (transfers of permanent long term entitlements) in southern Alberta has been limited thus far (Nicol and Klein, 2006).

The varying degrees of acceptance of intersectoral water transfers by the affected populations (rural and urban) may be influenced by the difference in value orientations held by individuals. This reflects the findings by Schwartz (1977) with respect to the perception of environmental issues. It has been theorized that there will be notable differences in values and attitudes towards environmental protection between rural and urban populations (Tremblay and Dunlap, 1978; Lowe and Pinhey 1982; Mohai and Twight, 1986; Freudenburg, 1991; Dietz, Stern and Guagnano, 1998; Jones *et al.*, 1999). However, more recent literature indicates that this difference in environmental concern may be diminishing due to the in-migration of urban residents with pro-environmental values to rural communities, rural communities gaining access to environmental services such as recycling facilities and public transit, the decline in employment in the natural resource extractive sectors in rural areas and subsequently lower levels of regular social interaction with those involved with these sectors (Huddart-Kennedy *et al.*, 2009b; Sharp and Adua, 2009). The possible determinants of the value orientations of individuals (related to natural resource extraction and environmental protection) and the types of values thought to be dominant in rural and urban settings will be discussed in detail in Chapter 3.

Past literature has attempted to discover the motivations or characteristics of people aligning with pro-environmental values as well as those exhibiting pro-environmental behaviour (Tremblay and Dunlap, 1978; Lowe and Pinhey 1982; Mohai and Twight, 1986; Freudenburg, 1991; Dietz, Stern and Guagnano, 1998; Jones et al., 1999; Schultz and Zelezny, 1999; Salka, 2001; Dietz *et al.*, 2002; Huddart-Kennedy *et al.*, 2009b; Sharp and Adua, 2009; Milfont and Duckitt, 2010; Vugteveen *et al.*, 2010), but these studies have all focused on broad environmental concerns and not specific, local issues. As a result of the needs of the urban and environmental sectors in the southern Albertan region there is pressure to transfer water from the irrigation sector, but the most effective method of undertaking this task has not yet been determined. Southern Alberta is a prime example of a water scarce region where intersectoral water transfers are becoming necessary. An excellent opportunity is present to not only take stock of the values held by rural and urban Albertans related to water reallocation, but to also determine which reallocation schemes are favored by the population. This study will concentrate on the part of the population not directly involved in owning or operating an irrigated farm. If a reallocation of water out of agriculture entails compensating irrigators for giving up their water for the environment, then this sector of the community will be paying the bill via the taxes. Further, this sector of the society has the largest electoral influence, hence the opinions of this sector of the population are important for policy makers.

1.2 Research Purpose and Objectives

The purpose of this research is twofold: (1) to discover if there is a difference in values held toward water reallocation between rural and urban people in southern Albertans not directly involved in operating an irrigated farm; a difference that may vary greatly

depending on how dependent the local community is on the irrigation sector, and (2) to determine which water reallocation policy options are accepted by those residing in rural and urban locales. The region is characterized by its semi-arid climate and heavy economic reliance upon irrigated agriculture, two features which make the study of water reallocation policy in this region very important. To achieve this aim, three research objectives are outlined:

1. Determine whether or not rural and urban people in southern Alberta have different value orientations towards water.
2. Evaluate the factors that influence the values orientations held by urban and rural people in southern Alberta, and the extent to which they are related to involvement with irrigation.
3. Determine the extent to which values influence peoples' opinions regarding water reallocation and the conditions under which this process should take place.

1.3 Structure of Thesis

The thesis contains two literature review chapters. The first literature review chapter (Chapter Two - The Alberta Policy Context) examines the history of water reallocation policy in North America, the guiding legislation that dictates how water is governed in Alberta and the major issues surrounding water reallocation in southern Alberta. The second literature review chapter (Chapter Three - Rural-Urban Difference in Values Related to Environmental Policy) provides a thorough review of the relevance of accounting for stakeholder values and outlines the findings of past studies that have sought to determine if there is a difference between rural and urban populations in terms of values held towards the environment and associated environmental policies. The

Methodology Chapter (Chapter Four) provides a brief outline of the study area, the hypotheses that have emerged and the expected outcomes, how the data collection tool (mail-out questionnaire) was developed and finally a discussion of the statistical tests that will be applied to the questionnaire data that is collected. Chapter Five reports findings that were observed following the application of the statistical tests on the data collected. The findings are then discussed in Chapter Six; connections are made to the academic literature outlined within the two literature review chapters. Overall implications and opportunities for future research are presented in Chapter Seven (Conclusions). The Appendix provides copies of research instruments and additional information about the study.

CHAPTER 2

THE ALBERTA POLICY CONTEXT

2.0 Water Allocation in Southern Alberta

In order to fully understand water reallocation there first needs to be a discussion of how water reallocation policy has evolved and why certain policies have been implemented in North America and in southern Alberta specifically. The following sections outline the history of water allocation legislation, the southern Albertan context, in terms of the geographical and economic background, and finally why new reallocation policy is imperative in the region.

2.1 Historical Significance of Water Allocation Policy

To attract settlement in the dry prairies in the past, the Canadian Dominion had to not only convince settlers that the southern Albertan prairies were suitable for farming, but also that sufficient water supplies would be available (Kwasniak, 2010). As a British Colony, Canada originally adopted the common-law doctrine of riparian rights. Under this doctrine, only owners of riparian land were able to access water. This soon proved to be an impediment to large-scale irrigation or the development of land that was distant from a watercourse (Percy, 2005). Therefore, the government looked to systems in place in similarly arid regions such as those employed in Australia and the Western United states. The Australian system eliminated riparian rights and vested ownership of all water in the crown, enabling the government to issue water licences to water users in support of government policy. This facilitated the development of irrigation on non-riparian land and justified government investment in major dams and water conveyance infrastructure to support such irrigation.

The Western United States adopted the prior appropriation doctrine (Kwasniak, 2010) which vests private ownership in the person appropriating the water and associates a priority of each such right according to the date it was appropriated. In western Canada, the Dominion government created the North-West Irrigation Act, 1894, which established a system of prior allocation (Percy, 2005). This new legislation incorporated the principle of ‘first-in-time, first-in-right’ (FITFIR), which combines elements of both the Australian licensing system and the US prior appropriation doctrine. It did this by following the Australian system by vesting the water in the crown and issuing licences to water users upon application and following the US system by assigning each licence with a priority date, the date at which the licenced allocation was granted.

2.2 First-In-Time, First-In-Right Water Allocation

The FITFIR system of water allocation has been an important part of the development of the West. It provides the rules and procedures for assigning rights and for establishing the processes used to decide how water should be shared among various users across industrial, agricultural, municipal, and domestic sectors (Brandes *et al.*, 2008). Water allocation arrangements reflect differing historical, geographic, and cultural traditions and conditions. The FITFIR system traditionally ensured that farmers had secure access to water and established an orderly allocation of water for those who settled the West (Christensen and Droitsch, 2008; AENV, 2003). The rights to certain quantities of water are based on licences that have a priority date attached, which is the date the licence was first approved. If one individual (or industry, municipality, or irrigation district) holds a licence dated earlier than another party, then during periods of shortage the former has the right to access their full allocation before the latter can access any of

their water (Horbulyk and Adamowicz, 2002). Huffaker *et al.* (2000) indicates that the FITFIR allocation system is relatively easy to administer, promotes the security of water use that stimulates economic investment in the resource, as well as promoting security by definitively indicating the amount, purpose and place of appropriative water use.

There are however many limitations of the FITFIR allocation system. The system does provide a simple and practical strategy for water allocation, but it does not rationalize water allocation based on aspects such as the socioeconomic values or environmental vulnerabilities associated with water resource management (Rood and Vandersteen, 2010). The FITFIR has also been criticized for its “limited promotion of water conservation and efficiency, insufficient consideration of environmental and social equity factors in allocation decisions, and a lack of flexibility in the face of uncertainty” (Brandes and Nowlan 2008, 274). Additionally, longstanding rights holders maintain priority regardless of how much more valuable competing uses might be at the margin of use (Huffaker *et al.* 2000).

Instream needs were not recognized as being a beneficial use of the resource when the prior allocation system was established in southern Alberta in the late 19th and early 20th centuries, a time when the majority of water licences were tied to irrigated agriculture. The result of the perpetuation of this type of system is that “irrigated agriculture currently has priority regardless of how little water remains for instream flow needs when streamflow is low” (Huffaker *et al.* 2000, 267). Kwasniak (2010, 9) also notes that “although FITFIR does not prevent measuring instream flow needs and scientifically determining how much water needs to remain instream to meet instream flow needs, it prevents protection in fully or over allocated water courses unless water

rights become transferred to instream uses”.

The FITFIR system is not likely to be abandoned anytime soon, but there are some innovated methods of meeting the demands of new users through water rights trading, which voluntarily reallocates water between competing users, while still operating within the current system. The next section explains who the major users of water are within the southern Alberta region and the legislation that enables water rights trading and water reallocation.

2.3 Water Rights Trading and Intersectoral Reallocation

2.3.1 Supply and Demand in the Oldman River Basin

Prior to the discussion of the need for intersectoral water reallocation the major water users within the region and the available supply need to be reviewed. There are nine irrigation districts at least partially located within the Oldman River Basin (Alberta Environment, 1996). Irrigation (district and private irrigators) accounts for 87% of the total volume of licenced allocations in the Oldman River, while commercial and municipal uses comprise 3.73% and 2.70 % respectively (AENV, 2003). The remainder of the Oldman River’s flow is allocated to other uses such as water management, habitat enhancement, oilfield injection, dewatering and recreation. It is expected that non-irrigation water use will increase by 40% in the next 25 years and by 80% in the next 50 years, based on assumptions of moderate population and economic growth (Hydroconsult, 2002; Stratton *et al.*, 2004).

Streamflow in the Oldman River watershed generally is declining. The 5-year moving average of annual minimum monthly streamflow for the Castle River, an unregulated river in the upper reaches of the Oldman River watershed, has declined by

10% since 1949 while the 5-year moving average for the annual mean streamflow for the Castle River has declined by 26% (Byrne, 2006). Consistent decline of the annual minimum monthly streamflow of this system is a clear indication of a reduced snow pack. Byrne (2006) also states that rivers with a declining streamflow have less water available to dilute pollutants. These decreases can result in increased concentrations of harmful substances in the water (water pollution), negatively affecting aquatic ecosystems, and placing maintenance or creation of a healthy ecosystem at risk. Not only is the available water supply shrinking, but also, to exacerbate the issue further, the human population continues to grow.

Reflecting the seriousness of the degradation taking place in the South Saskatchewan River Basin as well as the decreasing supply, in late 2005 the provincial government stopped accepting applications for new licences to extract water from the Bow, Oldman and South Saskatchewan river sub-basins until the Minister of Environment specifies, through a Crown Reservation, how water not currently allocated is to be used (AENV, 2006). As a consequence of this certain sectors such as industry and municipalities that are in need of water allocations will only be able to acquire water rights through water rights trading (Bjornlund *et al.*, 2009); the environment's needs will have to be secured through the creation and enlargement of water conservation objectives (WCOs), discussed in detail in section 2.5.2. In summary, the increasing demand for water within the region will need to met by a fixed, or possibly declining, supply of water.

2.3.2 Legislation Enabling Water Rights Trading in Alberta

The provincial legislation that enables water to be transferred between users is the

Alberta's *Water Act* (1999). Essentially, the *Water Act* (1999) allowed for the creation of a water market where buyers and sellers of water licences can engage in the market on a voluntary basis. The legislation provides a wide range of mechanisms to proactively manage water to meet the full range of demands during periods of scarcity, including provisions for redistributing water; this is facilitated by allowing users to buy water licences from existing users, and by permitting voluntary sharing agreements, a tool utilized effectively during the drought period of 2001 (AWRI, 2009). The *Water Act* (1999) also encourages and accommodates the many changes in water use that can occur by allowing for both temporary and permanent transfers, as well as short-term assignments of water (Percy, 2005). The *Water Act* (1999) requires that "an assignment of water merely requires the parties to file a copy of a written assignment agreement with the Director, who may intervene in the assignment only if it harms the rights of other users or has an adverse effect on a water body or the aquatic environment" (Percy 2005, 2102).

As noted throughout the previous sections, irrigators control the vast majority of water rights in southern Alberta. The *Irrigation Districts Act* (2000) governs the irrigation districts and their use of water. Irrigation Districts may transfer water licences or portions of their licence via the mechanisms provided by the *Water Act* (1999), but they may also "expand the purposes for which they can divert water and use water by amending their licences and provide a portion of their licenced water to a variety of users including golf courses, industrial plants, conservation organizations and municipalities through a variety of agreements sanctioned under the *Irrigation Districts Act* (2000)" (Bankes, 2006). The main differentiating factors between the two pieces of legislation is

that agreements arranged under the *Irrigation Districts Act* (2000) are not subject to public review and offer the transferee far less security of supply than would be afforded with an entitlement obtained through the *Water Act* (1999) (Bankes, 2006). The implications of water trading enabled by the *Irrigation Districts Act* (2000) will be examined through a case study presented in section 2.6.

Positive and negative qualities are associated with water rights trading. Positive outcomes associated with water trading include: i) the ability to accommodate new users; ii) an incentive for all water users to reduce wasteful use by allowing the marginal value of their water to be recognized (i.e., an incentive for licence holders to use water efficiently because they are permitted to sell or lease any water they do not use); iii) the ability of water users to get long-term security of water through the permanent transfer of water rights; iv) the ability to have flexible water supplies to attain long-term structural adjustments in the economy; and v) an encouragement to change water use (i.e., water voluntarily moving from low-value to high-value uses or moving intersectorally) (Tisdell and Ward, 2003; Percy, 2005; Nicol and Klein, 2006).

Increased water rights trading within a watershed can potentially have a number of serious negative impacts. Three major ecological impacts that may result from water reallocation have been indicated within the academic literature. First, a transfer may result in a change of authorized use (e.g., municipal to industrial) with substantially different return flow characteristics (Bankes and Kwasniak 2005). This can alter both the volume and quality of water reaching the downstream users, including meeting instream needs. Secondly, the licensee making the transfer may not have been utilizing the full licenced volume; in such a case the transfer of a licence may have the effect of further depleting instream flows even though there has been no change in licenced volume

(Bankes and Kwasniak 2005). Percy (2005, 2102) also notes that “transferability tends to intensify water use, as licencees have incentives to save and transfer water that, for example, might otherwise return to the river or seep into wetlands”. Thirdly, a water rights transfer may result in a different point of diversion, possibly negatively affecting the entitlements of other downstream users and the environment in terms of changes in water quality (Bankes and Kwasniak 2005).

There are also negative socioeconomic impacts that may arise due to water reallocation. Studies by Edwards *et al.* (2007, 2008) conducted in Australia found that water reallocation from existing local users to large corporate farming operations or to water users outside the local area, perceived as being more efficient and more productive users of the resource, resulted in fewer farms in their district. This led to an accelerated population decline, which, in turn, led to fewer local employment opportunities and a contracting local economy due to reduced spending (see also Tisdell and Ward, 2003; Bjornlund, 2004; Fenton, 2006). The major consensus of those involved in the studies was that individual farmers do have the right to sell their water if it makes sense for them economically and if this achieves the goal of moving water away from inefficient users, who are producing low-value commodities, to those who use water efficiently and who produce high-value commodities (Edwards *et al.*, 2007). However, decisions motivated by private interests that involve exporting water resources that are critical to the community’s viability and sustainability as a whole are of great concern (Edwards *et al.*, 2007). The findings from this study are not unique to Australia and indicate the need to consider the broader impacts on the communities that will be affected by water rights trading and the development of water markets.

The Alberta *Water Act* (1999) attempts to mitigate these aforementioned negative effects by ensuring that any transfer does not impair the right of other water users. In addition, the *Water Act* (1999) acknowledges the fact that a transfer may have external effects on the river system, therefore a review is undertaken to ensure that a transfer does not cause a significant adverse effect on the aquatic environment (Percy, 2005).

Now that the legislation and guiding doctrine behind Alberta's water allocation system has been discussed, the current and future state of water use in Alberta needs to be outlined. The following section discusses how new demand for water will be met and the possible strategies that may be employed to effectively reallocate water resources from existing users to emerging new users.

2.4 Increasing Water Use Efficiency

Due to a projected increase in population as well as associated economic growth within southern Alberta, the demand for water resources from the non-irrigation sector could increase by as much as 136% by the year 2046 (AENV, 2005). Essentially, the province has to deal with the problem of an increasing demand for water while the supply remains static. To mitigate this problem of increased demand the Water for Life Strategy (introduced by the province in 2003) calls for a 30% increase in water-use efficiency and productivity (AENV, 2003). The strategy acknowledges that allocations will need to be transferred to ensure that societal needs can be met. The saved water, created through efficiency gains, could be used to meet new demand and environmental needs while maintaining agricultural production and rural viability.

An increase in efficiency will need to be achieved by all sectors, but the sector that will need to make the most change is the irrigation sector which, utilizes 71% of the

South Saskatchewan River Basin's water resources (AENV, 2002). However, it is problematic to assume that the water savings created by the increases in efficiency made by irrigators will necessarily be readily transferred to meet the needs of other sectors.

Over time, irrigation efficiency has improved, resulting in lower necessary diversion requirements to irrigate farmland. Since irrigators have the consumptive right to all the water they extract it is up to the irrigator to decide how to use the saved water. Many irrigators “contend that the unused portion constitutes conserved water that they can spread over additional land (i.e. water spreading) or sell to others” (Huffaker *et al.* 2000, 268). Simply put, if farmers save water through increased efficiency, it is up to them how to use it. An economically rational farmer would either use the saved water to increase irrigation operations or sell the excess volume to a buyer that would be likely to use it. Hence, increased efficiency is likely to result in increased water use. This has led many researchers (Huffaker *et al.*, 2000; English *et al.*, 2002; Huffaker and Whittlesey, 2003; Nicol *et al.* 2008) to conclude that technology investments, which increase the water use efficiency of irrigators, have actually caused an increase rather than a decrease in water consumption and thereby reduced return flow.

In a basin-wide context, where return flows can be very significant, this implies less water within the basin and ultimately a tradeoff between upstream agricultural benefits and downstream users and in-stream purposes (Nicol *et al.*, 2008). This means that water saved by technology improvements will only be made available for other sectors if irrigators are willing to sell it.

As indicated above, volumes of water that are saved through increased efficiency gains by large licence holders (especially the irrigation sector) need to be reallocated to

meet the growing demand from emerging new users. The major problem is that once greater efficiency has been achieved, should the licensee be allowed to retain (and possess the ability to transfer) all of the saved water or should the government play a role in determining how the excess volumes are redistributed? (Minister's Advisory Group (MAG), 2009). The government's involvement in this matter is justified because of the fact that many of these increases in efficiency have occurred and will continue to occur through investments paid for by the government (upgrades to canals and conveyance systems) (MAG, 2009). The Minister's Advisory Group (2009) has suggested that the proportion saved due to government funding should go to the environment while the water saved due to private funds should remain with the licensee.

These findings indicate the need for conditions to be attached to any public subsidies that help irrigators to become more efficient in their water use if the objective is to conserve water for the environment or save water to meet the needs of new consumptive users and the environment.

It is understood that increases in efficiency by large water users such as the irrigation sector will need to be made and that the saved volumes will need to be reallocated to meet the needs of the emerging new users within the region. The following section will examine those new users that are in need of increased water allocations, the resulting consequences if these needs are not met and a discussion of possible methods available to policy makers to help satisfy all water users in southern Alberta.

2.5 Key Water Allocation Issues in Alberta

Three major issues need to be addressed regarding Alberta's current water allocation system in terms of accommodating emerging new users. The first problem is

that as the southern Albertan population grows, urban municipalities and small communities within the region will need to ensure that they secure adequate volumes of water to meet their domestic needs. The second problem that needs to be discussed is the current system's inability to protect aquatic ecosystems effectively. The final issue involves security of access to water, in other words, the assurance of water sharing access between existing water users during periods of drought. All three of these issues are discussed in detail throughout the following sections.

2.5.1 Vulnerable Communities

Many communities located within water scarce regions of southern Alberta are now recognizing that their growth is limited by the terms of their water licences. Examples of municipalities within southern Alberta that have faced scarcity issues include Okotoks, Strathmore, and Cochrane. These municipalities are predicted to reach the maximum allocations under their current water licences in the coming years, even when the Water for Life Strategy's goal of a 30% reduction in water use is factored into the calculation (Droitsch and Robinson, 2009; CH2M HILL, 2009). In the case of Okotoks, the municipality had gone so far as to work with its citizens to determine the ultimate water-related growth limits of their community. Community members have made a conscious decision to live within the limits imposed by the Sheep River, their primary water supply (AWRI, 2009). These affected communities, as well as many others located in southern Alberta, now confront the real possibility that they will run out of water to support future growth. This in turn leads to the question of whether special assurances for domestic water security should be established (Droitsch and Robinson, 2009).

Southern Albertan municipalities are reaching their limits of economic and population growth, based on the size of their current water licences. The government may want to play a more active role in ensuring that water is reallocated from licencees possessing underutilized licences to meet the needs of the communities faced with water security issues. How to do this is yet to be decided.

2.5.2 Protection of Aquatic Ecosystems

This section focuses on the problem of securing increased volumes of water to meet each individual watercourse's environmental needs. The notion of securing these needs both within the current water allocation system as well as outside of the FITFIR system will be discussed. To begin this discussion, instream flow needs must be defined and their significance determined. The literature on environmental water needs uses a number of different terms such as in-stream flow needs, protected water, water conservation objectives, environmental flow etc. In this thesis the term environmental flow is used as the generic term for water needed to meet environmental and ecosystem needs. The term "instream flow needs" is used only to describe meeting the needs of instream ecosystems and water quality objectives. The term "over-the-bank flows" is used to describe the need for water to create environmental events such as flooding of wetlands and riparian zones. The terms "Water Conservation Objectives" and "Protected Water" are only used in specific context where reference is made to documents using these terms.

2.5.2.1 Environment's Needs

Richter *et al.* (2003) suggest that water resource management methods need to protect the ecological integrity of affected ecosystems, which includes sustaining the full

array of products and services provided by natural freshwater ecosystems. Ideas such as this do not suggest that water must be reallocated in a manner that restores freshwater ecosystems to their natural state. Instead, proponents of water reallocation suggest that through the use of existing technologies and management tools, water managers can do a far better job of protecting freshwater ecosystems, while also meeting human needs (Fitzhugh and Richter, 2004).

An example of a management tool being employed in southern Alberta to secure environmental flows of water is the setting of water conservation objectives (WCOs) in the context of watershed plans. However, WCOs exist within the FITFIR system and will be secured by licences with a priority date of the day the plan defining the WCO is approved, making them very junior when compared to other licences in the region (Bjornlund, 2010).

The current provincial *Water Act* (1999), section 15(1) provides for the establishment of water conservation objectives. In 2007, after technical and public consultation had been undertaken, the Director of Alberta Environment initiated a policy which defined the amount of water to remain in the Oldman River for environmental purposes as “either 45% of the natural rate of flow, or the existing instream objective increased by 10% whichever is greater at any point in time” (AENV, 2007). Arthington and Pusey (2003) argue that rivers require 80 to 92 percent of their natural mean flow to maintain vital ecological functions. Since every river system is different, individualized instream flow assessments are required. It has been argued that extracting from one-third to one-half of a river’s annual discharge “would almost certainly alter the timing and range of variation of ecologically important flow events” (Arthington and Pusey, 2003).

In the Bow and Oldman River systems, between 60 and 70 percent of the water have been allocated for use (AENV, 2003). This alludes to the apparent need for greater volumes of water to be reallocated to secure instream flow needs and that those volumes need to have a senior priority date attached if they are to be effective in securing the aquatic ecosystem's needs.

Maintaining a healthy aquatic ecosystem is important because of the many economically valuable services and long-term benefits that ecosystems provide to society. These underlying benefits are called ecosystem services, and they are valuable in both the short-term and long-term. The short term benefits include ecosystem goods and services, such as drinking water, food supply, flood control, assimilation of human and industrial wastes, and habitat for plant and animal life (Baron *et al.*, 2002). All of these services provided to us will be extremely costly, if not impossible, to replace. The long-term benefits involve the sustained provision of those goods and services, as well as the adaptive capacity of ecosystems to respond to future environmental alterations, such as climate change (Baron *et al.*, 2002). Kwasniak and Lucas (2008) offer additional benefits that may accrue from increasing instream flow volumes such as improved conditions for fish and other aquatic life, the prevention of harmful algae blooms, making recreation possible, the provision of aesthetic experiences and opportunities and providing greater downstream supply.

The Alberta *Water Act* (1999) does provide additional methods for securing water for the environment, which are outlined in section 83 (1). The *Water Act* (1999) states “If the Director is of the opinion that withholding water is in the public interest to protect the aquatic environment or to implement a water conservation objective, and the ability to

withhold water has been authorized in an applicable approved water management plan or order of the Lieutenant Governor in Council, the Director may withhold up to 10% of an allocation of water under a licence that is being transferred.” However, the effectiveness of this mechanism is based on the level of activity in the water market. Presently, very few permanent water licence transfers are actually being undertaken, meaning that very little water is being reallocated to meet the environment’s needs via this mechanism (Nicol, 2008). In addition to this, it is under the discretion of the Director as to how much water is actually held back, which means that any volume from 0% to 10% of the licenced volume changing hands may be withheld to meet the water conservation objective.

2.5.2.2 Securing the Environment’s Needs within the Current Legislation

If the water market did become more active, meaning that an increased amount of water licences were being bought and sold, there are some creative solutions that could be employed to facilitate the reallocation of water from current users to the environment while working within the current water allocation legislation. The first of these solutions addresses the problem of under-utilized licences becoming fully-utilized if made available for sale on the open market essentially contributing to water shortages and leaving less water to satisfy the environmental needs of the watercourse. The solution to this problem could involve having the Crown purchase or confiscate some percentage of the outstanding stock, either immediately or as a “tax” on water trading transactions (Horbulyk and Adamowicz, 2002). The second approach involves creatively interpreting the water conservation holdback, or even increasing the withheld volume. Horbulyk and Adamowicz (2002, 5) indicate,

The new Alberta Water Act ... provides for compensation if a water licence is amended or cancelled, however, this same Act outlines a mechanism by which a portion of water transferred in a transaction may be held back by the government, without compensation. If Canadian governments feel an obligation to compensate for losses caused by regulatory change, and if the reduction of public deficits and debt is a high priority, might this preempt further reform of water policies for the foreseeable future?

This statement brings up two ways that the government may claw back water licences from existing users. The first idea involves identifying users who are not utilizing their full allocation and then offering them compensation for the unused portion of their licence. The second idea involves increasing the volume that is held back during a sanctioned licence transfer. Both of these ideas are not implausible. The major factor that is unidentified is whether society would be willing to bear the cost of the compensation to licence holders and whether the increased transaction cost (holdback) would impede market activity. Examples from other sectors indicate that voluntary compensation offered by the government for a loss of user access to resources has been successful in the past, such as when eliminating rail freight subsidies under the Western Grains Transportation Act, or in buying back unusable fishing licences following the closure of specific fishing grounds (Horbulyk and Adamowicz, 2002).

2.5.2.3 Securing the Environment's Needs outside of the FITFIR System

The previous section explains how the current legislation may be creatively interpreted to help achieve the stated goal of reallocating volumes of water from current large licence holders to those interests in need of increased water allocations, mainly the environment. This section differs somewhat from the previous, in that the following water reallocation strategies are not permitted by the current legislation. This section discusses the concept of allowing water allocated for environmental needs (i.e., WCOs)

to exist outside of the FITFIR system. Additionally, the idea of allowing private individuals and groups to hold water licences for non-diversionary purposes to satisfy the environment's needs will be discussed.

Bjornlund (2010) contends that the environment's needs should be met before licence holders are permitted to extract water. These defined volumes of water, often referred to as protected water or flows, would exist outside of the FITFIR system, with no priority date attached. The Minister's Advisory Group (2009, 1) recommends that establishing protected flows should involve "a quantity of water or rate of flow that is not available for allocation to other uses". The Minister's Advisory Group (2009) indicates that the major barrier to achieving this goal is that many of the most vulnerable watercourses in the province are located in fully allocated basins making it difficult to secure additional volumes of water to meet the environment's needs (MAG, 2009). The only methods of securing additional volumes for the environment's needs are through conservation holdbacks during the transfer process or through the cancellation of licences deemed to be 'not in good standing', both of which are then allocated to water conservation objectives (WCOs). These methods are proving to be insufficient in securing adequate volumes of water for the environment, leading to the realization that new policy needs to be implemented to facilitate the reallocation of resources from irrigators to the environment.

Another option for securing the environment's needs could be facilitated through the purchase of water rights by private individuals or groups that do not intend on diverting the water. However, the Alberta *Water Act* (1999) does not allow for private individuals or groups to hold water licences for non-diversion or instream purposes,

effectively preventing this policy option for securing the environment's needs. Moreover, the *Water Act* (1999) requires that any water licence must involve a "diversion" of water and an identifiable point of diversion, thus making it legally questionable whether one may privately hold an instream licence (Kwasniak, 2010). The *Water Act* (1999) only clearly authorizes instream licences to the government by expressly excluding a diversion. This means that private individuals or groups may only actively secure water for the environment through the purchase of a licence that is then transferred to the provincial government to fulfill a water conservation objective (WCO).

There is however one manner in which a private individual or group may acquire a water licence to secure the environment's needs. Conservation organizations are permitted under the *Water Act* (1999) to hold a licence for the diversion of water for the replenishment of a wetland, but once again, the licensee is not permitted to hold this licence for the purpose of leaving water in the river to meet the environment's needs (Bankes, 2006).

In support of the idea of private individuals and groups being able to hold instream licences, Bjornlund (2010, 13) notes, "if private individuals and NGOs were only allowed to buy water licences (...) it would open up opportunities for concerned citizens to take practical steps at their own expense to secure additional public benefits while compensating sellers". The allowance of this type of activity could be a positive step towards securing the environment's needs. However, licences held for instream purposes would still be subject to a priority date. The acquisition of a very junior licence in an over allocated basin is less than ideal since at times of water shortages out of stream diversions will inevitably have priority over instream rights (Kwasniak, 2009). To

effectively secure the river's environmental needs a senior licensee would have to convert a consumptive use to an instream use, or transfer or lease a senior right to an instream use.

Although not permitted in the province of Alberta, the practice of private individuals and non-governmental groups purchasing water rights, both temporarily and permanently, for environmental needs is permitted in many jurisdictions around the world, mainly in Australia and the Western United States. Holding water for the environment in this manner is referred to as a water trust. Water trusts are typically nonprofit organizations that transact with irrigators to procure water for the protection of fish habitat and wildlife (Hadjigeorgalis, 2009). Hadjigeorgalis (2009) explains that most transactions conducted by water trusts in the United States are simply short-term leases, meaning that the environment's needs are secured while the original licensee holder does not effectively lose control of their licence permanently. Additionally, water trusts in the United States also work with irrigators to assist them in conserving water that can then be leased back to the trusts (Hadjigeorgalis, 2009). Droitsch and Robinson (2009, 26) make a similar recommendation when stating,

Shares held for instream purposes would be similar to conservation easements that are currently granted for land areas that are held for conservation purposes. Organizations, such as water trusts could hold water shares directly for conservation purposes or through trust arrangements with individual shareholders, similar to the arrangements that organizations such as the Nature Conservancy of Canada now have for land.

This section has discussed a number of mechanisms that potentially can be used to secure water for the environment. However, there is little or no research evaluating the likely acceptance of such policies within the wider community and what influences such

acceptance. This is a critical issue for policy makers when introducing such policies. They will have to take into account both the environmental and societal context in which they will be implemented for successful policy implementation (Pahl-Wostl *et al.*, 2007). The question therefore needs to be asked of the southern Albertan population whether they are in favor or opposed to allowing these new types of water allocation strategies to exist in their region. It also is necessary to know more about which sections of the community agree and disagree with these reallocation mechanisms.

2.5.3 Water Sharing During Drought Periods

This section discusses the current allocation system's inability to provide certainty of water sharing between existing water users during periods of drought. Water markets have been applauded for their ability to help satiate the needs of water users during periods of drought by permitting short term (temporary) trades. However, due to the interim nature of these assignments of water there is no secure long-term certainty about how water should be shared during drought (AWRI, 2009). Many jurisdictions in the United States are proposing the development of drought management plans that could be used to override current water allocations in the case of an extreme drought (Kelly and Sturgess, 2010). The state of California handles drought events in a unique manner. Although only applying to federal water projects in the state and not privately acquired appropriative rights, during drought periods all water users, even the most senior irrigator in a water district, must reduce water usage by the same percentage as every other user in the district (Rosegrant and Gazmuri, 1995). Each user's priority is respected but the actual volume conveyed is reduced to reflect the lack of supply in a predetermined way.

In Alberta, recommendations have been made that significant water licence holders prepare a Water Shortage Response Plan (WSRP). Kelly and Sturgess (2010, 13) explain that “these are specific plans for each licence holder to deal with water shortages, relative to their type of licence and the risks they face. These Water Shortage Response Plans will provide the basis for due diligence review, risk evaluation, drought planning, and pre-planned arrangements for each licence holder to obtain sufficient water in dry and drought years to accord with their true needs”. This type of proactive approach to water scarcity is important and can ensure that users, both economic and domestic, will not essentially run out of water.

Planning for drought is highly important, especially in southern Alberta where the experience of a water shortage in 2001 is still fresh in the minds of irrigators and domestic users. However this type of strategy is intended to deal with emergency situations. In the long term, water will need to be permanently reallocated from existing users to meet the growing needs of municipalities and the environment.

2.5.4 Concluding Remarks About Key Water Reallocation Issues

For water markets to be successful in Alberta in their goal of accommodating new users while limiting the impacts on existing users, water supply regulations and policies need to be sufficiently flexible, adaptive, and robust to deal with current and future demand, but also be cognizant of an uncertain and changing supply in the future (Kelly and Sturgess, 2010).

The ideas presented in section 2.5 lead to the conclusion that some of the guiding principles behind Alberta’s water allocation policy may need to be altered to reflect the most current science available as well as preparing for future climactic variation and a

growing number of domestic users. Water will need to be transferred voluntarily from irrigators to municipalities and the environment. Possible methods of solving these key issues have been addressed. However, the solutions must be tailored so that they meet the goals and objectives of the Water for Life Strategy of (1) safe, secure drinking water supply; 2) healthy aquatic ecosystems; and 3) reliable, quality water supplies for a sustainable economy) using methods and policies that are in line with the values held by Albertans. Public policy must be reflective of not only the current state of science, but also reflect the value system held by the residents that will inevitably be affected by the decisions made by the policy makers and resource managers.

The next section examines two rural to urban water reallocation cases that met great public opposition. These two cases provide insight into the type of opposition that intersectoral water reallocation has met thus far and indicate a need for the values and attitudes of the stakeholders involved in the water reallocation process to be better understood.

2.6 Rural to Urban Water Reallocation - In the Public's Best Interest?

The transfer of water rights or water reallocation has become an issue that has generated conflict between many stakeholders in Alberta, especially irrigators, environmental NGOs and policy makers. The first major irrigation-to-urban water transfer occurred in 2007 when the municipality of Rocky View, located north of Calgary, proposed building a massive commercial development that would include a racetrack, casino and shopping mall. The project had trouble securing water as they were unable to apply for a water licence. The development was located within the SSRB, which is closed. Thus, the MD of Rocky View did not have adequate water for the

development, and the city of Calgary, which had ample supply, refused to provide the water. Initially, the developer sought to obtain a licence from the Red Deer River, which is currently open to new water licences. This plan would, however, involve an inter-basin transfer, piping the water to the development based in the Bow River Basin (D'Aliesio, 2007). This proposal met with opposition from the selling community and the transfer was negated, as inter-basin transfers are not permitted under current legislation. Instead, Rocky View entered into negotiations with the Western Irrigation District (WID). A deal was reached that allowed for the permanent trade of 2500 ML of water in exchange for a payment of \$15 million to the WID to convert a leaky canal into an efficient pipeline. In fact the pipeline would save more than the 2500 ML, hence in addition to the financial payment the irrigators in the district would get access to more water after the sale (Christensen and Droitsch 2008; Bjornlund, *et al.* 2009).

Members of the irrigation district as well as urban stakeholders opposed this deal. The urban opposition felt that this transfer would be the first of many, which would lead to environmental degradation, while irrigators were concerned about the permanent loss of water even though the project would result in them having access to more water rather than less. The required plebiscite among the WID members was eventually passed with a very narrow margin (Nicol *et al.*, 2010).

The *Water Act* (1999) allows current licencees to enter into agreements with water seekers to temporarily assign water to new uses under s.33 of the *Act* or permanently transfer all or part of a licence under s.81 of the *Act*. Bankes (2006) comments that irrigation districts have the ability to amend their licences in order to convey a portion of their licence (yet not permanently sell the underlying licence) to non-irrigation users such

as golf courses, industrial plants and municipalities, through the use of sanctioned contractual agreements under the *Irrigation Districts Act* (2000). However, unlike transfers under the *Water Act*, (s.33 and s.81), illustrated above in the Rocky View case, these contractual agreements are not subject to public review (Bankes, 2006), meaning that the affected communities or the government are not able assess the environmental impact and the possible third party impacts of the transfer agreement. The use of such contractual agreements under an amended licence also circumvents the opportunity for the government to apply a 10% conservation holdback that could be used to return water to the watercourses to help restore instream flow needs (Bankes and Kwasniak, 2005). Therefore, when a new user is seeking to acquire water they have the option of either purchasing a licence under the *Water Act* (1999), with all of the noted terms and conditions, or they can choose to become a derivative user of the irrigation district's current allocation. This will avoid the associated transactions costs, public review by external bodies the Director's discretionary powers to apply a 10% conservation holdback (Bankes and Kwasniak, 2005). A number of irrigation districts have sought to amend their licences and succeeded, including the St. Mary's River Irrigation District (SMRID), operating within the Oldman River Basin, which were approved in 2003 to have 1200 acre feet of water annually diverted under its licence for several purposes other than irrigation (Bankes and Kwasniak, 2005). Despite opposition from environmental groups such as the Southern Alberta Environment Group (SAEG) who lobbied to have this licence amendment reviewed by the Alberta Environment Appeal Board, the amendment was granted.

In 2007 the Eastern Irrigation District (EID) applied to amend their licence to

allow for the delivery of water for non-agricultural purposes. This motion met with protests from members of the public who disagreed with the lack of regulation and review associated with these contractual arrangements of transferring water from an ID to non-irrigation users. This public opposition ultimately led to the government halting the process pending the completion of further investigation (Bjornlund, 2010). Bjornlund (2010, 4) explains “opponents argued that allowing the district more transfer flexibility amounted to circumventing the rigorous assessments associated with the transfer of licenced water allocations”.

Due to the public opposition seen in 2007 with the EID case, the Alberta government has now stopped amending district licences (Bjornlund, 2010). Although forcing irrigation districts to formally engage in a water market ensures that this process is more strictly regulated, it does inhibit the use of more flexible water management methods to meet urban needs which the licence amendment would facilitate; methods which have been called for in the Water for Life strategy. The irrigation sector is likely to be unwilling to make permanent transfers, but is very likely to be willing to make other more flexible arrangements afforded by amending the licence conditions. The provision of temporary assignments of water to non-irrigation interests leaves the irrigation district in ultimate control of their current licenced allocations, results in the generation of income from the water assignments, and finally, these types of temporary assignments will not be subject to a plebiscite among members, as would be necessary with a permanent transfer.

Therefore, without amending irrigation district licences, the only way for the non-irrigation sector to gain access to greater volumes of water would be through voluntary

transfers (either permanent or temporary) under the *Water Act* (1999), which would involve the irrigation districts (presumably the party to be transferring water to the non-irrigation sector) selling or renting licences to those requiring increased volumes. From the supply side, the irrigation districts themselves are able to make a choice as to whether they will permanently or temporarily transfer a portion of their licence, the former essentially involving a loss of control of a resource that is relied on for future economic security of the industry. From the demand side, if the licence is transferred permanently, then those new users will be gaining greater water security, which is a positive attribute for vulnerable municipalities.

It can be seen through the review of the Rocky View and Eastern Irrigation District cases that water markets, as reallocation mechanisms, are still strongly opposed. Given the fact that the *Water for Life* strategy relies on voluntary transfers of irrigation water to meet new demand from the non-irrigation sector including the environment, these examples have illustrated the need to better understand the perspectives of those affected by the water reallocation process as well as posing questions as to which method of reallocation will be favored or perceived to be equitable and fair by all sectors of the community. The scope of this study will focus specifically on the non-irrigation sector to discover how this group perceives the issue.

2.7 Chapter Conclusion

This chapter reviewed the legislation and doctrine that guides how water is allocated amongst users in the province of Alberta. The major problem that has been identified is that water needs to be reallocated from users possessing volumes of water that may not be reflective of their current water needs (the irrigation sector), while other

interests in the province do not have enough water to meet their current or future needs (municipalities and the environment). The many ways that this process is permitted by the current legislation have been outlined, but the manner in which this process should actually take place that will be perceived equitable by the society is still unknown. So far, water trading has been met with opposition from all sides. This indicates that there is a need to better understand the stakeholders involved in this issue, the residents of southern Alberta, to understand their underlying values and their perspectives on the issue of water reallocation.

One way to help overcome complex decisions, such as the ones facing the policy makers in the province of Alberta, is to gain a greater understanding of the stakeholders involved by ascertaining information about the values held by individuals (Jakeman, *et al.*, 2007). There is a wealth of academic literature spanning the past four decades that attempts to explain how an individual's values influence behaviour and decision making, how environmental values are formed, and if demographic characteristics (i.e., rural versus urban residence) can be used to predict pro-environmental values and actions. This literature will be discussed in detail within the following chapter.

CHAPTER THREE

RURAL-URBAN DIFFERENCE IN VALUES RELATED TO ENVIRONMENTAL POLICY

This chapter provides the theoretical basis for this research. The first section discusses the relevance of studying values and their utility to policy makers. This will be followed by a thorough review of the many theories that are offered by the academic literature which seek to determine the origins of environmental values. Although much of this research has been conducted at the national, state, and provincial scales and involves collecting information about perceptions of broader environmental issues such as climate change or participation in environmentally supportive behaviour, the major findings are still relevant and can help to inform a study such as this, which focuses on a smaller population and a locally relevant environmental issue.

There will be a heavy focus on the past studies that have sought to determine if there is a notable difference between rural and urban populations in terms of values held towards the environment. Many of the studies that will be examined involve surveys as their method of data collection. The findings from these past studies as well as the types of questions asked of the respondents and how the data is collected and analyzed will be incorporated into the design and analysis of this thesis.

3.1 The Importance of Stakeholder Values

The values held by stakeholders are a main determinant of how they perceive the fairness of a given policy. Rokeach's (1968) study of the concept of values and their importance to policy makers is a foundational work that is widely referenced by academics studying the relationship between held values and pro-environmental

behaviour fundamentally justifying the relevance of making the correlation between values and the perception of environmental policy (Stern *et al.*, 1995; Stein *et al.*, 1999; Dunlap *et al.*, 2000; Morrissey and Manning, 2000; Huddart-Kennedy *et al.*, 2009b). Rokeach (1968, 160) explains, “once a value becomes internalized, it becomes, consciously or unconsciously, a standard or criterion for guiding action and for developing and maintaining attitudes toward relevant objects and situations”. Knowing this, if policy makers can identify the various stakeholders’ underlying values, they can predict whether proposed mechanisms enabling water licence transfers will be perceived as equitable or unjust by members of certain groups holding distinct values orientations.

An individual can hold multiple values that form a ‘value system’. A value system is a “hierarchical organization – a rank ordering – of ideals or values in terms of importance” (Rokeach 1968, 124). This concept is important because a person may be confronted with a situation in which he or she cannot behave in a manner congruent with all of his or her values, causing an internal conflict (Rokeach 1968). Huddart-Kennedy *et al.* (2009a, 153) concur with this concept by acknowledging that values are never perfectly correlated with behaviour. They state, “most of us have a number of fundamental values that guide our behaviour, and one value can be violated while another is acted upon”. This concept is important to understand because decisions about the acceptability of proposed water allocation policy will require respondents to weigh economic security against a healthy ecosystem. This internal conflict, which possibly pits one held value against another, forces individuals to prioritize their held values.

Stern and Dietz (1994) argue that attitudes to environmental issues are based on the relative importance that a person places in themselves, other people, or plants and

animals, which they refer to as egoistic, altruistic and biospheric value orientations. These main value orientations will be discussed in greater detail within section 3.7, but it must be noted that almost all of the academic research pertaining to values and the environment have found that respondents align with one of these three broad value orientations. It can be expected that Albertans will represent these value orientations as well, but that is yet to be determined. What is known is that when an individual is faced with an unfamiliar environmental condition, one must ask themselves, “What are the implications of this object for the thing I value most?” (Stern *et al.*, 1995).

