Values and attitudes of landowners toward the supply of ecosystem services in Southern Alberta

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Abstract

There are Increasing demands for supplying ecosystem goods and services so that the ecological degradation of wetlands, lakes and rivers can be alleviated. A number of market-based instruments including payments for delivering ecosystem services, funding mechanisms, tax breaks, and environmental taxes, are proposed to complement regulation to deal with the supply of ecosystem services worldwide. In order to ensure the effective adoption and implementation of market-based instrument for the provision of Ecosystem Services, it is imperative that the proposed suite of market-based instruments be set-up for a specific issue in a regional context and be based on the values and nature of the community. Using data from a telephone survey of rural land owners in Southern Alberta, Canada, this paper investigates the willingness of land owners to supply ecosystem goods and services and how the willingness is associated with their values and attitudes toward the provision of ecosystem services through market-based instruments.

Keywords: ecosystem services; market-based instruments; policy acceptance

INTRODUCTION

Freshwater is arguably the most important resource for a secure future in many parts of the world. Canadians agree with the importance of freshwater, ranking it as the number one resource important to Canada's future, with a 3-1 margin over oil and gas (Nanos 2009). However, the degradation of aquatic ecosystems and loss of wetlands is more rapid than that of other ecosystems (Millennium Ecosystem Assessment 2005). Although Canada has the third largest supply of fresh water, behind Brazil and Russia (Gleick, Cooley et al. 2009), not all areas have ample supply. Focusing on the western Province of Alberta, this disparity becomes quite prevalent. Here approximately 80% of the freshwater is located in the northern part of the province while 80% of the population and most of the economic activity is in the southern half which can best be described as semi-arid (GoA 2002). The Government of Alberta (GoA) appreciates the importance of the limited freshwater supply for the province's economy and quality of life, and through the Water Act, 1999, the government created the Water for Life strategy (WFL) which aims at ensuring a sufficient supply of safe freshwater for drinking, to provide healthy ecosystems, and to supply a sustainable economy (GoA 2003). It aims at doing this through the dual means of improved water use efficiency and productivity and the reallocation of existing water licences to meet new demand from urban and industrial water users as well as the need of the environment. To facilitate that the 1999 Water Act introduced water trading. As such the WFL has placed most emphasis on the need to manage water quantity. However, just as important in meeting the main objectives of the WFL is the need to maintain water quality in the major water ways. Without adequate water quality in the rivers the provision of Ecosystem Services (ES) will decline with potential health implications as well as economic implications and the future wellbeing of Albertans will be under threat.

In the Oldman River and its tributaries in the southern part of the South Saskatchewan River basin (Figure 1), water quality monitoring have shown total phosphorous and total nitrogen concentrations, and levels of fecal coliforms that are occasionally in excess of the Alberta Surface Water Quality Guidelines (Saffran 2005). Many of the tributaries in the eastern parts of the basin act as irrigation drains as a number of artificial drainage canals dispose their drainage water into these tributaries. They are therefore affected heavily by the intensive agriculture in the region and exceed the guidelines more often and to a higher degree than the main river (GoA 2003;Saffran 2005; Ivey, de Loë et al. 2006). In general, the southern Alberta landscape has been greatly altered over the last century with the development of agricultural lands, especially the expansion of land under irrigation and intensive livestock. The loss of natural ecosystems caused by the expansion of agricultural land resulted in a sharp decline of ecosystem services in the region. The GoA defines ES as the 'Economic and social benefits resulting from the natural process of a healthy environment and biodiversity' (GoA 2008b, p.51), which are often under produced by private landowners because ES tend to have public goods characteristics. Healthy riparian ecosystems, however, do a better job at filtering out runoff contaminants than do barren

