# INVESTMENT IN THE PROVISION OF ECOLOGICAL GOODS AND SERVICES ON PRIVATE RURAL LAND IN ONTARIO: A FRAMEWORK FOR POLICY DEVELOPMENT

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PAUL GUERRA

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# ABSTRACT

INVESTMENT IN THE PROVISION OF ECOLOGICAL GOODS AND SERVICES ON PRIVATE RURAL LAND IN ONTARIO: A FRAMEWORK FOR POLICY DEVELOPMENT

Paul M. Guerra
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Advisor:
Professor G. Fox

This thesis is an investigation of the development of ecological goods and services policy in Ontario. This investigation includes the development of a list of general principles that can guide the development of ecological goods and services policy in Ontario based on lessons learned from international experiences with ecological goods and services policy, in-depth interviews with individuals with policy responsibility in Ontario, and a Geographic Information Systems (GIS) analysis characterizing supply of ecological goods and services in Ontario. The principles include: a clear and consistent definition of ecological goods and services, clear definition of objectives, fairness, cost-effectiveness, policy integration and political feasibility. This research represents an opportunity to move the debate on ecological goods and services policy forward in Ontario.

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# Chapter 1 - Introduction

## 1.1 Background

Wiken *et al.* (2003) report that wetlands in southern Canada have come under pressure due to agricultural expansion, urban expansion, population growth and natural resource extractions. This is particularly true along the southern Great Lakes and St. Lawrence Waterway regions of Southern Ontario. These regions are characterized by the highest population density in Canada as well as representing some of the most agriculturally productive land. According to Ducks Unlimited (2009), agricultural expansion was responsible for the conversion of 70% of the wetlands in Southern Ontario. The pressures of development have not been borne by wetlands alone; forests, native grasslands and natural riparian areas have all been reduced due to the pressures of development.

Over time, recognition of the value of the goods and services that flow from the natural environment has emerged. These benefits are called ecological goods and services. Agriculture and Agri-Food Canada (2005) defines ecological goods and services as, "the benefits that humans derive from our ecosystems [which] include water supply and regulation, erosion control, climate regulation, food production, raw materials, and recreational activities", while the Millennium Ecosystem Assessment (2005) defines them as the benefits that humans obtain from healthy functioning ecosystems. Demand for these goods and services has been demonstrated as a number of countries adopt strategies to increase the provision of ecological goods and services from private rural land.[1] Antle (1999) states that this change has occurred because, as

[1] I will present four international experiences with payment for ecological goods and services programs in Chapter 4 of this thesis, but there are numerous other examples of payment for ecological goods and

population and incomes increase, individuals increasingly value the environmental goods and services that agricultural and other rural lands can supply. Figure 1.1 shows that both income and population have been growing in Ontario since 1981. Therefore, as the population grew in Southern Ontario and that population became wealthier there has likely has been a corresponding increase in demand for ecological goods and services. Since the expansion of agricultural production has encroached on some naturals areas that provided ecological goods and services in the past, rural landowners are in a unique position to increase the supply of beneficial ecological services that provide value to others.

It is clear that farmers can supply environmental goods and services and also that some individuals and groups have demand for them but, as Ribaudo *et al.* (2008) report, they are typically undersupplied in markets. Klimas (2007) provides a taxonomy of potential impediments to markets exchanges of ecological goods and services including the public goods nature of some ecological goods and services and prohibitively high transaction costs. Despite potential impediments, Klimas (2007) and Drozdz (2009) report that market exchanges of ecological goods and services are occurring in a limited capacity in Ontario.

The typical government response to the issue of ecological goods and services undersupply is to mandate their provision through regulation. Rural landowners are forced to adopt certain land-use practices or retire parts of their agricultural land to comply with these regulations. This type of policy amounts to regulatory takings. Landowners bear the cost of ecological goods and services provision while those who

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services programs worldwide, including some in Canada. For a comparison of a large number of payments for ecological goods and services policies see Wunder *et al.* (2008).

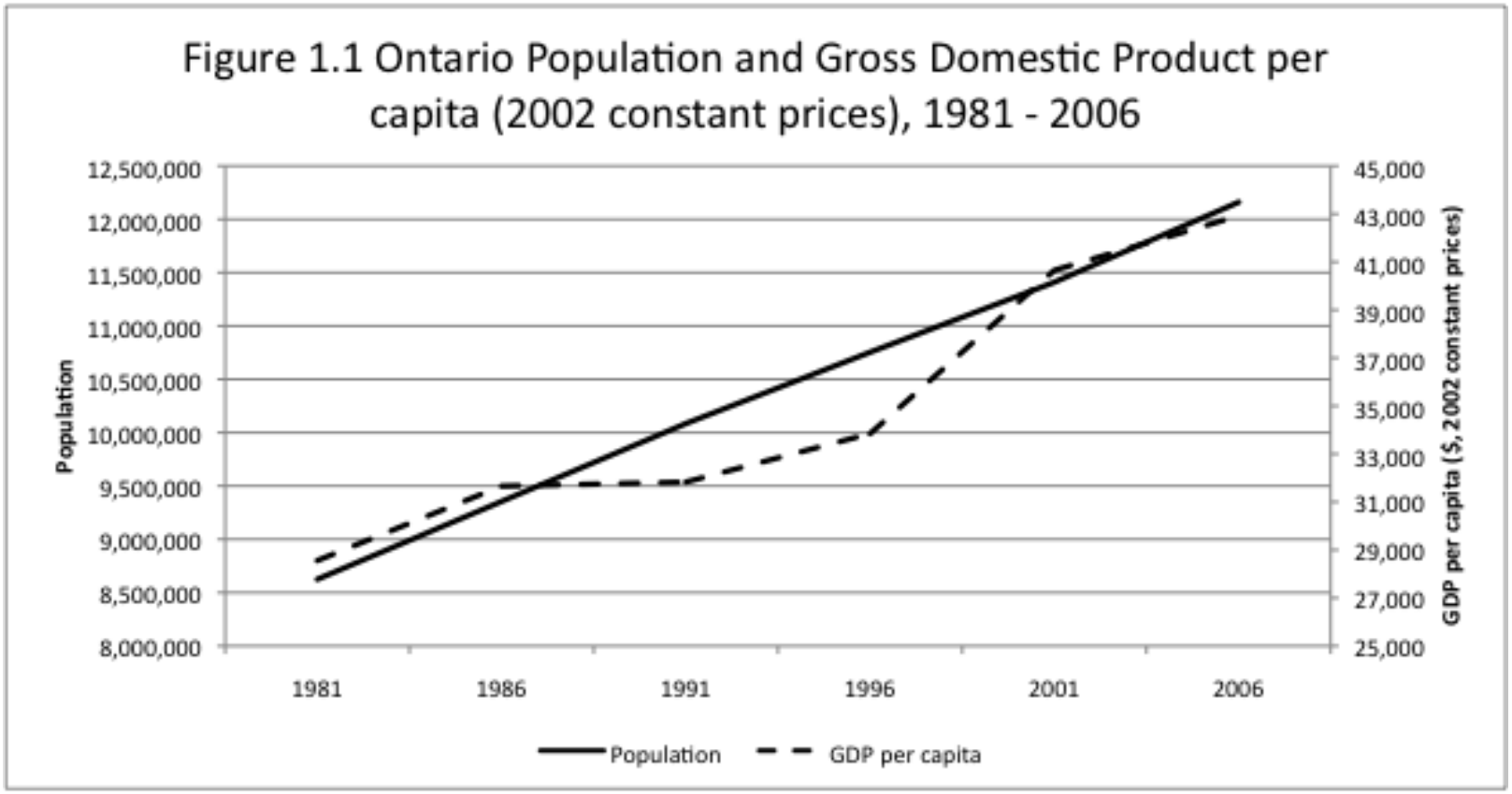


Figure 1.1 Ontario Population and Gross Domestic Product per capita (2002 constant prices), 1981 - 2006
Population
GDP per capita ($, 2002 constant prices)
12,500,000
12,000,000
11,500,000
11,000,000
10,500,000
10,000,000
9,500,000
9,000,000
8,500,000
8,000,000
45,000
43,000
41,000
39,000
37,000
35,000
33,000
31,000
29,000
27,000
25,000
1981
1986
1991
1996
2001
2006
Population
GDP per capita

benefit from that provision, outside of the landowner him or herself, do not bear any cost. In Ontario, regulatory takings are embodied in legislation like the Species at Risk Act, Migratory Birds Act, Source Water Protection legislation, the Nutrient Management Act, Greenbelt legislation and the Clean Water Act.

In 2004, at a meeting of Federal-Provincial Ministers of Agriculture in Cardigan, Prince Edward Island, a recognition of the inadequacy of current policy approaches to ecological goods and services provision emerged and a commitment was made to explore new policy options. This change occurred following the presentation of the Alternative Land Use Services (ALUS) approach to ecological goods and services provision. The Canadian Intergovernmental Conference Secretariat (2004) reports that officials were directed to continue with policy discussions on the environmental objectives of the current Agricultural Policy Framework and "to further explore the potential of various policy tools and mechanisms that could be used to achieve those objectives."

The following year, in Kananaskis, Alberta, Federal and Provincial Ministers of Agriculture committed to the development of an ecological goods and services policy framework "that balances both the benefits of agriculture and the responsibilities of producers for sound environmental stewardship" (Canadian Intergovernmental Conference Secretariat, 2005). This included a plan to develop research pilot projects to test various policy options. It also resulted in the organization of a national symposium on ecological goods and services that was held in Winnipeg, Manitoba in 2006. This symposium brought together over 200 individuals and groups with Canadian ecological goods and services policy responsibility to discuss the direction for Canadian ecological goods and services policy. The symposium also brought together featured speakers from

Australia, the U.S., England, France and the Organization for Economic Co-Operation and Development that spoke on international experiences with ecological goods and services policy.

In April 2009, the results of the ecological goods and services research pilot projects were presented at an Ecological Goods and Services Technical Meeting in Ottawa, Ontario. According to Joyce and Campbell (2009), the lessons learned from the pilot projects "are a critical component of the developing body of knowledge needed to support integration of [ecological goods and services] concepts and options during Growing Forward and subsequent policy frameworks." This body of knowledge is continuing to grow but there has not been further development of a framework for ecological goods and services policy either nationally or provincially in Ontario since the commitment in Kananaskis in 2006.

**1.2 Economic Problem Statement**

Rural landowners have the potential to supply ecological goods and services through management and stewardship of natural characteristics of their property as well as through land use decisions. But they may be reluctant to provide these goods and services because, although demand is perceived to exist, landowners bear the cost of the provision and they are not adequately compensated. There may also be penalties in the future for good deeds today. This is a problem for landowners because they may supply a positive quantity of ecological goods and services intentionally or unintentionally as a positive externality of their land use decisions. Those who enjoy the diffuse benefits of the supply of ecological goods and services in Ontario have not had to pay for them and therefore landowners often do not benefit from their production. In other words, demand for ecological goods and services in Ontario is not meeting the existing supply nor is it

providing the impetus for landowners to increase their supply of ecological goods and services to meet the perceived demand.

### 1.3 Economic Research Problem

Despite the commitment of Federal and Provincial Ministers of Agricultural to develop a framework for ecological goods and services policy, there has been no such framework developed in the five years since this commitment. The research problem addressed in this research is that ecological goods and services policy development has stalled and the general principles guiding the development of a framework for ecological goods and services policy in Ontario are unknown. This is a policy problem that needs resolution in order to address the economic problem described above. In order to address this research problem, I will attempt to answer the following research questions:

1. What are the key concepts and distinctions in the economics literature that provide insight into ecological goods and services policy design?
2. What is the context of ecological goods and services policy development in Ontario, at this time?
3. What insights can be drawn from international experiences with ecological goods and services provision programs that can inform the design of ecological goods and services policy in Ontario?
4. What are the perceptions and opinions of leading ecological good and service practitioners in Ontario on critical issues in ecological good and service policy development in Ontario?
5. What general principles should guide the development of ecological goods and services policy in Ontario?

### 1.4 Purpose and Objectives

The purpose of this study is to propose a framework for ecological goods and services policy in Ontario. In order to do so, I will use a number of research methods that can provide insight into the context of ecological goods and services policy development in Ontario as well as the context of ecological goods and services supply and demand within Ontario.

The objectives of this thesis are:

1. To assess the economic concepts in the current literature on ecological goods and services in order to identify key concepts and distinctions for policy design.
2. To compare and evaluate international experiences with ecological goods and services policy in order to draw insights for Ontario ecological goods and services policy design.
3. To engage leading ecological goods and services policy practitioners, in order to understand the context of and impediments to ecological goods and services policy development in Ontario.
4. To estimate existing and potential supply of ecological goods and services in Southern Ontario.
5. To propose essential elements of ecological goods and services policy and general principles that should guide the development of ecological goods and services policy in Ontario in order to stimulate policy debate on key issues.

### 1.5 Thesis Organization

Chapter 2 contains a review of the literature relevant to ecological goods and services policy in Ontario. This includes a discussion of research methods used for policy research, key economic concepts and distinctions and an analysis of current literature on ecological goods and services in Canada. Chapter 3 presents the Alternative Land Use Services (ALUS) approach to ecological goods and services provision including a history of its development and how it is put into practice. The ALUS pilot project demonstrates the context of ecological goods and services in Ontario. In Chapter 4, insights from international experiences with ecological goods and services policy that could inform policy development in Ontario and Canada are identified and evaluated. Chapter 5 contains the results of in-depth interviews with individuals and groups with responsibility for ecological goods and services policy in Ontario. In Chapter 6, I use GIS analysis to estimate the existing and potential supply of ecological goods and services from private rural land in Southern Ontario and then provide an analysis of those results. Chapter 7 draws on the insights and lessons learned in Chapters 2 through 6 to

propose general principles that should guide ecological goods and services policy development in Ontario. Finally, in Chapter 8, I summarize the purpose and key findings of this research, propose policy implication and suggest avenues for future research supporting the development of ecological goods and services policy in Ontario.

# Chapter 2 – Review of Literature Relevant to the Study and Analysis of Ecological Goods and Services Policy in Ontario

## 2.1 Introduction

The purpose of this chapter is to review and describe literature relevant to the study and analysis of ecological goods and services policy in Ontario. To fulfill this purpose I will review literature on the use of qualitative research methods for policy research, review economics literature relevant to ecological goods and services policy and review literature on Canadian ecological goods and services policy development.

The first section of this chapter contains an overview of using qualitative research methods. This section draws largely from sociology literature and explores the use of qualitative research methods for conducting policy research. This section also presents Miller and Crabtree's framework for conducting in-depth interviews that was adhered to in this research.

The second section identifies and clarifies economics literature related to ecological goods and services policy. This section begins with a discussion of transaction costs, the boundaries of a firm and the role of intermediaries in ecological goods and services provision. This is followed by a discussion of key concepts and distinctions including the distinction between providing environmental 'goods' versus reducing environmental 'bads' based on standard of physical invasion of property, strict versus negligence liability, legalised nuisance and the myth of efficiency.

The third section presents a description and analysis of the current literature on potential ecological goods and services policy mechanism that could be adopted in Canada. The spectrum of approaches to increase the provision of ecological goods and services through policy ranges from command and control measures such as regulation to

market-based programs such as annual area-based payments to providers of ecological goods and services. This section will also discuss attempts to calculate the value of ecological goods and services in Ontario.

## 2.2 Qualitative Research Methods

### *2.2.1 The Use of Qualitative Research Methods for Policy Research*

According to Ritchie and Spencer (1994, pg. 173), the use qualitative research approaches in policy research is appropriate because of the, "persistent requirement in the social policy field to understand complex behaviours, needs, systems and cultures". In this research it is important understand complex systems such as the political process and lines of jurisdiction in government. Additionally, there are complex aspects of culture that must be understood in this research, such as the degree of cooperation or competition amongst groups and organizations with similar or divergent goals. For example, groups may oppose initiatives that take away responsibility that traditionally existed under that group or organization. Qualitative research techniques are a appropriate research method for this policy research.

### *2.2.2 Approaches to Qualitative Research*

According to Liamputtong and Ezzy (2005), a variety of theories and techniques are used in qualitative research and, as such, there is no theory or technique that applies in every scenario. For the purpose of this research, in-depth interviews were chosen as the qualitative research instrument for eliciting opinions and thoughts from groups and individuals with policy responsibility in the area of ecological goods and service.

According to Liamputtong and Ezzy (2005), in-depth interviews fit in a continuum between completely structured interviews used in survey research on one end and unstructured conversational interviews at the other. In-depth interviews are focused

and administered according to an interview guide but it is not necessary to administer the same questions with the same wording in the same order in each interview, as would be the case with structured interviews. Liamputtong and Ezzy (2005) state that the aim of in-depth interviews is to explain the complexity and dynamic nature of interpretations and understandings that cannot be examined using quantitative methods. Structured interviews can be used to elicit results that are needed for large quantitative surveys but they cannot capture the dynamic and complex narratives that can be elicited through in-depth interviews and are necessary for qualitative research. In this type of qualitative research the interviewee is not assumed to be a bank of knowledge from which data can be mined but rather are treated as builders of knowledge on the research questions in concert with the interviewer. Liamputtong and Ezzy (2005) suggest that the interviewer has an influence on the narrative developed in an in-depth that should not be ignored. They state that this may be interpreted as introducing bias into the interview but refute that structured interviews also include bias albeit in a different form. Liamputtong and Ezzy (2005, pg. 57) also suggest that the method of in-depth interviews, "grows out of an attempt to constructively respond to the problem of subjectivity in interviews rather than to pretend that it can be avoided." Therefore, problems of bias and subjectively are actively acknowledged by the interviewer when using an in-depth interviews while the problems may be assumed away when using structured interview methods.

I chose in-depth interviews for this research because: (a) I know that potential respondents are familiar and comfortable with interviews as a communication tool; (b) the narratives of groups and individuals with ecological goods and services policy

responsibility are both complex and difficult to quantify in a meaningful way; and (c) discourse on ecological goods and services and ALUS usually takes the form of stories.

### *2.2.3 Overview of the In-depth Interview Approach*

Miller and Crabtree (2005) describe a framework for the process of conducting in-depth interviews. They state that in-depth interviews should be conducted in five steps: (1) mapping or thematizing; (2) designing; (3) preparing; (4) interviewing; and, finally, (5) transcribing. The following section describes each of these steps sequentially.

#### *Mapping*

Miller and Crabtree (2005) identify three aspects of mapping. The first is a literature review. The literature review is used to identify the theoretical categories to develop a conceptual framework which informs an interview guide. An initial review of the literature on economic theories related to ecological goods and services and their provision, the ALUS concept and international experiences with environmental goods and services policy were used to identify the theoretical categories. This initial literature review contributes to this chapter as well as to Chapter 3, 4 and 5.

The second aspect identified by Miller and Crabtree (2005) is a review of the everyday or, what they term, 'commonsense' understandings of the research topic. They identify newspaper articles and key informants as sources of this information. A preliminary understanding of ecological goods and services policy and the ALUS concept was achieved through conversations with the ALUS organizers, attendence at relevant conferences and through review of press releases dedicated to ecological goods and service policy both domestically and internationally as well as dedicated specifically to the ALUS approach.

The third and final aspect of mapping identified by Miller and Crabtree (2005) is a self-review to bring out the biases of the researcher. The self-review is conducted by the researcher with the objective of revealing associations, preconceptions and assumptions related to the research area to other members of the research team. Miller and Crabtree report that the self-review is important in order to reveal biases that could influence the interpretation of collected data. Self-reviews have been done consistently through research meetings with my peer group and through consultations with Jessica Rosenberg, another M.Sc. student conducting research on ecological goods and services and ALUS, in order to reveal any biases that may be held. Biases pertaining to preferences towards certain incentive mechanisms, delivery mechanisms and administrative structures were identified and acknowledged.

*Designing*

Designing refers to the act of laying out the form of the interview. In this stage both the sampling strategy for selecting interview participants and questions for the interview guide are developed. According to Miller and Crabtree (2005), the process of designing has three parts. The first is the development of a strategy to choose interview participants. From there, the sampling frame can be combined with the themes identified in the mapping stage to form an interview guide. The final step of designing is to account for ethical considerations. The following section addresses each of these parts in the order they were introduced above.

According to Miller and Crabtree (2005), interview participants should be selected so as to maximize the information elicited pertaining to the research question. The first step in this process is to decide on characteristics of interview participants that

are desired and relevant to this research. I decided that a broad characteristic that all interview participants must share is that they have policy responsibility for ecological goods and services in Ontario. This scope encompasses those who are directly involved in the formation and development of policy, those who advocate on the behalf of groups that are affected by this policy and those who have technical policy knowledge. This scope encompasses as many of the diverse interests in the ecological goods and services policy debate as possible. A more specific characteristic that was desired is that the individual participants identified have a senior position in their group or organization. These individuals were identified because they could more likely speak on the behalf of their organization as a whole and therefore their perceptions and opinions have greater weight than a staff member with less seniority.

Arcury and Quandt (1999) report that a list of the community of people that have information relevant to the research usually does not existing and therefore the researcher needs a method for identifying, selecting and recruiting participants. A list can be formed by using qualitative sampling strategies. I decided that, for the purpose of this research, a combination of multiple sampling strategies would be used to identify participants: maximum variation sampling, critical case sampling and snowball sampling. A description of these sampling techniques and their application in this research is provided below.

According to Kurzel (1999), maximum variation sampling can be used to obtain information from a broad range of perspectives on the research area. The purpose of using this strategy is to document unique perceptions that vary across groups with ecological goods and services policy responsibilities. Amongst initial participants,

variation was sought in terms of an opinion on the ALUS approach itself, from those who fully support it to those who did not. This was the initial focus of participant selection because initially this research was focused largely on exploring opinions and perceptions related directly to the ALUS. The process of mapping, described above, identified some of these groups and individuals, as did conversations with key ALUS organizers.

Choosing participants in this way was appropriate given the original focus of this research but the focus of this research has changed over the course of the project. Originally this research was to explain and characterize the obstacles to the ALUS approach gaining traction, and thereby taxpayer funding, at the provincial level in Ontario. As will be explained in Chapter 3, ALUS is no longer pursuing provincial taxpayer funding as a primary objective of the pilot project. Therefore this research is now focusing on broad lessons that can be learned of interest to ALUS organizers. Additionally, the focus of this research has shifted to examine ecological goods and services policy broadly instead of a narrow focus on the navigation of ALUS through the policy process. Therefore choosing only amongst those groups and individuals that had strong opinions on the ALUS concept limited the scope the potential participants and may have excluded some who could have provided relevant information.

Kurzel (1999) reports that critical case sampling is where participants are identified on the basis of the relevant information they can provide. Again, I used process of mapping was useful in identifying participants. Attendance at conferences and workshops relevant to this research area was also helpful for identifying those who had a depth of understanding of this research topic and could provide rich information. For

example, a conference held at the University of Toronto on August 4, 2009 featured four presenters who later participated in interviews for this research.

The sampling technique used to identify most interview participants was the use of snowballing. Snowball sampling starts by identifying a few members of the desired sampling frame, in this case they were identified using the other sampling techniques listed above, and asking them to identify others that would fit in the same frame. Kalton and Anderson (1986) note that this technique is best used in qualitative research and is not suited for statistical research. This is because individuals that are isolated from others in the sampling frame may not be discovered, introducing bias into the distribution. Though this problem could exist in this research, it is unlikely because the sampling frame is limited in scope spatially and potential participants are generally well connected with other participants. For example, participants readily suggested other potential interview participants who did not necessarily agree with them, knowing that identifying areas of disagreement was important for this research. Moreover, much of the debate on the issue of ecological goods and services is in the public realm and therefore it would be unlikely that a source of deep information is isolated from all other participants.

The second part of designing, according to Miller and Crabree (2005) is to create an interview guide. The interview guide lays out a general framework for conducting the in-depth interviews by addressing, as stated by Miller and Crabtree (2005, p 191), "research themes through questions designed to elicit narratives detailing the informant's conception of the identified domains". It also includes probing questions that are used to increase the depth of context. A general interview guide for this research is included in Appendix A. The interview guide varied based on the general group that an interview

participants belonged to. This was necessary because certain groups can provide insights on some questions that others cannot. For example, environmental non-governmental organizations are less likely to provide meaningful information on issues, such as jurisdiction, than government. Questions were designed to elicit open-ended narrative responses. Some probing themes were designed beforehand with the interview group in mind, while others emerged during the interview. That being said, probing themes varied largely from group to group and interview to interview.

Miller and Crabtree (2005) state that the final step in design is to address ethical considerations. Ethical considerations were addressed through the submission of an interview strategy and guide, as well as other information to the University of Guelph's ethics board. The approach described to the ethics board was strictly adhered to and the University of Guelph's ethics board approved this research.

*Preparing*

Miller and Crabtree (2005) report that preparation for the interview begins with contacting the desired interview participants, setting a location for the interview and having a specific format for pre-interview contact. In this research contacting potential interview participants occurred either through e-mail or by telephone. The location of the interview was determined through consultation with interview participant as to what location is of most convenience to them. Miller and Crabtree (2005, p. 195) identify the goals of pre-interview contact as, "(a) introduce the interviewer, (b) identify sponsorship, (c) explain purpose, (d) explain selection of the respondent, (e) assure anonymity, (f) obtain informed consent". The goals (a) through (d) do not need further explanation, as what they would encompass is self-explanatory. Assuring anonymity is not necessarily

required for this research as it is ideal if the respondents allow the data from their interview to be linked to their name and organization so that the context of the data is better established. If the participant preferred to remain anonymous, their wishes were, of course, respected. Acquiring informed consent was done through the review and signing of a consent form prior to the start of the interview. Consent for digital recording of the interview was also requested at this time.

*Interview*

The interviews were conducted in accordance with the interview guide. Each interview began with background and contextual questions about the participant. The bulk of the interview was spent discussing the development of ecological goods and services policy in Ontario and using probing questions to elicit meaningful responses. Depending on the responses of the interview participant, probing questions varied from interview to interview. Some participants directly answered and providing meaningful response to the main questions themes, while others required substantial probing. For this reason, no two interviews were identical. During the interview, brief written notes were taken to supplement the digital recording. The interviews lasted between forty minutes and two hours with the majority lasting just over an hour. Upon conclusion of the interview the recorder was turned off and the participant was thanked for their time.

*Transcription*

Before transcription of the digital recording of the interview takes place it is first necessary to summarize the information from the interview in the form of field notes. This took place as soon as possible following the interview. Actual transcription of the interview followed from the digital recording. Transcription was not verbatim, due to

time constraints, and instead focused on identifying key statements and summarizing themes. When quoting interview participants in this thesis, quotes were transcribed verbatim.

## 2.3 Key Economic Concepts Related to Ecological Goods and Services Policy

### *2.3.1 Transaction Costs*

Fox (2007) attributes the introduction of transaction costs into economic thinking to Carl Menger (1871/1994) and Ronald Coase (1960). The idea being that parties that engage in market exchanges face costs as a result of efforts to coordinate and agree upon the terms of said exchange that are amenable to all parties involved. Menger termed this concept marketability. His concept of marketability includes the idea that barriers to exchange may exist because there is a lack of information among parties privy to the exchange about details of the exchange itself.

Coase called these costs the, "costs of using the price mechanism" in his 1937, The Nature of the Firm and later called them "the value of resources used in a market exchange" in his 1960, The Problem of Social Cost.

In The Problem of Social Cost (1960, p.15), Coase states that:

> "In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on."

Dahlman (1979) further classified the distinctive aspects of transaction costs as: search and information costs, bargaining and decision costs, and policing and enforcement costs. According to Dahlman, this taxonomy is not necessary as each cost represents the existence of imperfect information. Accordingly, in Dahlman's (1979, p 148) words, "it is really necessary to talk only about one type of transaction cost: resource losses incurred

due to imperfect information". This understanding of transaction costs is too broad. For example, adverse selection occurs because of imperfect (asymmetric) information but does not represent a transaction cost. Therefore Dahlman's original taxonomy of the aspects of transaction costs is a more accurate definition.

Fox (2008) notes that the definition of transaction costs has extended beyond what was originally meant by Coase. According to Fox (2008, p 125), "costs involved in the political process, costs of institutional change generally, adjustment costs, and even charges for various types of service have been lumped into this category".

Klimas (2007) states the definition of transactions cost as used by Dahlman (1979), particularly his labeling of concluding costs are "policing and enforcement costs", strays from Coase's definition. According to Fox (2007) this mislabeling has led to "needless confusion". It is his contention (2007, p. 379) that using, "monitoring and enforcement costs suggest that the parties are involved in an ongoing commercial relationship." Fox (2007) states that in a Coasian view, an ongoing commercial relationship represents a contract and if that contract stipulates that one factor owner can direct the production of other factors owners than, in the Coasian view, this would be a firm. I do not believe that it is necessary to conclude that using the terms monitoring and enforcement costs suggests that there are ongoing commercial relationships between parties to the exchange any more than the term concluding costs. Monitoring that the terms of the contract are being observed seems to me to be analogous to Coase's (1960, p.15) statement above that parties must, "undertake the inspection needed to make sure that the terms of the contact are being observed". Enforcement costs do not necessarily suggest that there is an ongoing commercial relationship as one party to the exchange can

engage in enforcement of contracts terms without engaging the original parties to the exchange. For example, a firm could contract out enforcement to a third party, as some firms do in order to collect overdue accounts. For these reasons, I believe the use of Dahlman's "monitoring and enforcement costs" is analogous to Coase's "concluding costs". Dahlman's definition of transaction costs will be used for this research.

*2.3.2 The Boundaries of a Firm*

According to Coase (1937) the main reason why firms develop and can make a profit is because of the existence of transaction costs. Rao (2003, p. 31) states that, "firms exist (primarily) to reduce transaction costs". Rao goes on to state that a firm's boundaries are determined by the implications of organizing new transactions within or across firms subject to constraints imposed by the market's organization and the interacting institutional environment. Coase (1937) speaks to this point when stating that price movements, coordinated by market exchanges, direct production outside the firm while inside a firm production is directed by the "entrepreneur-coordinator". Inside the firm this "entrepreneur-coordinator" can make decisions and direct resources at a lower cost than would be available on the market, because it is always possible to revert back to the market should this not be the case. Coase (1937, p 389) states that, "the distinguishing mark of the firm is the supersession of the price mechanism." Firms do not have to pay the market price for goods and services they produce themselves.

Coase (1988) proposes that firms emerge when the cost of organizing a market transaction exceed the cost of administration in that firm. In this situation a firm replaces transaction costs with administrative costs. According to Coase (1988, p. 7), "the limit to the size of the firm is set where its costs of organizing a transaction become equal to the cost of carry it out through the market." A firm that can direct production internally at

cost equal to or lower than that can be obtained through market transactions, the firm will expand its boundaries to include this production activity.

There are two ways in which a firm can expand; vertically or horizontally. That is not to say that each type of expansion is mutually exclusive, as both can occur simultaneously. Vertical expansion, commonly referred in the literature as vertical integration, occurs when a firm absorbs part of the production process, which had previously been carried out through market transactions with another organization, into the firm. A simple example of this type of integration would be that of farm deciding to mix its own feed that had previously been purchased from a feed mill. Horizontal expansion, or horizontal integration, occurs when a firm absorbs another firm that is at the same stage of production, commonly through a merger or acquisition. An example of this type of integration is when a cash crop farm takes over another farm with the idea of expanding production using the same production processes.

According to Perry (1989), vertical integration occurs in two directions. A firm can absorb 'upstream' production processes that contribute intermediate input(s) required for the output of their production. A firm could also absorb 'downstream' production process for which their output is an intermediate input required for the 'downstream' output. Perry (ibid.) suggests that vertical integration arises in three ways: vertical formation, vertical expansion and vertical merger. Vertical formation occurs at the time the firm emerges. Vertical expansion refers to an existing firm growing internally to encompass new production processes. Vertical merger refers to an existing firm acquiring an existing firm engaged in either 'upstream' or 'downstream' relevant production. These distinctions, while important, are commonly subsumed under the

simple ‘vertical integration’ moniker.

Williamson (1985) suggests that a hierarchical relationship, or vertical integration, in comparison to separate firms, can more easily avoid transaction costs arising from potential disputes in the negotiation of a market transaction. The logic being that a single party that has formal control over both sides of the transaction only faces costs of internal coordination.

Firms engaging in market exchange of EG&S and related products are emerging (Klimas, 2007; Drozdz, 2009) and it is important to understand the reasons why these firms emerge, why they expand and where their boundaries lie. Klimas (2007, p. 70), offers some insight on these topics from the Coaseian/transaction cost perspective when she states that transaction costs can be reduced, “with the establishment of firms specializing in the sales of ecological goods and services or acting as a middleman to the exchange of these goods and services as opposed to being a producer of these goods and services”. I will call this type of specialized firm or ‘middleman’ an intermediary. The following section is devoted to a discussion of intermediaries.

*2.3.3 The Role of Intermediaries*

A definition of an intermediary is provided by Spulber (1996, p. 135):

> “An intermediary is an economic agent that purchases from suppliers for resale to buyers or that helps buyers and sellers meet and transact. Intermediaries seek out suppliers, find and encourage buyers, select buy and sell prices, define the terms of transaction, manage the payments and record keeping for transaction, and hold inventories to provide liquidity or availability of goods and services.”

An intermediary is an individual or a firm whose purpose is to facilitate the transaction between two other parties by reducing transaction costs. Though Spulber defines this function as intermediation, it could also be called brokerage. The emergence of an

intermediary is an example of vertical formation but that does not mean that all instances of vertical formation indicate the emergence of an intermediary.

Spulber (1996) notes that the roots of his analysis come from the work of Coase (1937) and Williamson (1975) but adds to them through the insight that transaction costs not only have implications on the organization of firms but also on the organization of market institutions. Spulber (1996, p. 136) speaks to this point when stating, "just as producing goods and services consumes resources, so does the establishment of markets to allocate those goods and services". Intermediaries have a role to play in reducing the costs of establishing markets to allocate goods and services.

According to Spulber (1996, p. 136), the roles that intermediaries fill include, "setting prices and clearing markets; providing liquidity and immediacy; coordinating buyers and sellers; and guaranteeing quality and monitoring performance". Each of these roles is defined in greater detail below.

In the neoclassical perfectly competitive market model, firms are price takers. In reality, in many cases, firms have some control over prices due to factors such as product differentiation, transportation costs, transaction costs and incomplete information. Therefore firms have some responsibility in setting prices. Spulber (1996) reports that price setting can be costly because firms need to gather information on competitors prices, communicate prices to their consumers and suppliers and try to determine their profit-maximizing price. The presence of an intermediary with market power can mitigate some of these costs through coordinating the transaction with price signals. According to Spulber (1996) the intermediary can adjust its bid and ask prices in response to changes in supply or demand and, in doing so, allow the market to clear with

higher output.

Firms wishing to engage in market transactions for a particular good or service may face the problem of the double coincidence of wants. The double of coincidence of wants exists because buyers wait for the time when a seller is ready to transact and a seller must wait for a willing buyer. Spulber (1996) suggests that intermediaries can help avoid this problem by holding inventories on hand to sell to buyers and have cash ready to make purchases from sellers. Spulber states that holding inventories can help smooth fluctuations in supply and demand through quantity rationing and that this action is complementary to the firm's ability to set prices. Holding inventories also allows intermediaries to provide immediacy to their exchanges with buyers and sellers. This function could be particularly important in the market for ecological goods and services as an intermediary would have the potential to hold inventories of potential ecological goods and services supplies from myriad suppliers that would be ready for sale to a large buyer.

Intermediaries play an important role in coordinating and matching buyers and sellers. According to Spulber (1996) intermediaries can reduce or eliminate the uncertainty of purchases and suppliers finding the right party to the exchange. Intermediaries increase the number of trading partner options and thereby reduce the costs of searching for one. A large purchaser of ecological goods and services may find it costly to search and transact with numerous smaller suppliers. An intermediary could reduce these costs by matching that large buyer with sellers identified as willing suppliers of ecological goods and services.

The final role of intermediaries proposed by Spulber (1996) is that of

guaranteeing and monitoring. He states the information asymmetries are common between buyers and sellers. Intermediaries can collect and disseminate information to and between upstream and downstream parties. Apreda (2001) states that intermediaries act as brokers of asymmetric information. In doing so, they can reduce or eliminate lost economic activity from asymmetric information. For example, Spulber (1996) reports that an intermediary would have a greater willingness to invest in monitoring quality than an individual buyer because it buys more goods. This, in turn, leads to the intermediary being better able to distinguish between high and low quality sellers. The ability to distinguish between high and low quality sellers is particularly important in markets for ecological goods and services because sellers hold information on the quality of their potential to supply ecological goods and services that is not known by buyers. Intermediaries that can distinguish between high and low quality sellers can help avoid the problem of adverse selection. Because an intermediary is engaged in repeated transactions, establishing and upholding a positive reputation is of particular importance and therefore moral hazard issues become of less concern.

Recognizing the role of intermediaries in market transactions and in fostering market formation is of importance to this study because it is possible that the use of intermediaries could be incorporated into ecological goods and services policy in Ontario and Canada. Chapter 3 describes the ALUS approach to ecological goods and services provision that is currently being piloted in Ontario. ALUS operates as an intermediary between farmers supplying environmental goods and services and the myriad groups that demand them. Chapter 4 also describes examples of countries that benefit from the incorporation of intermediaries in ecological goods and services provision programs.

*2.3.4 Physical Invasion*

Rothbard (1982) proposed that any person's action which constitutes physical invasion of another person's property should be illegal. According to Brubaker (1995), under the common law in Canada it is a trespass, and therefore illegal, to invade another's land by any means regardless of whether the trespass constitutes an invasion by people or is carried by the wind or through the water. Brubaker (1995, p. 42) states that, in addition to trespass, nuisances that constitute an "interference with the use or enjoyment of property" are also illegal. Nuisance law can be used to protect against myriad environmental harms. Indeed, Brubaker states that it has been doing so for over seven hundred years.

The standard of physical invasion will be used in this thesis as a distinction for what constitutes an ecological good and service. Those actions that reduce environmental harm that amounts to physical invasion of private property will not be considered ecological goods and services. This includes, but is not limited to, actions that improve water quality be reducing nutrient or sediment loading, fencing to keep livestock out of waterways and improving air quality. Ecological goods and services include, but are not limited to, actions like improving and providing wildlife habitat, increasing biodiversity, providing scenic vistas and providing access to hunting or other recreation activities on private property.

*2.3.5 Strict Liability versus Negligence Liability*

Brubaker (1995) states that polluting industries often attempt to use the defense that their polluting actions are reasonable. Brubaker reports that "the defense of reasonable use" seems to differ based on who is employing it. Who determines what is reasonable and what is not? Brubaker reports that courts have traditionally refused to

consider the reasonable use defense. Rothbard (1982) reports the contrary, suggesting that, in the 19th century, the doctrine of strict liability was replaced by what he terms the 'reasonable man' theory or negligence theory. Rothbard has issue with the negligence theory because the definition of 'reasonable' is subjective and vague. Rothbard states that the negligence theory of tort liability has let defendants, who would be judged guilty according to strict liability, go free while leaving their victims uncompensated. I will use the theory of strict liability to determine who holds responsibility for harm in this research.

*2.3.6 Legalised Nuisance*

Fox (2007, p. 389) states that the second real Coase Theorem is: "In a world with positive transaction costs, judicial activism or legislative action has the potential to increase efficiency by reallocating property to higher valued uses when transaction costs prevent this occurring through voluntary exchange". Coase suggests that both the government and firms can avoid transaction costs. Governments can avoid certain transaction costs through regulation. But this is not to suggest that government is the solution to all instances of high transaction costs because, as Fox (2007, p. 390) rightly notes, "actual judicial and state actions may actually make matters worse." A regulator acting in the supposed public interest could permit actions that cause harm to the property of others. For example, right-to-farm legislation in Ontario exempts farmers from liability from their agricultural production activities. This is what Coase ([1960] 1988) termed legalised nuisance. According to Brubaker (1995, p. 95), "Governments have long asked taxpayers and the affected public to pick up the tab for the environmental harm wrought by industry. In order to do so, they have had to override or modify the common law with statutes and regulations enabling polluters to violate others' property rights with

impunity."

Legalised nuisance is an important concept to understand when examining ecological goods and services policy because of the opportunities to reduce environmental harm by changing legislation in order to remove exceptions that allow the physical invasion of property. In Ontario, that could mean repealing right-to-farm legislation and other such legislation that overrides common law property rights. It could also mean upholding the requirements of existing legislation in order to ensure violation of property rights does not go on unpunished.

*2.3.7 The Myth of Efficiency*

The concept of efficiency is often pursued as a goal in social policy. Rothbard (1979) calls efficiency a, "meaningless concept when it includes more than one individual, let alone an entire society." Rothbard identifies three fallacies with the concept of efficiency: "(1) the problem is not only in specifying ends but also in deciding whose ends are to be pursued; (2) individual ends are bound to conflict, and therefore any additive concept of social efficiency is meaningless; and (3) even each individual's actions cannot be assumed to be "efficient"; indeed, they undoubtedly will not be." According to Rothbard, public policy, laws and rights cannot be decided on the basis of efficiency. Instead, Rothbard states that only, "ethical principles can serve as criteria for our decisions." For the fields of public policy and law, the ethical principle that should primarily guide decision making is that of justice. For ecological goods and services policy this means rewarding those landowners who provide ecological goods and services that benefit others and not rewarding those actions that reduce environmental harm that amounts to an invasion of private property.

## 2.4 Canadian Ecological Goods and Services Policy Discourse

### *2.4.1 Potential Policy Option for Increasing Ecological Goods and Services Provision in Canada*

Campbell (2009), reported advantages and disadvantages of the potential policy options in a presentation on the experiences of the ecological goods and services pilot projects funded by Agriculture and Agri-Food Canada from 2006 to 2009 at a workshop held at the University of Toronto for Incentive Mechanism for the Provision of Environmental Goods and Services. Table 2.1 displays the pilot projects funded, the principle organizers, the location of the pilot and what was tested in the pilot project. The advantages and disadvantages of these pilot projects were derived by Campbell (2009) and will be used as the starting point for this analysis. Each advantage and disadvantage will be evaluated in order to better understand the potential of employing these policy options in Ontario and Canada. Table 2.2 displays the advantages and disadvantages of some of the policy options used in these pilot projects according to Campbell (2009).

*Regulation*

Campbell (2009) identifies the involuntary nature of regulatory models as a drawback of their use. I believe that the involuntary nature of regulatory models are not a drawback in itself because sanctions against nuisance are also involuntary and, as previously stated, enforcing sanctions against nuisance is necessary and just. It is only when regulations amount to expropriations of private property that their involuntary nature is problematic.