A person’s value system can therefore represent “a learned organization of rules for making choices and for resolving conflicts” (Rokeach 1968, 161). The accounting of held values, independently, is also a valid study area as it has been theoretically reasoned and empirically proven that values play a significant role in explaining specific beliefs and behaviour and can therefore be used as predictors for various variables such as attitudes and behavioural intentions (de Groot & Steg 2008).

The way that individuals rank the importance of their held values is often based on culture, social system, class, sex, occupation, education, religious upbringing, and political orientation (Rokeach 1968). Based on this knowledge, the value systems of stakeholders from different socioeconomic backgrounds, for example, people with social and communal ties to irrigators who are dependent upon available supplies of water to secure their livelihood (mainly rural residents) and urban residents further removed from resource exploitative industries, will hold different values systems (values orientations) and therefore have very different responses to water reallocation policy. Therefore, a key concern in this research is to determine and compare which values are ranked the most

prominent (and least prominent) among rural and urban stakeholders. Other concerns include understanding how value systems can be related to the acceptance of water allocation policies, and determining whether or not stakeholders can be grouped together according to a collective perspective based on value orientation.

Peterson (1994, 99) states “procedures consistent with personal values and that show dignity and respect for participants are considered 'fair' and are likely to be supported. Policies inconsistent with personal values and that do not show dignity and respect for those involved are likely to be opposed.” This statement reflects the utility of incorporating and understanding the values of the affected population when attempting to design public policy that will be perceived as fair and just.

3.2 Properly Framing Information about Environmental Policy

Attitudes and subsequent behaviours surrounding new attitude objects (i.e., any new situation or dilemma that an individual is introduced to and forced to create an opinion about), such as environmental policies related to water scarcity, may be motivated not only by held values and how each are prioritized by the individual, but also by the relevant information available (Stern, *et al.* 1995). Therefore, there is an opportunity present for policy makers to frame issues in ways that will be understood and supported by those holding differing value orientations. Stern, *et al.* (1995, 1631) assert,

Influence agents, including environmental movement organizations and their opponents, can be expected to frame environmental conditions so as to activate or deactivate altruistic personal norms by emphasizing or deemphasizing consequences and responsibility... They may accomplish similar effects by focusing audiences selectively on certain value clusters ... Issue entrepreneurs can use new information about the environment to influence the formation of attitudes and to mobilize public opinion in support of their positions.

Therefore, not only can policy makers use information about an individual's value

orientation to determine if new policies will be well received or opposed, but also the way in which the information about the policy is framed (e.g., necessary trade-offs involved) can influence levels of support. Due to this reality, policy makers must be active in disseminating useful information to the general public rather than allowing other interests (e.g., non-governmental organizations) to shape attitudes towards water scarcity and reallocation to meet their own possibly narrow goals. “The degree of consensus in public opinion about emergent attitude objects may depend on differences in values, but it will also depend to a great degree on the efforts of organized interests to shape public opinion” (Stern *et al.*, 1995, 1632).

In summary, it is important to understand and incorporate various stakeholders’ values into water reallocation policy design because this understanding can aid resource managers in addressing varying resource use behaviour, determining how users of the resource perceive themselves and other users within the larger issue of the allocation of a limited resource, understanding how the users’ sets of values govern the acceptance (perception of fairness) of institutional decisions and policy and finally creating public educational materials that target the varying types of value orientations present in the region. Vugteveen *et al.* (2010, 15) note that attempts to account for variance in stakeholder values “add value in the field of environmental management studies as understanding the discursive positions of stakeholders, and especially the association between value priorities, enables decision makers to bring more nuance in negotiating management solutions”. Essentially, the understanding of stakeholder values can help to identify possible conflicts and mitigate them through effective policy design, instead of having to manage conflicts following implementation.

3.3 The Formation and Differences between Rural and Urban Values Regarding Environmental Protection

Considerable research has been completed that seeks to explain the differences in values held by those living in rural settings compared to those living in urban settings, less directly dependent upon natural resource utilization. Brunson and Kennedy (1995) offer some explanations for the shift to a ‘new environmental paradigm’ expressed largely by urban dwellers. Their research is based on studies from the United States, but the same processes have also occurred in Canada and in many other Western countries. They offer three main societal trends that began in the 1960s and 1970s that have shaped current environmental values: economic expansion away from wholly resource dependant sectors; technological innovation (making ‘wild places’ more accessible); and migration to cities and suburbia. As urban populations began to grow, individuals were able to adopt more non-utilitarian values. Kennedy (1985, 128) states, “urbanites (have) the luxury of being able to focus on romantic, idealistic forest values, for, unlike their agricultural ancestors, few directly utilize nature for a livelihood”. This statement emphasizes the reality that the number of people who are directly involved in natural resource extractive industries has contracted significantly resulting in a greater proportion of the population deriving a non-consumptive (aesthetic and/or intrinsic) benefit from natural resources (i.e., forests, lakes, rivers). These societal trends have led to more urbanites gaining a newfound appreciation for nature and wild places. As the threats to nature gained currency, the value society placed on traditional commodity resources decreased relative to the value placed on amenity resources such as wildlife, scenery, and

non-consumptive recreation (Brunson & Kennedy 1995).

These trends indicate that the values held by many individuals toward natural resources may be shifting towards a greater appreciation of non-consumptive uses. However, it has not yet been determined if this shift in values is shared by all members of society. Therefore, the differences in value sets between rural and urban individuals need to be examined. If there is a difference in held values, what is the cause? Is the difference primarily due to residency or are there other factors that shape the values people hold that influence how they perceive the environment and environmental protection policies? The literature offers a variety of theories for these differences in perception of natural resources and hence values.

3.3.1 Differential Exposure Theory

Berenguer, *et al.* (2005, 136) suggest that behaviour depends to a great extent on specific attitudes or on direct experience with the natural world. They state “the different experience of nature in rural people and urbanites shape different ways of thinking and feeling about the environment.” This statement leads to the formation of the hypothesis that there will be a significant difference in values related to the environment when comparing urban and rural populations. This theory is commonly referred to as relative environmental deprivation or differential exposure. It is often argued that urban residents are more often exposed to instances of environmental degradation (e.g., higher air pollution, noise pollution, etc.), while rural residents tend to live in more undeveloped areas, face less degradation, and have generally experienced a tradition of utilizing natural resources (Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Freudenburg, 1991; Salka, 2001; Sharp and Adua, 2009). This explanation assumes that place of

residence is an indicator of objective physical conditions, and that exposure to poor environmental conditions leads to environmental concern (Tremblay and Dunlap, 1978), thus leading to a difference in environmental values between rural and urban individuals.

The above theory refers to differential exposure to varying levels of environmental degradation, and not specifically differential exposure to water scarcity. Although urban people may feel a greater need to protect the environment, more holistically, when specific water scarcity issues are posed, rural residents in southern Alberta may have a far better understanding of water scarcity and hold a much stronger conservation or stewardship ethic.

3.3.2 Extractive-Commodity Theory

It has been argued that those who utilize natural resources directly (e.g., loggers, farmers; and more broadly, rural residents) feel that securing their own livelihood and local economic interests supersede the protection of resources for environmental flows, habitat, recreation or aesthetics (Lowe and Pinhey, 1982). This theory was originally posited by Tremblay and Dunlap (1978), but has since been supported by many others studying the differences in environmental values between rural and urban residents (Freudenburg, 1991; Salka, 2001; Huddart-Kennedy *et al.*, 2009b). This approach also anticipates that rural residents not employed in natural-resource extractive industries will share these more utilitarian views of the environment as a result of a common culture (Tremblay and Dunlap, 1978). Urban dwellers, who secure their livelihoods further down the supply chain (e.g., through occupations in the service sector), have been theorized to view the environment from a different perspective and therefore hold very different values and beliefs about how natural resources, and the environment more holistically,

should be managed (Kennedy 1985). Murdock and Schriener (1977) note that the relative weakness of rural economies may cause rural residents to desire economic development even at the expense of environmental protection. Rural economies are often dependent upon the extraction or utilization of natural resources, hence these economies and the people employed are directly, immediately, and drastically threatened by the costs of environmental reforms. Rural dwellers are therefore expected to show the strongest opposition to environmental protection policies that may threaten local industries (Morrison *et al.*, 1972; Salka, 2001). This reasoning alludes to the idea that not only those directly involved in the resource sector may hold utilitarian values, but also those non-farm members of the community who would suffer if the resource industry suffers. However Bennett and McBeth (1998) refute this theory, of a shared utilitarian value held by non-farming rural residents, as in many rural communities a diversified economy has arisen which has allowed for more pro-environmental support to flourish, even if this new diversified economy poses a threat to the once dominant extractive industries. The cause for a shift in environmental values within rural communities will be discussed in detail in section 3.6.

3.3.3 Proximity to and Social Ties with Agriculturalists

The extractive-commodity theory subscribes to the idea that rural residents, due to their proximity to natural resources, are likely to have more utilitarian views of the environment than urban residents. However, the research for this thesis only focuses on non-farming or non-irrigating members of the rural and urban communities meaning that the extractive-commodity theory, which relates more to those directly involved in resource utilization, is not applicable as not all rural residents are directly involved in the

natural resource sector. However, the extractive commodity theory also suggests that beliefs, values, and norms are diffused throughout the community and a shared rural culture is developed. This seamless diffusion of values may be related to the fact that people living in rural villages tend to be economically dependent upon farmers (Tremblay and Dunlap, 1978).

Sharp and Adua (2009, 76) offer a new idea, that it may not be all rural people who share this utilitarian ethic but only those who have regular social interaction with farmers or farm households. This social proximity may lead to a sympathetic appreciation of farming, a stronger affinity for agriculture and greater concern about the quality of the agricultural environment. Findings from their study revealed that “the effect of geographic residence on agrarian attitudes and agro-environmental concern is mediated by an individual’s social proximity to agriculture. Thus, where one lives is not as critical a factor as the social relationships one has with those engaged in farming”. Their study did find that a rural-urban difference in environmental values and attitudes is present, but when levels of social interaction with agriculturalists are controlled for, it is noticeable that social relationships are the main determinant. Moreover, this proves that rural culture is not homogeneous. Agglomerating all rural residents together is therefore problematic, especially since urban and suburban individuals may have just as much interaction with agriculturalists, resulting in a similar process of value diffusion. Sharp and Adua (2009, 78) conclude “that using direct measures of social links to the relevant natural extractive industry will provide a more accurate understanding of the social basis of environmental concerns pertaining to that industry”.

Another interesting finding from this study was that because of this strong

relationship of social proximity to farmers and utilitarian values it is evident that farmers can impact public views of their industry via their social relationships in their larger community. However “as the public becomes further removed socially from farming and other natural resource-dependent industries through generational transitions or farm consolidations (which result in fewer farmers available to socially interact with), public support might wane” (82). It is therefore expected that the number of individuals expressing sympathy for the agriculture sector and general utilitarian values could be quite low.

3.3.4 Provenance

The term provenance is used in a unique way for the purpose of this study. The Oxford Dictionary defines provenance as “the place of origin or earliest known history of something” (Oxford Dictionaries Online, 2010). Although the traditional definition applies to objects, it has been decided to use the term to refer to the setting in which an individual has been raised and essentially their place of socialization.

The setting in which people are socialized as children, either in rural or urban areas, has been noted as a possibly stronger determinant of an individual’s value orientation than simply current residence (Lowe and Pinhey, 1982; Stern *et al.*, 1995; Salka, 2001; Huddart-Kennedy *et al.*, 2009b). Stern *et al.* (1995) note that values are shaped largely by pre-adult socialization and, when compared to attitudes, are relatively resistant to being reshaped by new information. Kennedy (1985, 127) strengthens this idea by noting that “(m)any agricultural children (...) learn to value plants and animals primarily for their ability to satisfy human needs, especially monetary needs (...). This practical, utilitarian perception of nature is reinforced in logging, farming or mining employment”.

Socialization in metropolitan environments, on the other hand has been seen as encouraging people to view human activities as being responsible for creating environmental disruptions, but also as being capable of correcting them (Lowe and Pinhey, 1982). This leads to the concept that being socialized in either a rural or urban environment can lead to a very different perception of the biosphere, natural resources and their utility.

Research by Lowe and Pinhey (1982) on rural-urban differences in support for environmental protection found that people raised in metropolitan areas show the highest levels of support for environmental issues. An even more interesting finding of this study was that while place of socialization had a statistically significant effect on environmental concern, current place of residence did not. This concept leads to the idea that not only does a survey need to account for the rural-urban dimension, but also must ask questions about where the respondent was raised (socialized) as well as where they have spent the majority of their lives.

Since the 1970's the migration of urban residents into rural areas has been a common occurrence in North America, which Brown *et al.* (2005, 1858) term the 'rural population turnaround.' The authors note "this shift was fueled, in part, by the deconcentration of the urban population and also by the rising importance to migration decision making of non-economic factors (e.g., natural amenities and recreational opportunities)". Although this analysis was conducted in the United States, it must be noted that this trend appears to have parallels in other developed countries (Boyle and Halfacree 1998; Brown *et al.* 2005), such as Canada. It must also be noted that the types of rural communities that are experiencing urban to rural in-migration are generally rural

destinations attractive to retirement-age migrants and areas that contain recreation areas (Johnson and Beale, 1999). Within the United States, these areas include the Sunbelt, coastal regions, parts of the West, and in the Upper Great Lakes. These areas are especially attractive to urban in-migrants due to the many amenities, temperate climate, and scenic landscapes that attract vacationers and seasonal residents (Johnson and Beale, 1999).

Due to the realization that it is now very common for people to move from rural to urban areas or vice versa throughout their lives, targeting the location (rural or urban) of where the respondent's held values originated from (place of socialization) is an important piece of data to account for. Huddart-Kennedy *et al.* (2009b, 312) support this method and agree that it is essential to not only capture information about current residence, but of equal importance is the place of socialization. They argue, "whether one is raised in a rural or an urban environment can affect future perceptions and interactions with the natural environment". These findings suggest that provenance or place of socialization may be the greatest determinant of held values towards water resources.

3.3.5 Demographic Differences

Many studies surrounding the creation of environmental values suggest that the rural-urban dimension is the main determinant, but demographic characteristics such as age, gender, income and education may also be strong determinants. It is a commonly held idea that residents who display lower levels of environmental support are more likely to have lower levels of income and education while residents with higher educational attainment and income levels are more likely to represent values, beliefs and attitudes that are more amenable to environmental protection (Van Liere and Dunlap,

1980; McMillan *et al.*, 1997; Morrissey and Manning, 2001; Huddart-Kennedy *et al.*, 2009b). The relationship between increased income levels and environmental concerns has been attributed to the idea that as “real income increases, the public’s willingness to support increased spending on environmental protection also increases (...). It is expected that those areas with higher incomes will be more supportive of environmental protection, as those areas will be better able to pay the economic costs perceived to be associated with that protection” (Salka 2001, 36). In support of this idea, research by Kahn and Matsusaka (1997) found that voting on environmental issues could be linked to economic factors (income and occupation) more strongly than simple rural or urban residence, claiming that differing levels of support for environmental protection at the county level can be explained solely by the economic variables of median income and a county’s dependence on natural resource–related industries.

Related to both the differential exposure theory and the idea that people with higher income levels and education display more environmental concern is the concept that the upper and middle classes have solved their basic material needs and thus are free to focus on the more aesthetic aspects of human existence. This hypothesis rests on Maslow's (1970) hierarchy of needs theory, and assumes that concern for environmental quality is something of a luxury which can be indulged in only after more basic material needs (adequate food, shelter, and economic security) are met (Dunlap *et al.*, 1975; Van Liere and Dunlap, 1980).

Age has also been correlated with differing levels of environmental concern. Van Liere and Dunlap (1980, 183) argue “that young people are less integrated into the American economic system or, more generally, the dominant social order. Since solutions

to environmental problems often are viewed as threatening the existing social order, possibly requiring substantial changes in traditional values, habitual behaviours, and existing institutions, it is logical to expect youth to support environmental reform and accept pro-environmental ideologies more readily than their elders”. Another theory as to why younger populations may be more pro-environmental relates to the shared values held by age cohorts. Stern *et al.* (1993) hypothesize that people within an age cohorts may hold similar values to each other based on shared formative experiences. This theory also anticipates that exposure to the same scientific information by members of different age cohorts may be internalized in a different way, resulting in a different perception of the environmental issue for each age cohort.

Finally, gender has been linked to differing levels of environmental concern. In a study of university students in New York State, Stern *et al.* (1993) found that women are able to make the connection between environmental conditions and potential harm to themselves, others, and other species of the biosphere far easier than men. Their findings are consistent with the argument in feminist theory that women tend to see a world of interconnections and are socialized to have a stronger ‘ethic of care’, whereas men tend to be more independent and competitive and see a world of clearly separated subjects and objects, with events abstracted from their contexts (Stern *et al.*, 1993; Zelezny *et al.*, 2000). This research does hold credence, however, some past studies involving broad environmental concern (Van Liere and Dunlap, 1980; Mohai, 1992) have not been able to conclude that gender is a predictor of pro-environmental values as results have proven to be meager and inconsistent (no significant difference between males and females).

A lack of observable difference between males and females with respect to

environmental attitudes and values does not necessarily mean that there are no gender differences in pro-environmental behaviour. Zelezny *et al.* (2000) conducted a meta-analysis examining thirteen published studies concerning the connection between gender and environmental behaviour for the period of 1988 to 1998. From this analysis they found that nine of the thirteen studies found that women reported significantly more participation in pro-environmental behaviour/activism than men. When respondents are faced with statements and policy options that involve specific, locally relevant issues, such as water reallocation, these gender differences may become more pronounced as opposed to being ensconced due to the generality of the survey matter.

Although age, gender, income and education have all been discussed and suggested as possible determinants of pro-environmental values, the strongest predictors seem to be income and education, two characteristics that are commonly understood to be present at higher levels within urban populations when compared to rural (Van Liere and Dunlap 1980; Lowe and Pinhey, 1982; Fortmann and Kusel 1990; Jones and Dunlap 1992; Arcury and Christenson 1993; Huddart-Kennedy *et al.*, 2009b). This may allude to the fact that the rural-urban divide may only be a social class divide. Due to this discrepancy, specific demographic statistics will need to be gathered from survey respondents and subsequently controlled for to definitively identify the derivation of environmental values.

3.4 Differing Perceptions of Natural Resources

The values held by rural and urban stakeholders seem to be motivated by different factors, but the actual difference in attitudes related to environmental concern may not be so different (Arcury and Christianson, 1993). In a study of the differences in pro-

environmental attitudes between rural and urban populations by Berenguer, *et al.* (2005), their data indicated that rural residents were more concerned than urbanites with issues related to conservation of natural resources. The results of the study link this concern for the conservation of natural resources with their economic dependence on the environment (i.e. occupation involving irrigation which is greatly dependent upon a readily available supply of water), while the urban residents showed greater concern for air pollution, exhaustion of natural resources and climate change. The authors note that the differentiating factor, rural-urban, represents a good example of how perception of environmental aspects can be influenced by different types of interaction with natural resources. Both populations are concerned about environmental issues but express concern towards causes at differing scales.

In a similar study by Stein, *et al.* (1999) on the differences in values between rural and urban populations and how those values related to environmental concern, some interesting findings were presented related to which aspects of the environment respondents felt were most important to them. The results indicated that both groups share similar values even though they live very different lives and perceive the environment in different ways. Specifically, rural dwellers place high value on specific physical landscape features, such as farmland and rivers, and urban dwellers place high value on the overall natural ecosystem, but both groups place high value on living in a healthy environment, maintaining control of their lives and the lives of their family, and knowing that a preserved natural resource exists for future generations (Stein *et al.*, 1999). The similarities that were found between the two stakeholder groups (rural and urban) can be used as a valuable tool for resource managers. When conflict arises, the

acknowledgement of shared values can be used to resolve the conflict. Along the same line of thinking, it is also important to acknowledge and respect different stakeholders' value orientations and perspectives. Vugteveen *et al.* (2010, 15) note, "at the policy level, [accounting for stakeholder values] might be useful in developing planning scenarios". In this case, the author insists that allowing each stakeholder group to observe and comment on various scenarios that may result from instituting the type of policy decision that they each are lobbying for may help to accommodate useful discussion as well as aid in the understanding of one another's perspective.

3.5 Rural Farm versus Non-Farm Residents

Due to the reality that not all rural residents are involved in natural resource extractive industries (such as irrigated agriculture in the case of southern Alberta), a short discussion about this distinction is needed. The catchall category of rural dwellers may be far too broad of a classification when attempting to explain environmental concern, as many rural populations are not homogenous in how they perceive the environment due to their differing levels of involvement in the resource extraction industry. Studies like those of Buttell and Flinn (1974) or Lowe and Pinhey (1982) have separated respondents in their rural sample into rural farm and rural non-farm residents. Both of these studies found that the rural farm residents had less concern for environmental problems than rural non-farm residents (even when controlled for education). They found that rural non-farm residents were as concerned about environmental problems as urbanites.

Considering that this thesis research seeks to gather information about the values held by rural non-irrigators, it could be expected that actual differences between the rural and urban populations may not be as great as expected and the influence of factors such a

provenance, income, education, or social interaction with agriculturalists may show a stronger association with held values.

3.6 Shifting Environmental Values

The literature referenced above speaks to the reasoning behind differences in environmental values and environmental concern between urban and rural residents, but there are other contributing factors that suggest that this divide may be diminishing. One possible explanation for this narrowing gap in rural-urban differences in environmental values has been the availability of community environmental services (e.g., recycling facilities and public transit) becoming more commonplace in rural communities (Huddart-Kennedy *et al.*, 2009b).

Another possible explanation for a shift in rural populations' value system may be related to the increased migration of people that had been raised and primarily lived in urban locales into rural areas (see section 3.3.4). One theory suggests that as urbanites migrate into the rural areas they bring with them their environmental values. These values are often transferred to the longstanding rural residents who may internalize these values resulting in increased action (voting in support of pro-environmental policy) (Salka 2001). Morrison (1986) also suggests that environmental concerns have slowly diffused through the population, resulting in broader support for environmental protection among all citizens and overall, rural areas may not be as opposed to environmental protection as earlier studies had suggested.

In support of the theory that the a gap exists between rural and urban individuals, in terms of levels of environmental support, Fortmann and Kusel (1990) found that long-time urban residents who have moved into rural settings tend to be more involved in

environmental activism than the rest of the rural population. A more recent study that supports this trend (Jones *et al.*, 2003) indicated that amongst rural populations, immigrants from urban areas were more knowledgeable about environmental issues, more concerned about the environment, place higher priority on environmental protection, and are more engaged in activities that promote environmental values (environmental activism) than long time rural residents. This is yet another reason why limiting research to the rural-urban dimension as an explanation of held values is not likely to reveal the entire picture. Although pro-environmental values and attitudes may be present within rural communities, it is important to also collect information regarding place of socialization. The influence of friends and neighbors on an individual's value system is quite formative and important to take note of, whether it is agriculturalists encouraging utilitarian or pro-growth perspectives or urbanites promoting pro-environmental values.

Lastly, in a recent study by Huddart Kennedy *et al.* (2009b) on the rural-urban differences in environmental values and environmentally supportive behaviour it was found that there were very few differences between rural and urban Canadians in terms of environmental concern. However, noticeable differences were observed when examining participation in environmentally supportive behaviours such as recycling and stewardship behaviours, with rural respondents participating to a greater degree. This difference was significantly great for rural respondents participating in stewardship behaviour. This finding indicates that although both urban and rural residents are theoretically in equal agreement with protecting the environment, and in many studies urban residents have displayed a stronger affinity for environmental protection, when it comes to reducing their own use of resources, bearing the cost of environmental protection or becoming

involved in environmentally supportive activities (taking action) urban residents tend to be less involved and less supportive.

3.7 Value Orientations Towards Environmental Issues

It has been observed through various studies of environmental values (Stern *et al.*, 1993; Stern *et al.*, 1995; Dunlap *et al.*, 2000; Schultz, 2001; Dietz *et al.*, 2002; de Groot and Steg, 2008; Soyez *et al.*, 2009) that there are three main value orientations that may influence reaction to environmental issues and thus influence perceptions of certain environmental policies. The three value orientations identified by past research studies are egoistic, altruistic and biospheric. These three value orientations have been hypothesized to produce environmental concern under different conditions. The primary tool used to measure these three value orientations in the past has been Dunlap and Van Liere's New Ecological Paradigm (NEP) Scale published in 1978. The authors posed 12 item issues which survey respondents were asked to agree or disagree with. This was one of the first studies that proposed the existence of the three distinct value orientations that will be discussed in this section. The NEP scale had been revised and published by Dunlap *et al.* (2000) to include 15 statements relating to balance of nature, limits to growth, antianthropocentrism, human exemptionalism (i.e. the idea that humans, unlike other species, are exempt from the constraints of nature) and ecocrises (i.e. items focusing on the likelihood of potential catastrophic environmental changes). Survey items from the two NEP scales as well as many other similar surveys that sought to measure the influence of values on individual's perceptions of environmental issues were used in the development of the mail-out questionnaire used for this thesis.

An individual expressing egoistic values towards the environment will be mainly

motivated by self interest, in that the individual would favor protecting the environment when and only when doing so would have expected benefits for the individual that would outweigh the expected costs (Stern *et al.*, 1993). An individual who has a vested economic interest in a threatened resource (e.g., a farmer who wishes to apply high quality freshwater to their acreage) would likely hold this type of value orientation.

An individual aligning with the altruistic value orientation would bear personal costs to safeguard the environment only when doing so would protect other human beings (Stern *et al.*, 1993). This distinction is important because the individual may only be expressing concern due to a threat to their family, friends and surrounding community and not necessarily a threat to the surrounding environment (i.e., functionality of the ecosystem, health of the plants and animals).

Finally, an individual aligning with the biospheric value orientation would express and act on moral principles that incorporate concerns with other species and with natural environments (Stern *et al.*, 1993). Relating this value orientation back to the costs associated with the related policy decision, people with a biospheric value orientation will mainly base their decision to act pro-environmentally or not on the perceived costs and benefits for the ecosystem and biosphere as a whole (de Groot and Steg, 2008).

Zelezny *et al.*, (2000) support this type of value orientation, referring to them as ecocentric environmental attitudes. People holding this value orientation believe that the environment should be preserved because of the intrinsic value of the biosphere and of all living things.

Huddart-Kennedy *et al.*, (2009a) have also proposed that an individual's environmental values can be divided into discrete groups. These groups are seen as

having tension, or as potentially conflicting: self-transcendence versus self-enhancement. Huddart-Kennedy *et al.*, (2009a) build on theories proposed by Stern *et al.*, (1993) in stating that self-transcendent value items are referred to as ‘altruistic’, while self-enhancing values are referred to as ‘egoistic’. They indicate that previous studies of value orientations and environmental behaviour have shown relatively consistent support for the positive relationship between altruistic values and environmentally supportive behaviour (Stern *et al.* 1995; Schultz and Zelezny 1999). This indicates that those survey respondents aligning with altruistic or biospheric types of value statements will also be in support of water reallocation policies that secure water for the environment.

Dietz *et al.*, (1998) have also posed an interesting method of testing motivations behind environmental concern and environmental behavioural intentions. Their survey asked whether six kinds of environmentally relevant human activities have negative consequences ‘for the environment’, ‘for your family’ and ‘for health’. Identification of the influence of detrimental human activities (e.g. pollution from automobiles) and given a choice of which negative consequence is seen as most important can help to target an individual’s value orientation. Family and health concerns are noted as relevant motivators of value orientation, hence unique value statements need to be designed to account for these influences.

Knowledge of the various motivations behind pro-environmental values, attitudes and subsequent behaviour will be of great importance when designing a questionnaire that accounts for the types of values that may be expressed by southern Albertans when posed with statements related to local water management.

3.8 Concluding Remarks and Identifying the Knowledge Gap

The importance of accounting for stakeholder values when designing and implementing environmental policy has been outlined above. This task is paramount if policy is to be well received by members of society representing various value orientations. Extensive research has been conducted which attempts to determine whether there will be significant differences between rural and urban residents and moreover varying reactions to policy that will alter how economic development progresses and how natural resources are managed.

There have also been ideas introduced that indicate that the rural-urban dimension may not be the primary determinant or motivation behind variances in values and attitudes held towards the environment, environmental protection and resource utilization or that this rural-urban divergence in held values may not be as deep as was noticed in the past. Other factors such as place of socialization, income, education, age and gender may prove to be more strongly correlated with values, thus influencing an individual's perception of environmental issues.

A great amount of research has been completed over the past decade that aims to draw a connection between pro-environmental values and current residence (comparing rural and urban populations) (Schultz and Zelezny, 1999; Salka, 2001; Dietz *et al.*, 2002; Kuehne and Bjornlund, 2008; Huddart-Kennedy *et al.*, 2009b; Sharp and Adua, 2009; Milfont and Duckitt, 2010; Vugteveen *et al.*, 2010). However, there is very sparse literature available concerning how an individual's value orientation may influence perceptions of specific, local environmental issues such as the most relevant policies for water reallocation to meet new demand from urban and industrial users as well as the environment. In the light of the policy background set out in Chapter 2, this is a

significant gap, which urgently needs filling. The wealth of research already present confirms the relevance of this type of study, and a review of these past endeavors reveals that there is a noticeable gap in knowledge. Hence, there is an opportunity to not only study if current residence (rural or urban) is the major determinant of pro-environmental values, but also to research how an individual's value orientation may influence the perception of a locally relevant environmental problem, water scarcity, as opposed to correlating held values with broader environmental issues in which the consequences of policy decisions do not directly and immediately affect the individuals being queried.

Due to the lack of information available specifically related to how values influence the individual's perception of water scarcity and water reallocation, the first part of this research project will be an exploratory analysis of how key stakeholders (local experts in the field of water management) perceive the issues identified in this literature review in the context of water. The findings uncovered during the key informant interviews conducted in southern Alberta with water resource experts will be reported in the methodology section and have been used to inform the development of the hypothesis and questionnaire.

CHAPTER FOUR

METHODOLOGY

This chapter describes the methods used to complete the research for this thesis. The following sections outline the purpose of the research, study objectives, hypotheses developed following a thorough review of the academic literature, a brief description of the study area, an outline of the survey development, and the statistical techniques employed to analyze the data collected. Ethics clearance was granted for both the personal interview and mail-out survey methods of data collection.

4.1 Overview

The purpose of this research is to develop an understanding of the differences in held values between rural and urban residents within the Oldman River basin (regional description given in section 4.2) who do not own an irrigated property. To achieve this, the initial stage of the research study involved conducting in-depth personal interviews with key informants. This process helped to provide information related to how values may influence the stakeholder's perception of water reallocation, as this type of information is not available within the current literature. The key informant interviews, along with the review of the academic literature related to water allocation policy (i.e., the legitimacy of incorporating stakeholder values in the creation of public policy and the differences between the environmental attitudes held by rural and urban populations), informed the design of the survey instrument, which was used to gather information about the sample population.

Posing value statements related to personal use of water, water scarcity, the environment and water reallocation helped to reveal the value orientation of each of the

respondents. Respondents were then grouped together based on how similarly each of the individuals responded to the entire set of value statements. It was then determined that there were discrete value clusters of people amongst both populations reflecting like values. Attempts were made to determine the motivations behind the various value orientations. Based on the academic literature, differences in value orientations may be correlated with current residence, where an individual was socialized (raised), gender, age, income, education or a combination of any of these theorized motivations. Finally, attempts were made to determine if the value clusters responded to statements related to water reallocation policy in a uniform manner, indicating whether or not individuals belonging to the same value cluster perceive the issue in a similar way or not.

4.2 Hypotheses

Table 4.1 Hypothesis 1

<i>Hypothesis 1</i>	<i>How To Test</i>	<i>Expected Outcomes</i>
H1. There will be distinct groups of people that hold similar values towards the environment and more specifically water reallocation. (Rokeach, 1968; Schwartz, 1987; Stern <i>et al.</i> , 1993; Stern <i>et al.</i> , 1995; Stein <i>et al.</i> , 1999; Dietz <i>et al.</i> , 2002; Dunlap <i>et al.</i> , 2000; Morrissey and Manning, 2000; Kuehne & Bjornlund, 2007; Kuehne <i>et al.</i> , 2008; de Groot & Steg, 2008; Huddart-Kennedy <i>et al.</i> , 2009b)	<ul style="list-style-type: none"> Cluster analysis was applied to the rural and urban data to create clusters of respondents based on similarly answered value statements. 	3 or 4 distinct value clusters will emerge (for each data set) based on: <ul style="list-style-type: none"> i) Egoistic; ii) Altruistic; iii) Biospheric

Table 4.2 Hypothesis 2

<i>Hypothesis 2</i>	<i>How To Test</i>	<i>Expected Outcomes</i>
<p>H2a. There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters within the rural and urban populations.</p> <p>H2b. There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters when comparing the rural and urban clusters with the same value orientation. (Morrison <i>et al.</i>, 1972; Tremblay and Dunlap, 1978; Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Kennedy 1985; Freudenburg, 1991; Arcury and Christianson, 1993; Brunson & Kennedy, 1995; McMillan <i>et al.</i>, 1997; Stein <i>et al.</i>, 1999; Morrissey and Manning, 2000; Salka, 2001; Berenguer <i>et al.</i>, 2005; Huddart-Kennedy <i>et al.</i>, 2009b; Sharp and Adua, 2009)</p>	<ul style="list-style-type: none"> • Examine the size (proportion of the sample) of each cluster formed in both the rural and urban data sets. • Cross-tabulate the three clusters from each of the samples (rural and urban) to determine how each cluster differed in responses to the value statements. • Cross-tabulate the similarly oriented value clusters (rural and urban) to determine how the clusters differed in responses to the value statements. • Use cross-tabulation to determine if there are significant demographic differences between the clusters (both within the rural and urban datasets and between the similarly oriented value clusters) 	<p>H2a. The urban sample will exhibit a higher proportion of individuals aligning with the pro-environment value statements and the rural sample will have a high proportion of individuals aligning with the economic value statements (Tremblay and Dunlap, 1978; Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Freudenburg, 1991; McMillan <i>et al.</i>, 1997; Salka, 2001; Sharp and Adua, 2009).</p> <p>H2b. There will be observable demographic differences between each cluster (within the rural and urban datasets, as well as when similarly oriented value clusters are compared). Those aligning with the pro-environment value statements will possess higher levels of income and education, be younger, have higher proportions of females in the group and will have been raised and have mainly lived in urban areas. (Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Arcury and Christianson, 1993; Stern <i>et al.</i>, 1993; Kahn and Matsusaka, 1997; McMillan <i>et al.</i>, 1997; Zelezny <i>et al.</i>, 2000; Morrissey & Manning, 2001, Salka, 2001; Huddart-Kennedy <i>et al.</i>, 2009b)</p>

Table 4.3 Hypothesis 3

<i>Hypothesis 3</i>	<i>How To Test</i>	<i>Expected Outcomes</i>
<p>H3. The values that people hold will greatly influence their support or opposition to various water reallocation policies (Rokeach, 1968; Stern et al. 1995; Peterson, 1994; Schultz and Zelezny 1999; de Groot & Steg 2008; Huddart-Kennedy <i>et al.</i>, 2009b).</p>	<ul style="list-style-type: none"> • Cross-tabulate the responses of the value clusters within each dataset (rural and urban) with the proposed policy statements. • Cross-tabulate the responses of the similarly oriented value clusters (rural and urban) with the proposed policy statements. 	<p>H3a.</p> <ul style="list-style-type: none"> • Those aligning with the economic value statements will be in support of letting market forces dictate water licence prices and whom licences are traded to. • They will also be in favor of increased subsidies, but not transferring the water savings created through increased efficiency gains to other uses (urban and environmental). <p>H3b.</p> <ul style="list-style-type: none"> • Those aligning with the pro-environment value statements will be more supportive of policy statements involving the reallocation of water out of the irrigation sector. • These individuals will be supportive of private groups being granted the ability to own water licences for environmental protection purposes.

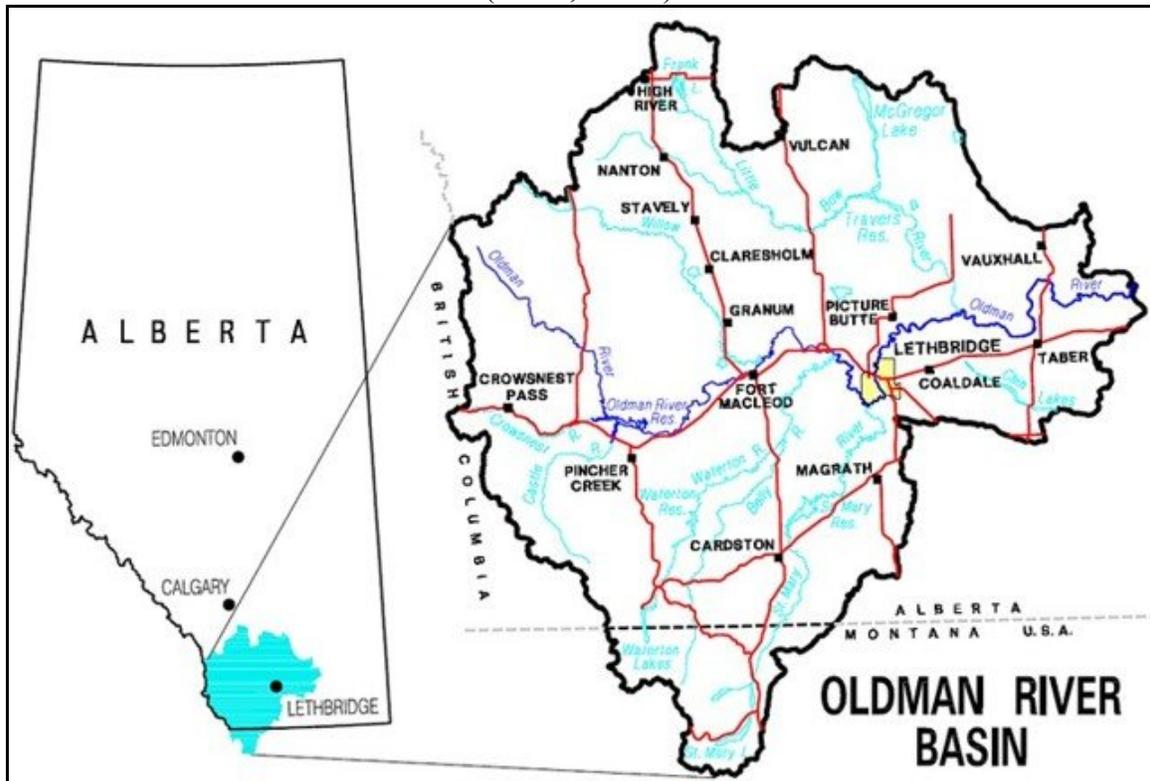
4.3 Oldman River Basin, Alberta, Canada

This section provides a brief overview of the geography of the study region. The Oldman River Basin in Southern Alberta, Canada is a prime example of a semiarid region where the pressure for reallocation has been building and now is urgent (Figure 1). The

watershed is 28,000 km² and has a population of approximately 161,400 people who live on rural farms, in villages, towns and within the city of Lethbridge (OWC, 2007b), which is located near the centre of the basin.

Figure 4.1: Oldman River Basin

(OWC, 2007a)



The main tributaries to the Oldman River include the Livingston, Crowsnest, Castle, Waterton, Belly and St. Mary Rivers, most originating in the Rocky Mountains forming Alberta's western boundary to British Columbia (OWC, 2007b). The rivers are mainly fed by snow and glacier-melt. Surrounding Lethbridge is a vast network of reservoirs and irrigation canals that drain into the Oldman River. The Oldman River continues to flow east, where it joins with the South Saskatchewan River upstream from Medicine Hat.

About 33% of the watershed's land cover is agricultural, 29% is forested and 17% is native vegetation (OWC, 2007b). Due to the semi-arid climate, agricultural practices that rely on rainfall are not always possible; therefore irrigated agriculture is widespread throughout the region. Irrigation is used to support a wide variety of field crops including grains, oil seed, pulse, sugar beets and potatoes (Byrne, 2006). To the north of Lethbridge, there is a highly developed cattle feedlot industry associated with the irrigated land of the Lethbridge Northern Irrigation District as well as private irrigators, many of which are producing feed as an input into value added production – beef cattle.

4.4 Survey Development

The primary method of data collection used in this research was the mail-out survey. This method was used due to its ability to reach a wide sample of the population, the ability to target certain demographic groups (rural and urban), and because we attempted to make the survey as accessible and easy to fill out as possible (i.e., paper as opposed to electronic to ensure that non-computer literate were able to participate equally). The mail-out survey also allowed respondents to complete the survey at their leisure within the comfortable surroundings of their own home. The survey questions were based on the findings of the literature review (Chapter 2 and 3), a review of similar surveys that sought to determine the value orientations of individuals related to environmental concern and attitudes, interviews with key informants involved in water related issues within the region (e.g., members of the municipal and provincial governments, irrigation district managers, environmental non-governmental organization members, etc.), use of the Statistics Canada Federal Census and the experiences of the researcher following a two week visit to the study region.

4.5 Survey Structure

The mail-out survey (Appendix A) contained three distinct sections: a set of value statements, a set of policy statements, and a section to gather information about the demographic characteristics of each of the individuals.

Following Dunlap *et al.* (2000) and Huddart-Kennedy *et al.* (2009a), it was decided to pose each of the value and policy statements using a one to five Likert-style rating scale in which the respondents were asked whether they agree or disagree with a series of value statements (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). This facilitated an analysis of the value orientations that the respondents most closely identify with.

Many surveys in the past that have sought to discover if there are differences between rural and urban populations related to their environmental attitudes and values have used large samples (national, state or provincial scale) and posed very general questions that are applicable to respondents regardless of their local surrounding and local environmental issues (Buttel and Flinn, 1974; Lowe and Pinhey, 1982; Salka, 2001; Dietz *et al.*, 2002; Huddart-Kennedy *et al.*, 2009b; Sharp and Adua, 2009). In order to gain higher quality information it was decided to send surveys to rural and urban samples living within a single watershed and to pose water related values statements that are relevant to the region.

As mentioned in Chapter 3, an important piece of data that is often not collected by surveys attempting to explain rural-urban differences in held values toward the environment is the setting in which a respondent was socialized (raised) and furthermore where the respondent has spent most of their life, either in a rural or urban setting. This information has been found to be a much stronger correlate to pro-environmental values

than simply current residence (Lowe and Pinhey, 1982; Freudenburg, 1991; Salka, 2001; Huddart-Kennedy *et al.*, 2009b). Huddart-Kennedy *et al.* (2009b, 312) support this method of data collection and note, “(t)o address the issue of migration and to account for place of socialization, we use a measure documenting not only the current place of residence but also where people were raised. We argue that whether one is raised in a rural or an urban environment can affect future perceptions and interactions with the natural environment”. In light of the positive results yielded from other studies employing this data collection method, our study will also account for this parameter and ask respondents in which setting they were raised as well as in which setting (rural or urban) they have spent most of their lives.

Determining the value orientations that may be expressed by respondents was extremely important. A great amount of surveys have been created which aimed to categorize survey respondents based on value orientations related to environmental issues (both broad and specific local environmental problems) (Buttel and Flinn, 1974; Van Liere and Dunlap, 1980; Freudenburg, 1991; Stern *et al.*, 1993; Stern *et al.*, 1995; Stein *et al.*, 1999; Morrissey and Manning, 2000; Salka, 2001; Dietz, *et al.*, 2002; Corral-Verdugo, 2003; Berenguer *et al.*, 2005; Butterworth and Syme, 2007; Corral-Verdugo *et al.*, 2008; de Groot and Steg, 2008; Harman *et al.*, 2008; Huddart-Kennedy *et al.*, 2009a; Huddart-Kennedy *et al.*, 2009b; Sharp and Adua, 2009; Milfont and Duckitt, 2010; Vugteveen *et al.*, 2010). The questions contained within these surveys were reviewed when creating the 32 value statements contained in the mail-out questionnaire for this study (See Table 4.4).

As indicated in the academic literature (Chapter 3), the motivations behind

support for environmental protection may be based on three main types of value orientations exhibited by individuals: egoistic, altruistic and biospheric (Stern *et al.*, 1993; Stern *et al.*, 1995; Dunlap *et al.*, 2000; Dietz *et al.*, 2002; de Groot and Steg, 2008). The value statements used in the mail-out questionnaire reflect these well established value orientations held by individuals toward environmental issues.