cannels (Rock and Mayer 2006), thus managing the land and the substances added to it is necessary in order to reduce the decline of freshwater quality.
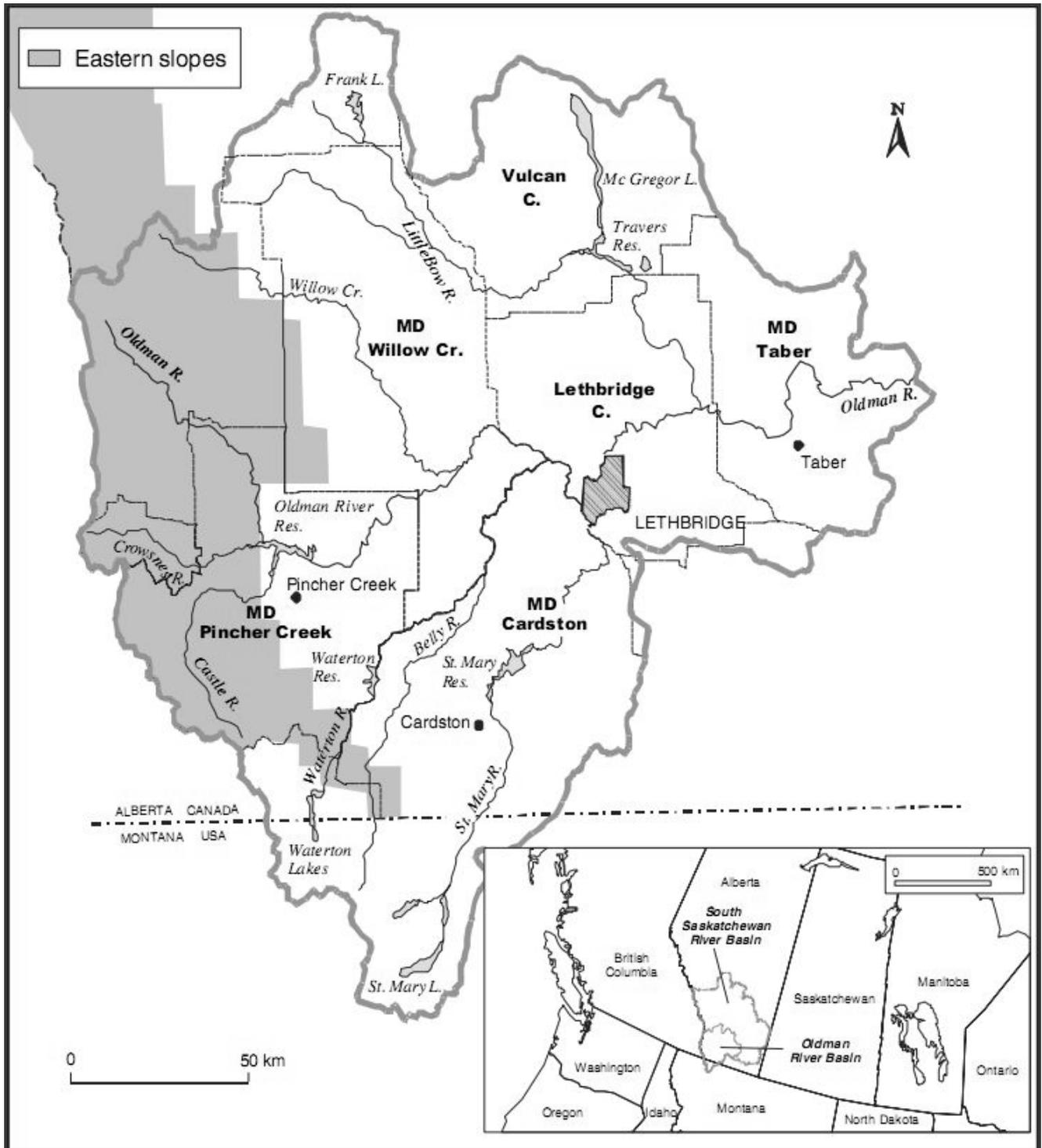

Figure 1: The Oldman River basin, Alberta, Canada (Ivey, de Loë et al. 2006)

In 2008, the GoA introduced the Land-Use Framework (LUF) to manage land-use issues in a growing economy while meeting Albertans' social and environmental goals. In the LUF, the need to maintain ES by measures such as runoff filtration in riparian areas is recognised as part of a strategy for conservation and stewardship of public and private lands (GoA 2008b). Part of this strategy is to employ market-based instruments (MBIs) for the provision of ES; where the LUF defines MBIs as providing 'financial incentives and disincentives to guide behaviour towards conservation and stewardship and mitigate undesirable activities in an effort to lessen adverse effect on the environment" (GoA 2008b, p.52). The renewed WFL in 2008 also investigated the merit of using MBIs and economic incentives to meet water conservation objectives (GoA 2008a). In the WFL Action Plan released in 2009, the key actions for water conservation were clarified further, listing the development of a policy framework for ES markets and to implement a market-based ES incentive program (GoA 2009). These frameworks show that the GoA is pursuing the use of MBIs for the provision of ES. However, the success of such programs depends on landowners' willingness to accept the use of these instruments. Since MBIs are based on voluntary participation of landowners(Wunder 2007), knowing if they'll be likely to support the use of MBIs for ES provision and what factors influence their decisions to act on a given MBI will aid in the creation and implementation of MBI programs.

