

# Southern Alberta Resource Economics Centre

Department of Economics, University of Lethbridge  
4401 University Drive, Lethbridge, Alberta, Canada, T1K 3M4

**SAREC Report 2011-01**

**Provision of Ecosystem Services:**

**A study of landowners' values, attitudes and perceptions  
of the use of market based instruments**

**2011**

**K. Howard, H. Bjornlund and W. Xu**



## **Southern Alberta Resource Economics Centre Publications**

The mission of the Southern Alberta Resource Economics Centre (SAREC) is to study resource issues that affect growth and development of Southern Alberta. Multi-disciplinary research is required on the impacts of human activity on water quality, water quantity, climate change, impacts of biotechnology, growth of the bio-economy, manure disposal from intensive livestock production, and other agricultural and resource issues. These resource-based issues provide the motivation for socio-economic research in this dynamic region of Canada.

While SAREC is centred in the Department of Economics at the University of Lethbridge, SAREC is informally organized and includes researchers in several disciplines, including, but not limited to, economics, geography, management, and public health. The purpose of SAREC publications is to provide a forum for the exchange of information on all aspects of resource issues in Southern Alberta and related areas. The research reports published in this series may be completed research, works in progress or thought-provoking information pieces submitted by academic researchers, graduate students or others with an interest in resource issues in Southern Alberta. SAREC researchers have been supported financially by the Social Science and Humanities Research Centre, the Alberta Water Research Institute (formerly the Alberta Ingenuity Water Research Centre), the Canadian Water Network, SouthGrow Regional Initiative, and other funding agencies.

The opinions expressed in this series of research reports represent those of the authors and not of University of Lethbridge officials or of funding agencies. Prospective authors for this series are invited to submit completed manuscripts or to contact the research leaders regarding proposed topics.

K. K. Klein and Henning Bjornlund, SAREC Research Leaders

Department of Economics, University of Lethbridge

Lethbridge, Alberta T1K 3M4

[klein@uleth.ca](mailto:klein@uleth.ca); [henning.bjornlund@uleth.ca](mailto:henning.bjornlund@uleth.ca)

## **Acknowledgements**

This research is funded by the Alberta Water Research Institute and the Canadian Water Network project 'More Value From the Same Water: Maximizing Water's Sustainable Contribution to the Canadian Economy'. The authors would like to acknowledge the work of PhD student Gillian Kerr who wrote the statements used in the governance and policy section of the survey conducted and examined in this report.

## **ABSTRACT**

With great importance placed on fresh water resources it is necessary for governments to protect them and use them wisely. Fresh water interacts with most aspects of the natural and artificial environment and this interaction influence the quality of water. Ecosystem Services (ES) are the benefits people receive from ecosystems, including those that keep water clean, however, they tend to be public goods and therefore under produced. The Government of Alberta is planning to use market-based instruments to entice landowners to incorporate ES into private decision making, and thereby increase the provision of ES and improve water quality. This report analyzes the values and attitudes that rural landowners hold towards their land, and how this may affect their willingness to participate in land management programs which will result in the increase in provision of ES. The report examines the variation between producers and non-producers with respect to their values and attitudes. The analyses are based on a telephone survey of 350 landowners in the Municipal District of Willow Creek and the County of Lethbridge in southern Alberta. The questionnaire collected information on personal and land characteristics, values orientation, opinions of governance and policy related to ES and water issues, beliefs that form the variables of the theory of planned behaviour, and the minimum financial incentives required to participate in ES programs. In general, producers were more economically oriented, which likely influenced them to be more willing to support the use of MBIs over the use of regulation, and their requirements to receive greater financial incentives to participate in ES programs. Producers also seem to have a less positive attitude towards providing ES through changes to land management, and believe that they have less control over actually being able to successfully participate in such a program due to factors such as climate, property characteristics and external economic factors.

## Table of Contents

|   |    |
|---|----|
| 1. Introduction .....                                 | 7  |
| 2. Literature Review .....                            | 10 |
| 2.1. Values Associated with Ecosystem Services .....  | 11 |
| 2.2. Willingness to Participate in ES Programs .....  | 12 |
| 2.2.1. Theory of Planned Behaviour .....              | 12 |
| 2.2.2. Extended TPB .....                             | 13 |
| 2.2.3. Socio-economic and Demographic Variables ..... | 14 |
| 2.3. Summary and Application to Study .....           | 15 |
| 3. Study Area, Data and Methodology .....             | 17 |
| 4. Findings .....                                     | 19 |
| 4.1. Demographics .....                               | 19 |
| 4.2. Value Orientation Statements .....               | 27 |
| 4.3. Governance and Policy Opinion Statements .....   | 31 |
| 4.4. TPB Statements .....                             | 34 |
| 4.5. Extended TPB Statements .....                    | 40 |
| 4.6. Willingness to Participate in ES Programs .....  | 41 |
| 5. Discussion .....                                   | 45 |
| 6. Conclusion .....                                   | 51 |
| References .....                                      | 54 |

## List of Figures

|  |    |
|--|----|
| Figure 1: The theory of planned behaviour .....  | 13 |
| Figure 2: Theoretical model to explain landowners' willingness to supply ES based on the theory of planned behaviour and the effects of value orientation..... | 16 |

## List of Tables

|   |    |
|---|----|
| Table 1: Number of respondents surveyed based on being a producer .....                                     | 19 |
| Table 2: Number of respondents surveyed based on being a livestock producer.....                            | 19 |
| Table 3: Number of respondents surveyed based on being an irrigating producer .....                         | 19 |
| Table 4: Number of respondents surveyed based on being a livestock producer and an irrigating producer..... | 20 |
| Table 5: Respondents by Land Use (yes responses shown only) .....   | 20 |
| Table 6: Respondents according to acres of land owned.....  | 21 |
| Table 7: Respondents according to approximate annual net household income .....                             | 22 |
| Table 8: Respondents according to percentage of household income derived from use of their land .....       | 22 |
| Table 9: Respondents according to sex .....   | 23 |
| Table 10: Respondents according to decade of birth.....   | 23 |
| Table 11: Respondents according to highest level of education.....  | 24 |
| Table 12: Respondents according to decade of highest education .....  | 24 |
| Table 13: Respondents according to marital status .....   | 25 |
| Table 14: Respondents according to number of children .....   | 25 |
| Table 15: Respondents according to being raised in a rural setting .....                                    | 26 |
| Table 16: Respondents according to number of generations family has owned their land .....                  | 26 |
| Table 17: Respondents according to succession expectation .....   | 26 |
| Table 18: Respondents according to political orientation .....  | 27 |
| Table 19: Economic Value Orientation Statements .....   | 28 |
| Table 20: Environmental Value Orientation Statements .....  | 29 |
| Table 21: Lifestyle Value Orientation Statements .....  | 29 |
| Table 22: Value Orientation Comparative Statements .....  | 30 |
| Table 23: Water Quality Opinion Statements.....   | 31 |
| Table 24: Ecosystem Services Opinion Statements .....   | 32 |
| Table 25: Financial Incentive/Disincentive and MBI Opinion Statements .....                                 | 33 |
| Table 26: Behavioural Belief Strength Statements.....   | 35 |
| Table 27: Behavioural Belief Outcome Evaluation Statements .....  | 36 |
| Table 28: Normative Belief Strength Statements .....  | 37 |
| Table 29: Motivation to Comply Statements.....  | 38 |
| Table 30: Control Belief Strength Statements .....  | 39 |
| Table 31: Control Belief Power Statements .....   | 40 |
| Table 32: Extended TPB Statements .....   | 41 |
| Table 33: Respondents' Willingness to Participate in ES Programs (Scenario One - Environmental) .....       | 42 |
| Table 34: Respondents' Willingness to Participate in ES Programs (Scenario Two - Economic) .....            | 43 |
| Table 35: Respondents' Willingness to Participate in ES Programs (Scenario Three - Lifestyle) .....         | 43 |
| Table 36: Respondents' Willingness to Participate in ES Programs (Scenario Four – All Benefits) .....       | 44 |

## **1. Introduction**

According to a recent poll, Canadians overwhelmingly view fresh water as the most important natural resource for Canada's future (Nanos 2009). At the same time, the degradation of aquatic ecosystems and loss of wetlands is more rapid than that of other ecosystems (Millennium Ecosystem Assessment 2005). It is therefore of the utmost importance that these ecosystems are protected to ensure that Canada's most important resource can continue to be enjoyed.

Wetlands deliver a wide range of ecosystem services that contribute to human well-being. These include fish and fibre, water supply, water purification, climate regulation, flood regulation, coastal protection, recreational opportunities, and tourism (MEA 2005). Any ecosystem within a watershed will affect the attributes of the water that pass through it, and thus affect the aquatic ecosystems that the waters enter (Brauman, Daily et al. 2007). All ecosystems perform, to some extent, hydrological services with downstream users of the water experiencing the effects. Also, human activities within these watersheds affect the aquatic ecosystems, both directly and indirectly, which tend to be in a harmful way. The Millennium Ecosystem Assessment states:

The primary indirect drivers of degradation and loss of inland and coastal wetlands have been population growth and increasing economic development. The primary direct drivers of degradation and loss include infrastructure development, land conversion, water withdrawal, eutrophication and pollution, overharvesting and overexploitation, and the introduction of invasive alien species (MEA 2005).

The future of Alberta is projected to see an increase in degradation caused by the two indirect drivers, and if not properly planned and managed, from the direct drivers as well.

The Government of Alberta sees the importance of its water resources as it is committed to maintaining and enhancing Albertans' quality of life linked to healthy aquatic ecosystems (Government of Alberta 2008). This is clearly expressed through the three goals of the Water for Life strategy (WFL): to provide safe, secure drinking water supplies for all Albertans, to ensure healthy aquatic ecosystems, and to provide reliable, quality water supplies for a sustainable economy (GoA 2003). All three goals add to Albertan's quality of life but healthy aquatic ecosystems are preconditions for securing the quality water needed for both drinking water and economic uses. Furthermore, recognition of Ecosystem Services (ES) that people receive benefit from will be key to conservation and stewardship practices, as outlined in the Alberta Land-use Framework (LUF), and the need to protect ES has been added to WFL Action Plan (GoA 2008; GoA 2009).

According to the LUF, ES are economic and social benefits resulting from the natural processes of a healthy environment and biodiversity, and are available to all of society and are essential to sustain a healthy and prosperous way of life (GoA 2008). Most ES can be considered public goods, and thus, are not fully considered in private decision making and therefore tend to be under-produced. The challenge then is to internalize the benefits of the public goods into private decision making so ecosystems are conserved and an adequate amount of ES is supplied.

Governments have initially relied on a 'command and control' (CAC) style of environmental regulation to achieve environmental goals, but many have found CACs to be too rigid and costly to implement as they force all firms to achieve the same level of mitigation, even though it may be relatively more costly for some firms than others (Hockenstein, Stavins et al. 1997). The inefficiencies of CACs gave rise for economists to advocate market-based instruments (MBIs) to achieve environmental benefits and compliance with environmental regulatory standards. MBIs can utilize the heterogeneities between

firms under the regulation and meet an equilibrium of what the public requires and what the private firms can provide (Newell and Stavins 2003), and therefore can be a useful tool for environmental policy.

In general, MBIs shape behaviour through price signals rather than explicit instructions (Hockenstein, Stavins et al. 1997). In the 1970s, when most of the environmental focus was on emissions, there was much fear from environmental groups of the use of MBIs such as tradable permits because they thought it was a “licence to pollute” (Hahn 2000). In the 1990s, MBIs were becoming used more often to solve environmental issues, and were becoming more accepted by the parties involved, including environmental groups such as the Environmental Defenders Office, especially after the success of the SO<sub>2</sub> Allowance Trading System in the United States (Henderson and Norris 2008). This example of a tradable permit system was able to achieve cost minimization for environmental outcomes, but it was also able to generate environmental improvements that went further than what the CAC approaches would have produced (Stavins 1998). The SO<sub>2</sub> Allowance Trading system enhanced competition among the different methods that firms could use to control emissions so marginal cost of abatement fell significantly. The fall of abatement costs allowed firms to reduce their emissions even further than expected and bank them for future use (Colby 2000). So in addition to cost-efficiency, MBIs also provide incentive to innovate because they allow firms to discover ways of meeting the environmental needs with what works best for them and they are able to abate beyond mandated levels (Hahn and Stavins 1992; Jaffe 2001).

Through the LUF, Alberta plans to incorporate both MBIs and CACs to encourage stewardship, and in the WFL Action Plan, MBIs are to be developed to provide ES (GoA 2008; GoA 2009). In Alberta, however, based on the low level of MBI use, it is reasonable to conclude that MBIs used to entice

people to provide ES are unfamiliar to Albertans, and its acceptability is largely unknown. The few example that do exist in the province include conservation easements, water transfers, carbon offsets, small NO<sub>x</sub> /SO<sub>x</sub> emissions trading program for the electricity sector, deposit-refund schemes, and a carbon charge on large final emitters (GoA 2010).

Additionally, MBIs have had mixed performances around the world. Many have not operated as well as predicted due to theory being based on ideal conditions or failing to consider political factors, such as grandfathered licenses to protect older polluters (Robertson 1995), incorporate transaction costs, remove uncertainty of property rights, have a competitive market, provide appropriate incentives to participate, or not take into account the “inability of firms to fully take advantage of the program opportunities because of flaws in their internal decision-making processes” (Hockenstein, Stavins et al. 1997). However, if implemented properly, MBIs can be useful in the provision of ES.

The research this report is based on aims to address the last two failures stated by Hockenstein et al. (1997) for MBIs that could be proposed by the Government of Alberta to help entice landowners to provide more ES. The research will examine how different levels of incentives/disincentives influence landowners’ willingness to participate in such programs, and thus what incentives will be most accepted. Also, the research looks at the internal decision making process of the targeted landowners and attempts to understand it by examining the influence of the overarching values they hold, their attitudes about the MBIs and resulting behaviours, societal pressures, external control, and demographics and socio-economic circumstances. The purpose of this report is to describe the research and provide a look at some initial results of the phone survey conducted for it.

## **2. Literature Review**

This literature review looks at some of the values landowners hold towards their land, and how these values influence their decision making and intention to participate in programs aiming to increase ES.

This review also goes into more detail on the influences of decision making with the Theory of Planned Behaviour.

### **2.1. Values Associated with Ecosystem Services**

Economic theory would suggest that the instrument that allows the individual to maximize their utility, based on the value that the individual places on ES and the activity of supplying the ES, would be the preferred MBI. However, this economic utility that individuals try to maximize does not tell us why the value was placed on the ES or the process of supplying it in the first place (Dietz, Fitzgerald et al. 2005), and thus the landowner's management response to an MBI is still not fully understood.

