Social variables in wetland restoration: the role of values, beliefs, and norms in conservation behaviour

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Abstract

The Canadian Prairie Provinces are home to an extensive area of North America's wetlands. However, since settlement these important ecosystems have been continuously drained to make way for farmland, urban construction, and other human development. The development of new wetland management policies has created the opportunity to test market-mechanisms, such as incentive programs, as a tool for wetland restoration. Social factors impacting participation in these programs are relatively unstudied. Using a sample of rural landowners across Alberta, Manitoba, and Saskatchewan, this study explores the predictors of participation behaviour, investigating specific social factors related to landownership, wetland restoration, and environmental values. Drawing on the value-belief-norm (VBN) theory we are particularly interested in the role of environmental beliefs, social norms on wetland drainage, and landowner values in the decision to participate in an incentive conservation program. We used adapted scales to measure the VBN constructs in the context of wetland restoration on productive land to focus on particular behavioural variables for rural landowners. Our results indicate that both personal and social norms are strong predictors of participation, and that values, beliefs, and norms are interrelated social constructs. The paper concludes with policy considerations that attempt to respond to specific social and cultural factors in the design of environmental conservation programs.

Preface

This thesis is an original work by Kaitlyn Cyr. The research project, of which this thesis is a part of, received research ethics approval from the University of Alberta Research Ethics Board, 'The role of social norms in environmental behaviour', September 30 2015.

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Chapter 1: Introduction

1. Overview

Human behaviour is a central component in establishing environmental policies and programs. Environmental stewardship is an increasingly important aspect of social and economic development. Human behaviour and how individuals and society perceive and respond to changing regulations and rules are central issues in addressing environmental concerns. Environmental behaviour is the behaviour of individuals that impacts or relates to the physical environment. An understanding of the factors that drive this behaviour is an important component in designing and implementing environmental conservation and management programs. The study of environmental behaviour can help to identify key influences on individuals' decisions and actions specifically in relation to conservation, and inform public policy makers of the types of factors that influence individuals. Investigating the range of different economic, social, and physical variables influencing environmental behaviour can contribute to the policy design of future conservation and resource management efforts. Many studies on the implementation of conservation programs acknowledge that behaviour results from an interaction of these variables. One limitation in using social variables to predict behaviour is that different types of social constructs are not well integrated in the measurement of environmental behaviour. This study uses the issue of landowner participation in wetland restoration programs to investigate several constructs of social variables and to model the role of social factors in environmental behaviour.

There are numerous studies on how social factors such as norms, beliefs, and values each influence individuals' views and perceptions of the environment. How do these factors interact and play a role in behaviour? This question is an important consideration in the development and delivery of incentive conservation programs, as voluntary participation in these programs is dependent on the factors that influence behaviour. Incentive programs are unique from other types of environmental regulations and policies in that they offer some type of incentive, often financial payment, to individuals in exchange for environmental measures (Sorice et al, 2010). Participation in incentive conservation programs has proven difficult to predict, and researchers and policy-makers understand that are multiple factors that influence behaviour, including

economic, social, and environmental constraints. These different factors create barriers and motivations for individuals' behaviour that is congruently influenced by the design and implementation of the program. Where many previous studies on incentive conservation programs focus on the land-use or economic factors in participation, the design of these programs could be improved by identifying other key influencing factors that play a role in individual's behaviour. This study examines the role of social factors in environmental behaviour.

The focus of this research is on the values, beliefs, and norms that drive environmental behaviour in the context of participation in a wetland restoration project on productive land. Value orientation, environmental beliefs, and norms have been identified as determinants of pro-environmental behaviours (PEB) in past research (Grendstad and Wollebaek, 1998; McKenzie-Mohr, 1996). Our study investigates the measurement of these factors and their role in a specific environmental behaviour, participation in a conservation program for wetland restoration. This study examines the social variables that influence environmental behaviour in a sample of rural landowners from within the Canadian prairie region who have control of management decisions on their private land. Our study is done in two stages, based on a general model of social factors in environmental behaviour that theorizes values, beliefs, and norms are influences on behaviour. In Chapter 2, we investigate the different types of norm constructs that individuals may ascribe to in the context of rural landownership and wetland restoration programs. We are interested in the social or personal norms that exist surrounding the issue of wetland restoration. In Chapter 3, we use the norm constructs identified in Chapter 2 in a broader model of environmental behaviour that includes norms in addition to values and beliefs in assessing the behaviour variable. Our goal was to assess the influence that these different social factors have on the likelihood of participation in a wetland restoration program that pays for participation.

The role of different social factors in environmental behaviour is still challenged in the literature. Studies have found as many as thirty different personal and social factors that act as barriers to behaviour change (Gifford, 2011), and as a result a definitive model of influences on behaviour is difficult to identify. Moreover, there is debate as to whether changing individuals' attitudes and beliefs is sufficient to change their behaviour, as many attitudinal studies have found that self-reported environmental concern or attitudes do not correspond to objective pro-environmental behaviour (Tanner, 1999). The personal and social factors impacting behaviour

are difficult to identify because of the broad range of influences and the lack of empirical evidence that certain factors cause behaviour. The assessment of social variables in behaviour is limited without the consideration of different types of social and personal influences. One gap in the literature on environmental behaviour, and particularly in the study of participation in conservation programs, is the lack of a holistic approach that examines how perceptions and concerns are formed, what beliefs and values drive these views, whether there are internal or external normative pressures, and how this process influences behaviour. The study of environmental behaviour that focuses on measuring only individual attitudes and concerns is constrained by a neglect of other personal and social aspects that may impact behaviour.

PEB typically requires that an individual sacrifice some personal comfort in favour of the interest of others (Ibtissem, 2010); this personal expense makes PEB socially responsible behaviour that involves ethical, environmental, and social considerations in the decision-making process (Webster, 1975). In our study that focuses on the likelihood of participation in an incentive wetland restoration program as the behaviour, we are interested in the social considerations that are related to wetland restoration on productive land. Several studies on incentive conservation programs have found that participation behaviour varies based on the type of program and on sociodemographic characteristics such as income, education, and age. Other studies indicate a multitude of additional factors that can influence conservation behaviour, including environmental considerations, status, effort, and behavioural opportunities (Steg and Vlek, 2009). Black et al (1985) found that some particular types of conservation behaviours were determined by attitudes, and some types were determined by personal factors. The range in findings in past research on important variables in adoption of environmental behaviours indicates that personal and contextual factors have various levels of influence on behaviour that are not held constant amongst different individuals and communities.

The significant variables in environmental behaviour are difficult to universalize because behaviour is typically a function of personal elements (Stern et al., 1995) and is influenced by a range of social, economic, and other institutional factors. There has been limited attention to the development and interaction of social and personal factors that play a role in individuals' environmental behaviour. The literature surrounding the design and implementation of conservation programs lacks an integrative approach to assessing the role of different social aspects in behaviour. This research addresses this gap through a focus on social dimensions such

as environmental values, social norms, and perceptions of environmental issues and landowner responsibilities that are important factors in participation in a wetland restoration conservation program. The investigation of environmental values, beliefs, and norms offers a unique insight into the variables that influence how people perceive and make decisions regarding environmental concerns. Incorporating these perspectives on the environment and behaviour to understand factors in participation in an incentive conservation program can provide a social context for the development of improved programs that address both social and environmental concerns.

2. Objectives

The focus of many studies on social factors in PEB is on predicting the influence of a single specific factor, where one social variable is isolated to measure its impact on behaviour (Nordlund and Garvill, 2002). Our central objective is to test a hierarchical model of social influences on PEB. As such, this study investigates measures of values, beliefs, and norms concerning incentive conservation programs and addresses two key issues: the presence of specific norms regarding the restoration of wetlands, and the other social variables impacting individuals' participation behaviour. The first section of this study examines what items contribute to what we define as a social norm or a personal norm around wetland drainage and environmental conservation, and what types of values and perceptions relate to these norm constructs. We investigate whether different types of collective or individual norms exist and what relationship they may have with other values and beliefs. In order to understand how these norms are incorporated into a model of environmental behaviour, the second section of this study uses the Value-Belief-Norm (VBN) theory (Stern, 2000) to measure a set of social variables influencing individuals' willingness to participate in conservation programs. Our quantitative approach to measuring the social factors in environmental behaviour aims to identify the role of norms and values for the development of more effective conservation programs.

Our study uses a questionnaire tool to investigate the trends in landowner views within a convenience sample of rural landowners within the Alberta, Manitoba, and Saskatchewan prairie pothole regions. The questionnaire measures a range of values, beliefs, and norms both generally about environmental conservation and more specifically about participation in an incentive wetland restoration program. The existing psychometric literature on environmental behaviour

from which we developed our questionnaire approach provides strong methodology and empirical results, but lacks a theoretical framework to ground its findings in a social or cultural paradigm (Bickerstaff, 2004). We were interested in applying a quantitative approach to more qualitative social variables. This research uses an adapted version of the VBN model of behaviour to frame the relationship between social variables and behaviour. The farmer value categories used by Maybery et al. (2005) replace the typically used Schwartz value scale to create a more landowner specific measurement tool. We also integrate contextual constructs about wetland drainage norms and environmental beliefs in the model. Our survey data was used to test this adapted framework and analyze the relationship between values, beliefs, norms, and behaviour.

This research contributes to the sociological study of environmental behaviour by investigating specific social factors influencing participation in conservation programs. Moreover, the adaptation of the farmer value categories into the behaviour framework can contribute to the literature by identifying whether these values align with other environmental beliefs. The identification of different types of norms regarding wetland drainage in rural landowner communities within the Canadian prairie region may indicate future challenges for policy development and implementation. The inclusion of these social aspects in a conservation program can offer insight into the dynamics of the region and its landowners, and improve communication and implementation efforts of current and future incentive conservation programs. As our small sample size limits the possibilities for generalization to the population of landowners in the western Canadian prairie region, we aim to provide a measurement approach and adapted behaviour model for future application in identifying specific barriers or motivations for participation in similar conservation programs.

3. Background

This research is part of a pilot project called Alberta's Living Laboratory (ALL) testing the use of a reverse auction mechanism to obtain land for restoration in Rocky View County, Alberta. ALL is a joint project between the Alberta Land Institute at the University of Alberta and Western University. The ALL research team is working with municipalities, counties, the provincial government of Alberta, and NGOs such as Ducks Unlimited Canada to fund and run the reverse auction program. The stages of the reverse auction are to collect bids from

landowners, compare them, select winning bids, and then pay the landowners with the winning bids and restore the identified wetlands on their land. The central objectives of this project are to assess the effectiveness of this mechanism, and to investigate the range of factors that influence landowner participation. The reverse auction method is a market-mechanism that uses economic incentives, but there are additional social and environmental factors that researchers are interested in identifying in relation to the restoration program. The use of reverse auctions as a market tool for restoring wetlands is of growing interest for policy-makers in the face of growing wetland loss and degradation. Addressing the current impacts of and potential future issues related to climate variability has become an important component of environmental management (Erwin, 2009), and wetland management is a growing focus for addressing climate change related issues.

Wetlands are critically important ecosystems that provide both habitat for wildlife and multiple ecological services that benefit humans, including maintaining water quality and playing a central role in the global carbon cycle (Ferrati et al., 2005). The recognized importance of wetland systems for environmental protection, particularly in the face of climate change uncertainty, has made wetland restoration an increasingly common practice to help maintain wetlands area. Wetland restoration either rehabilitates a degraded wetland or reestablishes a wetland that has been drained or lost from development (Cole et al., 2002). The restoration of a degraded or lost wetland can potentially reestablish lost wetland functions such as water recharge, flood reduction, and species habitat, and provide similar or the same ecological services as before. Restoration is an essential option for government and other agencies to address environmental issues from wetland loss. There are several types of approaches used for wetland restoration. Contrary to command-and-control regulatory policies that provide rules and instructions for conservation, market-based instruments encourage conservation behaviour through price incentives (Hockenstein et al., 1997). The adaptation of environmental management policies across Canada creates new opportunities to apply non-regulatory approaches for conservation.

Our study region is the Canadian prairie region in the provinces of Alberta, Saskatchewan, and Manitoba. Over 71% of wetland areas in this region have been lost since settlement (Watmough and Schmoll, 2007). The need for mechanisms to restore and conserve wetlands has recently been established as a prominent concern for environmental protection in

these provinces. In this region, there has traditionally been a tendency towards the use of compensation over avoidance to meet water policy goals and ensure wetland conservation (Clare et al., 2011). Developers are not restricted from draining wetlands, but are required to make financial or restoration compensation if development impacts an existing wetland. When the government requires compensation for impacted wetlands, developers make payments based on the extent of impact (Clare, 2014). Development continues to reduce the quality and quantity of wetlands when the option to pay a cost to drain is easier and more cost effective than avoiding wetland areas. The continued rapid loss of wetlands has brought restoration to the forefront of watershed management in Alberta, Saskatchewan, and Manitoba.

There are different wetland policies in place across the region. Saskatchewan Environment mandates the protection of Crown waters and managing wetlands to maintain numbers, diversity, and production (Rubec and Hanson, 2009). The Manitoba Water Strategy mandates sustainable management of all wetlands (Ibid). The 2013 Alberta wetlands policy aims to protect existing wetlands and restore them in cases where they have been lost (Government of Alberta, 2013). Though these water management policies address the need to protect wetlands, there is still an issue of how much area has already been lost. The structure of wetlands policies and goals for conservation are continuously impacted by the rate of drainage. Restoration is important for achieving these policy goals. Even with the aforementioned policy aims in place, there is still an ongoing loss of wetlands in these regions. The wetland management policies intend for those wetlands lost to be restored in other areas. Compensation and fee systems create a source of funding for restoration projects. For example, in Alberta the provincial government has established wetland replacement in-lieu fees for the drainage of wetlands (Government of Alberta, 2015). However, having funds for restoration projects is only part of the challenge: agencies need access to drained wetlands for restoration. A central issue for wetland restoration in Canada is that many of these drained wetlands for potential restoration are on private land. This creates a need for a cost-effective mechanism to use these limited available funds to acquire access to this land for restoration.