Work by Morrison (1973) also helped in framing the types of values that may be revealed. Morrison (1973, 76) categorized individuals and their perspectives on environmental issues into two types of groups: environmentalists and growthists. He claims “visible antagonists of the environmentalists [the growthists] are those who are the most immediately, directly, and severely threatened by the costs of environmental reform and who are sufficiently powerful to challenge environmentalists’ pressures for change”. In a similar study by Vugteveen *et al.* (2010), attempts were made to group individuals together based on values held towards water management. The study only included water management professionals and not the general public. The questions posed to those involved in the study were very technical and many of the resulting value orientations were not applicable for our survey of the general public. However, the study did provide a very useful description of the values held by an individual towards water who may be labeled an ‘environmentalist’. “People in this group (...) feel a strong personal bond with nature in general. The intrinsic value of nature is acknowledged, independent of our use of it. A respectful attitude toward nature is regarded as highly important, as is being able to experience peace and quiet in nature. Nature conservation is an important societal goal from the perspective of maintaining biological diversity” (Vugteveen *et al.* 2010, 13).

Based on the information gathered from the literature review a set of interview

questions (Appendix D) was developed. These questions were posed to key informants within the region to provide insight into the possible value orientations held by rural and urban southern Albertans and to help understand the issue of water reallocation from the perspectives of water management experts involved in different aspects of the process (e.g., irrigation district managers, NGO members, government officials and municipal water utility managers). The following information gathered from the key informant interviews (section 4.6) helped to strengthen the relevance of the value statements by making them locally relevant by proposing statements that have been identified by the interviewees as causing conflict between those possessing divergent value orientations.

4.6 Semi-Structured Interviews

In order to better understand the southern Alberta study region and the contemporary water allocation issues, the researcher traveled to Lethbridge, Alberta in May of 2009. Personal interviews were arranged prior to arriving in southern Alberta. An attempt was made to arrange interviews with key informants involved in water issues from a variety of professional backgrounds. Each interviewee was asked the same set of eleven questions. The set of questions was sent to each of the interviewees prior to the interviews for approval and to give the interviewees time to formulate answers to the questions ahead of time. Each interview was recorded using a digital recorder. Following the completion of the interviews each interview was transcribed and sent back to the interviewee for approval. All interviewees signed a consent form (Appendix C) indicating that they agree to have the information discussed during the interviews as well as their name and professional affiliation published within this thesis and any publications that may result afterward.

The information gathered from these interviews was an important part of gaining a better understanding of the issues. The transcribed interviewee responses were studied in order to discover any latent themes that may not have been present in the literature. However the main purpose of the key informant interviews was to identify what are the most prominent values held by those within the region, and to support the creation of the survey questions. This information was a valuable resource when developing the mail-out questionnaires. Responses from the interviews that supported the existence of a distinct value orientation present in southern Alberta are indicated in section 4.7. Additionally, any interview response that supported the creation of a value statement or policy statement is indicated in Tables 4.4 and 4.5.

4.7 Value Orientations Indicated by Key Informants

The following section details the types of value orientations that may be represented by rural and urban southern Albertans. The value orientations reflect the values found to be represented from past studies (Chapter 3) as well as the information extracted from the key informant interviews. The type of people (i.e., residence, demographics) that may align with each value orientation is not explicitly discussed, as this is one of the primary goals to be discovered by the study.

Each of the value statements contained within the survey corresponds to one of the four value orientations. The way in which the respondents collectively respond to the survey questions may not result in four discrete groups that correspond to the four pre-determined value orientations. Instead, it is expected that the structure of the groups, following the data analysis, will be a combination of the pre-determined value orientations, thus requiring unique labels to be given to the final groups.

4.7.1 Intrinsic / Bequest

The Intrinsic /Bequest value statements were designed to reflect the values that individual holds toward the environment and water as something to be respected. The importance of water to individual's aligning with this value orientation is derived not from its utilization or consumptive use, but rather from its ability to sustain humans and all other species within the region. These types of value statements are closely related to the biospheric value orientation proposed by Stern *et al.*, (1993) and ecocentric value orientation proposed by Zelezny *et al.*, (2000). The value items used within the survey created by Stern *et al.*, (1995) helped to frame many of the overarching values that this group may align with. These items include: unity with nature, protecting the environment, preventing pollution, respecting the earth, equality, a world of beauty and a sense of belonging. Even if people holding these values do not use this resource to sustain a livelihood or even for recreation, they gain great satisfaction just knowing that the resource is healthy and available. Bennett (2003) refers to these types of values as 'non-use' values. They do not require any direct contact with the environment to enjoy a benefit; instead they derive a benefit from the knowledge that ecosystems or species are protected from the threat of extinction (Bennett 2003). This idea led to the creation of value statements such as 6, 10, 18 and 31 (See Table 4.4)

The realization of these types of values being possessed by southern Albertans emerged when speaking with Lorne Fitch, the Provincial Riparian Specialist with the Cows and Fish program, and an adjunct professor with the University of Calgary. He stated,

There's a case to be made that natural functioning systems, that are healthy, have innate productivity that can be harvested and have some economic benefit. I think as well from a biodiversity standpoint, if we don't draw some lines, if we

don't create some thresholds, those attributes will disappear and so will the social and economic benefits (Fitch, 2009).

This comment aided the design of value statements 1 and 10 (See Table 4.4). Kathleen Murphy, the Water Approvals Team Leader for Alberta Environment, shared a similar opinion about how important water can be when simply left in the rivers. She noted, “Without sustaining (the) environmental component of our water supply, I think we would have a lesser quality of life in this province. So, though it may not have an economic value, it certainly has a social value. And I don't think they could put a number on that” (Murphy, 2009). This statement confirms the relevance of value statement 6 (See Table 4.4).

One final example of how the Intrinsic / Bequest value orientation was supported came from another comment made by Kathleen Murphy about the perception that people are entitled to water. A person who holds Intrinsic / Bequest values towards water respects the environmental benefits of water to a greater degree than the economic value that it may yield. Mrs. Murphy speaks of development in southern Alberta,

I think people still have the mindset that they are entitled to water, that it's a human right to have it and if they build a house here that it will come to them. I don't think they realize the implications of water use in this area of the province and I see it in a lot of developers and a lot of developments, although the mindset is slowly starting to change. To this point it has not specifically been a problem in Lethbridge because they have an allocation that can cover their use, but in other areas outside of the city, the mindset was that if you build the community or you build the sub-division, the water will automatically be there. But now with closure of the basin here to new allocations of water it's slowly starting to get into people's mindset that just because they build a sub-division, doesn't mean the water will be there (Murphy, 2009).

Not only did this statement support the relevance of value statement 13 (See Table 4.4), it also alluded to the idea that people migrating into the region from other areas of Canada may not share the same values and perspectives about water scarcity as those who have

lived within this semiarid region their entire lives. This lack of exposure to water scarcity will be reflected in an individual's held values.

4.7.2 Conservation / Lifestyle

The Conservation / Lifestyle value statements were created in an attempt to discover which respondents have altered their lives based on water scarcity. Individuals aligning with these statements will be expressing biospheric or ecocentric values. However, the distinct label has been given to these types of statements due to the findings made during key informant interviews.

This value orientation is supported through a review of survey questions posed by Huddart-Kennedy *et al.*, (2009a). Two particular questions that proved especially relevant include: "I always consider what my impact is when I act, but often time and resources prevent me from doing what I feel is best" and "I have oriented my entire lifestyle around my concern for the environment" (Huddart-Kennedy *et al.* 2009a, 155). The creation of the Conservation/ Lifestyle value orientation was also influenced by Stein *et al.*'s (1995) biospheric-altruistic value orientation and survey items discussed in greater detail within section 3.7.

Individuals aligning with this value orientation may realize that the resource needs to be rationed and their actions reflect this. They feel that all people who live within the watershed are connected and that part of the overall sense of community is derived from the fact that everyone is tied to the same water source. People who recreate on or around aquatic ecosystems and/or identify themselves as members of a watershed are also likely to align with this value orientation. Comments made by Lorne Fitch strengthen the fact that this is an important set of values to be accounted for when stating,

Water binds us together in terms of our river and stream systems and our irrigation systems, so it becomes to a degree, a linkage from the headwaters, from rainfall and snowmelt, to everything we are and everything we do (...) I think those linkages, which may be considered social linkages, are pretty important (Fitch, 2009).

An example of a Conservation / Lifestyle value statement which was strengthened by such a comment is value statement 11 (See Table 4.4).

Another characteristic of this type of value orientation is their desire for water efficiency and conservation regarding both domestic water use and public water use (municipal green space). Doug Kaupp, General Manager of Water, Wastewater and Storm Water for the City of Lethbridge, spoke to the different ways in which residents use water for private landscaping as well as how the City of Lethbridge uses water to landscape public spaces.

In a lot of our open spaces there's been recognized value of mulching around trees (...) and a lot of cases the drivers are maintenance efficiencies, lowering the maintenance costs, making it easier to cut the grass. And so there are more and more examples of shrub beds and rather than strictly pool table kind of lawns. Besides xeriscaping there's definitely in the last 20 to 25 years a move towards valuing native landscapes. So dry land grasses...if you go down to the river valley, the Indian Battle Park, 30 to 40 years ago that would have been irrigated from groundwater and looked just like a schoolyard. Whereas now it's all dry land grass that gets cut once or twice a year and it's a totally different experience, but people still value it even though it's not Kentucky Bluegrass (Kaupp, 2009).

Statements such as these aided in designing many of the Conservation / Lifestyle value statements. Examples include statements 9, 15, 20, 21 (See Table 4.4). Agreeing with these types of statements indicates that the individual would like water saving activities to be integrated into all aspects of their life, including municipal landscaping. People responding positively to these types of value statements would appreciate the less water intensive landscaping for its beauty as being native to the region as well as what it stands for, namely that water should be used carefully and efficiently.

4.7.3 Basic Needs / Family

The Basic Needs / Family value statements differ from the Conservation / Lifestyle and Intrinsic / Bequest value statements by focusing on basic needs or the perceived basic needs of the individual and their family and giving these needs priority over the needs of the environment or the economy. As noted in section 3.7, Dietz *et al.*, (1998) have specifically addressed the family and health as possible correlates to environmental values and related behaviour. An individual may base their environmental concern on how an environmentally friendly human activity may have negative consequences on an individual's family or health.

These Basic Needs / Family statements are framed around the need for water for domestic needs such as cooking, cleaning and hygiene, but also the desire for lush green landscaping, both private and public. Doug Kaupp addresses this value orientation in the following comment, "There's an oasis mentality within the urban areas (...) because even though the countryside is dry, the citizens like to have a lush environment to live in" (Kaupp, 2009). Two statements made by Doug Kaupp and Kathleen Murphy continue to strengthen this idea of certain individual's desire to create an artificial oasis in such an arid region, and even offers ideas as to which demographic groups represent such values when stating,

There is a small percentage of residents that are extremely wasteful with water. And generally it's fair to say that they are the more affluent demographic, so residents with extremely large lots (...). And we see from their utility bills that they can use (...) close to 10 times [more water than] the average [user]. I don't understand why they need that much water, but that small percentage of water users seems to be immune to the price signals, to the utility bill, to have a \$300 or \$400 water bill in a month doesn't seem to make any difference (Kaupp, 2009).

I think people still believe that they need to have a green lawn out in front and [that] they can use or waste water as much as they want. Municipalities also, I believe as a whole, even in their planning, need to change a bit in their mindset also. One of the things you will see in developments in municipal planning is that

often residences are put up around a water source, a lake in their backyard, and aesthetically people want to have that, and often they are filled with water from the municipal system. In this area I don't think [this is] a reasonable way of using water because all it does is increase the evaporation and losses to the system (Murphy, 2009).

Similar statements about domestic urban water use were made by many of the key informants. These ideas strengthened the arguments for value statements such as statements 7, 17, and 32 (See Table 4.4).

Stephanie Palachek, Executive Director of the Oldman Watershed Council (OWC) sheds light on the idea that the people who may be holding these types of values; those that feel the need to use excessive amounts of water to meet their perceived 'essential needs', are primarily urban dwellers that have primarily lived in urban settings throughout their lives.

I think that people, in the back of their minds, especially people who live in the city, will take it for granted until we do run into a problem. Water is always there. You can always turn the tap on. Until we start putting restrictions on water. [Restrictions on] when you can water you lawn, not letting people recklessly wash their vehicles in their driveway. I think until you put restrictions, people are not going to have a clear understanding as to the value of water. For most people it's just a fact, it's there, you turn the tap on, it's all good. But until you start putting restrictions and taking some of these luxuries away, the average (urban) citizen will not understand. (...) Rural is different. Rural people are different. Most of those people rely on a local creek or a stream and they are the stewards of that stream. They need to ensure that the water is clean and that it's abundant. They make their living off of these tributaries and these rivers that they [use to] water their livestock. (...) So they have to be conscious of the quality of the water because they are actually using it in their households (Palachek, 2009).

The respondents that align with the Basic Needs / Family value statements do not value water in an economic sense, but instead the values they attribute to water are more related to how they can attain certain comforts, such as always having water for domestic needs as well as aesthetics. This idea aided in the creation of value statement 5 (See Table 4.4) Their use may not be driven by a conservation ethic, but instead, they may feel that the

resource will always be available and thus their usage is not dictated by its inherently scarce or limited nature. It has also been noted that those aligning with these types of statements will be primarily urban residents.

4.7.4 Economic

Individuals aligning strongly with the economic value statements are likely to place most importance on the utilitarian/extractive use of local water resources. This value orientation specifically corresponds to the egoistic and self-enhancement value orientations discussed in section 3.7.

There will always need to be a balance between basic human needs, environmental needs and the need for sustained economic growth, however those aligning with the economic value statements prioritize economic growth as being the most important. These statements mainly correspond to the idea that water should be commoditized, that water can be bought and sold on the open market to the highest bidder. These statements also relate to the idea that humans have the right to modify natural environments to meet our economic need (value statement 22), and that water should be made available for economic uses before the environment (value statement 27).

City of Lethbridge Alderman Barbara Lacey addresses the idea of water markets when asked if water reallocation should be left completely to market forces, meaning that the highest bidder can purchase a water licence and use their allocation for whatever use they choose.

For an essential item like water I don't think it should be left to market forces; the people who can pay the most for it. The water should be used for the highest and best use, not just because you've got the money to buy it (...) But then you see what's happening in other parts of the province and you really wonder because the people who are going after the water are the sort of people like the developers who are trying to buy water from the irrigation companies. And the

irrigation companies see this as a very lucrative way of making money. And there's no control about who's going to buy this water and whether it's going to go to the best possible purpose (Lacey, 2009).

These types of comments helped in forming value statements 4 and 19 (See Table 4.4).

These statements mainly pertain to the private sale of water resources. Although Alderman Lacey did not explicitly express support or show opposition to these values she did mention that the closing of basins would lead to a water market where those who hold water would be able to sell their entitlement or part of their licence to whomever they choose and for the price they themselves determine. Those who agree with these types of ideas are primarily economically driven because of their prioritization of their livelihood over the environment's needs (egoistic value orientation).

It was also important to determine whether the respondent's livelihood is dependent upon water and this was probed with value statement 3. Kent Bullock, the Taber Irrigation District (TID) manager, raised ideas about how an individual's value orientation may be influenced by this economic dependence on the resource.

I think if water is important to your business and to your occupation, you have a greater appreciation and value to that water; better than someone who doesn't. (...) And I think that's what you see when you see people using the water for their livelihood. You know, they value how clean that water is, how much it has to be treated to be able to make it usable. They value the fact that they're taking good care of it because if they don't (then) they don't have enough water to grow a crop that year. The more you're dependent on the water I think the better steward you are of it (Bullock, 2009).

This statement raises ideas that people may value water due to its economic utility. However, that does not necessarily mean that they use the resource irresponsibly. Due to their dependence on the resource to secure a livelihood, those identifying with this value orientation may be the best stewards of the resource and better understand the need to conserve water. Although irrigators were not included in this study, it is expected that

those who have social ties with irrigators will align with these types of statements, given their expected greater understanding of the importance of water to an economy which is primarily driven by the agriculture sector. This perspective is reflected in value statement 14 (See Table 4.4).

4.8 Developing the Value Statements

Part A of the survey posed 32 value statements, which corresponded to four unique value orientations, as mentioned above. The actual statements used were constructed using the data collected from the academic literature, including statements and questions posed by similar studies concerning individual values and environmental issues. The relevance of the questions was strengthened by the key informant interviews. The interviews also help in designing questions that were locally relevant to the southern Albertan landscape.

Tables 4.4.1, 4.4.2, 4.4.3 and 4.4.4 illustrate the rationale behind how each individual value statement was designed including the research study that each value statement was based on and the key informant interview that provided the locally relevant support.

Table 4.4.1 Creation of the Value Statements - Intrinsic / Bequest

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
<p><i>Intrinsic / Bequest</i> (Stern <i>et al.</i>, 1993; Stern <i>et al.</i>, 1995; Dunlap <i>et al.</i>, 2000; Dietz <i>et al.</i>, 2002; de Groot and Steg, 2008)</p>	<p>1. A healthy, functioning aquatic environment should always take priority over human uses of water.</p>	<p>NEP Scale “Humans must live in harmony with nature to survive” (McMillan <i>et al.</i>, 1997; Corral-Verdugo, 2003) “Economic Growth always harms the environment” (Dietz <i>et al.</i>, 1998)</p>	<p>(Fitch, 2009)</p>
	<p>6. Healthy aquatic ecosystems add to the quality of life in the province of Alberta.</p>	<p>“The river landscape possesses inspirational beauty” (Vugteveen <i>et al.</i>, 2010) “The river landscape offers people the possibility to experience personal growth” (Vugteveen <i>et al.</i>, 2010)</p>	<p>(Murphy, 2009)</p>
	<p>10. Water in a river has value simply because of all of the benefits and services it gives to us.</p>	<p>“Environmental non-use values that do not require any direct contact with environment for people to enjoy a benefit. Notable amongst this class of value is the existence benefit that people enjoy from the knowledge that ecosystems or species are protected from the threat of extinction” (Bennett, 2003) “Human progress can be achieved only by maintaining ecological balance” (Corral-Verdugo <i>et al.</i>, 2008) “Nature has value, even if we do not use it” (Vugteveen <i>et al.</i>, 2010)</p>	<p>(Fitch, 2009)</p>
	<p>13. New subdivisions should not be allowed in this region if supplying the needed water would cause harm to the environment.</p>	<p>NEP Scale “We are approaching the limit of the number of people the earth can support” (Dunlap and Van Liere, 1978; Dunlap <i>et al.</i>, 1992; Stern <i>et al.</i>, 1995; Dunlap <i>et al.</i>, 2000)</p>	<p>(Murphy, 2009)</p>
	<p>18. I would feel a sense of pride if I knew that this region had a healthy natural ecosystem.</p>	<p>“Dealing with nature in a respectful way is important to me” (Vugteveen <i>et al.</i>, 2010) “Providing a good way of life through the tourism industry” (Stein <i>et al.</i>, 1999)</p>	

Table 4.4.1 Creation of the Value Statements - Intrinsic / Bequest (Cont'd)

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
<p style="text-align: center;"><i>Intrinsic / Bequest</i> (Stern <i>et al.</i>, 1993; Stern <i>et al.</i>, 1995; Dunlap <i>et al.</i>, 2000; Dietz <i>et al.</i>, 2002; de Groot and Steg, 2008)</p>	<p>23. The environment’s needs for water should be met before water is used for human economic purposes such as industry and agriculture.</p>	<p>“Nature not primarily to be used” (Klineberg <i>et al.</i>, 1998) “Economic growth always harms the environment” (Dietz <i>et al.</i>, 1998)</p>	<p>(Bradley, 2009)</p>
	<p>28. I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now.</p>	<p>“Preserving nature now means ensuring the future of human beings” (Corral-Verdugo <i>et al.</i>, 2008) “We must reduce our consumption levels to ensure well-being of the present and future generations” (Corral-Verdugo <i>et al.</i>, 2008) “The decision-making process surrounding water should take future generations into account” (Vugteveen <i>et al.</i>, 2010)</p>	
	<p>31. I would get satisfaction from knowing that enough water was in the river to support natural ecosystems even if I didn’t use the river for recreation.</p>	<p>“Nature has value, even if we do not use it” (Vugteveen <i>et al.</i>, 2010) “Providing a good way of life through the tourism industry” (Stein <i>et al.</i>, 1999)</p>	

Table 4.4.2 Creation of the Value Statements - Conservation / Lifestyle

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
<p>Conservation / Lifestyle (Stern <i>et al.</i>, 1993; Stern <i>et al.</i>, 1995; Dunlap <i>et al.</i>, 2000; Dietz <i>et al.</i>, 2002; de Groot and Steg, 2008; Huddart-Kennedy <i>et al.</i>, 2009a)</p>	2. The environment is important to me because of its natural beauty.	“A world of beauty” (Stern <i>et al.</i> , 1995) “The river landscape possesses inspirational beauty” (Vugteveen <i>et al.</i> , 2010)	
	9. Respect for the environment influences my willingness to conserve water.	“I always consider what my impact is when I act, but often time and resources prevent me from doing what I feel is best” and “I have oriented my entire lifestyle around my concern for the environment” (Huddart-Kennedy <i>et al.</i> , 2009a). “Respecting the earth” (Stern <i>et al.</i> , 1995).	(Kaupp, 2009)
	11. The river ties the community together.	“I feel part of a shared cultural identity that is connected to the landscape” (Vugteveen <i>et al.</i> , 2010)	(Fitch, 2009)
	15. I would like public spaces to be planted with trees and plants that need less water.	“Protecting the environment, preserving nature” (Dietz <i>et al.</i> , 2002)	(Kaupp, 2009)
	20. I use water carefully in ways that protect the environment.	“I always consider what my impact is when I act, but often time and resources prevent me from doing what I feel is best” and “I have oriented my entire lifestyle around my concern for the environment” (Huddart-Kennedy <i>et al.</i> , 2009a)	(Kaupp, 2009)
	21. I use water more carefully than most of my neighbors.		(Kaupp, 2009)
	40. I use rivers and their surrounding areas on a regular basis for recreation.	“A clean environment provides me with better opportunities for recreation” (Stern <i>et al.</i> , 1993)	

Table 4.4.3 Creation of the Value Statements - Family / Basic Needs

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
<p style="text-align: center;">Family / Basic Needs</p> <p>(Stern <i>et al.</i>, 1993; Stern <i>et al.</i>, 1995; Dietz <i>et al.</i>, 1998; Dunlap <i>et al.</i>, 2000; Dietz <i>et al.</i>, 2002; de Groot and Steg, 2008)</p>	<p>5. Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of a healthy aquatic environment.</p>		<p>(Murphy, 2009; Palachek, 2009)</p>
	<p>7. Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river.</p>	<p>“It is depressing to see neighborhoods and public spaces looking so dry” (Harman <i>et al.</i>, 2008)</p>	<p>(Kaupp, 2009; Murphy, 2009)</p>
	<p>12. Knowing that I have a safe and reliable supply of water for my family’s basic needs is important to me.</p>	<p>“Safety for my loved ones” Huddart-Kennedy <i>et al.</i>, 2009b)</p>	
	<p>17. I use water for washing my vehicle even if doing so may cause environmental harm to the river where the water comes from.</p>	<p>“Laws should be changed to make landholders more responsible for the consequences of their activities” (Butterworth and Syme, 2007) “The so-called “ecological crisis” facing humankind has been greatly exaggerated” (Dunlap <i>et al.</i>, 2000)</p>	<p>(Bullock, 2009; Kaupp, 2009)</p>

Table 4.4.3 Creation of the Value Statements - Family / Basic Needs (Cont'd)

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
Family / Basic Needs (Stern <i>et al.</i> , 1993; Stern <i>et al.</i> , 1995; Dietz <i>et al.</i> , 1998; Dunlap <i>et al.</i> , 2000; Dietz <i>et al.</i> , 2002; de Groot and Steg, 2008)	32. I enjoy having a lush green lawn and/or garden even if doing so may cause environmental harm to the river where the water comes from.	“Laws should be changed to make landholders more responsible for the consequences of their activities” (Butterworth and Syme, 2007) “The so-called “ecological crisis” facing humankind has been greatly exaggerated” (Dunlap <i>et al.</i> , 2000) “It is depressing to see neighborhoods and public spaces looking so dry” (Harman <i>et al.</i> , 2008) “Some individuals, especially older residents, feel sadness and grief at losing plants and gardens” (Harman <i>et al.</i> , 2008) (Wilke, 2005)	(Kaupp, 2009; Murphy, 2009)
	35. I only use water for domestic purposes such as washing, cooking and cleaning.		

Table 4.4.4 Creation of the Value Statements - Economic

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
Economic (Stern <i>et al.</i> , 1993; Stern <i>et al.</i> , 1995; Dunlap <i>et al.</i> , 2000; Dietz <i>et al.</i> , 2002; de Groot and Steg, 2008)	3. At least some of my household income depends directly on an activity that uses water from the river.	“Protecting the environment will threaten jobs for people like me” (Stern <i>et al.</i> , 1993)	(Bullock, 2009)
	4. I think that water is a commodity that individuals and private groups should be able to buy and sell.	“It is fact that we in general see water as a commodity in service to humans” (Vugteveen <i>et al.</i> , 2010)	(Lacey, 2009)

Table 4.4.4 Creation of the Value Statements - Economic (Cont'd)

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
<p style="text-align: center;"><i>Economic</i></p> <p>(Stern <i>et al.</i>, 1993; Stern <i>et al.</i>, 1995; Dunlap <i>et al.</i>, 2000; Dietz <i>et al.</i>, 2002; de Groot and Steg, 2008)</p>	<p>8. I'm more concerned about my livelihood than I am about the environment.</p>	<p>“One person’s right to a clean environment is not as important as another’s right to gainful employment” (Freudenburg, 1991) “We worry too much about the future of the environment and not enough about prices and jobs today” (Dietz <i>et al.</i>, 1998)</p>	
	<p>14. Irrigated agriculture is the most economically profitable use of water in southern Alberta.</p>	<p>“I personally think that nature should be recognized in terms of a monetary value within water management” (Vugteveen <i>et al.</i>, 2010) “Give economic productivity in the region higher priority than environmental health” (Stein <i>et al.</i>, 1999)</p>	<p>(Bullock, 2009)</p>
	<p>16. I am entitled to the same amount of water as any resident of the province of Alberta.</p>	<p>“Myth of entitlement – for many, access to clean, free water is seen as a right. This attitude dampens support for water conservation alternatives” (Wilke, 2005)</p>	<p>(Fitch, 2009)</p>
	<p>19. Buyers and sellers of water licences should be the ones who decide the price of water.</p>		<p>(Lacey, 2009)</p>
	<p>22. We have the right to modify the natural environment to meet our economic needs.</p>	<p>NEP Scale “Humans have the right to modify the natural environment to suit their needs” (Dunlap and Van Liere, 1978; Dunlap <i>et al.</i>, 1992; Stern <i>et al.</i>, 1995; Dunlap <i>et al.</i>, 2000) “Individual behaviour should be determined by economic self-interest, not politics” (Mifont and Duckitt, 2010) “The best measure of progress is economic” (Mifont and Duckitt, 2010) “If the economy continues to grow, everyone benefits”. (Mifont and Duckitt, 2010)</p>	

Table 4.4.4 Creation of the Value Statements - Economic (Cont'd)

Value Orientation	Value Statement(s)	Past Survey Item(s)	Key Informant Support
<i>Economic</i> (Stern <i>et al.</i> , 1993; Stern <i>et al.</i> , 1995; Dunlap <i>et al.</i> , 2000; Dietz <i>et al.</i> , 2002; de Groot and Steg, 2008)	26. I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers.	<p>"One person's right to a clean environment is not as important as another's right to gainful employment" (Freudenburg, 1991)</p> <p>"Protecting the environment will threaten jobs for people like me" (Stern <i>et al.</i>, 1993)</p> <p>"We should think of jobs first, and pollution second" (Klineberg <i>et al.</i>, 1998)</p>	
	27. Water should be made available for economic uses before the environment.	<p>Economic Liberalism Scale survey questions: "The best measure of progress is economic" and "If the economy continues to grow, everyone benefits" (Milfont and Duckitt, 2010).</p> <p>"Protecting the environment will threaten jobs for people like me" (Stern <i>et al.</i>, 1993)</p> <p>"We should think of jobs first, and pollution second" (Klineberg <i>et al.</i>, 1998)</p>	
	34. The amount of water I use in and around my home would change depending on how much I had to pay for it.	"How willing would you be to accept cuts in your standard of living in order to protect the environment?" (Dietz <i>et al.</i> , 1998)	(Kaupp, 2009; Palachek, 2009)
	38. Irrigated agriculture produces locally grown, healthy food for me and my family.		(Bradley, 2009; Fitch, 2009; Bullock, 2009)

4.9 Rural-Urban Differences

Although Sharp and Adua (2009) (see section 3.3.3) indicate that the diffusion of agricultural attitudes throughout both rural and urban communities is decreasing due to decreasing social contact with agriculturalists, this may be only an urban phenomenon.

Kent Bullock, the General Manager of the Taber Irrigation District, whose head office is

local within the rural southern Albertan town of Taber, indicated that the process of the diffusion of agricultural values to non-irrigators does occur within the rural townships. This diffusion of values, attitudes and perspectives may result in a heightened awareness of the importance of effective water management by the rural non-irrigator population.

I can't even go out on the street without having people, and this is not just farmers, it's even the people in the town of Taber because they are so tied to the agricultural sector, [asking me questions such as]: what's the water supply like, are the reservoirs full, did we get enough snow on the mountains? (Bullock, 2009).

People are very aware of what affects our economy, what affects our water supplies, always conscious of making sure that there's enough water available for the irrigation season, for their towns, their communities. (Bullock, 2009)

Stephanie Palachek, Executive Director of the Oldman Watershed Council agrees with the awareness of water scarcity amongst the rural populations that Kent Bullock spoke to above. The ideas she spoke to are mainly regarding those individuals who are directly utilizing water resources (e.g. farmers and ranchers) but this ethic among rural populations may be present among the non-irrigator population due to the diffusion of values throughout the community (Sharp and Adua, 2009) and the sharing of a common culture (Tremblay and Dunlap, 1978).

I think that when you do live on the land, you have a certain land ethic. You see the land every day. You keep a watch on weather patterns, rainfall patterns, if you're an agricultural person, rainfall at the right times is very important. (...) You just have a better understanding when you're there and you see it and you might rely on that water to survive where you are because you are not going to be piping it from the city (Palachek, 2009).

These statements strengthen the idea that rural populations may understand the issues of water scarcity more than urban residents due to their social ties. These influences may shape the rural non-irrigator's values to a great degree. Whether those values are rooted in the utilization of water resources to foster economic growth or if they are more

conservation and stewardship oriented remains unknown.

4.10 Developing the Policy Statements

Part B of the survey offered ten statements related to water reallocation policy. These policy statements were created through a review of water reallocation policies being implemented in other water scarce regions internationally and through policy recommendations made in the grey literature and academic journals. The significance and importance of the policy statements were confirmed through the information gathered from the key informant interviews. Each policy statement will be outlined and the comments made by key informants that led to the creation of each policy statement will be presented.

Table 4.5 Creation of the Policy Statements

<i>Policy Statement</i>	<i>Academic Relevance</i>	<i>Key Informant Support</i>
1. The government, rather than market forces, should decide who gets to use Alberta's water.	Horbulyk and Adamowicz, 2002; Chong and Sunding; 2006	Palachek, 2009; Renwick, 2009
2. Private individuals and groups should be able to hold water licences for environmental protection.	Droitsch and Robinson, 2009; Hadjigeorgalis, 2009; Bjornlund, 2010; Kwasniak, 2010	Bradley, 2009; Kaupp, 2009
3. All water licences, no matter when they were issued or for what purpose, must be honored.	Huffnaker <i>et al.</i> , 2000; Droitsch and Robinson, 2009; Kwasniak, 2010; Rood and Vandersteen, 2010	Fitch, 2009; Palachek, 2009

Table 4.5 Creation of the Policy Statements (Cont'd)

<i>Policy Statement</i>	<i>Academic Relevance</i>	<i>Key Informant Support</i>
4. If water is to be traded among irrigation districts and/or municipalities, the government should set the price.	Horbulyk and Adamowicz, 2002; Chong and Sunding; 2006	Palachek, 2009; Renwick, 2009
5. Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient.	Huffnaker <i>et al.</i> , 2000; English <i>et al.</i> , 2002; Huffaker and Whittlesey, 2003; Nicol <i>et al.</i> 2008; Droitsch and Robinson; 2009; MAG, 2009	Bradley, 2009; Kaupp, 2009; Lacey, 2009; Palachek, 2009
6. If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation.	Percy, 2005; Horbulyk and Adamowicz, 2002; Kwasniak, 2010	Bradley, 2009; Murphy, 2009
7. Water that is saved through improved water use efficiency should be used to expand economic activity.	Huffnaker <i>et al.</i> 2000; Droitsch and Robinson; 2009	Kaupp, 2009
8. I would only support the government spending public funds on improving irrigation systems if it meant that the saved water is left in the rivers.	Huffnaker <i>et al.</i> , 2000; English <i>et al.</i> , 2002; Huffaker and Whittlesey, 2003; Nicol <i>et al.</i> 2008; Droitsch and Robinson; 2009; MAG, 2009	Bradley, 2009; Kaupp, 2009; Lacey, 2009; Palachek, 2009
9. The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment.	Huffnaker <i>et al.</i> 2000; Droitsch and Robinson; 2009	Bradley, 2009; Murphy, 2009
10. Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation.	Bjornlund, 2008; MAG, 2009; Bjornlund, 2010	Bradley, 2009; Fitch, 2009

Policy Statement 1 *The government rather than market forces should decide who gets to use Alberta's water*

Policy Statement 4 *If water is to be traded among irrigation districts and/or municipalities, the government should set the price*

These two policy statements are related to the provincial government playing a regulatory role within the newly emerging water market or water right trading regime. Although the government is currently tasked with reviewing all water rights transfers, the information sought about the stakeholders in this case is to what degree they agree with the government playing this regulatory role. Some experts indicate that there must be regulations in place, which ensure that the province's water resources are being utilized in a way that is beneficial to the province (the general public) and not simply those who can bid the highest amount. The consequences of a lack of regulation are explained in the following quote from Ron Renwick, former district manager of the St. Mary's River Irrigation District.

In a situation where there isn't much water, if you let it go to where the market would take it, you're liable to get a lot of golf courses and nothing else. (...) You can't let that happen. (...) Or maybe an irrigator would want to grow some exotic crop where it might not serve the needs of very many people, but it could be very high priced or a very valuable crop. So would you want to shut everything down and let him have that water because he can pay for it? (Renwick, 2009).

Chong and Sunding (2006, 22) speak to the importance and necessity of effective government regulation when instituting water right trading regimes.

Those who caution against haphazard market formation are not necessarily opponents; once basic uses of water (human and environmental water needs) are met, water markets are an efficient mechanism for dealing with the scarcity of the remaining elective uses of water. The prognosis is that water markets need appropriate, effective institutions, and models that recognize the public good qualities of water, incorporate transactions costs, and address third-party externalities.

Although a free market system of water rights trading may prove to be economically efficient, Chong and Sunding (2006) make note of the fact that public interests may not

be fully protected within such a system. The idea of increased government regulation in controlling the types of development that is permitted is therefore directly probed in these two policy statements.

These two policy statements are linked together in that the respondents are asked whether they feel that the provincial government should be determining not only who gets to use Alberta's water, but also whether the government should be setting the prices at which water rights are being sold at to ensure that bidding wars don't drive up prices to levels that only the wealthy land developers are able to afford.

Horbulyk and Adamowicz (2002) note that when introducing a system of tradable water rights (a water market) there will be the problem dealing with the pre-existing stock of underutilized water licences. These under-utilized water licences or portions of water licences will be expected to be sold to those seeking additional water, making problems of water shortages grow worse and not better. Horbulyk and Adamowicz (2002) offer some interesting solutions to this problem such as having the Crown purchase or confiscate some percentage of the outstanding stock (related to policy statements 6 and 9), as well as having the regulator (the government) setting prices that are sufficiently high for the available water to be allocated efficiently without shortages developing. Policy statements 1 and 4 do not specifically speak to these issues, however they do ask the respondent whether they feel that the government should play a large role in regulating who gets to use the province's water resources and at what price, essentially ensuring that the province's development occurs in a manner that is consistent with the goals and values of the general public and not simply those who can pay for water licences.

Stephanie Palachek expresses her concern in the following statements.

I think they (the provincial government) have the ultimate responsibility to ensure that we have an abundant water supply for our citizens, for our health, for the ecosystem health, and of course for a thriving economy (...), but ultimately they have the legislative responsibility to ensure that all of these things are in place (...) I don't think we need the government telling us exactly what we need to be doing but they do need to be there to make sure that things are being done responsibly (Palachek, 2009).

Once you start selling water off, you can never get that back. If you're a farmer and you sell your allocation to the city to develop a casino, you're never going to get that back. You lose control. I think it takes it out of government's hands and you lose control of how your water is being used. And I just don't think it's a very good place to go for our province, or for the country for that matter (Palachek, 2009).

Policy Statement 2 Private individuals and groups should be able to hold water licences for environmental protection

As noted in Chapter 2, under the current legislation (the *Water Act*, 1999 as revised), private individuals and groups are unable to hold a water licence for the purpose of environmental protection. Additionally, the *Water Act* (1999) requires that any water licence must involve a diversion of water and an identifiable point of diversion, thus making it legally questionable whether one may privately hold an instream licence (Kwasniak, 2010).

This policy statement was posed to the survey respondents to determine if they agree or disagree with this concept. This concept has been widely suggested as a method for securing instream flows that would require no spending of public funds. In a report released by the Minister's Advisory Group (MAG) in 2009, a specific recommendation had been made that private organizations, water trusts or individuals should be permitted to acquire licences for the purpose of achieving the desired WCO for the river in question. The private organization or individual could then either hold the licences themselves, an action not permitted under the current legislation, or have them issued to

the Province to hold for a WCO purpose. The use of this type of policy decision has been implemented in other jurisdictions with great success and has been discussed in detail in section 2.5.2.

Doug Kaupp, General Manager of Water, Wastewater and Stormwater for the City of Lethbridge and Cheryl Bradley, a professional biologist and independent consultant based in Lethbridge Alberta and member of the Southern Alberta Group for the Environment (SAGE) speak to this idea,

In large part, cities have a means of acquiring the water that they need for growth. The environment on the other hand, does not have that. It's not nearly as obvious how that would work. And currently, the regulations prohibit anyone holding a licence for the use of the environment other than the province. So the responsibility is squarely on the provincial government to responsibly manage that portion of the resource. So Walleye Unlimited or Trout Unlimited or anyone else who might obviously be interested in [the] aquatic ecosystem can't buy an allocation [and] maintain it in trust to the benefit of the environment (...) People have to be able to trust the government with that. If those allocations were gifted to the province to the benefit of the environment, that they don't just get flipped for a nuclear power plant or some other use that may be seen of as a greater benefit (Kaupp, 2009).

[Currently] nobody can hold water to meet a water conservation objective except government and I object to that because if it's a market (...) I think government is responsible for establishing (...) the processes that allow the community to set their water conservation objectives with the backstop that it does have to meet the needs of the environment. But then anything beyond that is available to the market. Parties that want to buy allocations for in-stream purposes should not be prohibited from doing so and right now they are (Bradley, 2009).

As indicated by Mr. Kaupp, there needs to be a great deal of trust placed in the provincial government if they are to hold water for environmental purposes. They must be trusted that they will not reallocate water resources intended to secure ecosystem needs if a 'better deal' comes along sometime in the future. Not entirely opposing the idea of trusting the government with this responsibility, Mrs. Bradley suggests that if a market in which economic interests can purchase water allocations is established then environmental interests should be able to be secured in the same manner.

Policy Statement 3 All water licences, no matter when they were issued or for what purpose, must be honored

This policy statement explores the reality that many of the water allocations that are being utilized today were originally issued decades ago when the province was initially being settled and they may not reflect society's values and needs that currently exist. Lorne Fitch addresses this issue in the following statement.

I think that this is the opportunity to start reflecting on past allocation opportunities or past allocation histories where there is this willy-nilly giving away of the water and now we have to claw that back. And I think that there are a variety of mechanisms (...) I think the first step is that societal needs for water need to trump economic needs for water. It's not to suggest that we won't have water allocated to economic uses but I think we need to step back from this history of first in time, first in right. Where just because you were in at the beginning of the line you have compliant government who was willing to give away all that you asked for, doesn't necessarily mean that that meets the test for what's required today and for the future. So I think we have to step back from those policy decisions, these legislative decisions and this sense of entitlement that we created in people over water (Fitch, 2009).

The above comment as well as the many reasons indicated within the literature review (section 2.2) lead to the idea that the FITFIR allocation system may not be the most appropriate method of water allocation for the province of Alberta.

Stephanie Palachek, Executive Director of the Oldman Watershed Council, speaks to the possibly inappropriate nature of the FITFIR system given the current social, economical and ecological context.

I think that there has to be an ethic amongst people about sharing water, not only amongst themselves, but with the environment. There's going to have to be a change in attitudes and a change in understanding that we cannot keep all of the water for ourselves. (...). First-in-time, first-in-right is going to have to be re-evaluated. When you think about the number of people who are now living in urban areas and the number of people who are living on farms, there is a great shift in that demographic from when irrigation was conceived back in the early 1900's when the legislation was put into place. I think irrigators and farmers are going to have to accept the fact that we're going to have to share that water because the environment is high on people's radars now (...). The environment

takes a very high level on people's priorities and I think that they're just going to end up succumbing to a lot of pressure from the public to start sharing this not only with their urban counterparts but with the environment to keep the health of the aquatic ecosystems going (Palachek, 2009).

This particular policy statement is not posing a new method of allocating Alberta's water, but simply probing, in lay terms, whether those who currently hold water licences should be guaranteed the right to access the water that they had traditionally and legal maintained rights to.

Policy Statement 6 *If an irrigation district is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation*

Policy Statement 9 *The government should buy water from current licence holders, such as irrigation districts, so that more water can be left in the river for the environment*

Policy statement 3 (discussed above) asks whether or not the current FITFIR system and the associated historically held licences should be honored in the future. The next two policy statements introduce strategies as to how such a restructuring of the water allocation system within Alberta can take place so that the ecosystem's needs could be effectively secured. These two policy statements detail two different strategies in which the government can obtain water from current users to help meet the water conservation objectives (WCO) for the various rivers within southern Alberta.

Currently, under Section 43(1) of the Water Act (1999), the government has the ability to cancel any licences that are not held 'in good standing' and these volumes are added to the WCO of that river. Kathleen Murphy, Water Approvals Team Leader for Alberta Environment in Lethbridge, details this process.

If we find licences that are not being used, the Water Act states that if it hasn't been used in three years and there's no reasonable prospect that it will be used we can cancel a licence and we do (Murphy, 2009).

This is one way that the government can permanently transfer water from existing users to the environment. However, some experts believe that this process is not accomplishing enough (Bradley, 2009). This process of canceling licences that are not deemed to be ‘in good standing’ only applies to completely unused licences, while licences that are only being partially used, such as the large allocations held by the irrigation districts, are not affected by this legislation. Cheryl Bradley states,

[Alberta Environment] needs to aggressively engage in the market and purchase flows that come up. They also need to claw back unused water. But right now the Water Act will not allow for taking back of portions of licences and that needs to change. ... As long as the licence is being used, you cannot take it back. You can only take back whole allocations. So that has to change, in my mind (Bradley, 2009).

Taking unused flow for the environment (...) doesn’t change a lot of things because unused flow is obviously flow that’s still in the river. So it’s not a big social disruption. It’s just ensuring in the future that that water is still there (Bradley, 2009).

The Canadian provinces of Manitoba and Saskatchewan currently employ a process similar to policy statement 6 in which the provincial administrators are able to identify licencees that they feel have excessive water rights and then determine an amount of water to be removed from their licence to be made available either to new users or to increase the natural flow of a river system (Percy, 2005). This is in contrast to the current Alberta legislation which only allows the cancellation of a licence deemed to be ‘not in good standing’ if the entire licence is not being utilized. These two policy statements offer ideas as to how the government could more proactively secure water for the environment’s needs. The various methods suggested to secure these needs are discussed in section 2.5.2.

The major difference between the two statements is that policy statement 6 involves simply seizing unused portions of licences without compensation, a seemingly drastic and unjust method of meeting the water conservation objectives, although there is precedent set for the use of this method in other provinces. Policy statement 9, on the other hand, involves the government actively engaging in the market and purchasing water licences or portions of licences for environmental purposes. This would be fair to the licence holder as they would receive adequate compensation, however this method would come at a cost to the province and essentially the public.

There is also the idea that instead of simply purchasing licences for environmental purposes, the government could invest in infrastructure upgrades allowing the current users to become more efficient and the subsequent water savings could be reallocated to secure the environment's needs. Policy ideas surrounding increasing infrastructure efficiency are addressed within the next three policy statements.

Policy Statement 5 *Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient*

Policy Statement 7 *(Water that is saved through improved water use efficiency should be used to expand economic activity)*

Policy Statement 8 *(I would only support the government spending public funds on improving irrigation systems if it meant that the saved water is left in the rivers)*

These three policy statements address the same idea of increasing efficiency of water use. These policy statements partially emerged from recommendations made by the Minister's Advisory Group (2009) and other reallocation scenarios proposed in section 2.4. How the higher efficiency levels are achieved (e.g. who pays) and what the saved water should be used for are what differentiate the three statements from one another.