We turn to the field of psychology's use of the term 'value' to help explain the landowners' potential preferences of MBI and their willingness to supply ES. According to the belief system theory (Rokeach 1968), values are core beliefs that transcend all objects and situations and represent ideal modes of conduct and ends. People can hold a number of values that influence their life some of which are more influential than others, giving people value orientations. Maybery et al. (2005) discuss that farmers and landowners have been categorized into economic, environmental, and lifestyle value orientations and show that the farmers do hold these values. The economic orientation sees the land as a business and nature as a resource, whereas the environmental orientation cares more about protecting the land and being sustainable, and the lifestyle orientation is generally more concerned about the lifestyle aspects of farming. Identifying these value orientations in the Albertan landowners will help explain how they try to maximise utility from their property and how this influences their decision to supply ES in response to a given MBI, and why some landowners may not be motivated solely by profit incentives.

Stemming from values are attitudes, which the belief system theory describes as a group of beliefs that are particular to specific objects or situations (Rokeach 1968), such as the act of providing ES in response to a particular MBI. These attitudes are assumed to predispose its holder to behave in a certain

way that is in accordance with the attitudes and the overarching values (Rokeach 1968), and therefore also help explain the Landowners' willingness to supply ES given different incentives. i.e. it should indicate what how the preferred MBI should be designed. The relationship between attitudes and the landowners' behaviour is explained in more detail in the section on the theory of planned behaviour below.

## **2.2. Willingness to Participate in ES Programs**

To assess the landowners' willingness to participate in ES programs, or intention to participate, we need to understand the influences on such intention. As said earlier, attitudes are thought to directly influence behaviour, which can be illustrated with the theory of planned behaviour. Additionally, a number of researchers have added to this theory so some additional variables will be explained.

### **2.2.1. Theory of Planned Behaviour**

Much of the problems with earlier behaviour prediction models are that general values and attitudes were used and were not directed at a specific issue of interest. The theory of planned behaviour (TPB) (Ajzen 1991), aggregates specific belief questions surrounding the behaviour to create stronger predictive ability over behaviour and explanation of intention to behave. Ajzen (2006) states:

human action is guided by three kinds of considerations: beliefs about the likely outcomes of the behavior and the evaluations of these outcomes (behavioral beliefs), beliefs about the normative expectations of others and motivation to comply with these expectations (normative beliefs), and beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors (control beliefs). In their respective aggregates, behavioral beliefs produce a favorable or unfavorable *attitude toward the behavior*; normative beliefs result in perceived social pressure or *subjective norm*; and control beliefs give rise to *perceived behavioral control*. In combination, attitude toward the behavior, subjective norm, and perception of behavioral control lead to the formation of a behavioral *intention*.

Figure 1 illustrates how the theory is structured and the relationship between variables, and shows that the intention to behave is an immediate antecedent of behaviour. TPB was an expansion to the theory of reasoned action, which did not include the perceived behavioural control (PBC) variable, but because actual behaviour is also affected by external, situational factors (actual behavioural control), PBC was added to capture the influence of what people perceive will affect their behaviour (Ajzen 1991). With these factors, TPB has been used to predict human behaviour in specific contexts, such as water conservation (Trumbo and O'Keefe 2001; Lam 2006; Clark and Finley 2007) or landowners' decisions in riparian zone management (Beedell and Rehman 2000; Corbett 2002; Fielding, Terry et al. 2005).

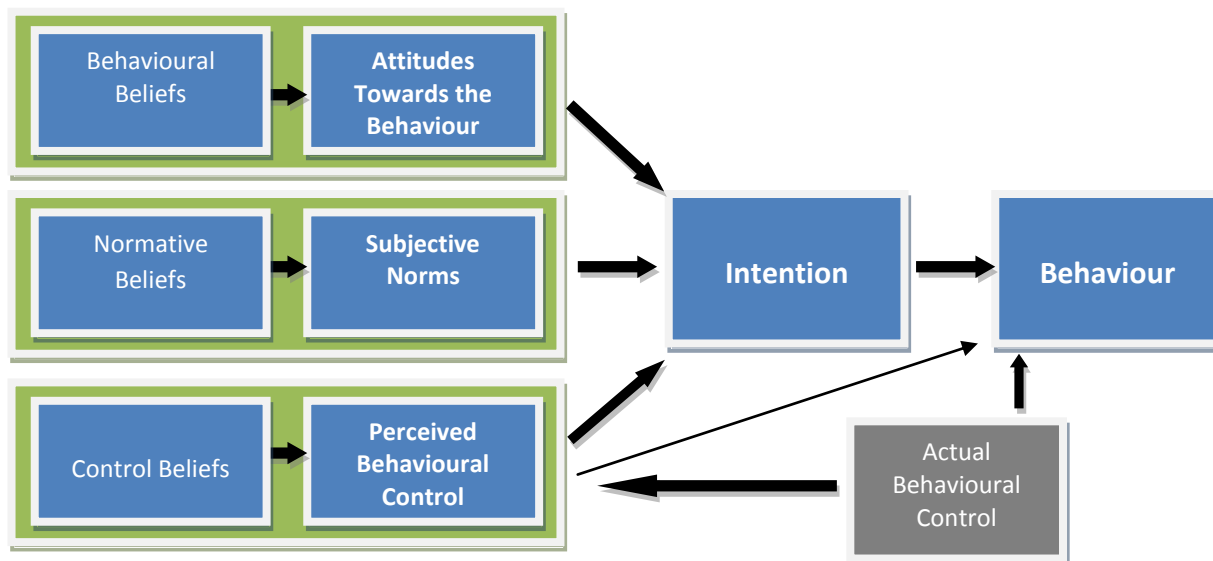


Figure 1: The theory of planned behaviour

### 2.2.2. Extended TPB

Researchers have added additional variables beyond the three core variables of TPB to provide increased explanation of variance in their studies. The inclusion of the variable past behaviour, moral obligation (Ajzen, 1991; Conner and Armitage, 1998), and self-efficacy (Conner and Armitage, 1998; Corbett, 2002) to TPB is common practice, as they tend to capture a significant amount of variance in the intention to behave or the actual behaviour itself. Although past behaviour does not cause future behaviour, people may have had similar experiences in the past or have formed a behavioural habit, which makes their decisions making simpler and less reliant on the other TPB variables (Ajzen, 1991;

Conner and Armitage, 1998). Moral obligation, or moral norms, considers the personal feelings of moral obligation or responsibility to perform, or refuse to perform, a certain behaviour in addition to the social pressures of the subjective norms and attitudes about the behaviour (Ajzen, 1991). The moral obligation relates to one's self identity; behaving, or intending to behave, against that identity would be unlikely as it creates internal conflicts (Conner and Armitage, 1998). Finally, self-efficacy as described by Corbett (2002) is the belief that one's actions make a difference on the overall environmental quality. Generally, people intend to engage in behaviours if they possess self-efficacy, which is theoretically different from the internal or external constraints or facilitators of PBC (Conner and Armitage, 1998).

### **2.2.3. Socio-economic and Demographic Variables**

Landowners' socio-economic and demographic characteristics as well as the physical and production characteristics of their land may also help to explain the landowner's choices. Values and attitudes are formed from exposure to external elements from a person's past experiences and interaction with others (Rokeach 1968), so these socio-economic and demographic variables that affect the landowners' lives will also have an influence on how they behave and make decisions.

Studies of environmental concern and behaviour in the 1970s and 1980s used attitudes and values as the principle variables for explanation and prediction (Corraliza and Berenguer 2000). However, their predictive capabilities were found lacking, the levels of measurement were general, abstract and hypothetical in nature, and there was little importance given to variables of a situational nature (Corraliza and Berenguer 2000). Because of the inadequacy of some the models, in the 1990s the focus of predictive variable for environmental behaviour shifted to situational factors, external to the person, to explain behaviour (Corraliza and Berenguer 2000). However, there are many possible external factors and they differ for each situation making them case by case factors. Knowler and Bradshaw (2007) reviewed situational factors of adoption of conservation agriculture by farmers identified in 31 different studies. They performed a synthesis of the studies and found that there were no universal

predictors of farmers' behaviour among the variables identified by each study. Commonly used variable in studies for adopting farm practices and participating in government programs include wealth, age, sex, education, experience, land size, type of land uses, family involvement, succession planning, and political affiliation (Marshall, 2004; Knowler and Bradshaw, 2007; Konisky et al., 2008).

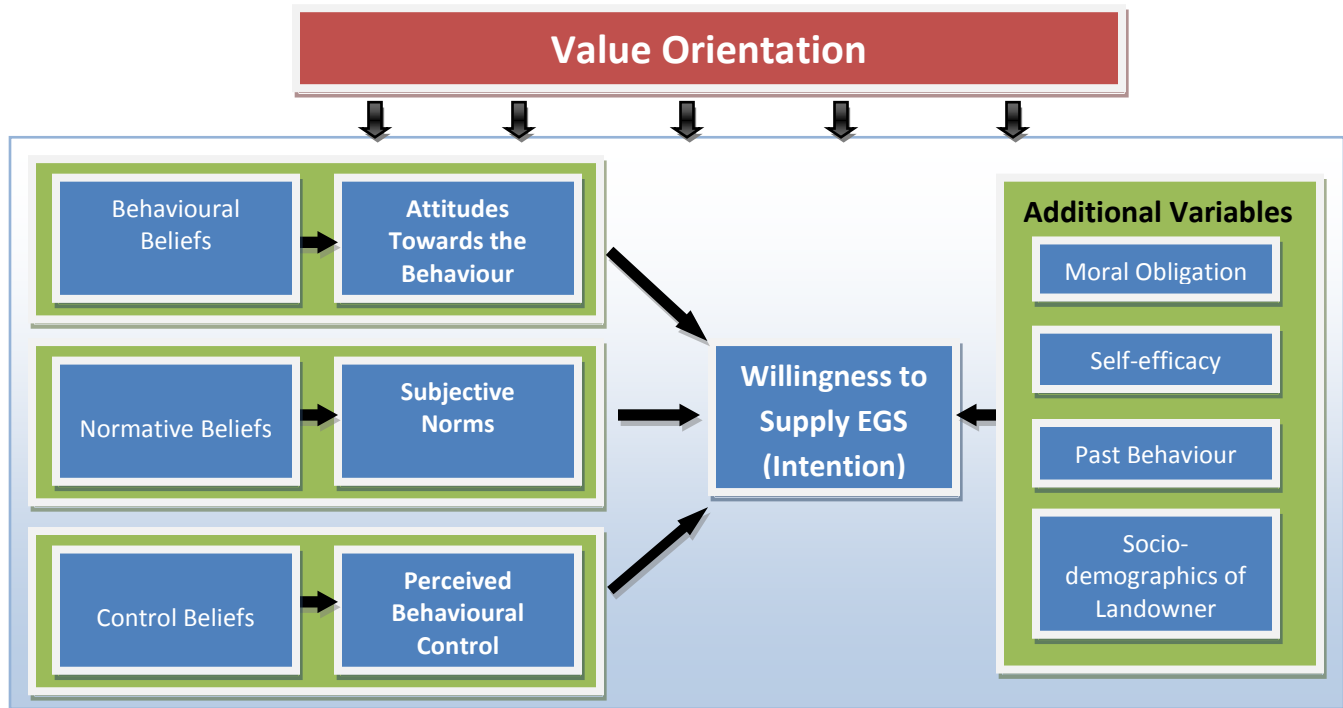
According to Ajzen (1991), the PBC of the TPB should account for many of these situational factors that might be limiting or facilitating of the behaviour in question, but for an in-depth analyse they will be included to help explain the PBC and the other belief variables. The external and situational factors push people towards certain behaviour or decisions while internal factors, such as values and attitudes, influence whether that decision is made or not. This means a person whose values and attitudes support a certain behaviour will be less likely to act on it if the external, situational variables are not facilitating it. It is when both the personal and situational variables coincide that an action, or non-action, will be likely to occur (Corraliza and Berenguer 2000). Therefore, understanding how situational variables and personal variables, of values and attitudes, interact is important for the understanding of why certain actions take place, such as the willingness to participate in ES programs.

### **2.3. Summary and Application to Study**

The literature surrounding values and attitudes when dealing with environmental issues around the world is far from consistent and therefore do not provide conclusive evidence to suggest how Albertan landowners think about MBIs and supplying ES. However, we do know landowners should be able to be grouped by their value orientation (Marbery et al. 2005), and since attitudes stem from values, grouping landowners by values then using TPB as the base of a model to understand their willingness to participate in ES programs should help our understanding. This literature review suggests that no studies like this have been conducted within the Albertan context. Additionally, only one known study has used the TPB while also braking down the study participants into clusters based on value orientation

(de Groot and Steg 2007). Beedell and Rehman (2000) grouped farmers based on environmental awareness and using TPB were able to show that those more environmentally concerned were more willing to participate in Land conservation practices and had more positive attitudes towards such behaviour.

The conceptual framework used in the study this report is based on can be seen in Figure 2. Unlike Figure 1, this framework stops at intention to behave (willingness to supply ES) because no actual behaviour was recorded. In addition to the standard TPB variables, the additional variables anticipated to influence the willingness are also shown in Figure 2. Indirectly influencing the importance of each variable on the willingness, are the different value orientations the landowners may belong to. This report, however, does not yet have the results of said study. Instead, this report will only show the results of the questionnaire conducted for the main study.



**Figure 2: Theoretical model to explain landowners' willingness to supply ES based on the theory of planned behaviour and the effects of value orientation.**

### **3. Study Area, Data and Methodology**

The study area included the Municipal District of Willow Creek and Lethbridge County of southern Alberta. Both neighbouring districts are in the Oldman River Basin (ORB) and contain a high amount of human land use. The combination of both districts allows for a good representation of the different land uses in ORB, as Lethbridge County contains irrigation districts and intensive agriculture and the MD of Willow Creek contains private irrigation, less intensive dryland farming, and larger ranches as the MD enters the foothill to the west. Within both the MD of Willow Creek and Lethbridge County there have been a number of studies on water quality within watersheds (Hyland, Byrne et al. 2003; Rock and Mayer 2004; Rodvang, Mikalson et al. 2004; Koning, Saffran et al. 2006; Rock and Mayer 2006; Lorenz 2008; Miller, Rasmussen et al. 2009), so the water quality is a well know concern in both areas.

The analysis in this report is based on a 350 completed phone interviews with rural landowners within the study area, during December of 2010. No list of purely rural landowners was available, so a list of phone numbers was purchased based on postal codes within the study region. A list of 4845 phone numbers was supplied to a professional firm to conduct the interviews. The list was narrowed down from all phone numbers available within the eligible postal codes in the study region from two separate list brokers to only include those that had rural addresses, P.O. Box addresses, or no address as it was impossible to tell whether or not they were rural landowners. A large portion of the phone numbers not linked to an address were still assumed to be non-landowners so a number of screening questions were asked before the actual phone questionnaire began. All 4845 phone numbers were dialled at least once, and at least 1918 were found to be ineligible for the study (i.e. not being landowners) and 1250 were never reached. Based on those who met the screening criteria or refused the interview before screening questions could be asked, there was a total of 1677 eligible households contacted, resulting in 350 completed surveys with a response rate of 20.9%.

The questionnaire was relatively long for a phone interview, containing 67 questions with answers based on a one to seven scale (e.g. 1 = strongly disagree and 7 =strongly agree), four questions providing the respondent's minimum amount of compensation required to participate in an ES program based on six option, and fourteen questions to gather socio-economic and demographic information.