One potential mechanism is the use of market-based instruments (MBIs) to integrate economic variables as incentives for restoration (Lantz et al., 2013). MBIs are methods or regulations that encourage certain behaviour through market pressures rather than through explicit commands (Stavins, 2000). MBIs are useful tools for restoration agencies because they

create a market environment to maximize the efficiency of the budget for restoration. Different types of MBIs include reverse auctions, tradable permits, mitigation banking, and wetland certification in which participants get a price for maintaining a defined sustainability level (Segerstedt et al., 2011). Generally, incentive conservation programs allow individuals to be compensated for providing environmental services. Reverse auctions, which are competitive bidding systems in which sellers compete to supply the buyers with a specific good or service, are one method used to allocate funding for conservation projects. The use of a reverse auction program as a market-based mechanism for conservation is a potential tool to address the issues of acquiring wetlands for restoration in Canada. An important part of using this mechanism is assessing the factors, separate from economic considerations, that impact participation. In addition to addressing the economic and biophysical variables that determine the costs and impacts of restoration to individuals' property, the social and personal influences on individuals are also an important consideration for participation. Differing perceptions on environmental issues or diverse values of landowners may result in different behavioural choices in participating in conservation programs. Understanding the role of social factors in participation can help policy-makers design programs that address social and personal considerations.

The identified social and personal influences on pro-environmental concern and behaviour range from knowledge, education, personality, values, worldviews, responsibility, norms, age, gender, and other beliefs and perceptions about environmental issues (Gifford and Nilsson, 2014). Participation in a wetland restoration program is a study of behaviour that encapsulates these different factors. Landowners' decision to participate is based on their perceptions of social pressures surrounding land management, their individual environmental beliefs, and their values as rural landowners. Proenvironmental behaviour requires individuals to consider both acting in their own immediate interest, or in the long-term interest of the collective (Ibid). As policy-makers develop restoration programs to achieve conservation targets, the factors that facilitate or limit participation behaviour are important for designing effective programs. Environmental behaviour is an inherent part of environmental policy. Individuals' environmental values and beliefs cause their concern about, and ultimate action on, environmental issues (Corraliza and Berenguer, 2000). Contrary to command and control regulatory policy, incentive- or market-based mechanisms for environmental management is more contingent on these individual and social level factors (Luzar and Diagne, 1999). The

growing issue of wetland restoration in an agricultural production context necessitates an improved understanding of landowners' behaviour to evaluate the future use of incentive-based programs.

4. Methods

The psychometric approach used in our survey measures constructs such as perceptions and environmental values by having respondents specify to what extent they agree or disagree with a number of statements (Nunnally and Bernstein, 1994). This method allows individual perceptions and preferences to be analyzed using a scaling procedure that can be adjusted for context appropriate measures. The survey measures the respondents' environmental values and beliefs and their perceptions of financial incentive-based conservation programs for wetland restoration, using mainly a series of Likert scales. The development of the survey instrument used in this project (appendix) built on previous surveys on similar types of conservation programs or environmental concerns. The measure of values is a reduced version of the Maybery et al. (2005) scale. The scale was modified to include nine of the original items to identify economic, conservation, and lifestyle values, with an additional item on family heritage as part of the lifestyle category.

The survey draws on the Trenholm et al. (2013) survey on landowner views on wetland restoration in an Ontario, Canada watershed. The borrowed questions include statements on landownership and landowner responsibility. The NEP scale (Dunlap and Van Liere, 1978) is included to provide a measure of general environmental concern. The NEP scale broadly classifies individuals as identifying with the New Ecological Paradigm or the Dominant Social Paradigm (Anderson, 2012). The scale has been slightly modified based on feedback from a focus group held in Airdrie, Alberta, in which respondents indicated words or statements that were unclear. These were amended with minor wording changes. Different social and environmental values were measured using landownership and farmer value statements used by Trenholm et al. (2013) and Maybery et al. (2005), respectively.

We devised a section on the specific outcomes of wetland drainage on productive land in order to create a measure of respondents' perceptions of consequences and responsibility for restoring lost wetlands. To account for landowners' perceptions of wetland drainage, we created eight statements of potential outcomes from draining wetlands to measure how important

respondents felt these impacts in respect to their property. Another section focuses on environmental incentive programs to identify how respondents perceive and understand these types of programs. We also include a section about the respondents with sociodemographic related questions such as province of residence, age, gender, income, and education. Throughout the survey, we include specific questions about the responsibility to restore wetlands, the beliefs of respondents' neighbours and community regarding restoration, and on the different economic and environmental factors in participating in a restoration program in order to tie the beliefs and value items to wetland restoration.

5. Data collection

The data collection for this study was undertaken in the Canadian prairie region within rural regions in Alberta, Manitoba, and Saskatchewan. The Canadian prairie pothole region contains an extensive area of wetlands due to the glacially formed depressions that characterize the landscape, and the region is an important habitat for waterfowl in North America, in addition to providing other ecological services (Johnson et al., 2005). However, agricultural conversion in the region has resulted in the loss of over 71% of the wetlands in Alberta, Manitoba, and Saskatchewan since settlement (Environment Canada, 1986). Growing environmental concern and increasing impacts of biodiversity loss, flooding, and water quality issues have created an impetus to develop policies and programs for restoration and conservation of wetlands. This region was selected for the study based on its ecological importance and the ongoing challenge of addressing wetland loss with policy development. This research is part of a project called Alberta's Living Laboratory, which ran a reverse auction program for wetland restoration on private land in the Nose Creek Watershed, Alberta in the spring of 2016.

A key part of this pilot project was to test the effectiveness of using an incentive program approach to restore wetlands under the province's new wetland policy. This study focused on developing a method to better understand the social factors influencing landowner participation and the impacts of these social influences on these types of incentive programs. The goal of the data collection was to survey rural landowners who manage their land and who would make the decision to participate in incentive programs that require changes to their property, in our survey specifically a wetland restoration program. The ALL project was centred in the Nose Creek Watershed in Rocky View County, Alberta. We used email and newsletter communications to

advertise our survey to landowners in this region. However, after six weeks of distributing surveys we had a low response rate with approximately 40 respondents. We expected a small sample size from the Nose Creek region alone would limit the analysis of landowner values, beliefs, and norms, and so we used panel data to increase the sample size. The scope of the study was broadened to include rural landowners across the Canadian prairie region under the assumption that these individuals face similar land-use challenges and the same potential to participate in restoration programs.

Our survey was distributed using both online recruitment methods, including newsletters and communication through community organizations and industry groups, and circulation through a panel data company. A sampling of 198 landowners across the Canadian prairie pothole region was collected using a combination of panel data and communication strategies to recruit respondents. The panel data recruitment sent 1,082 invitations to the study. We included two screen in questions to complete the survey: the respondent must be 18 years of age or older, and must be a landowner in a rural area that makes land-use decisions for their property. After the screen in questions, only 189 respondents could proceed to complete the survey. The additional 9 respondents were from recruitment efforts made in the southern Alberta region, where 50 surveys were sent out to interested landowners. After the survey closed, we removed cases that had missing variables for items used in our model, leaving a total of 165 cases to conduct our analysis.

Table 1: **Sample characteristics**

	Frequency	Percent
Gender		
Male	59	35.8%
Female	106	64.2%
Income		
Under $19,999	3	1.8%
$20,000-$39,000	23	13.9%
$40,000-$74,999	44	26.7%
$75,000-$99,999	36	21.8%
$100,000 and over	59	35.8%
Age		
29 years or younger	12	7.3%
30-49	48	29.1%
50-59	55	33.3%
>60	50	30.3%
Education		
High school	46	27.9%
College/trade certificate	73	44.2%
University degree or higher	46	27.9%
Province		
Alberta	89	53.9%
Saskatchewan	41	24.8%
Manitoba	35	21.2%

In addition to a low response rate and consequent small sample size, a central limitation on the findings of this study is that the survey data relied on subjective, self-reporting intent to participate and no objective assessment of actual participation in a conservation program (Chen, 2015). The nature of the data collection also produces the possibility that mostly individuals interested in environmental programs took the time to complete the survey, resulting in an overrepresentation of respondents who are more concerned about environmental conservation than average. As our sample is one of convenience, and neither nationally or provincially representative, this study focuses on providing a methodological approach for including different social constructs in participation in conservation programs and identifying specific collective or individual norms on wetland drainage. With the increasing development of voluntary restoration programs, it is important for policy-makers to understand the social factors related to wetland restoration and environmental behaviour in order to engage landowners and successfully implement conservation and restoration programs.

Chapter 2: Identifying social norms in the context of wetland conservation on agricultural land

1. Introduction

An important aspect of addressing environmental issues is the use of conservation programs and policies that aim to restore or conserve natural resources. Environmental management practices, including in the agricultural industry, is increasingly reliant on voluntary environmental management instruments to meet policy goals (Luzar and Diagne, 1999). Researchers seek to understand how shifts in social and cultural standards are related to environmental behaviour and participation in conservation programs and policies. An important environmental issue in the Canadian prairie region is the extensive drainage of wetlands for agricultural expansion, which threatens biodiversity and alters hydrological conditions and water quality (Zedler, 2003). Provincial policies are beginning to address this issue through new regulation and mandates for wetland conservation. The development of institutional policy changes is connected to shifts in socially shared beliefs that guide behaviour. As a component of these socially shared beliefs, it is important to consider the social context in which individuals perceive wetland drainage as part of the agricultural landscape. The environmental behaviour literature mainly focuses on attitudes and beliefs, often neglecting the role of social norms in individuals' decision-making and actions. Social norms are an important consideration in the study of behaviour because they represent standards imposed on individuals by their community or by society, and if present norms may influence subsequent attitudes and beliefs related to behaviour. This study addresses the need to bring social norm considerations into the development of conservation programs to promote participation behaviour.

There are multiple approaches to implement environmental conservation policies. Penalties, regulations, and incentives are all potential methods of achieving changes in behaviour (Carlson, 2001), but sustaining changes over time will likely require a fundamental shift in attitudes and beliefs. As many conservation programs for private land are participatory, policy-makers are interested in understanding how to create efficient incentive structures to engage landowners. The use of market-mechanisms to incentivize landowners to allow wetland restoration on their property in exchange for monetary payment is one potential method for engaging landowners. These conservation and environmental programs compensate farmers for the production of common goods or for adopting sustainable production practices (Ahnström et

al., 2008). The use of financial incentives to for these programs helps shift the costs for environmental conservation from individual landowners to society (Rolston, 1991). Still, landowner participation in these voluntary programs requires consideration of a range of social variables that interact with economic factors. Toogood et al. (2004) argue that a combination of regulations and social pressures for participation is the most effective approach to promote pro-environmental behaviours. The particular behaviours that address or reduce environmental issues have to become an inherent part of individuals' ethics in order for environmental improvements to be realized (Kinzig et al., 2013).

As environmental concerns become a more inherent part of land management policies and other regulations, the practices of individuals are pressured to adjust. Socially shared beliefs or attitudes towards the practice of drainage offer insight into motivations or barriers to engaging individuals in restoration programs. The consideration of normative pressures is important in understanding environmental behaviour. This study conceptualizes and measures two types of norms, personal and social, regarding wetland drainage in a sample of rural landowners. We aim to address the gap in the behaviour literature by exploring a methodology for measuring and including norms in models of environmental behaviour. Much of the existing literature on proenvironmental norms focuses on individual-level behaviours such as recycling and changing consumption habits. A broader focus on social norms in the present context of participation in a wetland restoration program is important to understand behaviours that have interactions with other social factors. Participation in these programs impacts landowners' property and makes changes to the landscape. Due to the broader impacts of participation in comparison to individual-level behaviours of landowners, a social norm about wetland drainage may exist, and this norm may play an important role in the shift from a production to conservation focus in agricultural communities. The identification and quantification of different types of norms can contribute to building more effective public and environmental policies by isolating potential latent influences on landowner behaviour.

The development and presence of a norm regarding changes to the biophysical environment is dependent on the perceptions of the environmental issue, beliefs about personal responsibility, and other cognitive and cultural constraints on individuals (Swim et al., 2009). Norms are an important consideration in determining environmental behaviour because they influence how people may perceive issues based on how other members in their social group act.

Norms also reveal whether a person follows individual or collective interests (Fehr and Fischbacher, 2004). Several studies have found that the extent to which individuals find that a collective resource, such as an environmental service, is fairly distributed in society increases how willing they are to contribute to this resource (Eek and Biel, 2003; Biel et al., 1999). An individual's decision to restore a wetland on his or her property likely includes the consideration of personal cost and benefits in addition to a normative perception of wetlands; for example, do his or her neighbours drain their wetlands, or is the environmental value of wetlands perceived as a common good that everyone should contribute towards and act to restore? The presence and adherence to an individual or social norm is a significant part of understanding this behaviour. In this paper, we explore the measurement of norms regarding participation in a wetland restoration program to investigate the perception of wetlands as a resource and of landowners' responsibilities in conservation. The development of a norm-based measure could greatly improve predictive behavioural frameworks and the design of participatory wetland restoration programs.

1.1 Study setting

The focal area of this research is the Canadian prairie pothole region in Alberta, Manitoba, and Saskatchewan. This region covers eastern Alberta, southern Saskatchewan, and part of western Manitoba. The prairie pothole region is an area filled with depressions from glacial activity, which has created thousands of shallow wetlands (Environmental Protection Agency, 2015). Due to decades of wetland drainage for development and agricultural production, the wetlands area has been severely impacted. The focus of this study is on the use of incentive conservation programs to engage landowners and obtain access to drained basins for wetland restoration projects. The longstanding practice of wetland drainage on agricultural land in the prairie region (Canadian Wildlife Service, 1991) is arguably the result of production taking precedence over conservation, as wetlands create land-use challenges for farmers and drainage is often the solution. This is an important policy issue in the Canadian prairie region. The extensive drainage of wetlands areas to make way for agricultural production and urban development is being addressed through new provincial policies mandating the conservation and restoration of these important ecosystems (Rubec and Hanson, 2009; Government of Alberta, 2013), but achieving these objectives requires the participation of landowners. We are interested in whether

social norms about landownership and wetland restoration in an agricultural production setting are part of these behavioural variables. We examine the role of norms through a study of rural landowners in this region and their potential to participate in a wetland restoration program.