Policy statement 5 mirrors how the current system operates. According to the irrigation district managers whom I spoke with while in southern Alberta, the Alberta government pays for 75% of the cost of improving/upgrading infrastructure while the irrigation district covers the remaining 25% (Bullock, 2009; Renwick, 2009). It is true that many of the irrigation districts in Alberta help to deliver water to many municipalities making them an integral component of the functionality of rural Alberta. However, even though subsidies are granted to improve the efficiency of the irrigation district's infrastructure, it is up to the irrigation districts themselves to decide how the water savings are used. If public funds are to be spent to help water users become more efficient then perhaps it should be the public that receives a partial benefit. City of Lethbridge Alderman Barbara Lacey addresses this point below.

I'm not totally against [the provincial government] providing the incentives if in fact it is the population as a whole that benefits and not just puts money into the pockets of the irrigation companies. So if you're going to put public money into incentives, I think there has to be a public benefit that you get out of it. And the government has to have some say in that. It can't just be up to the irrigation companies to say how they want to use the water that's freed up (Lacey, 2009).

This relates to policy statement 8, which suggests that any water saved as a result of public investment in efficiency upgrades should be left in the river for environmental purposes (i.e., to meet a water conservation objective). Many of the comments made by the water resources experts that were interviewed shared an affinity for this type of policy being implemented.

If the irrigation industry has saved that water, if they do not need it, the government should take it back for protected flows. And I have always advocated that if there's public investment in conservation efforts, the water saved should be returned...or a portion of it should be returned for public good...for public uses (Bradley, 2009).

[The irrigation districts] are already receiving money from the government to do canal rehabilitation, such as taking the ditches out and replacing them with pipelines. I don't know if that's specifically supposed to benefit the environment,

or just make sure that more water gets to the irrigator, but I definitely think that not only incentives be given to districts, but also to irrigators too. If they are willing to put money into using highly efficient infrastructure such as your drop pivots and those types of things, I think that that should be recognized and I think there should be a financial incentive accompanying that effort, (...) especially if they return it to the environment. (...) You can save water and give it to another sector, but if it's being returned to the river I think that would merit extra incentive and recognition (Palachek, 2009).

The provincial taxpayers support those irrigation projects through monetary support for maintenance and for the benefit of the provincial economy. If the capital investments result in system efficiencies like lower losses through evaporation or leakage, then the province, the community, could benefit the environment by reducing those allocations rather than having irrigation expand or find other uses for that water by shifting to more water intensive crops, say, as a means of increasing the economic benefit of that water. The benefit of those efficiencies could be attributed to the environment instead of being left in the hands of the irrigation districts (Kaupp, 2009).

Policy statement 8 is just one way that the government could secure more water to meet the needs of the environment. However, it would be expected that many irrigators, as well as those who are influenced by irrigators due to their social ties, would oppose this policy statement as it would essentially result in the irrigation sector losing hold of a resource that they have had control over for many decades.

Policy statement 7 is in direct opposition to policy statement 8. In order to ensure that all interests are represented, this policy statement introduces a situation in which savings achieved through increased efficiency gains should be reinvested into increased economic activity. It is important to not lose sight of the fact that although the environment's health is imperative, the agriculture sector's continued growth is also vital, especially due to the region's heavy reliance on this sector.

Policy Statement 10 *Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation*

This policy statement sought to discover if the survey respondents felt that not only minimum volumes of water should be set aside to meet the environment's needs (water conservation objectives), a process that is currently employed, but also that these minimum flows should exist outside of the prior allocation system (Bjornlund, 2008). This policy statement offers the idea that only after the environment's needs have been secured can water be utilized for economic purposes. Currently, water conservation objectives have a priority date attached to them and in many cases this priority is very junior. The priority date for water conservation objectives is set at the date of the reservation and does not retain the original priority date of the licence or portion of the licence that the water was originally assigned to (Bankes, 2005) (see section 2.5.2.3). This means that water conservation objectives are extremely junior when compared to the licences held by economic interests, mainly irrigation. This means that in times of scarcity instream flow needs may not be secured. Comments made by Cheryl Bradley and Lorne Fitch speak to the relevance of this policy statement.

There's a term that's being coined, protected flow, which is what is needed in the river. And my feeling is that the government, which is responsible for watching over the public interest, needs to implement the procedures to determine what that protected flow should be. And they need to secure it (Bradley, 2009).

There are a variety of mechanisms to get there, [creating protected flows], but one thing they need, (...) as we proceed to acquire them, that they become a priority. That they have the priority of any other water rights (...) And that's where we're up against a bit of a wall with the first-in-time, first-in-right system here in the basin. And so I don't think we can get there without re-evaluating FITFIR. And then I would say, whatever there is available, above that is open to a variety of uses and a market may be the best way to determine what those uses should be (Bradley, 2009).

I think there needs to be a conscious decision that the environment has to come first and then from that becomes a more rational approach to divvying up what

the so called surplus is that is over and above what is required for the ecosystem needs, to maintain natural capital and to sustain ecosystem goods and services, which also have some economic benefits. We've never ascribed those, in terms of weighing them so that we can make conscious decisions about what we're giving up for example to grow one more field of corn (Fitch, 2009).

The need for this type of policy to be implemented and the specific requirements of such a system are described in detail within section 2.5.2.

4.11 Collecting Demographic Information

Part C of the mail-out questionnaire collected demographic data about the survey respondents. The questionnaire collected gender, income, age, education and occupational data, all of which were standard questions that had been framed in the same manner as the Statistics Canada 2001 Federal Census. In addition to this data, the respondents were asked how they got their water for domestic purposes, in what ways do they recreate on or adjacent to water bodies, and whether they are members of the local WPAC or another water stewardship group. Finally, in order to add to the robustness of the rural-urban data, the respondents were asked whether they were raised in a rural or urban setting and if they have mainly lived their lives in a rural or urban setting. These questions were posed to try to discover where the individuals were socialized, but also to help control for the fact that many people migrate between rural and urban settings throughout their lives (Lowe and Pinhey, 1982; Kennedy, 1985; Freudenburg, 1991; Brunson and Kennedy, 1995; Salka, 2001; Huddart-Kennedy *et al.*, 2009b).

4.12 Distributing the Questionnaire

Equal numbers of mail-out questionnaires were sent to residents in Lethbridge, (urban water consumers) and to residents in Taber (MD), Magrath, Raymond and Stirling (rural townships within the watershed whose economies are mainly dependent upon

irrigation). Each of the forward sortation areas (FSAs) that served the five sample locations were determined and mailing addresses for the 6000 surveys were purchased from a list broker (West List Co.). Purchasing names and addresses from a list broker is a method of increasing the response rate of the survey. Surveys labeled with not only the address of the respondent, but also their name, decreases the possibility that the survey would be disposed of in the garbage.

Six thousand questionnaires were mailed to southern Albertans in November of 2009 in hopes that we would ensure a minimum of 300 usable responses from each residence type (rural and urban). The population of Lethbridge is far larger than 3000 residents, therefore every tenth mailing address was sent a survey to ensure that all households within the three Lethbridge FSA's had an equal opportunity to be sent a questionnaire. The total mailing addresses available for the four rural communities combined was 2993 (almost exactly 3000). For the rural population, every household was mailed a survey. Table 4.6 displays the breakdown of how the questionnaires were distributed amongst the population.

Table 4.6 Questionnaire Distribution

Name of Municipality	Number of Questionnaires Sent	Forward Sortation Area (FSA)	Rural or Urban Population
Lethbridge, AB	3000	T1H, T1J, T1K	Urban
Taber, AB	1713	T1G	Rural
Macgrath, AB	429	T0K 1J0	Rural
Raymond, AB	671	T0K 2S0	Rural
Stirling, AB	180	T0K 2E0	Rural

Each envelope contained a 14-page survey booklet, an information letter, a self addressed stamped envelope and a prize draw entry form and envelope (Appendices A, G, H and I). The cash prize draw was used as an incentive to participate in the research. It

was indicated that those who returned the completed survey within one week of receiving it would be entered to win one of five 'early bird' cash prizes of \$100. All surveys received after the first week, including those who did not win an 'early bird' prize would be entered into a second draw to win one of five additional \$100 cash prizes. After 14 days, a reminder postcard was sent to all participants to help increase the response rate.

Each envelope was then opened by hand and the envelope with the prize draw entry form was separated from the actual survey to ensure the anonymity of the respondents. Each survey was then numbered and was coded to differentiate between the rural and urban respondents. Data from the surveys were then inputted in Microsoft Excel. The data were then validated by double checking every tenth entry in the Excel database to ensure that no errors were present. At this point the Excel spreadsheet was imported into the statistical package, SPSS Statistics 17.0 for Mac. All fields that had been left blank by respondents were then replaced with a single decimal indicating a missing value and were omitted by the program when running the statistical tests relying on that particular variable.

4.13 Response Rate

Of the 6000 surveys sent, 394 were returned uncompleted due to the fact that the addressees were deceased, had since moved, or the letter was bounced (marked return to sender) due to address error. Another 46 surveys were returned uncompleted because the addressee had indicated that they were an irrigator making them unable to participate in the survey based on the fact that we were seeking responses from non-irrigators. This resulted in 5560 surveys being sent to those able to participate. Of this number, 1170 usable surveys were returned giving an acceptable response rate of 21.04%. From the

collection of usable surveys, 499 (42.8%) were from rural respondents and 671 (57.2%) were received from the urban sample population.

This survey was targeted at the voting adult population to identify their perception of the issue. The envelopes were therefore addressed to the 'head of households'. Hence the sample will not represent the population with respect to a number of key demographic variables such as age and gender. Addressing the questionnaire to the head of the household excluded young adults living at home. Test of survey results against census Canada data supports that the final sample is representative of the targeted section of the community (see Appendix J for community profiles extracted from the Statistics Canada 2001 Federal Census data).

It must be noted that not all of the surveys were entirely completed. All of the information that was gathered was inputted into the main database, including those cases (surveys) that had missed entire pages (presumably by accident) or did not wish to provide us with certain personal information (e.g., income or age data). For this reason, the number of cases (N) fluctuates throughout the analysis.

4.14 Data Analysis

In order to determine if there are groups present within the data set that hold similar values orientations, cluster analysis was applied to the data set. Cluster analysis is a "generic term for a set of techniques which produces classifications from initially unclassified data" (Everitt 1980, 6). Hair *et al*, (1992, 265) add, "Cluster analysis is a technique for grouping individuals or objects into clusters so that objects in the same cluster are more like each other than they are like objects in other clusters". In other words, objects are clustered so that objects within each cluster are as similar as possible

while the distance to members of other clusters are as great as possible. Finally, cluster analysis is appropriate for this type of research for its ability to reduce data objectively by reducing the information from an entire population or set to information about specific smaller subgroups (Hair *et al.* 1992).

In the case of this study, attempts were made to discover if there are clusters, based on the responses to the values statements in Part A of the mail-out survey, found within the rural and urban samples respectively. Cluster analysis was chosen as a method of classification based on its simplicity of use, the ability to make decisions about the clusters based on the researchers' common sense and intuition and based on its acceptability throughout the field, with many similar studies employing this technique (Kuehne *et al.*, 2008; Bauer *et al.*, 2009).

Hierarchical cluster analysis was used. There are two types of hierarchical techniques, agglomerative and divisive. The agglomerative technique was chosen. This technique considers all cases as part of their own cluster and then each of the clusters are fused together based on those clusters that are most similar to one another. The divisive technique is just the opposite with all cases beginning as part of the same cluster, then they are first separated into a few broad classes, each of which is further divided into smaller classes, and so on until each case is its own cluster, which cannot be further subdivided (Everitt 1980). Since all agglomerative techniques ultimately reduce the data to a single cluster containing all of the cases, the investigator must make a decision as to when to ultimately stop clustering (Everitt 1980; Reimann *et al.*, 2008).

Of the available agglomerative methods, the Ward's Minimum Variance Cluster Analysis with Squared Euclidean Distance was chosen as it is considered as a

conservative procedure with sound algorithm, it is the most often used method among the available hierarchical methods and distance measures (Reimann *et al.*, 2008), as well as its use in similar research studies (Bauer *et al.*, 2009; Kuehne *et al.*, 2008).

The statistical techniques mentioned above were applied to the rural and urban datasets separately. This was done to explore whether clusters based upon different values orientations would emerge as well as giving the researcher the ability to compare rural and urban clusters that may hold similar value orientations (i.e., different responses to the same policy statement even though held values seemed to be similar based on responses to the values statements).

At this stage in the data analysis an informed decision has to be made as to how many clusters to accept. A solution of three clusters was chosen as a way to classify the rural and urban data sets. A two-cluster solution was not chosen, as it does not make intuitive sense, and the data wanted to cluster further (according to the dendogram and agglomeration schedule). The three-cluster solution seems to be the optimal solution to accept, without having any of the value clusters becoming too small, as would happen with a four or five cluster solution, especially since one of the value clusters already has a membership as low as 61 individuals with the chosen three-cluster solution.

Once the clusters have been created for both the rural and urban samples, cross tabulation will be used to determine the proportion of each cluster that had agreed or disagreed with each of the value statements. Once the value statements that contributed to the creation of each cluster have been examined, an identity (name) can be given to each homogeneous group (Kuehne, *et al.* 2008).

Clusters possessing similar value orientations from the rural and urban samples will be cross tabulated using the Pearson Chi Square test to determine if the two corresponding clusters responded to the value statements significantly differently. This will help to determine if there are significant differences between the rural and urban populations that hold similar values. This same procedure will be used to determine if each of the similarly oriented value clusters responded significantly differently to the proposed water reallocation policies.

The size of each cluster (proportion of the sample) and the demographic characteristics of each of the clusters will be examined to determine if the rural-urban dimension is a strong predictor of held values as well as determining the possible factors influencing group membership. Significance tests were also applied to the data to determine if the clusters are significantly different from one another (both within the rural or urban sample and between the similarly oriented clusters) in terms of age, gender, income, education levels, place of socialization (provenance) and where the respondent had mainly lived their life.

4.15 Concluding Remarks

This chapter has laid out how the main data collection instrument, the mail-out questionnaire, had been developed including the justification of each of the statements posed to the respondents. The next chapter provides detailed findings that were yielded following the application of the data analysis methods outlined above.

CHAPTER FIVE

RESULTS

5.1 Overview

This chapter outlines the major findings revealed from the mail-out survey. The statistical tests outlined in the Methodology Chapter (Chapter 4) were applied to the data and various frequency tables and significance tests were created to help illustrate the findings. This chapter details the characteristics of each cluster that led to their unique label based on the group's collective responses to the value statements. The characteristics of each cluster (responses to the value statements, policy statements and the demographic characteristics) are then compared to one another within the rural and urban samples. The same method was also applied to the clusters from the rural and urban samples which represented similar value orientations to determine if there were significant differences in how the similarly oriented value clusters responded to the value and policy statements as well as determining if there were significant demographic differences between the similarly oriented clusters.

The results presented below are by no means representative of all rural and urban populations. Instead, the findings offer some insight into this highly contentious issue based on the findings drawn from a sample of the southern Alberta households.

5.2 Omitted Value Statements

Prior to applying cluster analysis all value statements that were answered uniformly by all respondents were removed, as they cannot contribute to separating respondents into distinct clusters. The decision was made to remove all of the statements in which the total dataset agreed or disagreed by a proportion of 85% consensus or

greater. This was done to not only reveal the values that are commonly held by the general population but to also facilitate the creation of more clearly discrete value clusters. Table 5.1 displays those value statements that were not included in the cluster analysis. The importance of those value statements that were uniformly answered will be discussed in the Discussion Chapter (Chapter 6).

Table 5.1 Value and Attitude Statements Not Used For Cluster Analysis

(Values Statements are rejected if >85% of the total sample agrees or disagrees)

<i>Values Orientation</i>	<i>Value Statement</i>	<i>Rural Response</i>	<i>Urban Response</i>	<i>Total Response</i>
Conservation/Lifestyle	Q.2 The environment is important to me because of its natural beauty.	Agree (85.7%)	Agree (87.0%)	Agree (86.46%)
	Q.9 Respect for the environment influences my willingness to conserve water.	Agree (90.9%)	Agree (91.1%)	Agree (91.02%)
	Q.15 I would like public spaces to be planted with trees and plants that need less water.	Agree (86.9%)	Agree (90.6%)	Agree (89.00%)
	Q.20 I use water carefully in ways that protect the environment.	Agree (88.9%)	Agree (83.5%)	Agree (85.80)
Intrinsic/Bequest	Q.6 Healthy aquatic ecosystems add to the quality of life in the province of Alberta.	Agree (92.4%)	Agree (93.3%)	Agree (92.96%)
	Q.18 I would feel a sense of pride if I knew that this region had a healthy natural ecosystem.	Agree (86.9%)	Agree (91.0%)	Agree (89.25%)
	Q.31 I would get satisfaction from knowing that enough water was in the river to support natural ecosystems even if I didn't use the river for recreation.	Agree (88.5%)	Agree (92.4%)	Agree (90.74%)
Family/ Basic Needs/ Health	Q.12 Knowing that I have a safe and reliable supply of water for my family's basic needs is important to me.	Agree (99.4%)	Agree (99.3%)	Agree (99.38%)

5.3 Labeling the Clusters

Following the procedures set out in the Methodology Chapter (Chapter 4) a solution of three clusters was chosen as a way to classify the rural and urban data sets. Upon initial analysis there appears to be an environmental/conservation oriented group, a moderate group and an economic use of water group that have emerged from each of the data sets (rural and urban). However there are distinct differences between how strongly each group within the rural sample and the urban sample align themselves with the value statements. To aid in determining the exact value orientation of each of the six clusters, cross-tabulation was applied to determine which percentage of each cluster agreed or disagreed with each of the values statements. Pearson Chi Square and Cramer's V tests were applied to verify the strength of the differences and similarities between the rural and urban clusters with the same label. The same tests were also used when examining the relationship between cluster membership, demographic characteristics and responses to the policy options. Throughout the reporting of the findings, p-values lower than 0.1 ($p < 0.1$) were considered significant and reported. Actual significance levels (p-values) were reported at the 0.10 level ($p < 0.1$), 0.05 level ($p < 0.05$) and the 0.01 level ($p < 0.01$). Throughout the rest of this thesis the acronyms RVC and UVC will be used for Rural Values Cluster (RVC) and Urban Values Cluster (UVC). Table 5.2 displays how each cluster collectively responded to the value statements including whether each of the clusters within the rural and urban samples responded to each statement in a significantly different manner.

Table 5.2: Value Statements - Cross-Tabulation with Cluster Analysis Solution

<i>Value Orientation</i>	<i>Value Statement</i>	<i>Rural</i>			<i>Urban</i>		
		RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
Intrinsic / Bequest	1. A healthy, functioning aquatic environment should always take priority over human uses of water. **RURAL **URBAN	22.2 SA; 44.9 AG; 17.6 NO; 14.2 DA; 1.1 SD;	5.8 SA; 30.0 AG; 23.8 NO; 36.3 DA; 4.0 SD;	0.0 SA; 1.6 AG; 4.9 NO; 54.1 DA; 39.3 SD;	19.3 SA; 51.1 AG; 18.3 NO; 10.8 DA; 0.5 SD;	1.6 SA; 14.8 AG; 18.0 NO; 54.7 DA; 10.9 SD;	3.0 SA; 23.8 AG; 20.8 NO; 44.6 DA; 7.9 SD;
	10. Water in a river has value simply because of all of the benefits and services it gives to us. **RURAL **URBAN	26.1 SA; 48.3 AG; 5.1 NO; 16.5 DA; 4.0 SD;	15.2 SA; 65.0 AG; 11.2 NO; 8.5 DA; 0.0 SD;	14.8 SA; 59.0 AG; 11.5 NO; 14.8 DA; 0.0 SD;	26.7 SA; 47.1 AG; 6.9 NO; 14.0 DA; 5.3 SD;	17.2 SA; 59.4 AG; 10.2 NO; 11.7 DA; 1.6 SD;	19.9 SA; 67.3 AG; 5.0 NO; 7.9 DA; 0.0 SD;
	13. New subdivisions should not be allowed in this region if supplying the needed water would cause harm to the environment. **RURAL **URBAN	27.8 SA; 51.1 AG; 15.3 NO; 4.5 DA; 1.1 SD;	9.0 SA; 54.3 AG; 27.4 NO; 9.4 DA; 0.0 SD;	1.6 SA; 24.6 AG; 23.0 NO; 44.3 DA; 6.6 SD;	29.4 SA; 54.0 AG; 11.1 NO; 5.0 DA; 0.5 SD;	2.3 SA; 35.2 AG; 24.2 NO; 32.0 DA; 6.3 SD;	8.9 SA; 62.4 AG; 20.8 NO; 6.9 DA; 1.0 SD;
	23. The environment's needs for water should be met before water is used for human economic purposes such as industry and agriculture. **RURAL **URBAN	17.0 SA; 52.3 AG; 18.2 NO; 10.2 DA; 2.3 SD;	2.2 SA; 22.9 AG; 40.4 NO; 31.4 DA; 3.1 SD;	0.0 SA; 11.5 AG; 6.6 NO; 63.9 DA; 18.0 SD;	13.2 SA; 48.7 AG; 23.8 NO; 13.0 DA; 1.3 SD;	3.1 SA; 18.8 AG; 21.1 NO; 46.1 DA; 10.9 SD;	4.0 SA; 29.7 AG; 42.6 NO; 23.8 DA; 0.0 SD;
	28. I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now. **RURAL **URBAN	31.8 SA; 58.0 AG; 6.3 NO; 2.8 DA; 1.1 SD;	7.2 SA; 61.4 AG; 24.7 NO; 6.7 DA; 0.0 SD;	3.3 SA; 42.6 AG; 37.7 NO; 13.1 DA; 3.3 SD;	26.2 SA; 63.8 AG; 9.5 NO; 0.3 DA; 0.3 SD;	3.9 SA; 46.9 AG; 38.3 NO; 10.2 DA; 0.8 SD;	13.9 SA; 66.3 AG; 15.8 NO; 3.0 DA; 1.0 SD;

Table 5.2: Values Statement - Cross-Tabulation with Cluster Analysis Solution (Cont'd)

Value Orientation	Value Statement	Rural			Urban		
		RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
Conservation/ Lifestyle	11. The river ties the community together. **RURAL **URBAN	18.8 SA; 55.1 AG; 19.9 NO; 5.1 DA; 1.1 SD;	8.1 SA; 59.6 AG; 23.3 NO; 8.5 DA; 0.4 SD;	8.2 SA; 32.8 AG; 32.8 NO; 21.3 DA; 4.9 SD;	17.2 SA; 59.3 AG; 16.1 NO; 6.6 DA; 0.8 SD;	8.6 SA; 42.9 AG; 25.0 NO; 16.4 DA; 0.8 SD;	7.9 SA; 56.4 AG; 25.7 NO; 9.9 DA; 0.0 SD;
	21. I use water more carefully than most of my neighbors. **RURAL *URBAN	13.6 SA; 42.0 AG; 39.2 NO; 4.5 DA; 0.6 SD;	5.8 SA; 37.7 AG; 52.5 NO; 4.0 DA; 0.0 SD;	3.3 SA; 23.0 AG; 50.8 NO; 21.3 DA; 1.6 SD;	11.6 SA; 40.5 AG; 44.2 NO; 3.7 DA; 0.0 SD;	7.0 SA; 31.3 AG; 54.7 NO; 7.0 DA; 0.0 SD;	8.9 SA; 28.7 AG; 52.5 NO; 9.9 DA; 0.0 SD;
	40. I use rivers and their surrounding areas on a regular basis for recreation. **RURAL **URBAN	8.5 SA; 36.9 AG; 17.6 NO; 29.0 DA; 8.0 SD;	1.8 SA; 25.1 AG; 18.4 NO; 47.1 DA; 7.6 SD;	9.8 SA; 27.9 AG; 14.8 NO; 42.6 DA; 4.9 SD;	9.0 SA; 33.9 AG; 17.7 NO; 33.9 DA; 5.6 SD;	7.8 SA; 26.6 AG; 20.3 NO; 39.1 DA; 6.3 SD;	0.0 SA; 14.9 AG; 11.9 NO; 55.4 DA; 17.8 SD;
Family / Basic Needs	5. Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of a healthy aquatic environment. **RURAL **URBAN	1.1 SA; 10.2 AG; 14.8 NO; 61.9 DA; 11.9 SD;	4.5 SA; 31.4 AG; 31.8 NO; 31.4 DA; 0.9 SD;	16.4 SA; 55.7 AG; 18.0 NO; 9.8 DA; 0.0 SD;	0.8 SA; 9.8 AG; 27.0 NO; 53.2 DA; 9.3 SD;	10.9 SA; 46.1 AG; 23.4 NO; 19.5 DA; 0.0 SD;	5.9 SA; 34.7 AG; 31.7 NO; 26.7 DA; 1.0 SD;
	7. Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river. **RURAL **URBAN	1.7 SA; 10.8 AG; 20.5 NO; 54.5 DA; 12.5 SD;	2.7 SA; 39.9 AG; 30.9 NO; 25.2 DA; 1.3 SD;	9.8 SA; 50.8 AG; 23.0 NO; 16.4 DA; 0.0 SD;	0.8 SA; 16.1 AG; 22.8 NO; 48.1 DA; 12.2 SD;	5.5 SA; 54.7 AG; 24.2 NO; 14.1 DA; 1.6 SD;	1.0 SA; 34.7 AG; 26.7 NO; 30.7 DA; 6.9 SD;
	17. I use water for washing my vehicle even if doing so may cause environmental harm to the river where the water comes from. **RURAL **URBAN	0.6 SA; 9.1 AG; 14.8 NO; 54.5 DA; 21.0 SD;	0.4 SA; 12.1 AG; 29.6 NO; 46.2 DA; 11.7 SD;	0.0 SA; 4.9 AG; 31.1 NO; 50.8 DA; 13.1 SD;	1.1 SA; 11.9 AG; 15.6 NO; 47.1 DA; 24.3 SD;	0.8 SA; 26.6 AG; 30.5 NO; 35.2 DA; 7.0 SD;	11.9 AG; 2.0 SA; 23.8 NO; 52.5 DA; 9.9 SD;

Table 5.2: Value Statements - Cross-Tabulation with Cluster Analysis Solution (Cont'd)

<i>Value Orientation</i>	<i>Value Statement</i>	<i>Rural</i>			<i>Urban</i>		
		RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
Family / Basic Needs	32. I enjoy having a lush green lawn and/or garden even if doing so may cause environmental harm to the river where the water comes from. **RURAL **URBAN	0.0 SA; 3.4 AG; 17.0 NO; 57.4 DA; 22.2 SD;	0.9 SA; 13.0 AG; 30.5 NO; 52.9 DA; 2.7 SD;	4.9 SA; 27.9 AG; 18.0 NO; 47.5 DA; 1.6 SD;	0.4 SA; 3.4 AG; 14.0 NO; 63.5 DA; 18.8 SD;	2.3 SA; 27.3 AG; 36.7 NO; 28.9 DA; 4.7 SD;	1.0 SA; 18.8 AG; 13.9 NO; 58.4 DA; 7.9 SD;
	35. I only use water for domestic purposes such as washing, cooking and cleaning. **RURAL **URBAN	8.0 SA; 26.1 AG; 9.1 NO; 54.0 DA; 2.8 SD;	8.5 SA; 38.1 AG; 14.3 NO; 38.6 DA; 0.4 SD;	0.0 SA; 1.6 AG; 4.9 NO; 70.5 DA; 23.0 SD;	4.5 SA; 36.5 AG; 9.3 NO; 46.8 DA; 2.9 SD;	5.5 SA; 23.4 AG; 8.6 NO; 58.6 DA; 3.9 SD;	16.8 SA; 37.6 AG; 17.8 NO; 23.8 DA; 4.0 SD;
Economic	3. At least some of my household income depends directly on an activity that uses water from the river. **RURAL **URBAN	15.3 SA; 30.1 AG; 13.6 NO; 23.3 DA; 17.6 SD;	4.9 SA; 28.3 AG; 22.0 NO; 29.1 DA; 15.7 SD;	24.6 SA; 45.9 AG; 9.8 NO; 9.8 DA; 9.8 SD;	15.3 SA; 30.7 AG; 17.5 NO; 26.5 DA; 10.1 SD;	8.6 SA; 39.1 AG; 18.0 NO; 21.1 DA; 13.3 SD;	2.0 SA; 7.9 AG; 10.9 NO; 36.6 SD; 42.6 SD;
	4. I think that water is a commodity that individuals and private groups should be able to buy and sell. **RURAL **URBAN	1.7 SA; 2.3 AG; 5.7 NO; 31.8 DA; 58.5 SD;	0.4 SA; 14.8 AG; 15.7 NO; 40.8 DA; 28.3 SD;	1.6 SA; 26.2 AG; 14.8 NO; 21.3 DA; 36.1 SD;	1.3 SA; 6.6 AG; 8.2 NO; 38.9 DA; 45.0 SD;	2.3 SA; 25.8 AG; 14.1 NO; 27.3 DA; 30.5 SD;	0.0 SA; 2.0 AG; 5.9 NO; 34.7 DA; 57.4 SD;
	8. I'm more concerned about my livelihood than I am about the environment. **RURAL **URBAN	0.0 SA; 10.2 AG; 14.2 NO; 52.3 DA; 23.3 SD;	1.8 SA; 29.6 AG; 36.8 NO; 28.3 DA; 3.6 SD;	9.8 SA; 47.5 AG; 23.0 NO; 19.7 DA; 0.0 SD;	1.9 SA; 12.7 AG; 20.4 NO; 51.1 DA; 14.0 SD;	10.2 SA; 29.7 AG; 34.3 NO; 25.8 DA; 0.0 SD;	1.0 SA; 27.7 AG; 28.7 NO; 34.7 SD; 7.9 SD;

Table 5.2: Value Statements - Cross-Tabulation with Cluster Analysis Solution (Cont'd)

<i>Value Orientation</i>	<i>Value Statement</i>	<i>Rural</i>			<i>Urban</i>		
		RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
Economic	14. Irrigated agriculture is the most economically profitable use of water in southern Alberta **RURAL **URBAN	11.4 SA; 37.5 AG; 28.4 NO; 18.8 DA; 4.0 SD;	11.7 SA; 52.5 AG; 28.7 NO; 7.2 DA; 0.0 SD;	36.1 SA; 44.3 AG; 13.1 NO; 6.6 DA; 0.0 SD;	6.1 SA; 38.1 AG; 36.0 NO; 16.1 DA; 3.7 SD;	14.1 SA; 58.6 AG; 18.0 NO; 7.8 DA; 1.6 SD;	5.9 SA; 40.6 AG; 36.6 NO; 13.9 DA; 3.0 SD;
	16. I am entitled to the same amount of water as any resident of the province of Alberta. **RURAL **URBAN	7.4 SA; 30.1 AG; 22.7 NO; 31.8 DA; 8.0 SD;	12.1 SA; 47.5 AG; 22.0 NO; 17.0 DA; 1.3 SD;	21.3 SA; 29.5 AG; 14.8 NO; 31.1 DA; 3.3 SD;	4.8 SA; 24.3 AG; 24.3 NO; 38.1 DA; 8.5 SD;	15.6 SA; 46.1 AG; 21.9 NO; 14.8 DA; 1.6 SD;	10.9 SA; 52.5 AG; 20.8 NO; 11.9 DA; 4.0 SD;
	19. Buyers and sellers of water licences should be the ones who decide the price of water. **RURAL **URBAN	1.1 SA; 2.3 AG; 12.5 NO; 38.1 DA; 46.0 SD;	0.4 SA; 7.6 AG; 19.7 NO; 51.1 DA; 21.1 SD;	1.6 SA; 24.6 AG; 16.4 NO; 39.3 DA; 18.0 SD;	2.1 SA; 4.0 AG; 11.6 NO; 41.5 DA; 40.7 SD;	3.9 SA; 17.2 AG; 21.9 NO; 40.6 DA; 16.4 SD;	0.0 SA; 0.0 AG; 8.9 NO; 42.6 DA; 48.5 SD;
	22. We have the right to modify the natural environment to meet our economic needs. **RURAL **URBAN	0.6 SA; 8.5 AG; 12.5 NO; 55.1 DA; 23.3 SD;	1.3 SA; 23.8 AG; 31.4 NO; 39.0 DA; 4.5 SD;	6.6 SA; 59.0 AG; 21.3 NO; 13.1 DA; 0.0 SD;	0.3 SA; 8.2 AG; 18.3 NO; 55.6 DA; 17.7 SD;	7.0 SA; 51.6 AG; 24.2 NO; 15.6 DA; 1.6 SD;	2.0 SA; 8.9 AG; 21.8 NO; 60.4 DA; 6.9 SD;
	26. I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers. **RURAL **URBAN	1.7 SA; 4.0 AG; 17.6 NO; 59.7 DA; 17.0 SD;	0.4 SA; 35.4 AG; 40.4 NO; 23.3 DA; 0.4 SD;	16.4 SA; 50.8 AG; 14.8 NO; 18.0 DA; 0.0 SD;	0.5 SA; 6.9 AG; 29.6 NO; 52.1 DA; 10.8 SD;	12.5 SA; 45.3 AG; 32.0 NO; 9.4 DA; 0.8 SD;	2.0 SA; 20.8 AG; 40.6 NO; 31.7 DA; 5.0 SD;

Table 5.2: Value Statements - Cross-Tabulation with Cluster Analysis Solution (Cont'd)

<i>Value Orientation</i>	<i>Value Statement</i>	<i>Rural</i>			<i>Urban</i>		
		RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
Economic	27. Water should be made available for economic uses before the environment. **RURAL **URBAN	0.0 SA; 1.7 AG; 11.9 NO; 59.1 DA; 27.3 SD;	0.4 SA; 17.0 AG; 47.5 NO; 32.7 DA; 2.2 SD;	8.2 SA; 32.8 AG; 39.3 NO; 19.7 DA; 0.0 SD;	0.3 SA; 2.4 AG; 16.7 NO; 61.6 DA; 19.0 SD;	4.7 SA; 39.8 AG; 31.3 NO; 24.2 DA; 0.0 SD;	0.0 SA; 5.0 AG; 32.7 NO; 53.5 DA; 8.9 SD;
	34. The amount of water I use in and around my home would change depending on how much I had to pay for it. *RURAL URBAN	9.1 SA; 49.4 AG; 13.1 NO; 23.3 DA; 5.1 SD;	9.0 SA; 49.8 AG; 18.8 NO; 20.6 DA; 1.8 SD;	9.3 SA; 52.0 AG; 6.6 NO; 11.5 DA; 3.3 SD;	11.6 SA; 46.0 AG; 12.7 NO; 26.2 DA; 3.4 SD;	10.9 SA; 50.8 AG; 11.7 NO; 25.8 DA; 0.8 SD;	12.9 SA; 53.5 AG; 11.9 NO; 16.8 DA; 5.0 SD;
Total Membership		176	223	61	378	128	101
% Of Data Set		38.3	48.5	13.3	62.3	21.1	16.6

(SA= strongly agree'; AG= 'agree'; NO= 'no opinion'; DA= 'disagree'; SD= 'strongly disagree')
* $p < 0.1$; ** $p < 0.01$; Rural N = 460, Urban N = 607

5.3.1 Rural Sample:

5.3.1.1 RVC1

After examining the rural cluster sizes, it is apparent that **RVC2** is the largest of the rural clusters with 48.5% of the rural sample aligning with this group. The second largest cluster is **RVC1** with 38.3% of the rural sample clustering toward this values orientation. And finally, **RVC3** makes up the smallest of the rural clusters with 13.3% of the sample adhering to this group (Table 5.3).

Table 5.3 Rural Cluster Size Comparisons

<i>Cluster</i>	<i>Count</i>	<i>% of Rural Sample</i>
RVC1	176	38.3%
RVC2	223	48.5%
RVC3	61	13.3%
Total	460	100.0%

The value cluster **RVC1** clearly displays a tendency toward environmental and conservation values. This can be seen when examining the way that the group collectively agreed with the Intrinsic / Bequest values statements, specifically statements 1, 13, 23, 28, and how they collectively disagreed with a majority of the Economic and Family / Basic Needs value statements, specifically statements 4, 5, 7, 8, 17, 19, 22, 26, 27, 32 (Table 5.2). These responses are significantly different from the other two rural clusters, indicating that they are indeed expressing a different set of values. When compared to the other two rural clusters, **RVC1** expressed greater support for the protection of aquatic ecosystems and overall conservation of water resources. Because of the values held, this group was labeled the *Rural Environmental Conservation Values Cluster*.

5.3.1.2 RVC2

The values cluster **RVC2** seems to make up a group of people who are fairly moderate in how they view the issue of water allocation and environmental interests for water security when compared to the other two rural value clusters. The group is comprised of 223 individuals making it the largest cluster within the rural dataset (48.5% of the rural sample belongs to this cluster) (Table 5.3). The members of this cluster do not fully commit to one value orientation or another (Table 5.2). Findings from the mail-out questionnaire indicate that members of this relatively large group of rural individuals are undecided when faced with decisions related to water or find themselves grappling with internal conflicts (i.e. social ties with farmers versus environmental protection). This group, more often than not, displays equal proportions of group members exhibiting opposing views from statement to statement, which causes the group to appear to be non-committal to a single value orientation. This is in contrast to the other two value clusters who differ significantly in that their responses clearly indicate that they are as a group either supportive of water for the environment or water for economic use. This group also tends to have the highest frequency of individuals choosing the ‘neither agree nor disagree’.

The recognition of this moderate value cluster is an accurate reflection of reality. Not all people in society hold strong opinions towards the environmental protection or economic growth. Therefore an analysis should not force people into one of two extremes if they do not belong there. The characteristics outlined above have led the researcher to label this group the *Rural Moderate Values Cluster*.

5.3.1.3 RVC3

The **RVC3** values cluster is substantially smaller than the other two rural value clusters, comprising only 13.3% (61 individuals) of the rural sample, making them not only the smallest cluster within the rural sample, but also the smallest of all six clusters (Table 5.3). This group exhibited a significantly different value orientation than the other two groups in the rural sample by tending to align very strongly with the value statements relating to water for economic purposes, mainly water for irrigation and industry. These individuals support the use of water for economic and municipal landscaping purposes to a far greater degree than for environmental purposes as expressed in value statements 1, 7, 23, 27 and 32 (Table 5.2). This group also indicated that they approve of using water for economic expansion within the region (housing development and irrigation expansion) by their responses to value statements 1, 5, 13, 14, 23, 26 and 27 (agreeing or disagreeing based on the orientation of the statement). Also of note, 57.3% of this group stated that they are more concerned about their personal livelihoods than they are about the environment (value statement 8), as well as largely agreeing (65.6%) with the value statement, “We have the right to modify the natural environment to meet our economic needs” (value statement 22). These opinions are partially explained by the fact that 70.5% of this group agreed with the statement “At least some of my household income depends directly on an activity that uses water from the river” (value statement 3). This group is statistically more supportive than the other rural value clusters of the utilization of the natural environment for financial gain (or to secure a livelihood) rather than its protection. The evidence discovered through the examination of the group’s responses to the values statements, resulted in this group being labeled the *Rural Utilitarian Values Cluster*.

5.3.2 Urban Sample

5.3.2.1 UVC1

The **UVC1** value cluster consists of 378 members of the urban population, representing 62.3% of the total population (Table 5.4).

Table 5.4 Urban Cluster Size Comparisons

<i>Cluster</i>	<i>Count</i>	<i>% of Urban Sample</i>
UVC1	378	62.3%
UVC2	128	21.1%
UVC3	101	16.6%
Total	607	100.0%

This group aligned with the Intrinsic / Bequest and Conservation / Lifestyle value statements, exhibiting significantly stronger alignment than the other two urban values clusters for value statements 1, 13, 23, 28 of the Intrinsic / Bequest orientation and value statements 11, 21, and 40 of the Conservation / Lifestyle orientation (Table 5.2). **UVC1** displayed overwhelming support for water being used to ensure healthy aquatic ecosystems prior to human uses of the available water, including the desire to not see new housing developments (subdivisions) built if doing so will harm the aquatic ecosystem (value statements 1, 13, 23). **UVC1** also aligned (agreed) with the Conservation / Lifestyle statements 11 and 40, indicating that they feel that rivers tie the community together (value statement 11) and that they regularly use the rivers and their surrounding areas for recreational purposes (value statement 40).

This environmental/conservation-oriented group responded negatively (disagreed) to most of the economic value statements (value statements 4, 8, 19, 22, 26, 27). They expressed values that indicate that they are more concerned about ensuring that the environment is protected than securing a livelihood (value statement 8). They are

opposed to treating water as a commodity that can be traded amongst private groups, and similarly oppose allowing buyers and sellers of water licences to determine the price that water is being traded at. This group also expressed significantly more support for protection and conservation of the local aquatic ecosystem when compared to the other two urban value clusters. This differentiating characteristic is exemplified in the responses to (disagreement) value statements 22 ('People have the right to modify the natural environment to meet their economic needs'), 26 ('I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers') and 27 ('Water should be made available for economic uses before the environment').

In terms of using water for landscaping purposes, both public and private, (value statements 7, 32) they are significantly more likely to disagree that using water to create 'lush green space' in public places adds to their quality of life to a greater degree than leaving the water in the river. Following the theme of landscaping, this group indicated that they would not use water for personal lawns and gardens if in doing so environmental harm is caused to the river. Based on the responses given, this group (**UVC1**) has been labeled, the *Urban Environmental Conservation Values Cluster*.

5.3.2.2 UVC2

UVC2 was found to be oriented with the economic value statements to a significantly greater extent than any of the other urban clusters. This group also made up a much larger proportion of the urban cluster than its economically driven counterpart from the rural population. This group included 128 respondents or 21.1% of the urban sample (Table 5.4).

This cluster disagreed with the two statements that expressed the view that water for the environment should be secured prior to allocating water for economic purposes and that a healthy functioning environment should always take priority over human uses of water (value statements 1 and 23). Members of this cluster also disagreed to a greater extent than the other urban clusters with the statement that new subdivisions should not be developed if stresses were placed on already over-allocated water sources (value statement 13). Only 50% of the group agreed with value statement 28 that future generations should be able to experience aquatic environments in southern Alberta that are healthier than they are at present. The other groups, **UVC1** and **UVC3**, showed overwhelming support for this statement, with 90% and 80% agreeing respectively. Additionally, 60% of **UVC2** also believes that using water to create green and lush public spaces adds more to their quality of life than leaving the water in the river (value statement 7). All other groups (rural and urban), except for the *Rural Utilitarian Values Cluster*, diverged from this result, disagreeing by an overwhelming majority to value statement 7 (Table 5.2).

Other group responses worth mentioning that separated **UVC2** from the rest of the urban value clusters include: 1) 72.7% of **UVC2** agreed with value statement 14 ('Irrigated agriculture is the most economically profitable use of water in southern Alberta.');

2) 57.8% of the group agreed with value statement 26 ('I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers.');

3) 44.5% agreed with value statement 27 ('Water should be made available for economic uses before the environment.');

and 4) 58.6% agreed with value statement 22 ('We have the right to modify the natural environment to meet our

economic needs.’) (Table 5.2). All of the aforementioned responses indicate that **UVC2** has a tendency to support economic expansion through increased water use over environmental protection and conservation of the region’s scarce water resource. A definite conclusion can be drawn that this group is driven to a greater extent by pro-economic or utilitarian values than all other clusters in the urban data set. Along the same lines as the trends noticed above, the group’s responses to value statements 4, 8 and 19 also displayed a tendency to agree with the idea of water being traded as a commodity and more of a concern for securing a livelihood than protecting the aquatic environment. The proportion of the group in agreement with these statements was not overwhelming, however when compared to the other groups in the sample (under 8% of **UVC1** agreed with value statements 4 and 19, while 0% of **UVC3** agreed with value statement 19), it is evident that **UVC2** holds values that are rooted in economic growth and development rather than environmental protection and conservation. Due to the evidence established throughout this section, it was decided to label this group the *Urban Utilitarian Values Cluster*.

5.3.2.3 UVC3

The final urban value cluster, **UVC3**, has the smallest group membership amongst the urban value clusters, made up of only 101 individuals (16.6% of the urban sample) (Table 5.4).

UVC3 responded to many of the value statements by indicating that they neither agree nor disagree. This group seems to be undecided or moderate when compared to the more resolute pro-economic and pro-environment groups, in that they do not fully commit themselves to one set of values or another. However, it was observed that this

group aligned slightly more with the pro-environment statements as opposed to those statements intended to reflect pro-economic values (Table 5.2). Examples of pro-environment value statements that this group displayed strong support for include: value statement 10 ('Water in a river has value simply because of all the benefits and services it gives to us. '), and value statements 13 and 28, reflecting values related to conserving water resources.