The responses to all of the questions within the survey instrument are discussed in the findings section. Because groups based on value orientation or other factors have yet to be finalized, the questions are explored as a complete sample and also between the most obvious distinction of producers and non-producers. Descriptive statistics are reported and significance tests are used to identify the differences between the producer and non-producers within the sample.

For questions that are answered in a seven level Likert scale (e.g. 1=strongly disagree to 7=strongly agree), the Wilcoxon-Mann-Whitney test and the two independent Sample t-test are both used to find any significant differences between the producers and non-producers. The data collected from these scales are often interpreted as either ordinal or interval (Jamieson 2004), so the Wilcoxon-Mann-Whitney test is used to test with the ordinal interpretation and the two independent Sample t-test is used to test with the interval interpretation. Pearson's Chi-square test is used to test the association between two categorical variables, or one categorical and one ordinal variable.

## 4. Findings

### 4.1. Demographics

For the purpose of the descriptive analysis of this report, the respondents were divided into two groups: producers and non-producers. As stated before, this is the most obvious separation that can be made within the sample and should show the most variation without doing further analysis. Table 1 shows that 14.9% (n=52) of the respondents were classified as non-producers and 85.1% (n=298) were classified as producers. Breaking the producers down further shows that 59.4% of the sample has livestock (Table 2) and 39.4% are irrigators (Table 3). The interaction between livestock producers and irrigating producers can be seen in Table 4, and the largest group is shown to be non-irrigating, livestock producers.

**Table 1: Number of respondents surveyed based on being a producer**

|              | N   | %     |
|--------------|-----|-------|
| Non-producer | 52  | 14.9  |
| Producer     | 298 | 85.1  |
| Total        | 350 | 100.0 |

**Table 2: Number of respondents surveyed based on being a livestock producer**

|                        | N   | %     |
|------------------------|-----|-------|
| Non-producer           | 52  | 14.9  |
| Non-livestock producer | 90  | 25.7  |
| Livestock producer     | 208 | 59.4  |
| Total                  | 350 | 100.0 |

**Table 3: Number of respondents surveyed based on being an irrigating producer**

|                         | N   | %     |
|-------------------------|-----|-------|
| Non-producer            | 52  | 14.9  |
| Non-irrigating producer | 160 | 45.7  |
| Irrigating producer     | 138 | 39.4  |
| Total                   | 350 | 100.0 |

**Table 4: Number of respondents surveyed based on being a livestock producer and an irrigating producer**

|                        | Non-irrigating producer | Irrigating producer | Total |
|------------------------|-------------------------|---------------------|-------|
| Non-livestock producer | 39                      | 51                  | 90    |
| Livestock producer     | 121                     | 87                  | 208   |
| Total                  | 160                     | 138                 | 298   |

The sample was classified into producers or non-producers based on the following table of land uses (Table 5). If the respondent answered yes to any of the land uses marked with ‘^’ then they were classified as producers. If the respondent answered no to all of the land uses marked with ‘^’ then they were classified as non-producers. The Pearson’s Chi-square test shows that the producers and non-producers only differed significantly for three land uses. The act of renting one’s land to agricultural uses had the most significant difference, with 24.8% of producers saying they do participate in this activity, and only 5.8% of non-producers say that they do. Gardening was also found to be significant,

**Table 5: Respondents by Land Use (yes responses shown only)**

|  | Complete Sample |      | Non-producers |      | Producers |      |
|--|-----------------|------|---------------|------|-----------|------|
|  | N               | %    | N             | %    | N         | %    |
| <b>Residence</b>   | 324             | 92.6 | 51            | 98.1 | 273       | 91.6 |
| <b>Dryland farming ^</b>   | 141             | 40.3 | .             | .    | 141       | 47.3 |
| <b>Irrigation within an irrigation district ^</b>                            | 93              | 26.6 | .             | .    | 93        | 31.2 |
| <b>Private irrigation ^</b>  | 56              | 16.0 | .             | .    | 56        | 18.8 |
| <b>Specialty crops ^</b>   | 57              | 16.3 | .             | .    | 57        | 19.1 |
| <b>Beef production ^</b>   | 177             | 50.6 | .             | .    | 177       | 59.4 |
| <b>Poultry production ^</b>  | 18              | 5.1  | .             | .    | 18        | 6.0  |
| <b>Pork production ^</b>   | 13              | 3.7  | .             | .    | 13        | 4.4  |
| <b>Dairy production ^</b>  | 15              | 4.3  | .             | .    | 15        | 5.0  |
| <b>Other agricultural related business</b>                                   | 84              | 24.0 | 10            | 19.2 | 74        | 24.8 |
| <b>Renting to agricultural users ***</b>                                     | 77              | 22.0 | 3             | 5.8  | 74        | 24.8 |
| <b>Personal recreation *</b>   | 182             | 52.0 | 33            | 63.5 | 149       | 50.0 |
| <b>Tourism and recreational business</b>                                     | 15              | 4.3  | 1             | 1.9  | 14        | 4.7  |
| <b>Equine ^</b>  | 6               | 1.7  | .             | .    | 6         | 2.0  |
| <b>Other livestock (sheep, llamas, and bison) ^</b>                          | 4               | 1.1  | .             | .    | 4         | 1.3  |
| <b>Gardening **</b>  | 6               | 1.7  | 3             | 5.8  | 3         | 1.0  |
| Pearson's Chi-square test: *** p<0.01, ** p<0.05, * p<0.10, ^ not applicable |                 |      |               |      |           |      |

with 5.8 Percent of non-producers reporting this and only 1.0% of farmers reporting it. Gardening, along with equine and other livestock categories were not asked directly but were common answers when asked to list other land uses, so they were included here, but may not represent the frequencies if they were asked directly. Lastly, the use of one's own land for personal recreation was also found to be significant, with 63.5% of non-producers reporting this land use and only 50.0% of producers reporting it. The land uses marks with '^' were not tested with Pearson's Chi-square test because, by classification, non-producers will all have answered no.

There is a significant difference between producers and non-producers when it comes to size of land owned (Table 6). The majority of non-producers own less than ten acres and none own a full section (640 acres) or more, while the bulk of producers own from a quarter section (160 acres) to 2000 acres. This is expected as producers need more land to operate their businesses on.

**Table 6: Respondents according to acres of land owned**

| Acres             | Complete Sample |       | Non-producers |       | Producers |       |
|-------------------|-----------------|-------|---------------|-------|-----------|-------|
|                   | N               | %     | N             | %     | N         | %     |
| 1 - 4.9           | 31              | 8.9   | 19            | 36.5  | 12        | 4.0   |
| 5 - 9.9           | 32              | 9.1   | 16            | 30.8  | 16        | 5.4   |
| 10 - 24.9         | 14              | 4.0   | 5             | 9.6   | 9         | 3.0   |
| 25 - 49           | 17              | 4.9   | 4             | 7.7   | 13        | 4.4   |
| 50 - 99           | 19              | 5.4   | 2             | 3.8   | 17        | 5.7   |
| 100 - 159         | 17              | 4.9   | 2             | 3.8   | 15        | 5.0   |
| 160 - 319         | 50              | 14.3  | 2             | 3.8   | 48        | 16.1  |
| 320 - 639         | 44              | 12.6  | 2             | 3.8   | 42        | 14.1  |
| 640 - 999         | 31              | 8.9   | 0             | .0    | 31        | 10.4  |
| 1000 - 1999       | 44              | 12.6  | 0             | .0    | 44        | 14.8  |
| 2000 - 2999       | 10              | 2.9   | 0             | .0    | 10        | 3.4   |
| 3000 - 3999       | 7               | 2.0   | 0             | .0    | 7         | 2.3   |
| 4000 - 4999       | 5               | 1.4   | 0             | .0    | 5         | 1.7   |
| 5000 - 5999       | 8               | 2.3   | 0             | .0    | 8         | 2.7   |
| 6000 - 6999       | 3               | .9    | 0             | .0    | 3         | 1.0   |
| 7000 - 19999      | 1               | .3    | 0             | .0    | 1         | .3    |
| 20000 and greater | 6               | 1.7   | 0             | .0    | 6         | 2.0   |
| Missing data      | 11              | 3.1   | 0             | .0    | 11        | 3.7   |
| Total             | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 115.602. p-value=.000 ("Missing data" category excluded)

For the producers and non-producers, the distribution of approximate annual net household income is not significantly different (Table 7). However, the percentage of their household income that is derived from use of their land is significantly different according to Pearson's Chi-square test (Table 8). Almost all of the non-producers (96.2%) claimed that they only receive 0%-25% of their income from the use of their land, while only 40.3% of producers said the same. Additionally, 35.6% of producers said that they make 75%-100% of their income from use of their land.

**Table 7: Respondents according to approximate annual net household income**

| Net household income | Complete Sample |       | Non-producers |       | Producers |       |
|----------------------|-----------------|-------|---------------|-------|-----------|-------|
|                      | N               | %     | N             | %     | N         | %     |
| 10000 - 14999        | 1               | .3    | 0             | .0    | 1         | .3    |
| 15000 - 19999        | 3               | .9    | 0             | .0    | 3         | 1.0   |
| 20000 - 34999        | 26              | 7.4   | 3             | 5.8   | 23        | 7.7   |
| 35000 - 49999        | 30              | 8.6   | 5             | 9.6   | 25        | 8.4   |
| 50000 - 74999        | 83              | 23.7  | 12            | 23.1  | 71        | 23.8  |
| 75000 - 99999        | 33              | 9.4   | 8             | 15.4  | 25        | 8.4   |
| 100000 - 149999      | 58              | 16.6  | 9             | 17.3  | 49        | 16.4  |
| 150000 - 199999      | 12              | 3.4   | 2             | 3.8   | 10        | 3.4   |
| 200000 - 249999      | 12              | 3.4   | 0             | .0    | 12        | 4.0   |
| 250000 and greater   | 9               | 2.6   | 0             | .0    | 9         | 3.0   |
| Missing              | 83              | 23.7  | 13            | 25.0  | 70        | 23.5  |
| Total                | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 7.112. p-value=.625 ("Missing data" category excluded)

**Table 8: Respondents according to percentage of household income derived from use of their land**

| Percent of income    | Complete Sample |       | Non-producers |       | Producers |       |
|----------------------|-----------------|-------|---------------|-------|-----------|-------|
|                      | N               | %     | N             | %     | N         | %     |
| 0% to less than 25%  | 170             | 48.6  | 50            | 96.2  | 120       | 40.3  |
| 25% to less than 50% | 38              | 10.9  | 0             | .0    | 38        | 12.8  |
| 50% to less than 75% | 31              | 8.9   | 1             | 1.9   | 30        | 10.1  |
| 75% to 100%          | 106             | 30.3  | 0             | .0    | 106       | 35.6  |
| Missing data         | 5               | 1.4   | 1             | 1.9   | 4         | 1.3   |
| Total                | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 57.147. p-value=.000 ("Missing data" category excluded)

Although the survey was based on households rather than individuals, information on the individuals was also collected for analysis. The Person's Chi-square test found that the sex distribution differed significantly between producers and non-producers. Females accounted for 53.8% of the sample of non-producers, with males representing 46.2% (Table 9). For the producers, only 28.2% were females, while 71.8% were male. The heavy male participation with the producers is expected as the interviewer asked to talk to the long term decision maker for the land, which on farms traditionally is male.

**Table 9: Respondents according to sex**

|   | Complete Sample |       | Non-producers |       | Producers |       |
|---|-----------------|-------|---------------|-------|-----------|-------|
|   | N               | %     | N             | %     | N         | %     |
| Male  | 238             | 68.0  | 24            | 46.2  | 214       | 71.8  |
| Female  | 112             | 32.0  | 28            | 53.8  | 84        | 28.2  |
| Total   | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 13.395. p-value=.000 ("Missing data" category excluded) |                 |       |               |       |           |       |

No significant differences were found with respect to the decade of birth (Table 10), education level (Table 11), and decade of latest education (Table 12), and the two independent Sample t-tests for the ungrouped years of birth and education were also insignificant. The largest cohort was born in the 1950s (36.6% of the sample), most had a trade or college diploma (45.1%), and most received their highest level of education in the 1970s (30.9%)

**Table 10: Respondents according to decade of birth**

| Birth Decade   | Complete Sample |       | Non-producers |       | Producers |       |
|--|-----------------|-------|---------------|-------|-----------|-------|
|  | N               | %     | N             | %     | N         | %     |
| 1920s  | 4               | 1.1   | 1             | 1.9   | 3         | 1.0   |
| 1930s  | 27              | 7.7   | 2             | 3.8   | 25        | 8.4   |
| 1940s  | 67              | 19.1  | 11            | 21.2  | 56        | 18.8  |
| 1950s  | 128             | 36.6  | 19            | 36.5  | 109       | 36.6  |
| 1960s  | 69              | 19.7  | 9             | 17.3  | 60        | 20.1  |
| 1970s  | 41              | 11.7  | 7             | 13.5  | 34        | 11.4  |
| 1980s  | 7               | 2.0   | 0             | .0    | 7         | 2.3   |
| 1990s  | 1               | .3    | 0             | .0    | 1         | .3    |
| Missing data   | 6               | 1.7   | 3             | 5.8   | 3         | 1.0   |
| Total  | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 3.388. p-value=.847 ("Missing data" category excluded) |                 |       |               |       |           |       |
| Two independent Sample t-test: p-value = .927 (Calculated without decade categories)         |                 |       |               |       |           |       |

**Table 11: Respondents according to highest level of education**

| Highest education   | Complete Sample |       | Non-producers |       | Producers |       |
|---|-----------------|-------|---------------|-------|-----------|-------|
|   | N               | %     | N             | %     | N         | %     |
| No certificate, diploma or degree   | 33              | 9.4   | 5             | 9.6   | 28        | 9.4   |
| Secondary (high school) diploma or equivalency certificate                              | 88              | 25.1  | 11            | 21.2  | 77        | 25.8  |
| College or other non-university certificate diploma (including apprenticeship or trade) | 158             | 45.1  | 23            | 44.2  | 135       | 45.3  |
| University Bachelor's Degree  | 50              | 14.3  | 8             | 15.4  | 42        | 14.1  |
| University Master's or Doctorate degree   | 16              | 4.6   | 3             | 5.8   | 13        | 4.4   |
| Missing data  | 5               | 1.4   | 2             | 3.8   | 3         | 1.0   |
| Total   | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: .620. p-value=.961 ("Missing data" category excluded)

**Table 12: Respondents according to decade of highest education**

| Highest education decade | Complete Sample |       | Non-producers |       | Producers |       |
|--------------------------|-----------------|-------|---------------|-------|-----------|-------|
|                          | N               | %     | N             | %     | N         | %     |
| 1940s                    | 7               | 2.0   | 1             | 1.9   | 6         | 2.0   |
| 1950s                    | 22              | 6.3   | 0             | .0    | 22        | 7.4   |
| 1960s                    | 54              | 15.4  | 10            | 19.2  | 44        | 14.8  |
| 1970s                    | 108             | 30.9  | 15            | 28.8  | 93        | 31.2  |
| 1980s                    | 86              | 24.6  | 10            | 19.2  | 76        | 25.5  |
| 1990s                    | 43              | 12.3  | 9             | 17.3  | 34        | 11.4  |
| 2000s                    | 21              | 6.0   | 5             | 9.6   | 16        | 5.4   |
| 2010                     | 1               | .3    | 0             | .0    | 1         | .3    |
| Missing data             | 8               | 2.3   | 2             | 3.8   | 6         | 2.0   |
| Total                    | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 8.052. p-value=.328 ("Missing data" category excluded)  
Two independent Sample t-test: p-value = .116 (Calculated without decade categories)

Pearson's Chi-square test found no difference in marital status (Table 13) or number of children (Table 14) between the two groups, with 84.6% being legally married and most having two to three children. The two independent Sample *t*-test, however shows that the number of children for producers and non-producers are significantly different, with more non-producers having one or no children, and producers being more likely to have large families.