Table 2.1 Canadian Environmental Goods and Services Pilot Projects Conducted from 2006 to 2009

| Proponent | Name | Location | Testing |
|---|---|---|---|
| Nova Scotia Federation of Agriculture | EG&S and Societal Expectations of the Farm Community | St. Andrews Watershed, Nova Scotia | Potential for new Best Management Practices (BMPs) to encourage EG&S provision |
| The Souris and Area Wildlife Federation | Prince Edward Island Ecological Goods and Services Pilot Project | Souris and Found Watersheds, Prince Edward Island | Annual area-based incentives<br>Grants for livestock fencing and winter cover |
| Eastern Canada Soil and Water Conservation Centre | Using EFPs for EG&S | New Brunswick | Potential for the Environmental Farm Plan to be used for EG&S program management and as a policy development tool |
| ÉcoRessources Consultants | Ecological Goods and Services and Agroforestry: The Benefits for Farmers and the Interests for Society | Esturgeon River and Fouquette River Watersheds, Quebec | Benefits and costs of implementing agroforestry BMPs |
| Coopérative de solidarité versant de la Riviére-aux-Brochets | Farmers' Contribution to the Production of Ecological Goods and Services in Targeted Sub-Basins of Missisquoi Bay | Missisquoi Bay, Lake Champlain, Quebec | Potential of new BMPs to reduce phosphorus loading in streams<br>One time grants made to cover opportunity costs of participation |
| Keystone Agricultural Producers | Alternative Land Use Services (ALUS) | Rural Municipality of Blanshard, Manitoba | Annual area-based incentives |
| Ducks Unlimited Canada | Wetland Restoration & Retention in Southern Manitoba | Southern Manitoba Prairie Pothole Region | EG&S valuation using a stated preference survey instrument |
| Lower Souris Watershed Committee | Lower Souris Watershed Ecological Goods and Services Pilot | Lower Souris Watershed, Saskatchewan | Annual area-based incentives for the provision of wildlife habitat |

Source: Prairie Habitat Join Venture (2009)

Campbell (2009) states that one advantage of regulation is that it can be objective-driven. For example, for species at risk legislation, regulations are driven by the objective of protecting habitat for specific wildlife species. But it is my belief that just because a regulation is objective-driven does not mean that the objective will be achieved. There is potential for regulations to lead to perverse incentives, whereby a landowner has incentive to remove species at risk or their habitat because of the fear of losing rights to use their property as they wish. Regulations that have an objective of securing more species at risk habitat may in fact lead to less habitat.

Campbell (2009) reports that regulatory models also have the advantage in that everyone is subject to the same regulations and therefore regulation is equitable. This point is debatable as certain landowners may be subject to greater cost of adhering to regulation than others. Taking the example of the Species at Risk Act again, there are some landowners who would not have to worry about an American Badger creating a den on their property because their property lies outside of natural Badger habitat. A landowner in an area of natural Badger habitat would therefore be subject to greater risk of having their operations affected by this regulation.

From Campbell (2009), other disadvantages of regulatory models include costly enforcement, arbitrary rules and the fact that they are inefficient. The onus of monitoring and enforcing regulation lies with the regulatory agency. This can be particularly difficult and costly because the party being regulated has little reason to cooperate with the regulating agency by providing information or access to their property. There is also the question of whether the regulatory agency will actually enforce the rules of the

Table 2.2 Advantages and Disadvantages of Potential Policy Options According to Campbell (2009) Based on Experiences in Canadian EG&S Pilot Projects

| Policy Option | Advantages | Disadvantages |
|---|---|---|
| Regulation | • Objective-driven<br>• Equitable | • Involuntary<br>• Costly enforcement<br>• Arbitrary rules<br>• Does not take advantage of the stewardship ethic<br>• Inefficient |
| Annual Payments | • Simple to administer<br>• Familiar | • Payment not attached to output<br>• Costly, creates long-term commitment<br>• Capitalization into land prices |
| One-time Payment | • Simple<br>• Familiar | • Arbitrary parameters<br>• Not linked to market opportunities or costs |
| Auctions | • Efficient<br>• Equitable | • Costly to administer<br>• Little experience in Canada<br>• Not feasible for all EG&S |
| Tradable Permits | • Efficient | • Needs agreements among diverse stakeholders |
| Tax Incentives | • Existing policy instrument<br>• Voluntary | • Driven by tax reasons, not service to public<br>• Cost not always linked to beneficiary |

Source: Campbell (2009)

regulation. As Brubaker (1995) reports, history shows that, in Ontario, regulatory agencies have often been reluctant to uphold environmental regulations. The difficultly in monitoring and enforcing regulation can lead to perverse incentives for landowners. Again using the example of the Species at Risk Act, landowners that are potentially subject to costs or reduced productivity stemming from the provision in the regulation may decide to destroy protected species and their habitat because of the difficulty in monitoring or enforcing against these actions.

According to Campbell (2009), the use of arbitrary rules is a problem with the regulatory model. I would argue that 'arbitrary' is not the best choice of words here as it implies that the rule was made on impulse or with little thought. Nonetheless, I agree that defining rules to guide actions under legislation can be problematic because the rules may not aid in achieving the objective of the regulation. For example, according to the Ontario Ministry of Natural Resources (2007), under the Species at Risk Act, groundhog and ground squirrel holes are protected within 850 metres of badger dens because they are prey for the badgers. The use of an 850 metre perimeter is a rule that may increase the ability for a badger to find food but how much better than a 500 metre perimeter or how much worse than a 1000 metre perimeter? And what if the maintenance of this perimeter leads to livestock injuring themselves in the holes? Once again, the landowner may decide to destroy habitat lest he or she be subject to the onus of rules that affect the ability to conduct farm business.

*Annual Payments*

According to Campbell (2009), policy options that use annual payments, like the ALUS model, are good because they are easy to administer and because landowners are

familiar with their use. I will assume that by 'easy to administer', Campbell means that the costs of administering an annual payments program are low compared to other options. Annual payments programs have the potential to have low administration costs because it is not necessary to assess and compare the value of the ecological goods and services being supplied, as is the case with reverse auctions. If a landowner is chosen to participate in the program, they receive an annual payment for undertaking recognized management actions regardless of potential ecological outputs. The concept of receiving an annual payment for undertaking recognized management actions is certainly easy for potential participants to understand. An additional advantage of using annual payments is that they can be used to provide an alternative income stream to agricultural producers that are not tied directly to commodity production. This can be advantageous when moving to a system of support payments that are decoupled from agricultural production.

Campbell (2009) states that the disadvantages of using annual payments are the fact that payments are not attached to the production of ecological outputs, they require long-term financial commitments and are therefore costly, and they can lead to capitalization into land prices. Annual payments in the ALUS approach are based on the annual rental rate of land in the county rather than attached to the ecological goods and services that result from the activities. That being said, annual payments could be attached to the production of ecological outputs should a program be designed that way. I do not agree that since annual payment programs are not designed in this way currently means that annual payments are a low desirable policy choice.

If annual payments are designed to continue on in perpetuity, the financial implications to taxpayers can be quite high. Chapter 6 of the thesis provides an estimate

of the annual cost of an annual payment program based on average land rental rates by county.

Finally, there is the issue of annual payments being capitalized into land prices. As I stated previously in this chapter, I do not believe that capitalization of ecological goods and services payments into lands price are a bad thing. There is also debate as to whether capitalization actually occurs. Shoemaker (1989) found some limited evidence of Conservation Reserve Program being capitalized into land prices and land rental rates. Shoemaker states that capitalization occurs because the difference between the annual payment received and what could be earned from the land otherwise is a surplus going to the landowner. On the other hand, Lence and Mishra (2003) found that the Conservation Reserve Program did not have an effect on the rental rate of land. Research would have to be done to see if the annual payments would be capitalized into land prices and land rental rate in the Canadian context before it could be concluded that capitalization is indeed an issue facing annual payments programs.

A policy using annual payments would be simple in design, which could encourage participation of landowners. I believe that annual payments have typically been designed in this way because it may not be practical at this time to monitor many ecological outputs. On the other hand, there are certain ecological goods and services that could be rewarded upon output. For example, payments could be given to landowners that specifically preserve habitat of species of risk rather than to landowners whose land use choices could one day lead to increased habitat. Other issues, specifically the costliness of an annual payment program could also be overcome with increased rigour in selecting participants and/or by capping payments at a certain level. Annual

payments are one policy option that, if targeted properly, could be used effectively to secure the provision of ecological goods and services.

*Cost-shares*

One-time payments, or cost-shares, are a common incentive used to secure the provision of ecological goods and services in Ontario. Cost-shares decrease the cost of implementing a best management practice by sharing the cost between the private landowner and taxpayers. The Canada Ontario Farm Stewardship Program is an example of a program that offers cost-shares for best management practices to landowners. I would argue that most of the best management practices funded under the Canada Ontario Farm Stewardship Program do not provide ecological goods but, rather, are used to mitigate the risk of producing ecological 'bads'. Nonetheless, activities like riparian buffers do provide ecological goods and services, like wildlife habitat, in addition to their pollution reduction functions. Cost-shares are also commonly used in conjunction with other policy mechanisms. For example, the ALUS approach shares the cost of implementing management options with landowners in addition to annual payments.

Similar to annual payments, cost-shares are well liked because they are simple and familiar. A disadvantage of using cost-shares is that the level of cost-share is often arbitrary. Some activities are cost shared at 30% of implementation costs, while others, when coupled with funding from multiple cost-shares program, can achieved 100% cost-share. Ideally the percentage of cost-share assumed by landowners and taxpayers would be equal to the distribution of public and private benefits. But in practice it is difficult to determine the division of public and private benefits of a project.

Cost-shares are typically used to fund best management practices. Pannell (2009)

is critical of best management practices because it says nothing about for whom or what the practice is best for. Is it best for the environment, for the farmer, or best overall? From a farmer's perspective best practices may mean those maximize the present value of net benefits. From the policy perspective it may mean the net benefits are maximized when both public and private benefits and costs are taken into account. Pannell (2009) states that, for either perspective, best practices vary from place to place and situation to situation. Therefore, policies that include cost-shares for best management practices may be, in fact, funding practices that are less cost-effective than alternatives.

Cost-shares are an ingrained part of agri-environmental programming in Ontario through the Environmental Farm Plan and the Canada Ontario Farm Stewardship Program amongst other programs. The advantages of simplicity and familiarity in program design and delivery are favoured over some of the problems and inefficiencies in adhering to best management practices. That being said, providing incentives for the implementation of beneficial land use changes in agriculture might be necessary; the capital intensive nature of agricultural operations may mean that the capital necessary to implement change is not available, despite the availability of other incentives. Cost-shares are also a useful instrument in that they can be combined with other policy options.

*Auctions*

Auctions, or reverse auctions, are a policy option in many ways similar to annual payments. The main difference is the annual payment amount is determined by bids submitted by landowners stating the amount they would be willing to accept for undertaking a given land use practice on their land. Bids can then be ranked according to

the quantity and quality of ecological goods and services provided for a given price.

The advantages of an auction system, according to Campbell (2009), are that they are both equitable and efficient. They are equitable in that all landowners are eligible to submit bids to enroll land and bids are selected on the basis of the goods and services provided against the cost of their provision. As was stated previously, efficiency is a flawed concept and as such cannot be used as a criterion to evaluate public policy choices. Perhaps it would be better to state that an advantage of the auction policy mechanism is that it can pursue specified ends cost-effectively. This says nothing about the validity of those specified ends, only that auctions can aid in meeting them more cost-effectively than other policy mechanisms. For any given bid price, bids can be selected on the basis of the quantity or quality of ecological goods and services provided. In this way, competitive bid auctions can overcome problems associated with information asymmetries. This is in contrast with annual payments where the annual price is set administratively and applied uniformly.

Campbell (2009) states that disadvantages of using an auction system in Canada are high administrative costs in comparison to alternatives and little experience using auctions for ecological goods and services in Canada. In Chapter 4, experiences using auctions in to secure the provision of ecological goods and services in Australia and the United States show that auctions can increase the complexity of the program administration and lead to higher administrative costs. For example, the Biodiversity Benefits Index, used in Australia's BushTender program, requires detailed information that is gathered by staff with significant local ecological knowledge and then must be processed before bids can be assessed. The collection and review of both successful and

unsuccessful bids increases the administrative costs of this system in comparison to a program like ALUS were participants are selected on a first come first serve basis.

Campbell (2009) stated a disadvantage of auctions as a potential policy option is there has been little experience using auction systems in ecological goods and services policy in Ontario. In fact, there has been experience using auctions in Ontario agri-environmental policy. According to Ontario Ministry of Natural Resources (2001), the Permanent Cover Program, used in Ontario from 1990-1993, used a competitive auction system to choose bids for land enhancements on private land. Even if this was not the case, there is no reason that lack of experience using an auction system in Ontario or Canada should limit its inclusion as a potential policy option.

*Tradable Permits*

The South Nation Conservation Authority's Total Phosphorous Management program was presented by Campbell (2009) as an example of a tradable permit system. In this system, phosphorous effluent from industrial operations was offset by a system that pays rural landowners to reduce their phosphorous emissions.

Campbell (2009) states an advantage of use tradable permits is that they are are efficient. The question is, efficient towards what end? Instead of assessing the efficiency of tradable permits, they will be assessed in comparison to other policy mechanisms on the basis of cost-effectiveness. In comparison to the regulatory model, tradable permits can be a cost-effective mechanism for reducing pollution. Under regulation, a firm that emits a regulated pollutant is required to reduce those emissions to a specified level, regardless of the cost of abating that pollution. Under a tradable permit system, a firm can decide whether it is more cost-effective to reduce their own emissions or pay another

firm to reduce their own. A firm would presumably reduce its own emissions up to the point where its marginal cost of abatement is less than or equal to the cost of paying another firm to abate pollution. If this point is reached before the firm has reached the regulated level emissions, then the firm will have reduced costs in comparison to the scenario of just pure regulation. In this way, an advantage of using tradable permits is that they are cost-effective.

One disadvantage of using a tradable permit system is the difficulty in trying to achieve agreement among diverse groups and individuals who stand to gain or lose base on how permits are allocated or dispersed. The decisions as to who gets what permits and in what quantity, what practices are considered acceptable offset activities, the quantity of offset credits that are created through each activity, and the ratio at which non-point source offsets are tradable with point source emissions are all potentially contentious issues. Resolving these issues so that creators of offsets and credits and the purchasers of offsets are both better off while reducing environmental damage can potentially be time-consuming and therefore costly. I would expect that problem is more pronounced as the scope and scale of a tradable permit system increases.

The final problem with a tradable permit system, according to Campbell (2009), is that it is not a suitable policy mechanism for many ecological goods and services. Tradable permits are particularly suited for reducing the costs of meeting environmental or ecological objectives of reducing or offsetting damage or harm. Tradable permits are not suitable for incenting the provision of beneficial ecological goods and services, such as scenic vistas, because the provision of beneficial ecological goods and services should be more than 'permitted' they should be encouraged and, at this time, I am unaware of a

tradable permit system that provides positive incentives encouraging provision of a desired good or service. Therefore, it is a suitable policy mechanism for solving specific ecological problems in certain circumstances but is less suitable for use as the policy foundation for incenting the provision of ecological goods and services.

*Tax Incentives*

Tax incentives are currently being used in Ontario through the Conservation Land Tax Incentive Program and the Managed Forest Tax Incentive Program. An obvious advantage of using this type of policy mechanism is that there is experience of its use in the context of Ontario for which to draw upon. Another advantage of this type of incentive is that participation is voluntary. Voluntary participation is an advantage because landowners can decide if and when they wish to enroll their land in such a program whereas an involuntary problem would require participation regardless of the landowners desires. One disadvantage, according to Campbell (2009), is that enrollment in this type of program may be specifically for tax reasons and not to provides goods and services to the public. I believe that this problem could be overcome by redesigning tax incentives to reward increased provision of ecological goods and services.

*Education and Outreach*

Campbell (2009) reports that education and outreach programs are distinguished from the other policy options detailed above in that they are not based on providing direct financial benefit. Education and outreach programs rely on the fact that the transfer of information, regarding how ecologically beneficial management practices can be beneficial to the landowner and the public, leads to changes in farm management. Increased information on the private and public costs and benefits of a change in

management practice can potentially lead to farm operators voluntarily adopting farm management practices, that provide ecological goods and services, which would not have been adopted in lieu of the new information. Providing information that is either unavailable or costly to obtain for landowners is a potential way to induce voluntary change that leads to increased supply of ecological goods and services.

*2.4.2 Valuation of Ontario's Ecological Goods and Services*

Troy and Bagstad (2009) prepared a report for the Ministry of Natural Resources that attempts to estimate the value of ecological services in Southern Ontario. They estimated that the total value of ecological goods and services exceeds $84 billion/year. Values were estimated by transferring the findings of valuation studies from sites that had similar context to Ontario because it would be too time consuming and expensive to conduct comprehensive valuation studies in Ontario itself. Techniques used in the research findings that were transferred to Ontario in this study include: contingent valuation, travel cost method, hedonic pricing, replacement cost and others. Some estimates of ecological goods and services value found in Troy and Bagstad (2009) include: $25,843 ha/year for urban forests, $236,392 ha/year for urban and suburban rivers, and $89,608 ha/year for beaches. One of the objectives of this report was to "investigate how ecosystem services information might support policy and planning decision making (i.e. allows for fuller cost accounting)" (Troy and Bagstad, 2009: 1). The idea is that with values attached to ecological goods and services, the benefits of undertaking ecological conservation, restoration or enhancement can be better balanced against the costs.

Fox (1992) argues the information derived from the use of the contingent valuation method of ecological goods and services cannot be used for the economic

calculation of full cost accounting. The argument stems from the fact that contingent valuation generates values of goods and services derived from hypothetical exchanges of hypothetical goods and services not privately owned by the parties in the exchange. Using these valuations as representations of value that are analogous to prices is troubling because, according to Fox (1992), prices represent the terms of real exchange. Individuals engaging in voluntary exchanges of private property are assumed to value that which they receive in the exchange more than that which they give up. According to Fox (1992, pg 251), "prices systemically underestimates and overestimates valuation. If the terms of an exchange are expressed in money, than the money price exceeds the valuation of the seller and understates the valuation of the buyer." Therefore, using hypothetical valuations in the calculation of benefits cannot be equated with the costs represented by prices derived from the terms of real exchange. Other critics of contingent valuation methods include Diamond and Hausman (1994).

## 2.5 Conclusion

The purpose of this chapter was to:

- to inform the choice and design of research method for eliciting information on the current state ecological goods and services policy in Ontario,
- to inform the analysis of results stemming from this research from the standpoint of environmental economics, and
- to describe and analyze the current discourse on ecological goods and services policy in Canada

These objectives were each addressed separately in subsections reviewing the relevant literature.

First, the choice of qualitative methods for this policy research was justified. In-depth interviews were selected as the method through which this qualitative research is conducted because potential interviewees should be familiar and comfortable in the

interview setting and semi-structured in-depth interviews are well suited for eliciting information on policy discourse because they can be tailored to probe areas of knowledge that interviewees are particularly well versed in. This section concludes with an overview of the in-depth interview approach used in this research as designed by Miller and Crabtree (2005).

Key distinctions and concepts from the environmental economics literature were then reviewed so that they could be applied in the analysis of the results of this research. Concepts such as transaction costs, the boundaries of the firm and the role of intermediaries in market exchanges are important to understand for this research because market exchanges of ecological goods and services brokered by intermediaries is an alternative method of securing the provision of ecological goods and services. In Chapter 3, the ALUS idea of brokering the sale of Ontario Ecological Credits is an example of an intermediary increasing the provision of ecological goods and services. Other important key distinctions discussed in this section are Rothbard's physical invasion standard of nuisance, Rothbard's distinction between strict and negligence liability, Coase's concept of legalised nuisance and Rothbard's discussion on the myth of efficiency. These distinctions are important for analysis later in this thesis.

Finally, examples of the current discourse on ecological goods and services policy in Canada were presented and analyzed. First, Campbell's (2009) evaluation of potential policy options for increasing the provision of ecological goods and services in Canada was presented. This section also included my own analysis of these potential policy options. This section concluded with a brief discussion the value of Ontario's ecological goods and services as reported by Troy and Bagstad (2009). Fox (1992) cautions against

using the results from contingent valuation studies in the economic calculation of full cost accounting.

# Chapter 3 – A Background on the Alternative Land Use Services Approach to Ecological Goods and Services Provision

*[co-written with Jessica Rosenberg]*

## 3.1 Introduction

Alternative Land Use Services (ALUS) is a concept, designed and delivered by farmers, that makes annual area-based payments for the provision of environmental goods and services from private farmland. This chapter describes the history of ALUS, its guiding and operating principles, how ALUS is being used in practice in Ontario, and the future aspirations for the ALUS approach according to ALUS organizers in Norfolk County. The purpose of this chapter is to provide an example of ecological goods and services policy development and implementation in Ontario and Canada.

## 3.2 History

A brief history of the ALUS concept, with a focus on the Norfolk County ALUS pilot project, is presented in this section. This section includes the origins of the ALUS concept's development, the commitment from government to investigate programs that provide EG&S, the development of pilot projects across Canada, and documented reactions to the ALUS approach in Ontario.

### *3.2.1 Origins*

News releases from Keystone Agricultural Producers and Delta Waterfowl provide information beginning in 2004. According to Delta Waterfowl (2004), Ian Wishart, of Keystone Agricultural Producers, was the principal designer and promoter of the ALUS approach. Mr. Wishart is credited by Delta Waterfowl with building support for ALUS among farm organizations, farmers, conservation groups and government

officials. Keystone Agricultural Producers found a partner in the promotion of ALUS in the Delta Waterfowl organization, a noted North American conservation group.

According to Dave Reid (Personal communication, October 9, 2009), in 2004, Ian Wishart presented the ALUS approach to a meeting of the Federal and Provincial Ministers of Agriculture in Cardigan, Prince Edward Island. At the conclusion of this presentation three appeals were made for supporting ecological goods and services policy in Canada. These appeals were: (1) that a federal/provincial working group be struck to work towards development of a policy on ecological goods and services; (2) that a national/international symposium on ecological goods and services be hosted to inform government and politicians about ecological goods and services policy and programming from around the world and; (3) that a fund be established to finance pilots for input to the development of a policy on ecological goods and services. According to Mr. Reid, all three of these appeals were granted.

In the time leading up to the 2005 meeting of Federal and Provincial Ministers of Agriculture, in Kananaskis, Alberta, farm groups, including the Canadian Federation of Agriculture, urged the ministers to adopt the ALUS approach as a National Stewardship Strategy (Delta Waterfowl, 2005a). At the meetings the ministers approved a policy agenda that included the testing of ALUS (Delta Waterfowl, 2005b).

In April 2007, a report conducted by Tyrchniewicz Consulting and funded by Delta Waterfowl stated that the benefits of a national ALUS program in Canada exceeded the costs. This was an important milestone because it was the first such estimate released to the public. Delta Waterfowl (2007) hoped that the release of this work would encourage further discussion of ALUS at a national level.

*3.2.2 Pilot Project in Manitoba*

In November 2005, following the meeting in Kananaskis, Manitoba announced the launch of a three-year pilot project of the ALUS approach. A news release from Delta Waterfowl (2005c) stated that funding for the pilot project came from the environmental pillar of the Federal Agricultural Policy Framework, the Rural Municipality of Blanshard (where the pilot project was conducted), as well as from agencies in Mississippi and Tennessee. The pilot project's budget over the three years was expected to be $1.8 million. This pilot project has since concluded and an analysis of the project is expected in the future.

*3.2.3 Pilot Project in Ontario*

David Reid (Personal communication, March 4, 2009), of the Norfolk Land Stewardship Council, said that the first discussion of the ALUS approach in Ontario occurred after he read an article (written by Robert Sopuck of Delta Waterfowl) about ALUS in the Ontario Farmer newspaper in Fall 2001. Mr. Reid (Personal communication, October 6, 2009) reports that, "as a result and because of a coincidental contact with Bob Bailey, I was able to arrange an ALUS presentation by Bob [Bailey] and Ian [Wishart] at an Ontario Stewardship zone meeting that I hosted here in Simcoe and that had an agricultural theme." Mr. Reid reports that a number of farmers, who were also members of the Norfolk Land Stewardship Council, attended this meeting and were impressed enough by the ALUS concept to encourage the Norfolk Land Stewardship Council to pursue hosting a pilot project. Representatives from the Norfolk Land Stewardship Council approached the Norfolk Federation of Agriculture to ask for the support of the Norfolk Federation of Agriculture in leading the pilot project. According to Mr. Reid, the Norfolk Federation of Agriculture agreed to lead the pilot

project in March of 2002. According to Bailey and Greenslade (2006), the first ALUS workshop in Norfolk County, Ontario occurred in 2003.

Bailey and Greenslade (2006) reported that, as of 2005, the Norfolk Country project had not yet launched. Gorsuch (2009) reports that as of April 2007, $250,000 had been spent in Norfolk County over the previous 5 years on pilot proposal development. Activities in this development stage included: the aforementioned workshop in 2003, publication of the pilot proposal in January 2004, establishment of a 9 member participatory advisory committee to direct the pilot, completion of a benchmark survey on public opinion related to farming and the environment in Norfolk Country, the publication of an ALUS brochure and the establishment of four ALUS demonstration farms. The ALUS pilot project was officially launched in Norfolk County on September 20, 2007.

The intent of the organizers of the Norfolk County ALUS pilot project was to secure enough funding to offer the ALUS program to all farmers in Norfolk County. At the time of the pilot project launch, the funding did not meet their expectations, and the project had to be scaled back. According to Norfolk ALUS coordinator Kristen Thompson (Personal communication, June 4, 2009), instead of a 9-year pilot project, the was scaled back to 3 years. As well, instead of offering the project county wide, ALUS organizers decided to focus on the development of the pilot project in Norfolk County, by setting up additional demonstration farms. This was hoped to display the ways in which ALUS could benefit farms of any types and sizes, as well as to target specific watersheds for riparian buffer creation. Due to an influx of funding in the last two years of the pilot project, its end date was extended from 2010 to 2012. New enrolments are being sought

up to the end of the 2010 field season, at which point the pilot will continue to pay annual incentives to all enrolled participants until 2012.

*3.2.4 PEI ALUS*

Dave Reid (Personal communication, October 9, 2009) reported that the PEI Minister and Deputy Minister of Agriculture attended and participated in an ALUS workshop held in Norfolk County, Ontario in March 2003. In 2007, discussions began in Prince Edward Island (PEI) about how to bring the ALUS concept there. PEI began testing a modified approach to the ALUS concept in two watersheds and quickly moved beyond the pilot stage to adopting ALUS as provincial policy in 2008. The program is administered through the PEI Department of Environment, Energy and Forestry. Hager (2009) reports that the PEI Department of Environment, Energy and Forestry typically relied on a heavily regulated approach to agri-environmental issues, but saw the ALUS concept as way to encourage farmers to make decisions that benefit themselves as well as the environment. ALUS in PEI had an initial budget of $750,000 for the 2008-2009 year and Delta Waterfowl (2009) reported that it annual funding increased to $1 million for the 2009-2010 funding year.

*3.2.5 Policy Discussion*

Policy discussions on the ALUS approach continue to the present. A Standing Committee on Agriculture and Agri-food (2007) report made two important recommendations that relate to environmental stewardship programs. First, they stated that farmers deserve to be compensated for generating EG&S, and that their place as environmental stewards should be recognized. They also noted that other countries are pursuing policies and programs that are similar to the ALUS approach, and they suggested that Canada follow suit.

The debate over the suitability of adopting the ALUS model as public policy in Ontario recently became apparent with a written debate between proponents and detractors in the farm community weekly paper, the Ontario Farmer. The Ontario Farmer from April 21st, 2009 contained a letter to the editor by Elizabeth Brubaker, the executive director of environmental NGO Environmental Probe, who wrote that the ALUS model failed to distinguish between the provision of environmental goods and services and the prevention of environmental harm. In her view only the former is acceptable. The following two Ontario Farmer issues, from April 28th and May 5th, contained letters to the editor defending the ALUS approach from a variety of sources including farmers, a farm organizations employee, employees from two separate environmental NGOs and a Masters Candidate from York University.

### 3.3 ALUS Principles

The ALUS approach is modeled on 11 key principles. These are outlined and detailed below, adapted from "The Key Principles of ALUS." (Dave Reid, Personal Communication, May 27 2009.)

1. ALUS believes that the stewardship of the environmental resources ought to be a cost-shared endeavour, as many EG&S that benefit the public are found on private lands. The delivery and maintenance of EG&S by participating landowners are incentivized with annual payments to reflect opportunity costs of converted land, on a per-acreage and yearly basis.
2. EG&S are understood to be a marketable service, and so its delivery is assigned a monetary value. The organization in Norfolk County currently uses land rental rates on which the EG&S are provided.
3. ALUS considers both payments for landscape improvement, as well as the maintenance of existing natural assets. There is also a scale-back policy for those farmers that have already maintained natural assets.
4. ALUS aims to produce measurable EG&S. They believe these to be associated with socio-economic and ecological benefits for all Canadians.
5. ALUS endeavours to be a grassroots program. They believe that investment in the capacity of citizens and rural communities is essential to conservation programming. They implement the program with flexible decision-making at the community level.

6. ALUS believes farmers and ranchers are in the ideal position to deliver EG&S from their lands. ALUS allows for their environmental agenda to be managed by these farmers, in cooperation with their communities, farm organizations, governments, non-government agencies, and the Canadian public.
7. ALUS is independently monitored and audited. Third party evaluation is an important component to the ALUS process.
8. ALUS development and delivery aspires to be transparent and accountable. Community leadership will be committed to planning, delivery, and reporting.
9. A key component of ALUS is that they will meet Canada's international trade obligations.
10. ALUS will complement the policies of the Agricultural Policy Framework, the Environmental Farm Plan, and other policies surrounding natural capital and environmental resource conservation that are currently in place. Their program also respects the local agricultural and environmental initiatives that exist already.
11. ALUS uses a "fee-for service" concept to provide environmental benefits. ALUS is designed to provide these benefits at a fair market value, and does not hand out environmental subsidies.

ALUS also functions according to 6 Operating Principles. These are summarized in Table 3.1.

## 3.4 ALUS in Practice

This section describes aspects of the ALUS pilot project design as they used in practice in the Norfolk County pilot project. Components of the Norfolk ALUS pilot project's design described here include: administrative structure, funding sources, delivery mechanism, participant selection, incentive mechanism, and monitoring and verification. Noted too are the changes in how ALUS is applied in practice in Norfolk County over time.

### *3.4.1 ALUS Administrative Structure*

The role of the Project Coordinator is a key part of the functioning of the Norfolk ALUS project. Kristen Thompson currently fills this position. Ms. Thompson acts as an intermediary between the farmers and the ALUS organizers, throughout their process of adopting the ALUS approach. For a given farmer, the adoption process begins with a statement of interest, and continues through with the approval of request, farm visits and

**Table 3.1: A Summary of Alternative Land Use Services (ALUS) Operating Principles**

| Operating Principle | Summarized Explanation |
|---|---|
| 1. Voluntary | Participation is a choice |
| 2. Capping | Up to 20% of a farmer's land can be signed up to be part of the fee-for-service concept |
| 3. Integrated | Aims to be integrated with the Environmental Farm Plan and other existing programs |
| 4. Flexible | Three year term<br><br>Opt-out possibilities |
| 5. Targeted | Environmentally sensitive lands targeted for stewardship |
| 6. Accountable | Managed and controlled by farm and rural communities<br><br>Independently monitored and audited<br><br>Transparent and open to public scrutiny |

**Source**: Bailey, Robert O. and David J. Reid. (2004). "ALUS: The Farmer's Conservation Plan" ALUS Pilot Project Proposal for Norfolk County, Ontario.

evaluation, planting and land-managing. The project coordinator has iterative meetings with the farmers throughout the course of these events, providing one-on-one assistance to the farmers as required.

The ALUS pilot project in Norfolk County is overseen by the Partnership Advisory Committee (PAC), acting as an executive board for the decision-making processes. The PAC is a sub-committee of the Norfolk Federation of Agriculture. The PAC meets bi-monthly, and is responsible for the administration, decision-making and management of the daily affairs of the project (Norfolk ALUS website, 2009). This committee is made up of farmers from the Norfolk farming community, as well as other stakeholders including members from the Norfolk Federation of Agriculture, Delta Waterfowl, Ministry of Natural Resources, OMAFRA, the Norfolk Land Stewardship Council, Norfolk County, the Norfolk Soil and Crop Improvement Association, the Long Point Region Conservation Authority and the project coordinator. According to Dave Reid (personal communication, October 9, 2009), there have been up to sixteen members of the PAC and of that sixteen, eight are farmers.

*3.4.2 ALUS Funding*

Originally, the objective of the Norfolk ALUS pilot project was to showcase the benefits of the ALUS approach so that it would be adopted as provincial policy backed by taxpayer funding. According to Bryan Gilvesy (Personal communication, January 27, 2010), ALUS was envisioned as a single-payer system, with funding coming from the government. This is no longer the focus of the ALUS project. Dave Reid (personal communication, October 10, 2009) stated that, due to current economic downturn, this is an inopportune time to be implementing a new and costly program province-wide.

Bryan Gilvesy (Personal communication, September 16, 2009), reported that, "carbon has changed everything in our funding model". He was speaking in reference to ALUS participating in carbon-offset markets that are developing to reduce the concentration of the greenhouse gasses in the atmosphere. Mr. Gilvesy reported that ALUS does not want to participate in traditional carbon exchanges. He believed that ALUS can provide carbon offsets that will be traded with those who demand them, and as such, ALUS can control its brand and its product.

ALUS is now proposing that funding for on-going program operations could be obtained through the sale of a marketable bundle of ecological goods and services. These were originally called the Ontario Conservation Credit, and are now referred to as the Ontario Ecological Credit (ecocredits). The idea behind these credits is that those who demand ecological goods and services can buy the equivalent of an acre of a specific ALUS land-use enhancement, which contains multifunctional ecological benefits associated with that acre of land, as well as a verified and quantified carbon offset attached. As of writing, this proposed concept is still in the policy debate stage in the ALUS Participatory Advisory Committee, and therefore no formal guidelines on pricing and implementation are available at this time.

*3.4.3 Delivery Mechanism*

Some of the tools that the ALUS team uses to engage public support include: demonstration farms, available for viewing upon request; farm tours to promote the impact of ALUS on the ground; speaking at various conferences and workshops (both academic and political) to promote the ALUS approach. They specifically market to the farming community in Norfolk County through word of mouth, ALUS workshops and targeting lands of specific ecological interests, with farmer liaisons making the first

contact. When a farmer decides that he or she would be interested in participating in the ALUS pilot project, the participation process is as follows (according to Kristen Thompson, (Personal communication, June 4th, 2009): first, they fill in a one-page Expression of Interest form. Then, their application goes to the approval committee, made up of members of the PAC and ALUS organizers. The committee ensures that all requirements are met, including having a registered farm number, and his or her proposed enrolment not exceeding 20% of their cultivated land. The coordinator then does a site visit to listen to the farmers' ideas about on-farm EG&S projects, and together they draft a plan for each farm.

*3.4.4 Incentive Mechanism*

There are two financial incentives for participation in the Norfolk ALUS pilot project. The first is that grants are given to implement all projects, so conversion costs are covered. ALUS pays for the materials and implementation of all of their activities and further pays landowners for their in-kind contributions (labour) to the projects. The second incentive is that landowners receive an annual payment, which recognize the opportunity costs of removing land for agricultural production. Landowners typically receive an annual payment of $150/acre/yr. ALUS organizers decided on this payment level based on an average annual rental rate of agricultural land in Norfolk County. Some ALUS projects receive a reduced annual incentive of $75/acre/yr if they use their project for livestock feeding late in the season.

*3.4.5 Participant Selection*

Selecting participants for enrolment in the Norfolk ALUS pilot project has so far been straightforward. Dave Reid (Personal communication, January 27, 2010) reported that landowners who submit Expressions of Interest in the program are selected on a first-

come first-serve basis up to the point that maximum potential participation is reached. Mr. Reid reported that full capacity was not reached in the 2008, nor the 2009 field seasons. ALUS organizers have used both a targeted approach to participant selection, as well as hosting workshops and having interested community members come to them.

*3.5.6 Monitoring and Verification*

One of the key principles of the ALUS approach is that their activities will produce measurable environmental goods and services. To ensure that the Norfolk ALUS pilot project adheres to this principle, ALUS contracted Agricorp to carry out third-party verification of the acreage enrolled in the ALUS pilot. At the April 7, 2010 meeting of the ALUS Participatory Advisory Committee, ALUS organizers recognized the importance of verification done by Agricorp, but expressed desire to undertake more extensive monitoring in the future that can lead to verified and quantified ecological benefits. At the time of writing, no formal procedures outside of the verification carried out by Agricorp have been adopted.

*3.4.7 ALUS Uptake*

According to Kristen Thompson (Personal communication, August 2009; Personal Communication, ALUS Newsletter May 2010) over the last three field seasons ALUS has 91 farm families participating on 105 farm properties. Some examples of the project that have been carried out in the Norfolk County pilot include: creation and expansion of wetland habitat; riparian buffer establishment; creation of Tallgrass Prairie and Oak Savannah; reforestation using native Carolinian species; pollinator hedgerows; and grassed windbreaks. (Kristen Thompson, Personal communication, August 2009). They have also targeted farms located on the South Creek watershed, and the Patterson

Creek, encouraging the placement buffer strips to protect increased lengths of the creek and river.

## 3.5 Future Aspirations

### *3.5.1 Broad Objectives for ALUS*

There are many aspirations for the future of the ALUS approach. While these tend to deviate slightly amongst the different stakeholders and organizers, the broad goals are listed below.

An overarching goal of ALUS is a visible greening of the landscape. This entails more conservation on the ground. Some ALUS organizers aspire to bring the EG&S provided through the ALUS approach to market. Bryan Gilvesy (Personal communication, September 16, 2009), chairman of the Norfolk ALUS Participatory Advisory Committee, spoke to this in commenting that "the future lies in the creation of green products". This includes entering markets for carbon offset credits as well as the creation of a bundled environmental goods and services offset credit. For others, like Steve Scheers (ALUS organizers, Personal communication, September 16, 2009), the goal of ALUS into the future would be to utilize the ALUS approach as a means to stabilize farm income while simultaneously protecting natural resources.

A desire among the ALUS organizers is that any expansion of the ALUS approach remains philosophically consistent with its application in the pilot project phase. Under this arrangement, the ALUS philosophies of being adaptive to local needs, being farmer driven and delivered locally remain central to the program.

An objective that was articulated in the formative stages of the ALUS pilot in Norfolk County, was to have an ALUS provincial program here in Ontario, and then a nation-wide program. For some, this goal persists. In the shorter term, some state the

objective as enabling other counties around Ontario, who have expressed interest in having a pilot, to initiate these programs.

*3.5.2 Objectives for the Pilot in Norfolk County*

There are varied hopes for ALUS in Norfolk County at the conclusion of the three-year pilot. On the one hand, it is important to keep in mind the nature of a pilot: it is a short-term program that must wind down due to time and funding constraints as well as the need to evaluate the pilot project. As Kristen Thompson wrote (Personal communication, Sept 16), "I think when the pilot is rolled out, and it is completed, it will really give us a good platform to show what we've done, and to report on the successes that we've had." After the conclusion of the pilot, Ms. Thompson (project coordinator) believes that much of the farmland enrolled in the ALUS pilot will remain in its converted state. Steve Scheers (ALUS Organizer) also believes that the areas where restoration has occurred through ALUS will remain. This belief stems from the notion that since the farmers who participate in the ALUS approach collaborate and become partners in the decision makings process, they then will take ownership for the changes made on their lands. As well, since the conversion costs have been sunk, the farmer is left with a decision between the co-benefits (whether they be economic, environmental or purely aesthetic) and associated maintenance costs of leaving the land in its converted state against the costs of converting the land back to agricultural production and the opportunity cost of not growing agricultural crops.

**3.6 Conclusions**

This chapter provided an overview of the history of ALUS, how it presently being applied in Norfolk County Ontario, and what future aspirations the Norfolk County ALUS organizers have for the ALUS approach. The history of the ALUS model as it has

been used in Manitoba and PEI and the development of the Norfolk County, Ontario pilot project were provided. This chapter stated the key and operating principles adhered to in the application of the ALUS model in Norfolk County. The aspects of the design of the implementation of the ALUS approach in Ontario are described. Finally, the future aspirations for the ALUS approach according to Norfolk ALUS organizers were presented.

# Chapter 4 – Review of International Ecological Goods and Services Provision Programs

## 4.1 Introduction

This chapter describes and evaluates four alternative policy approaches to promoting the supply of ecological goods and services on private rural land: the Conservation Reserve Program of the United States, the Environmental Stewardship scheme of England, BushTender in Australia and *Pago por Servicios Ambientales* in Costa Rica. These programs were selected for study in this research because detailed information on these programs was readily available in English. In additional, these approaches represent a range of policy approaches to ecological goods and services provision that can compared and contrasted. Experiences in these jurisdictions can provide lessons learned that can inform the development of ecological goods and services policy in Ontario and Canada.

This chapter describes these alternative policy approaches based on elements of program design for ecological goods and services policy. Elements of program design include:

- the size and scope of programs,
- administrative structure of the program,
- incentive mechanism and level of payments,
- participant selection mechanism,
- types of ecological goods and services eligible, and
- source(s) of funding

Programs will also be evaluated based on their ability to address critical policy issues including: the valuation of ecological goods and services, ensuring permanence of program activities, targeting of ecological goods and services and benchmarking.

The thesis of this chapter is that the policy approaches to ecological goods and services provision adopted internationally depend largely on the location specific context. Factors such as geography, politics, history, demographics and laws in a specific locales explain many aspects of ecological goods and service policy design. That being said, there are general lessons that can be learned from international experiences with ecological goods and services policy.

This chapter proceeds as follows. Each program is first described according to the elements of programs design and their ability to deal with critical policy issues. Then lessons that could inform the development of ecological goods and services policy in Ontario and Canada will be derived. The first program described is the Conservation Reserve Program of the United States, followed by the *Pago por Servicios Ambientales* program of Costa Rica, Environmental Stewardship of the England and BushTender of the state of Victoria in Australia, respectively.