Another defining characteristic of **UVC3** is that they rated the lowest out of all groups (both rural and urban) to statement 40 ('I use rivers and their surrounding areas on a regular basis for recreation. '), meaning that they have minimal direct experience with the local aquatic environment. This group was also significantly more likely to agree with statement 35 ('I only use water for domestic purposes such as washing, cooking and cleaning. '), again eluding to the idea that water is only important as a basic need, or that they do not understand the reality that freshwater resources are utilized in many processes outside of the household.

Members of this group were significantly more likely to disagree with value statements 3 ('At least some of my household income depends directly on an activity that uses water from the river. '), 4 ('I think that water is a commodity that individuals and private groups should be able to buy and sell. ') and 19 ('Buyers and sellers of water licences should be the ones who decide the price of water. '). These statements all relate to the utilization of water for economic purposes, and their tendency to be in opposition to value statements 3, 4 and 19 strengthen the claim that although this group is moderate, they have a slight tendency to align with the pro-environment value orientation. Further strengthening the above conclusions about the group, they are also significantly more

likely to disagree with value statements 22 ('We have the right to modify the natural environment to meet our economic needs.') and 27 ('Water should be made available for economic uses before the environment.'), which suggests that they are indeed concerned about the environment, or at least feel that the environment's needs are more important than economic development.

Although this group has displayed that they are indeed concerned about the environment, they are not as strongly aligned with the pro-environment and conservation oriented value statements as **UVC1**. A unique label was given to this group because of the great deal of questions answered 'neither agree nor disagree' coupled with the support for environmental protection and tendency to agree with the Family / Basic Needs statements, as well as the low level of interaction with water that was indicated, whether recreational or economic. It was decided to label this group the *Urban Basic Needs Environmental Values Cluster*. Due to the apparent divergence in responses from the *Rural Moderate Values Cluster*, further analysis need to be conducted to determine how these two groups differ and if each are significantly different when comparing responses to the values statements, policy options and demographic characteristics.

5.3.3 Cluster Labeling Conclusion - Hypothesis 1 Confirmed

Hypothesis 1. *There will be distinct groups of people that hold similar values towards the environment and more specifically water reallocation.*

Following the cluster analysis procedure, three groups emerged from each dataset (rural and urban) based on their similar responses to the value statements posed within the mail-out questionnaire. After careful examination of the collective responses of the groups Hypothesis 1 can be confirmed. Within each sample (rural and urban), three clusters emerged that are significantly different from one another with respect to how

they responded to the value statements. The three groups from each dataset reflect significantly different value orientations regarding water use and water allocation.

5.4 Comparing Similar Values Clusters Based on Values Orientation

In the previous section, the responses to the value statements were discussed. The collective value orientation of each of the six groups was determined based on the collective agreement or disagreement to certain statements and the significant difference in response trends between the groups within each of the rural and urban datasets. Agreement with the Intrinsic / Bequest and/or Conservation / Lifestyle value statements indicated a more pro-environmental values orientation, while agreement with the Economic statements indicated a pro-economic value orientation. A third type of group also emerged that was given the label moderate. Moderates did not show overwhelming support or rejection for any set of values and gave many 'neither agree nor disagree' responses to the values statements. There was also a cluster in the urban dataset that appeared to fall in between the pro-environment and moderate value alignments. This has led to the realization that a new dimension needed to be tested. The following section will directly compare the similarly aligned value clusters from the urban and rural datasets to discover: 1) if each similar cluster aligned with the same values statements; 2) if they are statistically different from one another (based on each group's responses to the value statements); and 3) if they are comprised of a larger or smaller proportion of their entire dataset. The findings from the analysis within section 5.4 will partially confirm or reject Hypotheses 2a and 2b. It will be conclusively determined whether the size of each similarly oriented cluster differs based on residence. In other words, which value

orientation is most prominent in the rural setting and which is most prominent in urban the setting.

Due to the fact that the specific value statements that each cluster aligned with have already been discussed in the previous section, the following results will mainly focus on those value statements that each like-cluster rated statistically significantly different. There will be minimal attention paid to those value statements that each like-cluster rated in a similar way either agreeing or disagreeing ($p > 0.1$).

Each of the major tables within this section (Tables 5.6, 5.7, and 5.8) contains the significance values (results of the Pearson Chi Square test) as well as a field labeled 'Response Trend'. This parameter displays the general trend direction of the group's response to each value statement (agreeing or disagreeing). Cells labeled 'Split' indicate that both groups had relatively equal proportions of responses distributed among agree, disagree and neither agree nor disagree.

5.4.1 Similarly Oriented Cluster Size - Rural versus Urban Dimension

It was necessary to test the similarly oriented cluster pairs to discover if the sizes of each pair were statistically significantly different from one another. Table 5.5 displays the findings. It was found that the sizes of each of the similarly oriented pairs are significantly different from one another when testing against the rural-urban dimension ($p < 0.01$).

Table 5.5 Similarly Oriented Cluster Pairs - Size Comparison

<i>Cluster Pair</i>	<i>Rural</i>	<i>Urban</i>	<i>Total</i>
Pro-Environment (RVC1 & UVC1)			
% within Sample (rural or urban)	38.3	62.3	52.0
% of Total Respondents	16.5	35.5	52.0
Pro-Economic (RVC3 & UVC2)			
% within Sample (rural or urban)	13.3	21.1	17.6
% of Total Respondents	5.6	12.0	17.6
Moderate (RVC2 & UVC3)			
% within Sample (rural or urban)	48.6	16.6	30.4
% of Total Respondents	20.9	9.5	30.4
N = 1066; p = 0.000			

5.4.2 Pro-Environmental Value Clusters

The pro environmental cluster, **UVC1**, constitutes a significantly larger proportion of the urban sample than **RVC1** does of the rural sample (Table 5.5). This cluster pair is the largest amongst the three pairs, with 52.0% of the respondents aligning with these two clusters. Approximately two-thirds of the pro-environmental respondents are from the urban sample and one-third is from the rural sample. From this simple comparison it is apparent that a far greater proportion of the urban population is motivated by pro-environmental values than the rural population.

The next comparison of the two pro-environment clusters was a test to determine if these two similarly oriented cluster groups differed in their responses to each of the value statements. Table 5.6 reveals that these two clusters deemed to hold predominantly pro-environmental values responded very similarly to the values statements. However, the two groups differed statistically significantly in their responses to five of the values statements.

Table 5.6 Pro-Environment Cluster Direct Comparison - Value Statements

<i>Value Statement</i>	<i>Pearson's p-value</i>	<i>Cramer's V</i>	<i>Response Trend</i>
Intrinsic/Bequest			
1	0.526	0.526	Agree
10	0.816	0.816	Agree
13	0.614	0.614	Agree
23	0.324	0.324	Agree
28	0.014**	0.014**	Agree
Conservation/Lifestyle			
11	0.719	0.719	Agree
21	0.475	0.475	Agree
40	0.674	0.674	Split
Family/Basic Needs			
5	0.034**	0.034**	Disagree
7	0.334	0.334	Disagree
17	0.532	0.532	Disagree
32	0.624	0.624	Disagree
35	0.103	0.103	Split
Economic			
3	0.132	0.132	Split
4	0.021**	0.021**	Disagree
8	0.014**	0.014**	Disagree
14	0.142	0.142	Agree/No Op.
16	0.344	0.344	Split
19	0.580	0.580	Disagree
22	0.324	0.324	Disagree
26	0.004*	0.004*	N/A
27	0.173	0.173	Disagree
34	0.685	0.685	Agree

* *Sign. at the 0.01 level, ** sign. at the 0.05 level, *** sign. at the 0.10 level*

There was a difference between the two cluster's responses to value statements 4, 5, 8 and 28 at the 0.05 level of significance and with the Economic oriented value statement 26 at the 0.01 level. Value statement 26 asked 'I would rather see Alberta's

economy grow through more irrigated agriculture as opposed to having more water in the rivers.’ The two groups differed in their disagreement for the statement with 69.9% of the rural respondents disagreeing with the statement, while 76.7% of the urban respondents disagreed. Both groups had a similarly small proportion of their groups agreeing with the statement, but the rural group had a higher proportion of their group holding no opinion than the urban.

The statements that yielded p-values at the 0.05 level, are briefly discussed below:

- Statement 28: ‘I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now’ ($p = 0.014$). Rural members were more likely to disagree with this statement.
- Statement 5: ‘Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of a healthy aquatic environment’ ($p = 0.034$). A higher proportion of urban members had no opinion, and a higher proportion of rural respondents disagreed.
- Statement 4: ‘I think that water is a commodity that individuals and private groups should be able to buy and sell’ ($p = 0.021$). A higher proportion of urban respondents agreed, and more rural respondents disagreed;
- Statement 8: ‘I’m more concerned about my livelihood than I am about the environment’ ($p = 0.014$). More rural respondents disagreed with the statement than the urban group; slightly more urban respondents agreed with the statement.

There were very strong statistical relationships for nine of the values statements that indicated very similar responses ($p > 0.5$). The two clusters responded similarly by agreeing to the Intrinsic / Bequest statements 1, 10 and 13. Statistically similar

proportions agreed with value statement 11 and were equally split (agreeing, disagreeing and holding no opinion proportionately) on value statement 40 which asked about the recreational use of the rivers and their surrounding areas. The two groups also disagreed equally to value statements 7, 17 and 32 of the Family / Basic Needs orientation.

Although not a significant difference, it is noticeable that the rural group disagreed to a greater extent than the urban group to these statements involving conservation or a reduction in the use of water for non-essential uses (i.e. vehicle washing and public and private landscaping).

The major findings from the comparison of the two pro-environmental clusters were that the *Urban Environmental Conservation Values Cluster* represents a much larger proportion of its sample than the *Rural Environmental Conservation Values Cluster*. In terms of the responses to the values statements, the *Rural Environmental Conservation Values Cluster* showed more opposition than the *Urban Environmental Conservation Values Cluster* to the concept that water is a commodity that private individuals and groups can buy and sell. The rural group also seems to display greater environmentally supportive behaviour. Finally, the *Rural Environmental Conservation Values Cluster* indicated to a greater extent that the environment is more important to them than their livelihood,

The *Rural Environmental Conservation Values Cluster* indicated that they are less likely to disagree with the statement that they would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers, but also more likely to agree with the statement that they want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the

ones we have now. These both indicate a more economic or utilitarian view. The fact that they are also more likely to disagree with the statement that water is a commodity can be seen in the same context. The responses by the *Rural Environmental Conservation Values Cluster* to these three particular statements may be because they see markets as a threat to irrigation and their community. So when it comes to the local industry (irrigated agriculture) and their community, they are more economically oriented than their urban counterpart. However, when it comes to the personal level they are less concerned about their own livelihood and are more willing to use less water for personal use than their urban counterparts showing a more environmental attitude. There seems to be a difference in attitudes towards water among the *Rural Environmental Conservation Values Cluster* between the community/industry level and the personal level. They are not willing to sacrifice irrigation as the foundation of their community, but they are willing to make personal sacrifice to ensure that the environment is protected and thereby also the continuity of the industry and the community.

5.4.3 Pro-Economic Values Clusters

The two clusters that have been labeled as pro-economic were the **RVC3** and **UVC2** clusters, named the *Rural Utilitarian Values Cluster* and the *Urban Utilitarian Values Cluster* respectively. These two clusters, when combined as a similarly oriented cluster pair, had the smallest membership amongst the three pairs; representing only 17.6% of the total sample. Within the rural sample, 13.3% of the respondents aligned with the pro-economic group (the smallest membership amongst all six clusters), while 21.1% of the urban sample belonged to the pro-economic cluster. The size difference

between the two pro-economic groups is statistically significant at the $p < 0.01$ level (Table 5.5).

The two pro-economic clusters responded significantly differently to a larger number of the value statements. Table 5.7 displays how each of the pro-economic responded to the values statements and which statements they responded to in a significantly different manner.

Table 5.7 Pro-Economic Cluster Direct Comparison - Value Statements

<i>Value Statement</i>	<i>Pearson's p-value</i>	<i>Cramer's V</i>	<i>Response Trend</i>
Intrinsic/Bequest			
1	0.000*	0.000*	N/A
10	0.832	0.832	Agree
13	0.509	0.509	Split
23	0.013**	0.013**	Disagree
28	0.706	0.706	Agree/ No Opinion
Conservation/Lifestyle			
11	0.118	0.118	Agree
21	0.022**	0.022**	Split
40	0.883	0.883	Split
Family/Basic Needs			
5	0.197	0.197	Split
7	0.664	0.664	Agree
17	0.006*	0.006*	N/A
32	0.030**	0.030**	Split
35	0.000*	0.000*	N/A
Economic			
3	0.010*	0.010*	N/A
4	0.893	0.893	Disagree
8	0.106***	0.106***	Split
14	0.013**	0.013**	Agree
16	0.031**	0.031**	Agree
19	0.640	0.640	Disagree
22	0.788	0.788	Agree
26	0.078***	0.078***	Agree
27	0.458	0.458	Split
34	0.069***	0.069***	Agree

Sign. at the 0.01 level, ** sign at the 0.05 level, * sign at the 0.10 level*

The following value statements were perceived significantly differently at the 0.01 level:

- Statement 1: ‘A healthy functioning aquatic environment should always take priority over human uses of water’ ($p = 0.000$). Virtually none of the rural group agreed or held no opinion. An overwhelming majority of the ***Rural Utilitarian Values Cluster*** disagreed (93.4%), a striking contrast to the 65.5% agreement from ***Urban Utilitarian Values Cluster***.
- Statement 17: ‘I use water for washing my vehicle even if doing so may harm the river where the water comes from’ ($p = 0.006$). The rural group disagreed by a proportion of 63.9% while only 42.2% of the urban group disagreed. Interestingly, 27.4% of the urban group admitted to washing their vehicles regardless of the environmental impacts, compared to only 4.9% of the ***Rural Utilitarian Values Cluster***.
- Statement 35: ‘I only use water for domestic purposes such as washing, cooking and cleaning’ ($p = 0.000$). A significantly higher proportion of the urban group disagrees with this statement. Interestingly, only 1.6% of the rural group agreed to statement 35, while a great deal of the urban people agreed (28.9%), possibly alluding to the urbanite’s lack of understanding as to the great importance of water resources outside of the home.
- Statement 3: ‘At least some of my household income depends directly on an activity that uses water from the river’ ($p = 0.01$). The rural group agreed with a proportion of 70.5% that at least part of their income was dependent upon water resources compared to only 47.7% of the urban group.

The following value statements were statistically significant at the 0.05 level:

- Statement 14: ‘Irrigated agriculture is the most economically profitable use of water in southern Alberta’ ($p = 0.013$). A significantly higher proportion of the rural respondents agree with this statement. A higher proportion of the urban group indicating that they disagree or hold no opinion.
- Statement 23: ‘The environment’s needs for water should be met before water is used for human economic purposes such as industry and agriculture’ ($p = 0.013$). A significantly higher proportion of the rural population disagrees with this statement.
- Statement 21: ‘I use water more carefully than most of my neighbors’ ($p = 0.022$). A significantly higher proportion of rural respondents disagreed while more urbanites agreed, indicating that among the pro-economic value clusters, the rural population believes that their neighbors are equally as responsible in their water use as they are. The urban respondent’s have far lower expectations of their neighbors.
- Statement 32: ‘I enjoy having a lush green lawn and/or garden even if doing so may cause environmental harm to the river where the water comes from’ ($p = 0.03$). Responding to this statement, a significantly higher proportion of the rural group disagreed, while a higher proportion of urbanites chose the ‘neither agree nor disagree option’.
- Statement 16: ‘I am entitled to as much water as any other resident of the province of Alberta’ ($p = 0.031$). A significantly higher proportion of the urban group agreed, while conversely, a higher proportion of the rural group disagreed.

The following value statements were statistically significant at the 0.10 level:

- Statement 8: ‘I’m more concerned about my livelihood than I am about the environment’ (p = 0.106). A significantly higher proportion of urbanites disagreed, while a higher proportion of rural respondents agreed with the statement;
- Statement 26: ‘. I would rather see Alberta’s economy grow through more irrigated agriculture as opposed to having more water in the rivers’ (p = 0.078). A significantly higher proportion of rural respondents disagreed and agreed while a large number of urbanites indicated ‘neither agree nor disagree’. A high proportion of both groups agreed to this statement.

The major findings to be reported from this comparison include the *Urban Utilitarian Values Cluster* representing a larger proportion of its sample than the *Rural Utilitarian Values Cluster*, more rural respondents from this value orientation indicating that their livelihoods are more important than the environment, more rural respondents indicated that their income is dependent upon a water extractive activity, and finally a general trend emerged which indicated that the *Rural Utilitarian Values Cluster’s* members feel that economic development, more specifically the growth of the irrigated agriculture sector should take priority over environmental protection, but at the same time the rural group tended to realize to a greater extent the harmful effects of household activities (landscaping, vehicle washing, etc.) on the local aquatic ecosystem than their urban counterparts indicating a greater understanding of the overall issue.

The differences between the two pro-economic value clusters are very similar to the differences observed between the pro-environment value clusters. The rural group is less likely to prioritize the environment before the use of water for economic purposes

(irrigated agriculture). However, the *Rural Utilitarian Values Cluster* seems to be more likely to take actions that reduce their personal impact, a sacrifice that the *Urban Utilitarian Values Cluster* have not indicated that they have or are willing to make.

5.4.4 Moderate Values Clusters

The final two clusters to be compared are the moderate clusters (**RVC2 and UVC3**; or the *Rural Moderate Values Cluster* and the *Urban Basic Needs Environmental Values Cluster*). These two clusters were labeled moderate because they did not align as strongly as the other four clusters with either the pro-economic or pro-environment value statements. The moderate label was also due to these two group's heavy reliance on using the 'neither agree nor disagree' option when responding to the value statements. Since the urban moderates trend more towards holding pro-environmental values, it is expected that the differences between these two groups will be great.

The moderate values pair is the second largest similarly oriented pair, making up 30.4% of the total sample. A significantly larger proportion of the rural sample was determined to represent a moderate value orientation ($p < 0.01$). Approximately two-thirds of all moderates were from the rural sample and one-third was from the urban sample (Table 5.5). The *Urban Basic Needs Environmental Values Cluster* is comprised of 101 members (16.6% of the urban dataset), making it the smallest group of the three urban values clusters. The *Rural Moderate Values Cluster* on the other hand is made up of 223 members (48.6% of the rural dataset), making it the largest cluster within the rural sample. The results of the analyses of how the members of the two moderate clusters perceived the value statements are reported in Table 5.8.

Table 5.8 Moderate Cluster Direct Comparison - Values Statements

<i>Values Statement</i>	<i>Pearson's p-value</i>	<i>Cramer's V</i>	<i>Response Trend</i>
Intrinsic/Bequest			
1	0.230	0.230	Split
10	0.273	0.273	Agree
13	0.320	0.320	Agree
23	0.154	0.154	Split
28	0.039**	0.039	Agree
Conservation/Lifestyle			
11	0.925	0.925	Agree
21	0.084***	0.084	No Op./Agree
40	0.006*	0.006	N/A
Family/Basic Needs			
5	0.904	0.904	Split
7	0.046**	0.046	Split
17	0.496	0.496	Disagree
32	0.007*	0.007	N/A
35	0.005*	0.005	N/A
Economic			
3	0.000*	0.000	N/A
4	0.000*	0.000	N/A
8	0.260	0.260	Split
14	0.003*	0.003	N/A
16	0.423	0.423	Agree
19	0.000*	0.000	N/A
22	0.001*	0.001	N/A
26	0.003*	0.003	N/A
27	0.000*	0.000	N/A
34	0.181	0.181	Agree

Sign. at the 0.01 level, ** sign at the 0.05 level, * sign at the 0.10 level*

The following value statements were statistically significant at the 0.01 level:

- Statement 3: ‘At least some of my household income depends directly on an activity that uses water from the river’ (p = 0.000). Not surprisingly 79.2% of the

- urban moderates disagreed with this statement, compared to 44.8% of the rural moderates. Following this trend, only 9.9% of the urban respondents agreed compared to 33.2% for the rural group.
- Statement 4: ‘I think that water is a commodity that individuals and private groups should be able to buy and sell’ ($p = 0.000$). While there was a high level of disagreement from both the urban and rural groups, a significantly higher proportion (92.1% total disagreement; with 57.4% strongly disagreeing) of the urban group disagreed compared to the rural group (69.1% total disagreement). This statement was intended to discover if the respondents supported the idea of the commoditization of water (water rights trading). The fact that a significantly higher proportion of urban people disagreed with this concept indicates that they are likely to be more in favor of environmental protection than the rural counterparts.
 - Statement 14: ‘Irrigated agriculture is the most economically profitable use of water in southern Alberta’ is a highly polarizing statement within all like-clusters. Within the moderate clusters a great deal of respondents from both the rural and urban clusters held no opinion towards the issue. The two groups differed significantly ($p = 0.003$) in the proportion agreeing with the statement, with 64.2% of *Rural Moderate Values Cluster* agreeing, while only 46.5% of *Urban Basic Needs Environmental Values Cluster* agreed.
 - Statement 19 ‘Buyers and sellers of water licences should be the ones who decide the price of water’ ($p = 0.000$). Both moderate groups disagreed with this statement suggesting a low level of support for the free market as a mechanism of

- reallocating water rights. However, the disagreement from the urban group (91.1%) was significantly greater than that of the rural group (72.2%). This type of response exemplifies the *Urban Basic Needs Environmental Values Cluster's* tendency to be somewhat more pro-environmental than their rural counterpart.
- Statement 22: 'People have the right to modify the natural environment to meet their economic needs'. Following the trend seen throughout the analysis of the moderate cluster's responses to the value statements, the *Urban Basic Needs Environmental Values Cluster* expressed stronger pro-environmental values than their rural counterpart; a significantly larger proportion of the urban moderates (70.3%) disagreed with the statement than did the rural moderates (43.5%) ($p = 0.001$).
 - Statement 26: 'I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers' ($p = 0.003$). The two groups differed significantly, with 22.8% of the *Urban Basic Needs Environmental Values Cluster* agreeing (36.7% disagreeing), compared to 35.8% for the *Rural Moderate Values Cluster* (23.7% disagreeing). This follows the emerging trend of the urban population holding stronger pro-environmental values.
 - Statement 27: 'Water should be made available for economic uses before the environment' ($p = 0.000$). The *Urban Basic Needs Environmental Values Cluster* continue to express significantly stronger pro-environmental values than the *Rural Moderate Values Cluster*, in this case by largely disagreeing (61.4%) with this pro-economic statement, compared to only 34.9% disagreement

expressed by the *Rural Moderate Values Cluster*. Only 5.0% of the urban group actually agreed with this statement. The *Rural Moderate Values Cluster* conformed to their label by mostly choosing ‘neither agree nor disagree’ for this statement (47.5%).

- Statement 32: ‘I enjoy having a lush green lawn and/or garden even if doing so may cause environmental harm to the river where the water comes from’ ($p = 0.007$). A significantly higher proportion of the urban group disagrees (10% more) while a higher proportion of the rural group neither agree nor disagree.
- Statement 35: ‘I only use water for domestic purposes such as washing, cooking and cleaning’ ($p = 0.005$). A significantly higher proportion of the rural group disagreed with this statement (39% v. 27.8%) while a larger proportion of the urban group agreed (54.4% v. 46.6%).
- Statement 40: ‘I use rivers and their surrounding areas on a regular basis for recreation’. The two groups differed significantly in their response ($p = 0.006$); almost double the proportion of rural moderates agreed with this statement, but both were relatively low proportions.

The following value statements were statistically significant at least at the 0.05 level:

- Statement 28: ‘I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now’ ($p = 0.039$). In this case, the rural group had a significantly higher proportion of respondents indicating no opinion, while the urban population had a higher proportion agreeing with the statement.

- Statement 7: ‘Using water to create green and lush public spaces adds more to my quality of life than leaving water in the river’ (p = 0.046). A significantly higher proportion of the urban moderates disagreed with this statement, while a slightly higher proportion of the rural group agreed.

The following value statement was statistically significant at least at the 0.10 level:

- Statement 21: ‘I use water more carefully than most of my neighbors’ (p = 0.084).

The responses of the two groups were very similar, however the rural respondents agreed to a greater extent that they used water more carefully than their neighbors.

A major finding from the analysis of this similarly aligned pair was the size difference within each of their respective samples, with the *Rural Moderate Values Cluster* representing the most predominant value orientation amongst the rural sample and the *Urban Basic Needs Environmental Values Cluster* representing the smallest cluster in terms of membership amongst the urban sample. A general trend that is present throughout the comparison of these two values groups is that when the protection and/or conservation of water resources is pitted against using water for economic expansion or continuing current water intensive practices, the *Urban Basic Needs Environmental Values Cluster* is more concerned with the environment, while the *Rural Moderate Values Cluster* stays mainly neutral, but are also significantly more likely to express values which relate to the utilization of water for economic purposes, more specifically irrigated agriculture. The rural group also indicated that their income is much more dependent upon water extractive practices than the urban group and this is reflected in their positive responses to statements referring to the importance of the irrigated agriculture sector within the region. It must also be noted that although the rural group

trended towards a utilitarian value orientation, in most cases they held no opinion towards the value statements. This indicates a balanced or undecided opinion through abstaining from choosing one side over the other (pro-environment or pro-economic).

Finally it is worth noting that the pattern observed through the analysis of the two 'extreme' groups, that the rural respondents exhibit less environmental support when threats to the local economy/community are in focus while also indicating that they are more environmental at the personal level, was not detected when analyzing the two moderate clusters.

5.4.5 Concluding Remarks - Hypothesis 2 Partially Confirmed

Hypothesis 2a. *There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters within the rural and urban populations.*

Hypothesis 2b. *There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters when comparing the rural and urban clusters with the same value orientation.*

Following the comparison of the similarly oriented clusters, both Hypothesis 2a and 2b can be partially confirmed. It was found that cluster sizes, both within the rural and urban datasets and between the similarly oriented clusters, were significantly different. It was determined that pro-environmental values are most prominent amongst the urban respondents, while those representing a moderate value orientation are the largest group amongst the rural respondents. It is still unknown whether each of the clusters will differ significantly in terms of demographic differences. This characteristic will be tested in section 5.5.

5.5 Demographic Analysis

5.5.1 Gender Characteristics

The proportion of males and females who responded to the survey is of interest because it gives an idea as to which gender feels that the issue is important enough to take the time to respond to a mail-out survey. In this case, a higher proportion of males responded, but this may be related to the ‘head of household’ parameter, which has been mentioned in section 4.12. Of the 1043 respondents that indicated their gender, 69.7% (727) were males and 30.3% (316) were females. In terms of rural versus urban, the distribution of male and females was almost equal. Within the urban sample, 68.13% (404) of the respondents were male and 31.87% (189) were female, while in the rural sample the gender breakdown was 71.7% (323) male and 28.2% (127) female (Table 5.9).

Table 5.9 Within Sample (Rural-Urban) Gender Characteristics

<i>Cluster</i>	<i>Male</i>	<i>Female</i>
RVC1	65.5%	34.5%
RVC2	72.6%	27.4%
RVC3	86.7%	13.3%
Total n=450, p<0.01	71.7%	28.2%
UVC1	65.1%	34.9%
UVC2	77.2%	22.8%
UVC3	67.7%	32.3%
Total n=593, p<0.05	68.1%	31.9%

When comparing the gender breakdown of the sample to the actual gender distributions of Lethbridge and the surrounding rural communities, we found that our sample was not representative of the actual populations. The male/female gender

distributions of the sampled populations are almost equal (50-50). Our sample was made up of 20% more males than the actual population.

When examining the gender statistics of each of the six values clusters (Table 5.9) it is evident that the gender distribution within both the urban and rural clusters are significantly different (at the 0.05 level for urban and 0.01 level for rural). The three value clusters that have a tendency to hold pro-environmental values (*Urban Environmental Conservation Values Cluster, Urban Basic Needs Environmental Values Cluster* and the *Rural Environmental Conservation Values Cluster*) represent a similar gender proportion of males and females to the overall male/female tally. When looking at the gender breakdown within the three pro-economic values clusters, the *Urban Utilitarian Values Cluster, Rural Utilitarian Values Cluster* and the *Rural Moderate Values Cluster*, men were significantly more likely to belong to these clusters. This may indicate that gender plays a factor in the types of values held by individuals. These observations indicate that males are more inclined to hold pro-economic values. This finding is especially evident within the *Rural Utilitarian Values Cluster*, which contains 86.7% males.

Each like-cluster was also compared directly to determine if they are statistically different from one another in order to control for gender differences. According to Table 5.10, none of the like-cluster's gender proportions differ significantly. All of the chi-square tests yielded p-values greater than 0.1. The pro-economic groups are statistically significant at the 0.128 level, due to a higher proportion of males making up the rural pro-economic cluster when compared to the urban pro-economic cluster.

Table 5.10 Comparing Similarly Oriented Clusters - Gender

<i>Cluster</i>	<i>Male</i>	<i>Female</i>
Utilitarian		
UVC2	77.2%	22.8%
RVC3	86.7%	13.3%
n=187, p=0.128		
Environmental		
UVC1	65.1%	34.9%
RVC1	65.5%	34.5%
n=538, p=0.932		
Moderate		
UVC3	67.7%	32.3%
RVC2	72.6%	27.4%
n=318, p=0.370		

5.5.2 Age Statistics

The next factor that needs to be considered is the age of the respondents and to discover if this is a determining factor of value orientation. There is no significant difference in the age distribution between the urban and rural respondents. It is evident that the urban sample is slightly younger with higher proportions of respondents in the 18-29, 30-39 and 40-49 age categories (Table 5.11).

Table 5.11 Age Distributions for Rural and Urban Samples

Age Distribution (% of Total)	Sample Rural	Sample Urban
18-29	2.87	3.87
30-39	5.74	9.60
40-49	13.69	14.31
50-59	32.23	27.78
60-69	25.39	25.76
70-79	15.23	12.63
80-90+	4.86	6.06
Total	100.00	100.00

When comparing the age distribution of the rural clusters and urban clusters separately (Table 5.12) only the rural clusters were significantly different in their age distribution at the $p < 0.05$ level ($p=0.035$). Although the urban age statistics did not prove to be statistically significant, the two pro-environmental value clusters (**UVC1** and **UVC3**) had the highest proportion of respondents in the 18-29 and 30-39 age brackets. The age distributions of **RVC3** and **RVC2** were very similar, while **RVC1** had a significantly higher proportion of members within the 50-59 and 60-69 age brackets and the lowest proportions of members within the 40-49 and 70-90+ age brackets.

Table 5.12 Rural and Urban Age – Distribution by Cluster Group

<i>Cluster</i>	<i>18-29</i>	<i>30-39</i>	<i>40-49</i>	<i>50-59</i>	<i>60-69</i>	<i>70-90+</i>
RVC1	2.9%	5.7%	10.3%	36.2%	32.2%	12.6%
RVC2	3.2%	5.0%	15.5%	28.8%	22.8%	24.7%
RVC3	1.7%	8.3%	16.7%	33.3%	15.0%	25.0%
Total n=453, p=.035	2.9%	5.7%	13.7%	32.2%	25.4%	20.1%
UVC1	4.6%	10.8%	14.6%	29.8%	23.8%	16.3%
UVC2	2.3%	7.0%	10.9%	27.3%	31.3%	21.1%
UVC3	6.0%	8.0%	17.0%	20.0%	25.0%	24.0%
Total n=597, p=.221	4.4%	9.5%	14.2%	27.6%	25.6%	18.6%

To further probe this demographic characteristic, like clusters were tested against each other to determine if each pair has significantly different age distributions. When comparing each of the like-clusters, it was found that only the pro-environment clusters are statistically significant at the 0.05 level ($p=0.049$) (Table 5.13). The urban cluster (**UVC1**) contains a significantly higher proportion of younger people than its rural counterpart (**RVC1**).

Table 5.13 Similarly Oriented Values Clusters - Age

<i>Cluster</i>	<i>18-29</i>	<i>30-39</i>	<i>40-49</i>	<i>50-59</i>	<i>60-69</i>	<i>70-90+</i>
Utilitarian						
UVC2	2.3%	7.0%	10.9%	27.3%	31.3%	21.1%
RVC3	1.7%	8.3%	16.7%	33.3%	15.0%	25.0%
Total	2.1%	7.4%	12.8%	29.3%	26.1%	22.3%
n=188, p=.292						
Environmental						
UVC1	4.6%	10.8%	14.6%	29.8%	23.8%	16.3%
RVC1	2.9%	5.8%	10.4%	36.4%	31.8%	12.7%
Total	4.1%	9.2%	13.3%	31.9%	26.4%	15.1%
n=542, p=.049						
Moderate						
UVC3	6.0%	8.0%	17.0%	20.0%	25.0%	24.0%
RVC2	3.2%	5.0%	15.5%	28.8%	22.8%	24.7%
Total	4.1%	6.0%	16.0%	26.0%	23.5%	24.5%
n=319, p=.464						

The major findings yielded from testing the influence of age on value orientation was that those expressing pro-environmental values in the rural dataset are mainly in the age range of 50-69 (significantly more respondents in this age range than any other rural cluster) and that the rural pro-environment cluster is comprised of significantly older respondents than those expressing pro-environment values from the urban dataset.

5.5.3 Education Statistics

Another set of demographic statistics that may play a factor in shaping held values is level of education attained. The analyses show that there is little significant difference in the educational distribution between the urban and rural clusters; only among the rural clusters is there a significant difference at the 0.1 level (Table 5.14) with the *Rural Utilitarian Values Cluster* having a larger proportion with Bachelor degrees.

Table 5.14 Within Sample (Rural-Urban) Education Characteristics

<i>Cluster</i>	<i>No certificate, diploma or degree/ Secondary diploma or equivalency certificate/ Registered apprenticeship or trades certificate</i>	<i>College, CEGEP, or other non-university certificate or diploma</i>	<i>University - Bachelor's Degree</i>	<i>University - Certificate or diploma above Bachelor level/ Master's degree</i>	<i>University - Degree in medicine, dentistry, veterinary medicine or optometry/ Doctorate</i>
RVC1	49.7%	21.4%	14.5%	11.6%	2.9%
RVC2	51.1%	23.3%	11.0%	13.2%	1.4%
RVC3	31.1%	26.2%	26.2%	13.1%	3.3%
Total n=453, p=.081	47.9%	23.0%	14.3%	12.6%	2.2%
UVC1	39.3%	26.0%	19.5%	10.6%	4.6%
UVC2	37.3%	31.7%	17.5%	11.1%	2.4%
UVC3	41.0%	29.0%	16.0%	12.0%	2.0%
Total n=595, p=.825	39.2%	27.7%	18.5%	10.9%	3.7%

RVC2 seems to have the lowest level of education, but interestingly **RVC1** held the second lowest education level and not the highest. This is contrary to the literature, which suggests that those holding environmental values have obtained high levels of education (Van Liere and Dunlap, 1980; McMillan *et al.*, 1997; Morrissey and Manning, 2001; Huddart-Kennedy *et al.*, 2009b). The urban respondents, as a whole, have education levels that are higher than the rural respondents with the *Urban Environmental Conservation Values Cluster* rating the highest among urban values clusters. The finding that urban respondents have higher education levels than rural respondents is consistent with the literature as reported in Chapter 3. The most surprising statistic was that the *Rural Economic Values Cluster (RVC3)* had the highest education levels of all six clusters. It was expected that the pro-environment value clusters would have higher overall education levels with the urban pro-environment value clusters rating the highest.

The findings indicated the exact opposite, that the rural, pro-economic value cluster reported the highest levels of educational attainment.

The findings of the direct like-cluster comparisons reveal that none of the similar values groups have education levels that are significantly different from each other (Table 5.15). The difference between educational attainment levels between the pairs of value clusters is extremely similar within the moderate and pro-environment clusters, but there is a noticeable difference in the education levels of the rural and urban pro-economic clusters, with the *Rural Economic Values Cluster (RVC3)* indicating higher levels of educational attainment.

Table 5.15 Similarly Oriented Clusters - Education

<i>Cluster</i>	<i>No certificate, diploma or degree/ Secondary diploma or equivalency certificate/ Registered apprenticeship or trades certificate</i>	<i>College, CEGEP, or other non-university certificate or diploma</i>	<i>University - Bachelor's Degree</i>	<i>University - Certificate or diploma above Bachelor level/ Master's degree</i>	<i>University - Degree in medicine, dentistry, veterinary medicine or optometry/ Doctorate</i>
Utilitarian					
UVC2	37.3%	31.7%	17.5%	11.1%	2.4%
RVC3	31.1%	26.2%	26.2%	13.1%	3.3%
Total n=187, p=.613	35.3%	29.9%	20.3%	11.8%	2.7%
Environmental					
UVC1	39.3%	26.0%	19.5%	10.6%	4.6%
RVC1	50.0%	21.5%	14.0%	11.6%	2.9%
Total n=541, p=.130	42.7%	24.6%	17.7%	10.9%	4.1%
Moderate					
UVC3	41.0%	29.0%	16.0%	12.0%	2.0%
RVC2	51.5%	23.3%	11.0%	13.2%	1.4%
Total n=319, p=.404	48.0%	25.1%	12.5%	12.9%	1.6%

5.5.4 Income Statistics

There are no statistically significant differences in the income distribution between the urban and rural cluster groups (Table 5.16).

Table 5.16 Within Sample (Rural-Urban) Income Characteristics

<i>Cluster</i>	<i>Under \$10,000- \$29,000</i>	<i>\$30,000- \$39,000</i>	<i>\$40,000- \$49,000</i>	<i>\$50,000- \$59,000</i>	<i>\$60,000- \$69,000</i>	<i>\$70,000- \$79,000</i>	<i>\$80,000 and above</i>
RVC1	16.1%	10.1%	11.9%	15.5%	11.3%	7.7%	27.4%
RVC2	16.3%	12.0%	12.5%	9.6%	10.6%	9.6%	29.3%
RVC3	6.9%	13.8%	13.8%	5.2%	15.5%	5.2%	39.7%
Total n=434, p=.365	15.0%	11.5%	11.5%	11.3%	11.5%	8.3%	30.0%
UVC1	10.2%	11.0%	7.9%	12.7%	9.3%	9.6%	39.1%
UVC2	12.7%	8.5%	7.6%	11.9%	11.9%	9.3%	38.1%
UVC3	11.3%	10.3%	17.5%	14.4%	8.2%	7.2%	30.9%
Total n=568, p=.447	10.9%	10.4%	9.5%	12.9%	9.7%	9.2%	37.5%

Table 5.17 Similarly Oriented Clusters - Income Characteristics

<i>Cluster</i>	<i>Under \$10,000- \$29,000</i>	<i>\$30,000- \$39,000</i>	<i>\$40,000- \$49,000</i>	<i>\$50,000- \$59,000</i>	<i>\$60,000- \$69,000</i>	<i>\$70,000- \$79,000</i>	<i>\$80,000 and above</i>
Utilitarian							
UVC2	12.7%	8.5%	7.6%	11.9%	11.9%	9.3%	38.1%
RVC3	6.9%	13.8%	13.8%	5.2%	15.5%	5.2%	39.7%
Total n=176, p=.331	10.8%	10.2%	9.7%	9.7%	13.1%	8.0%	38.6%
Environmental							
UVC1	10.2%	11.0%	7.9%	12.7%	9.3%	9.6%	39.1%
RVC1	16.2%	10.2%	12.0%	15.6%	10.8%	7.8%	27.5%
Total n=520, p=.088	12.1%	10.8%	9.2%	13.7%	9.8%	9.0%	35.4%
Moderate							
UVC3	11.3%	10.3%	17.5%	14.4%	8.2%	7.2%	30.9%
RVC2	16.3%	12.0%	12.5%	9.6%	10.6%	9.6%	29.3%
Total n=305, p=.582	14.8%	11.5%	14.1%	11.1%	9.8%	8.9%	29.8%

The only significant difference between the like cluster groups ($p=0.088$) was found between the two pro-environment value clusters (Table 5.17). The *Urban Environmental Conservation Values Cluster* has significantly higher income levels.

5.5.5 Provenance and Setting Where Respondents Have Mainly Lived

Two dimensions about the samples that may be determinants of held values are where an individual was born and where an individual has spent the majority of their lifetime, as opposed to simply where an individual currently resides. As discussed in Chapter 3, more and more people are migrating fluidly between rural and urban communities bringing their values with them and potentially blurring the traditional rural/urban divide. Table 5.18 explores the link between the six value groups and the provenance of the respondents.

Table 5.18 - Provenance and Setting Where Respondents Have Mainly Lived Data

<i>Current Residence</i>	<i>Raised in Rural Setting</i>	<i>Raised in Urban Setting</i>	<i>Mainly Lived in Rural Setting</i>	<i>Mainly Lived in Urban Setting</i>
Rural	61.5%	38.5%	53.3%	46.7%
Urban	43.8%	56.2%	14.0%	86.0%

Approximately 60% of the rural respondents were raised in a rural setting (Table 5.18). The ‘mainly lived’ characteristic revealed that the rural sample is split between spending most of their lives in a rural or urban setting, indicating a high level of urban experience in the rural population. When examining the urban sample, an overwhelming proportion of urban respondents have mainly lived in urban settings (86.0%), but as many as 44% of the urban sample were actually raised in a rural setting, indicating strong rural links among the urban dwellers. These results are not predictors of held values, but are

simply reference points to compare when considering ‘provenance’ and ‘mainly raised in’ statistics for each of the values clusters.

There are statistically significant differences among rural clusters based on where the respondents have mainly lived and based on where the respondents were born among the urban clusters at the 0.05 level of significance (Table 5.19). The findings from the analysis of the urban respondents reveal that people expressing pro-economic values were significantly more likely to have been raised in a rural setting. Similarly, rural respondents who had expressed pro-economic values were significantly more likely to have lived most of their lives in rural settings. It is also evident that rural respondents representing pro-economic values are more likely to have been raised in rural settings when compare to the other rural clusters ($p=0.156$).

Table 5.19 - Rural and Urban ‘Mainly Lived In’ and ‘Raised In’

<i>Cluster</i>	<i>Mainly Lived in an Urban Area</i>	<i>Mainly Lived in an Rural Area</i>	<i>Raised in an Urban Area</i>	<i>Raised in an Rural Area</i>
RVC1	48.9%	51.1%	40.2%	59.8%
RVC2	49.3%	50.7%	40.2%	59.8%
RVC3	31.1%	68.9%	27.1%	72.9%
Total	46.7%	53.3%	38.5%	61.5%
	n=454, p=.033		n=452, p=.156	
UVC1	86.3%	13.7%	57.5%	42.5%
UVC2	84.0%	16.0%	46.8%	53.2%
UVC3	87.0%	13.0%	63.5%	36.5%
Total	86.0%	14.0%	56.3%	43.8%
	n=598, p=.768		n=592, p=.033	

Table 5.20 displays whether each of the cluster pairs is statistically different with respect to the proportion raised in an urban or rural setting and secondly the proportion that have mainly lived within an urban or rural setting. As would be expected, all three pairs are statistically different from each other.

**Table 5.20 Like-Clusters - Provenance and ‘mainly lived in’ - Statistical Significance
(Pearson Chi-Square Test)**

<i>Parameter</i>	<i>Pro-Economic</i>	<i>Pro-Environment</i>	<i>Moderate</i>
‘Mainly Lived In’	0.000	0.000	0.000
Provenance	0.011	0.000	0.000

5.5.6 Demographic Analysis - Major Conclusions

The major findings yielded from the analysis of the gender, age, education, income and provenance characteristics of the six clusters are the following:

- Men are significantly more likely to belong to the three more pro-economic value clusters (*Urban Economic Values Cluster*, *Rural Economic Values Cluster*, and *Rural Moderate Values Cluster*)
- Amongst the rural respondents, those expressing pro-environmental values are significantly older when compared to the rest of the rural respondents. The *Rural Environmental Conservation Values Cluster* is also significantly older than the *Urban Environmental Conservation Values Cluster*.
- The *Rural Economic Values Cluster* holds significantly higher education levels than the other rural clusters as well as being the most educated cluster of all six value clusters.
- The *Rural Environmental Conservation Values Cluster* have significantly higher income levels than the *Urban Environmental Conservation Values Cluster*
- Members of the *Urban Economic Values Cluster* were significantly more likely to have been raised in a rural setting. Similarly, members of the *Rural Economic*

Values Cluster were significantly more likely to have lived most of their lives in rural settings and more likely to have been raised in a rural setting when compared to those aligning with other value orientations.

In sum, people aligning with the more pro-economic value orientation are mainly males with higher than average education levels (especially amongst the *Rural Economic Values Cluster*) and are most likely to have been raised and spent most of their lives in rural settings.

5.5.7 Hypotheses 2a and 2b Confirmed

Hypothesis 2a. There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters within the rural and urban populations.

Hypothesis 2b. There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters when comparing the rural and urban clusters with the same value orientation.