To understand what effects landowners' decisions in response to an MBI and/or participate in an ES program it is first necessary to understand how people make decisions. 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 it, 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.


THEORETICAL FRAMEWORK

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 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 and show that farmers and landowners can be categorized into economic, environmental, and lifestyle value orientations. 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 are groups 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. However, the influence of values and attitudes are subject to external situational factors, which also need to be explored.

In addition to attitudes towards an action as a predictor of behaviour, the theory of planned behaviour (TPB) includes social pressures and control factors that a person perceives to be important for a specific action and their ability to perform it (Ajzen 1991). These external situational factors represent the person's internal beliefs about them and thus are called subjective norms and perceived behavioural control. The three factors are then used to explain a person's intention to behave, which when paired with actual behavioural controls explains actual behaviour (Figure 2). Ajzen (2006) identifies that the three TPB factors are aggregates of three kinds of considerations; behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs combine beliefs about the likely outcomes of behaviour (behavioural belief strength, b) and the evaluations of these outcomes (outcome evaluation, e), normative beliefs combine beliefs about normative expectations of others (normative belief strength, n) and the motivation to comply with these expectations (motivation to comply, m), and control beliefs combine beliefs about the presence of factors that may facilitate or impede performance of the behaviour (control belief strength, c) and the perceived power of these factors (control belief power, p). Intention to behave is thus explained by these sets of beliefs. TPB has been heavily used in the prediction of health behaviour (Armitage and Conner 2001) but has recently been used to explain environmental behaviour, including water

conservation (Trumbo and O'Keefe 2001; Lam 2006; Clark and Finley 2007) and landowners' decisions in riparian zone management (Beedell and Rehman 2000; Corbett 2002; Fielding, Terry et al. 2005).
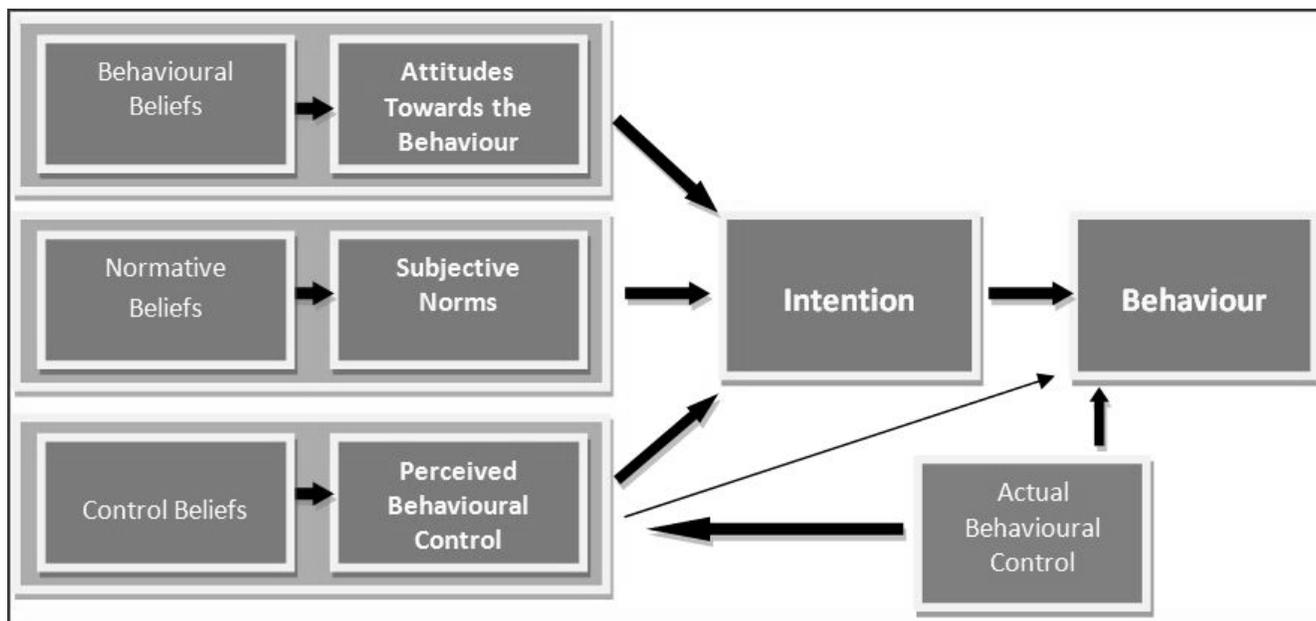
Figure 2: The Theory of Planned Behaviour