An important consideration for the sample of landowners used in this study is the cultural context of rural, agricultural communities and how this particular cultural setting impacts social factors. Unlike urban social contexts, rural culture is based on the societal roles that evolved from an agrarian history, and the relationships that connect individuals to neighbours, families, and others in their community are centrally important in this setting (Hartley, 2004). The close social networks that exist in rural communities can impact how norms develop and their importance to individuals. Moreover, where many previous studies focus on individual-level environmental behaviours, the restoration behaviour investigated in this study is a more public action that can affect others in the individual's community. The landowners who participated in our survey were asked about norms and behaviour in the context of a specific public action, i.e. wetland restoration, and the findings about the role of norms may reflect how the interpretation of each depends on the rural cultural context. Social norms are commonly understood definitions of what behaviours are valued or socially approved (Onyx and Bullen, 2000). Norms are often acted out as 'locally constituted phenomena' in specific contexts (Fine, 2001, p. 145) as situational factors have an influence on how norms are interpreted. In a rural cultural context, social norms may carry more weight in individuals' behaviour due to the dynamics of a smaller social network. Belonging to a social network characterized by a rural community can alter attitudes, beliefs, and behaviour, with the formation of a group identity that influences individual's compliance with norms (White et al., 2009).

2. Objectives

Empirical tests of measurements for social norms are fairly limited, even though there is a strong indication from past studies that norms play a central role in behaviour. We aim to contribute to the study of social norms in environmental behaviour through the development and testing of questionnaire items that assess different norm-based concepts surrounding wetland restoration. The central objective of this study is to investigate the existence of different social and individual norms. We use a sample of rural landowners and the context of hypothetical participation in a wetland restoration program to investigate the existence of a norm surrounding

wetland drainage. We used items measuring norm-related perceptions, beliefs, and behaviours to assess whether a specific type or types of norms exist in the drainage landscape of the Prairie Provinces. Moreover, we are interested in examining whether socially shared norms to restore wetlands are related to other values and beliefs about land ownership and the environment to better understand what constitutes a norm construct.

The distinction between social and personal norms is difficult to make, as many perceptions about behaviour are influenced by both external and internal beliefs. We characterize social norms as those beliefs specifically about the interests and opinions of others, and personal norms as the beliefs about individuals' own personal obligations to perform particular behaviours. Our aim is to understand what types of norm constructs individuals may ascribe to in this particular context. Identifying and emphasizing these values could provide insights for developing successful, engaging environmental policies and programs. However, the scales used to measure these norms have not been well integrated with economic and environmental variables in the implementation of conservation programs. A lack of a descriptive normative approach to assessing participation in conservation programs limits the capacity of policy-makers to design impactful programs and maintain high rates of participation. Our study facilitates the examination of proposed norm constructs and their relation to other values, beliefs, and sociodemographic factors. It is important to identify social and cultural aspects of behaviour to understand the range of barriers and motivations in conservation program participation.

3. Literature review

3.1 Social norm theory

The measurement of social norm constructs requires a general description of what a social norm consists of and represents. Although it has been established that norms play a role in behaviour, their description and identification requires characterization of the different beliefs, rules, or behaviours that constitute a norm. Norm-based behaviours are a consequence of the acceptance of certain personal values, beliefs that important aspects of those values are under threat, and beliefs that actions can be undertaken to alleviate the threat and preserve the values (Lönnqvist et al., 2009). Individual norms are individuals' internalized standards relating to a particular behaviour (Kallgren et al., 2000), while social norms are rules and standards that exist within a group that influence social behaviour without being established as laws (Cialdini and

Trost, 1998). Individual norms create an obligation to act based on the awareness of consequences, such as threats from certain environmental conditions, and the responsibility to act to prevent these consequences (Schwartz, 1977). Social norms are generally the reflections of the perceived expectations of significant reference groups (Bamberg et al., 2007). Social norms are often context specific, and are maintained by the beliefs and perceptions of individuals that their values are at stake (Biel and Thogersen, 2007).

The differentiation between types of social norms occurs through how the norm is enforced or interpreted. Where collective norms are enforced by sanctions by others and are based on social interpretation, subjective norms exist on the individual rather than societal level and are based more on how the individual interprets the norm (Lapinski and Rimal, 2005). More specifically, subjective norms are the perceived social pressures for certain behaviours, and are maintained by personal emotions such as shame or pride (Biel and Thogerson, 2007). There is also a stated difference between injunctive and descriptive norms. Injunctive norms are an individual's interpretation of behaviours that should be followed, and descriptive are those behaviours that are actively being followed (Ibid). While each of these types of social norms represents a social standard for behaviour, the important difference is in how individuals internalize or perceive the norm. Social norms can influence individuals' behaviour depending on how strongly they value conformance within the normative expectations (Ostrom, 2014).

In addition to differentiating between types of norms, it is also important to understand the distinction between norms and other social or personal values. Values and norms are similar in that they both represent ideas about what is acceptable or unacceptable in society. Values are conceptions of what is desired or good in society that guide behaviour and evaluation (Schwartz, 1999). Where values may represent ideals or goals as guiding principles in life, norms are the enforcement of these values that more explicitly represent societal institutions (Ibid). The measurement of values often relies on assessing individuals' beliefs and attitudes towards a particular concept. The measurement of norms aims to assess individuals' perceptions about social standards or expectations, which can be based on shared values, and the resulting obligation to adhere to these norms. Values and norms are related because both represent socially shared principles, but differ in how each is formed and maintained for individuals. It is therefore important to identify what norms exist alongside values and beliefs, and what type of influences the norm places on behaviour. Understanding how different perceptions of social expectations

are expressed through various types of social norms can help indicate whether a particular type of norm exists and how it influences behaviour.

3.2 Norms and behaviour

The role of norms on perceptions and behaviour is broadly acknowledged in the literature (Heider, 1958; Goldstein et al., 2008). Cialdini et al (1990) and Harvey and Enzle (1981) theorize that norms influence behaviour when individuals are actively aware of the norm. In a study on pro-social behaviour, Krupka and Weber (2009) found that pro-social choices typically increase as individuals observe the same type of behaviour in others. A common conclusion in studies that investigate the role of different psychological variables in pro-environmental behaviour is that the role of social norms in behaviour is mediated through personal norms (Doran et al., 2015). There is no single consensus on how the structure and development of different types of norms influences behaviour. Studies on behaviour indicate that individuals may engage in certain behaviour based on social standards or perceived expectations (McAdams, 1997). In order to understand the importance of a social norm, it is necessary to have a broad understanding of these different social influences on behaviour, and not just the perceptions and beliefs regarding one act or decision.

The focus on socio-cultural variables as indicators or factors in behaviour relates to the theory that individual behaviour is inherently part of other social considerations. The premise that attitudes and values originate from individuals' identification with a group is well supported in the literature (Prislin and Crano, 2008). Goldstein et al. (2008) found in a study on the influence of social norms on environmental conservation behaviour that shared social identities can act as a central determinant of an individual's personal adherence to the personal norms of the reference group. The research on the role of socio-cultural factors in environmental conservation programs demonstrates evidence that social norms play an important role in individuals' decision to participate. A study by Chen et al. (2009) on payment for ecosystem services (PES) used information on both economic incentives and a quantification of the effects of social norms on a neighbourhood level in relation to program participation, and found that individuals' behaviour was significantly dependent on their neighbours' behaviour. The decision to participate in conservation programs can be influenced by observing or discussing the experiences of others (Morrison and Greig, 2006).

Sorice et al. (2011) applied the theory of reasoned action (Ajzen and Fishbein, 1980) to explain preferences for an incentive conservation program structure, in which landowners were offered monetary incentives to manage land cover for the benefit of endangered species, to assume that landowner participation is influenced by both attitudes toward participation and perceived social pressures to participate. Their findings regarding preferences for this incentive conservation program were consistent with the hypothesis that landowners are not motivated solely by economic interests (Koontz, 2001). The group that held negative attitudes and perceptions of a social pressure not to participate had the lowest willingness to consider participation, whereas the group with positive attitudes and perceived social pressure to participate had very high willingness (Sorice et al., 2011). The findings of these studies confirm that the design and implementation of conservation programs must incorporate social factors to understand what encourages or dissuades landowners from participating. Although financial incentives may provide some benefit to participation, programs that do not consider the potential disruptions to community and culture often have a lower probability of uptake (Knobloch and Cawley, 2005). As norms shape individuals' attitudes and values on which they base their behaviour, a social-norms approach to designing incentive conservation programs may increase participation and potentially encourage participation at lower levels of incentives (Sorice et al., 2011).

Producers and rural landowners face social pressures in addition to ecological and economic factors in the decision to adopt a conservation program or practice (Schoon and TeGrotenhuis, 2000). The quantification of these socio-cultural constructs is complex, and there is limited research on social norms specifically related to agricultural production (Chenard and Parkins, 2010). Many studies on the link between social norms and behaviour acknowledge that attitudes and beliefs are highly variable amongst social groups, and as social norms typically emerge out of interaction with others (Cialdini and Trost, 1998), the study of norms is also context specific. To incorporate the study of norms in developing or marketing conservation programs, it is important to be able to measure different types of norms as well as determining the interactions between norms and other factors. The implementation of incentive conservation programs using financial instruments should consider the capacity of the program to undermine pre-existing norms (Kinzig et al, 2013). An improved measure of norms in an agricultural

production context would enable voluntary conservation programs to address specific cultural and social barriers to participation.

4. Methods

This research was part of a larger investigation of the social factors contributing to environmental behaviour in incentive conservation programs.

4.1 Participants

In the fall of 2015, a total of 7,550 surveys were distributed to landowners in the region. Panel data recruitment sent 7,500 invites to the study, and our research team distributed 50 invitations via email to interested landowners in the southern Alberta region. Of these invitations, 1,082 entered the survey. We included two screen-in questions to complete the survey: the respondent must be 18 years of age or older, and must be a landowner in a rural area who makes land-use decisions for their property. After the screen-in questions, 198 respondents proceeded to complete the survey. In total, 165 surveys were used in the analysis, as 33 submitted surveys were not fully completed. Our sampling strategy creates several limitations for this study. Given the small sample size, it is neither provincially or nationally representative. Moreover, our environmental value and belief items reveal that our sample may have an overrepresentation of respondents who are highly concerned about environmental conservation. Notwithstanding these limitations, we do observe significant variation in our variables and this sample affords an opportunity to measure and describe social norms and to examine how these norms relate to other key variables in this study.

4.2 Survey instrument

The survey, titled ‘Landowner Views on Conservation Programs’, included five sections: about your property, about wetlands, about your values, about environmental incentive programs, and about you. Our survey instrument contains scales designed in previous studies on conservation program behaviour (Maybery et al., 2005; Trenholm et al., 2013) in addition to more general measures of environmental beliefs (Dunlap et al., 2005). We designed questions to investigate how landowners perceive what their neighbours and community believe about wetland drainage, and also to inquire more generally about the responsibilities the respondent feels toward society and the environment. The survey included statements specific to wetland

restoration and the objectives of landowners to create a contextual inquiry about environmental beliefs and values. Participants were asked to respond to the different items using a series of Likert scales to measure the level of importance or agreement.

4.3 Norm constructs

We postulate that there are two general types of norms related to wetland drainage: an individual norm that creates an obligation to conserve the environment, and a social norm that describes the expectations of individuals' neighbours and community in regard to participating in a program for wetland restoration. Personal norms influence individuals through internalized responsibility, and social norms create social pressures to act in a certain way based on perceived repercussions from others. In this study, personal norm was conceptualized as a feeling of individual obligation to protect the environment. Social norm was conceptualized as a feeling of pressures from others in your community to act in a certain way. The measurement of norms as separate constructs allows for the distinction between beliefs, values, and norms. Based on previous research that has identified both individual pro-environmental norms and social norms about environmental behaviour, we assume that an individual and a social norm are separate, measurable constructs. Our items were therefore designed to represent either a personal or social obligation or influence on individuals' behaviour, and we aim to determine what the different types of norms represent.

5. Results

5.1 Norm components

We used 10 items to create a measure of norms related to conservation and wetland restoration (Table 1). Items 1-7 were designed to indicate whether the respondent perceives a social pressure or influence in his or her community related to the restoration of wetlands. Items 8-10 are more general statements about whether the individual feels an obligation to contribute to society and conserve the environment, meant to indicate whether a pro-environmental individual norm exists.

Table 2: Norm measurement items

Items	Mean	SD	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
1. Criticism from my community for impacting the natural environment is an important outcome of draining wetlands.[1]	3.39	0.962	24.8	11.4	32.3	43.1	8.4
2. Recognition as a participant in an environmental conservation program is an important reason to participate in a wetland conservation program.[1]	3.15	0.916	6.0	13.8	43.1	33.5	3.6
3. Approval from my neighbours for increasing available land for production is an important outcome of draining wetlands.[1]	2.84	1.151	17.4	17.4	34.1	25.7	5.4
4. Agreement with what my neighbours and community would do is an important reason to participate in a wetland conservation program.[1]	2.96	0.864	7.2	16.2	50.9	24.6	1.2
5. Not wanting to upset my neighbours by restoring a wetland close to their property is an important reason to not participate in a wetland conservation program.[1]	2.60	0.982	15.0	29.9	36.5	17.4	1.2
6. My neighbours are against draining wetlands to increase available land for production.[2]	2.95	1.085	9.6	23.4	38.3	19.8	9.0
7. My neighbours' opinions are important to me when I make decisions about my property.[3]	1.86	0.711	30.5	55.1	12.0	2.40	
8. I think I have the responsibility to be a good steward of the natural environment and maintain it in good condition for future generations.[4]	4.43	0.653	1.2	0	1.8	49.1	47.9
9. Protecting the environment is an important objective for my property.[1]	4.38	0.636	0.6	0	4.8	50.3	44.3
10. Improving the environment for the next generation is an important reason to participate in a wetland conservation program.[1]	4.13	0.730	1.2	1.2	10.2	58.7	28.7

[1] 1 = not at all important; 2 = unimportant; 3 = neither unimportant nor important; 4 = important; 5 = very important
[2] 1 = strongly in favour; 2 = in favour; 3 = I'm not sure; 4 = against; 5 = strongly against
[3] 1 = never; 2 = rarely; 3 = somewhat often; 4 = very often
[4] 1 = strongly disagree; 2 = disagree; 3 = unsure; 4 = agree; 5 = strongly agree

To understand the relationships between the different norm constructs and other personal factors, we compared the components to specific values and beliefs that reflect perceptions about the environment and the important objectives of landownership. We used the revised NEP (New Ecological Paradigm) scale as a measure of general environmental beliefs. Respondents

completed a 15-item scale with statements about humans and the environment, using a 5-point Likert scale from strongly disagree to strongly agree. The statements that indicate a dominant social paradigm (DSP) view were reverse coded, so that a total higher score indicated stronger NEP beliefs. We calculated a total sum variable to include in the analysis. To measure landowner values, we included 9 of the items in Maybery et al. (2005) landowner value scale that focused on different economic, conservation, and lifestyle values. We ran a Principal Component Analysis (PCA) to assess the measures of this scale, and found that conservation and lifestyle items loaded onto one component. We combined these items and used a mean score for the lifestyle/conservation items and for the economic items to represent respondents' values. We examined the relationships between the norm components and additional items in our survey, questions about property objectives and reasons to participate in a restoration program, to get a better understanding of the values and beliefs associated with the norms. Table (2) presents the items.