Based on the major findings indicated in section 5.4 (significant differences in cluster sizes both within the rural and urban samples and between similarly oriented cluster pairs) and section 5.5. (significant differences between the demographic characteristics of each of the value clusters both within the rural and urban datasets and between similarly oriented cluster pairs) Hypotheses 2a and 2b can be wholly confirmed.

The finding that the pro-environment value orientation makes up the majority of the urban sample was expected, but it was not expected that the urban sample would also contain such a large pro-economic value cluster. Conversely, it was expected that the rural sample would be largely oriented towards the pro-economic value orientation, but in fact the pro-economic cluster had the smallest membership amongst the rural clusters.

5.6 Responses to the Policy Statements

Following the classification of the rural and urban samples into discrete clusters and the discussion of the demographic characteristics of each group, the next section will analyze how each of the values groups react to the policy statements proposed. The formation of each of the ten policy statements emerged from policy recommendations discussed in the Literature Review Chapter (sections 2.3, 2.4 and 2.5), policies being implemented in other watersheds domestically and internationally (section 2.5) and from personal interviews conducted with key informants in May of 2009 (sections 4.6 and 4.7).

As discussed in Chapter 3, held values do not always translate into similar behaviours. It has already been observed through the analysis of the responses to the value statements that even though some respondents indicate that they do value the environment and its protection, when it comes to altering their own activity (e.g., environmentally supportive behaviours such as decreasing lawn watering and vehicle washing), the expressed value orientation is not always congruent with real actions taken. The next section will aid in confirming or rejecting Hypothesis 3, which states ‘The values that people hold will greatly influence their support or opposition to various water allocation policies.’

Significance tests found that the value groups perceive all policy statements significantly different (except policy statement 5 in the urban sample) (Table 5.21).

Table 5.21 Value Clusters Cross-Tabulation with Policy Options

Policy Options	Rural			Urban		
	RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
1. The government, rather than market forces, should decide who gets to use Alberta's water. ***RURAL: N=459 *URBAN: N= 605	20.0 SA; 49.1 AG; 20.6 NO; 8.0 DA; 2.3 SD;	5.8 SA; 42.6 AG; 30.0 NO; 20.2 DA; 1.3 SD;	11.5 SA; 47.5 AG; 13.1 NO; 19.7 DA; 8.2 SD;	16.0 SA; 51.9 AG; 17.3 NO; 12.8 DA; 2.1 SD;	7.8 SA; 46.9 AG; 24.2 NO; 15.6 DA; 5.5 SD;	13.9 SA; 51.5 AG; 20.8 NO; 8.9 DA; 5.0 SD;
2. Private individuals and groups should be able to hold water licences for environmental protection. ***RURAL: N=459 **URBAN: N= 602	8.6 SA; 38.3 AG; 22.3 NO; 21.1 DA; 9.7 SD;	1.8 SA; 33.2 AG; 35.9 NO; 24.2 DA; 4.9 SD;	4.9 SA; 27.9 AG; 23.0 NO; 31.1 DA; 13.1 SD	7.0 SA; 38.8 AG; 28.1 NO; 20.9 DA; 5.3 SD;	1.6 SA; 32.8 AG; 28.1 NO; 29.7 DA; 7.8 SD;	3.0 SA; 34.0 AG; 22.0 NO; 31.0 DA; 10.0 SD;
3. All water licences, no matter when they were issued or for what purpose, must be honored. ***RURAL: N=459, ***URBAN: N= 606	5.1 SA; 18.9 AG; 21.1 NO; 46.9 DA; 8.0 SD;	3.6 SA; 36.8 AG; 27.8 NO; 29.1 DA; 2.7 SD;	8.2 SA; 34.4 AG; 23.0 NO; 32.8 DA; 1.6 SD;	1.9 SA; 16.4 AG; 20.2 NO; 50.9 DA; 10.6 SD;	9.4 SA; 32.0 AG; 31.3 NO; 25.8 DA; 1.6 SD;	3.0 SA; 18.8 AG; 22.8 NO; 43.6 DA; 11.9 SD;
4. If water is to be traded among irrigation districts and/or municipalities, the government should set the price. ***RURAL: N=459 ***URBAN: N= 606	9.1 SA; 47.4 AG; 25.7 NO; 14.9 DA; 2.9 SD;	1.8 SA; 37.7 AG; 34.1 NO; 24.2 DA; 2.2 SD;	1.6 SA; 31.1 AG; 24.6 NO; 32.8 DA; 9.8 SD;	6.6 SA; 49.9 AG; 27.6 NO; 13.8 DA; 2.1 SD;	3.9 SA; 40.6 AG; 22.7 NO; 25.0 DA; 7.8 SD;	5.9 SA; 50.5 AG; 20.8 NO; 19.8 DA; 3.0 SD;
5. Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient. **RURAL: N=457 URBAN: N= 606	6.9 SA; 40.2 AG; 6.9 NO; 33.9 DA; 12.1 SD;	5.4 SA; 40.5 AG; 17.1 NO; 31.1 DA; 5.9 SD;	6.6 SA; 44.3 AG; 8.2 NO; 36.1 DA; 4.9 SD;	5.6 SA; 41.6 AG; 14.1 NO; 30.2 DA; 8.5 SD;	7.0 SA; 43.0 AG; 19.5 NO; 22.7 DA; 7.8 SD;	4.0 SA; 40.6 AG; 12.9 NO; 33.7 DA; 8.9 SD;
6. If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation. ***RURAL: N=457 **URBAN: N= 606	12.6 SA; 43.1 AG; 14.4 NO; 23.6 DA; 6.3 SD;	2.7 SA; 38.3 AG; 18.0 NO; 34.7 DA; 6.3 SD;	8.2 SA; 37.7 AG; 6.6 NO; 32.8 DA; 14.8 SD;	11.1 SA; 44.8 AG; 19.1 NO; 22.5 DA; 2.4 SD;	3.1 SA; 46.1 AG; 19.5 NO; 23.4 DA; 7.8 SD;	7.9 SA; 41.6 AG; 16.8 NO; 27.7 DA; 5.9 SD;

(SA= 'strongly agree'; AG= 'agree'; NO= 'no opinion'; DA= 'disagree'; SD= 'strongly disagree')

* p < 0.1; ** p < 0.05; *** p < 0.01

Table 5.21 Value Clusters Cross-Tabulation with Policy Options (Cont'd)

<i>Policy Options</i>	<i>Rural</i>			<i>Urban</i>		
	RVC1	RVC2	RVC3	UVC1	UVC2	UVC3
7. Water that is saved through improved water use efficiency should be used to expand economic activity. ***RURAL: N=457 ***URBAN: N= 606	6.3 SA; 29.9 AG; 24.7 NO; 32.8 DA; 6.3 SD	2.3 SA; 50.0 AG; 35.1 NO; 11.7 DA; 0.9 SD;	16.4 SA; 57.4 AG; 19.7 NO; 6.6 DA; 0.0 SD;	2.7 SA; 29.4 AG; 28.1 NO; 35.5 DA; 4.2 SD;	10.2 SA; 49.2 AG; 32.8 NO; 7.8 DA; 0.0 SD;	2.0 SA; 38.6 AG; 35.6 NO; 20.8 DA; 3.0 SD;
8. I would only support the government spending public funds on improving irrigation systems if it meant that the saved water is left in the rivers. ***RURAL: N=457 ***URBAN: N= 606	9.2 SA; 59.8 AG; 14.4 NO; 13.8 DA; 2.9 SD;	2.7 SA; 36.5 AG; 34.7 NO; 23.4 DA; 2.7 SD;	8.2 SA; 18.0 AG; 26.2 NO; 39.3 DA; 8.2 SD;	9.3 SA; 51.5 AG; 23.3 NO; 14.9 DA; 1.1 SD;	4.7 SA; 29.7 AG; 24.2 NO; 33.6 DA; 7.8 SD;	5.0 SA; 47.5 AG; 26.7 NO; 17.8 DA; 3.0 SD;
9. The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment. ***RURAL: N=457 ***URBAN: N= 606	5.2 SA; 36.2 AG; 28.2 NO; 26.4 DA; 4.0 SD;	0.5 SA; 27.5 AG; 38.7 NO; 28.8 DA; 4.5 SD;	0.0 SA; 14.8 AG; 23.0 NO; 47.5 DA; 14.8 SD;	5.3 SA; 32.9 AG; 38.2 NO; 20.2 DA; 3.4 SD;	1.6 SA; 14.1 AG; 39.1 NO; 40.6 DA; 4.7 SD;	2.0 SA; 30.7 AG; 34.7 NO; 28.7 DA; 4.0 SD;
10. Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation. ***RURAL: N=457 ***URBAN: N= 606	22.4 SA; 56.9 AG; 13.8 NO; 6.3 DA; 0.6 SD;	7.2 SA; 48.6 AG; 29.3 NO; 14.4 DA; 0.5 SD;	6.6 SA; 47.5 AG; 16.4 NO; 23.0 DA; 6.6 SD;	26.3 SA; 55.4 AG; 13.8 NO; 4.2 DA; 0.3 SD;	6.3 SA; 58.6 AG; 16.4 NO; 14.1 DA; 4.7 SD;	18.8 SA; 54.5 AG; 18.8 NO; 5.9 DA; 2.0 SD;
Total Membership	174	222	61	378	128	101
% Of Data Set (Rural or Urban)	38.1	48.6	13.3	62.3	21.1	16.6

(SA= 'strongly agree'; AG= 'agree'; NO= 'no opinion'; DA= 'disagree'; SD= 'strongly disagree')

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Another dimension that needed to be explored was whether the clusters that had expressed similar values orientations responded to the policy statements in a statistically significant way. Table 5.22 indicates that the pro-economic and pro-environment value clusters perceive eight out of ten policy statements in a similar way while the findings for the moderate clusters agree with previous discussions that the urban and rural moderate clusters are quite different; six out of the ten policy statements are perceived significantly different by the two moderate value clusters at the 0.1 level.

Table 5.22 Similarly Oriented Values Clusters - Significance Tests

<i>Policy Option</i>	<i>Pro-Economic</i>	<i>Pro-Environment</i>	<i>Moderate</i>
1.	.410	.351	.001***
2.	.441	.255	.071*
3.	.762	.189	.000***
4.	.586	.793	.022**
5.	.157	.104*	.702
6.	.029**	.138	.226
7.	.218	.196	.098*
8.	.478	.070*	.237
9.	.043**	.196	.670
10.	.537	.715	.001***

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Policy Statement 1: *The government, rather than market forces, should decide who gets to use Alberta's water.*

This policy statement was posed to gauge whether the respondents trust market forces to decide Alberta's water future or if water allocation decisions should be largely left up to the provincial government. When looking to the statistical significance, it is apparent that the three urban cluster's responses were significantly different ($p < 0.1$), with the ***Urban Environmental Conservation Values Cluster*** exhibiting the highest

proportion agreeing and the *Urban Utilitarian Values Cluster* with the highest proportion disagreeing. The rural respondents displayed a great variance in response to this policy statement resulting in a statistical significance at the $p < 0.01$ level. The high variance in responses resulting in the low p-values was due to a high proportion (30.0%) of the *Rural Moderate Values Cluster* indicating ‘no opinion’ and 27.9% of the *Rural Utilitarian Values Cluster* disagreeing with the policy statement, the highest disagreement amongst all six clusters.

The three clusters that exhibited pro-environmental values, the *Rural Environmental Conservation Values Cluster*, the *Urban Environmental Conservation Values Cluster* and the *Urban Basic Needs Environmental Cluster*, were the groups with the highest proportion of individuals agreeing with this policy statement with moderately strong levels of agreement, ranging from 65.4% to 69.1%.

Both of the moderate groups had a large amount of individuals indicating that they neither agreed nor disagreed. Because of the fact that these people seemed to be neither ‘hard-line’ environmentalists nor have values based on the economic development of the region, this uncertainty is to be expected and will likely remain continuous throughout the ‘Policy Statements’ portion of the survey.

It is a valuable finding that the economically driven value clusters (the *Rural Utilitarian Values Cluster* and the *Urban Utilitarian Values Cluster*) agreed with this statement (59.0% and 54.7% respectively) and showed similar responses to the more environmentally oriented values clusters. It could be expected that those who hold values dominated by economic prosperity or a priority to secure a livelihood would want market forces to govern decisions regarding who buys and sells water.

When examining the statistical differences between the responses of the similarly oriented values clusters, the pro-economic and pro-environment values clusters were not found to have responded significantly different ($p > 0.1$). The moderate clusters did respond significantly different from one another ($p = 0.001$). The main difference between the two clusters was the ***Rural Moderate Values Cluster's*** lower total agreement with the statement (17.0% difference) and higher amount of respondents registering a 'no opinion' response (19.2% difference) than that of their urban counterpart, the ***Urban Basic Needs Environmental Values Cluster***. The lower level of support from the rural moderates is not surprising, as they may be afraid that a free market system will move water away from their community and local irrigators, which would be to their detriment.

Trust in the government to manage the resource properly seems to be present within all six clusters, however, as noted there are still rather large proportions of certain values cluster who believe that the decision as to who gets Alberta's water should be left up to the open market (27.9% disagreed from ***Rural Utilitarian Values Cluster*** and 21.1% disagreed from ***Urban Utilitarian Values Cluster***). These findings support the acceptance of Hypothesis 3 that value orientation influences support for or opposition to public policy regarding water reallocation.

Policy Statement 2: Private individuals and groups should be able to hold water licences for environmental protection.

This policy statement posed the idea of allowing groups or individuals to acquire water licences for non-diversionary purposes. Holding a licence for a non-diversionary purpose is currently not permitted by the *Water Act* (1999).

The three urban value clusters responses to this policy statement were significantly different at the $p < 0.05$ level, while the rural groups differed at the $p < 0.01$ level. This difference among the urban respondents was caused by the *Urban Environmental Conservation Values Cluster's* greater level of agreement with the policy than the other two clusters. The cluster that caused the statistical difference within the rural sample was the *Rural Utilitarian Values Cluster*, whose membership indicated that 44.2% disagreed, the highest disagreement towards this statement of all six clusters.

The response trend indicated a high proportion of support from all respondents for the policy statement or 'no opinion' over the disagree option, except for the *Rural Utilitarian Values Cluster*. In terms of overall agreement, the *Rural Environmental Conservation Values Cluster* and *Urban Environmental Conservation Values Cluster* had a slightly higher proportion of members agreeing with the statement (as opposed to disagreeing or holding no opinion).

When comparing the responses of the like-cluster pairs to one another, the pro-environment and pro-economic clusters were not significantly different ($p > 0.1$), but the moderate clusters did respond in a significantly different way at the $p < 0.1$ level. This difference was due to the higher proportion of urban moderates disagreeing with the policy statement than their rural counterpart, and a higher proportion of rural moderates stating 'neither agree nor disagree'. With respect to private groups and individuals being granted the legal right to hold water licences for environmental protection, the rural moderates are greater supporters. This finding is not consistent with the findings yielded from the responses to the value statements, which was that the urban moderates are more pro-environmental than the rural moderates.

The pro-environment and pro-economic value clusters behaved in a manner consistent with their expressed values (confirming Hypothesis 3). For this policy statement, the rural moderates supported this statement to a greater degree than the urban moderates, who had been found to express stronger pro-environmental values through the analysis of their responses to the value statements. This finding does not support Hypothesis 3, but may indicate that although the rural moderates are relatively more supportive of pro-agrarian policies than the urban moderates, they are not opposed to pro-environment policies that do not negatively affect the irrigation sector, such as this policy.

Policy Statement 3: All water licences, no matter when they were issued or for what purpose, must be honored.

This policy statement specifically sought information regarding whether the survey respondents believed that all existing water rights should be honored or if the government should have the right to take them away for environmental or other purposes. Whether this course of action involved compensation or not was not probed.

When comparing the statistical significance relating to the variance in responses within the rural and urban datasets it became apparent that this was a particularly polarizing policy statement with both rural and urban cluster sets exhibiting significant differences ($p < 0.01$). The proportion of individuals from each of the values clusters that gave a response of ‘neither agree nor disagree’ was consistent across all six values clusters, with responses of this kind ranging from 20.2% to 31.3% from each of the six groups. The value clusters that had been found to express pro-environment values (***Rural***

Environmental Conservation Values Cluster, *Urban Environmental Conservation Values Cluster* and *Urban Basic Needs Environmental Values Cluster*) displayed the greatest opposition to this policy statement. The more economically oriented value clusters (*Rural Utilitarian Values Cluster* and *Urban Utilitarian Values Cluster*) agreed with the statement to a greater degree than all other groups with 42.6% and 41.4% support respectively.

Applying statistical tests to the like-cluster pairs, it was found that the pro-environment and pro-economic cluster pairs did not respond in a significantly different way ($p > 0.1$). The moderate cluster pairs did respond in a significantly different way ($p < 0.01$). Approximately 40% of the *Rural Moderate Values Cluster* agreed with this statement, very similar to the proportion of the members of the *Rural Utilitarian Values Cluster* who agreed (42.6%). This response is a sharp contrast to the *Urban Basic Needs Environmental Values Cluster* whose members only supported this statement with a 21.8% proportion. This may reflect once again the rural moderates showing support for pro-agrarian policies due to a perceived threat to the major economic driver of the community, irrigated agriculture. This finding, coupled with the support exhibited by the pro-environment clusters and the opposition seen from the pro-economic clusters helps to confirm Hypothesis 3, that value orientation influences the level of support for public policy that is congruent with those expressed values.

Policy Statement 4: *If water is to be traded among irrigation districts and/or municipalities, the government should set the price.*

This question mainly seeks to uncover the opinions held by respondents regarding the option of allowing market forces to determine the price of water licences that are being traded or if the government should set the prices. Allowing the government to set the prices of water licences discourages speculating and ensures that market forces don't drive the price of water towards over inflated ranges given the basic and essential nature of the resource.

In this case, the three clusters within the rural and urban datasets responded significantly different at the 0.01 level. The clusters that exhibited pro-environmental values throughout the analysis, the ***Rural Environmental Conservation Values Cluster***, the ***Urban Environmental Conservation Values Cluster*** and the ***Urban Basic Needs Environmental Cluster***, displayed the highest degree of agreement with this policy statement. The responses are very similar across these pro-environment clusters ($p > 0.1$), including the proportion of members indicating that they have no opinion about this policy statement, and the proportion of those disagreeing with the policy statement (approximately 20% of each pro-environmental values cluster disagreed with the statement).

The rural moderates did not respond homogeneously, with 39.5% agreeing, 34.1% undecided, and 26.4% disagreeing. When compared, the two moderate clusters differed in terms of total agreement with the policy ($p < 0.05$), with 17% more urban moderates agreeing with the policy.

The clusters found to be motivated by economic-based values displayed the strongest opposition. There is a noticeable, but not significant, difference in the responses between the rural and urban pro-economic clusters. The *Rural Utilitarian Values Cluster* displayed 10% more opposition than the *Urban Utilitarian Values Cluster* towards this policy statement (42.6% v. 32.8%).

The relatively high levels of opposition exhibited by the *Rural Utilitarian Values Cluster* and the *Rural Moderate Values Cluster* (26.4% total disagreement) reinforce the theory ('Social Proximity Theory' (Sharp and Adua, 2009)) that those who have a higher possibility of regular social interaction with members of the agrarian community (i.e.: rural residents) will show greater support for their neighbor's economic well-being and their securing of a livelihood in general.

Finally, the *Rural Environmental Conservation Values Cluster* had the largest proportion (9.1%) 'strongly agreeing' with this policy statement. This indicates that this group probably is most passionate or concerned about water issues. This strong support may be fueled by a fear that non-agricultural interests will press up the price of water if free market forces are allowed to dictate the price. Hypothesis 3 is once again supported by the findings yielded through the analysis of responses to this policy statement.

Policy Statement 5: Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient.

The main polarizing issue addressed within this policy statement is whether public funds should be used to help private water users become more efficient users of this resource or if this cost should be left to the private users themselves. If less water is

drawn from the watershed's rivers and streams due to more efficient technology being utilized then the surrounding aquatic ecosystem's needs could be secured without having to acquire water licences from existing users for that purpose. This can only happen if those efficiency savings are not sold to other users or used to expand the licence holder's business. The policy statements pertaining to how water savings can be used following the installation of more efficient technology will be addressed when analyzing the responses to policy statements 7 and 8. Municipalities have been included in this policy statement because they must apply for and obtain water licences in the same manner as all other users, meaning that they are only allotted a finite amount of the resource to work with, making higher efficiency a very important issue.

This policy statement yielded a similar response trend across all clusters with responses being almost equally distributed across agree and disagree. The within sample responses from the urban sample were not statistically significant ($p > 0.1$), however, the rural sample's responses were significantly different at the $p < 0.05$ level. A significantly higher proportion of the *Rural Utilitarian Values Cluster* agreed with the statement while members of the *Rural Environmental Conservation Values Cluster* had the highest proportion of members disagreeing with that policy statement.

The pro-economic clusters have the highest proportion of agreement and lowest proportion of disagreement and it was found that the difference in the cluster pair's responses was not significant ($p > 0.1$). This indicates that they are the largest supporters of public funds being spent on these types of upgrades, which would lead to an increase in profit margins for large water users (i.e., irrigators and industry). The other two

similarly oriented pair's responses were also not significant ($p > 0.1$), indicating that the rural-urban dimension was not a factor for this policy statement.

The expected outcome of this statement was that the more pro-economic value clusters would exhibit the greatest support. Value orientation did prove to be a motivator of support for or opposition to this policy statement, essentially supporting Hypothesis 3.

Policy Statement 6: *If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation.*

This policy statement poses the idea that underutilized water licences should be identified by the government, and the portion of the licence that is not being used by the licence holder should be reallocated in order to meet the river's ecosystem needs (i.e., water conservation objective).

Responses to policy statement 6 indicated that all cluster groups are divided, with large proportions of each cluster being both for and against, while relatively few respondents have expressed no opinion. However, while all cluster groups have relatively large groups for and against, the distributions differ significantly at the 0.01 level for the rural clusters and 0.1 level for the urban clusters.

Members of the two most pro-environmental values clusters were significantly more likely to agree with this statement (approximately 56% of each pro-environmental cluster supported this policy statement) while members of the ***Rural Utilitarian Values Cluster*** were significantly more likely to disagree (47.5%). In contrast to this response, only 31.3% of the ***Urban Utilitarian Values Cluster*** disagreed with this statement. The

two pro-economic group's responses differed significantly at the 0.05 level. This possibly reflects the agricultural community's influence on rural people to support pro-agrarian policy, a social pressure that may not be felt by the urban respondents.

The ***Rural Moderate Values Cluster*** showed lower levels of support (41% agree, 18% no opinion, 41% disagree) for this policy statement than their urban counterpart, although the difference in response was not significant ($p=.226$). The ***Rural Moderate Values Cluster*** seems to be split regarding this policy statement, but as noted they are more opposed than the urban moderates and in fact responded similarly to the ***Rural Utilitarian Values Cluster***.

The influence of rural residency has emerged through this question, as it seems as though the two more pro-economic rural clusters are not in favor of having volumes of water reallocated away from the irrigated agriculture sector without compensation as this action would have a serious impact on the future growth of the local rural economy. Hypothesis 3 is once again confirmed due to the levels of support exhibited by the pro-environment clusters and opposition to the policy from the more pro-economic clusters.

Policy Statement 7: Water that is saved through improved water use efficiency should be used to expand economic activity.

This policy statement was designed to be in direct opposition to policy statement 8. This policy statement involves using saved water created through efficiency gains to expand economic activity. Policy statement 8 offered the idea that water savings should be reallocated to satisfy the environment's needs. The method of making the improvements in efficiency was not probed in this statement (i.e., using public funds to

increase efficiency or reinvesting profits into system improvements); therefore those types of inferences cannot be made.

This statement yielded divergent responses from each of the three clusters within the rural and urban datasets, with both sets of responses being statistically significant at the 0.01 level. A significantly higher proportion of the *Rural Utilitarian Values Cluster* agreed with this option (73.8% agreeing, 19.7% held no opinion, and 6.5% disagreeing) compared to the other rural clusters. However, the rural moderate's responses were similar to the rural economic cluster with the majority of the group agreeing. The rural pro-environment cluster was largely split with a slightly higher proportion of the group disagreeing as would be expected.

The rural sample expressed a strikingly similar response to the rural sample. The majority of the pro-economic cluster agreed. The pro-environment cluster was split in their responses but more of the group members disagreed. This response was expected, but with much greater opposition. Although the urban moderate cluster has displayed more pro-environmental values throughout the analysis, more cluster members agreed with this pro-economic policy statement than any other option.

Further supporting the trend observed throughout the analysis of the responses to the value statements that rural residents would be more supportive of water licences remaining within the irrigation industry, the *Urban Utilitarian Values Cluster* exhibited significantly less support for this statement than their rural counterpart (59.4% agree, 32.8% no opinion, and 7.8% disagreeing) and had significantly more members holding no opinion. Although the support for this policy statement varied among the pro-economic clusters, the two groups did not respond significantly from one another ($p >$

0.1). The high proportion of the *Urban Utilitarian Values Cluster* holding no opinion towards this policy statement could be an indication that this group did not understand the policy statement. This is possibly due to their urban residency, which would result in looser social ties and/or lack of regular interactions with those involved in the irrigation industry.

The pro-environmental value clusters responded with a higher proportion of members disapproving of the statement than approving or holding no opinion, with 39.1% of the *Rural Environmental Conservation Values Cluster* disagreeing with the policy option and 39.8% of the *Urban Environmental Conservation Values Cluster* also disagreeing. The two group's responses were not statistically significant from one another ($p > 0.1$), indicating that the rural-urban dimension was not a factor. The most surprising piece of information to emerge regarding these two groups was their low level of disagreement and relatively high level of support. It was expected that a very high proportion of the pro-environment clusters would strongly oppose this kind of policy suggestion, but this was not seen. This may indicate a realization that although environmental protection is important, inputs of natural resources are still necessary to support a growing economy and if saved water is not used to expand economic activity, many people will be affected (i.e., trickle-down industries located in both rural and urban locales) not just those involved directly in the agricultural sector.

The difference in the moderate cluster's responses were significant ($p < 0.1$), and have followed the trend seen throughout the survey results of the rural moderates agreeing with the pro-economic policies. However, the trend of the urban moderates being more pro-environment was not observed when examining the responses to this

statement. A higher proportion of urban moderates agreed with this statement than any other option.

Regardless of the urban moderate cluster's tendency to agree with this statement, approximately 12% more of the rural moderate cluster agreed with using water savings for economic expansion than their urban counterparts. This difference in response reflects the influence of residence (rural or urban) on held values, and subsequent perceptions (in the form of support for certain policies). In this case, the rural moderates seem to be exhibiting greater support for this pro-economic or pro-agrarian policy.

This statement supports the economic development of the region through the use of water for economic expansion. The value clusters responded in a manner consistent with their expressed value orientation, effectively confirming Hypothesis 3.

Policy Statement 8: I would only support the government spending public funds on improving irrigation systems if it meant that the saved water is left in the rivers.

This policy statement ties in elements addressed in both policy statements 5 and 7. The idea of public funds being used to help farmers/irrigation districts become more efficient is once again mentioned but the catch is that all of the saved water would now be kept in the rivers and streams for environmental purposes, possibly to meet the water conservation objectives for the watershed. This policy statement is framed in opposition to the previous policy statement (policy statement 7), which posed the idea that efficiency gains should be used to expand economic activity beyond current levels, as water availability is an important factor in determining how large the southern Alberta economy can grow

The clusters within the rural and urban samples responded significantly different at the 0.01 level, indicating that each of the various value clusters perceives this policy option differently. Both of the pro-environment clusters agreed with over 60% support, while both of the pro-economic clusters opposed the policy by greater than 40% of each cluster disagreeing with the policy statement. Within the rural sample, the moderate cluster members were split in their opinion, with almost equal numbers agreeing, disagreeing and holding no opinion, although more rural moderates agreed than choosing any of the other responses. Amongst the urban sample the rural moderates agreed with this policy statement with over 50% support. The urban moderates responded very similarly to the urban pro-environment value cluster. The similarly oriented clusters will be directly compared below.

When comparing the like-clusters, the responses of the pro-economic and moderate cluster pairs were not statistically significant ($p > 0.1$), however the pro-environment cluster pair's responses were statistically significant at the $p < 0.1$ level. An almost equal proportion of the two pro-environmental values clusters 'strongly agreed' with this policy statement (*Rural Environmental Conservation Values Cluster* with 9.2% and *Urban Environmental Conservation Values Cluster* with 9.3%). However, they differed in their overall support for the policy statement. The *Rural Environmental Conservation Values Cluster* was the most supportive of this policy statement with 69% of the group agreeing, 14.4% holding no opinion, and 16.6% disagreeing. The *Urban Environmental Conservation Values Cluster* also showed very strong support for this policy statement with 60.8% agreeing, 23.3% holding no opinion, and 15.9% disagreeing.

A major difference between the two values clusters is the larger number of respondents agreeing (9% difference) from the *Rural Environmental Conservation Values Cluster*.

The moderate groups from both the rural and urban samples responded as they have for most of the other policy statements, being largely split between agreeing, holding no opinion, and disagreeing. However, both groups tended to agree with this policy over disagreeing. The *Urban Basic Needs Environmental Cluster* supported this particular policy statement to a far greater degree than their counterparts, the *Rural Moderate Values Cluster* (13.2% difference), once again a reflection of the rural moderates tendency to be supportive of the local agricultural interest and the urban moderates exhibiting stronger pro-environmental attitudes.

Finally, the responses of the pro-economic clusters were examined. Among the *Rural Utilitarian Values Cluster*, 26.2% agreed, 26.2% held no opinion and 47.6% disagreed with this policy option. The *Urban Utilitarian Values Cluster* responded with 34.3% agreed, 24.2% held no opinion, and 41.5% disagreed. Once again, the higher level of disagreement towards this type of policy from the *Rural Utilitarian Values Cluster* indicates that these individuals would favor reinvesting water savings back into the local economy as opposed to creating a healthier ecosystem. The pro-economic values clusters don't necessarily oppose environmental protection and conservation, but it seems as though they would prioritize a stronger economy over a healthier aquatic environment.

Due to the responses of each of the value clusters to this pro-environment oriented policy statement (each cluster responding according to their value orientation), Hypothesis 3 is once again confirmed.

Policy Statement 9: The government should buy water from current water licence holders, such as irrigation districts, so that more water can be left in the river for the environment.

This policy statement runs in opposition to policy statement 6 where it was suggested that the government take away portions of water licences that are not being utilized without compensation. This policy statement includes monetary compensation, which would be seemingly fair to the licence holder, but would involve spending public money on securing water for environmental purposes. This may be one of the only options to effectively secure environmental flows, as private groups and individuals are not permitted to hold water licences for environmental purposes under the provincial Water Act (1999).

The rural and urban values clusters gave responses that were significantly different ($p < 0.01$), indicating that each of the clusters within the rural and urban datasets held differing opinions regarding this issue. The two pro-environmental values clusters were the largest supporters of this policy statement, but not overwhelmingly agreeing to this strategy. The ***Rural Environmental Conservation Values Cluster*** displayed the greatest support for this policy option with 41.4% agreeing, 28.2% holding no opinion, and 30.4% disagreeing. Similar support was shown by the ***Urban Environmental Conservation Values Cluster***, except they were even more split with 38.2% agreeing, 38.2% holding no opinion, and 23.6% disagreeing. The responses of these two similarly oriented clusters were not statistically significant ($p > 0.1$), indicating that the rural-urban influence is not a factor.

The rural and urban moderate values clusters were similarly split on their support for this policy statement, and it was found that the variance in responses between two groups was not statistically significant ($p > 0.1$). The only variance to report is that 4.7% more of the *Urban Basic Needs Environmental Cluster* supported this policy statement.

Both of the economic values clusters were largely opposed to this policy statement, as it would result in the irrigation districts losing control of a resource that they have historically held in large quantities (approximately 75% of southern Albertan water licences belong to irrigation interests as noted in Chapter 2). The two pro-economic cluster's responses were significantly different at the $p < 0.05$ level. Only 14.8% of the *Rural Utilitarian Values Cluster* was in support of this policy statement and an overwhelming 62.2% of this group disagreed with the idea of the government buying water licences from the current licence holders for environmental purposes. Their urban counterpart responded in kind with only 15.7% agreeing, 39.1% holding no opinion, and 45.2% disagreeing. The main difference between these groups was the number of urban respondents who didn't seem to have an opinion regarding this policy statement. There was almost double the amount of undecided responses given from the *Urban Utilitarian Values Cluster* than that from the rural counterpart.

Once again each cluster responded to this statement in a manner consistent with their expressed value orientation, which further strengthens the support for Hypothesis 3.

Policy Statement 10: Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation.

Although there are minimum flow requirements that are outlined within the current provincial legislation, minimum in-stream flows and water conservation objectives are secured by very junior licenses, hence insecure during periods of drought. Therefore, this policy statement addresses the idea that water for the environment should not exist within the FITFIR system, and that only after environmental flows of water are identified and protected should additional water be allocated for economic and municipal uses.

The analysis showed that members of the rural and urban value clusters perceived this statement significantly different at the 0.01 level. There was support for this policy statement from all value clusters, with all six clusters indicating over 54% support.

A significantly higher proportion of the members of the pro-environmental clusters supported this policy statement with the ***Rural Environmental Conservation Values Cluster*** showing 79.3% support (13.8% holding no opinion, 6.9% disagreeing), and the ***Urban Environmental Conservation Values Cluster*** showing 81.7% support (13.8% holding no opinion, 4.5% disagreeing). The two pro-environment clusters did not perceive this policy statement significantly different ($p > 0.1$).

The pro-economic value clusters also showed great support for this policy statement with 54.1% of the ***Rural Utilitarian Values Cluster*** agreeing (16.4% holding no opinion, 29.5% disagreeing) and 64.9% of the ***Urban Utilitarian Values Cluster***

agreeing (16.4% holding no opinion, 18.7% disagreeing). The variance in responses given by the two pro-economic clusters was not statistically significant ($p > 0.1$).

The moderate clusters did give responses that were significantly different at the 0.01 level. The *Urban Basic Needs Environmental Cluster* supported this policy statement very strongly (73.3% agree), while the *Rural Moderate Values Cluster* only indicated 55.8% support. The urban moderates are clearly in favor of this pro-environment policy, while the rural moderates, although agreeing, are holding true to their label with a large proportion of their membership choosing to ‘neither agree nor disagree’, essentially remaining neutral.

Although all clusters exhibited support for this policy, the more pro-environment oriented clusters did prove to be the greatest supporters, acting consistently with their value orientation. This finding further strengthens Hypothesis 3.

One last finding that is worthy of mention was that of the 1,064 individuals that completed the policy statement section of the survey, 831 agreed or strongly agreed with this question. This translates to 78% of those people surveyed being in support of this policy statement. The support from the sample population for this policy statement is staggering and represents the most favorable policy statement from the list of ten tested. Strong support for environmental flows of water is evident, however, the opinions of those who would be affected to the greatest extent, the irrigation sector, are not accounted for by this research study.

5.6.1 Responses to the Policy Statements - Summary

Hypothesis 3. The values that people hold will greatly influence their support or opposition to various water allocation policies

Findings yielded from the analysis of the responses to the policy statements indicate that the respondents to the mail-out questionnaire acted consistently with their value orientation. Those who had been found to be aligned with the pro-economic value statements displayed the greatest support for the policy statements that involved water remaining within the irrigation sector and opposed policies that suggested water move out of the sector to secure environmental water needs. Similarly, the more pro-environmentally oriented value clusters were opposed to water being used for greater economic expansion, while also being the greatest supporters of policies involving greater environmental protection, prioritizing the environment's needs over the expansion of the economy and the reallocation of water from large licence holders to the environment.

The moderates acted consistently with the values observed through the analysis of the responses to the value statements, with the urban moderates expressing more support for pro-environment policies and the rural moderates being more supportive of policies that intend to protect the interests of the irrigation sector. The one statement which yielded findings in opposition to this trend was policy statement 3, in which the rural moderates were more supportive of the idea that private individuals and groups should be permitted to hold water licences for environmental purposes. This type of finding has actually been observed throughout the analysis of the moderate clusters, that although the moderates are supportive of the irrigation sector, they do approve of policies and action

that protect the environment through actions that do not negatively impact the irrigation sector.

CHAPTER SIX

DISCUSSION

The findings detailed in Chapter Five indicated that there are distinct differences between the rural and urban samples when it comes to value orientations. There are also noticeable differences in the perceptions of water allocation issues expressed by those aligning with the same value orientation but residing in a different setting (rural or urban). This indicates that current residence may be a factor in shaping value orientation towards water reallocation.

The following discussion evaluates the study's hypotheses and makes connections to previous academic literature (introduced in Chapter 2 and 3). This discussion also attempts to determine if the findings agree with those of earlier studies or if new information about rural-urban differences in environmental values and perceptions of environmental policy had been uncovered. Finally, policy implications are discussed based on the respondents' perceptions of the policy statements.

6.1 Shared Values of the Entire Population

Some values and opinions were commonly held by a large majority of the respondents. The general agreement with certain value and policy statements can help to explain some of the commonly held values and opinions of southern Albertans. The respondents indicated that they believe that the health of Alberta's ecosystems is important due to its natural beauty and its ability to add to the overall quality of life in the region, regardless of whether they use the resource for recreation. The sample also agreed that having a safe and reliable supply of water for their family's basic needs is important. To help meet this goal, the sample agreed that respect for the environment influences

their willingness to conserve water and that they would like public spaces planted with trees and plants that require less water.

Widespread agreement with these statements (Table 5.1) indicates that non-consumptive uses of water for aesthetics and ecosystem health are important to southern Albertans. If limitless supplies of water existed and all anthropogenic needs could be met while still ensuring that enough water was left in the rivers to meet the needs of the aquatic ecosystem then there would not be a problem, but this is not the case due to the scarce nature of the resource within this region. Hence, most of the differences in opinions and values among the survey respondents were revealed when they were asked to prioritize the uses of the region's water resources, and when they were asked whether or not they would make economic sacrifices to meet the needs of the environment.

In terms of the policy statements, all six clusters displayed support for three of the policy statements. The entire sample tended to agree with policy statement 1, which posed the idea of having the government, rather than market forces, dictate who gets to use Alberta's water; policy statement 5, which suggested that public funds should be used to help large water users in becoming more efficient users of the resource; and policy statement 10, which suggested that minimum flows of water should be set for all rivers, and that only the water above those minimum flows should be available for economic purposes such as irrigation. All six clusters agreed with levels of support of 50% or greater for these three policy statements and in the case of policy statement 10, 78% supported this concept.

Broad support for these policy ideas indicates that southern Albertans, regardless of rural or urban residence, prefer that the government make decisions about how water is

to be allocated amongst users as opposed to leaving the decision up to the water market, in which the resource could be sold to the highest bidder.

The findings also suggest that southern Albertan residents are willing to bear the financial burden of making the Alberta economy more sustainable through increasing the efficiency of the irrigation sector's infrastructure. Support for efficiency upgrades is consistent across all value orientations. However, when the question of how saved water should be used is posed the levels of agreement expressed by various value clusters differs significantly. This may indicate that the majority of the population understands that efficiency gains made by large water users can be used to create a potential benefit for many different sectors within the region. Increased efficiency may result in greater profitability for farmers, if the savings remain in the irrigation sector. On the other hand, there is also a potential benefit to other sectors in need of increased volumes of water if the savings are reallocated.

Support for increasing efficiency of water use is consistent across the board in southern Alberta, regardless of value orientation. How the savings will be used is the most contentious issue. There is no guarantee that increasing the efficiency of water use within the irrigation sector will result in more water in the rivers. In fact, it could result in less water in the river as it is up to the licence holder to determine how the saved water is used. If licence holders use the newly freed up volumes to expand the irrigated area or sell it to another irrigator then more water will be used and less returned to the river (Huffaker *et al.*, 2000). In this way, government support to increase efficiency will help increase productivity of water, one of the goals of the Water for Life Strategy, but no water will be conserved for the environment. The value clusters differed vastly in their

support for various options regarding how water savings should be used. The various perspectives will be discussed further in the section 6.3, which details the unique characteristics of each of the pro-economic, pro-environment and moderate value clusters.

The final policy statement that received high levels of support from respondents regardless of value orientation was the idea of establishing minimum flows of water that exist outside of the FITFIR system, thereby granting the environment the most senior priority. This policy option represents the most favorable policy option from the list of ten provided in the survey. Despite the suggestions by many academics (Arthington and Pusey, 2003; Brandes and Nowlan, 2008; MAG, 2009; Bjornlund, 2010; Kwasniak, 2010) to implement such a policy, this is not currently the method that water for the environment is secured. It is currently secured with a priority date of the day the water management plan is approved (see section 2.5.2.3). High levels of agreement from respondents representing divergent value orientations indicate that this is a policy amendment that the non-irrigation population would support, but not necessarily the entire population due to the fact that irrigators within the region were not polled for this research study.

6.2 Characteristics of the Value Clusters

This section outlines the structure (size and demographic characteristics) of each of the value clusters found within the rural and urban samples. Prior to discussing the rural and urban sample separately, it must be noted that Hypothesis 1 ('There will be distinct groups of people that hold similar values towards the environment and more specifically water reallocation') was confirmed (section 5.3.3). This was due to the

finding that distinct groups of individuals responding similarly to the value statements did emerge following the application of cluster analysis. As discussed in Chapter 3 (section 3.7), the three value orientations identified by past studies of environmental values (egoistic, altruistic and biospheric value orientations) were found to be present among those southern Albertans that participated in this research study. The three clusters that were identified within each sample did not align exactly as predicted. It was determined that the three clusters broadly represented pro-economic, pro-environment and moderate value orientations. The major defining characteristics of each cluster type will be detailed below.

6.2.1 The Rural Clusters

The academic literature discussed in section 3.3 contended that rural populations would display strong utilitarian values based on the ‘differential exposure’ (Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Freudenburg, 1991; Salka, 2001; Berenguer, *et al.*, 2005; Sharp and Adua, 2009), ‘extractive commodity’ (Tremblay and Dunlap, 1978; Lowe and Pinhey, 1982) and ‘social proximity’ theories (Sharp and Adua, 2009) as well as the dependant nature of rural economies on the utilization of natural resources (Morrison *et al.*, 1972; Salka, 2001). These theories proved to be partially applicable to the southern Alberta context. Almost half of the rural sample was found to represent moderate values, followed by almost 40% aligning with the pro-environment value statements and finally a very small proportion (13.3%) aligning with the pro-economic value statements. However, when examining the difference between the rural and urban moderate value clusters, pro-agrarian undertones can be detected in the rural value

cluster, placing the members of this cluster closer to reflecting utilitarian values than environmental values, while the opposite was the case for the urban moderates.

The theories behind the rural-urban differences in environmental values were substantiated when examining the urban sample. The high proportion of the urban sample aligning with the pro-environment value statements as well as great support for the policy statements involving environmental protection provide ample evidence for the support of the theories mentioned in sections 3.3 and 3.4.

When comparing the demographic characteristics of the three rural clusters it is evident that the pro-economic cluster had a significantly higher male membership than the other two rural clusters, whose gender proportions were very similar to that of the rural sample. The finding that males are more likely to represent pro-economic values toward natural resources is a finding that is partially supported by the academic literature. Past studies (Stern *et al.*, 1993; Zelezny *et al.*, 2000) had posited that women would be more likely to hold pro-environmental values, be more supportive of environmental protection and participate to a greater extent in pro-environmental behaviour/activism. This study did not find higher proportions of women belonging to the pro-environment value clusters, but it is an important and new finding that when posed with specific statements regarding the use of local resources, rural men were found to be more likely to represent pro-economic or utilitarian values.

Another significant demographic difference that was observed amongst the rural clusters was the finding that a significantly higher proportion of the pro-economic cluster members indicated that they were both raised and had spent most of their lives in rural settings. This finding supports the academic literature (Morrison *et al.*, 1972; Lowe and

Pinhey, 1982; Stern *et al.*, 1995; Salka, 2001; Berenguer, *et al.* 2005; Huddart-Kennedy *et al.*, 2009b) (section 3.3), which indicates that residence as well as place of socialization will greatly influence value orientation as well as influence an individual's perception of natural resources and their utilization. More specifically, that people who express utilitarian values toward natural resources are more likely to have been socialized and mainly lived in rural settings.

As noted, the most prominent value orientation among the rural sample was the ***Rural Moderate Values Cluster***. This value cluster was actually found to be slightly pro-economic in their value orientation and also found to be sympathetic to the irrigation sector's interests. This tendency of the rural moderates to be more pro-economic coupled with the proportion of the rural pro-economic cluster indicates that approximately 60% of the rural sample hold values that are more aligned with the pro-economic values than pro-environment. Within the rural sample there are significant findings to suggest that the majority of the population have stronger utilitarian values when it comes to the potential impact on the irrigation industry and its communities. However, as indicated throughout the Results Chapter, these clusters (especially the large ***Rural Moderate Values Cluster***) reflect stronger environmental views when it comes to the potential impact on themselves. In a sense they are saying that they are willing to make sacrifices in their own lives in order to secure water for irrigation. The industry and the community seem to be more important than their individual comfort.