**Table 13: Respondents according to marital status**

| Marital Status           | Complete Sample |       | Non-producers |       | Producers |       |
|--------------------------|-----------------|-------|---------------|-------|-----------|-------|
|                          | N               | %     | N             | %     | N         | %     |
| Single and never married | 17              | 4.9   | 3             | 5.8   | 14        | 4.7   |
| Legally married          | 296             | 84.6  | 42            | 80.8  | 254       | 85.2  |
| Common-law               | 9               | 2.6   | 4             | 7.7   | 5         | 1.7   |
| Separated                | 2               | .6    | 0             | .0    | 2         | .7    |
| Divorced                 | 11              | 3.1   | 1             | 1.9   | 10        | 3.4   |
| Widowed                  | 14              | 4.0   | 2             | 3.8   | 12        | 4.0   |
| Missing data             | 1               | .3    | 0             | .0    | 1         | .3    |
| Total                    | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 7.062. p-value=.216 ("Missing data" category excluded)

**Table 14: Respondents according to number of children**

| # of children | Complete Sample |       | Non-producers |       | Producers |       |
|---------------|-----------------|-------|---------------|-------|-----------|-------|
|               | N               | %     | N             | %     | N         | %     |
| 0             | 20              | 5.7   | 4             | 7.7   | 16        | 5.4   |
| 1             | 25              | 7.1   | 6             | 11.5  | 19        | 6.4   |
| 2             | 106             | 30.3  | 15            | 28.8  | 91        | 30.5  |
| 3             | 94              | 26.9  | 15            | 28.8  | 79        | 26.5  |
| 4             | 44              | 12.6  | 4             | 7.7   | 40        | 13.4  |
| 5             | 23              | 6.6   | 2             | 3.8   | 21        | 7.0   |
| 6             | 10              | 2.9   | 1             | 1.9   | 9         | 3.0   |
| 7             | 11              | 3.1   | 0             | .0    | 11        | 3.7   |
| 8 +           | 6               | 1.7   | 1             | 1.9   | 5         | 1.7   |
| Missing data  | 11              | 3.1   | 4             | 7.7   | 7         | 2.3   |
| Total         | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 5.816. p-value=.561 ("Missing data" category excluded)  
Two independent Sample t-test: p-value = .062 (Calculated with expanded "8+" category)

There was a significant difference in the proportion of respondents being raised in a rural setting (Table 15). For non-producers, 61.5% of the respondents said they were raised in rural settings compared to 86.9% for producers. The number of generations, which the respondents' families have owned their land (Table 16), is also significantly different, with 78% of non-producers being the first generation to own

the land, while only 45.3% of producers were the first generation land owners. Also, in Table 17 it can be seen that there is a significant difference between producers and non-producers in their expectancy of passing on their land to their children. Among the non-producers, 42.3% expected to pass on their land to the next generation with 15.4% being uncertain. However, among producers, 64.1% felt certain about family succession with 13.4% being uncertain.

**Table 15: Respondents according to being raised in a rural setting**

| Raised in a rural setting   | Complete Sample |       | Non-producers |       | Producers |       |
|---|-----------------|-------|---------------|-------|-----------|-------|
|   | N               | %     | N             | %     | N         | %     |
| Yes   | 291             | 83.1  | 32            | 61.5  | 259       | 86.9  |
| No  | 59              | 16.9  | 20            | 38.5  | 39        | 13.1  |
| Total   | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 20.339. p-value=.000 ("Missing data" category excluded) |                 |       |               |       |           |       |

**Table 16: Respondents according to number of generations family has owned their land**

| # of generations  | Complete Sample |       | Non-producers |       | Producers |       |
|---|-----------------|-------|---------------|-------|-----------|-------|
|   | N               | %     | N             | %     | N         | %     |
| 1   | 176             | 50.3  | 41            | 78.8  | 135       | 45.3  |
| 2   | 61              | 17.4  | 1             | 1.9   | 60        | 20.1  |
| 3   | 76              | 21.7  | 9             | 17.3  | 67        | 22.5  |
| 4   | 29              | 8.3   | 1             | 1.9   | 28        | 9.4   |
| 5   | 6               | 1.7   | 0             | .0    | 6         | 2.0   |
| 6   | 2               | .6    | 0             | .0    | 2         | .7    |
| Total   | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 23.258. p-value=.000 ("Missing data" category excluded) |                 |       |               |       |           |       |

**Table 17: Respondents according to succession expectation**

| Do you expect your land to remain in your family for the next generation?                     | Complete Sample |       | Non-producers |       | Producers |       |
|---|-----------------|-------|---------------|-------|-----------|-------|
|   | N               | %     | N             | %     | N         | %     |
| Yes   | 213             | 60.9  | 22            | 42.3  | 191       | 64.1  |
| No  | 89              | 25.4  | 22            | 42.3  | 67        | 22.5  |
| Maybe   | 48              | 13.7  | 8             | 15.4  | 40        | 13.4  |
| Total   | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 10.420. p-value=.005 ("Missing data" category excluded) |                 |       |               |       |           |       |

Finally for the demographic information, the producers and non-producers were also found to be significantly different on the political scale (Table 18). Producers in general are found to be more conservative, with 66.8% claiming to be right wing, 22.8% claiming to be centrists, and only 7.0% left wing. Most of the non-producers are also conservative (44.2%), but there is a higher percentage of centrists (32.7%) and leftists (15.4%).

**Table 18: Respondents according to political orientation**

| Political scale  | Complete Sample |       | Non-producers |       | Producers |       |
|--|-----------------|-------|---------------|-------|-----------|-------|
|  | N               | %     | N             | %     | N         | %     |
| Right  | 222             | 63.4  | 23            | 44.2  | 199       | 66.8  |
| Centrist   | 85              | 24.3  | 17            | 32.7  | 68        | 22.8  |
| Left   | 29              | 8.3   | 8             | 15.4  | 21        | 7.0   |
| Missing  | 14              | 4.0   | 4             | 7.7   | 10        | 3.4   |
| Total  | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 9.250. p-value=.010 ("Missing data" category excluded) |                 |       |               |       |           |       |

## 4.2. Value Orientation Statements

There were two types of statements used to assess the landowners' value orientations; statements referring to a single element of a value, and statements comparing two values. Three statements referring to a single element to assess a single value were used, making a total of nine of these statements (i.e. three economic value statements, three environmental, and three lifestyle statements). There were also three comparative statements asking respondents to rate the importance of each value against the other values when making decisions (i.e. economic vs. environmental, economic vs. lifestyle, and environmental vs. lifestyle). All twelve statements were answered on a Likert scale from one to seven, with one strongly disagree and seven strongly agree.

For the economic value orientation statements (A1, A4, and A7 in Table 19), all three were found to be statistically different between producers and non-producers with both the Wilcoxon-Mann-Whitney test and the two independent Sample t-tests (indicated by stars in the first column). The distribution of

answers suggests that non-producers have lesser of an economic value orientation than do producers. This is expected because producers derive more of their income from use of their land than do non-producers. The economic value statement of greatest importance was clearly A4 relating to increasing the asset value of the land.

**Table 19: Economic Value Orientation Statements**

|  |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |      |      |      |      |      |      |
|--|-----------------|---|------|------|------|------|------|------|
|  |                 | 1   | 2    | 3    | 4    | 5    | 6    | 7    |
| A1) A maximum annual financial return from your property is your most important aim. ***/**      | Complete sample | 21.7  | 6.9  | 5.1  | 19.4 | 16.6 | 13.7 | 16.6 |
|  | Non-producers   | 63.5  | 3.8  | 7.7  | 13.5 | 5.8  | .0   | 5.8  |
|  | Producers       | 14.4  | 7.4  | 4.7  | 20.5 | 18.5 | 16.1 | 18.5 |
| A4) Increasing the asset value or net worth of your land is very important to you. ***/**        | Complete sample | 1.7   | 1.7  | 2.6  | 13.7 | 19.1 | 24.9 | 36.3 |
|  | Non-producers   | 5.8   | 3.8  | 1.9  | 26.9 | 13.5 | 23.1 | 25.0 |
|  | Producers       | 1.0   | 1.3  | 2.7  | 11.4 | 20.1 | 25.2 | 38.3 |
| A7) You view your land as first and foremost a business investment. ***/**                       | Complete sample | 16.0  | 6.0  | 9.4  | 16.0 | 17.1 | 13.4 | 22.0 |
|  | Non-producers   | 53.8  | 13.5 | 3.8  | 9.6  | 9.6  | 5.8  | 3.8  |
|  | Producers       | 9.4   | 4.7  | 10.4 | 17.1 | 18.5 | 14.8 | 25.2 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test |                 |   |      |      |      |      |      |      |

For the environmental value orientation statements (A2, A6, and A9 in Table 20), only A6 (“Your right to do what you want on your property has to be balance against wider environmental concerns.”) was found to be significantly different between the two groups. The results show that non-producers agree more strongly than do the producers to that statement, while not significant non-producers are also more likely to strongly agree with A2 reflecting the importance of managing environmental problems on the land. The least difference was found with respect to A9, leaving the land in a better shape than you found it. Overall Table 20 suggests that the non-producers’ are more environmentally oriented.

**Table 20: Environmental Value Orientation Statements**

|  |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |     |     |      |      |      |      |
|--|-----------------|---|-----|-----|------|------|------|------|
|  |                 | 1   | 2   | 3   | 4    | 5    | 6    | 7    |
| A2) Managing environmental problems on your land is a high priority.   | Complete sample | .9  | 1.1 | .6  | 9.1  | 15.4 | 33.7 | 39.1 |
|  | Non-producers   | 1.9   | .0  | 1.9 | 19.2 | 11.5 | 15.4 | 50.0 |
|  | Producers       | .7  | 1.3 | .3  | 7.4  | 16.1 | 36.9 | 37.2 |
| A6) Your right to do what you want with your property has to be balanced against wider environmental concerns.<br>***/** | Complete sample | 3.1   | 3.4 | 3.4 | 12.6 | 20.9 | 28.0 | 28.6 |
|  | Non-producers   | .0  | .0  | 3.8 | 9.6  | 17.3 | 25.0 | 44.2 |
|  | Producers       | 3.7   | 4.0 | 3.4 | 13.1 | 21.5 | 28.5 | 25.8 |
| A9) The most important thing is leaving your property in better shape than you found it.                                 | Complete sample | .0  | .3  | .0  | 3.4  | 5.4  | 23.1 | 67.7 |
|  | Non-producers   | .0  | .0  | .0  | 1.9  | 7.7  | 19.2 | 71.2 |
|  | Producers       | .0  | .3  | .0  | 3.7  | 5.0  | 23.8 | 67.1 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test                         |                 |   |     |     |      |      |      |      |

None of the lifestyle value orientation statements (A3, A5, and A8 in Table 21) were found to be significantly different between the producers and non-producers. The vast majority of the sample as a whole strongly agreed to all three statements with 74.9%, 80.0% and 75.7% respectively. This shows that the lifestyle value is strong for most rural landowners.

**Table 21: Lifestyle Value Orientation Statements**

|  |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |    |     |     |     |      |      |
|--|-----------------|---|----|-----|-----|-----|------|------|
|  |                 | 1   | 2  | 3   | 4   | 5   | 6    | 7    |
| A3) The lifestyle that comes with living in a rural area is very important to you.               | Complete sample | .3  | .6 | .3  | 2.0 | 6.0 | 16.0 | 74.9 |
|  | Non-producers   | 1.9   | .0 | .0  | 1.9 | 3.8 | 15.4 | 76.9 |
|  | Producers       | .0  | .7 | .3  | 2.0 | 6.4 | 16.1 | 74.5 |
| A5) For you, a rural environment is a better place to live than an urban environment.            | Complete sample | .0  | .3 | .3  | 2.3 | 2.9 | 14.3 | 80.0 |
|  | Non-producers   | .0  | .0 | .0  | 1.9 | .0  | 13.5 | 84.6 |
|  | Producers       | .0  | .3 | .3  | 2.3 | 3.4 | 14.4 | 79.2 |
| A8) Rural communities are a great place to live and raise a family.                              | Complete sample | .0  | .0 | .3  | .9  | 5.7 | 17.4 | 75.7 |
|  | Non-producers   | .0  | .0 | 1.9 | .0  | .0  | 17.3 | 80.8 |
|  | Producers       | .0  | .0 | .0  | 1.0 | 6.7 | 17.4 | 74.8 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test |                 |   |    |     |     |     |      |      |

For the comparative value orientation statements (A10, A11 and A12 in Table 22), the statements that compared economic values against lifestyle (A10) and environmental (A11) values were found to be significantly different between producers and non-producers. Non-producers had a greater tendency to disagree that economic factors outweighed lifestyle or environmental consideration, while producers had a greater tendency to agree. This goes along with the significant differences found with the economic value orientation questions in Table 19, illustrating that economic values are the most evident difference between the value orientations of producers and non-producers. Generally the sample has a higher tendency to agree that environmental concerns outweigh lifestyle considerations (A12). This relationship is also shown in the previous two questions where the sample is slightly less likely to disagree that economic factors outweigh lifestyle considerations than environmental ones. While both groups agree on the importance of lifestyle values when it comes to decision making economic and environmental values are most important.