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).

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 models, in the 1990s the focus of variable chose for predicting environmental behaviour shifted to situational factors, external to the person (Corraliza and Berenguer 2000). However, there are many possible external factors and they differ for each situation making them case specific. 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, Milyo et al. 2008).

According to Ajzen (1991), the perceived behavioural control of the TPB should account for many of these situational factors that might be limiting or facilitating certain behaviours, but for the in-depth analyses conducted for this paper situational factors will be included to help explain the PBC and the other belief variables. The external and situational factors push people towards certain behaviours or decisions while internal factors, such as values and attitudes, influence whether that decision is made or not. This means that a person whose values and attitudes support certain behaviours will be less likely to adopt this behaviour 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.

Using this information about why it is people behave in certain ways, or intend to behave, we can examine how much support landowners in southern Alberta will give the use of MBIs for ES production. This paper uses the TPB variables along with some extended variables adopted by other researchers to investigate just that. The results of this paper aim to help Albertan policy makers better understand what needs must be met to appease the landowners who will be subject to the new policies and programs. Although research such as this is set in a regional context, it will contribute to the generally small body of literature on the subject of acceptance of MBIs for ES provision and the use of TPB to understand such behaviour around the world. Thus this paper asks what the main behavioural factors are that influence the decision of landowners in southern Alberta to accept the use of MBIs for ES purposes.

METHODS

To conduct the research a telephone survey was conducted in two rural municipalities within the Oldman River Basin, the Municipal District of Willow Creek and The County of Lethbridge (Figure 1). These two municipalities were chosen as a combined study area because they are both almost entirely enclosed within the basin, and thus share similar water issues and the same watershed authority (the Oldman Watershed Council). In addition, the span of the two municipalities allows for a greater variety of landowner to be included in the survey. The western edge of the MD of Willow Creek is in the foothills of The Rocky Mountains, which has more land used for ranching and dryland farming that is not overly intensive agriculturally. The eastern part of Lethbridge County contains the Lethbridge Northern Irrigation District, which contains some of the most intensive agriculture and highest concentration of intensive livestock operations in Canada (Saffran 2005). Also contained within the County of Lethbridge is the City of Lethbridge, which is the largest urban area within the Oldman River basin, thus attracting non-producing landowners as well. According to the 2006 Canadian Census there are 4762 rural dwellings in the study area, which represents our target population (Goa 2010a; GoA 2010b).

A survey instrument was created based on the literature as discussed above and to allow the theoretical framework to be tested. The wording and content of individual questions were also guided by preliminary personal interviews with eight local landowners ranging in land activities and a rural extension specialist with the county. The questionnaire was then tested in focus group for comprehension and for interview length in a number of pilot interviews. The questionnaire was then implemented using computer-assisted phone interviews. The final questionnaire was designed to collect data primarily for the research of a Master's thesis, but also aid in the research of a PhD thesis and a larger research project funded by the Alberta Water Research Institute, so its intent was to collect a large range of information not fully utilized in this paper. For this paper, two questions examining landowner's agreement with the use of MBI were used to describe the landowner's intention to accept the use of MBIs (table 1), which were asked on a scale of 1 to 7, with 1 being strongly disagree and 7 strongly agree. Three different sets of questions were asked on similar 1 to 7 scales to represent attitude, subjective norms and perceived behavioural control following Ajzen (2006). This resulted in 16 questions to form 8 behavioural beliefs (table 2), 12 questions to form 6 normative beliefs (table 3), and 10 questions to form 5 control beliefs (Table 4). Common themes taken from personal interviews with rural landowners lead to the development of these 8, 6, and 5 salient beliefs asked in the questionnaire. Four additional questions using the 1 to 7 scale were asked, one for moral responsibility, one for self-efficacy, two for past behaviour with one representing unaided land management change for environmental benefit, and the other representing change aided by an organised program to provide environmental benefit. Finally, socio-demographic questions were included.