Table 3: Value scale (Maybery et al., 2005) and belief measurement items

Items	Mean	SD	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
Property objectives							
Having a rural lifestyle is an important objective for my property.[1]	3.39	0.962	24.8	11.4	32.3	43.1	8.4
Protecting the environment is an important objective for my property.[1]	3.15	0.916	6.0	13.8	43.1	33.5	3.6
Having financial independence is an important objective for my property.[1]	2.84	1.151	17.4	17.4	34.1	25.7	5.4
Making a profit is an important objective for my property.[1]	2.96	0.864	7.2	16.2	50.9	24.6	1.2
Preserving family heritage is an important objective for my property.[1]	2.60	0.982	15.0	29.9	36.5	17.4	1.2
Economic value items							
I view my property first and foremost a profit-making business.[2]	2.62	1.266	19.4	40	7.9	24.8	7.9
When planning future land-use activities I only focus on being financially independent.[2]	2.81	1.129	10.9	37	17	30.3	4.8
A maximum annual return from my property is my most important aim.[2]	2.60	1.191	17.7	39.6	12.8	24.4	5.5
Lifestyle value items							
The lifestyle that comes with owning my land is very important to me.[2]	4.38	0.711	0.6	1.8	4.2	45.5	47.9
Rural communities are a great place to live and have a family.[2]	4.66	0.514	0	0	1.8	30.7	67.5
I want to preserve my land that is part of my family heritage.[2]	3.90	1.101	3.0	10.4	15.9	34.1	36.6
Conservation value items							
Good landowners regularly make improvements to their land and the environment.[2]	4.32	0.614	0	1.2	4.3	56.1	38.4
The most important thing is leaving my property in better shape for future generations.[2]	4.24	0.738	0.6	1.9	8.6	50.6	38.3
Managing my land to generate environmental services is a high priority.[2]	3.67	0.879	1.2	7.9	29.3	45.7	15.9
Reasons to participate in a wetland conservation program							
Financial opportunity is a good reason to participate in a conservation program.[1]	3.33	0.927	4.9	11.0	36.6	41.5	6.1
Learning more about wetland management is a good reason to participate in a conservation program.[1]	3.74	0.633	0.6	4.2	20.0	70.9	4.2
Getting paid for the benefits of a wetland on	3.42	0.813	2.4	8.5	38.2	46.1	4.8

my property is a good reason to participate
in a conservation program.[1]

[1] 1 = not at all important; 2 = unimportant; 3 = neither unimportant nor important; 4 = important; 5 = very important
[2] 1 = strongly disagree; 2 = disagree; 3 = unsure; 4 = agree; 5 = strongly agree

We used a PCA to determine if separate norm constructs could be identified within the 10 items. Our aim was to convert the set of items into principal components that represent separate types of norms. The analysis was not constrained (i.e. to a set number of factors), and used oblique rotation as we assumed the factors were correlated (Gorsuch, 1983). To further assess the scale as a measurement tool, we ran a reliability test on the items and found a Cronbach's alpha of 0.63. Based on this acceptable internal reliability level and fairly low cross-loadings between the items, we used the factor scores from the PCA to further investigate these norm constructs.

The PCA (Table 3) extracted three components with little cross loading between the items. The components were theoretically consistent. Component 1 included all the items relating to criticism, approval, and agreement with one's neighbours. Component 1 appears to signify an inward social norm about neighbours' opinions or judgments about the individual's actions, and is termed *neighbours' opinions*. Component 2 included the items relating to the interests and values of one's neighbours, and the individual responsibility to take these community interests into consideration when making decisions about behaviour. We believe that these statements measure an outward social norm in the form of responsibility to consider the opinions and interests of others, and termed this component *neighbours' interests*. The item 'my neighbours' opinions are important to me when I make decisions about my property' had the highest cross loading between components 1 and 3, likely because it is about both neighbours' opinions and the actions of the individual that impact their neighbours. Component 3 included the items pertaining to environmental conservation and a responsibility to maintain the environment for the future. We propose that this component is a more individualized norm about personal obligations to protect the environment, and is termed *responsibility to the environment*.

Table 4: PCA of the 10 norm construct items showing a three-factor structure

Item	Neighbours' opinions	Neighbours' interests	Responsibility to environment
Criticism from my community for impacting the natural environment is an important outcome of draining wetlands.	**0.622**	0.341	0.327
Recognition as a participant in an environmental conservation program is an important reason to participate in a wetland conservation program.	**0.655**	-0.055	0.266
Approval from my neighbours for increasing available land for production is an important outcome of draining wetlands.	**0.762**	0.134	-0.227
Agreement with what my neighbours and community would do is an important reason to participate in a wetland conservation program.	**0.770**	0.065	-0.121
Not wanting to upset my neighbours by restoring a wetland close to their property is an important reason to not participate in a wetland conservation program.	**0.576**	0.279	-0.360
My neighbours are against draining wetlands to increase available land for production.	-0.004	**0.881**	0.084
My neighbours' opinions are important to me when I make decisions about my property.	0.430	**0.603**	-0.017
I think I have the responsibility to be a good steward of the natural environment and maintain it in good condition for future generations.	-0.153	0.324	**0.701**
Protecting the environment is an important objective for my property.	0.081	-0.049	**0.711**
Improving the environment for the next generation is an important reason to participate in a wetland conservation program.	-0.054	0.002	**0.690**
Variance explained	26.19	11.95	19.01

Extraction Method: Principal Component Analysis
Rotation Method: Oblimin with Kaiser Normalization
[1] 3 components extracted

5.2 Norm components, values, and beliefs

We examined the associations between each norm component and different environmental beliefs, economic values, and conservation values to better understand the types of individuals who subscribe to the different types of norms. Both the NEP and the landowner scale have been established as measures of these particular values and beliefs. Using bivariate correlations, we investigated the relationships between the components and pro-environmental

beliefs and conservation or economic values. We found that the *neighbours' opinions* component is related to economic values, and the *neighbours' interests* and *environment* components are related to NEP beliefs and lifestyle/conservation values (Table 4).

Table 5: Bivariate correlations between component scores and NEP, landowner value scale scores, and behaviour (likelihood of participation)

	Neighbours' opinions	Neighbours' interests	Responsibility to environment
NEP beliefs	-0.012	0.241**	0.456**
Economic values	0.295**	-0.146	-0.196*
Lifestyle/Conservation values	0.095	0.073	0.424**
Behaviour	0.191*	0.093	0.388**

* . Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed).

The *responsibility to environment* component is, as expected, positively correlated to both the environmental belief measure and the lifestyle/conservation values. The slight relationship between the *neighbours' interests* component and the environmental value and belief items could be from the interpretation that addressing environmental issues is part of considering others' interests. The correlation between economic values and the *neighbours' opinions* component and no correlation to either NEP or conservation/lifestyle values indicates that this component may be related more to economic concerns than environmental ones.

To further investigate these findings, we used several additional items from our survey as comparisons to the components. As we were interested in the particular social or individual norms surrounding wetland drainage on private land, our survey asked respondents specific questions about reasons to restore wetlands and other landowner objectives. Table (5) shows the results of the correlations between the norm components and two survey questions: what objectives are important for your property, and what reasons are important to participate in a wetland restoration program.

Table 6: Bivariate correlations between components and property objectives and importance of reasons to participate

	Neighbours' opinions matter	Neighbours' interests matter	Responsibility to environment
To have a rural lifestyle	-0.007	0.026	0.219**
To protect the environment	0.081	-0.049	0.711**
To have financial independence	0.108	-0.117	0.265**
To make a profit	0.267**	-0.120	-0.029
To preserve family heritage	0.204**	-0.080	0.087
Financial opportunity	0.297**	-0.144	-0.039
Learning more about wetland management	0.316**	0.112	0.448**
Getting paid for the benefits of a wetland on my property	0.273**	-0.178**	0.010

* . Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

The propensity of the *neighbours' opinions* component towards economic factors and that of the environment component toward conservation factors are reflected again in these correlations. The *neighbours' opinions* component is correlated to the economic items, most strongly to the financial opportunity and wetland management items. These relationships indicate that this component represents a general preference for economic considerations, and that the important benefits from participation in an incentive wetland restoration program may be the financial and educational opportunities. Conversely, the *responsibility to the environment* component is correlated to the items about lifestyle and financial independence rather than profit. This component is most strongly correlated to the environmental protection and wetland management items. Participation in a restoration program from this perspective is likely based on environmental protection and management. The *neighbours' interests* component is not correlated significantly with these value items. Where the correlations of the other two components give an indication of some similarities between the *neighbours' opinions* and the environment norm concepts and other types of values, the *neighbours' interests* component is independent of the general alignment with economic or environmental values.

6. Discussion

From this exploratory analysis, we can draw some general conclusions about three different types of norms that exist in our sample of rural landowners surrounding wetland

restoration. Separate social norms about neighbours were identified in this data set, as was an individual pro-environmental norm. By using these measures of norm constructs in addition to measures of values and beliefs, both the relationship and distinction between norms and values is revealed. The *neighbours' opinions* and *responsibility to environment* components showed a general trend in slight correlations to particular types of values and beliefs, but the relationships are not strong. These components may represent similar ideals, but are expressed in a different way. As there were no significant relationships between the *neighbours' interests* component and other measured values and beliefs, this construct may be unique from conservation or economic factors. The presence of this component is important to consider in the distinction between an inward or outward social norm relating to individuals' neighbours or community. Although there was partial overlap between the two neighbour-related components, this data indicates that social norms about neighbours might be distinguishable as separate types of normative effects on behaviour. The measurable difference between a normative pressure related to opinions and interests suggests that neighbour influences can be self-motivated or externally motivated. Individuals influenced by neighbours' opinions are more concerned with their own status, and individuals influenced by neighbours' interests are more concerned with the needs of others. Future research in this area can build on the measurement of the values and beliefs that constitute these two types of norms about neighbours to better understand different types of social pressures.

The *neighbours' opinions* component appears to indicate a subjective norm. Subjective norms represent the perceived social pressure to behave in a particular way (Chenard and Parkins, 2010). These norms are formed based on individuals' perception of what behaviours are approved or disapproved by others, and are enforced on the individual level by personal emotions such as shame or pride (Biel and Thogerson, 2007; Aronson, 2010). Agreement, recognition, and criticism for draining or restoring wetlands are the important influences in this component. This component is correlated with economic values and the objectives of making a profit, learning about wetland management, getting paid for the benefits of a wetland, and also preserving family heritage (Tables 4 and 5). The relationship with both economic interests and also in wetland management is an insight into how some individuals perceive incentive conservation programs from an economic perspective rather than with interest in environmental conservation. The values and beliefs associated with this component represent economic

interests. As this component is based on items about social pressures and neighbours' opinions, there may be a broader social norm about the importance of production and economic gains that exists and impacts the perception of wetland restoration.

The *neighbours' interests* component more closely aligns with an injunctive norm, through which an individual interprets the social standards for behaviour and internalizes these rules of behaviour for his or herself. The clear behavioural choice in the item 'my neighbours are against draining wetlands' creates a normative standard of how others behave. The low correlation between this component and the likelihood of participation in a restoration program (Table 4) may be due to a lack of a descriptive norm, or a behaviour that is actually being followed by the majority (Lapinksi and Rimal, 2005) that is more influential on individuals' actions. Individuals with the perception that they should participate based on personal values and beliefs may not if others in their social reference group are not actively participating in the programs. In relatively new types of incentive conservation programs in the Canadian context, it may be more valuable to communicate information regarding other factors that are directly related to participation, such as economic or conservation values, rather than using injunctive or descriptive norms to promote behaviour based on the standards or actions of others. Particularly if individuals are more concerned with a descriptive norm rather than injunctive, communicating the issue from the neighbours' interests perspective will garner little support as restoration is still being established as a desired practice for private landowners. Understanding how the different expression of norms in behaviour relates to actual behavioural decisions is important for communicating reasons to participate in a program.

Exploring correlations between norms and other measures of values and beliefs can help policy-makers understand what norms represent and how they are expressed in behaviour. These measures of social norms are unique from other values and beliefs because each component centres on specific perceptions about individual and social standards. This is particularly important in the responsibility to the environment component. Differentiating between environmental values and an environmental norm could improve insight into individuals' conservation behaviour if one is present and the other is not. The NEP environmental belief items are a general measure of an individuals' concern for the state of the environment; the environmental value items from the landowner value scale are measures of an individuals' priorities for land ownership that pertain to the environment. The environmental norm construct

is moderately correlated to these values because both indicate a certain attitude towards the environment (Table 4). The key difference between these values and our norm construct is that the norm signifies the personal responsibility an individual feels to act on these environmental values and beliefs. The strong correlation of the component to the objective of protecting the environment and to learning about wetland management as a reason to participate indicates a strong relationship to individual action. This norm construct complements measures of values and beliefs by isolating the obligations to act on the latter.

In terms of using norm constructs in understanding behaviour, it is interesting to note that the *neighbours' opinions* and *responsibility to environment* components were both correlated to participating in a wetland program for restoration and to the participation reason of learning more about wetland management (Tables 4 and 5). Although the neighbours' component has only a slight correlation with these items, both being related to participating and an interest in wetland management is interesting to compare to the relation with other values. The *neighbours' opinions* component is correlated more with economic interest items, and the responsibility to the environment component more with conservation. This may indicate different types of motivations to participate in these programs, which could provide an important insight into the design and marketing of voluntary restoration programs. Individuals who identify more with the *neighbours' opinions* norm may be more highly motivated to participate in a program marketed as a financial opportunity, particularly if they also perceive a social norm that emphasizes production. Individuals who identify with the *responsibility to the environment* norm are likely less interested in financial gains, and are more interested in how to manage their land for environmental conservation. However, both types of individuals are interested in the educational aspect of learning management practices that benefit their personal values.