## 4.2 The Conservation Reserve Program in the United States

### *4.2.1 Overview of the Conservation Reserve Program*

The Conservation Reserve Program was established by the U.S. Farm Bill of 1985 and began enrolling land in 1986. According to Sullivan *et al.* (2004) the program was offered as an alternative means of farm income support in the form of acre-based grant payments for removing land from agricultural production. This was in contrast to previous farm income support policy of direct price support. Sullivan *et al.* (2004) report that the stated primary goal of the Conservation Reserve Program, at its inception, was to reduce soil erosion on highly erodible cropland. Other objectives included reducing sedimentation, improving water quality and creation of wildlife habitat.

Sullivan *et al.* (2004) report that the initial enrollment limit was set at five million acres in 1986 and was to be increased to forty million acres by 1990. In the beginning, landowners applied to the program by indicating what portions of their land they wished to enroll and the level of annual payment that would be required. Landowners could apply only during designated signup periods. The USDA set the maximum annual rental payment based on the county average cropland rental rate adjusted for the productivity of the soil. Bids were only selected at or below this rate. Sullivan *et al.* (2004) report that landowners quickly gained an understanding of how rental rates were determined and began bidding close to the maximum.

In addition to highly erodible cropland, other lands could be enrolled in the Conservation Reserve Program that pose an off-farm environmental threat. Under the Conservation Reserve Program, participants are required to implement a conservation plan approved by the local conservation district and establish vegetative cover on all enrolled land. If terms of the contract are violated, the participant would lose his or her right to all future payments and could be required to refund any received payments up to that point.

Provisions in the 1990 Farm Bill extended eligible lands to include sensitive pasturelands and other lands that could adversely affect water quality. This Farm Bill allowed applicants to enroll lands that had been converted to approved land uses, such as wetlands, riparian buffer strips, and grassy waterways as part of recognized conservation plans. This Farm Bill also dropped the restriction on haying and grazing from the 1985 Farm Bill and permitted limited fall and winter grazing in exchange for a reduced annual payment.

The U.S. Food, Agriculture, Conservation and Trade Act of 1990 altered how bids were ranked and selected. The USDA began ranking applications based on an Environmental Benefits Index. Hellerstein (2006) reports that the Environmental Benefits Index was used so that bids could be ranked according to their ability to address multiple environmental concerns. This ranking system addressed the issue of valuing ecological goods and services provided through the program.

The U.S. Farm Bill of 1996 included changes to the Environmental Benefits Index by including wildlife habitat as an ecological good and service indicator. It also included provisions that allowed landowners the option to enroll lands for riparian buffer strips and grassy waterways at any time during the year, also known as continuous signup, and receive the maximum bid payment based on characteristics of the land and soil, also known as the soil-adjusted bid rate.

The U.S. Farm Bills of 2002 and 2008 made only small changes to the Conservation Reserve Program. The 2002 Farm Bill earmarked 4 million of the 39.2 million acre enrollment limit for continuous signups. The 2002 Farm Bill also eased eligibility requirements so that more land could be potentially enrolled. The 2008 Farm Bill included a provision that provided incentives for management that has the potential to improve the growing condition of trees through activities such as brush clearing and thinning. The USDA (2009) reports a recent change that changes the enrollment limits in coming years from 39.2 million acres for 2009 to 32 million acres for 2010 – 2012.

### *4.2.2 Aspects of Program Design*

#### *Size and Scope of Activities*

The United States Farm Service Agency (2009b) reports that, as of September 30, 2009, a cumulative total of 33.7 million acres of land were currently enrolled in the

Conservation Reserve Program. This represents approximately 3.7% of total US cropland.[2] Contracts for 2.7 million acres of land were set to expire in October 2009. According to the United States Department of Agriculture (2010), $1.9 billion was spent on the Conservation Reserve Program in 2009. This figure represents both program payments and administration costs of the U.S. Natural Resources Conservation Service. It amounts to an average cost of just over $56/acre/year.

The United State Farm Service Agency (2010) reports two tests of eligibility that must be met for landowners to enroll their land in the Conservation Reserve Program. First, the landowner must have worked the land for at least the last 12 months prior to submitting an application. Exceptions to this rule include if the land was acquired following the previous owner's death, if the land was obtained via foreclosure or if the Farm Service Agency is assured that the land was not acquired for the purpose of placing it in the Conservation Reserve Program. Second, the land must either be cropland that has been planted in four of the past six growing seasons or marginal land that is suitable for use as a riparian buffer. According to the Farm Service Agency (2010) the land must be suitable for an eligible conservation practice including: riparian buffers, wildlife habitat buffers, wetland buffers, filter strips, wetland restoration, grass waterways, shelterbelts, living snow fences, contour grass strips, salt tolerant vegetation and shallow water areas for wildlife.

*Administrative Structure*

The Conservation Reserve Program is administered by the United States Department of Agriculture (USDA). The Farm Service Agency and the Commodity

[2] According to the 2007 United States Census of Agriculture (2007), there are just over 922 million acres of land in farms.

Credit Corporation are two divisions of the USDA involved in the Conservation Reserve Program. The Commodity Credit Corporation is the legal entity that contracts with landowners while the Farm Service Agency is responsible for administering the program. The Farm Service Agency uses a variety of intermediaries for implementation of the program and technical assistance. The USDA's Natural Resource Conservation Service (2009) is involved with providing technical assistance to help landowners determine what land is eligible and designing and implementing conservation plans. The Farm Service Agency (2009) reports that other groups involved in administering the Conservation Reserve Program at this level include the USDA's Cooperative State Research, Education and Extension Service, state forestry agencies, local soil and water conservation districts and private sector providers of technical assistance. It is important to note that although the funding for this program comes directly from the top of this structure, program implementation and planning is delivered through groups at a level much closer to the actual landowners.

*Incentive Mechanism*

The Conservation Reserve Program provides incentives for landowners to retire their land from production through cost-sharing and annual payments. Cost-sharing with landowners covers up to 50% of the costs of approved management practices including prescribed burns and seeding of legumes. Annual incentives payments are given on a per-acre basis according to the applicant's bid rate. Smith (2000) reports that starting in 2000 an additional incentive was provided to landowners who enrolled lands in the continuous signup for riparian lands. An up-front Signing Incentive Payment of between

$100 and $150 was given to these landowners based on the length of the contract they entered into.

*Participant Eligibility and Approval*

Hellerstein (2006) reports that nearly all those who applied were approved for the Conservation Reserve Program between 1986 and 1989. Smith (2000) states that bids were not ranked at this time and all bids at or below the maximum bid rate were generally accepted so that program participation met a minimum standard of enrollment mandated in the 1985 Farm Bill. According to Hajkowicz, Collins and Cattaneo (2009), the only environmental benefit targeted in this phase of the program was the reduction of soil erosion.

An Environmental Benefits Index was introduced in 1990 to rank bids based on their anticipated relative environmental benefits. Smith (2000) reports that, in the early 1990s, acreage enrollment neared the program's enrollment cap and therefore there was a desire to be selective about which lands were enrolled. Ribaduo et al., (2001) state that the Environmental Benefits Index was introduced in response to an investigation by the United States General Accounting Office that concluded that the cost-effectiveness of the Conservation Reserve Program could be increased if multiple program objectives were targeted instead of just soil erosion. The ranking process was designed to select lands that offered the greater environmental benefits relative to government costs. Bids that exceeded the soil-adjusted maximum bid rate were rejected outright while bids below this rate were ranked according to ratio of their anticipated environmental benefits to the government cost. Bids were then selected with the lowest bids for a given level of

environmental benefits selected first and then increasingly costly bids accepted until desired enrollment is fulfilled.

Smith (2000) reports that indicators of environmental benefits used in the original version of the Environmental Benefits Index included: surface-water quality, groundwater quality, soil productivity, conservation compliance assistance, tree planting, and identification as conservation priority areas or Hydrological Unit Areas targeted by the USDA's Water Quality Initiative. Each indicator of environmental benefit was given equal weight initially in the index. Subsequent modification of the index attached weights on each indicator.

Ribaudo et al. (2001) report that the Environmental Benefits Index used for the 15$^{th}$ general sign-up period in 1996 included indicators of water quality, wildlife habitat, soil erodibility, permanence of anticipated benefits, air quality, location in a conservation priority area, and the cost to government. Table 4.1 displays the weightings using in the Environmental Benefits Index for the 15$^{th}$ general sign-up in 1996. Cost was given the greatest weight in the index. This indicator was based on the bid rate submitted by the landowner. Bids with lower rates received a high ranking in the index for a given level of environmental benefits. Water quality, wildlife habitat and soil erodibility were given equal weights with the permanence of benefits, air quality and the location in a priority conservation area given lower weights respectively.

Cattaneo et al. (2006) report that the Environmental Benefits Index was again changed in 2003 for the 26$^{th}$ general sign-up. Table 4.1 also displays the weightings used in the 26$^{th}$ general sign-up. Location in a priority conservation area was removed as an indicator from the Environmental Benefits Index.

Table 4.1 - Environmental Benefits Index Weightings used in the 15th general sign-up period in 1997 and 26th general sign-up in 2003

| Indicator | Maximum Score Signup 15 | Maximum Score Signup 26 |
|---|---|---|
| Cost[1] | 200 | 150 |
| Wildlife habitat[2] | 100 | 100 |
| Water quality[3] | 100 | 100 |
| Reduced wind or water erosion[4] | 100 | 100 |
| Permanence of benefits[5] | 50 | 50 |
| Air quality[6] | 25 | 45 |
| Enrolment in priority area[7] | 25 | - |
| Maximum Total Points | 600 | 545 |

Source: Ribaudo et al. (2001) and Cattaneo et al. (2006)

Notes:

[1] Cost refers to the government cost of the bid.

[2] Wildlife habitat score is based on vegetative cover, importance to local, regional and national endangered or threatened species habitat, proximity to wetlands, proximity to protected wildlife habitat, and the size of area offered.

[3] Water quality score is based on ground and surface water quality protection, the enrollment of wetland associated with water quality improvements, location in a national or regional area where crop production has been identified to contribute to water quality impairment.

[4] Wind or water erosion score is based on the susceptibility of the soils to erosion that reduces soil productivity. Higher potential of erosion leads to a high score.

[5] Bids receive points for the permanence of benefits based on the likelihood that practices remain on the land beyond the contract. Planting hardwood trees receives the most points in this category.

[6] Air quality points are awarded based on the susceptibility of the soil to wind erosion and the distance to populations that could be affected by dust.

[7] Points are awarded is this category if the bid is located in conservation priority areas of national or regional importance for wildlife, water quality or air quality purposes.

The weight given to the indicator of air quality was increased slightly although this weight was still less than any other remaining indicator. Cost was given less weight than in previous sign-ups as 15 of the 150 points were allocated to bids that submitted a bid ask at less than the maximum soil-adjusted bid rate.

Cattaneo et al. (2006) report that significant changes in the relative weightings of indicators can lead to changes in the spatial distribution of program enrollment. They also found that changes in relative indicator weighting has more affect on program costs than on environmental outcomes. That is, the percentage increase in costs is greater than the percentage increase in an environmental outcome. Therefore, changes in weighting of indicators can have an impact on program outcomes.

*Type of Ecological Goods and Services Targeted*

The indicators of environmental benefits included in the Environmental Benefits Index represent the ecological goods and services targeted by the Conservations Reserve Program. The Environmental Benefits Index divides environmental indicators into groups by water quality, soil erodibility, air quality and wildlife habitat.

*Source(s) of Funding*

Funding for the Conservation Reserve Program comes wholly from the United States Federal Government through general taxpayer revenue. The U.S. Department of Agriculture (2010) reports that approximately $1.9 billion was spent on the Conservation Reserve Program in 2009.

*4.2.3 Ability to Deal with Critical Issues*

*Valuation*

The Conservation Reserve Program deals with the problem of valuation through the use of the Environmental Benefits Index. There is not an attempt to attach economic

value to the ecological goods and services provided through the Conservation Reserve Program. Instead, the Environmental Benefits Index and the weightings given to each environmental indicator represent a proxy for relative valuation. Through deciding on indicator weighting administratively, the Conservation Reserve Program attempts to deal with the issue of valuing ecological goods and services that are not traded in markets. But, by deciding on weightings administratively, there is no guarantee that the benefits given greater weight actually reflect the ecological goods and services demanded by taxpayers who are funding the program. How do program administrators know what the weights should be? The answer is: they cannot. As was stated above, the indicators and weightings used in the environmental benefits index are a construct of scientific and social values and do not necessarily reflect demand for ecological goods and services.

*Permanence*

The 1996 Farm Bill added an option for participants with certain land types to terminate their contact after five years. This provision does not apply to lands enrolled during continuous signups and some other specified land uses. This provision does give greater flexibility for participants to respond to market prices. Landowners can decide to convert the land back to crop production or pasture if the gains of doing so are greater than the annual payments provided by the Conservation Reserve Program.

The Environmental Benefits Index favours the selection of participants whose bids included activities that are more likely to be permanent, such as tree plants and wetland restoration. As was displayed in Tables 4.1 and 4.2, points are allocated in the Environmental Benefits Index to projects that have permanent environmental benefits. In this way, projects that have an increased likelihood of remaining as permanent parts of

the landscape will receiving a higher rating by the Environmental Benefits Index and therefore will more likely to be enrolled, *ceteris paribus*.

*Ecological Goods and Services Targeted*

The United States Department of Agriculture (2008) reports the outcomes of the Conservation Reserve Program in terms of both the number of acres enrolled and the environmental changes stemming from those enrolled lands. In 2008, a cumulative total of around 2 million acres of land were enrolled in both buffers and wetlands and 23.6 million acres of highly erodible land was enrolled. Environmental changes reported include: reductions in sediment and nutrient loadings in waterways, reductions in soil erosion, greenhouse gas sequestration and reductions for reduced agricultural production, increases in wildlife habitat. According to the United States Department of Agriculture (2008), the Farm Service Agency is responsible for reporting performance measures and does so through access to the USDA soils and natural resource inventories as well as through cooperative agreements with State and Federal government and other partners.

*Benchmarking*

A problem of fairness arises in the Conservation Reserve Program's determination of eligible lands. Only land that was previously used in agricultural production is eligible for program participation. Therefore, a landowner who established buffers strips along waterways voluntarily, before the Conservation Reserve Program was initiated, would not be eligible for the incentives provided by the Conservation Reserve Program. The Conservation Reserve Program currently does not have a mechanism to deal with this problem.

## 4.3 Pago por Servicios Ambientales in Costa Rica

### *4.3.1Overview of the Pago por Servicios Ambientales Program*

Chomitz *et al.* (1999) report that over half of Costa Rica was forested in 1950, but that by 1986 that figure had fallen to 29%. Deforestation is attributed to both pressures for increased pasture land and incentives for the harvesting of timber. Chomitz *et al*., state that the Costa Rican government decided that the social costs of deforestation exceeded the private gains. The Costa Rican government's response was to enact Forestry Law No. 7575 in 1996.

Zbinden and Lee (2005) describe Forestry Law No. 7575 as a legal and institutional framework from which a payment for environmental goods and services program can be based. Chomitz *et al.* (1999) report that the law recognizes four ecological goods and services of forests. These good and services are: carbon fixation, hydrological services, biodiversity protection and the provision of scenic beauty. Forestry Law No. 7575 gave legal recognition to provision of these ecological goods and services so that the government could institute mechanisms that incent their provision.

Costa Rica was in a position to implement this law because of institutions that had been put in place in prior to the enactment of the law. Pagiola (2008) reports that Costa Rica introduced tax incentives to support the timber industry in the 1970's. First for large timber producers and then broadened to include small producers with the creation of the Forest Credit Certificate in 1986. In 1995, the Costa Rican government established *Sistema Nacional de Areas de Conservacion* (SINAC); a system of conservation authorities that administrated over protected forest areas and coordinated conservation activities at a regional level. These existing institutions facilitated the emergence of the *Pago por Servicios Ambientales* [translates as Payments for Environmental Services]

because they had developed experience contracting with private landowners in Forestry related activities.

The *Pago por Servicios Ambientales* program provides incentive to private landowners for use of their land to produce environmental goods and services. Pagiola (2008) reports that, up until 2000, the *Pago por Servicios Ambientales* program remained similar to previous timber sector support programs in terms of both activities financed and incentives provided to landowners. According to Chomitz *et al.* (1999) in the beginning there were incentives for three types of stewardship activities: reforestation, forest management and forest preservation. In 2000, sustainable forest management was no longer offered as an option. Details on why this option was discontinued could not be found. In 2004, an agroforestry incentive was introduced. In 2006, an incentive to allow the natural regeneration of forests was developed.

*4.3.2 Aspects of Program Design*

*Size and Scope*

Figure 4.1 displays the additional land area under contract in the *Pago por Servicios Ambientales* program form 1997-2008 (left vertical axis) and the number of trees planted under the agroforestry portion of the *Pago por Servicios Ambientales* program from 2003-2008 (right vertical axis). This graph breaks down the total number of hectares under contract into the program components of forest conservation, reforestation, and sustainable forest management.

Starting in 2006, contacts were offered for the natural regeneration of forests. Data from FONAFIFO (2009) reported the hectares under natural regeneration contracts in the quantity of hectares under forest conservation contracts for 2006 and 2007. In 2008, 1,660 hectares were under natural regeneration contracts. As the Figure 4.1 shows,

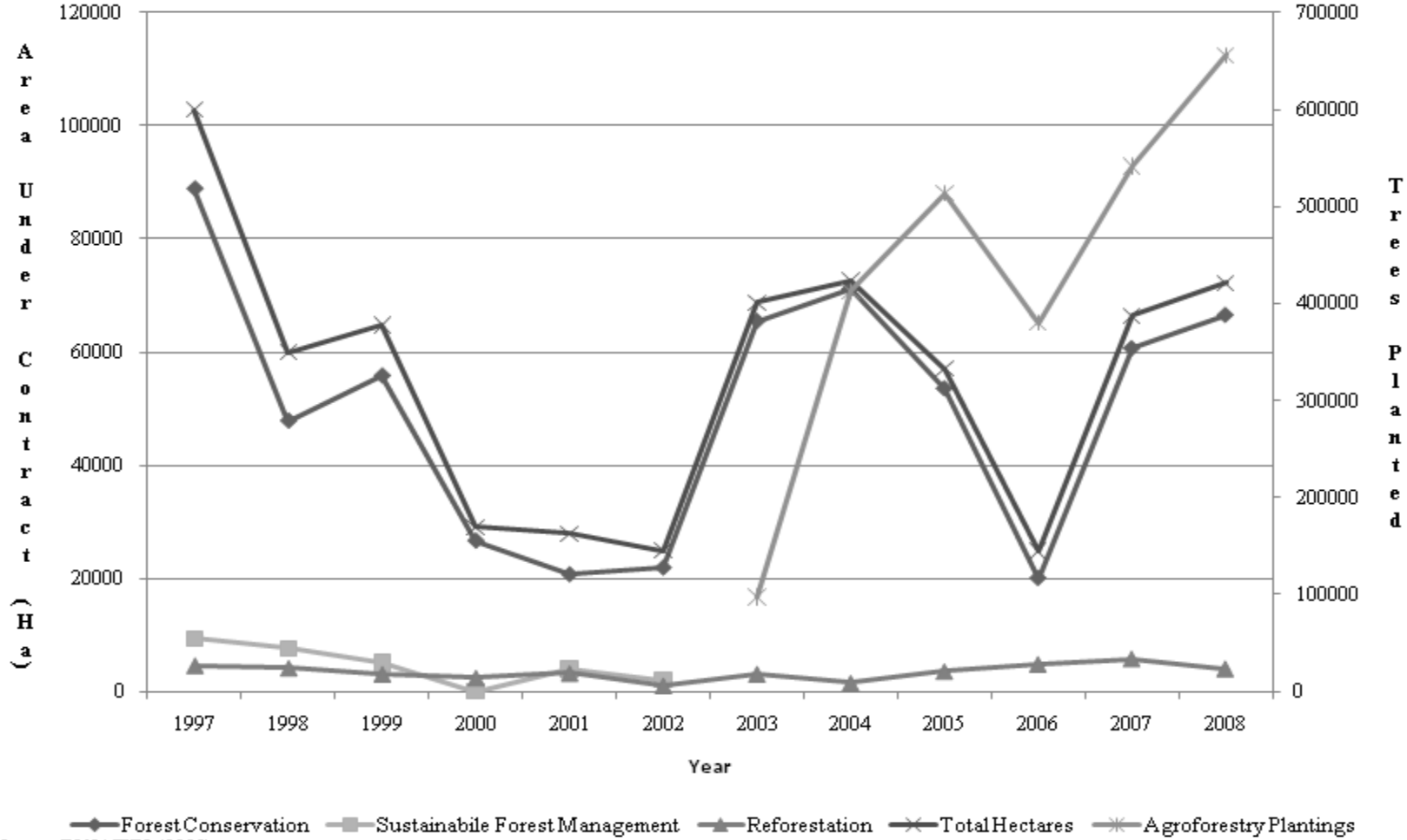
hectares under forest conservation contracts made up the majority of total hectares under contract in the *Pago por Servicios Ambientales* program.

The *Pago por Servicios Ambientales* program is national in scope and any private landowner is eligible to submit a management plan approved by a licensed forester for approval by FONAFIFO.

*Administrative Structure*

Initially, the *Pago por Servicios Ambientales* program was delivered by SINAC (*Sistema Nacional d Areas de Conservacion*) and non-government organizations entering into contracts with landowners. In 2003, FONAFIFO (*Fondo Nacional de Financiomento Forestal* or FONAFIFO) took over responsibility for delivery by establishing eight regional offices to review applications, sign contracts and oversee implementation. According to Zbinden and Lee (2005), licensed foresters and forestry organizations act as intermediaries between landowners and government by helping complete required management plans and performing monitoring and enforcement tasks. Zbinden and Lee (2005) report that these organizations reduce transaction costs by bundling collections of individual projects, including many smallholders, that makes participation more attractive.

**Figure 4.1 Additional Hectares Under New PSA Contracts and Agroforestry Plantings, 1997-2008.**




Source: FONAFIFO (2009)

*Incentive Mechanism*

The *Pago por Servicios Ambientales* program disperses grants over the course of the 5 year contract. Grants for activities that face high implementation costs are both higher and dispersed more quickly in order to alleviate the burden of implementation costs faced by landholders. Table 4.2 presents the grant rates for each category as of 2009. Payments for reforestation, forest conservation and natural regeneration are based on hectares under contract while the agroforestry grants are based on the number of trees planted. Not included in this table are the differential (i.e. higher) grants for forest conservation and natural regeneration in targeted priority areas. The payment schedule for incentives varies by contract category. Table 4.2 displays that grants payment schedule as of 2009. Contracts for reforestation are front-loaded with incentives in order to help pay for implementation costs, while forest conservation and natural regeneration contracts pay out stable amounts over the 5-year contract. Agroforestry plantings are also front-loaded with incentives and incentive payments conclude after 3 years.

*Types of Ecological Goods and Service Targeted*

As reported above, Costa Rican Forestry Law No. 7575 explicitly recognized four ecological goods and services provided by forest ecosystems: (1) carbon mitigation; (2) hydrological services; (3) biodiversity conservation; and (4) conservation of natural scenic beauty.

Table 4.2 -Pago por Servicios Ambientales Grant Payment Schedule by Category

| Category | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Forest Conservation | 20% | 20% | 20% | 20% | 20% |
| Reforestation | 50% | 20% | 15% | 10% | 5% |
| Natural Regeneration | 20% | 20% | 20% | 20% | 20% |
| Agroforestry | 65% | 20% | 15% | - | - |

Source: FONAFIFO (2009)

*Participant Selection*

Porras and Neves (2006) state that participants in the *Pago por Servicios Ambientales* program are enrolled on a first-come first-served basis. Potential participants must satisfy a number of conditions before they are eligible. They must prove either that they hold legal title to the land or that they hold possession rights that are authorized by a lawyer. They also must prove that they have paid all local taxes.

Porras and Neves (2006) report that the participant selection mechanism is becoming more refined through the selection of priority biological corridors and important water recharge areas. Landowners in these priority areas are targeted for participation. Porras and Neves note that these priority areas are subject to change according to funding partners (Global Environment Facility) and by FONAFIFO decree.

*Source(s) of Funding*

The *Pago por Servicios Ambientales* program is financed with taxpayer funding, loans and grants from the World Bank and payments from beneficiaries of ecological goods and service provision. According to Pagiola (2008) the *Pago por Servicios Ambientales* program had envisioned that all funding could eventually come from beneficiaries of the ecological goods and services produce. Currently, this goal has only partially been fulfilled as the majority of program funding comes from other sources. Taxpayer funding for the *Pago por Servicios Ambientales* program is raised through a 3.5% share of the national fossil fuel sales tax that is earmarked for FONAFIFO. Pagiola (2008) reports that this funding amounts to $10 million/year and represents the bulk of *Pago por Servicios Ambientales* program financing.

Financing has been raised from sales of Certified Tradable Offsets (CTOs) to international customers that want to offset their carbon emissions. According to Chomitz *et al*. (1999), CTOs are a Costa Rican invention that are externally certified and can be used, under the Kyoto Protocol, by developed countries to offset their own carbon emissions. Pagiola (2008) reports that the only sale of CTOs has been to Norwegian power producers, who paid $2 million USD for 200,000 CTOs. Pagiola (2008) reports that the use of this mechanism has been limited because only reforestation and afforestation are considered eligible under the Kyoto Protocol's Clean Development Mechanism and, as was stated above, most *Pago por Servicios Ambientales* contracts are for forest conservation. The natural regeneration contract was introduced to increase the provision of Kyoto-eligible reduction of carbon emissions, but Pagiola (2008) reports that this contract has not been a popular choice among land owners because of insufficient incentives.

Initially funding was also desired from private users of hydrological services, notably hydroelectric power producers and domestic water consumers. Pagiola (2008) states that the success of these efforts was limited because of the high cost of negotiating each agreement on an *ad hoc* basis. In 2004, the process was streamlined by the introduction of environmental services certificates that work as standardized instruments to represent the conservation of a hectare of forest conservation in a specific area. Pagiola (2008) reports that, in early agreements, users paid for a quarter of conservation costs, while in recent agreement users pay the full cost of conservation and cover FONAFIFO's administrative costs. Users typically enter into agreements to buy these certificates for 5 years.

In 2005, Costa Rica instituted a water tariff[3] that is to be used for watershed conservation. A quarter of funds raised from this instrument is earmarked for the *Pago por Servicios Ambientales* program. Pagiola (2008) states that the water tariff has the potential to generate ten times the amount of funding compared to the previous voluntary arrangement. Funding raised in the way has the condition that it must be used in the watershed where it was generated. Water users can also contribute funds directly to FONAFIFO and then deduct that amount from the amount due for the water tariff. By contributing directly to FONAFIFO users can choose what type of activity their funds are used for rather than leaving it up to FONAFIFO administrators.

Funding has also come from a World Bank loan and a from grant from the Global Environment Facility, which helps fund projects and program in developing countries that conserve and protect the global environment. The Global Environment Facility supported the *Pago por Servicios Ambientales* program through two programs. First, the Ecomarkets project, from 2001 – 2006, included an $8 million grant. Porras and Neves (2006) reports that this original grant was used to sponsor 100,000ha of biodiversity conservation in priority areas in Costa Rica as well as to increase the participation of women and indigenous communities in the *Pago por Servicios Ambientales* program. A second grant was given for a project called Mainstreaming Market-Based Instruments for Environmental Management Project. This grant, along with a loan from the World Bank, are being used to develop and implement sustainable financing mechanisms for the *Pago por Servicios Ambientales* program as well as increasing the scale of existing *Pago por*

[3] The water tariff is a fee paid by holders of water use permits to government for the right to use or extract water. This is not a tariff on water use by consumers.

*Servicios Ambientales* activities. Porras and Neves (2006) report that KfW, a German Bank, gave grants for a carbon offset project from 2000-2007.

*4.3.3 Ability to deal with critical issues*

*Valuation of ecological goods and services*

The *Pago por Servicios Ambientales* program does not attempt to attach economic value to ecological goods and services. Instead, the *Pago por Servicios Ambientales* attempts to secure funding thorough the voluntary contributions from the beneficiaries of ecological goods and services. This is a substitute for setting value administratively because, as Pagiola (2008) reports, agreements with water users provide information on the location and type of ecological goods and services that are desired by users. That being said, the move to a compulsory water tariff has eliminated the generation of this type of important information. The responsibility for the prioritization of conservation needs now lies with FONAFIFO. However, as mentioned above, water users can voluntarily contribute directly to FONAFIFO and can deduct that from the amount due to the water tariff. Water users can then ensure that their payments are used for agreed upon purposes rather than letting FONAFIFO choose. In this way water users are still providing useful information on what ecological goods and services are valued by users.

*Permanence*

*Pago por Servicios Ambientales* program participants enter into 5-year contracts; under which they agree to cede their rights to the carbon and other environmental goods and services produced through program activities to FONAFIFO. Participants in the forest conservation contracts are free to renegotiate and renew their contract after 5 years and can sell the rights to their environmental goods and services to another party, should they wish. Contracts for reforestation require that the agreed upon land use is adhered to

for 15 years. This commitment is entered into the public land registry and it applies to any future purchasers of the land.

Pagiola (2008) reports that monitoring and enforcement is undertaken by the intermediaries that initially contracted with landowners, such as SINAC and the licensed foresters. Porras and Neves (2006) reports that the FONAFIFO has established a database using GIS tools and satellite photography to monitor and enforce compliance. They report that contracts have been breached in approximately 2% of contracts. Any participants that are found to be out of compliance forfeit future program payments and may have to return payments already made. Licensed foresters that certify ineligible project may lose their licenses.

*Targeting*

Pagiola (2008) states that the lack of targeting areas that can generate ecological goods and services is one of the weaknesses of the *Pago por Servicios Ambientales* approach. While there is little in the way of targeting areas of local or regional importance, the tariff on water users is earmarked for activities in the watershed in which it was generated.

*Benchmarking*

Contracts for forest conservation are available to those landowners that have previously planted forests for their own private reasons and then can be compensated for keeping the land in that state. This aspect of the *Pago por Servicios Ambientales* program design allows those landowners who have taken action prior to the program to be partially compensated for their actions. That being said, those landowners who

undertook tree plantings would not be eligible for reforestation contracts that are worth significantly more than conservation contracts.

## 4.4 Environmental Stewardship in England

### *4.4.1 Overview of the Environmental Stewardship Scheme*

Hodge & Reader (2010) report that agri-environmental programs began emerging in England with the introduction of the Environmentally Sensitive Areas scheme in 1987. The Environmentally Sensitive Areas scheme identified agricultural areas that were in need of conservation because of ecological, aesthetic or historical value. Radley (2005) reports that there are now 22 designated Environmentally Sensitive Areas across England, covering approximately 10% of the country. The Environmentally Sensitive Areas scheme offered voluntary fixed-price contracts to landowners within Environmentally Sensitive Areas who agreed to adhere to specific land management practices. According to Hodge & Reader (2010), this first phase of agri-environmental programming was designed to protect valued parts of the rural environment against environmental damage commonly associated with agricultural intensification.

Hodge & Reader (2010) report that a second phase of agri-environmental policy began in 1991 with the introduction of the Countryside Stewardship Scheme (CSS). This second phase was an evolution in agri-environmental policy from programs designed to mitigate damage from agricultural intensification to programs that were aimed at promoting environmental enhancement. Radley (2005) reports that the Countryside Stewardship Scheme also emerged because there was a desire to have agri-environmental programming options for landowners outside of Environmentally Sensitive Areas. The Countryside Stewardship Scheme offered contract to landowners to conserve and

enhance landscapes and wildlife habitat. Contracts were awarded on a competitive basis to bids that offered the greatest environmental benefits relative to costs.

In 2005 the Environmentally Sensitive Areas scheme and Countryside Stewardship Scheme were closed to new entrants and a new scheme, Environmental Stewardship, was introduced. Environmental Stewardship is a two-tiered scheme offered to all landowners in England. According to Natural England (2010a), the primary objectives of the Environmental Stewardship program are:

1. To conserve wildlife and biodiversity
2. Maintain and enhance the character and quality of the traditional landscape
3. Conserve the historic environment through protecting archaeological features and traditional farm buildings
4. Provide opportunities to visit and learn about rural areas
5. Protect natural resources through improved water quality and reducing soil erosion

Natural England (2010a) reports the secondary objectives of the Environmental Stewardship Scheme are genetic conservation and flood management.

As stated above, the Environmental Stewardship scheme is comprised of two tiers. One tier, High Level Stewardship (HLS), adopted many characteristics of the discontinued Countryside Stewardship Scheme and, according to Hodge and Reader (2010), is seen as essentially a continuation of that program. The second tier, Entry Level Stewardship, is a program aimed at attracting broad uptake from landowners. Hodge and Reader (2010) report that Entry Level Stewardship was designed to bring a large proportion of English farmland under the influence of agri-environmental agreements. Hodge and Reader state that the Entry Level Stewardship scheme can be seen as the third phase of agri-environmental policy because it extends payments across all agricultural lands by supporting activities that provide environmental goods and services in less

intensively managed areas. Entry Level Stewardship represented a shift away from programs that are targeted spatially on specific areas.

Participants in Entry Level Stewardship submit an application detailing the management options they wish to undertake on their farm. An applicant must undertake management options that results in points equal to or exceeding 30 points/ha of land enrolled. Each management option is associated with a certain number of points based on the area covered by that option (as would be the case with buffer strips) or the units of that option implemented (as would be the case with plots of Skylark habitat). A buffer strip 4 meters in width on cultivated land would be awarded 400 points for each hectare covered by the buffer strip. For each plot of Skylark habitat implemented, 5 points would be awarded. A landowner wishing to enroll 100 ha in Entry Level Stewardship would have to choose management options in order to obtain the 3,000 points needed to qualify. There is a wide array of management options available in Entry Level Stewardship that can be used to satisfy the point requirement. See Natural England (2010a) for a detailed breakdown of these options. An opportunity for organic producers is included in the Entry Level Stewardship scheme whereby they are provided with additional incentives, £30/ha/year, for enrolling in the scheme.

*4.4.2 Aspects of Program Design*

*Size and Scope*

According to Natural England (2009a), the Environmental Stewardship scheme has resulted in over 58,000 contracts with landholders covering 6 million ha of agricultural land. This represents over 66% of the agricultural land in England. Natural England (2009b) report that funding for the Environmental Stewardship scheme for the seven year period from 2007-2013 is £2.9 billion, or an average of £414 million/year.

Environmental Stewardship has an average cost of £69/ha/year ($105.57/ha/year $Cdn or $42.74/acre/year $Cdn)[4].

In order to be eligible for the Environmental Stewardship scheme, landholders must register their land with the Rural Land Register. The Rural Land Register is a database of digital maps that shows the ownership of all agricultural, woodland and marginal lands in the United Kingdom that are enrolled in stewardship programs. Natural England (2010a) reports that all land parcels enrolled in the Environmental Stewardship scheme must be wholly in England and are active farmland. The Entry Level Stewardship scheme is a whole-farm scheme where an application must include all eligible farmed land and may also include non-farmed land. According to Natural England (2010a), landholders may want to enroll non-farmed land in order to receive additional payments but note that non-farmed land may not be suitable for many of the management options and therefore would make it more difficult to meet the required points target.

Natural England (2010b) reports that Higher Level Stewardship focuses on more intensive management options where agreements can be tailored to local environments. There are over 100 targeted areas and targeted themes for Higher Level Stewardship across England. Each targeted area has defined management options, or themes, that must be undertaken in order to be eligible for Higher Level Stewardship. Outside of these defined areas, vulnerable non-agricultural land that would benefit from protective management could also be eligible. Potential participants in Higher Level Stewardship must complete a Farm Environment Plan in order to be eligible.

*Administrative Structure*

[4] Converted at £1 = $1.53 $Cdn

Natural England is the administrator of the Environmental Stewardship scheme on behalf of England's Department of Environment, Food and Rural Affairs (DEFRA). Natural England is an Executive Non-Departmental Public Body that operates at an arm's length from government ministries. Applications are made directly to Natural England and advisors from Natural England aid in the application process and in the selection of management options for Higher Level Stewardship. The Rural Payment Agency, an executive agency of DEFRA, makes all program payments. The aforementioned Rural Land Registry is a part of the Rural Payment Agency.

*Incentive Mechanism and Payment Levels*

Participants in Entry Level Stewardship enter into 5 year contracts where they are paid £30/ha/year in bi-annual payments. There is no incentive to compensate participants for implementation costs in the Entry Level Stewardship scheme. As mentioned previously, organic producers receive an additional £30/ha/year for each hectare of organic production enrolled in the program. There are also additional incentives provided to producers to help to convert to organic production.

Incentives in the Higher Level Stewardship scheme are based on the management options undertaken. Some options are paid based on area while other are based on units implemented or protected. For instance, landholder could agree to protect an ancient tree in an arable field or intensively managed grassland in return for £25/year per tree. A landholder could also establish grassed buffer strips enhanced with flowers and forbs that provide habitat and foraging areas for birds and insects in return for £485/ha/year. There are also options that allow landholders to receive an annual payment for providing recreational access to their property and for offering the services for educational

activities. The Higher Level Stewardship options applied for by applicants have to relate to the predetermined environmental conservation and enhancement targets in their area and would have to be approved by a Natural England advisor. Incentives are also provided to help offset implementation costs for Higher Level Stewardship options and are paid for upon implementation. Contracts for Higher Level Stewardship usually run for 10 years, while 20 year contracts are available for some wetland inundation options.

*Participant Eligibility and Approval*

Entry Level Stewardship is open to all farmers and land managers in England. Potential participants must have management control of the land for the entire 5 year contract, but do not necessarily have to own the land. All eligible applicants to Entry Level Stewardship are approved provided that applicant agrees to undertake sufficient management options on their eligible land and meet all other program requirements.

Natural England (2010b) reports that Higher Level Stewardship agreements are allocated based on assessments of environmental benefits and value for money. According to Quillérou & Fraser (2010), participants in Higher Level Stewardship are selected competitively using a threshold and scoring mechanism that was derived from the Countryside Stewardship Scheme. Quillérou & Fraser report that scoring of environmental benefits is spatially differentiated based on 159 National Character Areas. These areas encompass lands with similar landscape characteristics. Each National Character Area has a corresponding set of key environmental and other management targets against which an application is scored. Applications are pooled within an administrative region for each National Character Area and a threshold is established for

each National Character Area, according to the available budget in that administrative region, above which all applications are accepted.

*Type of Ecological Goods and Services Included*

The type of ecological goods and services included in the Environment Stewardship scheme corresponds with the objectives of the program noted previously. The ecological goods and services provided through the Environmental Stewardship scheme are:

- wildlife habitat
- biodiversity
- scenic landscapes and views
- recreational access
- increased water quality
- reduced soil erodibility

*Source(s) of Funding*

Natural England (2009a) reports that funding for the Environmental Stewardship scheme comes through the Rural Development Programme for England (2007 – 2013). Funding for this program comes from the European Union through the European Agricultural Fund for Rural Development which is part of the Common Agricultural Policy transfer from the Single Farm Payment. Funding from the European Union is matched by funding from the United Kingdom Treasury.

*4.4.3 Ability to deal with critical issues*

*Valuation*

The problem of valuation of environmental goods and services in Entry Level Stewardship is addressed implicitly by the points awarded for undertaking each management option. The management options have been deemed sufficiently valuable to have incentives attached to their provision. The Entry Level Stewardship scheme does not use a scoring system like the Conservation Reserve Program in the United States.

Any management option is considered to have the same value regardless of where it is located and the potential ecological goods and services that will be provided. For example, the implementation of a grassed buffer strip of a certain length is awarded the same number of points regardless if it creates prime endangered bird habitat near to a populated area where the bird-watching is a popular hobby or if it provides few habitat opportunities in a remote farm. Since, in Entry Level Stewardship, there is no ranking of proposals and all proposals that meet the point requirement of 30 points/hectare are admitted into the scheme, there is not a need to explicitly value the ecological goods and services potentially provided by each proposal.

Unlike the Entry Level Stewardship scheme, there are no points targets in Higher Level Stewardship and entry is assessed, by program administrators, based on scoring the targeted environmental goals of the target region. Field representatives visit the applicants farm and performed an assessment of landscape features that are scored based on the environmental goods and services that are targeted in that region. As was stated above, the scoring system used in Higher Level Stewardship was derived from the Countryside Stewardship Scheme. Information on the weightings of indicators used in the scoring system for Higher Level Stewardship could not be found. Valuation of the environmental goods and services obtained through Higher Level Stewardship is implicitly determined by the weighting of indicators of environmental goods and services used in the scoring mechanism and by the targeting of specific environmental goods and services in target regions.

*Permanence*

Natural England (2010a) reports that both ELS and HLS agreements are legally binding for the term of the agreement. As noted previously, ELS agreements run for 5 years and HLS agreements typically run for 10 years. There are penalties for early withdrawal or breach of agreement terms although there have been few instances of the penalties being applied. Part of all future payment could be withheld. Part of all previous payment may have to be repaid with interest. Agreements could be terminated and participants could be prohibited from entering into a new agreement for 2 years. It should be noted that it is the responsibility of the original applicant to ensure that the terms of the agreement are adhered to even if they transfer control of the land. Also, Natural England (2010b) notes that both Natural England and HLS participants have the option to withdraw from their agreement following the end of the fifth year without penalty.

Agreements are renewable following the agreement term provided the agreement in question meets any conditions that have changed since the original agreement was signed. Outside of renewals of agreements into perpetuity, there is no guarantee that the environmental goods and services provided through the Environmental Stewardship will continue to be provided at the conclusion of the agreement term.

*Targeting*

ELS is a broad-broad scheme open to all landholders and is not targeted while HLS is targeted to specific stewardship options that are expected to yield environmental goods and services in specific areas (National Character Areas). Quillérou & Fraser (2010) state that a problem with the current design of the participant approval mechanism

is one of adverse selection. Adverse selection occurs when the lowest quality agricultural land is enrolled in the scheme instead of the land with greatest ability to provide environmental goods and services. They note that this problem is likely greater for ELS than HLS because the HLS scheme target participants based on an assessment of environmental benefits and because the selection of participants is subject to a budget constraint, although there is no bidding process in HLS. According to Davey *et al.* (2010, p. 14), the untargeted nature of the ELS scheme means that it is, "unlikely to provide the same localized benefits as HLS". This is likely because the stewardship options in ELS were designed to be applicable country-wide, rather than targeted to specific National Character Areas, as is the case with HLS. Hodge and Reader (2010) report that the high degree of choice available to landholders in ELS gives them opportunities to undertake management options that they may have adopted without the program or which they can undertake at minimal cost. Given the structure of ELS, landholders will have incentives to undertake those management options that cost them the least while still meeting the requirements of the program. Choosing management options so to minimize costs may not correspond with the provision of environmental goods and services that are of the highest value.