Table 1 - Agreement with Use of MBIs for ES Provision

Statement Setup	Statement
MBI agreement questions: '**Continuing on the same theme, there are some specific practices that lead to water quality problems. Manure management contributes to water quality problems and is an issue for a number of farmers in this area. Fertilizer and pesticide application is also a source of water quality problems. The following are specific issues that contribute to water quality problems in Southern Alberta; please indicate your level of agreement to the next two statements with the same 1 to 7 scale:**'	a) 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. b) 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.

Table 2 - Salient Behavioural Beliefs

Question	Statement Item
Behavioural Belief Strength (*b*): '**Each of the following questions describes a possible outcome that might occur if you change the management of your land to improve the provision of ecosystem services. Using the same 1 to 7 scale as the previous questions, please indicate your level of agreement to the following statements:**'	a) It will help to improve environmental quality, such as habitat, or water and air quality. b) It will take away your time, labour, financial, and land resources from other activities. c) It will give you a sense of pride in how you take care of your land. d) It will provide economic benefits such as increased property values or productivity levels. e) It will reduce your ability to compete in local, regional, or global markets. f) It will help protect the well-being of future generations. g) It will increase paperwork and red tape. h) It will benefit others in society, especially nearby or downstream.
Outcome Evaluation (*e*): '**Now, about the same set of outcomes that might occur if you changed the management of your land, please express how desirable you find each of these outcomes using a scale from 1 to 7, with 1 being highly undesirable, 7 highly desirable and 4 neither desirable nor undesirable or no opinion:**'	a) A healthy environment. b) Taking away your time, labour, financial, and land resources from other activities. c) A sense of pride in how you take care of your land. d) Economic benefits such as increases in your property value or productivity level. e) A reduced ability for you to compete in local, regional or global markets. f) Protection of the well-being of future generations. g) Paperwork and red tape. h) Providing benefit to others in society.

Table 3 - Salient Normative Beliefs

Question	Statement Item
Normative Belief Strength (*n*): 'Using the 1 to 7 scale, with 1 being "strongly disagree", 7 "strongly agree", and 4 "neither agree nor disagree", state your level of agreement with the next set of statements about what other parties would think if you made changes to your land management to improve the provision of ecosystem services.'	a) Members of your family would think it's a good idea.
	b) The government would think it's a good idea.
	c) Professionals, scientists and members of environmental or conservation groups would think it's a good idea.
	d) Your neighbours and peers would think it's a good idea.
	e) People who gain recreational or aesthetic benefit from your land through activities like hunting, sight-seeing, and so on would think it's a good idea.
	f) Members of agricultural communities and organizations would think it's a good idea.
Motivation to Comply (*m*): 'Now considering the same parties, please express how much you want to do what they think you should do, when it comes to making changes to your land management to improve the provision of ecosystem services. Answer on a scale from 1 to 7 with 1 being "not at all" and 7 "very much":'	a) Your family.
	b) The government.
	c) Professionals, scientists and members of environmental or conservation groups.
	d) Your neighbours and peers.
	e) People who gain recreational or aesthetic benefit from your land through activities like hunting, sight-seeing, and so on.
	f) Protection of the well-being of future generations.

Table 4 - Salient Control Beliefs

Question	Statement Item
Control Belief Strength (*c*): 'In the next set of questions I will provide you with some factors that may or may not limit your ability to change your land management to improve the provision of ecosystem services. Please express your level of agreement with the following statements on a scale from 1 to 7 with 1 meaning "strongly disagree", and 7 "strongly agree":'	a) Not having a clear understanding of the environmental, economic and social impacts of introducing such changes is likely to be a factor.
	b) External economic factors and market forces are likely to be factors.
	c) The physical characteristics of your land are likely to be factors.
	d) The weather is likely to be a factor.
	e) Having your time and finances allocated elsewhere is likely to be a factor.
Control Belief Power (*p*): 'The next set of questions is about the degree of difficulty the previous factors would add to the process of changing your land management to increase the provision of Ecosystem Services. Using a scale of 1 to 7, with 1 meaning the factor would make it "very difficult", 7 "very easy" and 4 "neither difficult nor easy, or no opinion", please respond to the following:'	a) Not having a clear understanding of the environmental, economic and social impacts of introducing such changes.
	b) External economic factors and market forces.
	c) The physical characteristics of your land.
	d) The weather.
	e) Having your time and finances allocated elsewhere.