6.2.2 The Urban Clusters

The majority (62.3%) of the urban sample aligned with the pro-environment value cluster. This finding is a strong indicator that pro-environmental values are much more

likely to be possessed by those residing in urban settings, which supports the theories examined in the literature review (‘differential exposure’, ‘extractive commodity’, and ‘social proximity’ theories) (Tremblay and Dunlap, 1978; Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Kennedy 1985; Freudenburg, 1991; Salka, 2001; Sharp and Adua, 2009). The remaining urban respondents aligned with either the pro-economic value cluster (21.1%) or the moderate value cluster (16.6%). It was an interesting finding that such a small proportion of the urban sample was found to possess moderate values related to water considering that this value orientation was the most predominant among the rural respondents. The finding that the urban sample was more likely to align with either the pro-environment or pro-economic value orientations reflects the reality that people residing in urban areas will not have to bear the consequences of cuts in water allocation to irrigation to nearly the same extent as do the rural respondents. Hence it is easier for them to take either the one or the other more extreme views whether it is environmental or economic.

When controlling for demographic characteristics, gender was found to be associated with the values held by the respondents. A significantly higher proportion of males were present within the *Urban Utilitarian Values Cluster*. The fact that this finding was consistent within both the urban and rural samples indicates that gender has a strong correlation to pro-economic values. Age, income, education and the setting in which the respondent had mainly lived were not found to be associated with any distinct value orientation among the urban respondents. However, place of socialization (setting in which the respondent was raised) did prove to be correlated with held values, just as was observed within the rural sample. A significantly higher proportion of those aligning

with the *Urban Utilitarian Values Cluster* indicated that they had been raised in a rural setting when compared to the other urban value clusters. In fact, the majority (53.2%) of the group had been raised in rural settings. This finding is consistent with the academic literature (Morrison *et al.*, 1972; Lowe and Pinhey, 1982; Stern *et al.*, 1995; Salka, 2001; Berenguer, *et al.* 2005; Huddart-Kennedy *et al.*, 2009b), which suggests that those raised in rural setting will tend to represent more pro-economic values. This finding also confirms the high level of migration between rural and urban areas discussed in the literature (Fortmann and Kusel, 1990; Brunson and Kennedy, 1995; Boyle and Halfacree 1998; Johnson and Beale, 1999; Jones *et al.*, 2003; Salka 2001; Brown *et al.* 2005; Huddart-Kennedy *et al.*, 2009b; Sharp and Adua, 2009) and further confirms the necessity of researchers to not only account for current residence, but also to account for place of socialization as it provides a valuable piece of information regarding the origin/creation of values related to natural resources.

6.2.3 Rural-Urban Differences Summarized

It can be concluded that those residing in urban settings have a tendency to hold pro-environmental values; however, this does not mean that those residing in rural setting will always possess utilitarian values. Within the southern Alberta context, it can be concluded that gender (males) and place of socialization (socialized in rural areas) are more closely related to utilitarian values than current place of residence. This finding partially agrees with the expected outcome of Hypothesis 2, that gender and place of residence will influence value orientation. It was not observed that income, education or age were strongly correlated with a difference in the types of values found to be represented.

The observation that the urban sample contains high proportions of respondents aligning with either the pro-environment or pro-economic value orientations leads to the conclusion that urbanites are more likely to hold strong opinions towards water, or for the most part, they have made up their minds as to where they stand on the issue. Those people in the urban dataset aligning with the utilitarian value orientation may simply have no concern for the environment due to a lack of exposure and may not fully understand the economic and political implications of taking a 'pure economic' view of the water resource. On the other hand, people living in a water dependent rural community are likely to be forced to think far more thoroughly about these issues and their implications on both the ecosystem and those members of the community who secure a livelihood from the direct utilization of the resource. This greater understanding and hence greater support for the irrigation sector is most likely due to the rural population's greater likelihood of regular social interaction with those who utilize natural resources directly ('social proximity' theory) (Sharp and Adua, 2009). This conclusion can only be speculated, as this parameter (regular social interaction with irrigators) was not tested within the survey. The testing of this parameter is strongly suggested for any further research which aims to discover the influence of residence on the values individuals may hold towards natural resources and the environment.

Hence, the rural dwellers seem to try and balance the economic and environmental values and this is reflected in the significantly larger amount of rural respondents aligning with the moderate value orientation than observed in the urban sample. Similarly, people in urban areas might hold stronger environmental values, as they do not understand the impact of these views on the livelihood of irrigators and those

dependent on them, or are of the belief that it is reasonable that environmental interests should prevail and that this is reasonable since they (irrigators) have had the opportunity to use the water for free for generations.

The finding that the rural population, in general, tries to take a balanced opinion when weighing in on the environment versus economy dispute and that the urban population in comparison tends to be more unilateral, supporting either the environment or economic growth with the minority holding a balanced or moderate opinion is a crucial finding as it is not found in any of the reviewed literature.

From a policy perspective, this finding indicates that there is a higher level of willingness to compromise within the rural community than in the urban. The values held by the urban sample tend to be more uncompromising and the sample, as a whole, is consequently far more polarized. This tendency of the urban sample to be so unilateral in their views towards water allocation could partially be a result of the fact that they do not have to pay the cost of implementing either of the polarized views. The rural sample displays a more balanced approach to water allocation in that they want to protect the interests of the irrigation sector, the main economic driver of their local community. Moreover, they have also expressed strong environmental values and a willingness to bear the costs of conservation and environmental protection at the personal level. They seem to be supporting utilitarian values when it comes to the industry/community impact but hold more environmental values when it comes to the personal level. This clearly illustrates their attempt to balance the two values.

It was expected, according to the academic literature (Morrison *et al.*, 1972; Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Freudenburg, 1991; Salka, 2001; Sharp

and Adua, 2009), that more rural individuals would hold pro-economic values because they are surrounded by agricultural landscapes and influenced by the agricultural attitudes that are diffused through the community (section 3.3). This was not the case in southern Alberta, as it was observed that the rural residents could not be easily classified as being mainly pro-economic.

As illustrated, the most prominent value orientation observed amongst the rural sample is far more complex. The major differences between the rural and urban clusters noted within this section of the discussion have led to the definitive confirmation of Hypothesis 2a ('There will be a significant difference in the composition/structure (cluster sizes and demographic characteristics) of the clusters within the rural and urban populations). The expected outcome of how the value clusters would be distributed amongst the sample (Expected Outcome H2a 'The urban sample will exhibit a higher proportion of individuals aligning with the pro-environment value statements and the rural sample will have a high proportion of individuals aligning with the economic value statements') was only partially found to be the case. The urban sample was found to be predominantly pro-environment, but as indicated, the rural sample was found to be predominantly moderate in their values held towards water and water allocation. The next section will discuss the differences between the similarly oriented value clusters and the connections to the academic literature.

6.3 Comparing the Similarly Oriented Clusters

While similar value orientations within the rural and urban samples emerged from the data analysis (pro-environment, pro-economic and moderate), there were significant differences between the similarly oriented clusters with respect to their demographic

characteristics, how they aligned with each of the value statements and how each cluster responded to the policy statements. The definitive characteristics of each of the value orientations (pro-environment, pro-economic and moderate) need to be discussed in order to determine if there are notable differences in demographics and responses to the value statements between those holding similar values within the rural and urban samples. This discussion will aim to draw connections to the past literature and identify if the findings from this study add to the body of literature.

6.3.1 Pro-Environment Value Orientation

As noted above, a much higher proportion of the urban sample belonged to the pro-environment cluster (62.3%) than from the rural (38.3%). This suggests that pro-environmental values are much more prominent within the urban population. Moreover, this finding confirms the expected outcome of Hypothesis 2a, that the pro-environment value orientation will be most prominent amongst the urban sample.

In general, the two groups were very much alike in their responses; the main differences seemed to lie in the rural group's stronger affinity for environmental protection. More rural respondents were concerned for the environment over their own livelihood, and securing environmental health before domestic uses of water than the urban respondents. This finding is consistent with the academic literature (Huddart-Kennedy, 2009b) in that it has been found that urban people sometimes have stronger expressed environmental views, but when it comes to actually taking actions to improve the environment, rural people are actually more pro-environmental. This finding is also consistent with past literature which has suggested that rural people may have a better understanding of the close relationship between ecosystem health and the utilization of

natural resources, in this case the irrigation sector (Stein, *et al.* 1999; Berenguer, *et al.*, 2005; Sharp and Adua, 2009). Finally, these findings support the Buttell and Flinn (1974) and Lowe and Pinhey (1982) studies that separated survey respondents within their rural sample into rural farm and rural non-farm residents. Both of these studies found that the rural farm residents had less concern for environmental problems than rural non-farm residents. Ultimately, they found that rural non-farm residents were as concerned about environmental problems as urbanites. In this case both rural and urban groups had a high proportion of members aligning with the pro-environment value orientation, with the rural group actually expressing stronger support for environmental protection.

Nonetheless, a significantly higher proportion of urban respondents opposed the expansion of the local irrigated agriculture sector over having more water in the rivers (Table 5.2). The urban cluster may support the idea of having more water in the rivers at the expense of the irrigated agriculture sector, but this may be only due to the reality that a much higher proportion of urban residents would not have to experience the trade-offs of this occurrence when compared to rural residents (i.e., more rural residents employed by industries related to agricultural production than urban residents). For rural populations, this trade-off of environmental protection at the expense of the irrigation sector's growth has detrimental consequences economically, both for the community and for their friends and family who may be more directly affected.

In terms of the responses to the policy statements, it was hypothesized that those individuals expressing pro-environmental values would support water allocation policies that sought to increase the health of the local aquatic ecosystems (Hypothesis 3). The pro-environment value clusters responded similarly to almost all of the proposed policy

options and as indicated in section 5.6 their values proved to influence their perception of the water allocation policy statements. Therefore Hypothesis 3 is confirmed.

The pro-environment clusters did differ significantly in their collective responses to policy statement 8 which suggested that public funds should be used to help large water users (irrigators) become more efficient and that any water saved in the process should be left in the rivers to meet the environment's needs. In this case, the rural group supported this policy to a significantly greater degree than the urban. The urban group, while largely being in support of this policy statement, still had a large number of undecided group members resulting in the significant difference. The response of the *Rural Environmental Conservation Values Cluster* agrees with the academic literature that although urban people may express stronger environmental views, rural people actually take action (Huddart-Kennedy, 2009b), in this case indicating that they support the spending of public dollars (sharing the cost of the initiative) to increase irrigation efficiency and thus increase environmental water allocation (the strategy indicated by policy statement 8). The larger proportion of undecided (indicating neither agree nor disagree) members of the urban pro-environment cluster may be an indication that they agree with this strategy for securing greater environmental flows, but are unwilling to foot the bill (higher taxes).

6.3.2 Pro-Economic Value Orientation

Interestingly, there are a significantly higher proportion of urban respondents (21.1%) aligning with the utilitarian values orientation than that of the rural sample (13.3%). This was a surprising finding, as the literature indicated that rural residents would most likely hold a utilitarian value orientation. This is not cause for the rejection of

Hypothesis 2, as the rural respondent's pro-economic values have been expressed in an unexpected way, which is discussed further in section 6.3.3 when the moderate value cluster are examined. Regardless, of this unexpected finding, the academic literature (Tremblay and Dunlap, 1978; Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Freudenburg, 1991; McMillan *et al.*, 1997; Salka, 2001; Sharp and Adua, 2009) suggested that rural respondents would be mainly pro-economic in their values towards natural resources, or at the very least the rural sample would contain a higher proportion of pro-economic value holders than the urban sample, but this was not observed of the southern Albertan respondents.

The actual number of total survey respondents (rural and urban combined) aligning with the purely economic value orientation was very small, accounting for only 17.6% of the total sample, indicating that southern Albertans as a whole may not be as economically driven as initially thought, but instead hold a more balanced set of values, as indicated by the large proportion of individuals representing moderate values.

In general, the results show that the members of the ***Rural Utilitarian Values Cluster*** exhibit stronger support for the utilitarian use of water, the importance of the irrigated agriculture sector, and display a lack of support for environmental protection superseding (having priority over) utilitarian use. This may indicate that although these rural people are not directly involved in irrigated agriculture, but they may have a greater understanding of the issue due to their social or family ties with agriculturalists. This group definitely realizes that more water for the environment involves a trade-off that would result in less water being allocated to other groups, mainly irrigated agriculture, an opportunity cost that results in less profitability within the industry. This finding supports

the academic literature (Sharp and Adua, 2009) that posits that rural people will support the utilitarian use of natural resources to a greater extent than urban people due to the diffusion of values from other rural residents that are directly employed by the natural extractive industries.

Based on the overwhelming disagreement by the rural utilitarian group to the question ‘I only use water for domestic purposes such as washing, cooking and cleaning’ (value statement 35), the members of this group are indicating that they use and value water for purposes outside of the home and this may provide some reasoning for their alignment with the pro-economic value. A significantly higher proportion of the urban group agreed with this statement indicating a vastly different perspective of the utility of water. The urban utilitarian group may only view water as a resource to be utilized in the urban context, while the rural utilitarian group may hold a perspective that is shaped by an understanding of the importance of water to all sectors.

This greater understanding of water and its utility for the local economy is most likely related to the high proportion of *Rural Utilitarian Values Cluster* members that indicated that they were raised in rural settings. It can be speculated and has been indicated in the literature (Lowe and Pinhey, 1982; Kennedy, 1985; Stern *et al.*, 1995; Salka, 2001; Huddart-Kennedy *et al.*, 2009) as well as key informants (Bullock, 2009; Palachek, 2009) that respect for natural resources (water resources in this context) due to their utility in the extractive industries, is taught at a young age, at the time of socialization when it is said that values are formed in individuals (Stern *et al.*, 1995).

This greater water awareness exhibited by the rural group may also stem from greater involvement in ‘trickle down’ economic activities from the irrigation industry to a

greater extent than the urban population. This proposition is confirmed by the finding that a significantly higher proportion of rural respondents indicated that at least some of their household income depends directly on an activity that uses water from the river (Table 5.2).

The utilitarian value clusters held similar opinions to one another for all but two of the policy statements. The groups responded as expected by largely agreeing to using water saved due to increased efficiency (as a result of government subsidies) to increase economic activity (policy statement 7), as well as disagreeing to policy statement 8, posing the idea of leaving saved water from increased efficiency gains created by government subsidies in the rivers to meet water conservation objectives. Interestingly though, the disagreement of both groups to this idea (policy statement 8) was not overwhelming, and there were high proportions of group members holding no opinion and even agreeing (Table 5.21). This is very useful information for policy makers, as it indicates that even those people who would like to use Alberta's water resources mainly for economic purposes are not entirely opposed to the idea of transferring water to the environment, as long as it doesn't hinder current levels of production, a goal that can be realized through the use of efficiency upgrades.

The two groups differed in their reaction to policy statements 6 and 9, both involving the government acquiring water licences from irrigators. Policy statement 6 suggested that if licence holders were not using part of their licence then the government could reallocate the unutilized portion to meet a water conservation objective, without compensation given to the licence holder. This is an approach that has been implemented in the Canadian provinces of Manitoba and Saskatchewan (section 4.9). Both groups

were split between agreeing and disagreeing, but the urban cluster disagreed to a lesser extent and instead had far more undecided members (Table 5.21). This was an extremely interesting finding. A relatively good understanding of Alberta's water allocation system would be necessary to answer this question. Therefore, it appears that the higher proportion of undecided urban pro-economic value holders was due to a lack of understanding of the water licensing system most likely due to a lack of social interaction with farmers.

Even more interesting was the relatively high proportion of both of the pro-economic groups agreeing with allowing the government to take away unused portions of a user's water licence (underutilized licences), despite the fact that no compensation would be offered to the licence holder. This finding may indicate that a large number of those holding economic values feel that if water is not being put to use year after year it should be redistributed to meet other uses (the environment's needs) permanently, as opposed to being held speculatively. According to the current legislation in Alberta, only licences that are not being utilized whatsoever can be considered to be held 'not in good standing' and subject to cancellation by the government without compensation (sections 2.5.2.3 and 4.9). Despite the limitations of the current legislation, the findings reported in the previous paragraph are still valuable to policy makers. They indicate that even individuals representing pro-economic values may not be opposed to streamlining the water allocation system by canceling not only full licences not being utilized, by also penalizing licence holders who are not putting their full allocation to work by taking back unused portions of licences without compensation. This could be a realistic way of

moving idle volumes of water to uses such as the environment's needs and to small southern Alberta municipalities in need of water.

Finally, the pro-economic clusters differed in response to the idea that the government should purchase water from current licence holders for environmental purposes (policy statement 9). Very few respondents from each of these groups agreed with this statement, which is peculiar considering the high levels of support for the recently discussed policy statement 6. Both groups largely disagreed, but once again the urban cluster had a high proportion of group members indicating that they 'neither agree nor disagree'. The pro-economic clusters seem to be expressing an opinion that water not being put to use should be reallocated, but water licences being fully utilized for economic purposes should remain in the hands of the current users, even when the reallocation involves adequate compensation. This disagreement may also be related to the fact that these respondents feel that public funds should not be used to purchase water licences that currently benefit the economy to be reallocated to a purpose that does not provide any direct economic benefit. Considering that these two groups have aligned strongly with the pro-economic value statements it is to be expected that they do not view water in the rivers as being as important as the profitability that is possible through the water's utilization.

Considering that the more pro-economic value clusters did respond to every policy statement in a manner consistent with their value orientation, in support of policies that favored the interests of the irrigation sector, Hypothesis 3 can be confirmed.

6.3.3 Moderate Value Orientation

The differences between the rural and urban samples are most prominent when comparing the two moderate clusters. The proportion of respondents aligning with the moderate value orientation from each of the datasets (rural and urban) was significantly different, with the majority of the rural respondents aligning with this value orientation (48.6%) and only 16.6% of the urban sample aligning with the moderate values cluster.

While moderate clusters emerged within both samples, they did not share the same perspectives concerning water allocation and as a result they were given two distinct labels. The urban moderates displayed stronger environmental values and attitudes, with higher proportions of the urban group disagreeing with ideas such as the commoditization of water (water rights trading, water trading within a free market system), that irrigated agriculture is the most economically profitable use of water, that people have the right to modify the natural environment, that green public spaces add to their quality of life and that economic uses of water should take priority over the environment's needs. These traits led to this group being labeled the ***Urban Basic Needs Environmental Values Cluster***.

The ***Rural Moderate Values Cluster's*** responses reflect a supportive or sympathetic relationship towards the irrigated agriculture sector based on a considerably lower proportion of members aligning with the pro-environment statements and higher proportions aligning with the pro-economic statements than the urban moderates. Moreover, the rural moderate value cluster was slightly more complex in how they expressed their values related to water reallocation. As noted throughout the analysis, the rural moderates tended to express their values at two different levels. At the community/irrigation sector level, the group expressed pro-economic values and was

supportive of the industry that drives their rural economy. At the individual level, the group expressed pro-environment values and a willingness to make personal sacrifices in support of the local ecosystem's health.

When crafting the hypotheses, the emergence of moderate value clusters was not anticipated. Nonetheless, it is clearly observable that the size of each of the moderate clusters is significantly different from one another in terms of the proportion of each of the samples. This confirms Hypothesis 2a. Additionally, the expected outcome noted in Table 4.2, that the urban respondents would predominantly represent pro-environmental values while the rural respondent would predominantly represent pro-economic values can be observed through the analysis of the responses of the moderate clusters to the value statements. The complexities of the *Rural Moderate Values Cluster* were not anticipated, but offer a valuable insight into how the majority of the rural respondents perceive water allocation in southern Alberta.

The majority of the rural respondents aligned with the *Rural Moderate Values Cluster*, a cluster that did prove to lean more towards pro-economic than pro-environmental values. This finding agrees with the past academic literature that suggests that rural populations would be more likely to express utilitarian values towards natural resources. Although the *Rural Utilitarian Values Cluster* was not found to be the predominant value orientation amongst the rural respondents, as suggested by the academic literature and thus hypothesized (Hypothesis 2a and Expected Outcome 2a), a more interesting finding has emerged. In a sense, the presence of this complex moderate value cluster within the rural sample suggests that Hypothesis 2a might still be correct, but expressing itself in a different way than expected. The rural respondents are mainly

pro-economic when it comes to the irrigation sector and the sustainability of the local economy, while at the same time pro-environmental at the personal level, through an expressed willingness to conserve and bear the cost of environmental protection. This finding adds to the current body of literature and suggests that the opposing values can be expressed at different levels, community and individual. This type of thinking may be only achieved through the understanding and experience of the consequences of increased resource utilization resulting in environmental degradation or conversely reduced profits and unemployment as a result of greater environmental protection.

Not only did these two groups differ greatly in their value orientation, but they also differed significantly in their responses to five of the ten policy statements. As indicated throughout the analysis, the *Rural Moderate Values Cluster* tended to support the pro-agrarian policies and to disagree with statements that involved the irrigation sector losing control of water rights. This tendency of the rural moderates to support the interests of the agricultural sector was evident in their agreement with policy statements involving the honoring of longstanding water licences and using efficiency gains to expand economic activity.

The two groups displayed similar levels of agreement to the idea that saved water through efficiency gains achieved by large users should be left in the rivers and to the idea that water for environmental purposes should maintain the most senior priority. In both cases the urban moderates, who have tended to be stronger supporters of the protection of aquatic resources, supported these policies to a greater degree, while the rural moderates had high proportions of undecided members. They both were similarly split between agreeing and disagreeing to the government using public funds to purchase

water licences to satisfy the environment's needs, but both groups were slightly more opposed than in favor of this idea.

The fact that the rural moderates exhibited divided positions (high proportions agreeing and disagreeing) as well as a high proportion of group members indicating no opinion to the three policy statements discussed above (policy statements 8, 9 and 10) may indicate that there is a divide in the community. They support the irrigators in their pursuit to become more efficient users of the resource, but there is a clear divide regarding the conditions under which water for the environment should be secured.

The impacts of implementing many of these policies, especially the policies which would see volumes of water leaving the hands of irrigators, or increasing regulations on how water is priced, will affect the rural economy and thus those people residing in rural communities. This may be a reason why the rural moderates seem so undecided on many of these policies and therefore appear to try to balance their perspective towards water issues. On the other hand the urban moderates have the luxury of supporting pro-environmental policies that will mainly provide intrinsic, aesthetic or otherwise intangible benefits. These types of benefits involve no immediate economic return and result in little or no negative consequences to be burdened on urban residents.

It is interesting to note that the urban moderates exhibited pro-environmental values and were supportive of many of the policies that would result in greater protection of aquatic ecosystems, but when the protection of aquatic ecosystems involved the public bearing the cost (policy statements 5 and 9), the urban moderates became far less supportive and ended up being equally split between agreeing and disagreeing. This is similar to the finding presented above (section 6.3.1) in which both pro-environment

clusters exhibited strong environmental values but when it came to environmentally supportive behaviour (participation in stewardship activities, conservation of resources, paying increased taxes for environmental protection), the rural group displayed far more support and are willing to bear the cost. This agrees strongly with the findings of Huddart-Kennedy (2009b) (section 3.6) that in many studies urban residents have displayed a stronger affinity for environmental protection, but when it comes to reducing their own use of resources, bearing the cost of environmental protection or becoming involved in environmentally supportive activities (taking action) urban residents tend to be less involved and less supportive.

Overall, these two groups were very different in their views of the irrigation sector. The urban moderates expressed views that supported greater amounts of water being reallocated out of the irrigation sector and into the environment but were not willing to pay the price of this. It can be speculated that the rural moderates are far more understanding of the trade-offs that are required to secure greater volumes of water for the environment and recognize that many members of the rural community will need to make sacrifices for this to occur, or that society as a whole will need to front the cost through increased taxation. The greater understanding of water allocation issues within the rural moderate cluster, and within the rural sample in general, is likely due to their close social and geographical proximity to the irrigation sector. This finding supports past findings by Tremblay and Dunlap (1978) and Sharp and Adua (2009) that suggest that beliefs, values, and norms are diffused throughout the community as a result of geographic proximity and social interaction with people involved in resource extractive industries, in this case the irrigation sector. This results in the development of a shared

rural culture. The Tremblay and Dunlap (1978) study also posited that this diffusion of values throughout the rural community is strongly related to the community's economic dependence on the irrigation sector. These shared utilitarian values are noticeable throughout the analysis of how the rural sample has aligned with the value statements and in their responses to the policy statements.

The finding that a large proportion of the rural sample demonstrated moderate values is most likely a reflection of not only an appreciation for the pristine landscapes they are surrounded by, but also of the realization that a mutually beneficial balance must be maintained between the environment and the economy. The findings suggests that that rural population tend to exhibit a more nuanced view of the water issue than did the urban population, again reflecting the fact that the outcomes of the opinions expressed will have little impact on urban peoples' lives and significant impacts on the lives of the rural population. In theory, the urban moderates are for the environment, but they are not willing to bear the costs of implementation (spending public funds to secure water for the environment).

6.4 General Comments About the Survey Respondents

Agriculture is a vital component of a functioning economy and society. However, water does need to be permanently transferred out of the irrigation sector and secured for environmental purposes (Rosegrant and Gazmuri, 1995; MAG, 2009; Bjornlund, 2010). There seems to be great support from residents from both the urban and rural settings for securing greater environmental flows, but there are still many people that do not hold an opinion or may be unwilling to support such policies that could possibly affect themselves, their family or members of their community economically. Evidence of the

influence of the close ties of rural non-irrigators to the agricultural industry is present. The rural individuals, labeled as moderate, account for the majority of the rural sample. Their allegiance to the agricultural industry is apparent, but they also may be in support of policies that involve equitable trade-offs (subsidies for efficiency gains), because this group has also expressed an awareness and respect for the region's aquatic ecosystems. There is evidence to suggest that living in a region characterized by water scarcity results in residents acquiring a greater awareness of the limits of the local resources, which is especially expressed by the rural respondents.

This awareness was also observed for the entire surveyed sample (both rural and urban) which is supported by the relatively high response rate to the mail-out questionnaire (21.04%) as well as the high levels of respondent consensus (agreement) to value statements 9, 15 and 20 ('Respect for the environment influences my willingness to conserve water', 'I would like public spaces to be planted with trees and plants that need less water', and 'I use water carefully in ways that protect the environment') which caused the statements to be omitted from the cluster analysis due to a total response of over 85% agreement. These factors, as well as comments made by the key informants (Bullock, 2009; Fitch, 2009; Palachek, 2009), indicate that this population (southern Alberta) has a greater understanding of local water issues than would a population with a greater abundance of the resource or with a more diversified economy (i.e. not as dependent on irrigated agriculture).

6.5 Discussion Chapter Summary

All three hypotheses have been confirmed through the analysis of the value clusters. There were three distinct value types represented amongst the rural and urban

respondents following the application of the cluster analysis technique. Within each of the samples (rural and urban) pro-environment, pro-economic and moderate values towards water reallocation were present.

In agreement with the past literature it was confirmed that people residing in urban locations were more likely to hold pro-environmental values than those residing in rural locations within the same region. The suggestion by the literature that rural people are more likely to hold pro-economic values towards natural resources was not as clearly observed. The proportion of rural people aligning with the pro-economic value orientation was actually smaller than those sharing similar values from the urban dataset.

Findings from this study revealed that rural southern Albertans are mainly moderate in their values held towards water reallocation. Moreover, their values and perspectives of water reallocation vary depending on whether the community (irrigation sector) will be affected or the effect will be on the individual. At the community level, the majority of the rural respondents are supportive of the irrigation sector's interests and having water remain within that sector to ensure the continued growth of the rural economy. At the personal level, the rural moderates (the majority of the rural respondents) are willing to make personal sacrifices, supportive of water conservation and support spending tax dollars to increase environmental water allocations. This willingness to bear the cost of reallocating water to the environment was also found to be supported to a greater degree by the rural respondents in general once each similarly oriented value cluster was compared.

In general, the urban respondents represented either pro-economic or pro-environment values and displayed an overall lack of balance in their perspective possibly

due to the reality that changes to water allocation legislation will have a minimal affect on them economically. The rural respondents tended to try and balance economic and environmental interests, display a greater understanding of the trade-offs involved for both to be successful and are more willing to bear the associated costs to meet these goals.

In terms of the policy options, support from all respondents was expressed for the policy statement that involved the leaving the decision of who gets to use Alberta's water up to the government as opposed to leaving the decision up to market forces, that public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient and that minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation.

CHAPTER SEVEN

CONCLUSIONS

The main objective of this thesis was to discover if there is a difference in values held toward water reallocation among southern Albertans not directly involved in operating an irrigated farm, and to determine which water reallocation policy options are accepted by those residing in rural and urban locales. In order to answer these research questions a mail-out questionnaire was designed and sent to rural and urban residents living within the Oldman River basin.

There has been a great amount of research by academic seeking to determine if there is a difference between rural and urban residents pertaining to their values related to the environment in general, participation in environmentally supportive behavior and voting on environmental issues. Much of the academic body of literature focuses on broad environmental issues and examines the issue at the national or provincial level. This research differs in that a specific, locally relevant issue is brought into focus, water reallocation, and that only those living within a single watershed were targeted.

7.1 Key Findings and Contributions

It was discovered that there are distinct groups within both the rural and urban populations and these groups represent values corresponding to prioritizing the use of water for environmental protection, economic purposes, and a balance between the two, referred to as moderate. The emergence of these subgroups within the sample led to the confirmation of the hypothesis that there will be distinct groups of people that hold similar values towards the environment and more specifically water reallocation (section 4.2) and is consistent with the findings of past studies on individual value orientations

and the noted relationship to perceptions of the environment, natural resources and environmental policy (Stern *et al.*, 1993; Stern *et al.*, 1995; Dunlap *et al.*, 2000; Schultz, 2001; Dietz *et al.*, 2002; de Groot and Steg, 2008; Soyez *et al.*, 2009) (section 3.7).

7.2 Rural-Urban Difference in Value Orientation

The proportion of individuals aligning with each of the value orientations was clearly dictated by current residence. Pro-environmental values were the most prominent value orientation amongst the urban respondents. Additionally, the urban respondents were significantly more likely to express pro-environmental values than the rural respondents. These findings are consistent with previous research (Tremblay and Dunlap, 1978; Van Liere and Dunlap, 1980; Lowe and Pinhey, 1982; Freudenburg, 1991; McMillan *et al.*, 1997; Salka, 2001; Sharp and Adua, 2009). However, the findings from this research were not consistent with the academic literature that found rural residents more likely to represent pro-economic values. Pro-economic values were actually the minority within the rural sample. Instead, the majority of the rural respondents belonged to the moderate cluster trying to balance economic and environmental needs. When the responses of those people who aligned with the rural moderate value cluster were examined closely, it was observed that this group represented both pro-economic and pro-environment values depending on the focus of the statement. Statements that would affect the community (irrigation sector) were met with pro-economic values. Their responses reflected an understanding of the importance of the rural economy. However, statements that involved making a personal sacrifice in order to protect the aquatic environment were strongly supported, in most cases stronger than the similarly oriented cluster from the urban dataset, the *Urban Basic Needs Environmental Values Cluster*.

The finding that rural people cannot simply be classified as either pro-economic or pro-environment in their values towards water reallocation is a very important finding, as this complex nature of the rural population has not been reflected in the academic body of literature.

In contrast to the finding that the majority of the rural respondents are able to express varying value orientations based on the context of the issue (community/industry versus personal/individual), the urban respondents were found to only express one value orientation or another, pro-economic or pro-environment regardless of the resulting consequences to the aquatic environment or regional economy. This commitment to one value set or the other may be a result of the reality that many of the decisions regarding how southern Alberta's water will be reallocated will not directly affect the urban population as substantially as the rural population. The rural economy is dominated by the irrigation sector, meaning that changes in irrigator's access to water will inevitably affect rural communities. The urban economy is far more diverse. Therefore the consequences of reallocating water out of the irrigation sector to meet the needs of the environment will be associated with minimal direct consequences to these people. The finding that rural respondents are more willing than urban respondents to achieve a balance between the economic use of water and sustaining the natural environment is a valuable finding that is not present in any of the academic literature.

Only a small minority of the urban sample was found to be moderate in its views. This value group was by no means as balanced as the rural moderates in their perspective of water reallocation. Instead, this group may have only appeared to be balanced or non-committal not because of an underlying aspiration to achieve conciliation but more likely

due to a lack of understanding of the issues. It is justified to make the assumption that the urban moderates lacked an understanding of water reallocation for two reasons: i) the urban moderates chose the ‘neither agree nor disagree’ option to a greater extent than the other value clusters; and ii) a general lack of exposure to water allocation policy and the agricultural sector.

Another finding from this research that supports the academic literature was the finding that rural residents are more supportive of the local irrigation sector than urban residents. The literature suggested that regular social interaction with agriculturalists would result in a diffusion of pro-agrarian values throughout the rural community (Sharp and Adua, 2009). This theory is strongly supported by the findings of the study due to the large rural moderate cluster’s tendency to be supportive of the agriculture sector. The unexpected emergence of the relatively large rural moderate cluster suggests that social ties with agriculturalists will lead to a greater understanding of the trade-offs involved with the reallocation of water rights from irrigators to the environment. This finding suggests that living in a rural setting, where interaction with farmers is more likely than in an urban setting, leads to a more reasonable and holistic perspective of the water reallocation process where compromises are more readily entertained and the necessary sacrifices involved are acknowledged.

A greater understanding of the trade-offs involved with water reallocation is necessary for all members of a population regardless of residence. It is apparent that the rural population, mainly comprised of residents representing moderate values, understands these trade-offs. They support the local industry, but also understand that in

order to ensure both economic stability and a healthy aquatic environment personal sacrifices will need to be made such as the burden of increased taxes.

The urban population's tendency to belong exclusively to one of the opposing value clusters is a reflection of a lack of balance between economic and environmental interests. This lack of a balanced approach may be due to the fact that they will not have to bear the immediate costs of the implementation of many of these policy-decisions due to the urban population's assumed disconnection from the agricultural industry, both socially and financially. Interestingly, when costs are implied (e.g. using public funds to increase water user's efficiency or to purchase water licences from existing users) the urban population's support for environmental protection tended to wane. This finding is consistent with the academic literature (Huddart-Kennedy *et al.*, 2009b;) that both urban and rural residents are theoretically in equal agreement with protecting the environment, and in many studies urban residents have displayed a stronger affinity for environmental protection, but when it comes to reducing their own use of resources, bearing the cost of environmental protection or becoming involved in environmentally supportive activities (taking action) urban residents tend to be less involved and less supportive than rural residents. This was directly observed when comparing the difference in responses between the pro-environment and moderate value clusters.

7.3 Demographic Correlations to Value Orientation

The rural-urban divide was not the only noticeable determinant of value orientation. It was determined that gender and place of socialization were also correlated with value orientation.

Those who aligned with the pro-economic value orientations had high proportions of members that had been raised in rural settings and complimenting this result it was observed that those who aligned with the pro-environment value orientation had higher proportions of members that indicated that they had been raised in an urban setting. This finding is consistent with results presented in a study by Huddart-Kennedy *et al.* (2009b) that those who were raised in urban settings will express greater pro-environmental values than people raised in rural settings.

In terms of the relationship of gender and value orientations, it was discovered that the three value clusters that aligned with the pro-environmental value statements (*Urban Environmental Conservation Value Cluster, Urban Basic Needs Environmental Values Cluster* and *Rural Environmental Conservation Value Cluster*) represent a similar gender proportion of males and females to the overall male/female tally. When investigating the gender breakdown within the *Urban Economic Values Cluster* and the *Rural Economic Values Cluster* it is evident that a much larger proportion of males make up these groups. This finding leads to the conclusion that males have a greater tendency to be in favor of the utilitarian use of water, a finding that is consistent with much of the academic literature (Stern *et al.*, 1993; Zelezny *et al.*, 2000).

Other demographic attributes such as age, education and income were not correlated with value orientation, as there were no significant differences among the clusters when testing these demographic characteristics.

7.4 Policy Implications

The ten policy statements introduced ideas surrounding whether the Alberta government should control the province's economic growth through permitting or

limiting access of certain groups to water allocations, how efficiency gains among large users should be achieved, how water savings through efficiency gains should be redistributed, where water for environmental needs should come from and how minimum flows of water for environmental purposes should be secured.

When analyzing the responses of the six clusters to the proposed policy statements, the pro-economic and pro-environment clusters responded in a manner consistent with their value orientation, a finding that agrees with the proposed hypothesis that the value orientation expressed by individuals influences their support or opposition to various water allocation policies. The respondents that expressed a pro-environment value orientation supported policies that secured the need of aquatic ecosystems and strengthened the role of the government. On the other hand, respondents that aligned with the pro-economic value orientation expressed support for keeping water within the irrigation sector and leaving water allocation to market forces.

The *Rural Utilitarian Values Cluster* held very strong opinions about economic growth in the region. The group expressed support for public funds being used to help increase water use efficiency of the irrigation sector and that the water savings through efficiency gains should be reinvested back into the irrigation sector. The *Urban Utilitarian Values Cluster*, although displaying support for the same policies that the rural group supported, did not show the same degree of support and in fact had high proportions indicating no opinion for many of the policies. The reasoning behind the lower levels of support is unknown. The need for a better understanding of why these types of differences in support are addressed in section 7.5, which discusses future research opportunities

The moderate clusters deviated greatly in their responses. The rural group displayed support for environmental protection but only if it didn't affect the irrigation sector in terms of loss of access to water. This conclusion is substantiated based on the *Rural Moderate Values Cluster's* support for the honoring all water licences regardless of the time that they were issued, regardless of the significant changes in economic and environmental conditions that have occurred since many of Alberta's water licences had been issued. This group also displayed support for using water savings through efficiency gains to expand economic activity. These observations about the rural moderates lead to the conclusion that the non-irrigators in rural settings may not hold strong environmental or economically rooted values, but when it comes to their friends and neighbors losing a part of their business, they do not seem to be in favor of such an action taking place.

Three policy statements were received favorably by all of the clusters. Degrees of support varied, but more than 50% support was observed for policy statement 1 (The government, rather than market forces, should decide who gets to use Alberta's water), policy statement 5 (Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient) and policy statement 10 (Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation).

The support expressed by members of all value orientations and from both residence type (rural and urban) for the three policy options mentioned above indicate three very valuable policy implications: 1) southern Albertan residents want the provincial government to ensure that it is not simply the highest bidder who gets to use the province's resources; 2) southern Albertans are willing to bear the cost of using

public funds to make the large water users in Alberta more efficient, which can lead to both greater economic growth but also the ability to make water available for reallocation to the environment and small municipalities in need of greater allocations water; and 3) instream flow needs and thus ecosystem health are valued by southern Albertans, so much so that they agree with the concept of environmental water allocations existing outside of the FITFIR system and essentially receiving the most senior priority.

These policy implications are all linked together and together indicate that regardless of residency or value orientation, southern Albertans would rather have the government dictate the future growth of the region. Increased water use efficiency is perceived to be important to southern Albertans, so much so that they are willing to incur the necessary costs. If public funds are to be spent on increasing the water use efficiency of the irrigation sector, then the resulting water savings should be mutually beneficial to all those contributing. Unfortunately, no consensus among the differing value orientations or residence types (rural and urban) was achieved as to how saved water due to increasing irrigation efficiency should be used.

Finally, there is a general consensus amongst this sample of southern Albertans that minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes, as opposed to the current system where the environment's water needs are secured by the most junior licences, by way of water conservation objectives. Despite the suggestions by many academics (Arthington and Pusey, 2003; Brandes and Nowlan, 2008; MAG, 2009; Bjornlund, 2010; Kwasniak, 2010) to implement such a policy, this is not currently the way environmental water is secured. The observation of support for this policy option reflects support by the

public for a shift in management. The findings suggest that the electoral cost of implementing such a policy alteration might not be as high as anticipated. However, it must be noted that individuals and groups that would be affected the most by such a policy shift, the most senior licence holders (irrigators, irrigation districts and hydropower interests), were not included in this study. It is expected that these parties would be strongly opposed to such a shift in management.

7.5 Future Research

Throughout this thesis many valuable findings have been indicated. There have also been some indications for the need for future research in the field of water reallocation and stakeholder perceptions for the issue. There have been noticeable differences in support for certain water reallocation policies between those expressing similar value orientations but residing in different settings (rural and urban). These differences need to be better understood. Demographic characteristics did not prove to be the reason for the noted differences in perception in most of the cases. Therefore, there is a need for a greater understanding of why individuals support or oppose certain policies. More robust information could be gathered through the use of open ended questions, personal interviews with respondents, asking questions that help to gauge the respondent's level of understanding of water reallocation and attempt to discover the level of social interaction respondents have with people directly involved in irrigated agriculture (farmers). Collecting this kind of additional information about the survey respondents may facilitate a greater understanding of why certain policies are supported and certain values expressed. In many cases, it may not be just a rural-urban divide (as

indicated by Sharp and Adua (2009)) but a divide in those sympathizing with the irrigation industry due to a personal connection.

There are also research opportunities to examine rural-urban differences in values towards water reallocation within different arid regions. It may be useful to compare the rural-urban differences in values and perceptions of water reallocation when a larger urban centre is the focus of study. Very different results may be yielded from studying an urban area where the economy may not be as influenced by the irrigation sector as Lethbridge is. Calgary could provide an excellent location for this type of study considering the city's diverse economy, expanding population and limited water supply.

REFERENCES

- Alberta Environment (AENV). 2002. *Water for life – Facts and information on water in Alberta, 2002*. Publication #I/930. Edmonton, Alberta: Author.
- Alberta Environment (AENV). 2003a. *South Saskatchewan River Basin Water Allocation*, Retrieved March 16, 2009 from <<http://www.assembly.ab.ca/lao/library/egovdocs/2005/alenv/161171.pdf>>.
- Alberta Environment (AENV). 2003b. *Water for Life – Alberta's Strategy for Sustainability*, Edmonton: Alberta Environment.
- Alberta Environment (AENV). 2005. *Draft Water Management Plan for the South Saskatchewan River Basin in Alberta*, Retrieved March 16, 2009 from <http://www3.gov.ab.ca/env/water/regions/ssrb/pdf/Draft_SSRB_Plan.pdf>.
- Alberta Environment (AENV). 2006. *Approved Water Management Plan for the South Saskatchewan River Basin (Alberta)*, Retrieved March 16, 2009 from <http://environment.alberta.ca/documents/SSRB_Plan_Phase2.pdf>.
- Alberta Environment (AENV). 2007. *Water Conservation Objective: Establishment of the Oldman River Sub-Basin Water Conservation Objective*. Retrieved March 16, 2009 from <http://environment.alberta.ca/documents/WCO_Oldman_River.pdf>.
- Alberta Water Research Institute (AWRI). 2009. *Towards Sustainability: Phase I: Ideas and Opportunities for Improving Water Allocation and Management in Alberta*. Retrieved February 2010 from <http://www.waterinstitute.ca/pdf/summary_report_future.pdf>.
- Arcury, T.A. and E.H. Christianson. 1993. Rural-urban differences in environmental knowledge and actions. *Journal of Environmental Education*, 25(1): 19-25.
- Arthington, A.H. and B. Pusey. 2003. Flow restoration and protection in Australian rivers. *River Research and Applications*, 19: 377-395.
- Bankes, N. and A. Kwasniak. 2005. St. Mary's Irrigation District licence amendment decision: Irrigation districts as a law unto themselves. *Journal of Environmental Law and Practice*, 16: 1-18.
- Bankes, N. 2006. The legal framework in Alberta for acquiring water entitlements from existing users. *Alberta Law Review*, 44: 323-376.
- Baron, J.S., N.L. Poff, P.L. Angermeier, C.N. Dahm, P.H. Gleick, N.G. Hairston, Jr., R.B. Jackson, C.A. Johnston, B.D. Richter and A.D. Steinman. 2002. Meeting ecological and societal needs for freshwater. *Ecological Applications*, 12(5): 1247-1260.