The distinctions in the interpretation of norms provide a potential approach to gaining participation in conservation programs by stressing aspects that appeal to landowners with different values and beliefs. Identifying different types of normative influences on behaviour can inform communication and program development strategies by proving that simply providing knowledge about the issues is not adequate to influence behaviour. The public understanding of an environmental issue, such as the need to conserve wetlands, may generally acknowledge that the restoration of these ecosystems is important. However, when high awareness does not result in high participation, insights into normative influences can help policy-makers and programs

understand the nuances of attitudes and beliefs. There are numerous theoretical frameworks that have been proposed to explain the gap between the possession of environmental knowledge and awareness and the display of pro-environmental behaviours (Kollmuss and Agyeman, 2002). An understanding of the causes and influences of social norms on certain environmental behaviours can help explain why increased knowledge and attitudes do not always lead directly to increased behaviour. As seen in our case study, the norm components concerning neighbours' interests and the environment are both positively correlated with NEP, representative of environmental beliefs. Only the environmental norm is correlated with other direct conservation beliefs and the likelihood of participating in a conservation program. Awareness and knowledge are not always adequate to encourage pro-environmental behaviour. The identification of norms helps to explain what other motivations and barriers individuals perceive that influence their behaviour. The rural community context of our study also has implications for our findings. As the rural cultural setting has unique characteristics, such as stronger traditional roles and closer social networks, landowners may be more influenced by social norms that are supported by their neighbours.

7. Conclusion

In conclusion, the formation, maintenance, or change in social norms is an ongoing study of human behaviour, and remains an important issue in the Canadian prairie province region as environmental policies are an increasing influence on the agricultural production environment. The Government of Alberta has long acknowledged that social pressures to maintain "clean" fields might be a significant factor in landowners' decision to drain wetlands (Alberta Water Resources Commission, 1993). The traditional norm of production may not be easily overcome by a shift towards more environmental awareness. The results of this study show that there are different expressions of normative pressures that can lead to certain behaviours. Individuals who hold strong environmental concerns and pro-environmental norms are likely to participate in a conservation program regardless of other considerations. The identification of two types of neighbours-related norms indicates that there is an important aspect of social behaviour in encouraging participation in conservation programs. Those individuals with perceptions of neighbours' opinions and interests who consider these as important factors affecting their behaviour require different types of motivations to participate.

As Jansson et al. (2011) conclude in their study on adoption of an environmental behaviour, adoption or participation rates would likely be more effective if the awareness of the consequences of not acting were emphasized. Promoting the environmental benefits of wetland restoration and the importance of conservation to society is one component, but it is also important to appeal to the social and individual values that landowners consider in behaviour. Social support tactics such as encouragement, engagement, and praise can be used to strengthen social norms by informing individuals about the perceptions and behaviour of others (Steg and Vlek, 2009). When the pro-environmental behaviour is relatively inconvenient and costly, the inclusion of social support in implementing conservation programs for wetlands restoration may help individuals make their decision based on factors other than their own costs for participation. The development of future incentive programs could be improved by considering these aspects of social standards in behaviour. The promotion of environmental conservation, emphasis on the broader interests and values of landowners' community, and addressing the recognition or approval from participating are all important social factors in designing and communicating these programs.

Chapter 3: Explaining participation in conservation programs: the role of social factors in an integrated behaviour model

1. Introduction

The growing use of incentive-based conservation programs to address environmental issues has revealed the difficulty in understanding environmental behaviour, particularly the motivations or barriers to participation in these programs. The application of science and policy to address environmental issues could include social insights to better understand the process of environmental behaviour (Guagnano et al, 1995). This paper uses a sociological model of environmental behaviour to investigate a range of social factors in the decision to participate in an incentive conservation program that pays landowners for wetland restoration. Our focus is on the role of social values, beliefs, and norms in the willingness to participate in this type of program. Incentive conservation programs, in comparison to facilitative or coercive programs, provide some counter measurement to perceptions of risks or costs with tangible benefits that interact with other factors in individuals' decision-making (Coggan et al., 2010). Policy-makers, researchers, and restoration agencies involved in conservation programs are interested not only in economic and biophysical barriers or motivations, but also in understanding the social factors that influence participation. It is important to understand how social variables interact with other considerations to influence individuals' behaviour and participation in these programs.

Environmental and resource management in Canada is beginning to respond to pressing issues such as degrading water quality, loss of wildlife habitat, and natural disaster prevention with the implementation of conservation programs on private land. One leading issue is the rapid loss of wetlands in the Canadian prairie region to agricultural conversion and other human development. Wetland drainage results in negative environmental impacts such as increased nutrient loading in waterbodies, the release of significant amounts of greenhouse gases, and loss of water quality. Concern over these issues as a contributor to environmental degradation and climate change has brought wetland restoration to the forefront of watershed management in the Canadian prairie province region. Many of the drained wetlands on the prairie landscape that could potentially be restored are on private land. Incentive conservation programs are an increasingly necessary approach to obtain access to these drained basins for restoration projects by using financial motivation for landowners to participate in restoration projects. Engaging landowners and acquiring private land for restoration projects is a unique challenge because it

requires effective communication and program delivery to commit landowners to allowing restoration on their property.

The identification of important social factors in landowner behaviour that impact participation in restoration programs is a key part of addressing the challenge of wetland conservation in Canada. Environmental behaviour is guided by a combination of sociodemographic variables, situational factors, and socio-psychological constructs (Oreg and Katz-Gerro, 2006). An important research question is therefore not only what variables are associated with participating in a conservation program, but also how these factors interact. We intend to build on the traditionally used variables in predicting environmental behaviour by using several additional measures of values, beliefs, and norms to investigate the role of social factors in participation. Many studies have found that higher pro-environmental attitudes and knowledge do not necessarily correspond to increased environmental behaviours (Kollmuss and Agyeman, 2002). The underlying social factors related to other environmental and economic considerations that influence behaviour are important to understand this gap. This research aims to quantify the role of social values, beliefs, and norms in landowners' decision to participate in a wetland restoration program to build on incorporating social factors in the design of conservation programs.

2. Objectives

Environmental issues concern personal, social, economic, and biophysical variables that may represent either self- or socially-interested behaviour. The difficulty in predicting environmental behaviour is identifying the range of factors that influence individuals and determining how these factors might interact. This study uses a particular environmental behaviour in a conservation incentive program, several measures of environmental values and beliefs associated with landownership, and indicators of social and personal norms to assess how different social constructs influence behaviour. As participatory conservation programs become necessary to achieve environmental conservation goals, it is important to study the factors in behaviour and identify their role in participation to consider these social influences in the design and communication of programs. We are also interested in understanding how social variables, such as specific and general environmental beliefs and landowner objectives, are related. Drawing on Stern's (2000) Value-Belief-Norm (VBN) theory, this paper builds an integrated

theoretical model with 5 interacting variables: landowner values, general environmental beliefs, social norms, personal norms, and behaviour. The paper tests the VBN constructs as predictors of behaviour in a specific context in order to build on the traditional theory with the addition of social norms and specific landowner values. Based on the growing potential for use of incentive programs for wetland restoration in Canada thus far, we aim to develop recommendations for future program development by identifying the social variables with a high impact on program participation.

We propose that the intent to participate in an incentive conservation program for wetland restoration is a result of landowners' (1) landowner values, represented by economic or conservation and lifestyle based categories; (2) general environmental beliefs, represented by the mean score on the NEP scale; and (3) social and personal norms about wetland restoration and environmental conservation, represented by beliefs about individual responsibilities and the opinions and interests of individuals' neighbours. We expect that each variable in the model will directly affect the next, as hypothesized in the VBN theory. Moreover, we are interested in understanding how the inclusion of a social norm variable will impact the behaviour. While the VBN model has been proven successful in explaining low-cost environmental behaviours, we are interested in its use for assessing decision-making that has broader implications than that of individual-level behaviours. The environmental behaviour we address in this study has direct effects on individuals' land, and can also impact their neighbours or community by changes in the landscape. We are therefore interested in whether the VBN theory can explain behaviour with more extensive social impacts, and include a social norm measure in addition to the traditional personal norm component.

3. Past research

3.1 Traditional predictive variables of environmental behaviour

An important part of building this study is identifying the variables used to predict and understand behaviour in past studies. In recent years, environmental policy research has shifted to a focus on the role of the individual in the context of global scale environmental challenges (Barr et al., 2011). There is a consequent growing interest in the integration of different natural and social science disciplines to develop policies that deliver environmental benefits and serve individual and social interests. Environmental behaviour is at the forefront of this field as it is an

important component of policies and programs. Many studies have investigated what variables play a role in individuals' environmental behaviour. The results of these past studies indicate that how individuals decide to act depends on multiple factors, including both the structure of the program and a range of personal variables. In the agricultural landowner context, market-based programs are used to promote the desired behaviour through the use of economic incentives (Luzar and Diagne, 1999). Through the continuous study of program uptake and participation, researchers have found that economic factors are not adequate to explain this behaviour. The traditional variables used for predicting participation in conservation programs can be broadly classified into four groups: demographic, economic, environmental, and social. Other factors, such as institutional organizations and program design, are also important structural considerations when assessing the implementation of a conservation program.

The traditional variables used to predict participation take into account a range of personal and environmental factors. Demographics are typically classified as age, gender, the type of property ownership (i.e. family or corporation), and level of education of the primary decision maker (Coggan et al., 2013). Economic variables mostly focus on the financial security of landowners: financial compensation is necessary for lost production resulting from participation in a conservation program (Ibid). Blackmore and Doole (2013) identify factors including transaction costs, financial and non-financial benefits, environmental outcomes, interaction with the implementing agency, and contract length as indicators of landowners' perceptions of program outcomes. Biophysical variables include the characteristics of the property and its suitability to the program requirements. The physical environment also plays role in situating landowners relative to neighbours; if individuals are close to neighbours who are participating in programs or close to information providers, the likelihood of participation increases (Pannell et al., 2006).

Other personal factors include the landowners' off-farm or off-property commitments and activities that use up time and resources. The social variables that influence participation include external and individual pressures. Social factors including financial goals, career goals, social acceptance, and leisure and work life balance have all been found as important influences on participation (Pannell et al., 2006). There is overlap between demographic, economic, and environmental characteristics and social and cultural factors. Social norms and values are identified as important variables in participation (Montague and Lohrenz, 2007; Goldstein et al.,

2008). The social and ideological variables that motivate environmental behaviour, such as social practices and personal norms, may indicate how and why individuals perceive certain economic and biophysical risks. The connection between willingness to pay for environmental protection or services is related to attitudes and indicators of personal norms, such as guilt or awareness of consequences (Widegren, 1998). The environmental behaviour literature identifies awareness of the environmental problem and the attribution of personal responsibility as motivations to act (Bamber and Möser, 2007).

Participation in conservation programs is an interesting study of behaviour because the perceived benefits or costs to both oneself and to others may factor into the decision to participate. Situational variables, such as physical structures, geography, and social institutions create a particular behavioural context for individuals (Barr and Gilg, 2007). Psychological variables are the perceived threats, motivations, responsibilities, and trust that an individual has within this context (Ibid). Environmental behaviour often requires the consideration of these variables for both oneself and others within a group. Wetland restoration can be perceived as a 'resource dilemma' in which individuals choose between keeping resources to themselves or contributing to a common pool, where members of a group should input something to receive something in return (Biel and Thogersen, 2007). In various communities or regions, individuals might perceive the costs and benefits of restoring a wetland differently. The idea that wetland restoration can provide public goods, such as water quality, contributes to the overall value of a wetland (Turner et al., 2000). The consequent benefits, either direct or indirect, of wetland restoration to individuals are a component of the valuation of wetland ecosystem services. Understanding environmental behaviour in conservation programs requires consideration of how individuals perceive the costs and benefits of the program's outcomes in addition to personal and social level characteristics.

3.2 Value-Belief-Norm theory and environmental behaviour

Stern's (2000) Value-Belief-Norm (VBN) theory provides a framework for addressing social variables in environmental behaviour. This theory helps to situate social factors as part of environmental behaviour. Values, beliefs, and norms are related but separate types of social factors. Though the use of values and beliefs as concepts varies in social research, it is generally agreed that values are more abstract evaluations and beliefs are more concrete perceptions about

behaviours, objects, or other phenomena (Early and Chaiken, 1993). Values are more general and not as domain-specific as beliefs, which are more focused on certain ideas (Davidsson and Wiklund, 1997). The definition of the concept of norms is also variable in literature and practice. The use of the term social norms in this study is generally referring to the beliefs, rules, or values that activate and steer social behaviours. Paluck (2009) defines social norms as socially shared beliefs prescribing or proscribing social behaviours. Personal norms are an obligation to act based on the awareness of consequences, such as threats from certain environmental conditions, and the responsibility to act to prevent these consequences (Schwartz, 1977). The VBN theory frames values, beliefs, and norms as separate influences that drive environmental behaviours. Building on Schwartz's norm activation model that describes how norms become enacted and influence individuals, Stern's theory outlines a causal series of variables that drive environmental behaviour: values, an individual's ecological worldview measured by the New Ecological Paradigm, more specific environmental concerns, and personal norms (Kaiser et al., 2005).

The aim of using the VBN model to understand behaviour is to measure the role of social variables individually and cumulatively. The literature on influential factors in environmental behaviour is inconclusive in terms of identifying the role of different social variables in relation to each other, and how this interaction affects behaviour. There is a range of findings that demonstrate attitudes, values, and beliefs play a role in environmental behaviour, but inconsistencies in the presence of these factors and consequent behaviour demonstrate a need for an improved understanding of the role of social factors. For example, a 1993 survey across 22 countries found high levels of environmental attitudes but low levels of corresponding environmental behaviour (Dunlap et al., 1993). Many similar studies have concluded that attitudes were a situational- rather than dispositional-based variable. Inconsistencies in attitudes, knowledge, and behaviour indicate that there are many influences on individuals' decision-making. The development and influence of these variables within individuals and social institutions is a social process that is difficult to generalize. While it is important to identify values, beliefs, and norms as important aspects of individuals' perceptions and behaviour, these factors should be considered both individually and collectively to draw conclusions about the role of a particular variable in behaviour.