Data was collected during the period from October to December of 2010 by a marketing firm with trained interviewers to conduct 350 computer assisted phone interviews after calling 4845 phone numbers within the region at least once. A problem with the list of numbers was that no list of only rural landowners was available so the closest thing was purchasing numbers from a list broker linked to postal codes within the study area. However, these postal codes also contained people living within towns and villages, thus contaminating the list of phone numbers. Therefore any number with a street address was removed, leaving only those with rural addresses, P.O. boxes, or no address listed. However, many of these may still reside within a town. To eliminate non-landowners, screening questions to determine whether they were rural landowners and the long term decision makers of their land were asked. 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 were a total of 1677 eligible households contacted. Using this and the 350 completed questionnaires, the survey received a 20.9% response rate of eligible landowners.

To determine the most important factors in landowners' decision making toward accepting the use of MBIs for ES provision a multiple linear regression was conducted. The means of responses from each respondent for the two MBI questions were calculated to create a dependent variable representing the level of agreement with the use of MBI to protect water quality. The TPB variables were operationalized by calculating the 8 behavioural beliefs (b*e), 6 normative beliefs (n*m) and 5 control beliefs (c*p). Transformations were made on a number of variables, including the dependent variable, to make them more normally distributed before being entered into the regression model. All independent variables were regressed against the transformed agreement with MBIs using Enter, Forward, Backward and Stepwise methods to find the variable that explain the most variance and to discover those that do not contribute to the model or in fact hinder it due to correlations with other independent variables or missing data. After removing insignificant variables and variables not contributing to the model, Cook's Distance revealed that there were many outliers. Instead of removing a large portion of the sample, the top three cases were removed, the highest of which also had the highest leverage, and the other two were the only cases with studentized residuals above 3.0.

FINDINGS AND DISCUSSION

Analysis of the socio-demographic data revealed that the respondents were reasonably representative of the population in the area with the exemption of age and sex. Given that this was a survey of landowners and the main decision maker for the land this was expected. Overall, 68% of the respondents were male, and the mean age was 55.5 years, ranging from 19 to 89. For education, 45% had a college diploma or trade certificate, 25% had high school diploma, 19% had a university education, and about 10% did not finish high school. About 17% reported an approximate annual net household income less than $50,000 (CND), 33% between $50000 and $100000, 26% greater than $100000, and 23.7% declining to answer the income question. The vast majority were raised in a rural setting (83%), and 85% owned land involved in some form of production, with 59% having livestock. Those who own less than 10 acres of land represent 18%, while there was 19.2% with between 10 and 160 acres (a quarter section). Those that owned between a quarter section and a full section (160 to 640 acres) represented 26.9% of the sample, 21.2% owned 640 to 2000 acres, and11.5% owned more than 2000 acres. Almost half (49%) claimed to make under 25% of their income from use of the land while 30% made over 75%. Half have only owned the land for one generation while 39% had owned it for two or three generations. Most of the landowners (61%) expect the land to stay within the family for the next generation while only 25% are confident it will not.

The dependent variable of agreement with the use of MBI had a mean of 5.5 and standard deviation of 1.32. The dependent variable and 39 independent variables were first entered into the initial regression model based on the TPB theoretical framework and the landowners' relationship with their land. After removing non-essential variables, fourteen variables were retained in the final model (Table 5). The adjusted R^2 of the regression model was 0.36 (i.e. the variance explained by the model was 36%). The R^2 of the model was 0.39, which also happens to be the mean R^2 value from a meta-analysis of 185 independent studies regressing the intention of a behaviour on the TPB variables (Armitage and Conner 2001). Similarly, the model is comparable to other studies that utilized TPB to explain the intention of landholders to manage riparian lands (Fielding, Terry et al. 2005) and for landowners intention to participate in government sponsored programs to conserve riparian areas (Corbett 2002). The R^2 values from these studies were between 0.54 and 0.29.