*Benchmarking*

According to Hodge and Reader (2010), former agri-environmental schemes in England targeted areas threatened by agricultural intensification, as was the case with the Environmentally Sensitive Areas scheme, and areas where landholders can achieve environmental enhancements, as was the case with the Countryside Stewardship Scheme. They argue that these programs could be seen as unfair because landholders outside of

Environmentally Sensitive Areas are not eligible and those landholders who have already undertaken environmentally beneficial management options are not eligible for the Countryside Stewardship Schemes. According to Hodge and Reader, ELS extends the right to receive payments for actions that are expected to lead to the provision of environment goods and services regardless of what would be done in absence of the payment. Therefore landholders who have undertaken environmentally beneficial management activities would be deservingly eligible for incentive payments. I believe this is a fair way of delivering an agri-environmental scheme compared to the previous programs in England.

## 4.5 BushTender in Australia

### *4.5.1 Overview of BushTender*

Stoneham *et al.* (2002) report that the Australian Government has used a variety of mechanisms to conserve biodiversity on private land. The Trust for Nature program, in operation since 1987, offers landowners education and extension services and support towards the aim of biodiversity conservation. The Bushcare program, part of the National Heritage Trust established in 1996, gives fixed price grants for livestock fencing and protection of remnant vegetation. Legislation has also been introduced to prevent the clearing of remnant vegetation. According to Stoneham *et al.* these mechanisms did not achieve the desired biodiversity conservation objectives and degradation has continued. The Department of Sustainability and Environment (DSE) (2008) attributes the continued decline to entitled land uses such as firewood collection and livestock grazing as well as unmanaged threats from pest animals and invasive plants. Stoneham *et al.* (2003) attribute the continued decline to a failure to engage landholders, especially commercial farmers, in existing stewardship programs.

The state of Victoria is located in South-Eastern Australia and is the country's second most populous state. DSE (2008) reports that 12% of Victoria's remaining native vegetation is located on private land and supports 30% of Victoria's threatened species populations. In 2000, Victoria drafted a Native Vegetation Management Framework that included a commitment to develop a test an incentive program with formal management contracts between the Government and landholders. This commitment resulted in the development of BushTender. BushTender is a stewardship program aiming to protect biodiversity. Participants in this program are selected via a competitive sealed-bid auction based on an index that ranks their bid based on their submitted bid price, the effect their chosen management options will have on their local biodiversity and the significance of that local biodiversity in a regional context.

*Size and Scope*

DSE (2008) reports that the first BushTender trial was conducted in 2001 – 2003. This initial trial focus on areas in North East and North Central Victoria. This initial trial had a budget of A$400,000 ($356,000 Cdn)[5] for stewardship payments. A total of 3,163 ha (7,816 acres) was enrolled in the North East and North Central Victoria trial at an average cost of A$126.46/ha ($46 $Cdn/acre). A second part of the trial was targeted to three areas in Gippsland and had A$800,000 ($712,000 Cdn) available for stewardship payments.

DSE (2008) reports that BushTender was given additional funding of A$3.2 million ($2.85 million $Cdn) after the trial was completed to expand into other areas of Victoria. In 2006, a further A$2.7 million ($2.40 million $Cdn) was added to roll-out BushTender state-wide in Victoria.

[5] Exchange rate of A$1 = $0.89 $Cdn

The BushTender program is open to landholders across the state of Victoria. Victoria is Australia's second most populous state, with a population of over five million and an area of over 225,000 $km^2$. All landholders in Victoria are eligible to apply for BushTender provided they have secure tenure of the land they are planning to enter into the program. This includes those landholders managing government owned land. According to DSE (2008) there were 149 bidders during for BushTender trial in total and of those 108 bidders were selected for participation. This resulted in nearly 5,000 ha under BushTender management agreements. Information on participation under the expanded BushTender program since the trial was not available at time of writing.

*Administrative Structure*

The DSE (2008) reports that the BushTender trial was a joint program run by three divisions of the Department of Natural Resource and Environment: Park, Flora and Fauna, Catchment and Water and the Agriculture Division. These divisions and the Department of Natural Resources and Environment have now been incorporated into the DSE. The DSE reports that Catchment Management Authorities also made significant contribution to implementation of the trial.

*Incentive Mechanism and Payment Levels*

The BushTender program uses an auction process where landholders submit bids to the DSE to manage their native vegetation. According to DSE (2008) and Stoneham *et al.* (2002) auctions are a useful policy mechanism because they have the potential to reveal hidden information. Landholders have information on the costs associated with changing land use practices or with implementing management options that may improve ecological goods and services provision. Stoneham *et al.* (2002) state that the

Government may not have access to this information because of the heterogeneity in biodiversity assets across the landscape and the variation in the costs of maintaining or enhancing those assets. On the other hand, Government agencies may have information about management options that might be taken to protect or enhance ecological goods and services provision. Stoneham *et al.*(2002) state that the government also know their preferences and priorities in terms of what ecological goods and services they wish to secure the provision of. Landowners do not necessarily know this information. Access to this information, for both landowners and Government, can help overcome the high transaction cost impediment to ecological goods and services provision. According to Stoneham (2008), the landholder holds some degree of market power in holding their private information. Therefore it may be necessary for the Government to pay landholders an information rent above their true opportunity cost as an incentive to reveal their private information.

The landowner determines how much the proposed management option will cost over the proposed contract length and submits his or her bid as a single lump-sum figure. This figure should reflect the cost of materials, labour, the hiring of any contractors and any income forgone as a result of the proposed management options. Payments are made periodically to the landholders when specific management activities are implemented or objectives are achieved.

BushTender uses a sealed bid auction. A sealed bid is an important aspect of auction design because it prevents collusion or price fixing between landholders. As was seen with the Conservation Reserve Program, landholders realized the maximum acceptable bid price soon after the initial auction round and had little incentive to bid less

than that price. Therefore valuable information on the costs faced by landholders was not generated.

A reserve price sets the maximum price per unit of biodiversity obtained (as measured by the aforementioned Biodiversity Benefits Index). If the reserve price is met before the budget constraint for that auction round, money can be transferred to a future auction round. If, on the other hand, the reserve price is not met before the budget constraint, that is an indication that there are proposals that have not been accepted that offer good value for money and that it may be worthwhile to attempt to secure additional funding for the current auction round.

BushTender payments are made periodically as progress payments. DSE (2008) reports that payments are heavily weighted at the beginning and the end of the contracts to reflect initial capital costs and to give incentives for completing the contract. Landholders are also paid when they fulfill the obligations of their individual management agreements. DSE (2008) reports that this recognizes the flow of the costs of project implementation from the perspective of both the landholder and the Government. It also improves monitoring and compliance aspects of program design because landholders must submit reports when management activities have been implemented or objective achieved. If a landholder does not meet their obligations payments are withheld. Compliant landholders are guaranteed periodic payments for the term of their agreements.

*Participant Eligibility and Approval*

BushTender participants are selected according to how they are ranked by the Biodiversity Benefits Index. The DSE (2008) reports that the Biodiversity Benefits Index

assesses each bid individually and takes into account heterogeneity of landholders, biodiversity across the landscape and outcomes of landholder actions. There are three components of the Biodiversity Benefits Index: the bid price, the Habitat Service Score and the Biodiversity Significance Score. DSE (2008) states that the Biodiversity Benefits Index is calculated as:

DSE (2008) reports that the Habitat Service Score assesses the quality improvements that are predicted to arise in a specific site by undertaking specific management options. According to the DSE (2008), the Biodiversity Significance Score reflects the conservation value of a specific site in a regional context. Landholders can improve the likelihood of their bid being successful through increasing their Habitat Service Score, by agreeing to additional management obligations, or by decreasing their bid price. Landholders cannot alter the Biodiversity Significance Score although they could influence it by identifying previously unidentified threatened species.

Once bids are ranked according to the Biodiversity Benefits Index, a cut-off point for bids is established. DSE (2008) reports that the cut-off point is determined by a Tender Evaluation Panel. They consider the budget and the application of a reserve price where the slope of the marginal cost curve is equal to one. As stated previously, all bids below this reserve price will be accepted up to the budget constraint. If the budget constraint is not reached when the reserve price is surpassed, then funds will be reserved for a future auction round.

*Type of Ecological Goods and Services Included*

The ecological good and service targeted by the BushTender program is biodiversity. It targets the conservation and enhancement of native vegetation to achieve this objective. DSE (2008) reports that typical management plan include: retention of large tree and other standing trees, fencing of areas to exclude stock, retention of fallen timber, control/eradication of rabbits and other pests, control of the spread of high threat weeds and supplementary planting of key understory species.

*Source(s) of Funding*

The BushTender program is exclusively taxpayer funded.

*4.5.3 Ability to deal with critical issues*

*Valuation*

The difficult problem of the valuation of ecological goods and services in the BushTender program is addressed through the use of the Biodiversity Benefits Index. As with the Environmental Benefits Index used in the United States, the Biodiversity Benefits Index attaches value to the ecological goods and services by ranking bids so that the selected bids provide the best value for money.

According to DSE (2008) the Habitat Service Score predicts gains in biodiversity assets resulting for specific management practices in specific areas. In order to predict gains, a benchmark must first be established. This baseline is established using the Habitat Hectares method developed by Parkes *et al.* (2003). The Habitat Hectares methodology measures the current site quality against a benchmark of mature natural longstanding vegetation of the same type. According to Parkes *et al.* (2003), using the Habitat Hectares requires a good base of local environmental knowledge that only specialists posses.

According to DSE (2008), the Habitat Service Score can account for heterogeneity in site size and quality, threats impacting the site and existing land use entitlements. Gains are scored based on the anticipated changes in vegetation quality that are expected to arise from management. DSE (2008) reports that the Habitat Service Score is based on: expected habitat maintenance gains, habitat improvement gains, prior management gains, security gains, length of contract and the area of the site. Habitat maintenance gains are based on current land use entitlements, land use commitments and site quality. Habitat improvement gains are based on the proposed land use management changes and current site quality. Prior management gains acknowledge management actions that have occurred since controls on native vegetation removal were introduced in 1989. Security gain recognizes landholder action to secure the protection of the site by entering into an on-title agreement. Length of contract recognizes the years of active site management agreed to. The area of site values site areas of greater size.

DSE (2008) reports that the Biodiversity Significance Score reflect the conservation value of a specific site in a regional context. The Biodiversity Significance Score is based on the type and quality of native vegetation present and its conservation status in the bioregion, the occurrence and status of flora and fauna present and the position of the site with respect to the broader landscape requirements for mobile fauna.

Attributes of both the Habitat Service Score and the Biodiversity Significance Score can be weighted to reflect outcomes that are desired by program administrators. DSE (2008) states that these attributes typically reflect regional native vegetation/biodiversity plans or statewide policy objectives. As these attributes are

determined administratively, there is no guarantee that they accurately reflect the ecological goods and services demand by taxpayers who fund the program.

*Permanence*

Permanence of landscape of land conservation and enhancement achieved through the voluntary option to write the land use changes into the land title, thus protecting it permanently. DSE (2008) reports that 21% of participants in the initial trial chose this option. There was no indication given as to why participants would chose to write land use changes into the land title. A further 25% chose to keep their land in that land use for 10 years despite signing up for only six years of active management for which they would receive payments. The Habitat Service Score gives greater weight to those bids that agree to retain their land use changes in perpetuity

*Targeting*

Salzman (2005) reports that BushTender has achieved some real results its objective of enhancing biodiversity. According to Salzman twenty-four populations of endangered or threatened species were identified on BushTender sites and the majority of enrolled sites were ranked as being high or very high conservation significance.

*Benchmarking*

The BushTender approach uses the Habitat Service Score to measure vegetation quality according to the degree in which current vegetative cover differs from a benchmark representing the average undisturbed historical vegetative cover. According to Parkes *et al.* (2003, pg. S30), this provides, "a consistent and logical reference point for naturalness against which loss of quality and direction for improvement can be considered". Included in the Habitat Service Score is recognition for actions the proactive

landscape managers have taken on their land. Those landowners who took proactive actions to conserve and enhance the native vegetation on their land can receive incentives through the BushTender program. In this sense, BushTender treats all landowners fairly.

## 4.6 Lessons learned from international experiences with ecological goods and services policy for Ontario and Canada

The lessons learned are grouped across programs by functional equivalence[6]. This aids the comparison of the lessons learned across programs and policies. This section describes and compares lessons learned from international experiences with ecological goods and services policy according to aspects of policy design that are functionally equivalent.

### *4.6.1 Farm Income Enhancement*

The lessons learned for Canada on programs that support farm incomes through ecological goods and services provision programs are presented in Table 4.3. The U.S. Conservation Reserve Program was designed and implemented in response to the low commodity prices and resulting farm crisis that existed in the mid-1980s. The reduction of available agricultural land leads to reduced farm agricultural output and results in a corresponding reduction in aggregate supply of US agricultural output. Reduced supply, given anything but perfectly elastic demand, leads to an increase farm output prices.

Total demand for food, in general, is inelastic. The difference between Canada and the United States is a result of a difference in net demand. Net demand is equal to total demand minus supply from competing sources. In Canada, net demand for most important agricultural resources is elastic, while, when the Conservation Reserve

[6] Functional equivalence refers to aspects of program or policy design that perform the same role across experiences but are not necessarily designed in the same way or have similar names. This is in contrast to formal equivalence.

Table 4.3 - Lessons Learned for Canada from International Ecological Goods and Services Programs on Farm Income Enhancement

| Functional Equivalence | Program | Country | Lessons Learned |
|---|---|---|---|
| Farm Income Enhancement | Conservation Reserve Program | United States | - The relatively inelastic demand for US agricultural outputs compared to Canada allows set-aside programs to achieve multiple objectives: (1) raise the world price of agricultural outputs by reducing supply; (2) supplement farmer incomes with an additional income stream; and (3) address environmental issues<br>- Canada cannot affect the world prices of agricultural commodities, particularly grains and oilseeds, to the same degree as the United States and therefore would not benefit from a set-aside program to the same degree as the United States |
| | Environmental Stewardship | England | - Entry Level Stewardship would be prohibitively costly to extend to all landowners in Canada<br>o Greater population density and smaller agricultural land area in England versus Canada<br>- Contrasting ideas of naturalness exist across regions and countries |

Source: Author

Program was developed, it was believed that net demand was inelastic for many important agricultural commodities in the United States. A graphical example showing the differential effects of a supply shift with inelastic versus elastic demand is presented in Appendix B.

Agriculture and Agri-Food Canada (2002) modeled the effect on grain and oilseeds prices if Canada, the United States, the European Union, Australia and Argentina agreed to set-aside 10 percent of their historical productive land area. They estimate that, if all countries agreed to this set-aside, world prices for corn, wheat and soybeans would increase to approximately 30 percent above baseline levels. However, if Canada was the only country to set-aside land they estimate approximately a 3 percent rise in the world prices above baseline levels. These findings support the conceptual argument presented above as to why Canada would not benefit from a set-aside program if the goal is to increase prices.

Canada introduced a land set-aside program for agricultural land in 1970 called Lower Inventories For Tomorrow or LIFT. Easter (2005) reports that LIFT was initiated in response to surplus wheat production and depressed prices. The National Farmers Union (2000) reports that the LIFT program was in place for one year and paid farmers between $6 and $10 an acre not to plant wheat. The National Farmers Union states that, "wheat acreage fell from 29 million acres in 1968 to approximately 10 million acres in 1970". Easter (2005) reports that LIFT was ended when prices of wheat returned to normal in the mid-1970s.

Another option for farm income enhancement is England's Entry Level Stewardship approach. This program does not attempt to set-aside productive

agricultural land and instead makes whole farm payments. The cost of applying the Entry Level Stewardship scheme's approach of whole farm payments in Canada would be prohibitively costly due to the amount of farm land that could potentially be enrolled. Natural England (2010a) reports that 6 million ha of England's land in agriculture out of a total of 9 million ha is enrolled in Entry Level Stewardship. Annual payments of £30/ha/year results in a fiscal commitment of £180 million/year ($275.4 million $Cdn/year). Statistics Canada (2008) reports that farm areas in Canada is greater than 67.5 million ha. If it is assumed that participation rates would be equal to England, than 45 million ha would potentially be enrolled in a Canadian Entry Level Stewardship scheme. If the same annual payments of £30/ha/year were applied, than a total fiscal commitment of £1.35 billion/year ($2.06 billion $Cdn/year). I believe this scale of fiscal commitment is unrealistic for Canada as it represents over 1% of GDP. England can better afford this level of farm income enhancement because of both its relatively small land area and greater population density.

*4.6.2 Valuation of ecological goods and services*

Three of the programs examined used methods for addressing the issue of valuing ecological goods and services: the U.S. Conservation Reserve Program, England's Environmental Stewardship scheme and Australia's BushTender program. Table 4. presents a comparison of the approaches to valuation used in these countries. The lessons learned from these approaches to valuation are presented in Table 4.4. This section compares each approach to the issue of valuation and suggests what lessons can be learned from each for ecological goods and services policy in Ontario.

Table 4.4 – Comparison of Approaches to Valuation of Ecological Goods and Services in the United States, England and Australia

| Valuation Approach | Environmental Benefits Index (United States) | National Character Areas (England) | Biodiversity Benefits Index (Australia) |
|---|---|---|---|
| Administrative Requirements | Site visit is not necessary. | Requires a site visit and assessment. | Requires a site visit and assessment. |
| Targeting | Point weightings for indicators do not vary across regions. Areas defined as wildlife priority areas are ranked higher than areas not defined as such. | Targets specific ecological goods and services of regional importance in defined regions spanning the country. | Targets ecological goods and services of both local and regional significance. |
| Eligible Ecological Goods and Services | Multiple<br>• Air<br>• Water<br>• Wildlife<br>• Biodiversity<br>• Soil | Too many to list | One<br>• Biodiversity |

Source: Author

The Environmental Benefits Index used by the U.S. Conservation Reserve Program targets multiple ecological goods and services. This is important because management actions often lead to multiple ecological outcomes. The Environmental Benefits Index is also designed to be simple enough for use across the whole of the U.S. A difficult issue with valuing ecological goods and services is that actions in two different areas could lead to different ecological outcomes. The Environmental Benefits Index cannot account for the variation of potential ecological outcomes supplied as a result of program actions. An additional issue exists in the fact that the value of ecological outcomes resulting from program actions varies spatially. An action taken in a remote area is ranked by the Environmental Benefits Index the same as an equivalent action taken at the urban fringe, even though the values could be quite different. That being said, the Environmental Benefits Index awards more points to bids located in areas defined as wildlife habitat or water quality priority areas compared to bids not in these areas.

The Higher Level Stewardship tier of the Environmental Stewardship scheme of England goes a step further in valuing ecological goods and services than the U.S. Conservation Reserve Program in that the prioritization of ecological goods and services occurs on a regional scale. Being flexible to local needs and wants as well as local environmental and geographical conditions is a strength of the Higher Level Stewardship tier of the Environmental Stewardship scheme. The drawback of this approach in comparison to the Conservation Reserve Program is that a site visit by a program officer is necessary to assess the application. Increased administrative costs are incurred by site visits, which are not a feature of the Conservation Reserve Program.

Applicants to the BushTender program also receive a one-on-one site visit by a field officer who provides information on the site's significance and possible management options. In this case, the landholder also provides the field officer with information that may not be immediately evident, such as the presence of threatened or endangered species habitat or populations. The information gathered during the site visit is input into the Biodiversity Benefits Index and is used in the ranking of bids. This information is critical in determining the local and regional significance of that site's biodiversity and the potential effects that management actions may have.

The targeting approach of the Biodiversity Benefits Index of the BushTender program is a different approach than the use of National Character Areas in the Higher Level Stewardship scheme in England, although both are used to target environmental goods across a heterogeneous landscape. National Character Areas identify specific management options that qualify for Higher Level Stewardship funding in that area. The Biodiversity Benefits index goes a step further by assessing the effect that the applicant's proposed management options could potentially have on the local site's ecological significance in the broader regional context. BushTender administrators acknowledge that determining the Habitat Service Score requires a good deal of localized knowledge in order to be done correctly. This would likely represent an increase in program administrative costs.

Lessons learned for Ontario from the three approaches to addressing the issue of valuation are represented in Table 4.5. The three approaches range in complexity from low cost and undifferentiated in targeting to requiring local environmental knowledge, higher cost and the ability to differentiate both across and within regions. The English

Environmental Stewardship scheme's approach to valuation appears to fit somewhere between the other two programs in this continuum. If the goal of the program is to secure the provision of ecological goods and services, than I would argue that the Australian BushTender approach to valuation is the best choice because of its ability to value actions in both a local and regional context. That being said, the BushTender and Environmental Stewardship approaches both require site visits assessments and this would likely increase program administration costs.

Another lesson learned for Ontario is the fact that attempts to address the issue of valuation of environmental goods and services cannot mimic the information obtained through market exchanges. Valuations methods attempt to calculate the value of environmental benefits for program benefactors, usually taxpayers whose contributions to the program were involuntary. Voluntary market exchanges of environmental goods and services would provide a greater deal of information on what goods and services are valued and what are not. In the absence of market exchanges, valuation tools, such as those described in this chapter, can be used to achieve the cost-effective provision of administratively determined objectives, but it should be noted that these objectives do not correspond with the demand of each individual taxpayer contributing to the program.

*4.6.3 Incentive Mechanism*

The programs examined provided incentives for the provision of environmental goods and services using either fixed grant payments or by asking for and selecting from bids using an auction. Table 4.5 presents the lessons learned for Ontario and Canada from the use of these incentive mechanisms by the programs studied in this chapter.

Table 4.5 – Lessons Learned for Ontario from International Ecological Goods and Services Programs on the Valuation of Ecological Goods and Services

| Functional<br><br>Equivalence | Program | Country | Lessons Learned |
|---|---|---|---|
| Valuation | Conservation Reserve Program | United States | - Environmental Benefits Index cannot account for variation in ecological goods and services across the landscape<br>- Defining the indicators of environmental benefit for the whole country makes assessments less complex<br>- Can target multiple ecological goods and services |
| | Environmental Stewardship | England | - Identifying the high-value ecological good and services that can be supplied in specific ecological zones can aid in the targeting of their provision<br>- Site visits and assessments increase administrative costs |
| | BushTender | Victoria, Australia | - Assessments of the effects of management actions on the provision of ecological goods and services should be evaluated based on both the site's local significance and how that site connects in a broader regional context<br>o The Biodiversity Benefits Index provides a method to achieve this objective<br>- Site visits and assessments increase administrative costs |

Source: Author

England's Environmental Stewardship Scheme and Costa Rica's *Pago por Servicios Ambientales* both use fixed payments to incent the provision of ecological goods and services. Pagiola (2008) identifies three potential issues with programs using fixed payments:

1. Payments may be insufficient to induce inclusion of lands that are of high value (either agricultural or for timber production) but can also supply a socially-desirable environmental goods and services
2. Inducing the inclusion of lands that supply limited or low quality environmental goods and services at high cost
3. Providing incentives for activities that would have been undertaken with or without the program

The first issue arises when there are insufficient incentives to induce a landowner to supply ecological goods and services that are deemed desirable by program administrators. This situation may arise when returns from agricultural or timber production exceed the incentives provided. Even if a landowner can supply high quality or quantity ecological goods and services, there is little incentive for participation. On the other hand, the second issue arises because there may be landowners who have incentives to participate in the program even though the value of ecological goods and services they provide is less than what is paid as compensation.

The third issue identified by Pagiola (2008) is when incentives are given to participants for actions that would have been taken (or not taken) if the incentives was never given. For example, in the case of the *Pago por Servicios Ambientales*, incentives for forest conservation could be given to landowners who would have conserved the forest with or without the incentive. This raises the issue of fairness. Should those who provide ecological goods and services not be compensated for that provision regardless if they would have undertaken beneficial actions without incentives or not? In my view, for

Table 4.6 – Lessons Learned for Ontario and Canada from International Ecological Goods and Services Programs on Incentive Mechanisms

| Functional Equivalence | Program | Country | Lessons Learned |
|---|---|---|---|
| Incentive Mechanism | *Pago por Servicios Ambientales* | Costa Rica | - There are a number of issues when using fixed payments including:<br>o Potential to overpay for some services<br>o Failing to secure the provision of expensive services<br>o Actions may be induced that would have taken place without the incentives |
| | Conservation Reserve Program | United States | - Auctions become essentially fixed payments if information on maximum bid rates is made public<br>o Incentives to bid less than maximum bid rates can help correct this problem |
| | BushTender | Victoria, Australia | - Sealed bid auctions can be effective in securing ecological goods and services at bids close to opportunity costs<br>- Recognition of past management actions when providing incentive ensures that good stewards are rewarded for being pro-active<br>- A BushTender style auction should be tested in Ontario and Canada |

Source: Author

reasons of fairness, they are worthy of compensation regardless of whether the action would have taken place anyway.

The first two issues identified by Pagiola (2008) could potentially be overcome by auctioning conservation contracts and selecting bids that provide the best value for money according to a mechanism for valuing ecological goods and service. The U.S. Conservation Reserve Program and Australian BushTender program are the two programs examined that use auctions.

The U.S. Conservation Reserve Program is subject to some of the same issues with using fixed grant payments because it has essentially become a fixed payment under the guise of an auction. The Conservation Reserve Program uses the aforementioned maximum soil-adjusted bid rate as a cut-off level for eligible bids. The rate is made publicly available so applicants can ensure they do not exceed the maximum bid rate when applying to the program. Capping eligible bids using the maximum soil adjusted bid-rate means that the first issue with using fixed payment identified by Pagiola (2008) would still exist. In addition, there is little incentive for applicants to submit bids for less than the maximum soil adjusted bid-rate because only 15 of the 700 points available in the Environmental Benefits Index are granted for submitting bids at less than the maximum bid rate. The U.S. Conservation Reserve Program is therefore likely to be overpaying for some environmental goods and services although the use of the Environmental Benefits Index should ensure that all successful bids result in the provision of valuable environmental goods and services. The Conservation Reserve Program's auction mechanism is also improvement over Costa Rica's *Pago por Servicios Ambientales* program because the maximum soil-adjusted bid rate varies spatially based

on soil quality. One drawback of the Conservation Reserve Program in comparison to Costa Rica's *Pago por Servicios Ambientales* program is that it does not recognize past management and therefore unfairly does not reward those landowners who have undertaken environmentally beneficial management options in the past.

Australia's BushTender program uses an auction that overcomes both of the first two issues identified by Pagiola (2008). There is no maximum allowable bid rate and so management options that are high cost but also have the potential to yield high value environmental goods and services can be selected if they provide good value for money. The same is true for bids containing environmental goods and services of lower value. If the bid asks for limited payment in return for these lower value environmental goods and services and still provides good value for money than the bid may be accepted. Drawbacks of using an auction in comparison to fixed grants payments include the potential for higher administrative costs and the potential for lower program participation due to the complexity of an auction. Those issues notwithstanding, I would argue that the BushTender auction is the best incentive mechanism for the cost-effective provision of environmental goods and services of the programs examined in this chapter. An auction in the BushTender mold should be considered when developing environmental goods and services policy in Ontario and Canada.

*4.6.4 Intermediation*

Each of the programs examined in this chapter uses an intermediary to both give information to potential participants and to gather information from potential participants. But the information can be transmitted through two distinctly different means. Costa Rica's *Pago por Servicios Ambientales* uses private intermediaries between program administrators and landholders while the other three programs rely on program

administrators to transmit and receive information with landholders. Lessons learned for Ontario and Canada from the use of intermediaries are presented in Table 4.7.

When applying for Costa Rica's *Pago por Servicios Ambientales* landowners must complete a sustainable forest management plan that is approved by a licensed forester. According to Porras and Neves (2006) the licensed forester can help design and write the application for a percentage of incentive payments not exceeding 18%. In this way, the licensed forester is working as an intermediary in the transaction between landowners and the Pago por Servicios Ambientales. The participation of non-governmental organizations at this stage of program delivery can be helpful in encouraging participation. Zbinden and Lee (2005, p, 270) state that,

> "specific targeted information provided – and often personally delivered – by forest engineers and forest organizations was shown to be a key element in influencing participation. These intermediaries take on a central role in the PSA system. They not only furnish services for potential participants by providing administrative and management tasks, the also deliver information. The mechanism is quite apparent. An independent forest engineer or consultant is likely to manage carefully his own time and resources and is most likely to inform those potential participants from whom he thinks he will subsequently earn the highest returns to his time."

Porras and Neves (2006) report that intermediaries play a variety of roles in the *Pago por Servicios Ambientales* approach. They are responsible for aggregating contracts from smallholders, approach large landowners that do not want to complete the necessary paperwork, provide technical assistance and monitor and enforce compliance. However, despite the benefits of using intermediaries, Porras and Neves (2006) report those intermediaries also burden the *Pago por Servicios Ambientales* program because they claim a percentage of payments that could otherwise be going to landowners. I disagree that this a burden on the *Pago por Servicios Ambientales* program because the function

Table 4.7 - Lessons Learned for Ontario and Canada from International Ecological Goods and Services Programs on Intermediation

| Functional<br><br>Equivalence | Program | Country | Lessons Learned |
|---|---|---|---|
| Intermediation | Pago por Servicios Ambientales | Costa Rica | - Involving intermediaries in the delivery process can encourage participation<br>o If the cost of the intermediary comes out of program payments than there is the incentive for the intermediary to target landholders that they believe will generate the greatest returns from program participation as well as offering any services that may be valuable to those landholders<br>o If the cost of the intermediary is assumed into program administration costs than the intermediary will only offer those services that are stipulated by program administrators |
| | BushTender | Victoria, Australia | - Flexibility in project design for landholders can encourage participation |
| | Environmental Stewardship | England | - The information generated from completing a Farm Environment Plan can be useful in determining program costs and potential opportunities for further action<br>o This information is only useful for public decision making when it is not confidential and held by the landholder |

that intermediaries play is essential and would otherwise have to be assumed by program administrators and add to administrative costs.

Similarly, a prerequisite to participation in England's Higher Level Stewardship scheme is the completion of a Farm Environment Plan[7]. According to Natural England (2010b: p. 15), a Farm Environment Plan is used to gather, "good quality information about the current environmental value and interest in your farm and its potential to deliver additional environmental benefits". The Farm Environment Plan is used by both Natural England and landholders in the design of an Higher Level Stewardship agreement. It is used by Natural England to identify landscape features that have the potential to benefits from management under Higher Level Stewardship and deliver additional environmental goods and services. Natural England reports that the information gathered from the Farm Environment Plan is used as a basis for monitoring the success of the program as well as providing a baseline for future assessments of the landscape. According to Natural England (2010c), the Farm Environment Plan is usually carried out by a Farm Environmental Plan surveyor who can complete and submit the plan on a landholder's behalf. If a Farm Environment Plan meets the required standards and is accompanied by a Higher Level Stewardship application the applicant will be paid a grant based on the amount total area of land registered by that landowner in the Rural Land Register. These one-time grants range from £395 for smallholders (less than 5.5 ha) to £3,350 for very large landholders (exceeding 3,000 ha).

[7] The Farm Environment Plan was introduced along with the Environmental Stewardship scheme in 2005. There is no indication it is related to the Environmental Farm Plan in Canada despite the similar name.

The completion of a sustainable management or farm environment plan as a pre-requisite to program participation is certainly something that could be adopted in Ontario. The necessary institutional foundation is already in place in the form of the Environmental Farm Plan. As noted in Chapter 3, the ALUS approach requires that a peer-reviewed Environmental Farm Plan be completed as a pre-requisite to participation. According to Maxine Kingston (personal communication, January 14, 2010), Agriculture and Agri-Food Canada's Technical Director of the Agri-Environment Services Branch in Ontario, the Environmental Farm Plan will be the foundation of any ecological goods and services payment program in Ontario. It seems reasonable to take advantage of existing institutions like the Environmental Farm Plan.

That being said, use of the Environmental Farm Plan in Ontario could be improved. For one, the information generated from the completion of an Environmental Farm Plan is confidential and for use by the landowner only and is not entered into a public record. The benefits of having landowners complete an Environmental Farm Plan could be enhanced if the information generated could be used by those other than the landowners. For example, a database of digital maps showing the ownership of agricultural land, similar to the Rural Land Registry in England, would be beneficial when attempting to estimate the benefits and costs of agri-environmental programs. There would, of course, be issues of privacy associated with allowing this information to be used by others. Landowners may feel that their agricultural practices would be subject to increased scrutiny if this information were more widely available. This is a potentially controversial subject in Ontario, but one that should be explored nonetheless. Although incentives are already given for completing the Environmental Farm Plan, perhaps there

is potential for offering a greater incentive based on land area, similar to the Farm Environment Plan incentive offered by Natural England, which may assuage privacy concerns. Or there could potentially be a way to derive important information for decision making while maintaining confidentiality.

Intermediaries in the BushTender approach allow for a greater degree of flexibility in choice of management options for the landowner. Following the site visit the field officer explains to the landholder how the site has been assessed and discusses specific threats and opportunities. The landholder then has the flexibility to choose among a range of management options that suit their personal needs and desires. The choices that landholders make are reflected in their resulting Habitat Service Score and would also likely be reflected in their bid price. Based on the information shared between the field officer and the landholder the greatest threats to native vegetation and greatest opportunities to conserve or enhance biodiversity would be identified, but if those opportunities conflicted with the landholders current land use entitlements they would have the choice to select different options and still be accepted into the program, provided other chosen management options provide sufficient value for their bid price.

Flexibility in choice of management options by landholders has the potential to increase participation in an ecological goods and services provision program. In the ALUS pilot project flexibility is one of its key operating principles. Future ecological goods and services provision programs in Ontario and Canada can learn from BushTender and the ALUS pilot project by allowing landowners more flexibility in choosing management options as long as the potential supply of ecological goods and services is secured. For example, a landowner wishing to implement riparian buffers

should be allowed some flexibility in terms of what the riparian area is planted with according to local and regional ecological conditions.

Agri-environmental programs in Ontario are also already delivered through an intermediary: the Ontario Soil and Crop Improvement Association. An ecological goods and services program in Ontario could potentially be delivered through this organization. The question is how much responsibility for providing information, technical assistance, monitoring and enforcement and administrative activities should be placed on intermediaries in Ontario? In order to answer these questions, another question should probably be asked first. That is, who should be responsible for paying the costs of the intermediary?

In the *Pago por Servicios Ambientales*, landholders pay the cost of the intermediary through a portion of their incentive payments. If the responsibility is on the landowner to pay the intermediary then the intermediary will only offer services that are: (a) required by the program and; (b) demanded by landowners. Porras and Neves (2006) report that in the *Pago por Servicios Ambientales* approach, intermediaries, the licensed foresters, are required to disburse incentive payments in a certain timeframe and to monitor compliance, among other things. Licensed foresters and forestry organizations sign an agreement of collaboration with FONAFIFO in the *Pago por Servicios Ambientales* program. Outside of the stipulations of this agreement they are free to offer whatever services they want to landholders. Therefore, they can target landowners and offer services based on what will garner them the greatest returns.

If, on the other hand, intermediaries are funded as though they represent administrative costs of the program, as they are with England's Environmental

Stewardship scheme and Australia's BushTender program, then there they will offer services based on what is stipulated by program administrators. Program administrators may want to keep intermediation costs low and decide that some services should not be offered by intermediaries. For example, the Ontario Soil and Crop Association does not engage in one-on-one technical assistance with landowners who are preparing their Environmental Farm Plan. Instead two day group courses are offered. Some landowners may have desired and would be willing to pay for technical assistance but that is outside the scope of the Ontario Soil and Crop Association's current activities.

### 4.7 Conclusions

This purpose of this chapter was to describe and evaluate experiences with environmental goods and services provision programs internationally so that lessons learned could be used to inform the development of environmental goods and services policy in Ontario and Canada. The main lessons learned for Ontario and Canada in this chapter are:

1. A land set-aside program like the Conservation Reserve Program benefits countries with inelastic demand for their commodity exports (United States) more than countries with elastic demand for commodity exports (Canada).
2. The fiscal implications of a whole-farm program like the Environmental Stewardship scheme are substantial for a country with a relatively low population and large agricultural land base (Canada) versus a country with a relatively high population and small agricultural land base (England).
3. Non-market valuation approaches are important in achieving specified environmental cost and services program outcomes cost-effectively.
    a. Measuring both the local and regional significance of actions is an important component of BushTender's Biodiversity Benefits Index and should be used if an approach to the valuation of environmental goods and services is needed in Ontario and Canada.
    b. Site visits and assessment can increase administrative costs but important information is also obtained.
4. Auctions in the mold of the BushTender approach should be considered and tested in Ontario and Canada.

5. Private intermediaries between program administrators and landholders can reveal information and offer services demanded by landholders that are not offered by program administrators.
6. The Environmental Farm Plan has the potential to gather more detailed information that can be used to inform future policy development and decision-making.
    a. Privacy and confidentiality are issues that would have to be faced should the Environmental Farm Plan be used this way in Ontario and Canada.

These lessons will be used in the discussions of results from in-depth interviews with groups and individuals with ecological goods and services policy responsibility in Chapter 5. These lessons will also be used in the development of principles of a policy framework for ecological goods and services provision in Ontario in Chapter 7.

*Implication for the ALUS approach*

The ALUS approach already exemplifies a number of the lessons learned in this chapter. For example, ALUS is an intermediary between those who demand environmental goods and services and the agricultural community from which they are supplied. ALUS conducts detailed site visits with landowners to determine the potential actions that can be taken and allow landowners flexibility in their choice of action. ALUS is also attempting to engage in market exchanges of environmental goods and services with the introduction of the Ontario Conservation Credit. Market exchanges involving the Ontario Conservation Credit can address the issue of valuation better than the non-market methods used by the countries studied in this chapter. That being said, if the Ontario Conservation Credit is not a successful initiative, there will be a need for some other method of valuation, as ALUS does not attempt to value the environmental goods and services provided through their actions currently. The use of fixed annual payments by the ALUS approach are subject to the issues identified with that type of

incentive mechanism in this chapter, although it would require a complete restructuring of the ALUS program to switch to an auction.

*Implications for OMAFRA and Agriculture and Agri-Food Canada*

There are a number of implications from the lessons learned in this chapter for OMAFRA and Agriculture and Agri-Food Canada. First of all, this chapter presented why the land set-aside approach used in the Conservation Reserve Program and the whole-farm approach used in the Environmental Stewardship scheme are not appropriate for Ontario and Canada in their current design. Secondly, market exchanges of environmental goods and services should be the first best option but, recognizing that market exchanges are not always feasible, the government, specifically OMAFRA and Agriculture and Agri-Food Canada in Ontario and Canada respectively, can have a role in environmental goods and services provision. In order to do so, a method for the non-market valuation of environmental goods and services will need to be developed so that the program is targeted toward the provision of valuable goods and services. Again, I suggest developing an approach akin to BushTender's Biodiversity Benefits Index for this task because it can assess both the local and regional significance of management actions. Auctions should again be considered a viable incentive mechanism. Private intermediaries have a role to play in information delivery and reception and can reduce program administration costs while providing services that would otherwise not be offered. Finally, the Environmental Farm Plan has the potential to be a powerful information tool if somehow concerns over privacy and confidentiality can be assuaged. Both OMAFRA and Agriculture and Agri-Food Canada can learn much from the experiences with ecological goods and services programs used elsewhere.

# Chapter 5 – In-depth Interviews on the State of Ecological Goods and Services Policy Development in Ontario

## 5.1 Introduction

The purpose of this chapter is to develop an understanding of the state of ecological goods and services policy development in Ontario from groups and individuals with ecological goods and services policy responsibility. In order to fulfill the purpose of this chapter, I aim to meet the following objectives:

1. Describe the in-depth interviewing process as applied in this research
2. Present the views, perceptions and opinions of interviewees on issues of importance to ecological goods and services policy development in Ontario

The policy and program review in Chapter 4 suggests that policy and program design and implementation is influenced by the political, geographical and social context in which a policy or program is to be integrated. It is necessary to explain the context under which ecological goods and services policy is emerging in Ontario. In-depth interviews are used to explain this context by describing how issues relevant to the development of ecological goods and services policy are perceived by groups with policy responsibility (i.e. group/individuals with technical policy knowledge, policy advocacy roles and/or involvement in policy debates).

The chapter proceeds as follows. Section 5.2 outlines the research methods used in this component of this research study. Section 5.3 presents the views and perceptions of interview participants on issues relevant to the development of a policy framework for ecological goods and services in Ontario. Section 5.4 reports lessons learned on the current state of, obstacles to and next steps in the development of ecological goods and services policy in Ontario. Section 5.5 concludes this chapter.

## 5.2 In-depth interview approach

For this research I follow the approach of Miller and Crabtree (2005), in how in-depth interviews are designed and conducted. This approach was discussed in Chapter 2.

Table 5.1 presents a list of participants that were interviewed in this research. This table gives details on the participant's organizational affiliation, position with that organization and date of initial interview. For more detailed account of all interviews conducted please refer to Appendix C for the Interview Log. The following section details the choice of organizations from which to draw participants and how individuals were identified with those organizations.

As this research originally was going to have greater focus on the ALUS approach, ALUS organizers were identified as key informants. ALUS organizers had input in the interview sampling process and helped identify both groups and individuals that would be sources of information on both ALUS and ecological goods and services policy and programs in Ontario. Multiple interviews were conducted with the ALUS key informants both before and during the formal interview phase. Dave Reid and Bryan Gilvesy were particularly insightful in this snowballing process.