- Bauer, N., A. Wallner and M. Hunziker. 2009. The change of European landscapes: Human-nature relationships, public attitudes towards rewilding, and the implications for landscape management in Switzerland. *Journal of Environmental Management*, 90: 2910-2920.
- Bennett, J. 2003. Environmental values and water policy. *Australian Geographical Studies*, 41(3): 237-250.
- Bennett, K. and M.K. McBeth. 1998. Contemporary western rural USA economic composition: Potential implications for environmental policy and research. *Environmental Management*, 22(3): 371-381.
- Berenguer, J., J.A. Corraliza and R. Martin. 2005. Rural-urban differences in environmental concern, attitudes, and actions. *European Journal of Psychological Assessment*, 21(2): 128–138.
- Bjornlund, H. and J. McKay. 2000. Do water markets promote a socially equitable reallocation of water? A Case Study of Rural Water Markets in Victoria Australia. *Rivers*, 7(2): 139–152.
- Bjornlund, H., L. Nicol and K.K. Klein. 2007. Challenges in implementing economic instruments to manage irrigation water on farms in southern Alberta. *Agricultural Water Management*, 92: 131-141.
- Bjornlund, H., L. Nicol and K.K. Klein. 2008. Implementing Alberta's Water for Life Strategy: An irrigation industry perspective. *Prairie Forum*, 33(1): 167-190.
- Bjornlund, H., Nicol, L. and Klein, K. 2009. The adoption of improved irrigation technology and management practices – A study of two irrigation districts in Alberta, Canada. *Journal of Agricultural Water Management*, 96: 121-131.
- Bjornlund, H. 2010. The competition for water: Striking a balance among social, environmental and economic needs. *C.D. Howe Institute Commentary*, No. 302: 1-25.
- Boyle, P. and K. Halfacree. 1998. *Migration in to Rural Areas*. Chichester, UK: Wiley.
- Brandes, O.M., L. Nowlan and K. Paris. 2008. Going with the flow? Evolving water allocations and the potential and limits of water markets in Canada. *The Conference Board of Canada*, Report December 2008. [Online] <http://www.waterdsm.org/publication/200>.
- Brown, D.G., K.M. Johnson, T.R. Loveland and D.M. Theobald. 2005. Rural land-use trends in the conterminous United States, 1950-2000. *Ecological Applications*, 15(6): 1851-1863.

- Brunson, M.W. and J.J. Kennedy. 1995. Redefining multiple use: Agency responses to changing social values. In *A New Century for Natural Resources Management*, eds. R.L. Knight and S.F. Bates, 130-138. Washington, DC: Island Press.
- Buttel, F.H. and W.L. Flinn. 1974. The structure of support for the environmental movement, 1968-1970. *Rural Sociology*, 39: 56-69.
- Butterworth, J.E., G.J. Syme and B.E. Nancarrow. 1997. Land and water management in the Herbert River Catchment: A survey of rural and urban Residents. *CSIRO, Land and Water Consultancy Report No:97-2*.
- Byrne, J., S. Kienzle, D. Johnson, G. Duke, V. Gannon, B. Selinger and J. Thomas. 2006. Current and future water issues in the Oldman River Basin of Alberta, Canada. *Water Science & Technology*, 53(10): 327-334.
- CH2M Hill Canada Limited. 2007. *Planning and Technical Study on Water and Wastewater Servicing in the Calgary Region: Summary Report*, Revision 1. Prepared for Calgary Regional Partnership.
- Chong, H. and D. Sunding. 2006. Water markets and trading. *Annu. Rev. Environ. Resour.*, 31(11): 1-26.
- Christensen, R. and D. Droitsch. 2008. Fight to the last drop: a glimpse into Alberta's water future. *Bow River Keeper*. April 2008.
- Corral-Verdugo, V., R.B. Betchel and B. Fraijo-Sing. 2003. Environmental beliefs and water conservation: An empirical study. *Journal of Environmental Psychology*, 23: 247-257.
- Corral-Verdugo, V., G. Carrus, M. Bonnes, G. Moser and J.B.P. Sinha. 2008. Environmental beliefs and endorsement of sustainable development principles in water conservation: Toward a *New Human Interdependence Paradigm* scale. *Environment and Behaviour*, 40(5): 703-725.
- D'Aliesio, R. 2007. Tapped Out: Water Woes, Part One. *Calgary Herald*, December 1.
- De Groot, J. and Steg, L. 2008. Value orientation to explain beliefs related to environmental significant behaviour: how to measure egoistic, altruistic and biospheric value orientations. *Environment and Behaviour*, 40(3): 330-354.
- Dietz, T., P.C. Stern and G.A. Guagnano. 1998. Social structural and social psychological bases of environmental concern. *Environment and Behaviour*, 30(4): 450-471.
- Dietz, T., L. Kalof and P.C. Stern. 2002. Gender, values and environmentalism. *Social Science Quarterly*, 83(1): 353-364.

- Droitsch, D. and B. Robinson. 2009. Share the water: Building a secure water future for Alberta. *Water Matters Society of Alberta*. [Online] <http://www.water-matters.org/pub/share-the-water>.
- Dunlap, R.E., J.K. Grineeks and M. Rokeach. 1975. Human values and 'pro-environmental' behaviour. Paper presented at the *Annual Meeting of the Pacific Sociological Association*, Victoria, B.C, 1975.
- Dunlap, R.E. and K.D. Van Liere. 1978. The new ecological paradigm: A proposed measuring instrument and preliminary results. *Journal of Environmental Education*, 9: 10–19.
- Dunlap, R.E., K.D. Van Liere, A.G. Mertig and R.E. Jones. 2000. Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3): 425-442.
- Edwards, J. H. Bjornlund and B. Cheers. 2007. Revisiting the Goldschmidt hypothesis: Community members' beliefs about water trading and the future of rural communities'. Proceedings of the *TASA/SAANZ Joint Conference*, Auckland, New Zealand, December 4-7, 2007.
- Edwards, J., B. Cheers and H. Bjornlund. 2008. Social economic and community impacts of water markets in Australia's Murray Darling Basin region. *International Journal of Interdisciplinary Social Sciences*, 2(6): 1-10.
- English, M.J., K.H. Solomon and G.J. Hoffman. 2002. A paradigm shift in irrigation management. *Journal of Irrigation and Drainage Engineering*, 128(5): 267-277.
- Everitt, B. 1980. *Cluster Analysis*. Second Edition. New York, New York: Halsted Press.
- Fenton, M. 2006. The social implications of permanent water trading in the Loddon-Campaspe Irrigation Region of Northern Victoria. North Central Catchments Management Authority, Department of Primary Industry, Victoria.
- Fitzhugh, T.W. and B.D. Richter. 2004. Urban thirst: Growing cities and their impacts on freshwater ecosystems. *BioScience*, 54(8): 741-754.
- Fortmann, L. and J. Kusel. 1990. New voices, old beliefs: Forest environmentalism among new and long-standing rural residents. *Rural Sociology*, 55(2): 214-232.
- Freudenburg, W.R. 1991. Rural-urban differences in environmental concern: A closer look. *Sociological Inquiry*, 61(2): 167-198.
- Hadjigeorgalis, E. 2009. A place for water markets: Performance and challenges. *Review of Agricultural Economics*, 31(1): 50-67.

- Hair, J.F. Jr., R.E. Anderson, R.L. Tatham and W.C. Black. 1992. *Multivariate Data Analysis with Readings*. Third Edition. New York, New York: Macmillan Publishing Company.
- Harman, J., D. Lynch and S. McEachern. 2008. Social impacts of water restrictions: Householders in the Ballarat Water Supply System. Proceedings of *Water Down Under 2008*. Retrieved June 15, 2009 from <<http://search.informit.com.au/documentSummary;dn=591609191442139;res=IELENG>>
- Horbulyk, T.M. and W.L. Adamowicz. 2002. The role of economic instruments to resolve water quantity problems. Project Report 97-02, Report to Environment Canada on the Project: Economic Instruments for Water Resource Allocation.
- Huddart-Kennedy, E., T.M Beckley, B.L. McFarlane and S. Nadeau. 2009a. Why we don't "walk the talk": Understanding the environmental values/behaviour gap in Canada. *Human Ecology Review*, 16(2): 151-160.
- Huddart-Kennedy, E., T.M Beckley, B.L. McFarlane and S. Nadeau. 2009b. Rural-urban differences in environmental concern in Canada. *Rural Sociology* 74(3): 309-329.
- Huffnaker, R., N. Whittlesey and J.R. Hamilton. 2000. The Role of Prior Appropriation in Allocating Water Resources into the 21st Century. *Water Resources Development*, 16(2): 265-273.
- Huffnaker, R. and N. Whittlesey. 2003. A theoretical analysis of economic incentive policies encouraging agricultural water conservation. *Water Resources Development*, 19(1): 37-53.
- Hydroconsult EN3 Services Ltd., and Canadian Resource Economics Ltd. 2002. *South Saskatchewan River Basin Nonirrigation Water Use Forecasts*. Edmonton, Alberta: Alberta Environment.
- Jakeman A., et al. 2007. Outstanding research issues in integration and participation for water resource planning and management. In *Topics on System Analysis and Integrated Water Resource Management*, eds. A. Castelletti and S.R. Soncini, 273-289. Amsterdam: Elsevier.
- Johnson, K.M. and C.L. Beale. 1999. The continuing population rebound in nonmetro America. *Rural Development Perspectives*, 13(3): 2-10.
- Jones, R.E. and R.E. Dunlap. 1992. The social bases of environmental concern: Have they changed over time? *Rural Sociology*, 57: 28-47.

- Jones, R.E., M.J. Fly, and H.K. Cordell. 1999. How green is my valley? Tracking rural and urban environmentalism in the southern Appalachian ecoregion. *Rural Sociology*, 64: 482–499.
- Jones, R.E., M.J. Fly, J. Talley and H.K. Cordell. 2003. Green migration into rural America: The new frontier of environmentalism? *Society and Natural Resource*, 16: 221-238.
- Kahn, M.E. and J.G. Matsusaka. 1997. Demand for environmental goods: Evidence from voting patterns on California initiatives. *Journal of Law and Economics*, 4: 137-173.
- Kelly, M. and K. Sturgess, 2010. Water management in southern Alberta: Key opportunities for water storage, allocation, flood and drought management. Prepared by the Alberta Society for Sustainable Water Management and Related Technologies and Alberta WaterSMART, Calgary, Alberta.
- Kennedy, J.J. 1985. Conceiving forest management as providing for current and future social values. *Forest Ecology and Management*, 13: 121-132.
- Klineberg, S.L., M. McKeever and B. Rothenbach. 1998. Demographic predictors of environmental concern: It does make a difference how it's measured. *Social Science Quarterly*, 79(4): 734-753/
- Kuehne, G. and H. Bjornlund. 2007. One size does not fit all: recognising heterogeneity in Australian farmers. Proceedings from *USCID's Fourth International Conference on Irrigation and Drainage*, Sacramento, California, October 3-6, 2007.
- Kuehne, G., H. Bjornlund and B. Cheers. 2008. Identifying common traits among Australian irrigators using cluster analysis. *Water Science & Technology*, 58(3): 587-595.
- Kuehne, G. and H. Bjornlund. 2008. Exploring non-profit maximising influences on irrigator's behaviour. Presented at *Irrigation Australia Conference 2008*, Melbourne, Australia, May 20-22, 2008.
- Kwasniak, A. and A. Lucas. 2008. Dribs and drabs: Western U.S. and Canadian responses to water scarcity. *Rocky Mountain Mineral Law Institute*, 53: 16(1): 16(35).
- Kwasniak, A. 2010. International perspective: Water scarcity and aquatic sustainability: Beyond policy limitations. *University of Denver Water Law Review*, 13: 321-360.

- Levine, G., R. Barker and C.C. Huang. 2007. Water transfer from agriculture to urban uses: Lessons learned, with policy considerations. *Paddy Water Environ*, 5: 213-222.
- Lowe, G.D. and T.K. Pinhey. 1982. Rural-urban differences in support for environmental protection. *Rural Sociology*, 47: 114-128.
- Maslow, A.H. 1970. *Motivation and Personality*, 2nd ed. New York, New York: Viking Press.
- McMillan, M., T.J. Hoban, W.B. Clifford and M.R. Brant. 1997. Social and demographic influences on environmental attitudes. *Southern Rural Sociology*, 13(1): 89-107.
- Milfont, T.L and J. Duckitt. 2010. The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology*, 30: 80-94.
- Ministers Advisory Group (MAG). 2009. *Recommendations for Improving Alberta's Water Management and Allocation*. Government of Alberta, Edmonton.
- Mohai, P. and B.W. Twight. 1986. Rural-urban differences in environmentalism revisited: Nature manipulative vs. nature exploitative orientations. Paper presented at the *Annual Meeting of the Rural Sociological Society*, Salt Lake City, August, 1986.
- Mohai, P. 1992. Men, women, and the environment. *Society and Natural Resources*, 5: 1-19.
- Morrison, D. E., K.E. Hornback and W. K. Warner. 1972. The environmental movement: Some preliminary observations and predictions. *Social Behaviour, Natural Resources and the Environment*, 259-279.
- Morrison, D.E. 1986. How and why environmental consciousness has trickled down. In *Distributional conflict in environmental-resource policy*, eds. A. Schnaiberg, N. Watts and K. Zimmermann, 187-220. New York, New York: St. Martin's Press.
- Morrissey, J. and R. Manning. 2000. Race, residence and environmental concern: New Englanders and the White Mountain National Forest. *Research in Human Ecology*, 7(1): 12-24.
- Murdock, S.H. and E. Schriener. 1977. Social and economic determinants of the level of support for environmental protection and economic growth in a rural population. Presented at the *Annual Meeting of the Rural Sociological Society*, Madison, WI, August, 1977.

- Nicol, L.A. and K.K. Klein. 2006. Water market characteristics: results from a study of southern Alberta irrigators. *Canadian Water Resources Journal*, 31: 91-105.
- Nicol, L.A. 2008. A case study analysis of permanent transfers of water rights in southern Alberta. *Prairie Forum*, 33(2): 341-356.
- Nicol, L.A., H. Bjornlund and K.K. Klein. 2008. Improved technologies and management practices in irrigation - Implications for water savings in southern Alberta. *Canadian Water Resources Journal*, 33(3): 283-294.
- Nicol, L.A., H. Bjornlund and K.K. Klein. 2010. Towards sustainable irrigation: Economic instruments to save and reallocate water in private and district irrigation in Alberta, Canada. In *Incentives and Instruments for Sustainable Irrigation*, ed. H. Bjornlund. Southampton: WIT Press.
- Oldman Watershed Council (OWC). 2007a. Basin Map.
<http://www.oldmanbasin.org/pdfs/basin_map.pdf>. Accessed on April 20, 2009.
- Oldman Watershed Council (OWC). 2007b. About the Basin.
<http://www.oldmanbasin.org/about_basin.html>. Accessed on April 20, 2009.
- Oxford Dictionaries Online. 2010. Definition of Provenance.
<http://oxforddictionaries.com/view/entry/m_en_gb0668890#m_en_gb0668890>. Accessed on March 17, 2010.
- Pahl-Wostl, C., M. Craps, A. Dewulf, E. Mostert, D. Tabara and T. Taillieu. 2007. Social learning and water resources management. *Ecology and Society*, 12(2): 5. [online] URL: <http://www.ecologyandsociety.org/vol12/iss2/art5/>.
- Percy, D.R. 2005. Responding to water scarcity in western Canada. *Texas Law Review*, 83(7): 2091-2107.
- Peterson, R.S. 1994. The role of values in predicting fairness judgments and support of affirmative action. *Journal of Social Issues*, 50: 95-115.
- Reimann, C., P. Filzmoser, R.G. Garrett and R. Dutter. 2008. *Statistical Data Analysis Explained: Applied Environmental Statistics with R*. West Sussex, England: John Wiley & Sons Ltd.
- Richter B.D., R. Mathews, D.L. Harrison, R. Wigington. 2003. Ecologically sustainable water management: Managing river flows for ecological integrity. *Ecological Applications*, 13: 206-224.
- Rokeach, M. 1968. *Beliefs, Attitudes and Values: A Theory of Organization and Change*. San Francisco: Jossey-Bass Inc. Publications.

- Rood, S.B. and J.W. Vandersteen. 2010. Relaxing the principle of prior appropriation: Stored water and sharing the shortage in Alberta, Canada. *Water Resource Management*, 24: 1605-1620.
- Rosegrant, M.W. and R.S. Gazmuri. 1995. Reforming water allocation policy through markets in tradable water rights: Lessons from Chile, Mexico, and California. *Cuadernos de Economia*, 32(97): 291-315.
- Salka, W.M. 2001. Urban-rural conflict over environmental policy in the western United States. *American Review of Public Administration*, 31(1): 33-48.
- Schultz, P.W. and L. Zelezny. 1999. Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology*, 19: 255-265.
- Schultz, P.W. 2001. The structure of environmental concern: Concern for self, other people and the biosphere. *Journal of Environmental Psychology*, 21: 327-339.
- Schwartz, S.H. 1977. Normative Influences on Altruism. In *Advances in Experimental Social Psychology, Volume 10*, ed. L. Berkowitz. 222-284. New York, New York: Academic Press, Inc.
- Sharp, J. and L. Adua. 2009. The social basis of agro-environmental concern: Physical versus social proximity. *Rural Sociology*, 74(1): 56-85.
- Soyez, K., S. Hoffmann, S. Wunschmann and K. Gelbrich. 2009. Proenvironmental value orientation across cultures: Development of a German and Russian scale. *Social Psychology*, 40(4): 222-233.
- Stein, T.V., D.H. Anderson and T. Kelly. 1999. Using stakeholders' values to apply ecosystem management in an upper Midwest landscape. *Environmental Management*, 24(3): 399-413.
- Stern, P.C., T. Dietz and L. Kalof. 1993. Value orientations, gender, and environmental concern. *Environment and Behaviour*. 25(3): 322-348.
- Stern, P. C. and T. Dietz. 1994. The value basis of environmental concern. *Journal of Social Issues*, 50: 65-84.
- Stern, P.C., T. Dietz, L. Kalof, and G.A. Guagnano. 1995. Values, beliefs and proenvironmental action: Attitude formation toward emergent attitude objects. *Journal of Applied Social Psychology*, 25(18): 1611-1636.

- Stratton, E. R. R. de Loë, and J. Smithers. 2004. Adaptive capacity to climate change in the water sector and the role of local involvement in the Olman River Basin, Alberta. Paper presented at the *57th Canadian Water Resources Association Annual Congress*, Montreal, Quebec, Canada, June 16-18 2004.
- Tisdell, J.G. and J.R. Ward. 2003. Attitudes toward water markets: An Australian case study. *Society & Natural Resources*, 16(1): 61-75.
- Tremblay, K.R. and R.E. Dunlap. 1978. Rural-urban residence and concern with environmental quality: A replication and extension. Paper presented at the *Annual Meeting of the Rural Sociology Society*, Madison, Wisconsin, September 1977.
- Van Liere, K.D. and R.E. Dunlap. 1980. The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence. *Public opinion Quarterly*, 44: 181-197.
- Vugteveen, P., H.J. Lenders, R.J.H.M. Van Der Veeren, M.A. Wiering and A.J. Hendriks. 2010. Stakeholder value orientations in water management. *Society and Natural Resources*, 23: 1-17.
- Williams, J.A. and H.A. Moore. 1991. The rural-urban continuum and environmental concerns. *Great Plains Research*, 1(2): 195-214.
- Wilke, K. 2005. Balancing act: water conservation and economic growth. *Building the New West Report #40*, January 2005. Canada West Foundation.
- Zelezny L.C., P. Chua and C. Aldrich. 2000. Elaborating on gender differences in environmentalism. *Journal of Social Issues*, 56(3): 443-457.

PERSONAL COMMUNICATIONS

- Bradley, C. 2009. Professional Biologist and Independent Consultant. Southern Alberta Group for the Environment (SAGE). Personal Communication. Lethbridge, Alberta. April 30, 2009.
- Bullock, K. 2009. General Manager. Taber Irrigation District. Personal Communication. Taber, Alberta. May 6, 2009.
- Fitch, L. 2009. Founder and Provincial Riparian Specialist. Cows and Fish. Adjunct Professor. University of Calgary. Personal Communication. Lethbridge, Alberta, April 30, 2009
- Kaupp, D. 2009. General Manager of Water, Wastewater and Storm Water. City of Lethbridge. Personal Communication. Lethbridge, Alberta. May 4, 2009.
- Lacey, B. 2009. Alderman. City of Lethbridge. Board of Directors, Oldman Watershed Council. Personal Communication. Lethbridge, Alberta. April 29, 2009.
- McFadden, F. 2009. Planner. Alberta Environment. Personal Communication. Lethbridge, Alberta. May 1, 2009.
- Murphy, K. 2009. Water Approvals Team Leader. Alberta Environment. Personal Communication. Lethbridge, Alberta. May 7, 2009.
- Palachek, S. 2009. Executive Director. Oldman Watershed Council. Personal Communication. Lethbridge, Alberta. May 5, 2009.
- Renwick, R. 2009. General Manager. St. Mary's River Irrigation District. Personal Communication. Lethbridge, Alberta. May 5, 2009.

APPENDIX A
SOUTHERN ALBERTA WATER ALLOCATION AND STAKEHOLDER
VALUES SURVEY

PART A: Values Orientation

- The statements in this section reflect different ways in which people value water.
- Indicate the degree to which you agree or disagree with each statement by circling the number that corresponds to your position.
- **Do not leave any questions blank.** If you don't have an opinion about a particular question, then please indicate this by circling option 3 (Neither Agree nor Disagree).

1. A healthy, functioning aquatic environment should always take priority over human uses of water.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

2. The environment is important to me because of its natural beauty.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

3. At least some of my household income depends directly on an activity that uses water from the river.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

4. I think that water is a commodity that individuals and private groups should be able to buy and sell.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

5. Domestic uses of water such as washing, cooking and cleaning should take priority over the needs of a healthy aquatic environment.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

6. Healthy aquatic ecosystems add to the quality of life in the province of Alberta.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

7. Using water to create green and lush public spaces adds more to my quality of life than leaving the water in the river.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

8. I'm more concerned about my livelihood than I am about the environment.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
9. Respect for the environment influences my willingness to conserve water.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
10. Water in a river has value simply because of all of the benefits and services it gives to us.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
11. Rivers tie communities together.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
12. Knowing that I have a safe and reliable supply of water for my family's basic needs is important to me.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
13. New subdivisions should not be allowed in this region if supplying the water they need would cause harm to the environment.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
14. Irrigated agriculture is the most economically profitable use of water in southern Alberta.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
15. I would like public spaces to be planted with trees, shrubs and flowers that need less water.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
16. I am entitled to use as much water as any other resident of the province of Alberta.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |
17. I use water for washing my vehicle even if doing so may harm the river where the water comes from.
- | | | | | |
|---------------------------------|------------------------|--|---------------------|------------------------------|
| 1 | 2 | 3 | 4 | 5 |
| <i>Strongly Disagree</i> | <i>Disagree</i> | <i>Neither Agree nor Disagree</i> | <i>Agree</i> | <i>Strongly Agree</i> |

18. I would feel a sense of pride if I knew that this region had a healthy natural ecosystem.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

19. Buyers and sellers of water licenses should be the ones who decide the price of water.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

20. I use water carefully in ways that protect the environment.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

21. I use water more carefully than most of my neighbours.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

22. People have the right to modify the natural environment to meet their economic needs.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

23. The environment's needs for water should be met before water is used for human economic purposes such as industry and agriculture.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

24. I live in a drier environment than most Canadians.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

25. The way we manage water in our rivers in Alberta is outdated and not in line with society's current values.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

26. I would rather see Alberta's economy grow through more irrigated agriculture as opposed to having more water in the rivers.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

27. Water should be made available for economic uses before the environment.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

28. I want future generations to be able to experience aquatic environments in southern Alberta that are healthier than the ones we have now.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

29. I'm concerned that aquatic habitats in southern Alberta are not receiving enough protection.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

30. Water from rivers should be used to provide benefits to the whole community, not just to those who can afford to buy a water license.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

31. I would get satisfaction from knowing that enough water was in the river to support natural ecosystems even if I didn't use the river for recreation.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

32. I enjoy having a lush green lawn and/or garden even if doing so may cause environmental harm to the river where the water comes from.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

33. The government should be responsible for ensuring that water quality and quantity are good enough to ensure a healthy environment.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

34. The amount of water I use in and around my home would change depending on how much I had to pay for it.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

35. I only use water for domestic purposes such as washing, cooking and cleaning.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

36. I trust the government to manage water in ways that are best for the environment.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

37. The aquatic environment of southern Alberta is healthy.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

38. Irrigated agriculture produces locally grown, healthy food for me and my family.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

39. I have a better understanding of how water in southern Alberta is managed than do most of my neighbours.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

40. I use rivers and their surrounding areas on a regular basis for recreation.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

PART B: Policy Options

- The statements in this section are examples of different ways in which water in southern Alberta can be managed.
- Indicate the degree to which you agree or disagree with each statement by circling the number that corresponds to your position.
- **Do not leave any questions blank.** If you don't have an opinion about a particular question, then please indicate this by circling option 3 (Neither Agree nor Disagree).

1. The government, rather than market forces, should decide who gets to use Alberta's water.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

2. Private individuals and groups should be able to hold water licenses for environmental protection.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

3. All water licenses, no matter when they were issued or for what purpose, must be honored.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

4. If water is to be traded among irrigation districts and/or municipalities, the government should set the price.

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>

5. Public funds should be used to help larger water users (irrigators, industries and municipalities) to become more water efficient.

1 2 3 4 5
Strongly Disagree *Disagree* *Neither Agree nor Disagree* *Agree* *Strongly Agree*

6. If an irrigation district or municipality is not using all of the water it has been allocated, then the government should be able to take that water for environmental purposes without compensation.

1 2 3 4 5
Strongly Disagree *Disagree* *Neither Agree nor Disagree* *Agree* *Strongly Agree*

7. Water that is saved through improved water use efficiency should be used to increase economic activity.

1 2 3 4 5
Strongly Disagree *Disagree* *Neither Agree nor Disagree* *Agree* *Strongly Agree*

8. Public funds should be used to improve irrigation systems only if the water that is saved is left in rivers.

1 2 3 4 5
Strongly Disagree *Disagree* *Neither Agree nor Disagree* *Agree* *Strongly Agree*

9. The government should buy water from current water license holders, such as irrigation districts, so that more water can be left in the river for the environment.

1 2 3 4 5
Strongly Disagree *Disagree* *Neither Agree nor Disagree* *Agree* *Strongly Agree*

10. Minimum flows of water should be set for all rivers, and only the water above those minimum flows should be available for economic purposes such as irrigation.

1 2 3 4 5
Strongly Disagree *Disagree* *Neither Agree nor Disagree* *Agree* *Strongly Agree*

PART C: Demographic Information

- In this final section, we have a few questions that will help us to learn more about your background.
- We'll use this information to see whether or not peoples' different backgrounds can explain how they value water.

1. Gender

Male

Female

2.

Age:

18 - 20

60 - 69

20 - 29

70 - 79

30 - 39

80 - 89

40 - 49

90+

50 - 59

3.

Average household income:

Under \$10,000

\$50,000 - 59,000

\$10,000 - 19,000

\$60,000 - 69,000

\$20,000 - 29,000

\$70,000 - 79,000

\$30,000 - 39,000

\$80,000 and over

\$40,000 - 49,000

4. Highest level of education achieved:

- No certificate, diploma or degree
- Secondary (high school) diploma or equivalency certificate
- Registered apprenticeship or trades certificate
- College, CEGEP, or other non-university certificate or diploma
- University – Bachelor’s Degree
- University – Certificate or diploma above Bachelor level
- University – Master’s degree
- University – Degree in medicine, dentistry, veterinary medicine, or optometry
- University – Doctorate

5. Your occupation is in the field of:

- Management
- Business, finance or administration
- Natural and applied sciences
- Health
- Social science, education or government service
- Art, culture, recreation or sport
- Sales and service
- Trades, transport or equipment operator
- Primary industry (forestry, mining, oil and gas extraction, fishing, primary production labour, etc.)
- Processing, manufacturing or utilities
- Other _____

6. How do you get the water you use for domestic purposes?

- Municipal water utility
- Private well (ground water)
- Surface water (river or lake on or adjacent to property)
- Storage on-site (dug-out or imported)
- Other _____

7. I regularly use water bodies (lakes, rivers, reservoirs) for the following activities (check all that apply):

- | | |
|---|--------------------------------------|
| <input type="checkbox"/> Fishing | <input type="checkbox"/> Bushwalking |
| <input type="checkbox"/> Bird watching | <input type="checkbox"/> Hunting |
| <input type="checkbox"/> Canoeing/Boating | <input type="checkbox"/> Swimming |
| <input type="checkbox"/> Waterskiing | |
| <input type="checkbox"/> Other: _____ | |

8. During my life, I have mainly lived in:

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> an urban area | <input type="checkbox"/> a rural area |
|--|---------------------------------------|

9. a) I was **raised** in:

- | | |
|--|--|
| <input type="checkbox"/> an urban area | <input type="checkbox"/> a rural setting |
|--|--|

b) **Now** I live in:

- | | |
|--|--|
| <input type="checkbox"/> an urban area | <input type="checkbox"/> a rural setting |
|--|--|

10. Did you live in southern Alberta prior to 2001?

- | | |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

11. I am a member of a WPAC or watershed stewardship group.

Yes

No

12. I am a member of an environmental or conservation group (e.g., Ducks Unlimited, CPAWS, Southern Alberta Group for the Environment, Lethbridge Naturalists, Crowsnest Conservation Society, Alberta Ecotrust Foundation, Trout Unlimited Canada, etc.).

Yes

No

Thank you for participating in this study!

We sincerely appreciate your input.

If you have any comments, please use the blank pages at the end of this booklet

APPENDIX B KEY INFORMANT INTRODUCTION LETTER

Dear (Key Informant Name):

This letter is an invitation to participate in a study I am conducting for a Master's thesis at the University of Waterloo. My faculty supervisors are Henning Bjornlund and Rob de Loë. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

The broad question that this research addresses is the extent to which values influence stakeholder perceptions of water allocation policy in southern Alberta. I have chosen to contact you because I feel that you possess valuable knowledge that is relevant to my study based on your involvement in water management issues in the region. Participation in this study is voluntary. It will involve an interview lasting approximately one hour, at a mutually convenient location and time. I will provide you with a copy of the interview questions prior to the interview and you may decline to answer any of the interview questions if you wish. Further, you may decide to withdraw from this study at any time. With your permission, I would like to record the interview. Shortly after the interview has been completed, I will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. With your permission, I would like to be able to quote things that you tell me in my thesis and other publications. I would also like to use your name and affiliation in my thesis. However, if you prefer you can remain anonymous, including the name of the company/organization with which you are associated. If you indicate that you would like to remain anonymous, then all information you provide will be considered confidential. All interview data and audio recordings will be securely stored on a password-protected computer in the Water Policy and Governance Group's locked office in the Department of Environment at the University of Waterloo. The audio recordings and other interview data will be retained for one year upon the completion of the study then will be erased and confidentially destroyed. Only authorized researchers will have access to the information collected. There are no known or anticipated risks to you as a participant in this study. Finally, after I've completed my thesis, I will send you an executive summary of the research results.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me by email at cbparrac@uwaterloo.ca. You can also contact Dr. Rob de Loë, at 519-888-4567 ext. 38648 or by email (rdeloe@uwaterloo.ca).

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes, Director, Office of Research Ethics at 519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

I very much look forward to speaking with you and thank you in advance for your assistance in this project.

Yours Sincerely,

Cameron Parrack
Student Investigator

APPENDIX C
KEY INFORMANT CONSENT FORM

Consent of Participant

I have read the information presented in the information letter about a study being conducted by Cameron Parrack of the Department of Environment at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses. I am aware that I will have the opportunity to review and approve the quotations as they are written in the paper prior to finalizing the paper.

Below I have indicated my preference regarding attribution. If I indicate that I can be quoted, I understand that excerpts from the interview may be included in the thesis and/or publications to come from this research.

This project has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact Dr. Susan Sykes, Director, Office of Research Ethics at 519-888-4567 ext. 36005 or by email at ssykes@uwaterloo.ca.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES NO

I agree to have my interview audio recorded.

YES NO

Regarding quotation and attribution of things that I say during the interview in the thesis and or publications to come from this research, the following is my position:

My comments can be quoted with attribution (including the name of the organization I represent)

My comments can be quoted anonymously

I do not wish to be quoted or attributed

Participant Name (Please Print)

Witness Name (Please Print)

Signature of Participant

Witness Signature

Date

APPENDIX D
KEY INFORMANT INTERVIEW QUESTIONS

1. In what ways do you think water is important in southern Alberta?
2. Which benefits do you personally derive from water?
 - a) Which other benefits do you think that people derive from water?
3. What values would you say that you hold towards water?
 - a) Can you explain why you identified these values?
 - b) Do these values influence the way you use water in your home? If so, how?
4. As you might know Irrigators in Southern Alberta use more than 70% of the freshwater resources. Do you think that irrigators use the water responsibly?
 - a) It is evident that more water is needed for the environment and urban uses, it could be expected that some water need to be taken out of irrigation. How do you think this should be done?
5. One of the goals of Water for Life is protection and restoration of aquatic ecosystems. How do you think that water should be provided for aquatic ecosystems when available supplies already are allocated to human uses?
6. Do you think that government should be responsible for ensuring that enough water is available for the environment and for growing urban and industrial demands?
 - a) If so, how should they do that? If not, who should be responsible?
 - b) Should water reallocation be left completely to market forces?
7. Should the government provide incentives for irrigators to increase efficiency to enable more water to be transferred out of that sector and into water scarce sectors such as the environment and urban users?
8. The *Water For Life* strategy stresses increases in efficiency of use and productivity with respect to water (i.e., reallocating water from lower-value uses to higher-values uses)(ex. tillage, hay production to specialty crop production). Do you feel that a permanent transfer of rights to the environment (from the irrigation sector) conforms to goals and objectives of the Strategy?
 - a) Do you perceive the allocation of water to the environment as a less productive use of water resources?
 - b) If Yes. Why? If no. Why not?
 - c) Do you think that your values influence your answer to this question?
 - d) Which values specifically influence this perspective/opinion?

9. Do you feel that the director should be able to hold back more than 10% of a transfer for environmental flows? Should the current 10% water conservation holdback (Section 83 of the 1999 Water Act) be discretionary (based on the river or watershed) or mandatory?

10. Alberta's water allocation system currently allows for water to be transferred temporarily or permanently among licence holders. Do you think that this system is an appropriate way to provide water for the environment and for growing urban and industrial demands? Why or why not?

11. What do you think influences how people value water in southern Alberta, and how they would respond to the kinds of questions I've asked you? For example, do you think that it matters whether or not you live in the city or a rural area? Do you think it matters whether or not you need and use water in your business?

APPENDIX E
KEY INFORMANT FOLLOW-UP LETTER

Dear Respondent,

I would like to thank you for your participation in this study. As a reminder, the purpose of this study is to uncover the influence of stakeholder values on water allocation policy.

The data collected from the questionnaires will contribute to a better understanding of the interests and issues that concern stakeholders involved in this issue, and is meant to aid in the development of more effective water policy in Alberta.

Any data you provide will be kept confidential. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or if you have any questions or concerns, please contact me at either the phone number or email address listed at the bottom of the page. A summary of the results of the survey will be posted on the website of the Water Policy and Governance Group (www.wpgg.ca). The study will be completed by April 2010.

As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes, Director, Office of Research Ethics at 519-888-4567 ext. 36005 or by email ssykes@uwaterloo.ca.

Cameron Parrack

University of Waterloo
Department of Environment

647-213-1122

cbparrac@uwaterloo.ca

**APPENDIX F
LIST OF KEY INFORMANTS**

List of Key Informants		
Name	Position	Organization
Bradley, Cheryl	Professional Biologist and Independent Consultant	Southern Alberta Group for the Environment (SAGE), Lethbridge, AB.
Bullock, Kent	General Manager	Taber Irrigation District (TID), Taber, AB.
Fitch, Lorne	Founder of Cows and Fish, Provincial Riparian Specialist, Adjunct Professor (University of Calgary)	Cows and Fish, Lethbridge, AB. University of Calgary, Calgary, AB
Kaupp, Doug	General Manager of Water, Wastewater and Storm Water	City of Lethbridge, Lethbridge AB.
Lacey, Barbara	City Alderman, Board of Directors, Oldman Watershed Council	City of Lethbridge, Lethbridge, AB Oldman Watershed Council, Lethbridge, AB
McFadden, Farah	Planner	Alberta Environment, Lethbridge, AB.
Murphy, Kathleen	Water Approvals Team Leader	Alberta Environment, Lethbridge, AB.
Palacheck, Stephanie	Executive Director	Oldman Watershed Council, Lethbridge, AB
Renwick, Ron	General Manager	St. Mary's River Irrigation District, Lethbridge, AB

APPENDIX G
SURVEY RESPONDENT INFORMATION LETTER

Dear Resident:

This letter is an invitation to participate in a study I am conducting for a Master's thesis at the University of Waterloo. My faculty supervisors are Dr. Henning Bjornlund from University of Lethbridge and Dr. Rob de Loë from the University of Waterloo. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

This research investigates the values that non-irrigators hold toward water. How do these values influence perception of how water should be used in southern Alberta, and how do they influence peoples' perceptions of how water should be reallocated out of agriculture to meet increasing urban and environmental needs.

Participation in this study is voluntary and anonymous. Completion of the survey is expected to take about 20 minutes of your time.

Please make sure to complete the Prize Draw Entry Form contained in the envelope for a chance to win cash prizes. The contact information that you provide on the entry form will be separated from your survey data to ensure that your anonymity is kept. Finally, the anonymous data will be kept indefinitely.

If you are interested in participating in this study, please return the completed questionnaire in the self-addressed, stamped envelope by November 15, 2009. If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me by email at cbparrac@uwaterloo.ca. You can also contact Dr. Rob de Loë, at 519-888-4567 ext. 38648 or by email (rdeloe@uwaterloo.ca). A short report summarizing the aggregated results of this survey will be posted on the internet at <http://www.wpgg.ca>.

This project received ethics clearance through the Office of Research Ethics at the University of Waterloo (1-519-888-4567 ext. 36005 or ssykes@uwaterloo.ca).

Thank you in advance for your interest in this project.

Yours Sincerely,

Cameron Parrack
Student Investigator

APPENDIX H SURVEY RESPONDENT PRIZE DRAW ENTRY FORM

PRIZE DRAW ENTRY FORM

The information we are seeking from our questionnaire surrounds the extent to which the values that people place on water resources and the way they interact and use water influence their perceptions of water allocation policy in southern Alberta, the rules that determine how we share the access to use water. This is a very important issue and we appreciate your willingness to participate in this survey.

In recognition of this, if you **complete and mail back the questionnaire within one week of receiving the letter and this entry form** (in the postage paid envelope marked "Questionnaire Return"), you will be entered into a draw to win one of our five prizes of \$100. Your completed questionnaire and the Prize Draw Entry Form will be separated upon reception to ensure that your anonymity is kept.

Remember, to be eligible **you must answer all questions in the questionnaire and return it within one week of receiving the letter!** Winners will be notified at the end of November.

**YOU COULD
WIN
1 of 5
CASH PRIZES
of \$100**

****This survey is being sent to only 6000 residents of southern Alberta giving you great odds of winning****

-----**Thank you and good luck!**-----DETACH HERE-----

I'VE RETURNED MY COMPLETED QUESTIONNAIRE.
PLEASE ENTER ME IN THE DRAW FOR CASH PRIZES!

NAME: _____

ADDRESS: _____

PHONE NUMBER: _____

Return this form in the white envelope marked "Entry Form Return" and send it to us together with the questionnaire in the postage-paid envelope labeled 'Questionnaire Return'.

APPENDIX I
SURVEY RESPONDENT REMINDER LETTER

Dear Resident:

This letter is to remind you of the study that we have recently invited you to participate in. Two weeks ago you had received a package containing a survey. If you have already completed and mailed back the survey we thank you. If you have not yet completed and mailed back the survey, there is still time to be a part of this very important study.

To reiterate the purpose of the study, this research investigates the values that non-irrigators hold toward water. How do these values influence perception of how water should be used in southern Alberta, and how do they influence peoples' perceptions of how water should be reallocated out of agriculture to meet increasing urban and environmental needs.

This above research study is part of my Master's thesis at the University of Waterloo under the supervision of Dr. Henning Bjornlund from the University of Lethbridge and Dr. Rob de Loë from the University of Waterloo.

Participation in this study is voluntary and anonymous. Completion of the survey is expected to take about 20 minutes of your time.

The first package contained a cash prize draw entry form with a chance to win 1 of 5 cash prizes of \$100. This draw was only open to those who returned their completed survey within the first week of receiving the survey. However, we are now holding a second cash prize draw for all survey respondents. We will be drawing for a chance to win 1 of 5 addition cash prizes of \$100.

If you are still interested in participating in this study, please return the completed questionnaire in the self-addressed, stamped envelope. If you would like to participate in the study but have not kept the survey and prize draw entry form please contact me by email at cbparrac@uwaterloo.ca and we will mail you the package once more. You can also contact Dr. Rob de Loë, at 519-888-4567 ext. 38648 or by email (rdeloe@uwaterloo.ca) if you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation. A short report summarizing the aggregated results of this survey will be posted on the internet at <http://www.wpgg.ca>.

Thank you in advance for your interest in this project.

Yours Sincerely,
Cameron Parrack
Student Investigator

APPENDIX J
CANADIAN FEDERAL CENSUS DATA - COMMUNITY PROFILES

Age Characteristics of the Population	Lethbridge, AB		
	Total (% of total)	Male	Female
Total - All persons	67,370	32,545 (48.31%)	34,825 (51.69%)
Age 0-4	3,845	1,915	1,930
Age 5-14	8,240	4,330	3,910
Age 15-19	5,015	2,485	2,540
Age 20-24	6,315 (9.37%)	3,050	3,270
Age 25-44	18,750 (27.83%)	9,315	9,435
Age 45-54	9,265 (13.75%)	4,505	4,760
Age 55-64	5,775 (8.57%)	2,745	3,030
Age 65-74	5,115 (7.59%)	2,245	2,770
Age 75-84	3,695 (5.48%)	1,440	2,260
Age 85 and over	1,355 (2.01%)	430	925
Median age of the population	36.7	35.1	38.0
% of the population ages 15 and over	82.1	80.8	83.2

Statistics Canada. 2002. 2001 Community Profiles. □ Released June 27, 2002.

Age Characteristics of the Population	Taber Municipal District, AB		
	Total (% of total)	Male	Female
Total - All persons	6,015	3,155 (52.45%)	2,855 (47.46%)
Age 0-4	575	300	275
Age 5-14	1,295	665	625
Age 15-19	570	315	255
Age 20-24	345 (5.73%)	175	165
Age 25-44	1,625 (27.01%)	835	785
Age 45-54	720 (11.97%)	390	330
Age 55-64	465 (7.73%)	240	220
Age 65-74	260 (4.32%)	155	100
Age 75-84	145 (2.41%)	75	70
Age 85 and over	25 (0.41%)	5	10
Median age of the population	28.3	28.4	28.3
% of the population ages 15 and over	69.0	69.5	68.5

Statistics Canada. 2002. 2001 Community Profiles. □ Released June 27, 2002.

Age Characteristics of the Population	Stirling, AB		
	Total (% of total)	Male	Female
Total - All persons	875	450 (51.43%)	425 (48.57%)
Age 0-4	80	40	35
Age 5-14	210	115	95
Age 15-19	80	40	35
Age 20-24	40 (4.57%)	20	25
Age 25-44	235 (26.86%)	110	115
Age 45-54	105 (12.0%)	55	55
Age 55-64	65 (7.43%)	35	35
Age 65-74	35 (4.0%)	20	15
Age 75-84	20 (2.28%)	10	15
Age 85 and over	5 (0.57%)	5	5
Median age of the population	28.0	27.2	29.4
% of the population ages 15 and over	67.0	65.6	69.4

Statistics Canada. 2002. 2001 Community Profiles. □ Released June 27, 2002.

Age Characteristics of the Population	Magrath, AB		
	Total (% of total)	Male	Female
Total - All persons	1,990	955 (47.99%)	1,040 (52.26%)
Age 0-4	145	55	90
Age 5-14	395	195	200
Age 15-19	210	110	100
Age 20-24	105 (5.28%)	65	40
Age 25-44	420 (21.10%)	200	220
Age 45-54	240 (12.06%)	115	120
Age 55-64	155 (7.79%)	70	80
Age 65-74	140 (7.03%)	75	65
Age 75-84	130 (6.53%)	55	80
Age 85 and over	55 (2.76%)	25	35
Median age of the population	33.2	31.6	34.5
% of the population ages 15 and over	72.7	73.8	72.1

Statistics Canada. 2002. 2001 Community Profiles. □ Released June 27, 2002.

Age Characteristics of the Population	Raymond, AB		
	Total (% of total)	Male	Female
Total - All persons	3,200	1,560 (48.75%)	1,640 (51.25%)
Age 0-4	285	140	145
Age 5-14	580	295	285
Age 15-19	340	185	160
Age 20-24	190 (5.93%)	90	95
Age 25-44	665 (20.78%)	325	345
Age 45-54	385 (12.03%)	190	200
Age 55-64	270 (8.43%)	130	145
Age 65-74	215 (6.72%)	100	115
Age 75-84	175 (5.47%)	70	100
Age 85 and over	90 (2.81%)	30	55
Median age of the population	30.9	28.7	33.5
% of the population ages 15 and over	72.8	71.8	73.8

Statistics Canada. 2002. 2001 Community Profiles. □ Released June 27, 2002.