Table 5: Coefficients of Regression Model of Theory of Planned Behaviour and Extended Variables Predicting Agreement with Use of MBIs for ES provision

Variable	β
Action increasing quality of environment (beneficial behavioural belief, *b*e)*	.147*
Action giving a sense of pride (beneficial behavioural belief, *b*e) *	.131*
Action providing additional economic benefits to land (beneficial behavioural belief, *b*e) *	.094[†]
Action benefiting society, especially downstream (beneficial behavioural belief, *b*e) *	.157*
Action taking resources away from other activities (cost behavioural belief, *b*e) *	-.077[†]
The Government would think it is a good idea (normative belief, *n*m) *	.102*
Knowledge (control belief, *c*p) *	.203***
Time and finances allocated elsewhere (control belief, *c*p) *	-.111*
Past land management for environmental benefit on own accord: '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.'	.112*
Past land management for environmental benefit as part of organized program: 'You have adopted land management practices as part of government or other organised programs to fix environmental problems and benefit the ecosystem.'	.050
University education	-.070
Percent of income from land use	-.145**
Generations of family owning land	-.088[†]
Succession of land to next generation	.063
VARIABLE NOTE: *See tables 1, 2 and 3 for question wording	
β NOTE: [†]p <0.1. *p <0.05. **p<0.01. ***p<0.001	

The coefficients of the independent variables found to contribute to the model are listed in Table 1. The most significant ($p < .001$) influence on the level of agreement with the use of MBIs for the provision of ecosystem services is a control belief. The positive coefficients on this variable indicates that those who find that the lack of knowledge of the environmental, economic and social impacts of introducing land management changes reduces their ability to participate in a program, are less likely to agree with MBIs. The percentage of income derived from land use is the second most significant variable ($p < .01$). The negative coefficient of this variable suggests that the larger the portion of net annual household income that is derived from use of the land, the less likely the landowner is to agree with the use of MBIs.

Six variables are significant at the 0.05 level ($p < 0.05$), three of which are beneficial behavioural beliefs: the stronger the respondent believe that the MBI program to provide ES will increase the quality of the environment, give a sense of pride to the landowner, and benefit society, the greater the agreement with the use of MBIs. The fourth variable, the only normative belief retained in the model, is the importance of the government's view. The stronger the belief that the government think it would be a good idea to implement the new practice, the higher the level of agreement with MBIs and the greater their motivation to comply. The fifth variable is a second control belief. This belief deals with the control factor that the landowner having his or her time and finances allocated elsewhere limits their ability to implement land management practices. The negative coefficient suggests that those who see this as a limiting factor are less likely to agree with the use of MBIs. The sixth variable suggests that those that have changed land management to provide benefit to the environment in the past, without the aid of an organized program, are more likely to agree with the use of MBIs.

Three variables are significant at the 0.1 level ($p < 0.10$): i) a beneficial behavioural believe, the greater the respondent believes that additional economic benefits to the land can be gained from changing the land management, the greater the agreement with MBIs; ii) the only cost behavioural belief retained in the model, the more a respondent believes the action would take away time, labour, financial, and land resources from other activities, the less they would agree with the use of MBIs; and iii) the more generations the land has been in the family, the less likely the landowner is to agree with the use of MBIs.

Three variables were not significant in the model but made a contribution to the models explanatory power: i) if respondents had participated in past organized programs for land management change for the benefit of the environment they are more likely to agree with MBI; ii) respondents with a university education are less likely to agree with MBIs; and iii) if sure of family succession landowners are more likely to agree with MBIs