These pre-interview stage conversations identified the major groups and organizations where information on ecological goods and services and ALUS could be found. These groups were: ALUS organizers, government bureaucrats at relevant government ministries, farm groups, conservation authorities and environmental non-governmental organizations. These groups represent interests that have technical knowledge of ecological goods and services and their provision, are involved in the

Table 5.1 - Interview participants' organizational affiliation, position and date of initial interview

| Name | Date of Initial Interview | Organizational Affiliation | Position |
|---|---|---|---|
| Maxine Kingston | 14-Jan-2010 | Agriculture and Agri-Food Canada | Technical Director - Agri-Environment Services Branch Ontario Region |
| Bryan Gilvesy | 16-Sep-2009 | ALUS/Norfolk County Farmer | ALUS Participatory Advisory Committee Chair |
| Dave Reid | 4-Jun-2009 | ALUS/Norfolk Land Stewardship Council | Key ALUS Organizer/ Stewardship Coordinator |
| Steve Scheers | 16-Sep-2009 | ALUS/Norfolk County | ALUS Organizer/ Superintendent Norfolk County Forest Conservation Service |
| Kristen Thompson | 4-Jun-2009 | ALUS | ALUS Project Coordinator |
| John Clement | 27-May-2009 | Christian Farmers Federation of Ontario | General Manager |
| Jo-Anne Rzadki | 11-Feb-2010 | Conservation Ontario | Watershed Stewardship Coordinator |
| Elizabeth Brubaker | 3-Feb-2010 | Environment Probe | Executive Director |
| Anne Loeffler | 10-Feb-2010 | Grand River Conservation Authority | Conservation Specialist |
| Tracey Ryan | 10-Feb-2010 | Grand River Conservation Authority | Supervisor of Conservation Activities |
| David Cooper | 3-Mar-2010 | Ontario Ministry of Agriculture Food and Rural Affairs | Manager - Environmental and Land Use Policy Unit |
| Scott Duff | 3-Mar-2010 | Ontario Ministry of Agriculture Food and Rural Affairs | Manager - Program Coordination, Research and Partnerships |
| Paul Smith | 30-Oct-2009 | Ontario Ministry of Agriculture Food and Rural Affairs | Policy Analyst - Environmental and Land Use Policy Unit |
| Matt Wilson | 13-Jan-2010 | Ontario Ministry of Agriculture Food and Rural Affairs | Environmental Specialist - Innovation, Engineering and Program Delivery Unit - Western Region |
| Eric Miller | 3-Feb-2010 | Ontario Ministry of Natural Resources | Coordinator - Socio-Economic Analysis |
| Andrew Graham | 1-Mar-2010 | Ontario Soil and Crop Improvement Association | Programs Manager |
| Dennis O'Grady | 19-Oct-2009 | South Nation Conservation Authority | General Manager |

forming policy positions on ecological goods and services and their provision, or advocate for certain ecological goods and service policies or programs.

Interviews were conducted with four OMAFRA employees, one employee from Agriculture and Agri-Food Canada and one employee from the Ministry of Natural Resources. All four OMAFRA employees and one of the Agriculture and Agri-Food Canada employees were identified through snowballing. The Ministry of Natural Resources employee was identified at a workshop and conference respectively as they were determined to represent critical cases. It was necessary to interview employees from a variety of government ministries because jurisdiction for ecological goods and services policy, as will be further illustrated in the results from the interviews, cuts across government ministries both vertically (i.e. municipal, provincial, federal) and horizontally (i.e. OMAFRA, Ministry of Natural Resources, Ministry of Environment). An interview with an employee from the Ontario Soil and Crop Improvement Association (OSCIA) was also conducted. The OSCIA works as a delivery agent for government funded and designed agri-environmental programs, including the Ontario Environmental Farm Plan and the Canada Ontario Farm Stewardship Programs. This employee was identified by ALUS organizers as having significant experience and insights into the design and delivery of agri-environmental programs.

Interviews were conducted with representatives from farm groups. ALUS was originally developed by a farm organization and its activities are targeted specifically to farmers. Farm organizations targeted for interviews include the Ontario Federation of Agriculture and the Christian Farmers Federation of Ontario.

Interviews were conducted with two Conservation Authorities and one employee at Conservation Ontario because they are involved in the delivery and coordination of agri-environmental and land stewardship programs in Ontario. Groups with a range of view on ecological goods and services in general and ALUS in particular were identified and included. Two employees were identified and included in interviews from the Grand River Conservation Authority based on recommendations from ALUS organizers and an understanding gained through the mapping process that the Grand River Conservation Authority is involved in ecological goods and services provision. These provision activities will be examined in greater depth later in this chapter. An additional participant was identified and included from the South Nation Conservation Authority. These individuals were identified through conversation with ALUS organizers and other interview participants.

The final group identified and included in interviews was environmental non-government organizations. These groups are responsible for research and advocacy in the interest of the environment. The environmental group included in the interview was Environment Probe.

*Interview*

Interviews were conducted in accordance with an semi-structured interview guide. A sample interview guide is included in Appendix A. Each interview began with background and contextual questions on the participant. The bulk of the interview was spent addressing the criteria used to evaluate policy approaches in relation to ALUS and using probing questions to elicit meaningful responses. Depending on the responses of the interview participant, probing questions were different from interview to interview.

Some participants directly answered and providing meaningful response to the main questions themes, while others required substantial probing. For this reason, no two interviews were identical. During the interview, brief written notes were taken to supplement the digital recording. The interviews lasted between forty minutes and two hours with the majority lasting just over an hour. Upon conclusion of the interview the recorder was turned off and the participant was thanked for their time.

*Transcription*

Before transcription of the digital recording of the interview takes place it is first necessary to summarize the information from the interview in the form of field notes. This took place as soon as possible following the interview. Actual transcription of the interview followed from the digital recording. Transcription was not verbatim due to time constraints and instead focused on identifying key statements and summarizing themes.

**5.3 Interview Results – Ecological Goods and Services Policy in Ontario**

The purpose of this section is to present the results of the in-depth interviews related to ecological goods and services policy broadly in Ontario. Interview participants were asked for the perceptions, views and opinions of themselves and their organizations on various aspects of ecological goods and services policy and points of debate on these aspects in Ontario. The aspects of ecological goods and services policy that were commented on by interview participants include, in the order they are to be presented in this section: designing a national ecological goods and services policy framework, the definition of ecological goods and services, policy options for increasing the provision of ecological goods and services, jurisdiction over the issue of ecological goods and services within government in Ontario, policy integration of new initiatives, funding options,

permanence, the delivery mechanism, and monitoring and verifying outcomes. This section addresses the research problem of this thesis by providing answers to the follow questions:

1. What issues related to ecological goods and services policy in Ontario are of greatest concern to groups and individuals with policy responsibility?
2. What are the impediments, debates and opportunities facing the development of a framework for ecological goods and services policy in Ontario according to groups and individuals with ecological goods and services policy responsibility?

*5.3.1 Why has a national ecological goods and services policy framework not yet been developed?*

The major problem that this research is addressing is why, when a commitment was made to develop a National ecological goods and services policy framework by Federal and Provincial Ministers of Agriculture in 2005, has such a framework not yet been developed. Interview participants were asked to give their perceptions on this issue.

David Cooper (interview, March 3, 2010), manager of the OMAFRA's Environmental and Land Use Policy Unit, stated that a federal/provincial working group on ecological goods and services is still active. According to Mr. Cooper the fact that a policy framework has not yet developed is a reflection of the complexity of the issue. He believes that the issue of ecological goods and services is still in its infancy and that there are points of debate that need resolution before a policy framework can be developed. An example of a point of debate that Mr. Cooper mentioned is the potential cost of using incentive mechanisms versus using a regulatory approach. Mr. Cooper believes that a national framework for ecological goods and services policy is going to be difficult to develop because the provinces do not agree on how the issue should be addressed. He stated that the different nature of agricultural sectors in each province and the variation in

the potential fiscal implications resulting from a national environmental goods and services policy make it difficult for the provinces to agree on a national policy.

Scott Duff (interview, March 3, 2010), manager of OMAFRA's Program Coordination, Research and Partnerships Unit, shares Mr. Cooper's belief that a national policy framework has not yet been developed because of the complexity of the issue. He adds that the potential cost of implementing a national policy framework has been a concern. Mr. Duff believes that the next step in the developing a policy framework is to address how ecological goods and services policy fits into the overall vision for food and agricultural policy. Mr. Duff stated that. "If it is going to [require] a significant amount of money, then it needs to be placed in the context of all agricultural policy, because there is a very slim chance that you could make the policy argument to fund it on its own without looking at the larger context." He stated that movement towards the development of a national policy framework could be hastened if there was a common voice and vision from the agricultural sector. It is easier to set the direction of policy when opinions are not fractured.

Elizabeth Brubaker (interview, February 3, 2010), Executive Director of Environment Probe, expressed being pleased that we do not yet have a national policy framework for ecological goods and services. She stated that it is necessary to find out what is working and what is not working before committing to any universal policy. She is pleased that there are programs and pilots being undertaken at a smaller scale because decentralized approaches are correctable and allow for experimentation in order to find out how effective various policies and instruments are before committing to any broad program.

Eric Miller (interview, February 3, 2010), Senior Economist at the Ontario Ministry of Natural Resources, also questioned whether we have adequate information at this time to be able to effectively consider the various policy options available. He stated that any national framework would be very difficult to develop without answering some more fundamental questions first. For example, Mr. Miller expressed the desire to find a balance between supporting the provision of ecological goods and services through payments and supporting their provision through other mechanisms such as the regulatory approach or education.

Paul Smith (interview, October 30, 2009), a policy analyst at OMAFRA, stated that the federal/provincial working group wanted the issue of ecological goods and services examined and so they funded pilot projects across the country to investigate the issue. These pilot projects finished in 2009 and a meeting was held to showcase the results. Mr. Smith believes the working group is now trying to figure out what to do with these results and what the next step should be although he gave no indication of what the timeline for future action would be.

*5.3.2 What is the definition of ecological goods and services?*

Paul Smith (interview, October 30, 2009), a policy analyst from OMAFRA, remarked that, "it's amazing the traction that ecological goods and services does have. When people speak the word[s], they mean different things." Mr. Smith stated that the lack of a coherent and consistent definition is an issue facing ecological goods and services policy development right now. According to Elizabeth Brubaker (interview, February 3, 2010), Executive Director of Toronto-based Environmental Non-Governmental Organization Environmental Probe, it is difficult to take a position on ecological goods and services policy because a policy position would depend on how

ecological goods and services is defined. This section presents the definition of ecological goods and services according to interview participants. Following the presentation of definitions there is an analysis of the implications two points of debate in defining the scope of ecological goods and services as an issue.

Mr. Smith reported that the definition of ecological goods and services depends on what group is using it. For example, Mr. Smith stated that when farmers use the term EG&S, they are talking about the payments they can receive from the provision of goods and services from their land. When economists use it, they are talking about the dollar value attached by humans to those goods and services. When ecologists use it, they are talking about the biological function of those goods and services. The definition that Mr. Smith subscribes to each group is not necessarily subscribed to by all or most of the groups individual members, but these definitions do illustrate that ecological goods and services is being defined differently across some groups.

Dennis O'Grady (interview, October 19, 2009), the General Manager of the South Nation Conservation Authority, stated that anything done to protect the environment for the future is ecological goods and services. Mr. O'Grady said that ecological goods and services and, in particular, the acronym EG&S is just the "buzzword of the month". He said that EG&S used to be called extension services or conservation services and that his conservation authority has been doing these things for decades. Tracey Ryan (interview, February 10, 2010), Supervisor of Conservation Activities at the Grand River Conservation Authority, stated that ecological goods and services is akin to what the Grand River Conservation Authority calls performance incentives for conservation activities. Similar to Mr. O'Grady, Ms. Ryan states that EG&S is just a term for

something that the Grand River Conservation Authority has been doing for years. It appears that, for these Conservation Authorities, ecological goods and services are defined as the actions or activities that result in the provision of some ecological or environmental output that is deemed beneficial. This definition includes both the provision of environmental goods and the reduction of environmental harm.

David Cooper (interview, March 3, 2010), Manager of the Environmental and Land Use Policy Unit at OMAFRA, stated that the concept of ecological goods and services is difficult to define consistently. Mr. Cooper reported that OMAFRA, the Ministry of the Environment and the Ministry of Natural Resources are all studying the issue of ecological goods and services but approaching the issue from different angle. OMAFRA is looking at opportunities for farmers to generate an alternative income stream through the provision of ecological goods and services. The Ministry of the Environment is looking at the role they may assume as a regulator. The Ministry of Natural Resources is attempting to attach value to natural features through non-market methods. Mr. Cooper stated that provincial government ministries in Ontario are, "still very much at an early dialogue stage right now, getting our collective acts together and understanding where each other is coming from". Until the provincial ministries can come to a common definition of ecological goods and services, it will be difficult to move forward with policy development.

Eric Miller (interview, February 3, 2010), Senior Economist at the Ontario Ministry of Natural Resources, stated that ecological goods and services can be broken down into two components: the goods and the services. According to Mr. Miller, goods are exchanged in markets while services are outside markets at this time. So, in Mr.

Miller's view, ecological goods are the typical commodity outputs of agricultural land that are traded in markets. Ecological services, on the other hand, are the non-commodity outputs of agricultural land that are typically not traded in markets. According to Mr. Miller, ecological goods and services policy therefore can contribute by, "recognizing that those benefits are not commercial benefits but that they're still valuable to the public". Mr. Miller believes that this delineation is helpful because it is simple to understand and communicate. He stated that early collaborations on ecological goods and services policy between the Ontario Ministry of Natural Resources and OMAFRA were difficult because, "OMAFRA was saying one thing and we were saying something different" but that, "we overcame that" because of this delineation. While this delineation may be gaining traction, ecological goods and services was not defined in this way by anyone interviewed at OMAFRA or any other branch of government. This definition may be simple to understand but I believe that it is misleading because: (a) goods and services are not distinguished in this way in any other contexts and (b) it assumes that ecological services are not being traded in markets. Klimas (2007) and Drozdz (2009) each presented examples of ecological services that are being traded in markets. Therefore the definition of ecological goods and services should not be based on whether that good or service is traded in markets or not.

Jo-Anne Rzadki (interview, February 11, 2010), the Watershed Stewardship Coordinator at Conservation Ontario, stated that she finds the definition provided by Mr. Miller easy to understand, but noted that, "you talk to a landowner and they think it's something completely different." Ms. Rzadki added that her definition of ecological

goods and services includes anything where the environment contributes to human well-being.

On January 26, 2010 a workshop entitled "Building a Common Message: Moving the Ecological Goods and Services Agenda Forward" was held by The Ontario Rural Council (TORC) in Guelph, Ontario. This workshop included participants from the same group types that were selected from for interviews in the research (TORC, 2010). One of the objectives of this workshop was to identify areas of common ground on the issue of ecological goods and services (TORC, 2010). Common ground was found on broad issues like the fact that ecological goods and services can benefit all of us but consensus was not found in the definition. Two points of debate in the definition of ecological goods and services that emerged related to whether there should be a distinction between promoting the provision of ecological 'goods' versus the reduction of ecological 'harms' as well as identifying the groups that are potential suppliers of ecological goods and services. In Chapter 7, I propose a definition of ecological goods and services that addresses these points of debate.

*5.3.3 What are the available policy options?*

If the presence of high transaction costs are indeed a barrier to market exchanges of environmental goods and services, then, following from Coase, the state provision of ecological goods and services as an alternative to voluntary market transaction becomes worthy of consideration. As was seen in Chapter 4, states are supporting ecological goods and services provision by providing financial incentives. Other methods of securing ecological goods and services provision from private landowners include mandating their provision through law and regulation, supporting provision through penalties for non-compliance by the formation of clubs that collect payments from and disburse benefits to

members and through encouraging free and voluntary market transactions by reducing barriers, legal, institutional and otherwise, that hinder free exchange. This section identifies the policy options that were perceived by interviewees to be appropriate for increasing the supply of ecological goods and services in Ontario.

Bryan Gilvesy (interview, January 27, 2010) stated that the government model to increase provision of ecological goods and services is based on use of what he calls the influence model. This influence model relies on appealing to landowner's stewardship ethic to enact voluntary change. The Environmental Farm Plan is an example of a program that tries to elicit change through influence. It provides landowners with information on how farm operations impact the environment and provides options that can mitigate against damage. Mr. Gilvesy equates the influence model with trickery because it is asking for the provision of some goods or services of value without receiving any compensation by taking advantage of a landowner's willingness to undertake environmental beneficial actions.

Elizabeth Brubaker (interview, February 3, 2010) suggested policy options that should be studied further in tax incentives and a competitive bidding process. Ms. Brubaker stated that regardless of policy mechanism used, "it always makes sense to pay people for results instead of efforts". Therefore any incentives should be directed to outputs, such as increases in species residing in new habitat, rather than paying for simply for adopting certain land use practice. The would allow landowners the freedom to achieve a goal in whatever way they want rather than directing how a goal should be achieved. Ms. Brubaker believed that, whenever possible, groups or individuals with an interest in a specific resource should pay for it themselves; as is the case with waterfowl

hunters. On the other hand, Ms. Brubaker expressed concern that requiring farmers to provide ecological goods and services through greenspace regulation or the removal of development rights amounts to expropriation without compensation.

David Cooper (interview, March 3, 2010) stated that we are already using tax incentives in Ontario with the Conservation Land Tax Incentive Program and the Managed Forest Tax Incentive Program. These programs exempt lands from property taxes if they meet criteria of important conservation lands or if approved by a Managed Forest Plan Approver as a managed forest. Land that is in agricultural production is assessed tax at a rate of 25% of the municipal property tax rate. Mr. Cooper stated that these are existing programs represent forms of ecological goods and services provision incentives that are annual in nature and are already in place.

Dennis O'Grady (interview, October 19, 2009) suggested that lessons could be learned from the experience of South Nation Conservation with a water quality trading program called Total Phosphorous Management. Under this program, non-farm operations that release effluent from wastewater lagoons during peak flows are allowed to release phosphorous in their effluent provided the buy credits that fund phosphorous loading reduction measures through the South Nation Conservation's Clean Water Program. The Clean Water Program funds activities that reduce phosphorous from entering the waterways from agricultural sources. Mr. O'Grady stated that water quality trading is just one aspect of ecological goods and services policy. According to Mr. O'Grady, ecological goods and services policy is "not always about giving money to landowners. It's about how do you raise awareness for the environment and how to get people to connect with the environment." The educational and informational aspects of

ecological goods and service programs are important as they give landowners a broader array of choices when making land use decisions on their property.

According to Paul Smith (interview, October 30, 2009), some of the most efficient instruments for securing ecological goods and services are trading regimes, like the Total Phosphorous Management program mentioned above, and reverse auctions. Reverse auctions were discussed in Chapter 4 and are used in the Conservation Reserve Program in the United States and Australia's BushTender program. Mr. Smith stated that annual payments into perpetuity may not be the best option. He stated that such payments could be capitalized into land prices and drive up the rental rate of land, thereby competing against agriculture. While I do not share Mr. Smith's characterization of capitalization of ecological goods and services incentives into land prices as a problem, if an objective of OMAFRA is to support agricultural production at the lowest cost than I can understand how capitalization would come in conflict with that objective. Mr. Smith suggested that a limited time acreage-based payments to compensate for the opportunity cost of retiring land from production to a natural state. Mr. Smith believed that providing incentives in the short-term can avoid the problem and capitalization of payments into land rental rates while recognizing that landowners have cost associated with retiring productive land. A question that must be asked is why a landowner would be willing to permanently retire land in exchange for a temporary payment.

Andy Graham (interview, March 1, 2010) reported that Ontario and Canada has experience with using reverse auction competitive bid programs with the Permanent Cover Program from the early 1990's. Mr. Graham stated that a return to this type of program was proposed during in the design of the Agricultural Policy Framework in

2004, but that people had forgotten that had it been used successfully in the past. Mr. Graham perceived the commitment to cost-sharing with landowners to achieve best management practices through the Canada-Ontario Farm Stewardship Program as a reason that reverse auctions have not been used in recent years. Mr. Graham stated that members of the Ontario Soil and Crop Improvement Association would like to see the return of a program that compensated landowners for opportunity costs; especially for some practices such as riparian work.

Tracey Ryan (interview) did not suggest any specific policy options but instead provided a lesson learned from her experience with programs in the Grand River Watershed. First, is that programs should be kept simple if you want participation from farmers. Ms. Ryan stated that, "a farmer is not going to bid on the kilograms of phosphorous they save by implementing a buffer. They're not going to want to cost share that way." She believed that requiring landowners to bid on contracts makes the process unnecessarily complex and would therefore discourage participation.

According to Maxine Kingston (interview, January 14, 2010), Agriculture and Agri-Food Canada is already employing a range of policy options to increase the provision of ecological goods and services. She mentioned programs that focus on establishing best managements practices based on education and awareness building, cost-sharing, technical assistance and regulation. Agriculture and Agri-Food Canada is investigating how the adoption of best management practices could be accelerated through the use of other policy options. An ALUS style annual-payment model is one option available, as are reverse auctions. Ms. Kingston reported that Agriculture and Agri-Food Canada has brought people over from Australia to provide insight on the

BushTender program that was discussed in Chapter 4. According to Ms. Kingston, different mechanisms will work best under different conditions and all options are being considered although no specific options were stated. As of now, Ms. Kingston stated that she, "believe[s] that the Environmental Farm Plan should be the foundation piece for all environmental programs in the country, but for sure in Ontario." The Environmental Farm Plan and the Canada Ontario Farm Stewardship Program are in her opinion, "inexpensive and effective ways to get last change" on the landscape. Other policy options would have to be integrated with the Environmental Farm Plan if they are to be palatable to Agriculture Agri-Food Canada.

The above section presented the views of interview participants on the available policy options to increase the provision of said goods and services. Interview participants spoke of a range of policy options that could be used in Ontario, including: reverse auctions, annual payments, regulation, education and outreach, cost-shares, tradable permits, tax incentives, and acreage-based performance incentives with cost-shares. Interview participants also gave insight into the desired design characteristics of any policy mechanism. These characteristics include are simplicity in design, financial buy-in from landowners and incenting the provision of outputs rather than actions.

Simplicity in the design and delivery of ecological goods and services policy mechanisms was the characteristic most often cited by interviewees. Interviewees believed that simplicity in program design would encourage landowner participation. The idea being that, landowners, who are busy with their farm operations, will not devote significant time or effort to understand and fulfill the requirements of more complex or time consuming programs. While this is a legitimate concern, the question becomes

whether the goal of the policy is to elicit participation from as many people as possible or some other objective? Simplicity is also a moving target; what was complex a few years ago (i.e. smartphones) are now considered commonplace and people have learned and adapted. But let us for a minute assume that increasing complexity in policy mechanism design better ensures that program activities produce desired ecological outputs. If the objective is to target incentives for ecological goods and services provision at those landowners who can cost-effectively supply ecological goods and services of a given quality or quantity, would ensuring participation through simplicity of program design still be highly valued?

Pannell (2010) states that in Australia there is a belief that broad-based participation in environmental programs is essential in order to maximize the ecological benefits accruing from that program. Pannell (2010) suggests that the strongest reasons for favouring broad-based programs over targeted programs are political and that, "the potential gains in environmental values from sound and effective targeting are very large." Untargeted broad-based programs also have the tendency of becoming expensive, as was demonstrated in Chapter 4 with England's Environmental Stewardship scheme. Making participation in a program as simple as possible will encourage adoption, but when encouraging participation comes at the expense of cost-effective provision of environmental benefits, there needs to be questions asked as to the objectives of the program.

Some interview participants noted that the long-term integrity of ecological goods and services provision program activities are enhanced if land-owners buy-in financially to the project. The thinking is that landowners who have committed financial resources

to a project will better manage the project during the contract term and are more likely to keep the land enhancements after the contract term has ended than those who did not make the same financial commitment. Tracey Ryan (interview, February 10, 2010) spoke of landowners feeling ownership for the projects. Ownership in and of itself is more nuanced than most consider and does not necessary lead to ecological ends (Varghese *et al.* 2007). Regardless of whether a landowner makes a financial commitment to a project, they will face the same incentives to retain the project or use the land for some other valued purpose at the conclusion of the contract. I cannot see a clear economic rationale for the perception that financial commitment to a project by the landowner will enhance the permanence of a project and therefore I do not include landowner financial buy-in as an essential characteristic of ecological good and services policy.

Interviewees identified the provision of ecological goods rather than the reduction of environmental harm as an important characteristic of ecological goods and services policy. This point has already been discussed at some length but it is worth expanding on here. Any action that mitigates pollution that constitutes an invasion of another's property rights is considered a reduction of a 'bad'. If, on the other hand, an action mitigates pollution that does not constitute an invasion on another's property, then the activity is considered a 'good'. Distinguishing between ecological good and service 'goods' and 'bads' depends on consideration of the relevant property rights. In addition, the provision of some ecological good or services that does not mitigate pollution but, instead, provides a valuable good or service, such as wildlife habitat or scenic views, is considered a good.

A number of interview participants also expressed a desire for incentives for ecological goods and services provision to be attached to outputs of ecological goods and services rather than to management actions that have anticipated supply of ecological goods and services. This issue is similar to the issue of simplicity of design. Monitoring actions is generally simpler than monitoring outputs. The simplicity of monitoring action may make sense in terms of keeping costs down for a program that desires broad-based participation. On the other hand, monitoring and verifying outputs may make more sense for a more complex approach that is targeted towards increasing the supply of ecological goods and services. I believe that it would be difficult to simultaneously attach incentives to ecological outputs and promote broad participation in an ecological goods and services program. As was discussed earlier, simplicity is a key design characteristic if broad participation is an objective. By attaching incentives to outputs instead of actions a program becomes more complex and thereby decreases the likelihood of broad participation. Again, the objectives of a program will determine whether attaching incentives to ecological outputs is a necessary characteristic of program design.

This section provided an analysis of the policy options for ecological goods and services provisions. This analysis presented the advantages and disadvantages of using a range of policy options in Ontario. It appears that no policy option that is perfect and that a range of options are useful in a range of situations. This analysis also presented the advantages and disadvantages of four characteristics that interview participants believed were essential to successful program design: simplicity in design, financial buy-in from landowners, provision of ecological goods and incenting the provision of outputs. It was found that adherence to these characteristics of program design may be beneficial based

on the objectives of some programs and detrimental to others. The objectives of the program will determine if one or more of these characteristics are applicable.

### *5.3.4 Who holds jurisdiction over ecological goods and services policy in Ontario and Canada?*

Jurisdiction in this section refers the authority or control over the design and implementation of ecological goods and service policy held by specific groups. Interview participants were asked which government ministries have responsibility for the issue of ecological goods and services in Ontario. The purpose of defining lines of jurisdiction in this research is to better understand what groups have the authority to make policy and design programs regarding the issue of ecological goods and services. This section will present the lines of jurisdiction for ecological goods and services policy within government at the Federal and Provincial levels.

Dave Reid (interview, October 10, 2009) had the perception that silo thinking in government has been a barrier to the development of ecological goods and services policy. Silo thinking occurs when government ministries tend to communicate only vertically, within a ministry, rather than horizontally, across ministries. This can be problematic as it is difficult to coordinate inter-ministry activities when communication is limited. Mr. Reid believes that such thinking emerges because each ministry defends what it defines as its turf, so that jurisdiction, and thereby funding, is not given to another ministry.

According to Eric Miller (interview, February 3, 2010), there is an emphasis in the Ontario provincial government's policy development process to communicate horizontally across government silos. Mr. Miller stated that horizontal communication is being promoted both across ministries and within units of each ministry. The provincial

ministries that are involved in policy discussions on ecological goods and services include the Ministry of Food, Agriculture and Rural Affairs, the Ministry of Natural Resources, the Ministry of the Environment, the Ministry of Municipal Affairs and Housing and the Ministry of Finance. According to Mr. Miller this is an ad hoc group that is fluid in its membership. At this time, the group meets as a forum to exchange ideas rather than develop formal policy. Mr. Miller stated that jurisdiction over ecological goods and services policy is collaborative at this point. Although a group is meeting to discuss ecological goods and services policy, it does not appear that this group is advancing ecological goods and services policy forward.

Paul Smith (interview, October 30, 2009) reported that there are three ministries examining the issue of ecological good and services. The Ministry of Natural Resources is examining how economic value can be attached to ecological goods and services. Matt Wilson (interview, January 13, 2010) stated that the Ministry of the Environment is involved more on the enforcement of environmental regulations. OMAFRA's interest is in developing the most effective instruments for delivering benefits from ecological goods and services to society. OMAFRA works with their Federal counterpart, Agriculture and Agri-Food Canada on this issue. Mr. Smith stated that ecological goods and services is an issue where jurisdiction is shared between OMAFRA and Agriculture Agri-Food Canada and therefore OMAFRA would not develop and implement policy on its own. Mr. Smith stated that a formal program governed across jurisdictional lines was unlikely because, "government is not set up in this way". He stated that there is tendency to think in boxes in government and to design programs to address specific problems with specific solutions. This appears to echo the problem, raised by Dave Reid, of the silo

thinking in government. Mr. Smith reported that, "there is horizontality in government, where you try to work across ministries on things where it's a government priority." He identified the issue of climate change as a priority issue that cuts across government ministries and has a coordinated group, in the Climate Change Secretariat, which develops policy across ministries.

Maxine Kingston (interview, January 14, 2010) reported that jurisdiction over setting ecological goods and services policy at the National level rests with Environment Canada. Ms. Kingston stated that there are five federal ministries that have an interest in natural resource issues but that Environment Canada is the policy lead on all environmental issues. Agriculture and Agri-Food Canada would play a role in the policy process through providing recommendations but Ms. Kingston noted that it is usually politicians that make key policy decisions. She noted that if Ontario wanted to go ahead with ecological goods and services policy on its own, it would likely be a decision made by the provincial cabinet or even the premier.

Scott Duff (interview, March 3, 2010) stated that although there is a multi-ministry working group examining ecological goods and services, there are no defined ministerial jurisdictional boundaries. He believed that OMAFRA and the Ministry of Natural Resources have contributed the most to the issue so far provincially. Mr. Duff noted that if ecological goods and services policy emerged as an issue that can be addressed through revamping support for farmers, it would be OMAFRA in the lead of policy in Ontario. If, on the other hand, the goal of ecological goods and services policy is to protect and enhance the environment that Mr. Duff envisions a multi-ministry initiative emerging potentially led by the Ministry of Natural Resources. Either way, Mr.

Duff envisioned a role for OMAFRA in the ecological goods and services policy process. At the federal level, Mr. Duff identified Agriculture and Agri-Food Canada as having been involved the most with Environment Canada also contributing.

Interview participants identified the groups assuming responsibility for the issue of ecological goods and services policy in Ontario. The provincial ministries identified by most interview participants were OMAFRA and the Ontario Ministry of Natural Resources. At the Federal level, Agriculture and Agri-Food Canada and Environment Canada were identified as the ministries with the greatest involvement in this issue. Participants suggested that lines of jurisdiction have not yet been drawn clearly, although some ministries are staking out the areas of responsibility they wish to have in the meantime. It appears that lines of jurisdiction will be better defined when a decision is made as to whether ecological goods and services provision could and should be used as a new method of income support to the agricultural sector or if ecological goods and services provision will be pursued strictly for public good environmental benefits.

David Cooper (interview, March 3, 2010) stated that there is a debate on whether each ministry is approaching the issue of ecological goods and services from a valid position. He pointed out that assigning an economic value to a natural feature that is not exchanged in markets could be a flawed practice because the resulting value is a political one and not an economic one.

*5.3.5 How will ecological goods and services policy integrate with existing policy?*

Policy integration is defined in this research as opportunities to achieve administrative economies of scope by reducing overlap, duplication and inconsistencies amongst existing policies and when introducing new policies. David Cooper (interview, March 3, 2010) stated that there are number of initiatives going on in Ontario that could

be framed as ecological goods and services programs. There is then a need to ask how any new initiative will integrate with them. This section will present the views of interview participants on how new ecological goods and services policy will have to be integrated with existing programs and policies. It is important to understand how new policy proposals can complement or impede the objectives of existing policies and programs.

According to Andy Graham (interview, March 1, 2010), Matt Wilson (interview, January 13, 2010), Scott Duff (interview, March 3, 2010), Maxine Kingston (interview, January 14, 2010) and Paul Smith (interview, October 30, 2009) any new policy that addresses ecological goods and services on private rural land in Ontario will have to be integrated with the Environmental Farm Plan. According to Mr. Graham, the Environmental Farm Plan, "is not going to disappear any time soon. It [has] earned a reputation as a very valuable educational motivational tool. Mr. Duff stated that "we [OMAFRA] are behind the foundation of the [Environmental Farm Plan]". He goes on to state that, "it is our preference to have the [Environmental Farm Plan] front and center in terms of any payments going to farmers and really as an education[al] value in and of itself." Ms. Kingston stated that she, "think[s] the Environmental Farm Plan should be the foundation piece for all environmental program in the country, but for sure in Ontario." Clearly, any new initiative will have to recognize the support that the Environmental Farm Plan has in Ontario and will have to be designed to work with it instead of replacing it.

Steve Scheers (interview, September 16, 2009), an ALUS organizer, stated that problems could arise integrating payments for ecological goods and services policies with

Species at Risk legislation. This issue was addressed to some degree in 5.3.3 in the section discussing the advantages and disadvantages of regulation as a policy instrument. There is worry that incentives given to increase wildlife habitat could end up being detrimental to the landowner because of the regulatory requirements of the Species at Risk Act. For example, a landowner could increase the potential habitat on his/her property for the American badger through an ecological goods and services program. If a badger decided to make use of this new habitat the landowner would be subject to regulations under the Species at Risk Act, including a regulation requiring that any ground squirrel or groundhog holes within 850 metres of the badger habitat not be filled in. If the landowner is a livestock farmer and the 850 metre perimeter extends onto his grazing fields, there is potential for livestock injuries. The farmer would therefore be putting his agricultural operations at risk of facing increased costs by agreeing to provide new species at risk habitat. Mr. Scheers stated, "native species, especially species at risk, on private property should be celebrated and rewarded and should be a source of pride rather than [be subject to] regulatory takings". Development of ecological goods and services policy in Ontario must consider these kinds of unintended side-effects and avoid them.

This section provided comments on two policies that ecological goods and services policy will have to be integrated with-in Ontario. There are other policies and programs that ecological goods and services policy will have to be integrated with, but the policies and programs that need to be integrated with will depend on the policy option used. It is necessary to ensure that ecological goods and services policy does not create

perverse incentives or other unintended consequences because of the requirements of existing laws or regulations.

*5.3.6 Where will funding for ecological goods and services provision be obtained?*

The ecological goods and services programs reviewed in Chapter 4 were all similar in the fact that at least a portion of funding for program operations and administration came from taxpayers. Interviewees assumed that the same will be the case when a policy framework for ecological goods and services is implemented in Ontario. This section presents the perceptions and insights of interview participants related to where that funding would come from, whether sufficient funding would be available and whether funding could be shifted from other sources to support ecological goods and services provision.

Maxine Kingston (interview, January 14, 2010) stated that majority of funding for agri-environmental programs is through the federal government and Agriculture and Agri-Food Canada from taxpayers. According to Andy Graham (interview, March 1, 2010), the Agricultural Policy Framework, Agriculture and Agri-Food Canada's policy framework that was introduced in 2004, centralized decision making and attempted to unify agri-environmental programming across the provinces. On the other hand, Growing Forward, Agriculture and Agri-Food Canada's agricultural policy framework that began in 2009, provides funding directly to provincial agriculture ministries, OMAFRA in the case of Ontario, and allows them to decide on their own agri-environmental programming agenda. Ms. Kingston reported that provincial government programs are generally more specialized, like the Species at Risk Stewardship Program from the Ontario Ministry of Natural Resources. Therefore, if there is desire for ecological goods and services policy to have a broad scope, than funding would have to

come from the federal level even though decision making, in terms of how that funding is used, lies with the province. If a more targeted and specialized policy is desired than there is potential for funding to come from the provincial level.

There is a question as to the political and economic feasibility of using taxpayer funding to support a provincial ecological goods and services program. Dennis O'Grady (interview, October 19, 2009) reported that government money is limited and that funding for any new program would have to come at the expense of existing programs. Shifting funding from existing programs is option that should potentially be studied. In order to shift funding from existing programs both economic and political feasibility must be established. Though a new program may be desirable economically, if the funding is taken from a program that is popular with a particular interest group, it may be difficult or damaging to implement politically. That is not to say that this is not a viable option, it just needs recognized that political concerns can play as large as role as economic.

Elizabeth Brubaker (interview, February 3, 2010) asked, "is the government the best body to provide [ecological goods and services] programs?" She believes that they may be but that it is hard to speak for all tax-payers. Her ideal situation is when a group like Ducks Unlimited contracts directly with farmers to conserve their wetlands for waterfowl habitat. These situations are ideal because they are private agreement between two consenting parties that are both free to enter into contracts and taxpayers are not asked to contribute. This situation may be ideal, but at this point many ecological goods and services are not being exchanged in this way. Klimas (2007) offers a number of ways to overcome the impediments to market exchanges of ecological goods and services including: increased enforcement and monitoring of property rights, using landowner

organizations or clubs to provide information on buyers and standard templates for transactions, organizing ecological goods and services into club goods and employing intermediaries to reduce search and negotiation costs.

The above section presented the perceptions of interview participants on how ecological goods and services policy would be funded. Interviewees believed that it would be difficult to find new taxpayer funding for a broad ecological goods and services program in Ontario. Additionally, issues that could arise if funding was shifted from existing programs to ecological goods and services programs were presented. Policy options that do not require the use of taxpayer funding were presented as alternative options, although there are limitations to using these approaches as well.

*5.3.7 How can benefits become permanent?*

Permanence, in the case of ecological goods and services policy design, refers to the retention of land conservation, restoration or enhancements activities as a feature of the landscape after the conclusion of participation in an incentive program. Interview participants commented on mechanisms that could increase the likelihood that landscape improvements become permanent parts of the landscape.

Dennis O'Grady (interview, October 30, 2009) stated that the conservation agreements that South Nation Conservation Authority and other Conservation Authority enter into with landowners when implementing projects. These agreements ask the landowner to commit the land to specific land use for fifteen years. The agreement is not written into the title of the land and is not legally binding. These agreements rely on the landowner adhering to their commitment through personal desire to remain true to their word. Mr. Ryan reported that the Grand River Conservation Authority uses these conservation agreements when contracting with landowners. In their experience, 98% of

landowners have retained their landscape enhancements throughout the term of their agreement and beyond.

The permanence of landscape enhancements achieved by Grand River Conservation Authority may be attributable to factors other than the conservation agreement. Indeed, Ms. Ryan noted that the Grand River Conservation Authority plants trees in all retirements of working farmland because trees are more costly and difficult than grasses to remove and return to agricultural production. Tree planting may be appropriate for providing some ecological goods and services but other options, like tall grass prairie plantings, can supply a different suite of ecological goods and services that cannot be supplied by tree plantings. Therefore, relying on tree planting to increase retention of landscape enhancements may mean forgoing opportunities to provide other ecological goods and services. Tree planting also may not be appropriate in all places as trees are not a natural feature of the environment in all parts of Canada and may not be suitable in some cases in Ontario. In addition, certain ecological goods and services cannot be provided by trees or lands planted predominantly with trees.

Ms. Ryan also spoke briefly on why Grand River Conservation Authority determined the conservation easements were not the preferred methods of increasing permanence. A conservation easement includes the transfer of the right to use the land from the landowner to another party. Title of the land remains with the landowner but the party that obtained the usage rights determines how the land is used at least in part, depending on the terms of the easement. The ownership of usage rights are written into the title of the land and are transferred if ownership of the land changes. Conservation easements are used to ensure that land will remain in a specified state into perpetuity and

are legally binding. Ms. Ryan stated that landowners did not want to give up the right to make future decisions on their land through entering into a conservation easement. I would argue that it depends on the prices of easements offered to landowners. Interest in using easements would be expected to increase as the price offered through easements increases. Nonetheless, Grand River Conservation Authority decided that their conservation agreements would sufficiently ensure permanence.

It is understandable why landowners would like to retain the right to make future decisions on their land. If commodity prices change so that it becomes profitable for a farmer to restart agricultural production on what was once marginal farmland, they want to be able to make that decision. Policies that allow landowners this level of flexibility would be expected to have increased participation. As has become a common theme in this chapter, if the objective of the policy is to increase participation from landowners then this characteristic of policy will be valuable. On the other hand, if the objective of the program is to secure the provision of ecological goods and services for the future, then ensuring permanence through the purchase of conservation easements may be a better option, acknowledging that landowner acceptance of a policy using that instrument may be decreased.

Another option that incorporates aspects of both flexibility and permanence are long term renewable contracts such as those used in the Conservation Reserve Program. Contracts are signed for 10 – 15 years and penalties exist for breaking the contract before its conclusion. Landowners who exit the contract early must reimburse a portion of the incentives they received for participation based on the length of the contract and the degree that the contract had been fulfilled. This type of contract allows landowners

flexibility in decision making but also provides disincentives from exiting the contract early. Contracts are eligible for renewal at their conclusion if the landowner and contracting agency decide that renewal would be mutually beneficial. Once a contract has concluded, landowners can once again decide freely how they wish to use their land.

*5.3.8 How should programs be delivered?*

According to Andy Graham (interview, March 1, 2010), government employed extension agents used to be the standard deliverers of programs. This method of delivery started to change in the late 1980's. OMAFRA decided to employ the Ontario Soil and Crop Improvement Association as third-party delivery agents starting in 1987 and Agriculture Agri-Food Canada soon followed suit. Since then, the Ontario Soil and Crop Improvement Association has been the standard delivery agent for all agri-environmental programs in Ontario. Ontario Soil and Crop Improvement Association employs farmer representatives to deliver programs across the province. All field representatives work part-time and are farmers or are part of farm families.

By the mid-1990s OMAFRA no longer used extension agents for one-on-one technical assistance on farms. Mr. Graham stated that this change occurred not because farmers wanted it, they did not, but because budget constraints required the change. According to Mr. Graham, the, "one-on-one assistance at the farm level, I won't doubt a minute that the farmers greatly enjoy it and would want to see that type of thing continue." But, at this point, he does not see OMAFRA taking on that role again.

Interview participants commented that ideally programs would be delivered by groups or individuals as close to the landowners as possible. Dennis O'Grady (interview, October 19, 2009), Tracey Ryan (interview, February 10, 2010) and Jo-Anne Rzadki (interview, February 11, 2010) stated that Ontario Conservation Authority's have

approached landowners to participate in their programs through employees that had experience in agricultural. The belief is that farmers are more likely to participate if they are approached by other farmers. Ms. Rzadki stated that the delivery agent does not have to necessarily be a farmer themselves but that it is familiarity and experience that is key to making landowners feel comfortable. Anne Loeffler (interview, February 10, 2010) stated that in her experience, the fact that she did not have a background in farming was not a hindrance after she had built relationships and trust in communities.