**Table 22: Value Orientation Comparative Statements**

|  |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |      |      |      |      |      |      |
|--|-----------------|---|------|------|------|------|------|------|
|  |                 | 1   | 2    | 3    | 4    | 5    | 6    | 7    |
| A10) When faced with decisions that affect the way you manage your land, economic factors tend to outweigh lifestyle considerations.<br>***/** | Complete sample | 6.9   | 6.9  | 6.9  | 19.4 | 28.0 | 21.1 | 10.9 |
|  | Non-producers   | 19.2  | 11.5 | 3.8  | 21.2 | 17.3 | 25.0 | 1.9  |
|  | Producers       | 4.7   | 6.0  | 7.4  | 19.1 | 29.9 | 20.5 | 12.4 |
| A11) When faced with decisions that affect the way you manage your land, economic factors tend to outweigh environmental concerns.<br>***/**   | Complete sample | 8.9   | 9.1  | 16.0 | 23.4 | 21.4 | 16.6 | 4.6  |
|  | Non-producers   | 25.0  | 15.4 | 13.5 | 19.2 | 7.7  | 19.2 | .0   |
|  | Producers       | 6.0   | 8.1  | 16.4 | 24.2 | 23.8 | 16.1 | 5.4  |
| A12) When faced with decisions that affect the way you manage your land, environmental concerns tend to outweigh lifestyle considerations.     | Complete sample | 2.9   | 5.7  | 8.3  | 32.9 | 26.0 | 17.7 | 6.6  |
|  | Non-producers   | .0  | 5.8  | 17.3 | 23.1 | 32.7 | 15.4 | 5.8  |
|  | Producers       | 3.4   | 5.7  | 6.7  | 34.6 | 24.8 | 18.1 | 6.7  |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test   |                 |   |      |      |      |      |      |      |

### 4.3. Governance and Policy Opinion Statements

This section looks at the responses of rural landowners to different statements about water quality, ecosystem services, and financial incentives, disincentives and types of MBIs. The statements addressing the landowners' opinions on water quality issues (B1\_1, B1\_2, B1\_3 and B1\_4 in Table 23) resulted in two significant differences between producers and non-producers. There are more non-producers that do not believe water quality issues are well recognised in their area, and producers are more favourable towards using voluntary approaches or market incentive rather than regulation by the government to control water quality. The other two questions show that the sample believes both the government and the landowners should be responsible for water quality, with a stronger emphasis on the responsibility of the landowner.

**Table 23: Water Quality Opinion Statements**

|   |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7)                    |      |      |      |      |      |      |
|---|-----------------|--|------|------|------|------|------|------|
|   |                 | 1  | 2    | 3    | 4    | 5    | 6    | 7    |
| B1_1) Water quality issues are well recognized in your area. */**   | Complete sample | 3.7  | 4.3  | 3.4  | 10.0 | 13.1 | 27.1 | 38.3 |
|   | Non-producers   | 5.8  | 19.2 | 1.9  | 7.7  | 7.7  | 25.0 | 32.7 |
|   | Producers       | 3.4  | 1.7  | 3.7  | 10.4 | 14.1 | 27.5 | 39.3 |
| B1_2) Instead of using regulation to control water quality, government should use other means such as voluntary approaches or market incentives. **/*           | Complete sample | 11.4   | 7.7  | 10.0 | 26.0 | 13.7 | 18.3 | 12.9 |
|   | Non-producers   | 11.5   | 15.4 | 9.6  | 30.8 | 15.4 | 7.7  | 9.6  |
|   | Producers       | 11.4   | 6.4  | 10.1 | 25.2 | 13.4 | 20.1 | 13.4 |
| B1_3) The provincial government should be the entity held accountable and responsible for water quality.  | Complete sample | 5.4  | 8.0  | 6.3  | 21.7 | 20.6 | 19.4 | 18.6 |
|   | Non-producers   | 3.8  | 9.6  | 3.8  | 26.9 | 13.5 | 9.6  | 32.7 |
|   | Producers       | 5.7  | 7.7  | 6.7  | 20.8 | 21.8 | 21.1 | 16.1 |
| B1_4) Landowners, including farmers, ranchers, municipalities, golf courses, first nations, and so on, should be accountable and responsible for water quality. | Complete sample | .6   | 1.7  | 1.1  | 5.7  | 13.7 | 32.6 | 44.6 |
|   | Non-producers   | 3.8  | 3.8  | 3.8  | 1.9  | 7.7  | 30.8 | 48.1 |
|   | Producers       | .0   | 1.3  | .7   | 6.4  | 14.8 | 32.9 | 44.0 |
|   |                 | *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test |      |      |      |      |      |      |

The landowners' opinions on ecosystem services (B2\_1 and B2\_2) are shown in Table 24. The vast majority think that their land provides ecosystem services that benefit them and their family. However, Non-producers agree slightly stronger that improving water quality within the County of Lethbridge and the MD of Willow Creek will increase the benefits they receive from their land. This last statement was found to be significant only at the 10% level

**Table 24: Ecosystem Services Opinion Statements**

|   |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |     |     |      |      |      |      |
|---|-----------------|---|-----|-----|------|------|------|------|
|   |                 | 1   | 2   | 3   | 4    | 5    | 6    | 7    |
| B2_1) Your land provides Ecosystem Services that benefit you and your family.   | Complete sample | .6  | 1.1 | .6  | 4.0  | 14.0 | 31.7 | 48.0 |
|   | Non-producers   | .0  | 1.9 | .0  | 5.8  | 21.2 | 19.2 | 51.9 |
|   | Producers       | .7  | 1.0 | .7  | 3.7  | 12.8 | 33.9 | 47.3 |
| B2_2) Improving water quality within the County of Lethbridge and the MD of Willow Creek will increase the benefits that your family gets from your land. */* | Complete sample | 5.1   | 4.3 | 2.9 | 16.3 | 14.3 | 20.9 | 36.3 |
|   | Non-producers   | 1.9   | 1.9 | 3.8 | 15.4 | 11.5 | 19.2 | 46.2 |
|   | Producers       | 5.7   | 4.7 | 2.7 | 16.4 | 14.8 | 21.1 | 34.6 |
| *** p<0.01, ** p<0.05, * p<0.10, **/***: Wilcoxon-Mann-Whitney test/two independent Sample t-test   |                 |   |     |     |      |      |      |      |

Table 25 shows the results of different statements aimed at obtaining the opinions of the landowners on financial incentives and disincentives, and different MBIs for water quality protection. In general, question B3\_1 shows that there is a large group of landowners (30.3%) that are unsure if financial incentives are understood by members of their communities, rating it a four; producers and non-producers are not significantly different. However, the opinions of producers and non-producers on cost effectiveness being an appropriate reason to use MBIs to improve water quality (B3\_2) was found to differ significantly using both tests. It seems that producers are more likely to agree with this statement than are non-producers. The sample generally agrees that MBIs should be used to reduce run-off (B3\_3). However, the likelihood of agreeing with using MBIs to entice landowners to install buffer zones (B3\_4) differed significantly between producers and non-producers using the two independent Sample t-test. Although both groups generally agreed with the statement, non-producers agreed more

strongly. The sample generally agreed with the government providing payments for modifying land practices (B4\_1) and also that a financial reward/penalty program should be used (B4\_2). However for B4\_2, the level of agreement was significantly different, with non-producers more likely to agree with this reward/penalty system. Finally there is a wide range of opinions on the use of a credit system (B4\_3), with 21.7% being unsure or undecided.

**Table 25: Financial Incentive/Disincentive and MBI Opinion Statements**

|  |               | % of responses for scale of strongly disagree (1) to strongly agree (7) |      |      |      |      |      |      |
|--|---------------|---|------|------|------|------|------|------|
|  |               | 1   | 2    | 3    | 4    | 5    | 6    | 7    |
| B3_1) The use of financial incentives to improve water quality is currently understood by members of the Municipal District of Willow Creek and the County of Lethbridge.                            | Sample        | 8.6   | 9.4  | 12.3 | 30.3 | 21.4 | 12.0 | 6.0  |
|  | Non-producers | 7.7   | 15.4 | 13.5 | 30.8 | 21.2 | 5.8  | 5.8  |
|  | Producers     | 8.7   | 8.4  | 12.1 | 30.2 | 21.5 | 13.1 | 6.0  |
| B3_2) Cost effectiveness is an appropriate reason for using market-based instruments to improve water quality in this area. **/**  | Sample        | 4.6   | 2.9  | 7.7  | 21.7 | 26.6 | 24.9 | 11.7 |
|  | Non-producers | 7.7   | 9.6  | 9.6  | 23.1 | 21.2 | 15.4 | 13.5 |
|  | Producers     | 4.0   | 1.7  | 7.4  | 21.5 | 27.5 | 26.5 | 11.4 |
| B3_3) As fertilizer run-off contributes to water quality issues market-based instruments should be used to provide incentives to change land management practices to reduce run-off.                 | Sample        | 4.6   | 2.6  | 4.0  | 11.7 | 21.7 | 31.1 | 24.3 |
|  | Non-producers | 1.9   | 1.9  | 1.9  | 11.5 | 15.4 | 40.4 | 26.9 |
|  | Producers     | 5.0   | 2.7  | 4.4  | 11.7 | 22.8 | 29.5 | 23.8 |
| B3_4) As buffer zones in specific areas can help limiting run-off and thereby improve water quality market-based instruments should be used to provide incentives to install buffer zones. /**       | Sample        | 2.9   | 1.1  | 3.1  | 8.9  | 20.0 | 32.3 | 31.7 |
|  | Non-producers | .0  | .0   | .0   | 7.7  | 23.1 | 30.8 | 38.5 |
|  | Producers     | 3.4   | 1.3  | 3.7  | 9.1  | 19.5 | 32.6 | 30.5 |
| B4_1) As the greater community benefits from increased water quality, the gov should pay landowners to modify their land management practices to increase water quality.                             | Sample        | 6.6   | 6.6  | 7.4  | 18.6 | 21.7 | 21.7 | 17.4 |
|  | Non-producers | 5.8   | 7.7  | 11.5 | 19.2 | 15.4 | 26.9 | 13.5 |
|  | Producers     | 6.7   | 6.4  | 6.7  | 18.5 | 22.8 | 20.8 | 18.1 |
| B4_2) Land use regulations should be changed so that landowners with good conservation practices that benefit water quality are provided incentives and those with poor practices are penalised. /** | Sample        | 2.6   | 2.9  | 4.3  | 8.9  | 18.0 | 27.7 | 35.7 |
|  | Non-producers | .0  | 1.9  | 1.9  | 5.8  | 19.2 | 32.7 | 38.5 |
|  | Producers     | 3.0   | 3.0  | 4.7  | 9.4  | 17.8 | 26.8 | 35.2 |
| B4_3) The use of substances that are proven to degrade water quality should be limited. You would only agree if the landowners who reduce the use of these substances can earn a credit.             | Sample        | 15.1  | 10.9 | 11.7 | 21.7 | 21.7 | 11.4 | 7.4  |
|  | Non-producers | 11.5  | 9.6  | 11.5 | 25.0 | 23.1 | 9.6  | 9.6  |
|  | Producers     | 15.8  | 11.1 | 11.7 | 21.1 | 21.5 | 11.7 | 7.0  |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test   |               |   |      |      |      |      |      |      |

#### 4.4. TPB Statements

Ajzen (2006) outlined a method to elicit people's attitudes towards a behaviour or action, the subjective norms they are pressured by, and their perceived behavioural control to carry out that behaviour or action. This method was followed and involved asking pairs of questions to elicit their thought on the likelihood (strength) of a belief and some evaluation (weighting) of that belief actually being true. A set of eight pairs of behavioural beliefs statements were asked to understand the landowners' attitude toward the behaviour of changing land management practices for the provision of ES (Tables 26 and 27). A set of six pairs was used for the normative beliefs that make up the subjective norms of the landowners (Tables 28 and 29). A set of 5 pairs were used to elicit the control beliefs that make up the landowner's perceived behavioural control (Tables 30 and 31).

For behavioural beliefs, the landowners were first asked to state their agreement level toward the likelihood of possible outcomes from changing their land management practices to occur; in essence, a probability. Of the listed outcomes in Table 26, four out of eight were found to have statistically different responses from producers and non-producers. Non-producers think more strongly than producers that changing their land management practices for ES provision will improve the quality of the environment. Non producers are less likely, and producers are more likely, to think such changes will take their resources (i.e. time, labour, land and finances) away from other activities. Similarly, non-producers are less likely to think that the land management changes will reduce their ability to compete in local, regional or global markets. Finally, the producers have a much stronger thought than non-producers that these changes will bring on increased paper work and red tape. All other potential outcomes had a general agreement within the sample.

**Table 26: Behavioural Belief Strength Statements**

| Outcome of changing land management for ES provision   |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |      |      |      |      |      |      |
|--|-----------------|---|------|------|------|------|------|------|
|  |                 | 1   | 2    | 3    | 4    | 5    | 6    | 7    |
| C1_1a) Improved quality of the environment. ***/**     | Complete sample | 2.6   | 1.4  | 2.6  | 9.7  | 22.6 | 35.7 | 25.4 |
|  | Non-producers   | .0  | .0   | 1.9  | 7.7  | 15.4 | 36.5 | 38.5 |
|  | Producers       | 3.0   | 1.7  | 2.7  | 10.1 | 23.8 | 35.6 | 23.2 |
| C1_2a) Resources removed from other activities. ***/** | Complete sample | 6.3   | 5.1  | 12.6 | 30.3 | 28.3 | 12.3 | 5.1  |
|  | Non-producers   | 11.5  | 9.6  | 17.3 | 26.9 | 26.9 | 5.8  | 1.9  |
|  | Producers       | 5.4   | 4.4  | 11.7 | 30.9 | 28.5 | 13.4 | 5.7  |
| C1_3a) A sense of pride                                | Complete sample | 1.7   | .6   | .9   | 6.9  | 15.7 | 38.3 | 36.0 |
|  | Non-producers   | 1.9   | .0   | .0   | 7.7  | 17.3 | 32.7 | 40.4 |
|  | Producers       | 1.7   | .7   | 1.0  | 6.7  | 15.4 | 39.3 | 35.2 |
| C1_4a) Economic benefit                                | Complete sample | 4.0   | 2.6  | 3.1  | 16.9 | 20.9 | 28.6 | 24.0 |
|  | Non-producers   | 5.8   | 1.9  | 1.9  | 15.4 | 17.3 | 32.7 | 25.0 |
|  | Producers       | 3.7   | 2.7  | 3.4  | 17.1 | 21.5 | 27.9 | 23.8 |
| C1_5a) Reduced ability to compete. **/**               | Complete sample | 13.4  | 12.0 | 15.1 | 28.9 | 16.0 | 9.1  | 5.4  |
|  | Non-producers   | 25.0  | 13.5 | 15.4 | 23.1 | 15.4 | 1.9  | 5.8  |
|  | Producers       | 11.4  | 11.7 | 15.1 | 29.9 | 16.1 | 10.4 | 5.4  |
| C1_6a) Help protect the future                         | Complete sample | 1.1   | .9   | 2.0  | 7.7  | 14.9 | 30.0 | 43.4 |
|  | Non-producers   | 1.9   | .0   | .0   | 7.7  | 17.3 | 17.3 | 55.8 |
|  | Producers       | 1.0   | 1.0  | 2.3  | 7.7  | 14.4 | 32.2 | 41.3 |
| C1_7a) Increased red tape. ***/**                      | Complete sample | 3.7   | 3.4  | 7.4  | 13.4 | 14.6 | 23.1 | 34.3 |
|  | Non-producers   | 9.6   | 7.7  | 7.7  | 28.8 | 21.2 | 11.5 | 13.5 |
|  | Producers       | 2.7   | 2.7  | 7.4  | 10.7 | 13.4 | 25.2 | 37.9 |
| C1_8a) Benefit others                                  | Complete sample | 1.4   | 2.3  | 2.9  | 8.3  | 14.9 | 32.0 | 38.3 |
|  | Non-producers   | 1.9   | .0   | 5.8  | 1.9  | 21.2 | 21.2 | 48.1 |
|  | Producers       | 1.3   | 2.7  | 2.3  | 9.4  | 13.8 | 33.9 | 36.6 |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10, \*\*/\*\*: Wilcoxon-Mann-Whitney test/two independent Sample t-test

The second set of questions had the respondents evaluate the outcomes from the first set of questions based on desirability of the outcome. Again only four of the eight were found to be significantly different; of these two were the same as from the first questions (Table 27). Nobody found it desirable to have resources removed from other activities, but non-producers had 50.0% with no thought one way or the other and producers were more likely to think it was highly undesirable. Addressing a reduction in the ability to compete in markets, both groups have around 35% having no opinion one way or the other, but non-producers are more likely to think that it is highly undesirable than producers, which is

counter intuitive. The last two outcomes that were found to be significant did so only with one of the two tests run. For both, protecting the well being of future generations and benefiting others in society, the non-producers were more likely to find the outcomes more desirable. Thus while the two groups perceive the likelihood of the outcome similarly non-landowners found the outcome of benefitting the next generation and others in society to be more desirable, hence might have a bigger impact on their decision making.