The independent variables included in the regression show that the TPB variables are generally quite important in explaining agreement with the use of MBIs for ES provision. We see that the importance of the lack of knowledge about the effects of the land management change as a predictor for the agreement with the use of MBIs. If people are more informed on the outcomes of an activity, they will be better able to judge whether or not they will be able to participate. Related to the control belief about knowledge, the behavioural beliefs about outcomes are important for explaining the agreement with the use of MBIs. Of the eight behavioural beliefs

tested, all five representing benefits were significant (however, protecting the wellbeing of future generations was removed due to high collinearity with benefitting the environment and society), while of the three cost outcomes, only one, having resources taken way from other activities, was found to be marginally significant. These results show that the beliefs about benefits rather than costs of participating in a MBI program to change land management to provide ES and protect water quality are more critical for influencing the adoption of these programs. These finding are consistent with the work of Fielding et al. (2005) using TPB for the adoption of riparian zone management. This information should be important for policy makers and those marketing new MBI programs and policies. They should focus on making landowners understand the full benefits that can be gained from MBIs, whereas the costs are less important in influencing the adoption of MBI programs. The financial and time aspect of cost should not be overlooked, however, as the other control belief found to be significant was that of time and finances being allocated elsewhere. Those who found that the fact their resources was tied up elsewhere or that implementing new practices would take up too many of their resources were less likely to agree with the use of MBIs, meaning financial incentives may be more appealing to landowners with financial and time constraints. Normative beliefs are the least represented of the three TPB variables, with the only one included in the model, being the government. The findings suggest that the stronger the landowner believe that the Government support the idea the more they support MBIs. Hence, the government's opinion has a larger influence on the landowner's decision making for this kind of land management choice than other groups.

From the expanded conceptual model, the most important explanatory variable was the percentage of income derived from the use of the land. The higher it is the less likely they are to agree with the use of MBIs. Additionally, those who have participated in past programs to change management of their land for environmental benefit without the help of organized programs, were more likely to agree with the use of MBIs. This relationship was also found with those who had participated in organized land management programs, but it was not significant. Generally we see that those who have done environmental land management in the past will be more likely to agree with the use of MBIs, and more so when the action was under their own initiative. The explanatory relationship of past behaviour of future action, is argued by other researcher (Ouellette and Wood 1998), and the findings in relation to past land management explaining future intention is also supported by past studies (Fielding, Terry et al. 2005). Other similar empirical studies, however, have shown the opposite relation, that those who have participated in activities to conserve riparian zones have less intention of participating in programs in the future (Corbett 2002). The author suggested that this may be due to landowners thinking that their past activities were adequate and no more effort was needed on their part. Also, the number of generations the land has been in the family is influential on agreement with MBIs. The greater the number of generations the less likely they are to agree with the use of MBIs. These landowners have a greater history with their land and thus may feel they know how to best manage it and thus reject organized land management programs. However, those who had succession of their land to the next generation in their family in place are more likely to agree with the use of MBIs. Even though this variable was not significant in the model, its coefficient has an opposite direction to that of the number of generations the land has been in the family. So with greater family history and knowledge of the land, the less likely landowners are to agree with the use of MBIs, but knowing the land will be in the next generation of the family, landowners may be more concerned about the future of the land and thus more willing to accept the use of MBI as an incentive for changing land management practices for environmental purposes. Finally having a university education, although not significant in the model, had a negative coefficient, meaning that people with a university degree are less likely to agree with the use of MBIs as incentives.

CONCLUSION

With the Government of Alberta's desire to use MBIs for the provision of ES to protect the quality of its limited freshwater supply to help meet the goals of the WFL, it is necessary to understand whether or not the landowners affected will accept these sorts of policy. 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 paper, using a survey of landowners in a portion of southern Alberta, identifies important variables to predict their acceptance of MBIs for ES provision.

Using an extended version of the TPB as a format for a regression model, we found that the most important variable to explain the landowners' acceptance of MBIs was the control belief about knowledge. In addition, the TPB variables were also well represented with the beneficial behavioural beliefs and also the normative belief that the government support an action increases the acceptance of the use of MBI. The important variables

found from the extended TPB, generally come from the landowner's relationship with their land; i.e. the income they make from the use of it, past environmental activities they have conducted on it, and how many generations it has been in the family.

In general, we see value in the use of the TPB variables along with some extension variables to predict how landowners will react to the implementation of MBIs for ES provision. This information will help policy makers tailor policy and instruments to be acceptable for use by the landowners. Educating the landowners on all the effects of participating in such a program, especially the positive outcomes will likely be more convincing than speaking only of the economic or environmental aspects alone. The key is to speak to all of their values. Further research can be done to get an even closer look at what affects the landowners' behaviour by identifying the landowners by their value groups, as did Maybery (2005). It is likely that the importance of certain variables may be more prominent for different value groups for explaining the acceptance of MBIs.

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