It appears that the credibility and trustworthiness of the delivery agent or organization and the familiarity that landowners have with them may have an effect on the likelihood that a landowner will participate in a program. Initially, there may be rationale for farmers to be used as delivery agents because their initial acceptance as credible by a landowner may be great than an outsider. This effect could decrease as the credibility and trustworthiness of the delivery agent or organization is established through their actions and this information is passed through social networks. It is not within the scope of this research to establish if this is indeed the case. Rather, when proposing an ideal framework for ecological goods and services policy in Ontario, the fact that non-farmer delivery agents have been successful in connecting with landowners will be taken into consideration.

*5.3.9 How are the benefits monitored and verified?*

Interview participants were asked to comment on how the activities of an ecological goods and services provision program should be monitored and verified. Monitoring and verification of program outcomes is important in order for the process to remain transparent and accountable. For example, government needs to show taxpayers that their money, if invested by government in ecological services provision, is resulting

in measureable outcomes. According to Jo-Anne Rzadki (interview, February 11, 2010), if taxpayers are asked to pay for ecological services provision programs, "there needs to be some way of evaluating [whether] those benefits are happening". That means monitoring and verification of environmental outputs and not just actions.

Scott Duff (interview, March 3, 2010) suggested that OMAFRA has not, "done the greatest job on [sic] documenting environmental improvement or estimated environmental improvements that you might expect to see from different practices". He stated that monitoring of the number and type of best management practices and the dollars that have been spent, from government, landowners and other agencies, on implementing those practices in Ontario is done instead. Mr. Duff acknowledged that the information to undertake monitoring of environmental benefits does exist and is available but that it has not yet been made a part of OMAFRA's formal evaluation and reporting framework. This kind of monitoring has not been including in this framework up to this point because (1) it is complex; (2) it has been difficult deciding what outputs to measure; (3) it has been difficult deciding how measure them. Ms. Rzadki expressed similar concern as to whether, "we have a really good handle on what key indicators we should be monitoring". Mr. Duff reported that OMAFRA is working to get consensus so that barriers number (2) and (3) can be addressed. Currently OMAFRA is working on quantifying the benefits of best management practices. Mr. Duff stated that monitoring and verification is increasingly being recognized as a priority by OMAFRA and procedures are being formalized.

It is worth noting how government provision of ecological goods and services compares to market provision of ecological goods and services on the point of monitoring

and verification. It is necessary for the government to prove to taxpayers that their money is being well spent through ecological goods and services programs. The same is not necessary when ecological goods and services are obtained through market exchanges. For example, when you go to a theme park, who audits the entertainment value? The reflection of the individual determines whether the entertainment value of the theme park was worth the price of admission. No such mechanism exists when the government obtains ecological goods and services through non-market mechanisms. Therefore, the government engages to complex monitoring and verification procedures in order to convey to taxpayers that the expense of provide ecological goods and services is worthwhile.

Formalized monitoring and verification procedures may not always be ideal. David Cooper (interview, March 3, 2010) stated that if monitoring and verification procedures place an additional onus on the landowners to demonstrate program success, they may be reluctant to join such a program. Mr. Cooper pointed to a debate that occurred when the Environmental Farm Plan was being implemented about farmers' proprietary information being shared. There was a suggestion that the Environmental Farm Plan could be used as a tool to demonstrate a farmer's compliance with legislation. Farmer's were resistant to this idea because they did not want their private information made public. Once again, resolving this issue is a question of whether promoting program participation or securing the provision of ecological goods and services is the objective of the policy. If participation is sought after, then monitoring and verification should place as little onus on the landowner as possible. If provision of ecological goods

and services is the main objective, then there is justification for more intensive monitoring, even if it means decreased likelihood of participation from some landowners.

According to Elizabeth Brubaker (interview, February 3, 2010), "it always makes sense to pay people for results rather than actions." While I agree in principle, it comes down to the practicality of implementing monitoring and verification procedures. Extensive monitoring and verification would indeed make a program more transparent and accountable but undertaking such monitoring and verification has real costs. The questions is whether the cost-effectiveness of supplying ecological goods and services through a program that has extensive monitoring and verification procedures is greater than a program that has relatively simple monitoring and verification procedures. I expect that the answer to this question would vary based on the goods or service being monitored, how it is being monitored, and the extensiveness of the monitoring. Therefore, ecological goods and services that can be easily monitored and verified should by all means be monitored and verified, as there are real benefits in measuring and quantifying environmental benefits directly. On the other hand, ecological goods and services that are more difficult or costly to monitor should be monitored through a proxy, such as acreage that is expected to produce that ecological goods or service, until direct monitoring and verification is viable.

### 5.4 Lessons learned from interview participants on ecological goods and services policy in Ontario

In this chapter, results from interviews on ecological goods and services policy with individuals identified as having policy responsibility in Ontario have been presented. I have critically evaluated and assessed the results from these discussions. This critical analysis now allows me to provide lessons learned pertaining to ecological goods and

services policy development in Ontario. These lessons will be broken down into three sections. First, an evaluation of the current state of ecological goods and services policy will be provided. Second, the obstacles to ecological goods and services policy progress will be summarized. Finally, I will suggest what should be accomplished in the policy development process over the next year.

*5.4.1 Current state of ecological goods and services policy development in Ontario*

Ecological goods and services policy development in Ontario appears to be stagnant at this time. There is no indication that the development of ecological goods and services policy is a government priority right now either provincially or federally. There is precedence in a province striking out on their own in terms of ecological goods and services policy in PEI, but it appears that Ontario and specifically OMAFRA is waiting for leadership on the issue to come from the federal level. This could potentially be a long wait; the provinces seem to be divided on how ecological goods and services policy should be developed.

Government is not the only sector where a coherent unified direction for ecological goods and services development does not exist; the agricultural sector does not have a unified position on policy development either. Some agricultural groups are supportive (Christian Farmers Federation of Ontario) of the approach used by ALUS while others are opposed (Ontario Federation of Agriculture) to the approach used by ALUS.

Regulation that forces landowners to supply ecological goods and services from their property without compensation is a common policy option used by the Ontario government. Legislation like the Species at Risk Act leads to regulatory takings from private landowners. The agricultural sector has been vocal about their opposition to the

'stick' approach of regulation and are looking for the government to provide some 'carrots' in the form of incentives.

The Environmental Farm Plan appears to the policy foundation for ecological goods and services policy in Ontario from which further policy responses can be developed and integrated. Modifications to the Environmental Farm Plan in terms of using additional incentive mechanisms for the provision of ecological goods and services appear to have potential and have not been ruled out at this time.

There appears to be general agreement on some aspects of ecological goods and services policy. For one, there is a general consensus that incentives for ecological goods and services provision should be available to any landowner and not limited to only agricultural producers. This is an issue of fairness and the consensus has it right.

A second area of consensus exists in the fact that any ecological goods and services policy should include an education and outreach component. The transmission of critical and new information to potential suppliers (landowners) as well as to taxpayers is going to be a feature of any ecological goods and services policy in Ontario.

An additional area of consensus exists in how ecological goods and services policy should be delivered. Interview participants acknowledged that delivering programs through an agent that is familiar to the landowner can increase program uptake. That being said, there were differing opinions on what groups qualify as being familiar to landowners.

*5.4.2 Obstacles to ecological goods and services policy development in Ontario*

There are a number of obstacles that are slowing progress towards the development of ecological goods and services policy in Ontario. For one, the issue of ecological goods and services provision is still infancy in Ontario. Therefore, some

initial conceptual confusions and controversies still exist that must be addressed. Chief among these obstacles include the lack of a consistent definition of ecological goods and services. Each definition of ecological goods and services that exists run now appears to bear direct relation to the interests of the group espousing it. A consistent, clear definition of ecological goods and services could help the policy development process move forward.

There is no agreement on the ideal policy option to incent the provision of ecological goods and services. Regulation seems to be the default policy response at this time but, as stated above, there is opposition to the regulatory takings that stem from regulation dictating what landowners are forced to supply without compensation. Cost-shares are also currently in favour because of their use in conjunction with the Environmental Farm Plan and the Canada-Ontario Farm Stewardship Program but there is support for a range of policy options including ALUS style annual payments, reverse auctions, permit trading and tax incentives. The choice of policy option or combination of policy options is a difficult obstacle that must be overcome.

The potential costs of implementing ecological goods and services policy are perceived to be high and represent an obstacle to policy development at this time. This obstacle exists because of a lack of information on what the potential costs may be. This research, Chapter 6 in particular, represents the first attempt to calculate the potential costs of ecological goods and services policy in Ontario.

It is unclear what level of government and which government ministries are going to be responsible for developing, implementing and administering ecological goods and services policy. Part of this issue is due to the fact that it is not clear if ecological goods

and services policy will emerge as a means of enhancing farm incomes or as a means to secure valuable goods and services from rural Ontario. Resolution of this issue is critical in determining where jurisdiction over ecological goods and services policy lies in government.

*5.4.3 Direction for ecological goods and services policy in Ontario over the next year*

Over the next year the development of ecological goods and services policy in Ontario would be expedited by the achievement of the following objectives. First, a clear, consistent definition of ecological goods and services should be developed that recognizes actions that provide environmental 'goods' and excludes actions that lead to the reduction of environmental 'bads'. This definition should be communicated to all groups and organizations with stake in ecological goods and services policy and should become the standard definition used in Ontario and Canada.

Second, a decision needs to be made as to whether ecological goods and services policy will be used to enhance farm incomes or as a means of securing valuable environmental goods and services from the countryside. I suggest the latter option but understand and acknowledge that the former could be a more politically palatable option. This is a critical decision and will determine the direction of many aspects of policy development including which level of government and which ministry is responsible for policy development, the preferred choice of incentive mechanism and whether the program is broad-based or targeted.

Finally, lessons should be continue to be derived from pilot projects in Ontario and Canada, experiences with ecological goods and services policy in PEI and internationally and debate on policy issues amongst groups and individuals with policy responsibility in Ontario. Ecological goods and services policy will be developed in a

dynamic environment and will be a constantly moving target. It will be necessary to reassess the context under which ecological goods and services policy is being developed, implemented and administered constantly.

## 5.5 Conclusion

The purpose of this chapter was to develop an understanding of the state of ecological goods and services policy in Ontario. In order to fulfill this purpose, this chapter was divided into three main sections. First, the process of using in-depth interviews in this research was presented. Second, the results from conducting in-depth interviews were presented. This section was separated into sub-sections; each addressing an issue in ecological goods and services policy design. The final section of this chapter presented the lessons learned from the analysis of the results from the in-depth interviews. The purpose of this chapter was fulfilled by meeting the following objectives:

1. Described the in-depth interviewing process as applied in this research
2. Presented the views, perceptions and opinions of interviewees on issues of importance to ecological goods and services policy development in Ontario

# Chapter 6 – Supply of Ecological Goods and Services in Ontario

## 6.1 Introduction

This chapter presents a preliminary estimate of the inventory of ecological good and services producing private rural agricultural land and the potential costs of enrolling that land in a payment for ecological goods and services program in Ontario. This chapter also contains a discussion of opportunities for policy integration and a supply analysis. This information adds context to discussions about the potential fiscal implications of a government run ecological goods and services provision program by providing cost projections. The estimates contained in this chapter represent upper-bound estimates of the land that could be enrolled in an ecological goods and services program in Ontario.

The ArcGIS suite of programs was used to generate the data for this analysis using GIS map layers from Agriculture and Agri-Food Canada, the Data Research Center at the University of Guelph and the Ontario Ministry of Natural Resource's Land Inventory of Ontario. The data from this analysis were then used to analyze the potential costs of an environmental goods and services provision program in Ontario under scenarios based on participation and payment rates. The purpose of this chapter is to better understand the context of ecological goods and services in Ontario.

The method used in this analysis follows from Sparling *et al.* (2008) who estimated the nature and extent of lands that would qualify for an environmental goods and service provision program in Manitoba. Sparling *et al.* estimated the number of acres in Manitoba that would be eligible for environmental goods and service payments under four types of land: riparian areas,

wetland, upland areas[8] and ecologically sensitive lands. Sparling *et al.* used this estimate of the number of acres to characterize the total costs and benefits associated with a provincial environmental goods and services program. This analysis differs from Sparling *et al.* because they also included a calculation of projected benefits while this analysis will not include such a calculation. This analysis also differs from Sparling *et al.* in how eligible lands are identified in the GIS analysis because of the availability of data for Ontario was different from what was available in Manitoba.

This chapter begins with a description of the data, GIS processes and assumptions used to calculate the inventory and current supply of ecological goods and services in Ontario. This is followed by a presentation of the results of the GIS analysis. This section includes an analysis of the results and projection of the costs of a payment for ecological goods and services program in Ontario. This chapter concludes with a discussion and conclusion. Calculation using GIS are not perfect as the results are only as good as the data and processes used in the calculated. Therefore the data limitations of this GIS analysis will be discussed in this section. Implications stemming from this analysis are derived for ecological goods and services policy in Ontario.

**6.2 Description of GIS Analysis Data, Processes and Assumptions**

In order to clearly explain how I calculated the results of this GIS analysis I will first explain the data, processes and assumption used in the GIS analysis. GIS data were obtained from Agriculture and Agri-Food Canada, the Data Research Center at the University of Guelph, Natural Resources Canada and the Ontario Ministry of Natural Resource's Land Inventory of Ontario. The data layers collected included:

[8] Upland areas refer to natural woodlands and grasslands.

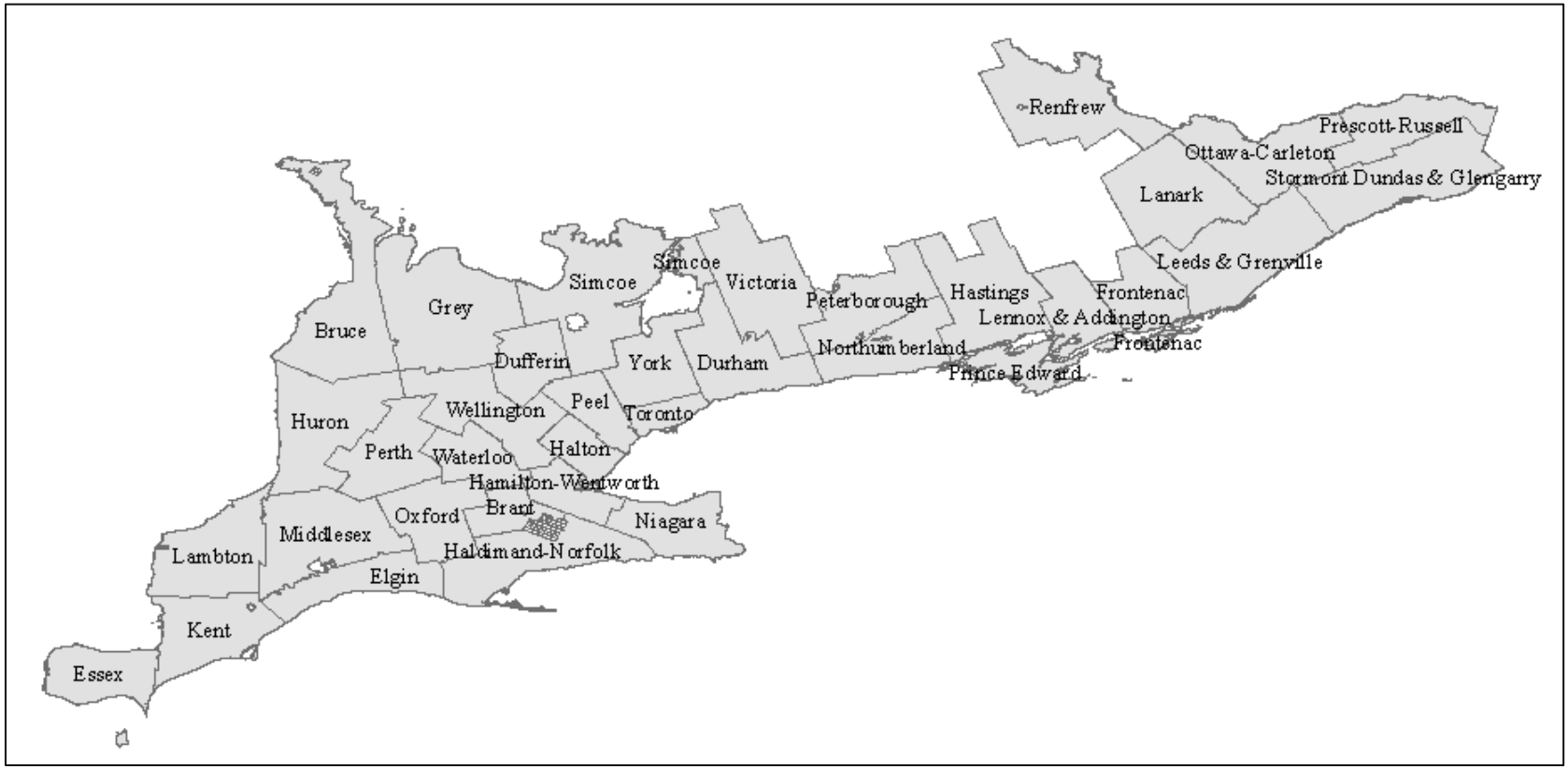
- Detailed base map of Ontario
- County boundaries
- Land cover classifications
- River and stream networks
- Soil class data
- Lot data[9]
- Protected or public lands
    - Conservation Areas
    - Wildlife Management Areas
    - Wildlife Refuges
    - Parks (Municipal, Federal and Provincial)
    - Road Allowances
    - Crown Leased Land
- Agricultural land rental rates

The scope of this GIS analysis is limited to Southern Ontario. Figure 6.1 displays the area of Southern Ontario included in this analysis. Southern Ontario is the most populated area of the province and contains the majority of productive agricultural land. This area includes all or parts of thirty-five counties. Most counties were included in full, except for: Peterborough, Hastings, Lennox & Addington, Frontenac and Renfrew. Portions of these counties were removed from the analysis because I determined that they did not include significant agricultural lands.

Certain urban areas were also removed from the analysis because their inclusion would lead to the identification of lots in urban areas from which ecological goods and services would be estimated.[10] The urban areas removed from the analysis were removed on the basis of the border of the municipality. Unfortunately, municipal boundaries encompass more than just urban areas and therefore the decision to remove each urban area was done on a case-by-case basis. I determined if a municipality should be removed from the analysis on the basis of whether

[9] Land Inventory Ontario (2007) defines a lot as a surveyed area that subdivides a township.
[10] The municipalities removed were: Windsor, Orillia, St. Thomas, Barrie, Guelph, Stratford, Goderich, Waterloo, Kitchener, Orangeville, Mississauga, Peterborough, Coburg, Toronto and Newmarket. All other municipalities remain in the analysis.

Figure 6.1 Map of Southern Ontario with County Labels




Source: Author's map derived from GIS data from the University of Guelph's Data Research Center

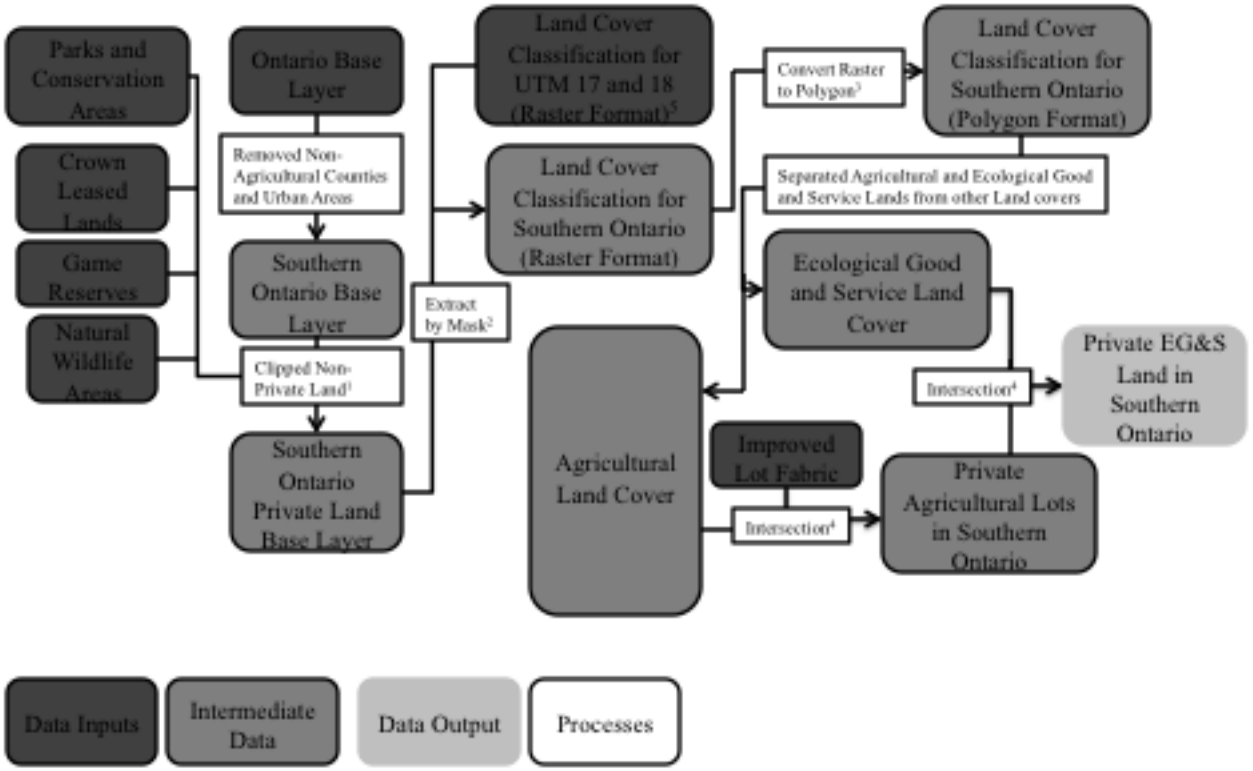
significant lots of rural land fell inside the municipal boundaries. I acknowledge that the urban areas removed contain some rural land that will then not be counted in the analysis. At the same time, the inclusion of other urban areas leads to the inclusion of lots and therefore potential ecological goods and services producing lands within urban areas. The area in the scope of this research will be referred to as Southern Ontario in this chapter.

Figure 6.2 presents a chart showing the data and GIS processed used to calculate the inventory of ecological good and services producing forests, wetlands and grasslands on private land in Southern Ontario. The darkest shaded boxes in this chart represent data inputs, the next darkest shaded boxes represent intermediate data layers in the GIS analysis, the lightest shaded boxes represent data outputs and outlined unshaded boxes represent the GIS processes used to create data layers. Arrows originate from data sources and go through GIS processes before resulting in new data layers and the arrowhead.

The first step in Figure 6.2 is related to setting the scope of the analysis as non-agricultural counties; portions of counties and urban areas were removed from the Southern Ontario base layer. This process was described above.

The next step was the removal of non-private lands from the analysis. As parcel data differentiating between private and public land were not available at the time of the GIS analysis. The Ontario Ministry of Natural Resource's Land Inventory of Ontario reports that parcel data delineating between private and public land is currently in progress. Incorporating this data into this type of analysis in the future will increase the relevancy of estimates. Therefore another method for identifying private agricultural land was

Figure 6.2 – Data inputs, intermediate data and processes used in GIS to calculate the inventory of private ecological good and services producing lands in Southern Ontario




1. A clip refers to the GIS process of removing parts of the base layer, in this case the Southern Ontario Base Layer, that overlap with another data layer.
2. Extract by mask is a GIS process which extracts the information in a given data layer based on where that data overlaps with another data layer. This process is used for data in raster format.
3. Convert raster to polygon is a GIS process to convert data in raster format to polygon format. This was necessary because areas cannot be calculated in raster format.
4. An intersection creates a new data layer based on combining the information contained in two data layers where they intersect.
5. The Universal Transverse Mercator (UTM) coordinate system is a grid-based method of specifying locations on the Earth's surface. UTM zones 17 and 18 contain Southern Ontario.

necessary. The first step used in an attempt to limit the scope of this analysis to private land was to remove lands that are known to be public from the analysis. To do so, data on conservation areas, national and provincial parks, natural wildlife reserves and sanctuaries and crown-leased land were combined and clipped from the Southern Ontario base layer. A clip is a GIS process used to remove part of a data layer based on where it overlaps with another data layer. In this case, public lands were clipped from the Southern Ontario based layer.

With the scope of the Southern Ontario base layer prepared it could now be used to set the scope of the land cover classification data. The land cover data used came from the Circa 2000 Land Cover for Agricultural Regions of Canada produced by Agriculture and Agri-Food Canada and was based on 2000 satellite imagery. This data came in two layers depicting land cover classifications in 30 meter by 30 meter pixels for land in Ontario and Quebec falling in Universal Transverse Mercator (UTM) zones 17 and 18. The Universal Transverse Mercator (UTM) coordinate system is grid-based method of specifying locations on the Earth's surface. Ontario spans UTM zones 15, 16, 17 and 18 though Southern Ontario is contained in zones 17 and 18.

A process called 'extract by mask' was used to clip the land cover classification data layer to the extent of the Southern Ontario base layer. Extract by mask is a GIS process which extracts the information in a given data layer based on where that data overlaps with another data layer. A clip is a GIS process used to remove part of a data layer based on where it overlaps with another data. An extract by mask is essentially a clip used on raster data. Satellite data is typically stored in raster format as a matrix of pixels to define where feature are located. The land cover classification data was also in raster format

and it was necessary to convert it to vector format because it is not possible to calculate the area of data in raster format.

Once in vector format, it was possible to separate out individual land cover classes into separate layers. The land cover classification data layer was originally delineated into the following land cover classes:

- Water
- Exposed rock
- Built-up
- Shrubland
- Wetland
- Grassland
- Annual Crops
- Perennial Crops
- Pasture
- Coniferous
- Deciduous
- Mixed forests

Following Sparling *et al.* (2008) a number land cover classifications were not used in this analysis because they were not considered to be potential ecological good and service producing lands. For example, a land cover class identified areas of exposed rock. Exposed rock is not considered to have the potential to provide ecological goods and services and therefore was not included in cost projections. The following land cover classifications were not used in the GIS analysis:

- Water[11]
- Exposed rock
- Built-up
- Shrubland

[11] Although the water layer could potentially identify areas that could supply ecological goods and services, it was not used in the GIS analysis because of the inclusion of the river and stream network data that was later used in the calculation of existing and permanent riparian buffers.

The land cover classes that remained in the analysis were grouped into four broad categories. This is appropriate for this analysis because, for the sake of making cost projections, it does not matter whether a forest is made up of deciduous, coniferous or mixed trees. Therefore, coniferous, deciduous and mixed forests were grouped together as forest covers. Similarly, annual crops, perennial crops and pasture were grouped together as agricultural land covers. The following land cover classes were included in the GIS analysis:

- Wetland
- Grassland
- Agricultural[12]
- Forest[13]

Wetlands, grasslands and forests were combined into one layer representing potential ecological good and service producing lands. Agricultural land cover data were separated into another layer.

The next step further limited the scope of this analysis to private agricultural land. The best available data layer for this purpose was determined to be the improved lot fabric data for Ontario from the Ontario Ministry of Natural Resources. A lot is a portion of a concession that can include multiple parcels of land. These data also included road allowances, which were removed from this analysis. Although individual parcels cannot be distinguished with these data and they do not delineate between private and public ownership, the can be used to determine the area of land that is wetland, grassland or forest that exists in the same lot as agricultural land. This is not an ideal method of determining the quantity of potential EG&S supplying land types on private land but it is

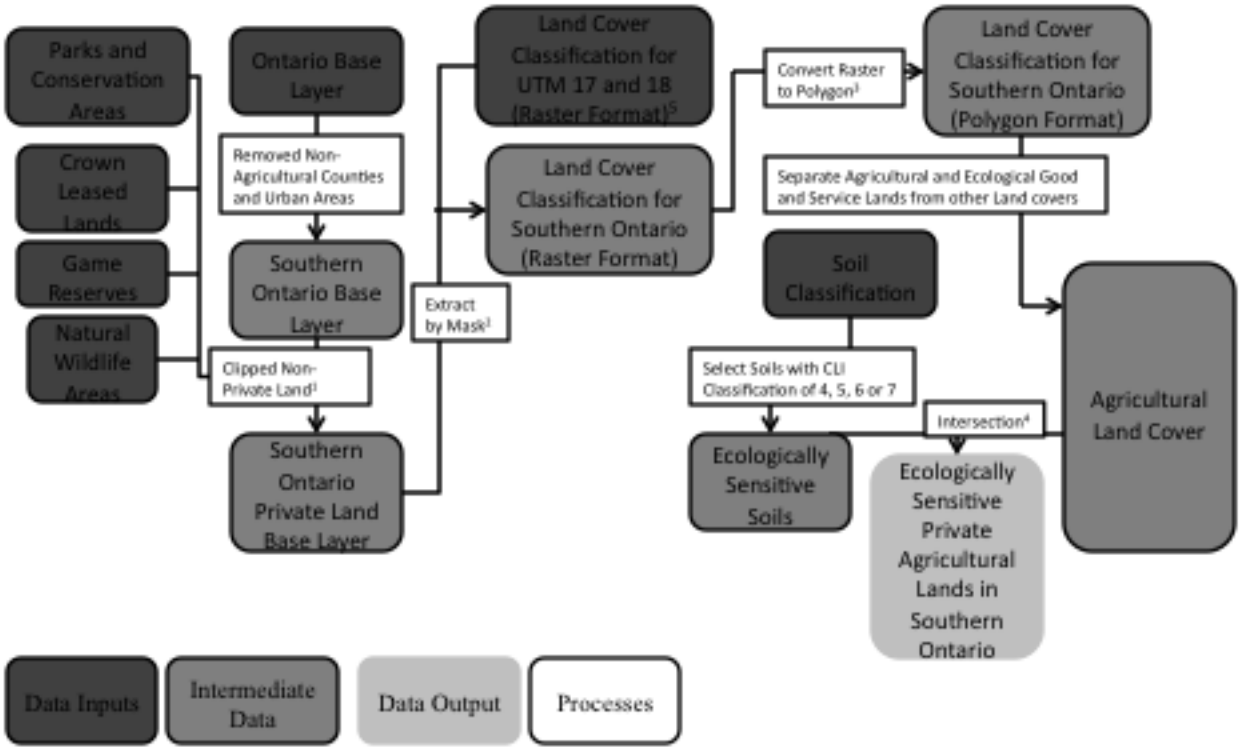
[12] Agricultural land cover is made up of annual crops, perennial crops and pasture
[13] Forest land cover is made up of coniferous, deciduous and mixed forests

the best available proxy until parcel data delineating between private and public land parcels in Ontario are available.

The improved lot fabric data were intersected with land cover data identifying agricultural land in order to identify all lots that include agricultural land in Southern Ontario. An intersection is a GIS process that creates a new data layer based on the data from where two data layer overlap. For the purpose of this analysis, the lots that contain agricultural land are assumed to be privately owned. These private agricultural lots were then intersected with the land cover data representing ecological goods and services to calculated the inventory of ecological goods and services producing lands on private land in Southern Ontario.

Figure 6.3 presents a chart representing the data and processes used to calculate the inventory of ecologically sensitive agricultural land in Southern Ontario. The calculation uses the same data and processes up to the point where agricultural and ecological good and services land covers were separated from the original land cover layer. At this point soil data for Southern Ontario were used to differentiate between soil classes. Following Sparling *et al.* (2008), land classes 4, 5, 6 and 7, as identified according to the Canadian Land Inventory system of soil capability classes, were assumed to be ecologically sensitive. Soils classified as 4 or higher have limited to no agricultural productivity and farming in these soils could lead to deterioration of the soil. Ecologically sensitive soil data were intersected with agricultural land cover in order to obtain an estimate of ecologically sensitive lands in Southern Ontario. Ecologically sensitive lands were identified as those lands that which are currently in agriculture but

Figure 6.3 – Data inputs, intermediate data and processes used in GIS to calculate the inventory of ecologically sensitive lands on private agricultural land in Southern Ontario

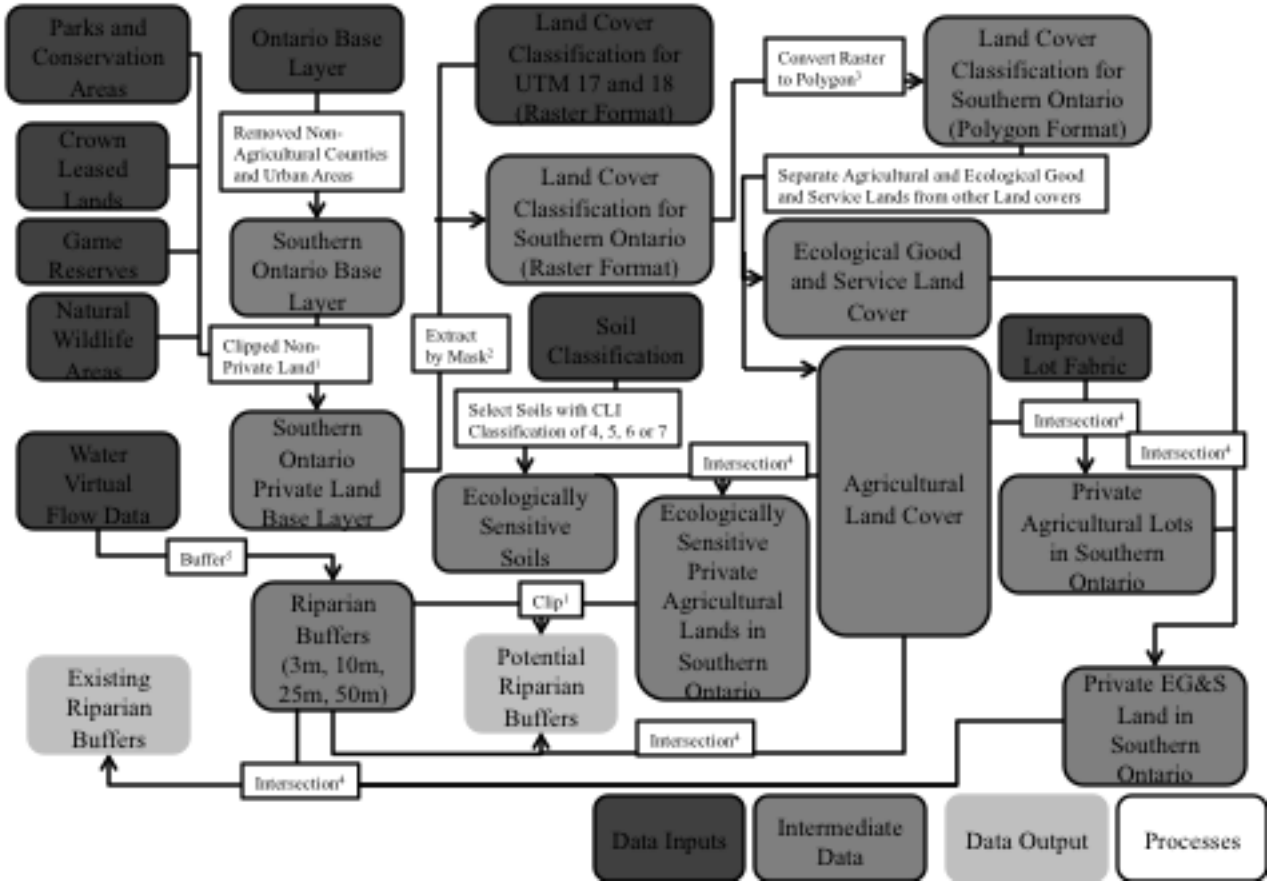



1. A clip refers to the GIS process of removing parts of the base layer, in this case the Southern Ontario Base Layer, that overlap with another data layer.
2. Extract by mask is a GIS process which extracts the information in a given data layer based on where that data overlaps with another data layer. This process is used for data in raster format.
3. Convert raster to polygon is a GIS process to convert data in raster format to polygon format. This was necessary because areas cannot be calculated in raster format.
4. An intersection creates a new data layer based on combining the information contained in two data layers where they intersect.
5. The Universal Transverse Mercator (UTM) coordinate system is a grid-based method of specifying locations on the Earth's surface. UTM zones 17 and 18 contain Southern Ontario.

are relatively less productive for agricultural uses, because of poor soil quality, and may cause environmental harm if mismanaged.

Figure 6.4 presents a chart describing the data and process used to calculate both existing and potential additional riparian areas. In order to calculate existing and additional potential riparian areas it was necessary to use the processes described in Figures 6.2 and 6.3. Therefore, Figure 6.4 again depicts those data and processes used in those Figures. Data on waterways was represented by Water Virtual Flow data from the University of Guelph's Data Resource Center. Riparian areas were identified by creating buffers on all watercourses in Southern Ontario. ArcGIS contains a process called 'buffer' that creates a layer of polygons representing buffers of a certain width around another layer. Four scenarios, using 3 meter, 10 meter, 25 meter and 50 meter riparian buffers, were developed. Additional potential riparian areas were identified by the intersection between the created buffers and the agricultural land cover. Ecologically sensitive lands were clipped from the additional potential riparian buffer areas in order to avoid double counting of potential ecological good and services producing lands. Existing riparian buffers were calculated through the intersection between the private ecological good and services lands (i.e. the data output described in Figure 6.2) and the riparian buffer layers.

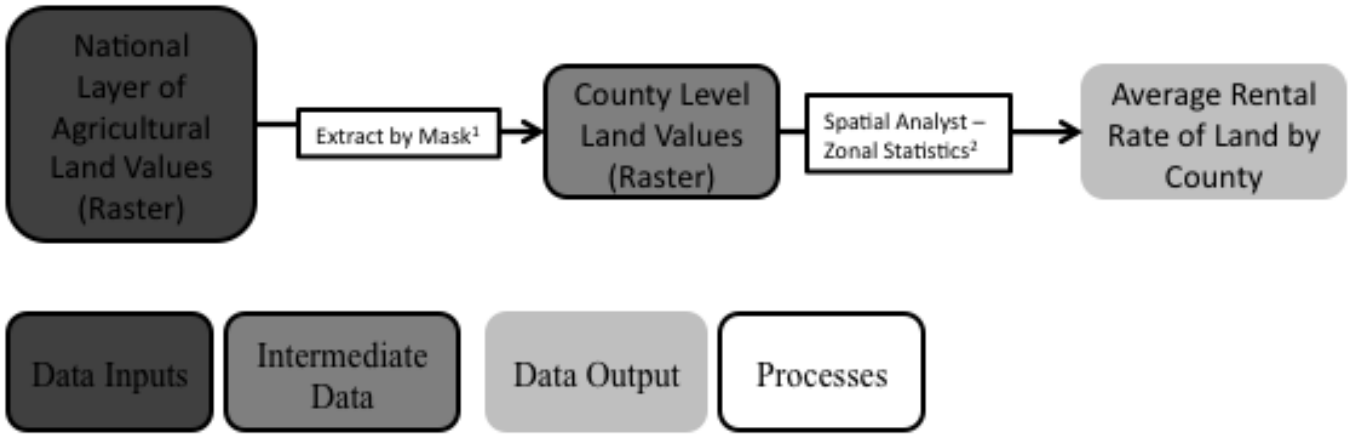
Figure 6.4 – Data inputs, intermediate data and processes used in GIS to calculate the inventory of existing and additional potential riparian buffers in Southern Ontario




1. A clip refers to the GIS process of removing parts of the base layer, in this case the Southern Ontario Base Layer, that overlap with another data layer.
2. Extract by mask is a GIS process which extracts the information in a given data layer based on where that data overlaps with another data layer. This process is used for data in raster format.
3. Convert raster to polygon is a GIS process to convert data in raster format to polygon format. This was necessary because areas cannot be calculated in raster format.
4. An intersection creates a new data layer based on combining the information contained in two data layers where they intersect.
5. Buffer is a GIS process that creates a polygon data layer of a user-defined width around a polygon data layer.

Figure 6.5 presents a chart representing the data and processes used to calculate average rental rates of land by county. Agricultural land rental rates were derived by county from data provided by the Natural Resources Canada based on agricultural land rentals rates from the 2006 Census of Agriculture. Agricultural land rental rates were derived by from a national 5 km resolution binary map of annual agricultural land values compiled by Natural Resources Canada based on the 2006 Census of Agriculture. County border data in Southern Ontario was used to separate data from the national agricultural land value map using a GIS function called a clip. Once separated from the national agricultural land value data layer, the mean annual agricultural rental rate of land in each county was derived in $/hectare/year, and then converted into $/acre/year.

Figure 6.5 – Data inputs, intermediate data and processes used in GIS to calculate the average rental rates of agricultural land by county in Southern Ontario




1. Extract by mask is a GIS process which extracts the information in a given data layer based on where that data overlaps with another data layer. This process is used for data in raster format.
2. The Spatial Analyst – Zonal Statistics tools is used to calculate statistics on a given area of raster data. In this case, each the average county rental rate was calculated in each county based on raster data contained rental rate data across each county.

### 6.3 GIS Results

Table 6.1 presents my estimate the total acres of ecological goods and services producing lands by county in Southern Ontario. Total ecological good and service producing lands and ecologically sensitive land were calculated as described in the previous section in Figures 6.2 and 6.3, respectively. The total area of potential ecological goods and services producing forests, grasslands, wetlands and ecologically sensitive areas were estimated to be 4,796,192 acres, 77,963 acres, 567,430 acres and 2,877,059 acres respectively for the study area. This is a total of 8,318,643 acres of potential ecological goods and services producing lands. Of this area, forests, wetlands and grasslands represent existing ecological good and service producing lands, while ecologically sensitive lands represent potential additional ecological good and service producing land. Figure 6.6 shows the existing supply of ecological good and services producing lands in Southern Ontario. This figure is derived from Table 6.1 and shows that there is a total of over 5.4 million acres of ecological good and service producing private land in Southern Ontario.

In comparison, Conservation Ontario (2010) reports that Ontario's Conservation Authorities own approximately 353,360 acres of land. Table 6.2 displays the land area in Southern Ontario that is protected in National or Provincial Park, Bird Sanctuaries, Nature Reserve and Natural Wildlife Areas. The total land area protected in these areas in Agro-Ontario is 215,525 acres. Figure 6.7 shows the area of existing private ecological goods and services supply compared to existing protected areas in Southern Ontario. From this Figure, it is clear that total protected areas are far less than existing private ecological goods and services supply, hence private landowners can potentially play a significant role in Ontario's ecological goods and services producing lands.