Pro-environmental behaviour is often described as a combination of self-interests and of concern for others and the environment (Bamberg and Möser, 2007). Researchers typically use

Schwartz's (2007) norm activation model to describe pro-social motives in behaviour, or use rational choice models such as Ajzen's (1991) theory of planned behaviour to investigate self-interested behaviour (Ibid). In this study, we adapt the VBN model to look at both social and personal motivations for environmental behaviour. We were interested in measuring and including a social norm component in our behaviour model in addition to the personal norm component in the VBN theory. Stern proposes that environmental behaviour is a result of a moral obligation to act pro-environmentally, or a personal norm about the responsibility to protect the environment, that is activated as the result of a causal chain of beliefs and values. As our research question focuses on the uptake of conservation programs in rural communities, we are also interested in the role of social norms based on the perceptions of community or social group standards about the restoration of wetlands. We therefore altered Stern's model to include specific measures of landowner responsibilities and a social norm about wetland restoration.

4. Materials and method

4.1 Conceptual model

The model to be examined contains six constructs: (1) economic values, (2) conservation/lifestyle values, (3) general environmental beliefs, (4) social norm, (5) personal norm, and (6) behavioural intention (Fig. 1). The landowner value component includes two sub-components, economic and conservation/lifestyle values. The environmental belief component, measured by the NEP scale, represents a pro-ecological worldview. The social norm component includes two sub-components, a norm about neighbours' interests and a norm about neighbours' opinions. The personal norm component is the belief of a personal obligation to protect the environment. The behaviour intention component is a measure of the likelihood of participating in a wetland restoration program that pays for your participation. The model assumes that the higher the NEP score, the more likely an individual is to participate in the program. Previous literature using the NEP score as a predictor of behaviour supports that a pro-ecological worldview is related to environmental behaviour (Clark et al., 2003; Poortinga et al., 2004). The model proposes that values and beliefs influence the interpretation or perception of both social and personal norms about the environment. Our exploratory measures of social and personal norms and their relationship to behaviour are investigated in this model.

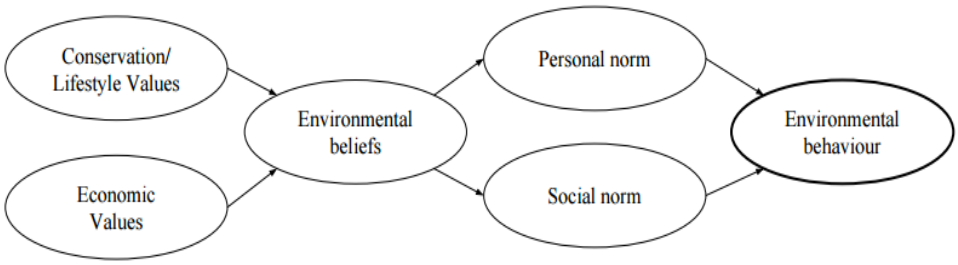

Fig. 1: Conceptual model of adapted VBN constructs

4.2 Data collection

In the fall of 2015, our questionnaire was distributed throughout rural regions in Alberta, Manitoba, and Saskatchewan. The panel data recruitment sent 7,500 invites to the study, and our research team distributed 50 invitations via email to interested landowners in the southern Alberta region. Of these invitations, 1,082 entered the survey. We included two screen in questions to complete the survey: the respondent must be 18 years of age or older, and must be a landowner in a rural area that makes the land-use decisions for their property. After the screen in questions, 198 respondents proceeded to complete the survey. In total, 165 cases were used in the analysis, as 33 surveys were not fully completed.

4.3 Questionnaire

The questionnaire was titled 'Landowner Views on Conservation Programs' and included five sections: about your property, about wetlands, about your values, about environmental incentive programs, and about you. The questionnaire asked about general and specific environmental beliefs, the values and responsibilities the respondent felt as a landowner, and about different objectives for his or her property. The questionnaire intended to assess beliefs about the outcomes of wetland drainage, the values of each landowner, and the perceptions about social norms on restoration or drainage, using a series of Likert scale questions. To create a measure of behaviour, respondents were asked their likeliness to participate in a wetland restoration program that paid for their participation.

4.4 Structural equation modeling

We used structural equation modeling (SEM) in Stata 14 for our central analysis to model the relationships between the variables. SEMs are multivariate regression models often used to

identify the causal influences of the exogenous variables on the endogenous variables and the causal influences of endogenous variables upon one another (Hailu et al., 2005). The objective of using SEMs was to describe the relationships both between the constructs and their influence on the behaviour variable. SEMs are often used when the variables of interest cannot be measured perfectly, as is the case with our exploratory measures of values, beliefs, and norms (Rabe-Hesketh et al., 2004). Our data contains sets of items reflecting hypothetical social constructs of values, beliefs, and norms. We included latent variables from each of our indicator value, belief, and norm measures. The use of a latent variable SEM framework created factors underlying the measured items to account for measurement error. We used single indicator variables for each latent variable due to our relatively large sample size (N=165) and the accompanying issues with multi-item measures.

5. Results

Our survey was designed to measure the social variables identified in the VBN theory and test these constructs as predictors of the dependent variable, our measure of environmental behaviour. The postulated causal chain of the VBN theory model was tested in our adapted framework, in which values influence beliefs that then activate norms. Index variables were calculated for the measurement scales used on our survey instrument.

5.1 Constructs

Values. We used the Maybery et al. (2005) landowner value scale for our value variables. The purpose of this scale is to indicate separate categories that describe the basic values landowners have for their land, which identifies what perceptions and ideologies are important to individuals. Maybery et al. (2005) state that these basic values are fundamental to other types of attitudes and beliefs. We modified the scale for our survey, including 9 of the 15 landowner value/objective items with one added statement about heritage as a conservation value item. We used a principal component factor analysis (PCFA) to measure if the three separate economic, conservation, and lifestyle factors were identifiable within the set of items, and found Cronbach's alpha for each set of items as a measure of internal consistency. The internal consistency of a scale is the level of correlation between the scale items and their ability to measure the same construct. A set of items with a Cronbach's alpha value greater than 0.60 is deemed acceptable (Nunnaly and Bernstein, 1994). The alpha value of our revised value scale was 0.80. The

individual subscales economic, lifestyle, and conservation had an alpha value of 0.90, 0.65, and 0.78 respectively. The lower internal reliability of the lifestyle subscale was reflected in our factor analysis.

The PCFA extracted separate factors within the scale based on Eigenvalues greater than 1; only a clear economic factor emerged (Table 1). The second factor cross-loaded on all of the items, but most strongly on the conservation items and two of the lifestyle items. We assume that the economic factor designates a landowner primarily concerned with profits, as intended by Maybery et al. (2005) in their design of the scale. The cross-loading on items with the second factor shows strong conservation and lifestyle values, but also consideration of economic variables. We can assume that the cross-loading of the economic items on the second factor is resultant of landowners concerned about being financially independent and making a profit, but still prioritizing the preservation of their land and the environment. Moreover, the reduced items scale we used in our survey could have limited the factor extraction. The combined conservation and lifestyle items had an alpha value of 0.76. We designated two value categories, economic and conservation/lifestyle, in our analysis. We used the total scores for each of the economic and conservation/lifestyle items to represent the value categories.

Table 7: PCFA of the 9 landowner value items showing a two-factor structure termed economic and conservation/lifestyle[1]

Survey Item	Economic	Conservation/ Lifestyle
Economic		
I view my property first and foremost a profit-making business	**0.75**	0.52
When planning future land-use activities I only focus on being financially independent	**0.72**	0.48
A maximum annual return from my property is my most important aim	**0.79**	0.47
Lifestyle		
The lifestyle that comes with owning my land is very important to me	-0.45	**0.56**
Rural communities are a great place to live and have a family	-0.39	**0.62**
I want to preserve my land that is part of my family heritage	-0.15	**0.70**
Conservation		
Good landowners regularly make improvements to their land and the environment	-0.34	**0.75**
The most important thing is leaving my property in better shape for future generations	-0.30	**0.77**
Managing my land to generate environmental services is a high priority	-0.02	**0.73**

[1] A cross-loading was confirmed if the loading on a second factor was higher than 0.40 (Maybery et al, 2005)

Beliefs. To measure general environmental concern, respondents completed the revised New Ecological Paradigm (NEP) scale (Dunlap et al, 2000). The odd-numbered items were worded so that agreement indicates a pro-ecological view; the even-numbered items so that disagreement indicates a pro-ecological view. For the analysis, the odd-numbered items were reverse scored so that the disagree statements were lower values than the agree statements. This allowed us to create a total score for each item to make a distinction between a DSP (dominant social paradigm) or NEP worldview. In environmental behaviour literature, the NEP scale is often used to identify particular environmental attitudes (Schultz and Zelezny, 1999; Roberts and Bacon, 1997). It is generally accepted that a score of 3 is the threshold between an anthropocentric and ecocentric worldview, where anything below indicates attitudes in the DSP (Ogunbode, 2013; Rideout et al, 2005). In our sample, the mean NEP score was 3.53, indicating that our sample was on average more pro-ecological in their worldview. In order to determine whether the set of 15 items acceptably constituted an internally consistent measuring instrument

(Dunlap et al, 2000), we conducted a reliability analysis and found an acceptable Cronbach's alpha of 0.87. We used total sum of NEP items (M = 53.00, SD = 9.56) in the analyses to indicate respondents' general environmental beliefs.

Norms. We used 10 items to create a measure of norms related to conservation and wetland restoration (Table 2). We used a PCA to determine if separate norm constructs could be identified within the 10 items. Our aim was to convert the set of items into principal components that represent separate types of norms. The analysis was not constrained (i.e. to a set number of factors), and used oblique rotation as we assumed the factors are correlated (Gorsuch, 1983). The PCA (Table 2) extracted three components with little cross loading between the items. The components were theoretically consistent. Based on an acceptable internal reliability level of 0.63and fairly low cross-loadings between the items, we used the factor scores from the PCA to represent three norm constructs: *neighbours' opinions*, *neighbours' interests*, and *responsibility to the environment*. The neighbours' opinions norm had an alpha value of 0.72, the neighbours' interests 0.41, and the responsibility to the environment norm of 0.60. In the full analysis, we used the neighbours' opinion factor to represent the social norm measure due to the stronger internal reliability and the cross-loading of the neighbours' interest component that indicates it is a weaker measure.

Table 8: PCA of the 10 norm construct items showing a three-factor structure

Item	Neighbours' opinions	Neighbours' interests	Responsibility to environment
Criticism from my community for impacting the natural environment is an important outcome of draining wetlands.	**0.622**	0.341	0.327
Recognition as a participant in an environmental conservation program is an important reason to participate in a wetland conservation program.	**0.655**	-0.055	0.266
Approval from my neighbours for increasing available land for production is an important outcome of draining wetlands.	**0.762**	0.134	-0.227
Agreement with what my neighbours and community would do is an important reason to participate in a wetland conservation program.	**0.770**	0.065	-0.121
Not wanting to upset my neighbours by restoring a wetland close to their property is an important reason to not participate in a wetland conservation program.	**0.576**	0.279	-0.360
My neighbours are against draining wetlands to increase available land for production.	-0.004	**0.881**	0.084
My neighbours' opinions are important to me when I make decisions about my property.	0.430	**0.603**	-0.017
I think I have the responsibility to be a good steward of the natural environment and maintain it in good condition for future generations.	-0.153	0.324	**0.701**
Protecting the environment is an important objective for my property.	0.081	-0.049	**0.711**
Improving the environment for the next generation is an important reason to participate in a wetland conservation program.	-0.054	0.002	**0.690**
Variance explained	26.19	11.95	19.01

Extraction Method: Principal Component Analysis
Rotation Method: Oblimin with Kaiser Normalization
[1] 3 components extracted

5.2 Structural equation models

SEM was used to assess the proposed model in Fig. 1 and examine the relationships between the adapted VBN constructs. Although there is no consensus about the criteria required to assess model fit, the chi-square fit index is the most commonly reported. For a good model fit, the chi-squared value should not be significant (Hailu et al., 2005). The variables, described in Table 9, were each representative of the different constructs in our model based on the

measurement items we used in our survey. To account for measurement issues, we set the individual reliabilities of each variable in the model to the estimated alpha value for the set of items found during the construct analyses.

Table 9: List of model variables for the analysis of factors in behaviour

Variable label	Description
Exogenous variables	
Economic values (latent)	Measure of economic values
Conservation/Lifestyle values (latent)	Measure of conservation/lifestyle values
Endogenous variables	
Economic values	Total economic values score
Conservation/Lifestyle values	Total conservation/lifestyle values score
Total NEP score	Total NEP scale score
FAC1	Factor score of neighbours norm
FAC2	Factor score of environment norm
Behavioural intention	Likelihood of participation
Social norm (latent)	Measure of social norm about neighbours
Personal norm (latent)	Measure of personal norm about the environment
Beliefs (latent)	Measure of general environmental beliefs

We ran several models with various paths between the VBN constructs measured in our variables. Table 10 shows the results of our first simplified model, in which we excluded the two norms variables to measure the relationship between beliefs and behaviour without the influence of norms. In Model 1, beliefs are highly significant in explaining the intent to participate variable. A higher environmental belief causes a higher likelihood of intent to participate. Economic values are negatively related to the beliefs measure and lifestyle/conservation values are positively related.

Table 10: Simplified value-belief-behaviour causal Model 1 results

	Std. Path Coef.	Std. Err.	z	P>z	Reliabilities
Structural					
Beliefs ←					
Economic values	-0.540	0.071	-7.54	0.000	0.90
Cons/Life values	0.289	0.086	3.37	0.001	0.76
Behaviour intention ←					
Beliefs	0.267	0.077	3.44	0.001	0.87

LR test of model vs. saturated: $chi^2(2) = 4.17$, Prob > chi2 = 0.1242

Table 11 shows the results of Model 2, in which we included all of our VBN variables as seen in our conceptual model (Fig. 1). We followed the causal chain proposed in the theory, through which values cause beliefs cause norms, which in turn directly influences behaviour. In Model 2, beliefs are no longer significant in the intent to participate, and both norm variables are

significant. The belief variable is related to the personal norm, but not the social norm. However, the poor model fit (chi^2=50.53) indicates that the model should be modified.