**Table 27: Behavioural Belief Outcome Evaluation Statements**

| Outcome of changing land management for ES provision   |                 | Percent of responses for scale of highly undesirable (1) to highly desirable (7) |      |      |      |      |      |      |
|--|-----------------|--|------|------|------|------|------|------|
|  |                 | 1  | 2    | 3    | 4    | 5    | 6    | 7    |
| C1_1b) Improved quality of the environment.  | Complete sample | .3   | .0   | .3   | 7.1  | 9.1  | 25.1 | 58.0 |
|  | Non-producers   | .0   | .0   | .0   | 7.7  | 9.6  | 15.4 | 67.3 |
|  | Producers       | .3   |      | .3   | 7.0  | 9.1  | 26.8 | 56.4 |
| C1_2b) Resources removed from other activities. ***/**   | Complete sample | 33.7   | 16.6 | 12.6 | 37.1 | .0   | .0   | .0   |
|  | Non-producers   | 19.2   | 15.4 | 15.4 | 50.0 | .0   | .0   | .0   |
|  | Producers       | 36.2   | 16.8 | 12.1 | 34.9 | .0   | .0   | .0   |
| C1_3b) A sense of pride  | Complete sample | .0   | .0   | .3   | 6.6  | 14.9 | 32.3 | 46.0 |
|  | Non-producers   | .0   | .0   | .0   | 5.8  | 17.3 | 30.8 | 46.2 |
|  | Producers       | .0   | .0   | .3   | 6.7  | 14.4 | 32.6 | 46.0 |
| C1_4b) Economic benefit  | Complete sample | 1.4  | 1.7  | 1.7  | 15.1 | 22.3 | 30.3 | 27.4 |
|  | Non-producers   | 1.9  | 5.8  | 1.9  | 15.4 | 17.3 | 21.2 | 36.5 |
|  | Producers       | 1.3  | 1.0  | 1.7  | 15.1 | 23.2 | 31.9 | 25.8 |
| C1_5b) Reduced ability to compete. **/**   | Complete sample | 12.6   | 12.6 | 15.1 | 35.7 | 12.6 | 5.4  | 6.0  |
|  | Non-producers   | 21.2   | 15.4 | 15.4 | 34.6 | 11.5 | .0   | 1.9  |
|  | Producers       | 11.1   | 12.1 | 15.1 | 35.9 | 12.8 | 6.4  | 6.7  |
| C1_6b) Help protect the future. **/  | Complete sample | .3   | 1.1  | 1.4  | 6.9  | 16.0 | 27.1 | 47.1 |
|  | Non-producers   | .0   | .0   | 3.8  | 3.8  | 13.5 | 15.4 | 63.5 |
|  | Producers       | .3   | 1.3  | 1.0  | 7.4  | 16.4 | 29.2 | 44.3 |
| C1_7b) Increased red tape.   | Complete sample | 20.9   | 14.0 | 9.7  | 21.4 | 14.3 | 9.1  | 10.6 |
|  | Non-producers   | 15.4   | 13.5 | 13.5 | 23.1 | 25.0 | 1.9  | 7.7  |
|  | Producers       | 21.8   | 14.1 | 9.1  | 21.1 | 12.4 | 10.4 | 11.1 |
| C1_8b) Benefit others. /*  | Complete sample | 1.1  | 1.1  | 2.6  | 11.4 | 24.0 | 30.9 | 28.9 |
|  | Non-producers   | .0   | .0   | 1.9  | 7.7  | 28.8 | 21.2 | 40.4 |
|  | Producers       | 1.3  | 1.3  | 2.7  | 12.1 | 23.2 | 32.6 | 26.8 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test |                 |  |      |      |      |      |      |      |

Similarly, the normative beliefs that form the subjective norms address the strength of the belief (what individuals or groups that may influence the landowner may think) and a weighting of it (motivation to comply with that individual's or group's thoughts). For the normative belief strength statements, landowners were asked how much they agreed that the individuals or groups listed in Table 28 would think it would be a good idea for the respondents to make changes to their land management for ES provision. Generally, most landowners agreed that the listed individuals and groups would think the provision of ES on the landowners' property would be a good idea. Only for the group of professional, scientists, and members of environmental or conservation groups was it significantly different between producers and non-producers; the non-producers have a slightly stronger tendency to agree, but this was only significant with one test.

**Table 28: Normative Belief Strength Statements**

| Individuals or groups that would think making changes to your land management practices for ES provision is a good idea: |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |     |     |      |      |      |      |
|--|-----------------|---|-----|-----|------|------|------|------|
|  |                 | 1   | 2   | 3   | 4    | 5    | 6    | 7    |
| C2_1a) Family  | Complete sample | .9  | .3  | 1.7 | 10.9 | 14.3 | 29.1 | 42.9 |
|  | Non-producers   | .0  | 1.9 | .0  | 11.5 | 13.5 | 23.1 | 50.0 |
|  | Producers       | 1.0   | .0  | 2.0 | 10.7 | 14.4 | 30.2 | 41.6 |
| C2_2a) Government  | Complete sample | 2.0   | 1.7 | 2.6 | 21.4 | 15.7 | 24.0 | 32.6 |
|  | Non-producers   | .0  | 1.9 | 1.9 | 28.8 | 11.5 | 21.2 | 34.6 |
|  | Producers       | 2.3   | 1.7 | 2.7 | 20.1 | 16.4 | 24.5 | 32.2 |
| C2_3a) Professionals, scientists and environmental or conservation groups. /**   | Complete sample | .6  | .9  | 1.1 | 10.3 | 8.9  | 24.3 | 54.0 |
|  | Non-producers   | .0  | .0  | .0  | 3.8  | 9.6  | 28.8 | 57.7 |
|  | Producers       | .7  | 1.0 | 1.3 | 11.4 | 8.7  | 23.5 | 53.4 |
| C2_4a) Neighbours and peers  | Complete sample | 1.4   | 1.4 | 2.3 | 15.7 | 26.9 | 28.9 | 23.4 |
|  | Non-producers   | .0  | 1.9 | 3.8 | 13.5 | 26.9 | 28.8 | 25.0 |
|  | Producers       | 1.7   | 1.3 | 2.0 | 16.1 | 26.8 | 28.9 | 23.2 |
| C2_5a) recreational users of your land   | Complete sample | 4.6   | 1.4 | 1.1 | 18.3 | 18.3 | 24.3 | 32.0 |
|  | Non-producers   | 7.7   | 1.9 | .0  | 19.2 | 17.3 | 19.2 | 34.6 |
|  | Producers       | 4.0   | 1.3 | 1.3 | 18.1 | 18.5 | 25.2 | 31.5 |
| C2_6a) Members of agricultural communities and organizations   | Complete sample | 1.7   | 1.1 | 2.0 | 14.9 | 22.0 | 30.3 | 28.0 |
|  | Non-producers   | 3.8   | 1.9 | 5.8 | 13.5 | 21.2 | 19.2 | 34.6 |
|  | Producers       | 1.3   | 1.0 | 1.3 | 15.1 | 22.1 | 32.2 | 26.8 |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10, \*\*/\*\*: Wilcoxon-Mann-Whitney test/two independent Sample t-test

In Table 29, the responses of the landowners' motivation to comply with the perceived thoughts of the individuals and groups listed to provide ES are shown. In general, most landowners feel motivated to comply with the thoughts of all groups. However, non-producers are shown to be significantly more motivated to comply with professionals, scientists, and environmental or conservation groups than producers.

**Table 29: Motivation to Comply Statements**

| How much to you want to do what the following individuals or groups think you should do?         |                 | Percent of responses for scale of not at all (1) to very much (7) |     |      |      |      |      |      |
|--|-----------------|---|-----|------|------|------|------|------|
|  |                 | 1   | 2   | 3    | 4    | 5    | 6    | 7    |
| C2_1b) Family  | Complete sample | 3.7   | .9  | 2.6  | 11.7 | 17.1 | 30.0 | 34.0 |
|  | Non-producers   | 3.8   | .0  | 1.9  | 15.4 | 17.3 | 26.9 | 34.6 |
|  | Producers       | 3.7   | 1.0 | 2.7  | 11.1 | 17.1 | 30.5 | 33.9 |
| C2_2b) Government  | Complete sample | 12.9  | 5.1 | 6.3  | 24.9 | 20.9 | 16.9 | 13.1 |
|  | Non-producers   | 7.7   | .0  | 11.5 | 32.7 | 13.5 | 19.2 | 15.4 |
|  | Producers       | 13.8  | 6.0 | 5.4  | 23.5 | 22.1 | 16.4 | 12.8 |
| C2_3b) Professionals, scientists and environmental or conservation groups. **/**                 | Complete sample | 6.9   | 4.0 | 5.4  | 16.0 | 22.0 | 22.9 | 22.9 |
|  | Non-producers   | 1.9   | .0  | 9.6  | 11.5 | 19.2 | 23.1 | 34.6 |
|  | Producers       | 7.7   | 4.7 | 4.7  | 16.8 | 22.5 | 22.8 | 20.8 |
| C2_4b) Neighbours and peers  | Complete sample | 4.3   | 4.3 | 4.3  | 16.9 | 32.3 | 25.4 | 12.6 |
|  | Non-producers   | 3.8   | 3.8 | 5.8  | 17.3 | 26.9 | 23.1 | 19.2 |
|  | Producers       | 4.4   | 4.4 | 4.0  | 16.8 | 33.2 | 25.8 | 11.4 |
| C2_5b) recreational users of your land   | Complete sample | 10.3  | 6.9 | 5.7  | 26.3 | 21.1 | 17.7 | 12.0 |
|  | Non-producers   | 13.5  | 5.8 | 3.8  | 26.9 | 19.2 | 15.4 | 15.4 |
|  | Producers       | 9.7   | 7.0 | 6.0  | 26.2 | 21.5 | 18.1 | 11.4 |
| C2_6b) Members of agricultural communities and organizations                                     | Complete sample | 6.0   | 4.0 | 3.7  | 17.1 | 28.3 | 26.3 | 14.6 |
|  | Non-producers   | 11.5  | 3.8 | 3.8  | 21.2 | 19.2 | 17.3 | 23.1 |
|  | Producers       | 5.0   | 4.0 | 3.7  | 16.4 | 29.9 | 27.9 | 13.1 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test |                 |   |     |      |      |      |      |      |

To assess the perceived behavioural control of the landowners, the respondents were asked to rate their level of agreement with two sets of statements reflecting factors that might influence their ability to participate in an ES program and change their land management practices . The first set to find the

control belief strength of the factors (or likelihood of the factors being influential) and the other set to find the control belief power of the factors (or how difficult or easy the factors would make the behaviour). Table 30 shows the distribution of responses for the control belief strengths, where in general the respondents believe that all factors are likely to be influential, but it is only significantly different for producers and non-producers regarding external economic factors, the physical characteristics of their land, and the weather. In these three factors producers tend to have a stronger belief that they will influence their ability to participate

**Table 30: Control Belief Strength Statements**

| Possible factors on the ability to make changes for the provision of ES:                         |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |     |     |      |      |      |      |
|--|-----------------|---|-----|-----|------|------|------|------|
|  |                 | 1   | 2   | 3   | 4    | 5    | 6    | 7    |
| C3_1a) knowledge of environmental, economical and social impacts                                 | Complete sample | 5.4   | 2.3 | 3.7 | 12.3 | 27.7 | 25.1 | 23.4 |
|  | Non-producers   | 7.7   | 1.9 | 3.8 | 13.5 | 25.0 | 23.1 | 25.0 |
|  | Producers       | 5.0   | 2.3 | 3.7 | 12.1 | 28.2 | 25.5 | 23.2 |
| C1_2a) External economic factors. ***/**   | Complete sample | 3.7   | 2.6 | 6.3 | 12.3 | 20.3 | 31.1 | 23.7 |
|  | Non-producers   | 5.8   | 5.8 | 7.7 | 23.1 | 26.9 | 21.2 | 9.6  |
|  | Producers       | 3.4   | 2.0 | 6.0 | 10.4 | 19.1 | 32.9 | 26.2 |
| C1_3a) physical characteristics of land. **/**   | Complete sample | 4.0   | 2.0 | 3.7 | 10.9 | 15.7 | 30.6 | 33.1 |
|  | Non-producers   | 11.5  | 3.8 | 7.7 | 9.6  | 17.3 | 25.0 | 25.0 |
|  | Producers       | 2.7   | 1.7 | 3.0 | 11.1 | 15.4 | 31.5 | 34.6 |
| C1_4a) Weather. ***/**   | Complete sample | 2.6   | 2.6 | 3.4 | 12.9 | 18.6 | 24.3 | 35.7 |
|  | Non-producers   | 3.8   | 3.8 | 3.8 | 25.0 | 17.3 | 23.1 | 23.1 |
|  | Producers       | 2.3   | 2.3 | 3.4 | 10.7 | 18.8 | 24.5 | 37.9 |
| C1_5a) Time and finances allocated elsewhere   | Complete sample | 3.7   | 3.4 | 4.9 | 10.9 | 24.9 | 29.4 | 22.9 |
|  | Non-producers   | 1.9   | 9.6 | 5.8 | 11.5 | 28.8 | 19.2 | 23.1 |
|  | Producers       | 4.0   | 2.3 | 4.7 | 10.7 | 24.2 | 31.2 | 22.8 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test |                 |   |     |     |      |      |      |      |

Table 31 shows the control belief power the landowners associated with each factor. Only the physical characteristics of the land and the weather were found to be significantly different between producers and non-producers. For these factors, producers are more likely to think that the factors will add a higher level of difficulty to the process of making changes.