Table 6.1 Eligible Acres of Forest, Grassland, Wetlands and Ecologically Sensitive Lands on Private Agricultural Land in Southern Ontario by County, 2000

| County | Land Area (Acres) | | | | |
|---|---|---|---|---|---|
| | Forest | Grassland | Wetlands | Ecologically Sensitive Lands[1] | Total |
| Brant | 37,563 | 376 | 1,344 | 34,844 | 74,127 |
| Bruce | 197,693 | 2 | 19,810 | 152,114 | 369,619 |
| Dufferin | 69,940 | 381 | 11,369 | 68,246 | 149,935 |
| Durham | 118,931 | 8,136 | 29,594 | 77,133 | 233,795 |
| Elgin | 76,693 | 115 | 1,818 | 84,304 | 162,930 |
| Essex | 15,932 | 818 | 979 | 53,719 | 71,449 |
| Frontenac | 144,707 | 4,046 | 21,657 | 24,989 | 195,399 |
| Grey | 260,543 | 521 | 33,932 | 164,605 | 459,601 |
| Haldimand-Nofolk | 144,708 | 775 | 7,566 | 134,515 | 287,563 |
| Halton | 59,249 | 947 | 2,373 | 24,550 | 87,120 |
| Hamilton-Wentworth | 59,270 | 517 | 2,408 | 33,540 | 95,735 |
| Hastings | 298,284 | 6,668 | 52,143 | 46,055 | 403,150 |
| Huron | 140,297 | 5 | 9,217 | 199,303 | 348,822 |
| Kent | 21,949 | 225 | 2,958 | 106,728 | 131,860 |
| Lambton | 68,051 | 0 | 4,777 | 121,808 | 194,636 |
| Lanark | 332,875 | 5,077 | 46,637 | 32,448 | 417,037 |
| Leeds-Grenville | 362,967 | 6,158 | 61,300 | 38,010 | 468,435 |
| Lennox & Addington | 107,451 | 4,373 | 22,446 | 30,105 | 164,375 |
| Middlesex | 94,970 | 99 | 5,539 | 165,795 | 266,404 |
| Niagara | 97,528 | 913 | 8,027 | 63,974 | 170,443 |
| Northumberland | 144,781 | 4,346 | 13,167 | 74,456 | 236,750 |
| Ottawa-Carlton | 195,259 | 1,288 | 15,485 | 63,505 | 275,537 |
| Oxford | 65,559 | 415 | 2,282 | 71,105 | 139,361 |
| Peel | 43,518 | 288 | 4,602 | 42,910 | 91,317 |
| Perth | 64,049 | 35 | 3,069 | 118,655 | 185,808 |
| Peterborough | 170,506 | 4,792 | 17,946 | 48,535 | 241,780 |
| Prescott-Russell | 118,771 | 0 | 5,774 | 79,120 | 203,666 |
| Prince Edward | 55,243 | 4,175 | 16,045 | 55,128 | 130,591 |
| Renfrew | 267,672 | 2 | 7,526 | 39,778 | 314,978 |
| Simcoe | 259,383 | 1,135 | 36,897 | 156,024 | 453,439 |
| Stormont, Dundas & Glengarry | 314,021 | 557 | 12,946 | 140,152 | 467,676 |
| Victoria | 147,296 | 13,780 | 57,795 | 74,615 | 293,485 |
| Waterloo | 43,095 | 617 | 1,383 | 56,806 | 101,900 |
| Wellington | 128,069 | 2,435 | 7,653 | 121,379 | 259,537 |
| York | 69,368 | 3,944 | 18,964 | 78,106 | 170,383 |
| Total | 4,796,192 | 77,963 | 567,430 | 2,877,059 | 8,318,643 |

Source: Author's calculations based on GIS data from Agriculture and Agri-Food Canada, Ontario Ministry of Natural Resources' Land Inventory of Ontario and the University of Guelph's Data Research Center

Notes:

1. Ecologically Sensitive Lands include all agricultural lands that have a Canada Land Inventory soil classification class of 4, 5, 6 or 7. These lands do not overlap with the the forest, wetland and grassland lands.

## Figure 6.6 Existing Supply of Ecological Good and Service Producing Land on Private Land in Ontario

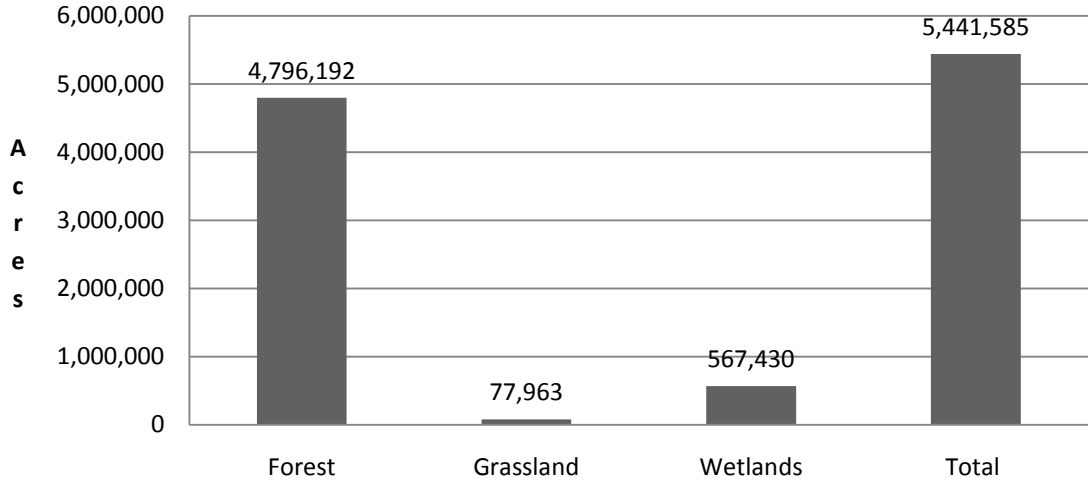
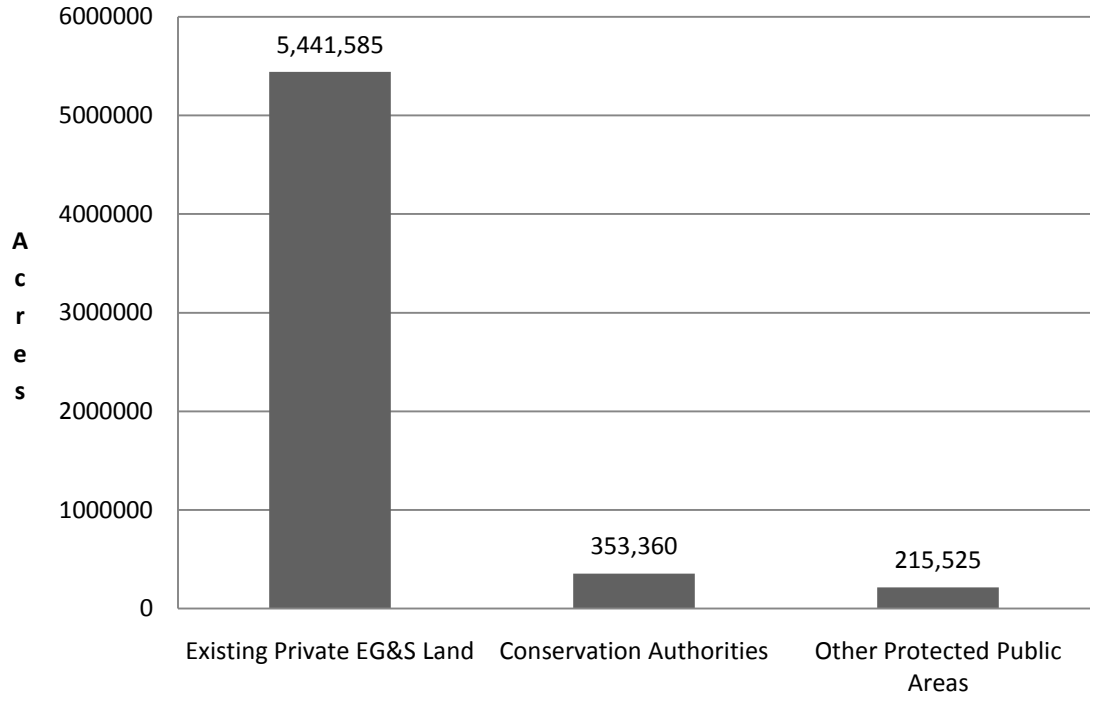


Table 6.2 Acres of Parkland and Wildlife Reserves in rural Ontario

| Protected Land Type | Acres |
|---|---|
| Migratory Bird Sanctuaries | 8,702 |
| National Parks | 41,548 |
| National Wildlife Areas | 9,171 |
| Nature Reserves | 1,295 |
| Provincial Parks | 154,808 |
| Total | 215,525 |

Source: Author's calculation based on GIS data from the Ministry of Natural Resources Land Inventory of Ontario

**Figure 6.7 Comparison of Existing Private Ecological Goods and Services Lands to Other Protected Areas in the Southern Ontario**



The counties that contained the greatest inventory of forest are generally large counties with relatively low populations. These counties are located either on the shores of southern Georgian Bay (Bruce, Grey and Simcoe) or in Eastern Ontario (Renfrew, Lanark, Leeds & Grenville, Ottawa-Carlton, Hastings and Stormont, Dundas & Glengarry). Grasslands are also a feature of some Eastern Ontario counties but are far more prevalent in central Ontario (east of the Greater Toronto Area) than elsewhere in the province.

Also interesting about the estimate of grassland is the fact that many counties contain little to no grassland area and these counties are dispersed across the province. For example, it is surprising that Renfrew contains an estimated 2 acres of grassland while its neighbor to the south, Lanark, has over 5,000 acres of grassland. The distribution of wetlands appears to follow a similar pattern to that of forests; the counties surrounding Georgian Bay and Eastern Ontario counties all contain many acres of wetlands, as do those counties east of the Greater Toronto Area. The distribution of ecologically sensitive lands across counties does not appear to follow any discernable pattern.

Essex County had the lowest quantity of total potential ecological goods and services producing lands. A possible explanation for this low total includes the flat topography of the county and the resulting potential for agricultural production that may have led to removal of forest, draining of wetlands and plowing of grasslands. Another possible explanation is the size of the county or the presence of a large urban area. This final explanation may hold some explanatory power as the 6 counties with the lowest total potential ecological goods and services area (Brant, Essex, Halton, Hamilton-

Wentworth, Peel and Waterloo) are all smaller counties and they all contain urban areas of over 100,000 people. On the other hand, the 6 counties with the largest total potential ecological goods and services area (Grey, Hastings, Lanark, Leeds-Grenville, Simcoe and Stormont, Dundas & Glengarry) are all large counties relative to others in Agro-Ontario and, with the exception of the city of Barrie in Simcoe, these counties do not contain large urban areas.

Table 6.3 represents the total acres of additional potential riparian areas by county according to the riparian buffer width scenarios of 3 meters, 10 meters, 25 meters and 50 meters. The total number of acres of additional potential riparian buffers in these four scenarios was estimated to be 67,681 acres, 232,511 acres, 620,766 acres and 1,409,388 acres respectively. The area of riparian buffers in each county is influenced by two main factors. First, the prevalence of waterways in the county. Regardless of the size of the county, if there is no water flowing through it, there will be no riparian areas. Second, the amount of agricultural land in each county classified by Canadian Land Inventory as class 1, 2 or 3 lands. The presence of high quality agricultural land and waterways leads to a high prevalence of riparian buffers. Other factors such as the size of the county and the presence of urban areas also likely influence the riparian area in each county.

Potentially interesting results can also be found by looking at the area of existing riparian buffers, existing forest, grassland or wetland in riparian areas, in each county. Table 6.4 presents the acres of existing riparian areas by county. The area contained in this table was previously counted in Table 6.1 and does not represented additional ecological good and service producing lands because these lands were previously counted as forest, grassland and wetlands. Factors influencing the area of existing riparian buffers

Table 6.3 Acres of Additional Potential Riparian Buffers On Private Agricultural Land Along Southern Ontario Watercourses

| County | Riparian Buffer Width | | | |
|---|---|---|---|---|
| | 50 meter[1] | 25 meter[1] | 10 meter[1] | 3 meter[1] |
| Brant | 24,801 | 10,952 | 4,065 | 1,178 |
| Bruce | 80,890 | 35,676 | 13,232 | 3,830 |
| Dufferin | 26,227 | 11,752 | 4,420 | 1,290 |
| Durham | 34,858 | 15,211 | 5,652 | 1,636 |
| Elgin | 37,871 | 16,633 | 6,240 | 1,827 |
| Essex | 60,481 | 25,100 | 8,748 | 2,472 |
| Frontenac | 12,773 | 5,211 | 1,860 | 532 |
| Grey | 78,168 | 34,708 | 13,011 | 3,793 |
| Haldimand-Norfolk | 68,655 | 29,314 | 10,715 | 3,089 |
| Halton | 19,413 | 8,162 | 2,964 | 856 |
| Hamilton-Wentworth | 34,704 | 14,888 | 5,440 | 1,565 |
| Hastings | 16,943 | 7,199 | 2,635 | 764 |
| Huron | 69,149 | 30,970 | 11,638 | 3,411 |
| Kent | 71,843 | 32,481 | 12,328 | 3,644 |
| Lambton | 75,140 | 32,501 | 12,139 | 3,563 |
| Lanark | 13,206 | 5,442 | 1,953 | 560 |
| Leeds & Grenville | 24,917 | 10,526 | 3,853 | 1,117 |
| Lennox & Addington | 9,603 | 4,049 | 1,478 | 429 |
| Middlesex | 66,269 | 29,780 | 11,232 | 3,274 |
| Niagara | 46,312 | 19,722 | 7,158 | 2,047 |
| Northumberland | 26,208 | 11,639 | 5,332 | 1,562 |
| Ottawa-Carlton | 36,100 | 16,014 | 5,989 | 1,748 |
| Oxford | 41,666 | 18,863 | 7,156 | 2,103 |
| Peel | 19,670 | 8,289 | 3,013 | 868 |
| Perth | 47,241 | 21,907 | 8,429 | 2,494 |
| Peterborough | 17,779 | 8,152 | 3,546 | 1,047 |
| Prescott-Russell | 47,605 | 21,772 | 8,242 | 2,393 |
| Prince Edward | 6,606 | 2,702 | 969 | 279 |
| Renfrew | 38,577 | 17,251 | 6,486 | 1,896 |
| Simcoe | 67,957 | 31,232 | 11,879 | 3,478 |
| Stormont, Dundas & Glengarry | 58,404 | 26,562 | 10,041 | 2,947 |
| Victoria | 23,439 | 9,956 | 3,638 | 1,051 |
| Waterloo | 26,605 | 11,620 | 4,275 | 1,239 |
| Wellington | 49,019 | 21,288 | 7,838 | 2,267 |
| York | 30,289 | 13,242 | 4,918 | 1,430 |
| Total | 1,409,388 | 620,766 | 232,511 | 67,681 |

Source: Author's calculations based on GIS data from Agriculture and Agri-Food Canada, Ontario Ministry of Natural Resources' Land Inventory of Ontario and the University of Guelph's Data Research Center

Notes:

1. Four scenarios estimating buffer widths of 50, 25, 10 and 3 meters were used in this analysis in order to test the sensitivity of estimates to different buffer widths. Buffers were drawn around all watercourses in Ontario using the buffer tool in Arc GIS and then were intersected with private agricultural land. Land identified as ecologically sensitive land in Table 6.1 were removed from the estimate of potential riparian buffers in order to avoid double counting.

Table 6.4 Acres of Existing Ecological Good and Service Producing Riparian Areas On Private Land Along Southern Ontario Watercourses

| County | Riparian Buffer Width | | | |
|---|---|---|---|---|
| | 50 meter[1] | 25 meter[1] | 10 meter[1] | 3 meter[1] |
| Brant | 15,383 | 7,442 | 2,831 | 812 |
| Bruce | 40,103 | 18,603 | 6,958 | 2,013 |
| Dufferin | 20,465 | 9,495 | 3,550 | 1,027 |
| Durham | 43,767 | 20,456 | 7,668 | 2,210 |
| Elgin | 30,869 | 15,488 | 6,070 | 1,784 |
| Essex | 5,772 | 2,610 | 966 | 278 |
| Frontenac | 45,930 | 19,186 | 6,724 | 1,874 |
| Grey | 70,049 | 32,868 | 12,523 | 3,655 |
| Haldimand-Norfolk | 41,979 | 20,011 | 7,611 | 2,207 |
| Halton | 22,190 | 10,359 | 3,902 | 1,130 |
| Hamilton-Wentworth | 22,257 | 10,494 | 3,980 | 1,154 |
| Hastings | 93,795 | 40,802 | 14,754 | 4,209 |
| Huron | 37,611 | 17,545 | 6,475 | 1,869 |
| Kent | 7,246 | 3,546 | 1,360 | 398 |
| Lambton | 17,859 | 8,582 | 3,248 | 945 |
| Lanark | 98,151 | 41,601 | 14,386 | 4,044 |
| Leeds & Grenville | 92,165 | 40,543 | 15,121 | 4,355 |
| Lennox & Addington | 26,481 | 11,883 | 4,381 | 1,259 |
| Middlesex | 32,405 | 15,683 | 5,996 | 1,730 |
| Niagara | 29,231 | 13,548 | 5,073 | 1,458 |
| Northumberland | 47,117 | 22,624 | 8,772 | 2,583 |
| Ottawa-Carlton | 45,570 | 20,765 | 7,762 | 2,249 |
| Oxford | 22,796 | 10,873 | 4,046 | 1,167 |
| Peel | 22,833 | 10,347 | 3,824 | 1,094 |
| Perth | 12,375 | 5,794 | 2,218 | 653 |
| Peterborough | 56,746 | 19,199 | 7,302 | 2,132 |
| Prescott-Russell | 25,445 | 12,181 | 4,640 | 1,340 |
| Prince Edward | 17,284 | 7,883 | 2,937 | 848 |
| Renfrew | 71,805 | 32,487 | 12,080 | 3,489 |
| Simcoe | 57,991 | 27,026 | 10,122 | 2,930 |
| Stormont, Dundas & Glengarry | 57,813 | 26,949 | 10,198 | 2,975 |
| Victoria | 53,146 | 23,762 | 8,823 | 2,546 |
| Waterloo | 13,724 | 6,341 | 2,328 | 674 |
| Wellington | 40,612 | 18,616 | 6,854 | 1,965 |
| York | 23,857 | 11,249 | 4,258 | 1,233 |
| Total | 1,362,823 | 616,841 | 229,744 | 66,290 |

Source: Author's calculations based on GIS data from Agriculture and Agri-Food Canada, Ontario Ministry

Notes:

1. Four scenarios estimating buffer widths of 50, 25, 10 and 3 meters were used in this analysis in order to test the sensitivity of estimates to different buffer widths. Buffers were drawn around all watercourses in Ontario using the buffer tool in Arc GIS and then were intersected with private land identified as wetland, forest, or grassland.

include the prevalence of waterways and presence of high quality agricultural land. The prevalence of waterways would increase the prevalence of existing riparian areas while the presence of high quality agricultural land would likely decrease the prevalence of existing buffers as farmers would be more likely to have converted existing buffers to agricultural production.

Table 6.5 represents the percentage of existing riparian buffers versus potential additional riparian buffers under the four buffer width scenarios. Existing riparian buffers are those riparian areas that are currently forests, wetlands and grasslands. Potential additional riparian buffers are those riparian areas that are currently agricultural land but could be converted to some other land use to provide riparian buffers. The percentage of total existing riparian buffers versus total potential additional riparian buffers in Southern Ontario is 97%, 99%, 99% and 98% under the 50, 25, 10 and 3 meter buffer width scenarios. This suggests that there is nearly the same area of existing riparian buffers as potential riparian buffers in Southern Ontario. While on the whole there is near the same amount of existing and potential additional riparian buffers in Southern Ontario, some counties have far more of one then the other. For example, the two South-Western most provinces in the Ontario, Essex and Kent, have around 10% as much existing riparian buffer as they have potential for additional riparian buffers. Nearby Lambton and Middlesex both have less than 50% as much existing riparian buffer as they have potential for additional riparian buffers. On the other hand, the counties East of the Greater Toronto Area and Eastern Ontario generally contain more existing buffer area than potential additional buffer area. In some cases, specifically in Hastings, Lanark, Frontenac and Leeds-Grenville, the percentage of existing buffer areas far exceeds the

Table 6.5 Existing Riparian Buffers as a Percentage of Potential Additional Riparian Buffers On Private Agricultural Land Along Southern Ontario Watercourses

| | Riparian Buffer Width | | | |
|---|---|---|---|---|
| County | 50 meter | 25 meter | 10 meter | 3 meter |
| Brant | 62% | 68% | 70% | 69% |
| Bruce | 50% | 52% | 53% | 53% |
| Dufferin | 78% | 81% | 80% | 80% |
| Durham | 126% | 134% | 136% | 135% |
| Elgin | 82% | 93% | 97% | 98% |
| Essex | 10% | 10% | 11% | 11% |
| Frontenac | 360% | 368% | 362% | 352% |
| Grey | 90% | 95% | 96% | 96% |
| Haldimand-Norfolk | 61% | 68% | 71% | 71% |
| Halton | 114% | 127% | 132% | 132% |
| Hamilton-Wentworth | 64% | 70% | 73% | 74% |
| Hastings | 554% | 567% | 560% | 551% |
| Huron | 54% | 57% | 56% | 55% |
| Kent | 10% | 11% | 11% | 11% |
| Lambton | 24% | 26% | 27% | 27% |
| Lanark | 743% | 764% | 737% | 722% |
| Leeds & Grenville | 370% | 385% | 392% | 390% |
| Lennox & Addington | 276% | 293% | 296% | 293% |
| Middlesex | 49% | 53% | 53% | 53% |
| Niagara | 63% | 69% | 71% | 71% |
| Northumberland | 180% | 194% | 165% | 165% |
| Ottawa-Carlton | 126% | 130% | 130% | 129% |
| Oxford | 55% | 58% | 57% | 56% |
| Peel | 116% | 125% | 127% | 126% |
| Perth | 26% | 26% | 26% | 26% |
| Peterborough | 319% | 236% | 206% | 204% |
| Prescott-Russell | 53% | 56% | 56% | 56% |
| Prince Edward | 262% | 292% | 303% | 304% |
| Renfrew | 186% | 188% | 186% | 184% |
| Simcoe | 85% | 87% | 85% | 84% |
| Stormont, Dundas & Glengarry | 99% | 101% | 102% | 101% |
| Victoria | 227% | 239% | 243% | 242% |
| Waterloo | 52% | 55% | 54% | 54% |
| Wellington | 83% | 87% | 87% | 87% |
| York | 79% | 85% | 87% | 86% |
| Average | 97% | 99% | 99% | 98% |

Source: Author's calculations based on data from Table 6.3 and Table 6.4

Notes:

1. Percentages calculated as the area of existing riparian buffers contained in Table 6.4 divided by the area of potential new riparian buffers containted in Table 6.3

Table 6.6 Payment Rates Used to Estimate Potential Costs of Ecological Goods and Services Payments in Ontario by County

| County | Rental Rate ($/acre/yr)[1] | 50% Payment Rate ($/acre/yr)[2] | 25% Payment Rate ($/acre/yr)[3] |
|---|---|---|---|
| Brant | $111.96 | $55.98 | $27.99 |
| Bruce | $44.98 | $22.49 | $11.24 |
| Dufferin | $38.55 | $19.28 | $9.64 |
| Durham | $39.45 | $19.72 | $9.86 |
| Elgin | $109.02 | $54.51 | $27.26 |
| Essex | $111.48 | $55.74 | $27.87 |
| Frontenac | $12.22 | $6.11 | $3.06 |
| Grey | $20.15 | $10.08 | $5.04 |
| Haldimand-Norfolk | $120.43 | $60.22 | $30.11 |
| Halton | $48.53 | $24.26 | $12.13 |
| Hamilton | $73.46 | $36.73 | $18.37 |
| Hastings | $13.11 | $6.55 | $3.28 |
| Huron | $123.94 | $61.97 | $30.98 |
| Kent | $154.82 | $77.41 | $38.71 |
| Lambton | $119.73 | $59.87 | $29.93 |
| Lanark | $17.46 | $8.73 | $4.37 |
| Leeds-Grenville | $29.14 | $14.57 | $7.28 |
| Lennox-Addington | $12.50 | $6.25 | $3.13 |
| Middlesex | $116.62 | $58.31 | $29.15 |
| Niagara | $117.86 | $58.93 | $29.46 |
| Northumberland | $28.00 | $14.00 | $7.00 |
| Ottawa | $42.19 | $21.10 | $10.55 |
| Oxford | $139.84 | $69.92 | $34.96 |
| Peel | $32.42 | $16.21 | $8.10 |
| Perth | $156.07 | $78.04 | $39.02 |
| Peterborough | $15.97 | $7.98 | $3.99 |
| Prescott-Russell | $43.24 | $21.62 | $10.81 |
| Prince Edward | $25.11 | $12.55 | $6.28 |
| Renfrew | $19.69 | $9.84 | $4.92 |
| Simcoe | $42.93 | $21.46 | $10.73 |
| Stormont, Dundas and Glengarry | $71.10 | $35.55 | $17.78 |
| Victoria | $21.47 | $10.73 | $5.37 |
| Waterloo | $101.13 | $50.56 | $25.28 |
| Wellington | $56.60 | $28.30 | $14.15 |
| York | $58.01 | $29.01 | $14.50 |

Source: Author's calculation based on GIS data from the 2006 Census of Agriculture compiled by Natural Resources Canada

Notes:

1. The rental rate was derived by county from a national map of agricultural land rental rates based on the 2006 Census of Agriculture using GIS. Each county was removed individually from the national layer and then the mean agricultural land rental rate for each county was calculated in $/hectare/year. Each county value was then converted into $/acre/year for this table.

2. The 50% Payment Rate is used in one scenario estimating the potential costs of a provincial payments for ecological goods and services program. It was calculated by dividing each county rental rate by 2.

3. The 25% Payment Rate is used in one scenario estimating the potential costs of a provincial payments for ecological goods and services program. It was calculated by dividing each county rental rate by 4.

potential for additional riparian buffers. These results are not surprising as it would be expected that counties renowned for agricultural production, Southern, South-Western Ontario and far Eastern Ontario, would have more agricultural production in riparian areas than counties with less or lower quality agricultural production (Central Ontario between the Greater Toronto Area and Ottawa).

In order to project the cost of a payment for ecological goods and services program in Ontario, it was important to first calculate the average rental rate of land in each county to use as the determinant of program payment rates in each county. The average rental rate of agricultural land in each county is represented in Table 6.6. The rental rate was calculated as the average per acre per year rate in each county using the data created by Natural Resources Canada based on the 2006 Census of Agriculture as described in section 6.2 and Figure 6.6. In order to verify the rental rate calculations in Table 6.6, I will compare these rates to data from Agriculture and Agri-Food Canada (2006) on regional rental rates of agricultural land based on Census Agricultural Regions. Census Agricultural Regions and the counties included in those regions in this analysis are presented in Table 6.7. Agriculture and Agri-Food Canada used data collected through the annual Farm Financial Survey to calculate median rental rates of farmland based on Census Agricultural Regions. The median annual rental rates derived through the Farm Financial Survey of 2006 are presented in Table 6.8. Comparing the regional medians contained in Table 6.8 to the rental rate calculated for each county in Table 6.6 shows that the average rental rates of agricultural land derived in this GIS analysis are similar to the regional average rental rates calculated by Agriculture and Agri-Food Canada. Estimates of the average rental rate of farmland in the counties in the Southern

Table 6.7 Rural Ontario Counties by Census Agricultural Region

| Census Agricultural Region | County |
|---|---|
| Southern Ontario Region | Hamilton-Wentworth |
| | Niagara |
| | Haldimand-Norfolk |
| | Brant |
| | Oxford |
| | Elgin |
| | Kent |
| | Essex |
| | Lambton |
| | Middlesex |
| Western Ontario Region | Peel |
| | Dufferin |
| | Wellington |
| | Halton |
| | Waterloo |
| | Perth |
| | Huron |
| | Bruce |
| | Grey |
| | Simcoe |
| Central Ontario Region | Hastings |
| | Prince Edward |
| | Northumberland |
| | Peterborough |
| | Victoria |
| | Durham |
| | York |
| Eastern Ontario Region | Stormont, Dundas and Glengarry |
| | Prescott-Russell |
| | Ottawa-Carlton |
| | Lanark |
| | Lennox and Addington |
| | Renfrew |

Source: Statistics Canada (2006)

Table 6.8 Median Rental Rate per Acre of Farmland Rented for Cash by Census Agricultural Region, 2006

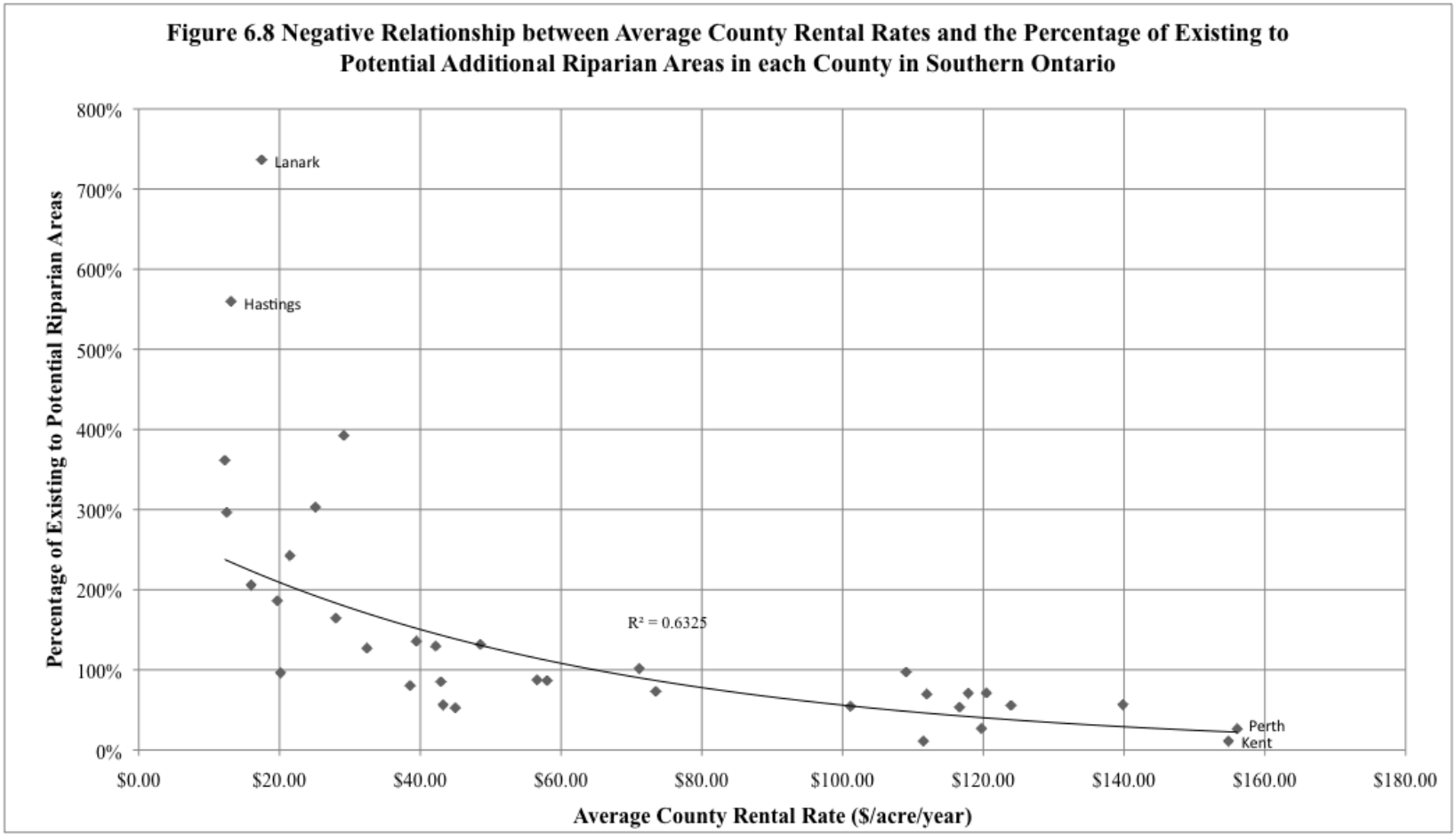
| Census Agricultural Region | Rental Rate ($/acre/year) |
|---|---|
| Southern Ontario Region | $125 |
| Western Ontario Region | $75 |
| Central Ontario Region | $35 |
| Eastern Ontario Region | $30 |

Source: Farm Financial Survey (2006)

Ontario Region ranged from around $73/acre/year in Niagara to around $155/acre/year in Kent, while the other counties fit near the regional estimate of $125/acre/year. Estimates in the Western Ontario Region ranged more widely with estimated average land rental rates of around $20/acre/year in Grey County to over $150/acre/year in Perth. Only Perth and Waterloo exceed the Farm Financial Survey's estimated $75/acre/year median rental rate of farmland in the Western Ontario Region, suggesting that my estimates may be a bit lower than the estimates found through the Farm Financial Survey. In the Central Ontario Region, the highest estimated average land rental rate was just over $58/acre/year in York and the lowest was $13/acre/year in Hastings. The estimated average land rentals rates in the Central Ontario Region appear to be in line with the estimate of $35/acre/year from the Farm Financial Survey. Finally, in the Eastern Ontario Region, estimated average land rental rates ranged from a high of over $71/acre/year in Stormont, Dundas and Glengarry to a low of around $12/acre/year in both Frontenac and Lennox-Addington. Again, the estimated average rental rates of land I calculated conform well to the estimate of $30/acre/year derived from the Farm Financial Survey.

Figure 6.8 shows the relationship between the average land rental rate of each country and the percentage of existing to potential additional riparian areas in that same county. The trend line contained in this Figure shows a clear negative trend between the percentage of existing to potential riparian area to average land rental rates. This means that the counties that have land that is of high agricultural productivity or value are likely to have less existing riparian buffer areas than counties with lower valued agricultural land.

**Figure 6.8 Negative Relationship between Average County Rental Rates and the Percentage of Existing to Potential Additional Riparian Areas in each County in Southern Ontario**



## 6.4 Projected Costs of a Payment Ecological Goods and Services Program in Ontario

The objective of this analysis is to estimate the potential cost of a provincial ecological goods and services program that targets the provision of ecological goods and services from private rural agricultural land. This section describes the design of the ecological goods and services program used to estimate the cost. The cost estimate is based on three rates of participation and two payment rates per county.

The three rates of participation were set at 100%, 50% and 10% in order to present a range of potential costs and land enrollments that could occur based on program design and implementation. Participation includes the enrollment of existing ecological good and service producing lands as well as new lands. While 100% participation is highly unlikely in reality, estimating program costs using this scenario results in an upper-bound estimate of costs. The 50% participation rate represents a conservative estimate of participation in a program targeted towards broad-based participation. England's Environmental Stewardship scheme has enrolled over 60% of farmland in England (Chapter 4) and the same could occur in Ontario depending on program design and implementation. The final scenario uses an adoption rate of 10%. This scenario was used to represent a lower-bound projection of program costs.

Payment rates are set at 50% and 25% of the average county rental rate. The reason that these payment rates were chosen stems from the fact that the targeted ecological goods and services providing lands in this analysis are assumed to be of marginal agricultural productivity because either (1) the land is not currently being used in agricultural production as is the case with wetlands, forests and grasslands, or (2) the land has been identified as ecologically sensitive land because of the presence of low

quality soil. For this reason, it is possible that program payment rates below the average agricultural land rental rate in each county could induce participation. The payment rates by county are included in Table 6.6.

For this analysis, I assumed that any agricultural landowner would be able to participate in the program and participation would be voluntary. It should be noted that, due to data limitations, the eligible area of wetlands, grasslands and forests potentially includes land not owned by agricultural producers as lots identified as containing agricultural land could also contain parcels of privately owned non-agricultural land.

Table 6.9 reports the number of eligible acres of potential ecological goods and services producing lands in each county at each program participation level. The number of total eligible acres in each county is the sum of the eligible acres of forests, grasslands, wetlands and ecologically sensitive lands presented in Table 6.1. Table 6.9 also calculates the cost of enrolling the eligible acres under each scenario according to the payment rate scenarios of 50% and 25% of the average annual rental rate of agricultural land in each county.