Table 11: Causal Model 2 results showing factors in behaviour

	Std. Path Coef.	Std. Err.	z	P>z	Reliabilities
Structural					
Beliefs ←					
Econ values	-0.551	0.070	-7.78	0.000	0.90
Cons/Life values	0.323	0.084	3.81	0.000	0.76
Social norm ←					
Beliefs	-0.048	0.097	-0.49	0.621	0.87
Personal norm ←					
Beliefs	0.633	0.074	8.47	0.000	
Behaviour intention ←					
Social norm	0.244	0.080	3.05	0.002	0.72
Personal norm	0.490	0.076	6.43	0.000	0.60

LR test of model vs. saturated: $chi^2(7)$= 50.53, Prob > chi2 = 0.000

Based on the poor fit of Model 2, we reexamined the path relationships in our model to see where improvements could be made and find the best fitting model. Though the VBN causal chain indicates that there is only a single direct relationship from values to beliefs to norms to behaviour, several studies suggest that values are fundamental in social factors. Values have been identified as the basis for other attitudes, beliefs, and norms (Eagly and Chaiken, 1993; Gray, 1985; Stern et al., 1995). Therefore, we believe that values may play a direct role in the formation of social and personal norms without the mediating role of beliefs. We also ran modification indices for Model 2 to assess what Stata estimates as the most likely relationship between variables where the current path is set to zero. The indices show an addition of a path between economic values and social norm and a path between conservation/lifestyle values and personal norm. To be theoretically consistent with the literature that suggests values are fundamental factors in both social and personal norms, we also added paths between the economic value and personal norm and the conservation/lifestyle value and social norm.

Table 12: Modification indices for variable paths in causal Model 2

	MI	P>MI	Std. EPC
Structural			
Social norm ←			
Econ values	16.737	0.00	0.425
Personal norm ←			
Cons/Life values	23.325	0.00	0.480

EPC = Estimated Parameter Change

We ran a third model based on suggestions from the modification indices shown in Table 6 and the relationships that match the underlying theory about the role of values in other social constructs. Table 13 shows the parameter estimates of the best fitting SEM, Model 3 (Fig. 3). In this model, we added a path between values and norms.

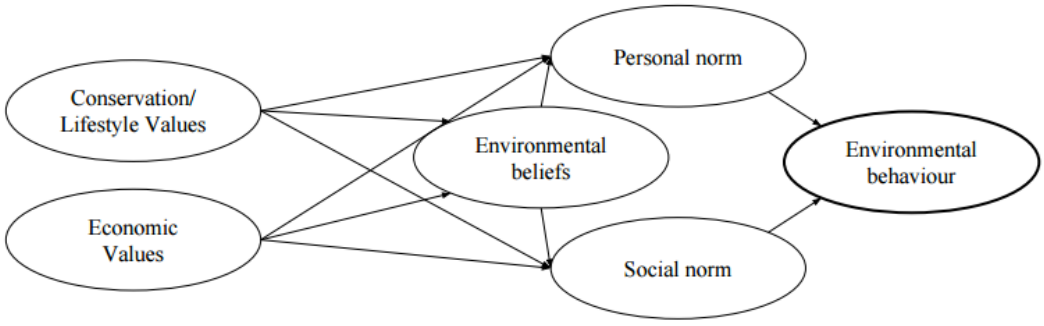

Fig 2: Revised model showing adapted variable paths

Model 3 has a lower chi-square value and improved fit from Model 2. In Model 3 (Fig. 2) we added a path from the value variables to the norm variables. As predicted by the VBN model, values explain beliefs, with economic values negatively related and conservation/lifestyle values positively related to the intent to participate measure. In Model 3, we see that economic values also contribute independently of beliefs to the social norm variable, and conservation/lifestyle values to the personal norm variable (Table 13). These relationships suggest that the contribution of values to the formation of norms occurs not through beliefs, but as a separate influence. The standardized coefficients suggest that the norm variables have a stronger effect on behaviour than the belief variable. Where the belief variable was highly significant in Model 1, the inclusion of the norm measures reduces the influence of beliefs on the intent to participate. The final structural model presented in Fig. 2 is a representation of the paths evident in the data based on the results of Model 3.

Table 13: Causal Model 3 results of best fitting SEM showing factors in behaviour

Standardized	Coef.	Std. Err.	z	P>z	Reliabilities
Structural					
Beliefs ←					
Econ values	-0.543	0.071	-7.60	0.000	0.90
Cons/Life values	0.284	0.086	3.30	0.001	0.76
Social norm ←					
Beliefs	0.215	0.117	1.84	0.066	0.87
Econ values	0.478	0.112	4.27	0.000	
Cons/Life values	-0.038	0.111	-0.34	0.732	
Personal norm ←					
Beliefs	0.443	0.104	4.26	0.000	

Econ values	-0.187	0.109	-1.71	0.087	
Cons/Life values	0.558	0.095	5.87	0.000	
Behaviour intention ←					
Social norm	0.236	0.081	2.90	0.004	0.72
Personal norm	0.444	0.076	5.80	0.000	0.60

LR test of model vs. saturated: $chi^2(4)= 4.862$, Prob > chi2 = 0.302

6. Discussion

In general, there is sufficient evidence for the conceptual model presented in Fig. 4, in which we added additional relationships not identified in the VBN chain. Overall, the data did not fit the proposed model of environmental behaviour (Fig.1) that follows the chain of the VBN theory. In this chain model (Model 2), the relationship between the value variables and norm variables was facilitated through the belief variable. The model fit was significantly improved in Model 3 by adding a direct relationship between values and norms. Our norm constructs provide measureable components of different types of norms that individuals may ascribe to, and these variables play an important role in our behaviour model. Our results indicate that there are strong relationships between values, beliefs, and norms and our measure of a specific intent to participate. As our survey items were designed to focus on landowner values and the issue of wetland drainage, we were able to construct a specific investigation of environmental behaviour in the context of participation in a wetland restoration program. As we proposed in our conceptual model (Fig. 1) and similarly to past work using the VBN framework, values, beliefs, and norms are interrelated. Values are significant explanators of beliefs. The values and belief measures are related to the measures of social and personal norms. In the full model, only the norm variables are significant in the behaviour intent, which supports the VBN hypothesis that norms are directly antecedent to behaviour.

One significant finding that contrasts to the chain proposed by the VBN theory is that there is a direct relationship between values and norms, without the mediation of the beliefs variable. Our behaviour model was significantly improved with the addition of a path between economics values, conservation/lifestyle values, the social norm, and the personal norm variables. This finding is consistent with much of the environmental behaviour literature that acknowledges values as antecedent to other determinants of behaviour, including attitudes, beliefs, and norms (Eagly and Chaiken, 1993; Gray, 1985; Stern et al., 1995). Though many studies have concluded that there is a connection between values and behaviour, values are abstract concepts that transcend situations and are therefore often weakly directly related to

behaviour (Nordlund and Garvill, 2002). Based on the significant relationship between values and both beliefs and norms, we conclude that values are important fundamental social factors in our behaviour model. Beliefs and norms are factors that come from values and contribute to the relationship between values and behaviour. This work adds to the literature suggesting that both values and mediating constructs are fundamental in understanding environmental behaviour (Thørgersen and Grunert-Beckmann, 1997), and further supports our claim that norms are connected to different levels of personal values and beliefs.

Another important finding is that beliefs are insignificant in the behaviour intent measure when norms are included in the model. Norms may be capturing the belief variable as part of a full model of behaviour. As our norms variables were exploratory norm constructs, the significant influence on behaviour indicates that we identified important items in measuring behaviour. Both the social and personal norms were significantly related to the belief measure, though the personal norm more so, reflected again in the norms' individual relationships to behaviour. If norms are significant in explaining behaviour, our norm constructs should be refined to clearly identify the types of normative pressures that are influencing the behaviour. Our results show a dynamic relationship between values, beliefs, norms, and our participation measure, which indicates that measuring behaviour may be limited without a holistic model including different levels of social factors. Values and beliefs about protecting the environment may not directly lead to conservation behaviour if a social norm is intermediate in this relationship. The items we used to construct our social norms component did not definitively define restoration as a positive or negative action based on neighbours or community opinions and interests, we were only able to identify social pressures as a significant influence in decision-making. The results of Model 3 demonstrate the important paths between values and beliefs to norms, and between norms and behaviour.

7. Conclusion

The main goal of this study was to conceptualize and assess the relationships between constructs proposed in the VBN theory and environmental behaviour. Our first aim was to identify different types of value and norm constructs to include in a model of the intent to participate in an incentive conservation program for wetland restoration. Using exploratory PCAs, we explored the structure of the data and were able to develop representative variables of

our constructs. Our application of SEM enabled us to identify the most influential factors in participation behaviour in our sample. The main contribution of this study is the empirical test of the VBN theory using context-specific scales and statements to substitute for the traditional VBN ones. By designing the questionnaire to include the constructs of the VBN model of behaviour using environment- and conservation-based measures, this study was able to test more specific value categories for landowners and context specific behavioural variables. Our main conclusion is that both personal and social norms are significant factors in the behaviour intent measure, and their relationship to other values and beliefs is important in understanding the process of behaviour. The relationship between beliefs and behaviour is captured by both personal and social norm constructs, which offers insight into how norms are developed. As norms proved to be highly important in environmental behaviour, this research adds to a growing consensus that a general behavioural change will only come from a shift in internal and external norms.

The existing focus on production and development must shift to a focus on conservation in order to achieve higher engagement and participation in programs such as a wetland restoration project. We found that personal norms about responsibility to the environment are not significantly more important in behaviour than social norms about neighbours' opinions and interests. Therefore, a social level shift towards more pro-environmental behaviours is necessary for conservation programs to achieve extensive impacts. Some potential applications of this research for the design of future conservation programs are mostly in the marketing and communication of the programs to potential participants. If awareness of the issue and beliefs concerning the environment do not translate directly to behaviour, more emphasis should be placed on norm-related issues such as individual responsibility to the environment and community-wide efforts to address environmental impacts. Several implications for future research are that the VBN theory constructs with some modifications are useful in understanding environmental behaviour to create a more contextual study, and that both social and personal norms are separate, measurable variables. Our findings contribute to the existing research on the role of norms in environmental behaviour.

This study was conducted in the Canadian prairie region following the development of wetland restoration programs in Alberta as a response to the new provincial wetlands policy. As such, our findings are centered on perceptions of wetland drainage and the role of landowners in conservation. It would be valuable to continue to study the values, beliefs, and norms of

landowners in this region over time as conservation efforts grow and these perceptions may adapt or change. The Alberta, Manitoba, and Saskatchewan provincial governments face future difficulties in successfully implementing restoration and conservation projects. The application of the results from this behavioural study could assist in the development, marketing, and communication of programs by adding a tool for identifying what factors are important in motivating or preventing landowner participation. Wetland restoration on private land is a central challenge in the success of conservation management strategies, and our findings suggest that both personal and social norms are highly influential factors in landowners' decision to participate in conservation programs. The design of incentive-based conservation programs should consider these key social factors in combination with other economic and biophysical variables that influence landowner behaviour.

Chapter 4: Conclusion

The introduction provides a background and framework for a conceptual and empirical model of environmental behaviour that incorporates interdisciplinary theory and measurement scales. Chapters 2 and 3 contribute to the literature on environmental behaviour, in addition to potential policy implications. These contributions are summarized in the following sections.

1. Contributions to the literature

Chapter 2 provides an empirical test of norm measurement items in the context of wetland restoration programs that pay for landowners' participation. Many studies that employ the VBN framework to investigate behaviour use a general environmental value scale and consider the activation of a personal norm in the behaviour process. Our work integrates a more specific landowner value scale and the presence of both a personal and social norm about environmental conservation and wetland restoration, respectively. Our aim in introducing these context specific components was to test different empirical measurements of social factors related to the central issue of our study. Where most studies on the role of norms in a behaviour model focus on the activation of a personal norm, our results indicate that both the personal and social norm variables are significant factors in behaviour. Normative pressures influence behaviour as individuals follow norms to conform for the judgments and behaviours of others (Manning, 2009). Our identification of two types of social norms, based on neighbours' opinions and on neighbours' interests, demonstrates that it is important to investigate the specific types of normative pressures that act on individuals and what these pressures are prescribing or proscribing. The literature on conservation and environmental behaviour has limited research on how different social and personal norms are expressed in individuals. This study provides insight into how norm constructs can be identified through context specific scales about perceptions, opinions, and obligations an individual feels from society and for his or herself.

The Maybery et al. landowner value scale was a useful tool for creating general value categories, economic and conservation/lifestyle, which related to our specific issue of participating in a conservation effort for economic incentives. We found that the scale had significant relationships to the NEP scale, with the economic values negatively related and the conservation/lifestyle values positively related. The use of the Maybery et al. landowner value scale in future VBN framework studies could allow a more introspective look at specific

landowner perceptions about how environmental, economic, and lifestyle factors are part of their operation or land management. The relationship between the value scale and the NEP scale indicates that it may offer improved insight into specific landowner issues in the study of environmental behaviour, as these values are related to other general environmental concerns. Maybery et al. suggest that values influence landowners' objectives, but does not conclude that these values have a direct role in behaviour. By investigating the relationship between the value categories and the NEP scale, we have furthered the application of using economic and conservation/lifestyle values as part of a behaviour model. Building relationships between the value categories and other beliefs, norms, and consequent behaviour can help to indicate how landowners react to certain policies and programs.

Connecting these measures to belief and norm measures may also help to indicate what incentives are needed for landowners in different value categories to participate. We suggest that categorizing types of landowners, as either economic- or conservation-minded, is not enough to predict behaviour. Several studies have focused on the classification of landowners, particularly farmers, in the context of policy formation. Petrzelka et al. (1996, as cited in Maybery et al., 2005) propose that farmers can be characterized as sustainable or conventional in their land management, based on whether they are protective of and value natural resources or see nature as a resource to control, respectively. Maybery et al. (2005) build on this theory of landowner classification to build the measurement items for landowner values, and our application of this scale with other belief and norm measures demonstrates that values have a fundamental and measurable effect on other social factors. However, as the growing range of environmental policies encourages more conservation and restoration behaviour in landowners, these strict characterizations may fail as individuals transition from the 'conventional' production approach to a more 'sustainable' practice. While the specific landowner value categories were useful in this study to help define our exploratory norm measures, designing incentives based on a strictly economic or conservation approach to land management may not attract many individuals who fall somewhere in between the categories.