**Table 31: Control Belief Power Statements**

| Degree of difficulty the factors would add to the process of making changes to land management for ES |                 | Percent of responses for scale of very difficult (1) to very easy (7) |      |      |      |      |      |      |
|---|-----------------|---|------|------|------|------|------|------|
|   |                 | 1   | 2    | 3    | 4    | 5    | 6    | 7    |
| C3_1b) Lack of knowledge on environmental, economical and social impacts                              | Complete sample | 12.3  | 10.3 | 12.0 | 26.0 | 17.7 | 12.3 | 9.4  |
|   | Non-producers   | 11.5  | 5.8  | 9.6  | 26.9 | 21.2 | 19.2 | 5.8  |
|   | Producers       | 12.4  | 11.1 | 12.4 | 25.8 | 17.1 | 11.1 | 10.1 |
| C1_2b) External economic factors.   | Complete sample | 8.9   | 8.0  | 13.7 | 26.0 | 20.6 | 15.4 | 7.4  |
|   | Non-producers   | 3.8   | 7.7  | 7.7  | 34.6 | 19.2 | 17.3 | 9.6  |
|   | Producers       | 9.7   | 8.1  | 14.8 | 24.5 | 20.8 | 15.1 | 7.0  |
| C1_3b) physical characteristics of land. */*  | Complete sample | 8.0   | 6.3  | 12.0 | 18.9 | 20.6 | 19.7 | 14.6 |
|   | Non-producers   | 5.8   | 1.9  | 5.8  | 26.9 | 13.5 | 26.9 | 19.2 |
|   | Producers       | 8.4   | 7.0  | 13.1 | 17.4 | 21.8 | 18.5 | 13.8 |
| C1_4b) Weather. */*   | Complete sample | 10.3  | 10.6 | 10.3 | 20.9 | 17.7 | 16.9 | 13.4 |
|   | Non-producers   | 5.8   | 7.7  | 3.8  | 23.1 | 23.1 | 23.1 | 13.5 |
|   | Producers       | 11.1  | 11.1 | 11.4 | 20.5 | 16.8 | 15.8 | 13.4 |
| C1_5b) Time and finances allocated elsewhere  | Complete sample | 12.9  | 10.0 | 10.0 | 20.3 | 24.0 | 14.3 | 8.6  |
|   | Non-producers   | 3.8   | 11.5 | 11.5 | 19.2 | 25.0 | 19.2 | 9.6  |
|   | Producers       | 14.4  | 9.7  | 9.7  | 20.5 | 23.8 | 13.4 | 8.4  |
| *** p<0.01, ** p<0.05, * p<0.10, **/***: Wilcoxon-Mann-Whitney test/two independent Sample t-test     |                 |   |      |      |      |      |      |      |

#### 4.5. Extended TPB Statements

The additional variables that were meant to extend the theory of planned behaviour are shown in Table 32. Almost all land owners claim to feel a strong sense of moral responsibility to ensure the management of their land does not cause harm, and most feel that their actions do make a difference on the quality of the environment. Additionally, almost all landowners agree that they have adopted land management practices to fix environmental problems and provide ES on their own accord without the help of organizations or the government. However, when asked if they have adopted similar practices as part of a government or other organised program there was a slightly larger portion that disagreed. This was also the only variable in this group that was found to be significantly different between the producers and non-producers. Here Producers are more likely to have participated in such a program.

**Table 32: Extended TPB Statements**

|  |                 | Percent of responses for scale of strongly disagree (1) to strongly agree (7) |      |      |      |      |      |      |
|--|-----------------|---|------|------|------|------|------|------|
|  |                 | 1   | 2    | 3    | 4    | 5    | 6    | 7    |
| D1) You feel morally responsible to ensure that the management of your land does not cause harm.   | Complete sample | .9  | .6   | .3   | .3   | 5.4  | 25.7 | 66.9 |
|  | Non-producers   | .0  | .0   | .0   | 1.9  | 5.8  | 17.3 | 75.0 |
|  | Producers       | 1.0   | .7   | .3   | .0   | 5.4  | 27.2 | 65.4 |
| D2) How you treat your land doesn't make a difference to the quality of the environment.   | Complete sample | 50.3  | 18.3 | 7.4  | 4.9  | 4.3  | 6.9  | 8.0  |
|  | Non-producers   | 57.7  | 11.5 | 3.8  | .0   | 5.8  | 15.4 | 5.8  |
|  | Producers       | 49.0  | 19.5 | 8.1  | 5.7  | 4.0  | 5.4  | 8.4  |
| D3) You have adopted land management practices to fix environmental problems and benefit the ecosystem on your own accord without the aid of government or other organised programs. | Complete sample | 1.4   | 1.1  | .3   | 6.6  | 14.6 | 31.4 | 44.6 |
|  | Non-producers   | 1.9   | .0   | .0   | 9.6  | 13.5 | 32.7 | 42.3 |
|  | Producers       | 1.3   | 1.3  | .3   | 6.0  | 14.8 | 31.2 | 45.0 |
| D4) You have adopted land management practices as part of government or other organised programs to fix environmental problems and benefit the ecosystem. **/**                      | Complete sample | 22.9  | 12.0 | 7.1  | 21.4 | 14.9 | 9.4  | 12.3 |
|  | Non-producers   | 36.5  | 9.6  | 11.5 | 17.3 | 9.6  | 7.7  | 7.7  |
|  | Producers       | 20.5  | 12.4 | 6.4  | 22.1 | 15.8 | 9.7  | 13.1 |
| *** p<0.01, ** p<0.05, * p<0.10, **/**: Wilcoxon-Mann-Whitney test/two independent Sample t-test   |                 |   |      |      |      |      |      |      |

#### 4.6. Willingness to Participate in ES Programs

The willingness of the landowners to participate in ES programs was assessed using multiple scenarios that provided different incentive and disincentive options. The interviewer first read a statement to the respondents explaining that landowners are often faced with costs when asked to change their land management practices for environmental purposes, and that MBIs try to provide financial incentives or disincentives to encourage landowners to make such changes. The respondents were then asked to imagine a hypothetical change they could make to their land management and respond to four scenarios with the minimum financial incentive or disincentive they would require for participating. The financial incentives were given as percentages of the costs the landowner would face, from no cost covered, or no incentive, to more than 100% of costs covered. Also, the threat of a fine was listed as a disincentive

option. The four scenarios listed additional benefits the landowner may receive from the action itself if they were to participate in the program. In scenario one, the program would only provide environmental benefits, which is the control scenario. In scenario two, in addition to the environmental benefits, the action of changing the land management practices would also increase the productivity or property value due to increase ES. Scenario three, states that the action will enhance the landowner's lifestyle through community, aesthetic or recreational value due to improved ecosystem service provision, but no additional economic benefit. Finally, scenario four includes all of the additional benefits; environmental, economic, and lifestyle.

For scenario one, Table 33 shows the distribution of the responses for the complete sample and for the non-producers and producers. The majority of the respondents are willing to receive less than their full cost of taking part of the program, and according to the significance level of the Wilcoxon-Mann-Whitney test, the non-producers are willing to accept less than producers.

**Table 33: Respondents' Willingness to Participate in ES Programs (Scenario One – Environment benefits only)**

| Minimum incentive required   | Complete Sample |       | Non-producers |       | Producers |       |
|--|-----------------|-------|---------------|-------|-----------|-------|
|  | N               | %     | N             | %     | N         | %     |
| No Incentive   | 34              | 9.7   | 5             | 9.6   | 29        | 9.7   |
| Under 50% of costs   | 103             | 29.4  | 21            | 40.4  | 82        | 27.5  |
| Not all but over 50% of costs  | 126             | 36.0  | 21            | 40.4  | 105       | 35.2  |
| 100% of costs  | 54              | 15.4  | 4             | 7.7   | 50        | 16.8  |
| More than 100% of costs  | 12              | 3.4   | 0             | .0    | 12        | 4.0   |
| Threat of a fine   | 5               | 1.4   | 0             | .0    | 5         | 1.7   |
| Missing data   | 16              | 4.6   | 1             | 1.9   | 15        | 5.0   |
| Total  | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 7.928. p-value=.160 ("Missing data" category excluded) |                 |       |               |       |           |       |
| Wilcoxon-Mann-Whitney test: p-value = .035   |                 |       |               |       |           |       |

The responses for scenario two show that with the additional economic benefits that providing ES can bring will lower respondent's minimum incentive required (Table 34). Table 35 illustrates the same

thing but with the addition of lifestyle benefits instead of economic ones. The lifestyle benefits, however, do not reduce the incentives required by the respondents quite as much as the economic incentives. Neither scenario showed a significant difference between producers and non producers; however, non-producers seem to be more willing to accept less than producers based on percentages, except for the greater percentage of producers willing to accept no incentive when there are already economic benefits of providing ES.

**Table 34: Respondents' Willingness to Participate in ES Programs (Scenario Two Environment and Economic benefits)**

| Minimum incentive required    | Complete Sample |       | Non-producers |       | Producers |       |
|-------------------------------|-----------------|-------|---------------|-------|-----------|-------|
|                               | N               | %     | N             | %     | N         | %     |
| No Incentive                  | 70              | 20.0  | 7             | 13.5  | 63        | 21.1  |
| Under 50% of costs            | 146             | 41.7  | 28            | 53.8  | 118       | 39.6  |
| Not all but over 50% of costs | 82              | 23.4  | 13            | 25.0  | 69        | 23.2  |
| 100% of costs                 | 31              | 8.9   | 2             | 3.8   | 29        | 9.7   |
| More than 100% of costs       | 3               | .9    | 0             | .0    | 3         | 1.0   |
| Threat of a fine              | 0               | .0    | 0             | .0    | 0         | .0    |
| Missing data                  | 18              | 5.1   | 2             | 3.8   | 16        | 5.4   |
| Total                         | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 5.705. p-value=.222 ("Missing data" category excluded)  
 Wilcoxon-Mann-Whitney test: p-value = .888

**Table 35: Respondents' Willingness to Participate in ES Programs (Scenario Three Environment and lifestyle benefits)**

| Minimum incentive required    | Complete Sample |       | Non-producers |       | Producers |       |
|-------------------------------|-----------------|-------|---------------|-------|-----------|-------|
|                               | N               | %     | N             | %     | N         | %     |
| No Incentive                  | 67              | 19.1  | 13            | 25.0  | 54        | 18.1  |
| Under 50% of costs            | 130             | 37.1  | 21            | 40.4  | 109       | 36.6  |
| Not all but over 50% of costs | 86              | 24.6  | 11            | 21.2  | 75        | 25.2  |
| 100% of costs                 | 42              | 12.0  | 5             | 9.6   | 37        | 12.4  |
| More than 100% of costs       | 7               | 2.0   | 0             | .0    | 7         | 2.3   |
| Threat of a fine              | 1               | .3    | 0             | .0    | 1         | .3    |
| Missing data                  | 17              | 4.9   | 2             | 3.8   | 15        | 5.0   |
| Total                         | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |

Pearson's Chi-squared test statistic: 3.208. p-value=.668 ("Missing data" category excluded)  
 Wilcoxon-Mann-Whitney test: p-value = .110

With scenario four, Table 36 shows the greatest reduction of incentives required when all additional benefits are considered. There is no significant difference between producers and non-producers in this scenario either, but for both groups it provides the highest percentage of landowners willing to participate in the program with no financial incentives or disincentive.

**Table 36: Respondents' Willingness to Participate in ES Programs (Scenario Four – All Benefits)**

| Minimum incentive required   | Complete Sample |       | Non-producers |       | Producers |       |
|--|-----------------|-------|---------------|-------|-----------|-------|
|  | N               | %     | N             | %     | N         | %     |
| No Incentive   | 98              | 28.0  | 15            | 28.8  | 83        | 27.9  |
| Under 50% of costs   | 145             | 41.4  | 22            | 42.3  | 123       | 41.3  |
| Not all but over 50% of costs  | 70              | 20.0  | 12            | 23.1  | 58        | 19.5  |
| 100% of costs  | 22              | 6.3   | 1             | 1.9   | 21        | 7.0   |
| More than 100% of costs  | 4               | 1.1   | 1             | 1.9   | 3         | 1.0   |
| Threat of a fine   | 0               | .0    | 0             | .0    | 0         | .0    |
| Missing data   | 11              | 3.1   | 1             | 1.9   | 10        | 3.4   |
| Total  | 350             | 100.0 | 52            | 100.0 | 298       | 100.0 |
| Pearson's Chi-squared test statistic: 2.456. p-value=.653 ("Missing data" category excluded) |                 |       |               |       |           |       |
| Wilcoxon-Mann-Whitney test: p-value = .791   |                 |       |               |       |           |       |

## 5. Discussion

From the results of our exploratory analysis on producer and non-producer landowners surveyed some patterns are arising. Mainly, the stronger economic value orientation of producers and the slightly stronger environmental and lifestyle value orientations of the non-producers. Obviously being a producer will subject them to consider economic values in a greater way than non-producers as their livelihood depends on it. The non-producer's economic interest is more related to how certain issues will potentially impact the value of their property. Non-producers are more likely to consider personal recreation and gardening to be primary uses of their land. It is likely that the producers enjoy similar recreational activities to non-producers, but because of the primary importance of the agricultural activities as the main source of income, recreational activities may not have been on the forefront of their minds.

It is not surprising that producers were found to own larger amounts of land than non-producers. While there were no significant differences in household income producers derive a significantly higher portion of their household income from the use of their land, which also explains why they hold more economic values than non-producers and are more likely to be driven by economic factors than environmental or lifestyle factors when making decisions.

Other characteristics such as sex could have played a role in differences between producers and non-producers. Research has shown that women tend to be more environmentally concerned than men (Stern, Dietz et al. 1993), and in our sample a significantly higher proportion of producers were men. Therefore it's possible that female producers may have responded with greater emphasis on environmental and lifestyle value, rather than the strong economic orientation seen.

Although year of birth, type of highest education and the year of highest education were not significantly different between producers and non-producers, these variables may still have influence on different beliefs asked in the survey. Younger people are often found to be more environmentally concerned than older people, as are the more educated (Klineberg, McKeever et al. 1998). The year of highest education actually is a proxy for amount of experience after schooling and thus informal or hands on learning.

Producers are more likely to have been raised in a rural setting and to own properties which have been in the family's possession for several generations. Many of the non-producers are newcomers to rural living and have acquired the property for lifestyle purposes and fewer have expectations of family continuity, and if they expect family continuity it is also likely to be as a residence for lifestyle purposes. Hence lifestyle and environmental issues are likely to be of more importance to them. Non-producers management decisions are more likely to be driven by what the influence would be on the value of their land rather than the productive capacity. Proceeds from selling the property might well be part of their superannuation planning.

The last of the personal characteristics that was found significant between producers and non-producers was their political orientation. More producers were found to consider themselves as conservative or right wing. People on the right wing of the political scale are considered to be less supportive of environmental programs than those on the left wing (Konisky, Milyo et al. 2008). The fact that producers are more conservative might help illustrate why they are less environmentally oriented. Also, the political orientation may have an effect on how they respond to the policy questions.

From the water quality questions in the governance and policy opinion statement section, producers are more likely to think that water quality issues are well recognized in their area than non-producers. As producers may deal more with irrigations and rain runoff issues, it makes sense that they are more aware

of the issues faced in the region. Non-producers think more strongly that improving the water quality within the regions will increase the benefit their family derives from their land. This may stem from their greater focus on environmental and lifestyle values as well as the asset value of their property. Producers are more likely to support the use of MBIs over the use of government regulation to control water quality. Additionally, more producers agree that cost effectiveness is an appropriate reason for the use of MBIs to improve water quality. These may also link back to their more conservative political orientation as well as their economic value orientation. Producers are slightly less supportive than non-producers of an incentive/disincentive system for landowners with good or bad conservation practices, and also less supportive of the use of incentives for buffer zones.