2. Policy implications

The use of reverse auction programs for wetland restoration in Canada has thus far been fairly limited. The results of this work can help to indicate areas needed for improvement in the

design and implementation of future incentive-based programs in order to gain landowner participation. There are many key factors that contribute to participation rates in conservation programs, and each of these factors should be considered in the development and communication of these programs. The target audience, their socioeconomic characteristics, the implications of the behaviour being sought, and the social pressures for or against the proposed behaviour are all important considerations in the design of conservation programs that require participation from landowners. Our study specifically focused on an environmental behaviour in which landowners with wetlands on their property make a voluntary decision to offer acres of wetlands for restoration in exchange for payment. By identifying both a social norm that represents pressure from neighbours and community and a personal norm that represents a personal obligation to protect the environment, we can assume that there are interactions between social and individual pressures. Policy makers may consider, in the development of conservation programs, communication and marketing geared towards these factors rather than focus on information about the environmental issue and the economic incentives associated with the program.

The growing interest in using incentive-based mechanisms for wetland restoration on productive land creates the opportunity to address environmental problems and integrate environmental management into landowners' practices. Many environmental policy proposals can be characterized as value based or behaviour based solutions (Thøgersen and Ölander, 2002). Behaviour based solutions aim to create social and institutional changes that ease environmental behaviours (Ibid). Value based solutions address the values that promote unsustainable behaviours (Ibid). In this work, we find that behaviours and values are connected through several social factors. Landowner behaviour is dependent on how personal and social factors interact with other considerations. As our work supports previous research that points to values as playing a fundamental role in behaviour, it appears as though both behaviour and value based solutions are necessary to institutionalize conservation programs as part of land management. Policy makers should focus on both approaches by developing simple, accessible conservation programs and by promoting education and outreach that focuses on environmental values and beliefs to encourage conservation behaviour.

Government and NGOs often work with landowners to implement conservation programs, and building a tool for assessing different social factors can help early program development. In Canada, Ducks Unlimited (DUC) is one of the key agencies that works with

farmers, ranchers, and other landowners who own private lands with wetlands or drained wetlands to help maintain or improve the agricultural and recreational value of their land. DUC and similar conservation organizations play a critical role between governments' policy mandates and landowners as the facilitator for program implementation. Landowner engagement is the first step in this process, and DUC and other agencies could benefit from understanding what social factors are influencing these individuals. Future research in this area could build on our findings to quantify the effectiveness of outreach and communication efforts that focus in the factors isolated in this study, including specific landowner values and both social and personal norms. A shift from educational outreach programs that inform landowners about the issues addressed through conservation programs to more engagement with individuals about their role as individuals and members of a rural community could facilitate more public involvement in conservation efforts.

3. Future research

There were several issues we encountered with data collection. First and foremost, our sample was neither provincially or nationally representative and we can therefore not make specific policy recommendations about the general population of prairie farmers. Ideally, future research on the role of social factors in behaviour can build on our model to design a more generalizable survey for landowners. As our survey was mainly designed for the purpose of theory building and methodological testing, it included several sections that may not be needed for a future research focus on norms and values. By identifying key factors and their relationship to established measures, such as the NEP belief scale, our work provides the basis for designing a survey tool that is succinct and focused on aspects of conservation programs and landownership. Our survey instrument contained several exploratory measurement scales that could be improved upon for future use. Our norm measurement items were not included in one scale, but contained within questions or sections throughout the survey. These items could be combined into a single scale to measure norm constructs. Including additional statements specific to the *neighbours' interests* construct could help further illustrate the difference between an inward and outward social norm about neighbours and community and different social pressures on individuals' behaviour. A shortened survey instrument that contains the measurement scales of the key factors we identified in this study could be included in the early

stages of conservation program development to guide further outreach and communication efforts.

The items comprising our central measurement scales of values, beliefs, and norms, may require alterations to be used in other contexts. Our survey was specifically about wetland restoration, but most of our items can be adapted to focus on different conservation efforts. One challenge we had using measurement items adapted from the literature was the rigidity in categorizing landowners as having a certain set of values or beliefs. An issue in many of the scales used to measure values or characterize beliefs is that it creates divisions that may not exist in landowners. For example, the landowner value scale that aims to identify respondents as more economic, conservation, or lifestyle is not well suited to account for landowners who are highly concerned about the environment, but equally concerned about being financially independent. Turning a profit on your property is not always mutually exclusive from environmental protection values, and so categorical scales are not always an accurate measure of landowner objectives. In future research, it may be more useful to include the traditionally used general environmental values scale that measures individuals' value orientations in terms of environmentalism as self-interested, altruistic towards other humans, and altruistic towards the biosphere (Stern et al., 1999). The landowner value scale provides a good measure of values in terms of objectives. The environmental value orientation scale could add another dimension of value measure to further characterize the economic and conservation/lifestyle categories.

Finally, one of the key findings of this study indicates an area of future research in testing the different paths between social variables in a behaviour model. Moreover, the direction of the causality between the social factors is another area that could be explored, especially as over time conservation programs and actions become more standard behaviour. Continued behaviour, made based on factors other than the values, beliefs, and norms variables we identified in our study, could possibly effect how these social factors are formed. Future research on participation in conservation programs can further clarify the relationships between different social variables, and identify how other economic and biophysical variables influence the role of these social factors in behaviour.

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Appendix

Survey instrument

LANDOWNER VIEWS ON ENVIRONMENTAL CONSERVATION PROGRAMS

SECTION ONE: ABOUT YOUR PROPERTY

1. What type of property do you own or operate?

☐ Ranch ☐ Farm ☐ Acreage ☐ Mixed

☐ Other (please specify)

2. What size is your property? (acres)

3. What county do you live in?

4. How important are the following objectives for your property?

	Not at all important	**Unimportant**	**Neither important nor unimportant**	**Important**	**Very important**
To have a rural lifestyle	☐	☐	☐	☐	☐
To protect the environment	☐	☐	☐	☐	☐
To have financial independence	☐	☐	☐	☐	☐
To make a profit	☐	☐	☐	☐	☐
To preserve family heritage	☐	☐	☐	☐	☐

5. Below are several statements about land ownership. Please indicate to what extent you agree or disagree with each statement.

	Strongly agree	**Agree**	**Unsure**	**Disagree**	**Strongly disagree**
I view my property first and foremost a profit-making business	☐	☐	☐	☐	☐
When planning future land-use activities I only focus on being financially independent	☐	☐	☐	☐	☐
A maximum annual return from my property is my most important aim	☐	☐	☐	☐	☐
The lifestyle that comes with owning my land is very important to me	☐	☐	☐	☐	☐
Rural communities are a great place to live and have a family	☐	☐	☐	☐	☐
I want to preserve my land that is part of my family heritage	☐	☐	☐	☐	☐
Good landowners regularly make improvements to their land and the environment	☐	☐	☐	☐	☐
The most important thing is leaving my property in better shape for future generations	☐	☐	☐	☐	☐
Managing my land to generate environmental services is a high priority	☐	☐	☐	☐	☐

SECTION TWO: ABOUT WETLANDS

6. Below are several potential outcomes of draining wetlands. How important do you find each of these impacts with respect to your property? *(Please check the box that best describes your answer)*

	Not at all important	**Unimportant**	**Neither important nor unimportant**	**Important**	**Very important**
Loss of flood and erosion protection	☐	☐	☐	☐	☐
Decreased water quality	☐	☐	☐	☐	☐
Reduced numbers of wildlife, such as geese	☐	☐	☐	☐	☐
Loss of recreational and educational opportunity	☐	☐	☐	☐	☐
Criticism from my community for impacting the natural environment	☐	☐	☐	☐	☐
Increased amount of land available for production	☐	☐	☐	☐	☐
Loss of scenic quality	☐	☐	☐	☐	☐
Approval from my neighbours for increasing available land for production	☐	☐	☐	☐	☐

7. The following should take leadership for restoring lost wetlands:

	Strongly agree	**Agree**	**Unsure**	**Disagree**	**Strongly disagree**
Government	☐	☐	☐	☐	☐
Industry	☐	☐	☐	☐	☐
Environmental agencies	☐	☐	☐	☐	☐

Landowners	☐	☐	☐	☐	☐
No one, nature will take its course	☐	☐	☐	☐	☐

8. How do you believe your neighbours feel about draining wetlands to increase available land for production?

Strongly against	**Against**	**In favour**	**Strongly in favour**	**I'm not sure**
☐	☐	☐	☐	☐

9. What do you believe your neighbours would think if you were to restore a wetland on your property?

Strongly disapprove	**Disapprove**	**Indifferent**	**Support**	**Strongly support**
☐	☐	☐	☐	☐

10. How often do you seek advice or opinion from others in your community before making a decision regarding how you manage your property?

Very often	**Somewhat often**	**Rarely**	**Never**
☐	☐	☐	☐

SECTION THREE: ABOUT YOUR VALUES

11. Please indicate the extent to which you agree or disagree with the following statements:

	Strongly agree	**Agree**	**Unsure**	**Disagree**	**Strongly disagree**
We are approaching the limit of the number of people the Earth can support.	☐	☐	☐	☐	☐
Humans have the right to modify the natural environment to suit their needs.	☐	☐	☐	☐	☐
When humans interfere with nature it often produces negative consequences.	☐	☐	☐	☐	☐
Human ingenuity will prevent the earth from becoming unlivable.	☐	☐	☐	☐	☐
Humans are seriously abusing the environment.	☐	☐	☐	☐	☐
The earth has plenty of natural resources if we just learn how to develop them.	☐	☐	☐	☐	☐
Plants and animals are equally important as humans.	☐	☐	☐	☐	☐
Nature has the capacity to absorb the impact of human activities.	☐	☐	☐	☐	☐
Despite our abilities, humans are still subject to the laws of nature.	☐	☐	☐	☐	☐
The so-called “environmental crisis” facing humankind has been greatly exaggerated.	☐	☐	☐	☐	☐
The Earth is like a spaceship with very limited room and resources.	☐	☐	☐	☐	☐
Humans were meant to have control over the rest of nature.	☐	☐	☐	☐	☐
The balance of nature is very delicate and easily upset.	☐	☐	☐	☐	☐
Humans will eventually learn enough about how nature works to be able to control it.	☐	☐	☐	☐	☐
If things continue on their present course, we will soon experience a	☐	☐	☐	☐	☐

major environmental disaster.					

12. Below are several statements regarding landowner responsibilities. Please indicate the extent to which you agree or disagree.

As a landowner, I think I have the responsibility to…

	Strongly agree	**Agree**	**Unsure**	**Disagree**	**Strongly disagree**
…be a good steward of the natural environment and maintain it in good condition for future generations	☐	☐	☐	☐	☐
…take into account the values and interests of my neighbours and fellow landowners in my community when making decisions about my land	☐	☐	☐	☐	☐
…contribute to the economic growth and development in the province	☐	☐	☐	☐	☐
…take into account the interests of society and minimize my contribution to climate change	☐	☐	☐	☐	☐

SECTION FOUR: ABOUT ENVIRONMENTAL INCENTIVE PROGRAMS

13. How do you feel about incentives to help you improve environmental conditions on your property?

	Strongly agree	**Agree**	**Unsure**	**Disagree**	**Strongly disagree**
The reverse auction program is a good way of delivering financial incentives to landholders.	☐	☐	☐	☐	☐
Environmental incentives are a business opportunity.	☐	☐	☐	☐	☐
Environmental incentives are an opportunity to improve my land management.	☐	☐	☐	☐	☐

14. How important are the following reasons in your decision to participate in a wetland conservation program that would provide funds for your participation?

	Not at all important	**Unimportant**	**Neither important nor unimportant**	**Important**	**Very important**
Financial opportunity	☐	☐	☐	☐	☐
Learning more about wetland management	☐	☐	☐	☐	☐
Getting paid for the benefits of a wetland on my property	☐	☐	☐	☐	☐
Improving the environment for the next generation	☐	☐	☐	☐	☐
Recognition as a participant in an environmental conservation program	☐	☐	☐	☐	☐
Agreement with what my neighbours and community would do	☐	☐	☐	☐	☐

15. How important are the following reasons in your decision to not participate in a wetland conservation program that would provide funds for your participation?

	Not at all important	**Unimportant**	**Neither important nor unimportant**	**Important**	**Very important**
Do not want to lose an area of profitable land	☐	☐	☐	☐	☐
Too busy to apply	☐	☐	☐	☐	☐
Too difficult to understand how a restored wetland would affect the revenue I gain from my land	☐	☐	☐	☐	☐
The land changes required would be too restrictive	☐	☐	☐	☐	☐
Would not want to upset my neighbours by restoring a wetland close to their property	☐	☐	☐	☐	☐
Do not trust the program and agency	☐	☐	☐	☐	☐

16. How likely is it that you would choose to participate in a program that would pay you to have wetlands restored on your property?

Not at all likely	**Not likely, but is dependent on other considerations**	**Unsure**	**Likely, but is dependent on other considerations**	**Very likely**
☐	☐	☐	☐	☐

17. Have you heard about an incentive conservation program happening in your area?

Yes ☐
No ☐

18. If yes, how did you hear about it?

☐ Newspaper article ☐ Word of mouth ☐ At a community event/meeting ☐ Advertisements ☐ Other (please specify) _____

SECTION FIVE: ABOUT YOU

1. Are you:

☐ Male ☐ Female ☐ Rather not say

2. What is your age?

☐ 29 years or younger ☐ 30-49 ☐ 50-59 ☐ 60-69 ☐ 70 years or older

3. What is your highest level of education?

☐ Primary school ☐ High school ☐ College/trade certificate ☐ University degree or higher

4. What was your total household income in the last year?

☐ Under $19,999 ☐ $20,000-$39,999 ☐ $40,000-$74,999 ☐ $75,000-$99,999 ☐ $100,000 and over

5. What is the total revenue your farm operation made during the last year from:

Sale of livestock _____
Sale of crops _____
Off-farm income _____
Not applicable (do not own or operate a farm) _____