When it comes to the producers' beliefs about the action of changing land management practices for the provision of ES, their higher economic and lower environmental concerns continue to show through. Producers think less strongly that the action will produce an increased quality of environment than do non-producers. Producers also are more likely to believe that their resources will be taken away from other activities, leaving them with a reduced ability to compete in different markets. In addition, producers are more confident that participating in such programs will increase paperwork and red tape, showing they may think it to be more of a hassle. Similarly, producers are more likely to find having resources taken away from other activities is undesirable, whereas non-producers are more likely to find the reduced ability to compete in markets to be undesirable, which is counter intuitive when thinking about their value orientations and lack of marketable production on their land. Non-producers are more likely to find it desirable that their decision to change management practice to provide ES will protect the future and benefit others in society. In general, this shows that non-producers may have a stronger attitude towards the action of participating in an ES program.

For the subjective norms, producers' and non-producers' perception of how certain groups will approve of participating in ES programs and how much they are motivated to comply with what those groups

think. However, non-producers seem to be more likely to be influenced by the opinion of professionals, scientists, and members of environmental and conservation groups.

Producers also seem to feel that they have weaker perceived behavioural control than non-producers. They are more likely to agree that external economic factors, the physical characteristics of their land, and the weather will have an effect on their abilities to follow through with completing the actions asked by an ES program. Producers also are less likely to believe that the physical characteristics of their land and the weather prevent them from partaking in ES programs. It's interesting to note that in the extended TPB variable the only one that was significantly different between producers and non-producers was that producers have participated in more government, or non-government, programs to provide ES than non-producers. This could show that producers have more experience with such programs and may know the actual difficulty involved, whereas non-producer do not have as much basis from their responses. Another theory, as identified by Corbett (2002) to explain her findings on past behaviour's negative influence on the intention of farmers and ranchers to protect riparian areas in the future, which was contrary to past research in other fields, was that the producers who have participated in past programs may find it unnecessary to participate in additional programs and that their land needs no more improvement.

When it comes down to the actual questions regarding the minimum financial incentive required in order for the landowners to be willing to participate in ES programs, the majority of landowners are willing to accept less than 100% repayment of the costs they may encounter, and as the landowners see more benefit from the programs they require less financial incentive. In the base-line scenario (scenario one, where only environmental benefits are gained) non-producers are more willing to accept lower financial incentives. When economic benefits are introduced, the sample shifts towards requiring lower financial incentives, and although non-producers remain to be the most willing to accept less than 100% of their costs in financial incentives, producers become the most willing to participate with no incentive. When

the lifestyle benefit is introduced, without the economic benefits, the minimum financial incentive for the sample also decreases from the base-line, however, not as much as the economic benefit scenario. Here non-producers become the most willing to participate with no financial incentive. Scenario four, where all the additional benefits are included, the sample is most willing to accept reduced financial incentives and there is the greatest proportion of the four scenarios that is willing to participate with no. Here non-producers are willing to accept less, but just by a small fraction; however, only scenario one was shown to be statistically significant between the producers and non-producers. Looking at the pattern between the producers and non-producers with the willingness to participate with no incentive, we can see the influence of benefits that the groups find more value in. Producers, who are more economic value oriented, have the highest percentage willing to participate with no incentive (7.6% greater than non-producers) when the program produces economic benefits. On the other hand, non-producers, who are more environmental and lifestyle value oriented, were the most willing to participate with no incentive (6.9% greater than producers) when lifestyle and economic benefits are possible. When only environmental benefits or the combination of all benefits are described, the percentage difference is under one percent. Seeing that the difference between what producers and non-producers value more, and then seeing that the combination of all benefits produces similar distributions among the two groups shows lifestyle benefits can be just as or more important than economic benefits, while being unimportant for others.

Further research, however, needs to be undertaken to fully explore the variables examined in this report. Although some trends in value orientations and willingness to participate in ES programs can be seen with the basic separation of producers and non-producers, a more sophisticated analysis is needed to take into account the influences of each variable and combinations of them. Can the landowners be grouped based on their value orientations and do those groups have common personal and land characteristics? Do attitudes, subjective norms, and perceived behavioural controls explain the

willingness of landowners to accept certain levels of financial incentives to participate in ES programs?  
If so, are the influences of these variables, as well as the others, more or less influential for different value orientation groups? These questions remain for future research on this project to answer.

## 6. Conclusion

Previous literature has shown that there are many variables that influence landowners' adoption of, or intention to adopt, conservation practices. From situational factors like demographics, economics and social pressures, to internal factors like one's core values and resulting attitudes and beliefs. This report is based on a survey of landowners and has investigated the minimum financial incentives required by landowners in southern Alberta to participate in ecosystem service providing, land management programs. From the literature, it should be possible to group different landowners together according to their value orientations. Within these orientations it should then be possible to see what other variables more heavily explain the landowners' willingness to participate in proposed ecosystem service programs. However, this report provides a preliminary analysis of the respondents based on them using their land as producers or non-producers rather than their value orientation.

The survey collected 350 responses from rural landowners in the Municipal District to Willow Creek and the County of Lethbridge in southern Alberta. The variables included personal and land characteristics pertaining to each landowner (14 items), beliefs that form attitudes (16 items), subjective norms (12 items), and perceived behavioural controls (10 items) from the theory of planned behaviour, as well as variables that extend the theory, including moral obligation, self-efficacy and past behaviour (four in all). As specific beliefs and attitudes one may hold stem from core values, variables measuring the economic, environmental, and lifestyle value orientations outlined by previous literature were also included (12 items). In the personal and land characteristics, 298 respondents were identified as producers, with the remaining 52 as non-producers. Additionally, the following statistical differences were found between these two groups (to at least 10%): producers are more likely to own larger pieces of land, rent it out to other agricultural users, derive a higher percentage of their income from the use of their land, and be less likely to list personal recreation and gardening as primary uses of their land.

Additionally, the producers were more likely to be male, be raised in a rural setting, be politically conservative, have more children, own land that has been in the family for longer, and have a higher expectancy of the land remaining in the family for the next generation. For value orientations, producers are more likely to value economics over other values, and feel less strongly that they have to balance their right to do what they want on their property with wider environmental concerns. For the questions on governance and policy, producers are more likely to agree that the issues of water quality are well recognized in their area. Also, in general, producers are more supportive of the use of voluntary methods and MBIs (with their cost effectiveness) over regulation.

When it comes to beliefs about the outcomes of providing ecosystem services, producers seem to be more concerned about the economics or hassle of doing so, where non-producers think more of the benefit it would provide to others and the environment. Producers are also less receptive to the opinions of professionals, scientists and members of environmental or conservation groups. Generally, producers feel they have less control over being able to provide ecosystem services, even though more have participated in such government programs in the past. These factors likely add up to influence the finding that producers require higher minimum financial incentive to participate in a new program to increase the provision of ES. Once the additional lifestyle and economic benefits are introduced, there wasn't a significant difference between the producers and non-producers. There is a general reduction of financial incentive required to participate in ES programs if it can be documented that the program will, apart from increasing the provision of ES, also resulted in increased lifestyle benefits, economic productivity and property values. This finding highlight the need to communicate multiple benefits from programs to improve ES as part of the marketing material used to promote the program. Often changing management practices promoted by ES programs do have these additional benefits but so far this has not been effectively communicated.

Our findings seem to indicate that different landowner groups hold different value orientations and opinions about supplying ecosystem services, with producers having more economic concerns and non-producers more environmental and social concerns. It can be anticipated that there is variability within the producer group so that it can be broken down into more specific groups. With the more sophisticated analysis planned, the groups will be based on value orientation and different land uses may group more strongly with the different orientations. It is of importance to note that those who listed the land use of leasing their land to other agricultural users may be producers leasing out only a portion of their land, or they have ended their farming operations but lease the land to other producers, and thus are no longer producers. A separate analysis, not reported here, compared the variables between these two groups and found few differences other than that those who rented out their land were older and owned less land, which supports the idea that retired producers have been included in the producer group of this report. This, and other topics, will be explored further in the research forthcoming from this project.

## References

- Ajzen, I. (1991). "The Theory of Planned Behavior." Organizational Behavior and Human Decision Processes **50**(2): 179-211.
- Ajzen, I. (2006). "Constructing a TPB Questionnaire: Conceptual and Methodological Considerations." Retrieved May 21, 2010, from <http://www.people.umass.edu/aizen/pdf/tpb.measurement.pdf>.
- Beedell, J. and T. Rehman (2000). "Using social-psychology models to understand farmers' conservation behaviour." Journal of Rural Studies **16**(1): 117-127.
- Brauman, K. A., G. C. Daily, et al. (2007). "The nature and value of ecosystem services: An overview highlighting hydrologic services." Annual Review of Environment and Resources **32**: 67-98.
- Clark, W. A. and J. C. Finley (2007). "Determinants of water conservation intention in Blagoevgrad, Bulgaria." Society & Natural Resources **20**(7): 613-627.
- Colby, B. G. (2000). "Cap-and-trade policy challenges: A tale of three markets." Land Economics **76**(4): 638-658.
- Corbett, J. B. (2002). "Motivations to participate in riparian improvement programs - Applying the theory of planned behavior." Science Communication **23**(3): 243-263.
- Corraliza, J. A. and J. Berenguer (2000). "Environmental values, beliefs, and actions - A situational approach." Environment and Behavior **32**(6): 832-848.
- de Groot, J. and L. Steg (2007). "General beliefs and the theory of planned behavior: The role of environmental concerns in the TPB." Journal of Applied Social Psychology **37**(8): 1817-1836.
- Dietz, T., A. Fitzgerald, et al. (2005). "Environmental values." Annual Review of Environment and Resources **30**: 335-372.
- Fielding, K. S., D. J. Terry, et al. (2005). "Explaining landholders' decisions about riparian zone management: The role of behavioural, normative, and control beliefs." Journal of Environmental Management **77**(1): 12-21.
- GoA (2003). Water for Life: Alberta's Strategy for Sustainability. AlbertaEnvironment.
- GoA (2008). Land-Use Framework. AlbertaEnvironment.
- GoA (2009). Water for Life: Action Plan. AlbertaEnvironment.
- GoA. (2010). "Market based instruments and fiscal mechanisms." Retrieved August 12, 2010, from <http://www.environment.alberta.ca/01825.html>.
- Hahn, R. W. (2000). "The impact of economics on environmental policy." Journal of Environmental Economics and Management **39**(3): 375-399.
- Hahn, R. W. and R. N. Stavins (1992). ECONOMIC INCENTIVES FOR ENVIRONMENTAL-PROTECTION - INTEGRATING THEORY AND PRACTICE, Amer Economic Assoc.
- Henderson, B. and K. Norris (2008). "Experiences with market-based instruments for environmental management." Australasian Journal of Environmental Management **15**(2): 113-120.
- Hockenstein, J. B., R. N. Stavins, et al. (1997). "Crafting the next generation of market-based environmental tools." Environment **39**(4): 12-33.
- Hyland, R., J. Byrne, et al. (2003). "Spatial and temporal distribution of fecal indicator bacteria within the Oldman River Basin of southern Alberta, Canada." Water Quality Research Journal of Canada **38**(1): 15-32.
- Jaffe, A. B., Newell, R., and Stavins, R. (2001). "Technological Change and the Environment." John F. Kennedy School of Government, Harvard University Research Working Papers Series.
- Jamieson, S. (2004). "Likert scales: how to (ab)use them." Medical Education **38**(12): 1217-1218.
- Klineberg, S. L., M. McKeever, et al. (1998). "Demographic predictors of environmental concern: It does make a difference how it's measured." Social Science Quarterly **79**(4): 734-753.

- Knowler, D. and B. Bradshaw (2007). "Farmers' adoption of conservation agriculture: A review and synthesis of recent research." Food Policy **32**(1): 25-48.
- Koning, C. W., K. A. Saffran, et al. (2006). "Water quality monitoring: the basis for watershed management in the Oldman River Basin, Canada." Water Science and Technology **53**(10): 153-161.
- Konisky, D. M., J. Milyo, et al. (2008). "Environmental policy attitudes: Issues, geographical scale, and political trust." Social Science Quarterly **89**(5): 1066-1085.
- Lam, S. P. (2006). "Predicting intention to save water: Theory of planned behavior, response efficacy, vulnerability, and perceived efficiency of alternative solutions." Journal of Applied Social Psychology **36**(11): 2803-2824.
- Lorenz, K. N., Depoe, S.L., and Phelan, C.A. (2008). Volume 3: AESA Water Quality Monitoring Project A Summary of Surface Water Quality in Alberta's Agricultural Watersheds: 1995 to 2006. Edmonton, Alberta, Canada, Alberta Agriculture and Rural Development.
- MEA (2005). Ecosystems and Human Well-being: Wetlands and Water Synthesis. Washington, DC., World Resources Institute.
- Miller, L. L., J. B. Rasmussen, et al. (2009). "Physiological stress response in white suckers from agricultural drain waters containing pesticides and selenium." Ecotoxicology and Environmental Safety **72**(4): 1249-1256.
- Nanos, N. (2009). "Canadians overwhelmingly choose water as our most important natural resource." Policy Options **30**(7): 12-15.
- Newell, R. G. and R. N. Stavins (2003). "Cost heterogeneity and the potential savings from market-based policies." Journal of Regulatory Economics **23**(1): 43-59.
- Robertson, H. (1995). "If Your Grandfather Could Pollute, so Can You: Environmental 'Grandfather Clauses' and Their Role in Environmental Inequity." Catholic University Law Review **45**(131): 131-179.
- Rock, L. and B. Mayer (2004). "Isotopic Assessment of Sources of Surface Water Nitrate within the Oldman River Basin, Southern Alberta, Canada." Water, Air & Soil Pollution: Focus **4**(2/3): 545-562.
- Rock, L. and B. Mayer (2006). "Nitrogen budget for the Oldman River Basin, southern Alberta, Canada." Nutrient Cycling in Agroecosystems **75**(1-3): 147-162.
- Rodvang, S. J., D. M. Mikalson, et al. (2004). "Changes in ground water quality in an irrigated area of southern Alberta." Journal of Environmental Quality **33**(2): 476-487.
- Rokeach, M. (1968). Beliefs Attitudes and Values: A Theory of Organization and Change. San Francisco, Jossey-Bass Inc., Pub.
- Stavins, R. N. (1998). "What can we learn from the grand policy experiment? Lessons from SO<sub>2</sub> allowance trading." Journal of Economic Perspectives **12**(3): 69-88.
- Stern, P. C., T. Dietz, et al. (1993). "VALUE ORIENTATIONS, GENDER, AND ENVIRONMENTAL CONCERN." Environment and Behavior **25**(3): 322-348.
- Trumbo, C. W. and G. J. O'Keefe (2001). "Intention to conserve water: Environmental values, planned behavior, and information effects. A comparison of three communities sharing a watershed." Society & Natural Resources **14**(10): 889-899.