The total cost of a provincial ecological goods and services program with a payment rate of 50% of the average agricultural land rental rate in each county is estimated to be around $24 million/year with nearly 2.5 million acres enrolled at 10% participation , $119 million/year with over 4.1 million acre enrolled at 50% participation and $238 million/year with over 8.3 million acres enrolled at 100% participation. The cost per Ontario citizen under this payment rate is estimated to be $1.95/year with 10% participation, $9.77/year with 50% participation and $19.54/year with 100% participation. The total cost of a provincial ecological goods and services program with a

Table 6.9 Eligible Acres and Cost of Enrolling EG&S Producing Lands in Each County by Program Participation and Payment Rates of 50% and 25% of the Average County Rental Rate

| County | Land Area | | Program Participation Level | | |
|---|---|---|---|---|---|
| | Payment Rate[1] | | 100% | 50% | 10% |
| Brant | Area (Acres) | | 74,127 | 37,064 | 7,413 |
| | 25% Payment Rate | $27.99 | $2,074,907 | $1,037,453 | $207,491 |
| | 50% Payment Rate | $55.98 | $4,149,814 | $2,074,907 | $414,981 |
| Bruce | Area (Acres) | | 369,619 | 184,809 | 36,962 |
| | 25% Payment Rate | $11.24 | $4,156,066 | $2,078,033 | $415,607 |
| | 50% Payment Rate | $22.49 | $8,312,132 | $4,156,066 | $831,213 |
| Dufferin | Area (Acres) | | 149,935 | 74,968 | 14,994 |
| | 25% Payment Rate | $9.64 | $1,445,016 | $722,508 | $144,502 |
| | 50% Payment Rate | $19.28 | $2,890,032 | $1,445,016 | $289,003 |
| Durham | Area (Acres) | | 233,795 | 116,898 | 23,380 |
| | 25% Payment Rate | $9.86 | $2,305,733 | $1,152,867 | $230,573 |
| | 50% Payment Rate | $19.72 | $4,611,467 | $2,305,733 | $461,147 |
| Elgin | Area (Acres) | | 162,930 | 81,465 | 16,293 |
| | 25% Payment Rate | $27.26 | $4,440,746 | $2,220,373 | $444,075 |
| | 50% Payment Rate | $54.51 | $8,881,493 | $4,440,746 | $888,149 |
| Essex | Area (Acres) | | 71,449 | 35,724 | 7,145 |
| | 25% Payment Rate | $27.87 | $1,991,251 | $995,626 | $199,125 |
| | 50% Payment Rate | $55.74 | $3,982,502 | $1,991,251 | $398,250 |
| Frontenac | Area (Acres) | | 195,399 | 97,699 | 19,540 |
| | 25% Payment Rate | $3.06 | $597,017 | $298,509 | $59,702 |
| | 50% Payment Rate | $6.11 | $1,194,034 | $597,017 | $119,403 |
| Grey | Area (Acres) | | $459,601 | $229,801 | $45,960 |
| | 25% Payment Rate | $5.04 | $2,315,626 | $1,157,813 | $231,563 |
| | 50% Payment Rate | $10.08 | $4,631,251 | $2,315,626 | $463,125 |
| Haldimand-Nofolk | Area (Acres) | | 287,563 | 143,782 | 28,756 |
| | 25% Payment Rate | $30.11 | $8,658,129 | $4,329,064 | $865,813 |
| | 50% Payment Rate | $60.22 | $17,316,258 | $8,658,129 | $1,731,626 |
| Halton | Area (Acres) | | 87,120 | 43,560 | 8,712 |
| | 25% Payment Rate | $12.13 | $1,056,977 | $528,488 | $105,698 |
| | 50% Payment Rate | $24.26 | $2,113,954 | $1,056,977 | $211,395 |
| Hamilton-Wentworth | Area (Acres) | | 95,735 | 47,868 | 9,574 |
| | 25% Payment Rate | $18.37 | $1,758,237 | $879,119 | $175,824 |
| | 50% Payment Rate | $36.73 | $3,516,475 | $1,758,237 | $351,647 |
| Hastings | Area (Acres) | | 403,150 | 201,575 | 40,315 |
| | 25% Payment Rate | $3.28 | $1,321,098 | $660,549 | $132,110 |
| | 50% Payment Rate | $6.55 | $2,642,197 | $1,321,098 | $264,220 |
| Huron | Area (Acres) | | 348,822 | 174,411 | 34,882 |
| | 25% Payment Rate | $30.98 | $10,808,178 | $5,404,089 | $1,080,818 |
| | 50% Payment Rate | $61.97 | $21,616,356 | $10,808,178 | $2,161,636 |

Table 6.9 (cont.) Eligible Acres and Cost of Enrolling EG&S Producing Lands in Each County by Program Participation and Payment Rates of 50% and 25% of the Average County Rental Rate

| County | Land Area | | Program Participation Level | | |
|---|---|---|---|---|---|
| | Payment Rate[1] | | 100% | 50% | 10% |
| Kent | Area (Acres) | | 131,860 | 65,930 | 13,186 |
| | 25% Payment Rate | $38.71 | $5,103,812 | $2,551,906 | $510,381 |
| | 50% Payment Rate | $77.41 | $10,207,625 | $5,103,812 | $1,020,762 |
| Lambton | Area (Acres) | | 194,636 | 97,318 | 19,464 |
| | 25% Payment Rate | $29.93 | $5,826,143 | $2,913,072 | $582,614 |
| | 50% Payment Rate | $59.87 | $11,652,286 | $5,826,143 | $1,165,229 |
| Lanark | Area (Acres) | | 417,037 | 208,519 | 41,704 |
| | 25% Payment Rate | $4.37 | $1,820,596 | $910,298 | $182,060 |
| | 50% Payment Rate | $8.73 | $3,641,191 | $1,820,596 | $364,119 |
| Leeds-Grenville | Area (Acres) | | 468,435 | 234,217 | 46,843 |
| | 25% Payment Rate | $7.28 | $3,412,240 | $1,706,120 | $341,224 |
| | 50% Payment Rate | $14.57 | $6,824,480 | $3,412,240 | $682,448 |
| Lennox & Addington | Area (Acres) | | 164,375 | 82,188 | 16,438 |
| | 25% Payment Rate | $3.13 | $513,703 | $256,852 | $51,370 |
| | 50% Payment Rate | $6.25 | $1,027,406 | $513,703 | $102,741 |
| Middlesex | Area (Acres) | | 266,404 | 133,202 | 26,640 |
| | 25% Payment Rate | $29.15 | $7,766,887 | $3,883,443 | $776,689 |
| | 50% Payment Rate | $58.31 | $15,533,774 | $7,766,887 | $1,553,377 |
| Niagara | Area (Acres) | | 170,443 | 85,221 | 17,044 |
| | 25% Payment Rate | $29.46 | $5,021,946 | $2,510,973 | $502,195 |
| | 50% Payment Rate | $58.93 | $10,043,891 | $5,021,946 | $1,004,389 |
| Northumberland | Area (Acres) | | 236,750 | 118,375 | 23,675 |
| | 25% Payment Rate | $7.00 | $1,657,500 | $828,750 | $165,750 |
| | 50% Payment Rate | $14.00 | $3,315,000 | $1,657,500 | $331,500 |
| Ottawa-Carlton | Area (Acres) | | 275,537 | 137,769 | 27,554 |
| | 25% Payment Rate | $10.55 | $2,906,403 | $1,453,201 | $290,640 |
| | 50% Payment Rate | $21.10 | $5,812,805 | $2,906,403 | $581,281 |
| Oxford | Area (Acres) | | 139,361 | 69,680 | 13,936 |
| | 25% Payment Rate | $34.96 | $4,871,875 | $2,435,937 | $487,187 |
| | 50% Payment Rate | $69.92 | $9,743,750 | $4,871,875 | $974,375 |
| Peel | Area (Acres) | | 91,317 | 45,659 | 9,132 |
| | Payment Rates and | $8.10 | $740,112 | $370,056 | $74,011 |
| | Costs | $16.21 | $1,480,223 | $740,112 | $148,022 |
| Perth | Area (Acres) | | 185,808 | 92,904 | 18,581 |
| | 25% Payment Rate | $39.02 | $7,249,828 | $3,624,914 | $724,983 |
| | 50% Payment Rate | $78.04 | $14,499,655 | $7,249,828 | $1,449,966 |
| Peterborough | Area (Acres) | | 241,780 | 120,890 | 24,178 |
| | 25% Payment Rate | $3.99 | $965,239 | $482,620 | $96,524 |
| | 50% Payment Rate | $7.98 | $1,930,479 | $965,239 | $193,048 |

Table 6.9 (cont.) Eligible Acres and Cost of Enrolling EG&S Producing Lands in Each County by Program Participation and Payment Rates of 50% and 25% of the Average County Rental Rate

| County | Land Area | | Program Participation Level | | |
|---|---|---|---|---|---|
| | Payment Rate[1] | | 100% | 50% | 10% |
| Peterborough | Area (Acres) | | 241,780 | 120,890 | 24,178 |
| | 25% Payment Rate | $3.99 | $965,239 | $482,620 | $96,524 |
| | 50% Payment Rate | $7.98 | $1,930,479 | $965,239 | $193,048 |
| Prescott-Russell | Area (Acres) | | 203,666 | 101,833 | 20,367 |
| | 25% Payment Rate | $10.81 | $2,201,452 | $1,100,726 | $220,145 |
| | 50% Payment Rate | $21.62 | $4,402,904 | $2,201,452 | $440,290 |
| Prince Edward | Area (Acres) | | 130,591 | 65,296 | 13,059 |
| | 25% Payment Rate | $6.28 | $819,678 | $409,839 | $81,968 |
| | 50% Payment Rate | $12.55 | $1,639,355 | $819,678 | $163,936 |
| Renfrew | Area (Acres) | | 314,978 | 157,489 | 31,498 |
| | 25% Payment Rate | $4.92 | $1,550,318 | $775,159 | $155,032 |
| | 50% Payment Rate | $9.84 | $3,100,636 | $1,550,318 | $310,064 |
| Simcoe | Area (Acres) | | 453,439 | 226,720 | 45,344 |
| | 25% Payment Rate | $10.73 | $4,865,968 | $2,432,984 | $486,597 |
| | 50% Payment Rate | $21.46 | $9,731,936 | $4,865,968 | $973,194 |
| Stormont, Dundas & Glengarry | Area (Acres) | | 467,676 | 233,838 | 46,768 |
| | 25% Payment Rate | $17.78 | $8,313,329 | $4,156,664 | $831,333 |
| | 50% Payment Rate | $35.55 | $16,626,658 | $8,313,329 | $1,662,666 |
| Victoria | Area (Acres) | | 293,485 | 146,743 | 29,349 |
| | 25% Payment Rate | $5.37 | $1,575,177 | $787,589 | $157,518 |
| | 50% Payment Rate | $10.73 | $3,150,355 | $1,575,177 | $315,035 |
| Waterloo | Area (Acres) | | 101,900 | 50,950 | 10,190 |
| | 25% Payment Rate | $25.28 | $2,576,209 | $1,288,105 | $257,621 |
| | 50% Payment Rate | $50.56 | $5,152,419 | $2,576,209 | $515,242 |
| Wellington | Area (Acres) | | 259,537 | 129,768 | 25,954 |
| | 25% Payment Rate | $14.15 | $3,672,139 | $1,836,070 | $367,214 |
| | 50% Payment Rate | $28.30 | $7,344,278 | $3,672,139 | $734,428 |
| York | Area (Acres) | | 170,383 | 85,191 | 17,038 |
| | 25% Payment Rate | $14.50 | $2,471,045 | $1,235,523 | $247,105 |
| | 50% Payment Rate | $29.01 | $4,942,091 | $2,471,045 | $494,209 |
| **Total** | Acres | | 8,318,643 | 4,159,322 | 2,495,593 |
| | 25% Rate | | $118,830,581 | $59,415,291 | $11,883,058 |
| | 50% Rate | | $237,661,162 | $118,830,581 | $23,766,116 |
| **Cost Per Ontario Citizen Per Year[2]** | 25% Rate | | $9.77 | $4.89 | $0.98 |
| | 50% Rate | | $19.54 | $9.77 | $1.95 |

Source: Author's calculation based on data from Table 6.1 and Table 6.6

Notes:

1. Payment rates from Table 6.6
2. According to Statistics Canada (2006), Ontario's population was 12,160,282.

payment rate of 25% of the average agricultural land rental rate in each county is estimated to be around $12 million/year with 10% participation, $59 million/year with 50% participation and $119 million/year with 100% participation. The cost per Ontario citizen under this payment rate is estimated to be $0.98/year with 10% participation, $4.89/year with 50% participation and $9.77/year with 100% participation. Note that these figures do not include start up costs, administration costs, monitoring and verification costs or evaluation costs.

The cost of enrolling potential riparian buffers was calculated according to riparian buffers of varying widths rather than by participation rates. In effect, 100% participation was assumed in the calculation of the cost of enrolling potential riparian buffers. Table 6.10 represents the cost of making payments for new riparian buffers according to the varying riparian buffer widths (Table 6.3) under payment rates equal to 50% and 25% of the average rental rate of agricultural land in each county (Table 6.6). Table 6.10 does not include existing riparian buffers, as they were included in the cost projection in Table 6.9, and I thereby avoid double-counting. The total annual cost of payments for all riparian buffers in Southern Ontario based on a payment rate of 50% of the average agricultural rent rate in each county are around $2.6 million/year, $9 million/year, $24 million/year and $55 million/year for 3 meter, 10 meter, 25 meter and 50 meter riparian buffers respectively. The total annual cost of payments for all riparian buffers in Agro-Ontario based on a payment rate of 25% of the average agricultural rent rate in each county are around $1.3 million/year, $4.5 million/year, $12 million/year and $28 million/year for 3 meter, 10 meter, 25 meter and 50 meter riparian buffers respectively.

Table 6.10 Acres and Cost of Enrolling Potential Additional Riparian Buffers On Private Agricultural Land Along Southern Ontario Watercourses based on Buffer Width and Payment Rates of 25% and 50% of the Average County Rental Rate of Land

| County | Area (Acres) | | Riparian Buffer Width | | | |
|---|---|---|---|---|---|---|
| | Payment Rates (25%/50%) | | 50 meter[1] | 25 meter[1] | 10 meter[1] | 3 meter[1] |
| Brant | Area (Acres) | | 24,801 | 10,952 | 4,065 | 1,178 |
| | 25% Payment Rate | $27.99 | $694,206 | $306,558 | $113,779 | $32,970 |
| | 50% Payment Rate | $55.98 | $1,388,412 | $613,116 | $227,559 | $65,939 |
| Bruce | Area (Acres) | | 80,890 | 35,676 | 13,232 | 3,830 |
| | 25% Payment Rate | $11.24 | $909,538 | $401,144 | $148,787 | $43,070 |
| | 50% Payment Rate | $22.49 | $1,819,075 | $802,289 | $297,574 | $86,139 |
| Dufferin | Area (Acres) | | 26,227 | 11,752 | 4,420 | 1,290 |
| | 25% Payment Rate | $9.64 | $252,763 | $113,265 | $42,599 | $12,428 |
| | 50% Payment Rate | $19.28 | $505,527 | $226,529 | $85,198 | $24,857 |
| Durham | Area (Acres) | | 34,858 | 15,211 | 5,652 | 1,636 |
| | 25% Payment Rate | $9.86 | $343,780 | $150,017 | $55,736 | $16,137 |
| | 50% Payment Rate | $19.72 | $687,560 | $300,034 | $111,473 | $32,274 |
| Elgin | Area (Acres) | | 37,871 | 16,633 | 6,240 | 1,827 |
| | 25% Payment Rate | $27.26 | $1,032,188 | $453,354 | $170,082 | $49,802 |
| | 50% Payment Rate | $54.51 | $2,064,377 | $906,708 | $340,163 | $99,604 |
| Essex | Area (Acres) | | 60,481 | 25,100 | 8,748 | 2,472 |
| | 25% Payment Rate | $27.87 | $1,685,578 | $699,532 | $243,793 | $68,889 |
| | 50% Payment Rate | $55.74 | $3,371,156 | $1,399,064 | $487,585 | $137,777 |
| Frontenac | Area (Acres) | | 12,773 | 5,211 | 1,860 | 532 |
| | 25% Payment Rate | $3.06 | $39,025 | $15,923 | $5,682 | $1,627 |
| | 50% Payment Rate | $6.11 | $78,050 | $31,846 | $11,363 | $3,253 |
| Grey | Area (Acres) | | 78,168 | 34,708 | 13,011 | 3,793 |
| | 25% Payment Rate | $5.04 | $393,838 | $174,870 | $65,554 | $19,113 |
| | 50% Payment Rate | $10.08 | $787,676 | $349,740 | $131,107 | $38,226 |
| Haldimand-Norfolk | Area (Acres) | | 68,655 | 29,314 | 10,715 | 3,089 |
| | 25% Payment Rate | $30.11 | $2,067,119 | $882,606 | $322,617 | $93,019 |
| | 50% Payment Rate | $60.22 | $4,134,238 | $1,765,211 | $645,234 | $186,039 |
| Halton | Area (Acres) | | 19,413 | 8,162 | 2,964 | 856 |
| | 25% Payment Rate | $12.13 | $235,533 | $99,026 | $35,964 | $10,383 |
| | 50% Payment Rate | $24.26 | $471,066 | $198,052 | $71,927 | $20,766 |
| Hamilton-Wentworth | Area (Acres) | | 34,704 | 14,888 | 5,440 | 1,565 |
| | 25% Payment Rate | $18.37 | $637,361 | $273,428 | $99,900 | $28,748 |
| | 50% Payment Rate | $36.73 | $1,274,722 | $546,855 | $199,801 | $57,497 |
| Hastings | Area (Acres) | | 16,943 | 7,199 | 2,635 | 764 |
| | 25% Payment Rate | $3.28 | $55,520 | $23,590 | $8,635 | $2,503 |
| | 50% Payment Rate | $6.55 | $111,041 | $47,181 | $17,270 | $5,006 |
| Huron | Area (Acres) | | 69,149 | 30,970 | 11,638 | 3,411 |
| | 25% Payment Rate | $30.98 | $2,142,551 | $959,592 | $360,604 | $105,697 |
| | 50% Payment Rate | $61.97 | $4,285,103 | $1,919,185 | $721,208 | $211,393 |

Table 6.10 (cont.) Acres and Cost of Enrolling Potential Additional Riparian Buffers On Private Agricultural Land Along Southern Ontario Watercourses based on Buffer Width and Payment Rates of 25% and 50% of the Average County Rental Rate of Land

| County | Area (Acres) | | Riparian Buffer Width | | | |
|---|---|---|---|---|---|---|
| | Payment Rates (25%/50%) | | 50 meter[1] | 25 meter[1] | 10 meter[1] | 3 meter[1] |
| Kent | Area (Acres) | | 71,843 | 32,481 | 12,328 | 3,644 |
| | 25% Payment Rate | $38.71 | $2,780,772 | $1,257,224 | $477,161 | $141,047 |
| | 50% Payment Rate | $77.41 | $5,561,545 | $2,514,449 | $954,322 | $282,095 |
| Lambton | Area (Acres) | | 75,140 | 32,501 | 12,139 | 3,563 |
| | 25% Payment Rate | $29.93 | $2,249,208 | $972,876 | $363,359 | $106,639 |
| | 50% Payment Rate | $59.87 | $4,498,416 | $1,945,752 | $726,719 | $213,279 |
| Lanark | Area (Acres) | | 13,206 | 5,442 | 1,953 | 560 |
| | 25% Payment Rate | $4.37 | $57,651 | $23,757 | $8,526 | $2,446 |
| | 50% Payment Rate | $8.73 | $115,303 | $47,514 | $17,052 | $4,891 |
| Leeds & Grenville | Area (Acres) | | 24,917 | 10,526 | 3,853 | 1,117 |
| | 25% Payment Rate | $7.28 | $181,506 | $76,675 | $28,066 | $8,136 |
| | 50% Payment Rate | $14.57 | $363,012 | $153,349 | $56,133 | $16,272 |
| Lennox & Addington | Area (Acres) | | 9,603 | 4,049 | 1,478 | 429 |
| | 25% Payment Rate | $3.13 | $30,010 | $12,655 | $4,618 | $1,341 |
| | 50% Payment Rate | $6.25 | $60,020 | $25,310 | $9,236 | $2,682 |
| Middlesex | Area (Acres) | | 66,269 | 29,780 | 11,232 | 3,274 |
| | 25% Payment Rate | $29.15 | $1,932,030 | $868,214 | $327,454 | $95,439 |
| | 50% Payment Rate | $58.31 | $3,864,060 | $1,736,427 | $654,908 | $190,878 |
| Niagara | Area (Acres) | | 46,312 | 19,722 | 7,158 | 2,047 |
| | 25% Payment Rate | $29.46 | $1,364,539 | $581,080 | $210,893 | $60,316 |
| | 50% Payment Rate | $58.93 | $2,729,078 | $1,162,160 | $421,787 | $120,631 |
| Northumberland | Area (Acres) | | 26,208 | 11,639 | 5,332 | 1,562 |
| | 25% Payment Rate | $7.00 | $183,481 | $81,486 | $37,332 | $10,936 |
| | 50% Payment Rate | $14.00 | $366,962 | $162,973 | $74,664 | $21,873 |
| Ottawa-Carlton | Area (Acres) | | 36,100 | 16,014 | 5,989 | 1,748 |
| | 25% Payment Rate | $10.55 | $380,791 | $168,916 | $63,174 | $18,442 |
| | 50% Payment Rate | $21.10 | $761,581 | $337,831 | $126,349 | $36,885 |
| Oxford | Area (Acres) | | 41,666 | 18,863 | 7,156 | 2,103 |
| | 25% Payment Rate | $34.96 | $1,456,591 | $659,423 | $250,152 | $73,510 |
| | 50% Payment Rate | $69.92 | $2,913,183 | $1,318,847 | $500,304 | $147,021 |
| Peel | Area (Acres) | | 19,670 | 8,289 | 3,013 | 868 |
| | 25% Payment Rate | $8.10 | $159,424 | $67,179 | $24,418 | $7,037 |
| | 50% Payment Rate | $16.21 | $318,847 | $134,358 | $48,836 | $14,074 |
| Perth | Area (Acres) | | 47,241 | 21,907 | 8,429 | 2,494 |
| | 25% Payment Rate | $39.02 | $1,843,235 | $854,779 | $328,868 | $97,298 |
| | 50% Payment Rate | $78.04 | $3,686,471 | $1,709,557 | $657,736 | $194,596 |
| Peterborough | Area (Acres) | | 17,779 | 8,152 | 3,546 | 1,047 |
| | 25% Payment Rate | $3.99 | $70,979 | $32,543 | $14,158 | $4,179 |
| | 50% Payment Rate | $7.98 | $141,958 | $65,086 | $28,315 | $8,358 |

Table 6.10 (cont.) Acres and Cost of Enrolling Potential Additional Riparian Buffers On Private Agricultural Land Along Southern Ontario Watercourses based on Buffer Width and Payment Rates of 25% and 50% of the Average County Rental Rate of Land

| County | Area (Acres) | | Riparian Buffer Width | | | |
|---|---|---|---|---|---|---|
| | Payment Rates (25%/50%) | | 50 meter[1] | 25 meter[1] | 10 meter[1] | 3 meter[1] |
| Prescott-Russell | Area (Acres) | | 47,605 | 21,772 | 8,242 | 2,393 |
| | 25% Payment Rate | $10.81 | $514,571 | $235,336 | $89,092 | $25,871 |
| | 50% Payment Rate | $21.62 | $1,029,141 | $470,673 | $178,185 | $51,741 |
| Prince Edward | Area (Acres) | | 6,606 | 2,702 | 969 | 279 |
| | 25% Payment Rate | $6.28 | $41,466 | $16,960 | $6,084 | $1,749 |
| | 50% Payment Rate | $12.55 | $82,932 | $33,920 | $12,169 | $3,498 |
| Renfrew | Area (Acres) | | 38,577 | 17,251 | 6,486 | 1,896 |
| | 25% Payment Rate | $4.92 | $189,877 | $84,908 | $31,925 | $9,331 |
| | 50% Payment Rate | $9.84 | $379,754 | $169,816 | $63,850 | $18,662 |
| Simcoe | Area (Acres) | | 67,957 | 31,232 | 11,879 | 3,478 |
| | 25% Payment Rate | $10.73 | $729,267 | $335,156 | $127,473 | $37,324 |
| | 50% Payment Rate | $21.46 | $1,458,535 | $670,311 | $254,947 | $74,648 |
| Stormont, Dundas & Glengarry | Area (Acres) | | 58,404 | 26,562 | 10,041 | 2,947 |
| | 25% Payment Rate | $17.78 | $1,038,178 | $472,161 | $178,480 | $52,381 |
| | 50% Payment Rate | $35.55 | $2,076,357 | $944,322 | $356,960 | $104,762 |
| Victoria | Area (Acres) | | 23,439 | 9,956 | 3,638 | 1,051 |
| | 25% Payment Rate | $5.37 | $125,798 | $53,438 | $19,524 | $5,643 |
| | 50% Payment Rate | $10.73 | $251,597 | $106,876 | $39,048 | $11,287 |
| Waterloo | Area (Acres) | | 26,605 | 11,620 | 4,275 | 1,239 |
| | 25% Payment Rate | $25.28 | $672,616 | $293,762 | $108,081 | $31,332 |
| | 50% Payment Rate | $50.56 | $1,345,232 | $587,523 | $216,161 | $62,663 |
| Wellington | Area (Acres) | | 49,019 | 21,288 | 7,838 | 2,267 |
| | 25% Payment Rate | $14.15 | $693,562 | $301,206 | $110,905 | $32,070 |
| | 50% Payment Rate | $28.30 | $1,387,124 | $602,413 | $221,811 | $64,139 |
| York | Area (Acres) | | 30,289 | 13,242 | 4,918 | 1,430 |
| | 25% Payment Rate | $14.50 | $439,282 | $192,047 | $71,328 | $20,744 |
| | 50% Payment Rate | $29.01 | $878,564 | $384,093 | $142,656 | $41,488 |
| **Total** | Acres | | 1,409,388 | 620,766 | 232,511 | 67,681 |
| | 25% Rate | | $27,623,837 | $12,194,684 | $4,554,807 | $1,327,597 |
| | 50% Rate | | $55,247,673 | $24,389,368 | $9,109,613 | $2,655,193 |
| **Cost Per Ontario Citizen Per Year[2]** | 25% Rate | | $2.27 | $1.00 | $0.37 | $0.11 |
| | 50% Rate | | $4.54 | $2.01 | $0.75 | $0.22 |

Source: Author's calculations based on Table 6.3 and Table 6.6

Notes:

1. Four scenarios estimating buffer widths of 50, 25, 10 and 3 meters were used in this analysis in order to test the sensitivity
2. According to Statistics Canada (2006), Ontario's population was 12,160,282.

Again, these figures only represent payments made to landowners and do not include start up costs, administration costs, monitoring and verification costs or evaluation costs.

Table 6.9 and Table 6.10 report estimates of the individualized cost to each Ontario citizen as a result of making payment to secure ecological goods and services from private rural land in Ontario. Table 6.11 reports the individualized annual cost for each scenario and payment rate for both the potential riparian areas and the other ecological goods and services producing lands by adding together the individualized annual cost calculations from Tables 6.9 and 6.10. The cost to each Ontario citizen ranges from a low of $1.20 year/citizen for a program scenario of 3 meter riparian buffers, 10% participation rate and a 25% payment rate to a high of $24.09 year/citizen for a program scenario with 50 meter riparian buffers, 100% participation and a 50% payment rate.

Table 6.12 summarizes the projected total annual cost, under the aforementioned scenarios, by adding the total cost projections in Tables 6.9 and 6.10. The total projected annual cost of an Ontario ecological goods and services program ranged from a low of approximately $13 million a year, under a program scenario with 3 meter riparian buffers, 10% participation rate and a 25% payment rate, to a high of approximately $293 million a year, under a program scenario with 50 meter riparian buffers, 100% participation and a 50% payment rate.

*6.4.1 Business Risk Management Programs in Ontario*

In order to contextualize the figures presented above, I will compare the estimated program costs to the amount spent by OMAFRA on business risk management programs each year. This example is intended to show how the funding required to finance a

Table 6.11 Annual Cost per Ontario Citizen for a Payment for Ecological Goods and Services Program in Ontario ($/year/Ontario citizen)

| Payment Rate | Potential Additional Riparian Buffers | Existing Ecological Goods and Service Producing Lands | | |
|---|---|---|---|---|
| | | Participation Rates | | |
| | Buffer Width | 10% | 50% | 100% |
| 25% | 3 m | $1.09 | $5.00 | $9.88 |
| | 10 m | $1.35 | $5.26 | $10.15 |
| | 25 m | $1.98 | $5.89 | $10.77 |
| | 50 m | $3.25 | $7.16 | $12.04 |
| 50% | 3 m | $2.17 | $9.99 | $19.76 |
| | 10 m | $2.70 | $10.52 | $20.29 |
| | 25 m | $3.96 | $11.78 | $21.55 |
| | 50 m | $6.50 | $14.32 | $24.09 |

Source: Authors calculation by adding individualized cost calculations from Table 6.9 and Table 6.10

Table 6.12 Total Annual Cost for a Payment for Ecological Goods and Services Program in Ontario ($/year)

| Payment Rate | Potential Additional Riparian Buffers | Existing Ecological Goods and Service Producing Lands | | |
|---|---|---|---|---|
| | | Participation Rates | | |
| | Buffer Width | 10% | 50% | 100% |
| 25% | 3 m | $13,210,655 | $60,742,887 | $120,158,178 |
| | 10 m | $16,437,865 | $63,970,097 | $123,385,388 |
| | 25 m | $24,077,742 | $71,609,974 | $131,025,265 |
| | 50 m | $39,506,895 | $87,039,127 | $146,454,418 |
| 50% | 3 m | $26,421,309 | $121,485,774 | $240,316,355 |
| | 10 m | $32,875,729 | $127,940,194 | $246,770,775 |
| | 25 m | $48,155,484 | $143,219,949 | $262,050,530 |
| | 50 m | $79,013,789 | $174,078,254 | $292,908,835 |

Source: Authors calculation by adding annual cost estimates from Table 6.9 and Table 6.10

provincial ecological goods and services program can be integrated and added to existing farm support programs.

The business risk management suite of programs is intended to support farm operators who experience unexpected losses due to adverse weather, market or financial conditions. Business risk management programs under the Growing Forward agricultural policy framework are administered on behalf of Agriculture and Agri-Food Canada and OMAFRA by Agricorp. Table 6.13 presents the farm incomes support programs and payments made through Agricorp in Ontario over the period from the 2005-2006 season to the 2008-2009 season. Programs administered by Agricorp include AgriStability, which compensates farmers when their farm margins fall below a percentage of their historical margins, and Production Insurance, which protects farm from crop losses and reduced yields due to adverse weather and other insured harm.[14] Agricorp also administers ad hoc programs such as the Ontario Cattle, Hog and Horticulture Payment Program and the Ontario Grain and Oilseed Program, which provide income support to producers in sectors facing financial distress. The average annual farm income support payments in Ontario over the past four seasons was calculated to be in excess of $378 million per year.

The average annual farm income support payments made through Agricorp over the past four seasons exceed the upper bound projected cost of a payment for ecological goods and services program in Ontario by nearly $100 million a year. There could be potential for integrating and adding an ecological goods and services program into the business risk management suite of programs. This could be beneficial to agricultural producers on

[14] AgriStability was formerly called the Canadian Agricultural Income Stabilization program or CAIS

Table 6.13 Annual Agricultural Income Support Payments in Ontario, 2005-2009 ($ millions)

| Agricultural Income Support Programs[1] | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 |
|---|---|---|---|---|
| CAIS/Agri-Stability | $210.1 | $225.0 | $235.6 | $233.4 |
| Risk Management Program for Grain and Oilseed Producers | - | - | $44.5 | $8.1 |
| Self-Directed Risk Management[2] | $22.9 | $12.8 | $5.3 | $4.3 |
| General Top-Up | $21.0 | $20.1 | $13.9 | $1.0 |
| Ontario Grain and Oilseed Program | - | $74.1 | - | - |
| Ontario Edible Horticultural Crop Program | - | $34.0 | - | - |
| Ontario Cost Recognition Top-up Program | - | - | $48.8 | $1.6 |
| Ontario Juice Grape Transition Program | - | - | $2.5 | $0.2 |
| Ontario Cattle, Hog and Horticulture Payment | - | - | $130.0 | $9.3 |
| Ontario Inventory Transition Program | - | $51.2 | $7.7 | $0.6 |
| CAIS Inventory Transition Program | - | $78.3 | $12.5 | $1.0 |
| Orchnards and Vineyards Transition Program | - | - | - | $5.0 |
| Total | $254.0 | $495.5 | $500.8 | $264.5 |
| Average Annual Farm Income Support Payments in Ontario (2005-2009) | $378.7 | | | |

Source: Agricorp (2008) and Agricorp (2009)

Notes:

1. For descriptions of the agricultural income support programs please see Agricorp (2008) and Agricorp (2009)

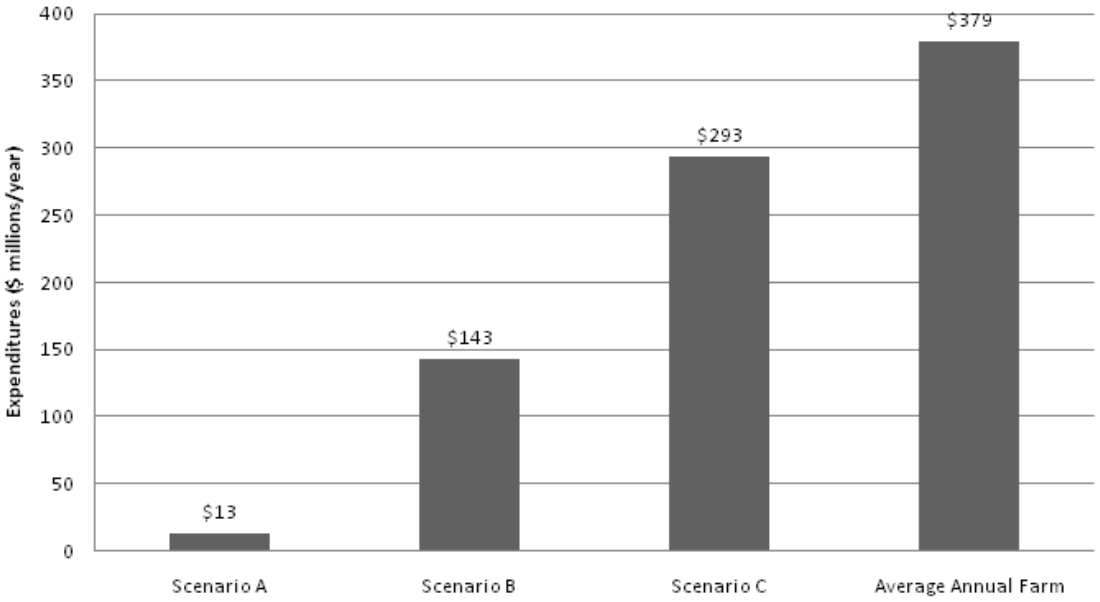
2. Agricultural producers contribution to the Self-Directed Risk Management Program are matched by government funds. Therefore only 50% of the payments made through this program represent taxpayer contributions to this program. The figures presented here are 50% of the figures reported in Agricorp (2008) and Agricorp (2009).

a number of fronts. For one, such a program would provide a stable level of income support to agricultural producers and could thereby reduce the need for, or at least the magnitude of, ad hoc income support programs. In addition, such a program could result in the provision of valuable ecological goods and services in exchange for farm income support.

Figure 6.9 shows a comparison between the average annual expenditure on farm income support programs in Ontario from 2005 – 2009 and the projected cost of a payment for ecological goods and services program in Ontario under three scenarios illustrating varied participation rates and riparian buffer widths. Scenario A has a projected cost of approximately $13 million per year based on a participation rate of 10% and a riparian buffer width of 3 meters. Scenario B has a projected cost of approximately $143 million per year based on a participation rate of 50% and a riparian buffer width of 25 meters. Scenario C has a projected cost of approximately $293 million per year based on a participation rate of 100% and a riparian buffer width of 50 meters. The average annual expenditure on farm income support program over the period from 2005 – 2009 was approximately $379 million per year. The Figure shows that program costs may amount to a relatively small portion of the annual expenditure on farm support programs. Again, there could be potential for using a payment for ecological goods and services program as an alternative method of farm income support by integrating it within the existing farm income support budget.

A payment for ecological goods and services program could work as an income stabilization scheme because agricultural producers would receive steady annual program payments that are not tied to changes in agricultural productivity or commodity prices.

Figure 6.9 Comparison of Projected Expenditure on Provincial Payment for Ecological Goods and Services Program Scenarios to Average Annual Farm Income Support Expenditure in Ontario, 2005 - 2009




Notes:
Scenario A: 50% Payment Rate, 10% Participation, 3 m Riparian Buffer
Scenario B: 50% Payment Rate, 50% Participation, 25 m Riparian Buffer
Scenario C: 50% Payment Rate, 100% Participation, 50 m Riparian Buffer

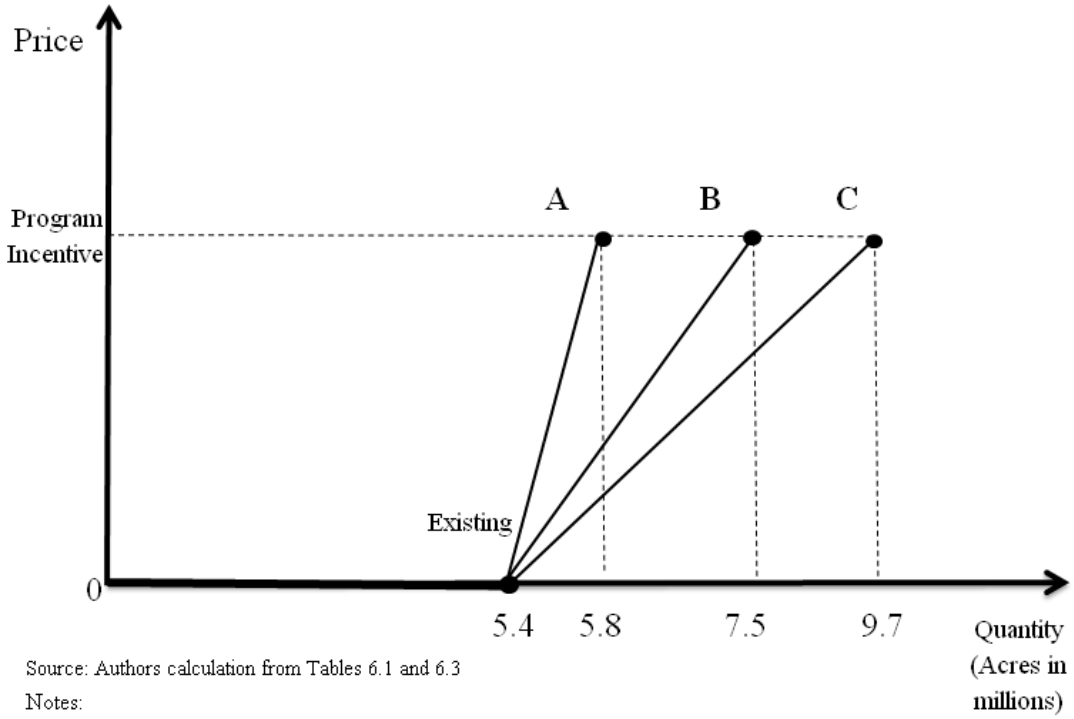
Payments through such a program would be guaranteed for the length of the contract and agricultural producers could budget their resources accordingly. Agricultural producers could also receive the same total amount of income support while also being recognized for providing valuable ecological goods and services through their land stewardship. Formal recognition of the beneficial stewardship actions of agricultural producers could enhance the perception that non-agricultural producers hold of the agricultural sector. There could be potential for incorporating a payment for ecological goods and services program into the business risk management suite of programs because it would be a stable income stream for landowners as well as providing benefits to the taxpayers who are financing existing business risk management programs. The Conservation Reserve Program in the United States emerged as an alternative to traditional farm income support programs in the 1980's when there were large changed in commodity prices. There could be potential for an payment for ecological goods and services program emerging in Ontario and possibly Canada that also provides an alternative to traditional farm income support programs.

## 6.5 Discussion and Conclusions

### *6.5.1 Inventory and Current Supply of Ecological Goods and Services from Private Land in Southern Ontario*

Above I presented results from the GIS analysis that represented the inventory and current supply of ecological goods and services from private land in Southern Ontario. Figure 6.10 shows the existing and potential additional supply of ecological goods and services from private land in Southern Ontario based on three scenarios of varied program participation and riparian buffer width. This Figure show that there is an existing supply of approximately 5.4 million acres of ecological good and service

Figure 6.10 Supply of Ecological Goods and Services in Ontario based on Three Program Scenarios with Varied Participation Rates and Riparian Buffer Widths




Source: Authors calculation from Tables 6.1 and 6.3

Notes:

Scenario A - 10% participation rate, 3 m riparian buffer

Scenario B - 50% participation rate, 25 m riparian buffer

Scenario C - 100% participation rate, 50 m riparian buffer

producing private land in Southern Ontario. Program scenario A assumes a participation rate of 10% and 3-meter riparian buffers has the potential to increase supply to approximately 5.8 million acres. Program scenario B assumes a participation rate of 50% and 25-meter riparian buffers has the potential to increase supply to approximately 7.5 million acres. Program scenario C assumes a participation rate of 100% and 50-meter riparian buffers has the potential to increase supply to approximately 9.4 million acres. Figure 6.10 also indicates that a zero price is being paid for existing ecological goods and services supply at this time.

Figure 6.10 also indicates that current privately supplied ecological goods and services are supplied at a price of zero. That is, most landowners currently supplying ecological goods and services have not been paid for that supply. As I explained in my statement of the economic problem this research addresses (Chapter 1), landowners may supply ecological goods and services intentionally or unintentionally as a positive by-product of their land use and management decisions. Landowners are also bear the cost of that provision. A question that arises is: why would landholders supply goods and services for which there is a zero price. Two possible answers for this question are explored in the following section.

*6.5.1.1 Motivations for Supply of Ecological Goods and Services at Zero Price*

In this section I will describe two possible explanations for why a landowner would choose to supply ecological goods and services at zero price. First, a landowner may reap private benefits for the provision of a public good that outweigh the opportunity costs of using the ecological good and service producing lands for another purpose. Second, a landowner may not reap substantial private benefits from the ecological goods and services produced by his/her land but the cost of converting the land to another

productive use is perceived to be greater than the expected flow of benefits. Both of these explanations will now be discussed in detail.

*Private Benefits of Producing a Public Good*

The first explanation rests on the assertion that landowners reap value from the ecological goods and services produced on their land that are often assumed to be public goods. I believe it is a mistake to view ecological goods and services as pure public goods. Drozdz (2009, p 123) reported that, "pure public goods, goods that are nonrival in consumption and non-excludable, exist in theory but rarely, if ever, in reality." Assuming ecological goods and services are pure public goods leads to the assumption that producers of ecological goods and services cannot capture the benefits from their production for him or herself while excluding others. The benefits from a pure public good are non-excludable, so that the owner of the public good cannot exclude other from enjoying the benefits. Pure public goods are also nonrival, so no amount of enjoyment of benefits reduces the possible enjoyment of benefits by others. But, according to Drozdz (2009), in the case of many ecological goods and services, there is a degree of both excludability and rivalness.

Take, for example, a scenic view of a wetland populated by waterfowl that is within a landowner's private property and can only be viewed from that property. In this case, some ecological goods and services benefits are reaped by the landowner and those he wishes to give access to his property, while excluding others. This would include benefits such as the scenic vista itself and recreation opportunities offered by the wetland and wildlife (hunting, nature viewing, etc.). There is also rivalness in consumption; if the landowner hunts the waterfowl in his or her wetland, no other hunter will be able to hunt

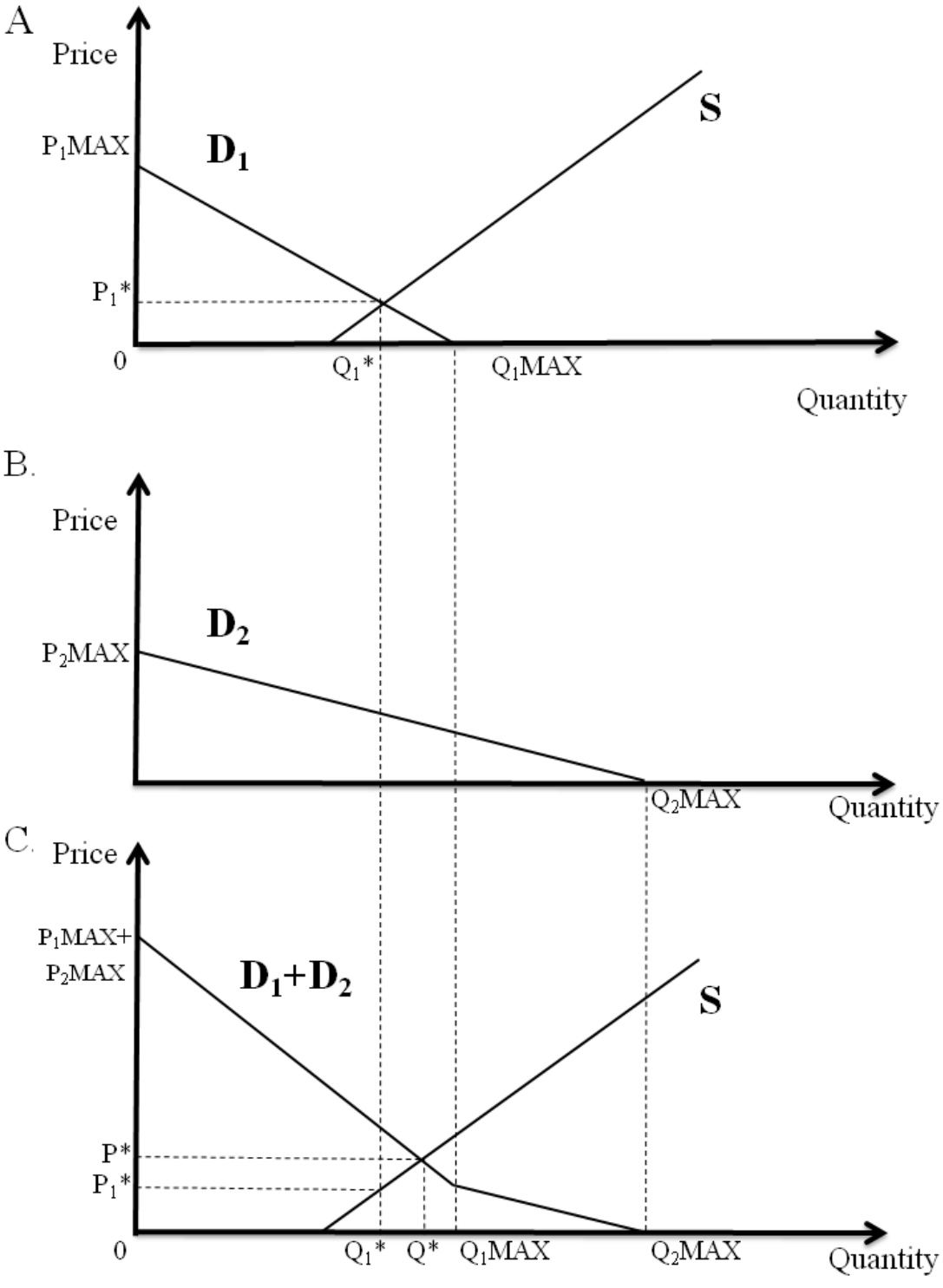
those same waterfowl. But there are also benefits of the landowner's provision of wetlands that are nonexcludable and nonrival. For example, some people may value the existence of wetlands and resulting waterfowl habitat even if they cannot derive use value from the wetland or waterfowl habitat. A landowner who enjoys the benefits of ecological good and services production on his land may not be concerned that others can free-ride on the ecological good and service benefits that either are non-excludable or that he or she does not wish to exclude from others. The above stands as one possible explanation for the provision of ecological goods and services at zero price.

To further clarify the above explanation as to why a landowner would supply ecological goods and services at zero price, I will use a series of graphs. Figure 6.11 represents a modification to the traditional aggregation of demand for public goods used in economics. In Figure 6.11, two people demand a public good while one of those people (the landowner) has the ability to supply that public good. Panel A presents the supply and demand of the public good for the landowner. Panel B represents the other person's demand for the public good. Panel C aggregates both the landowner's and the other actor's demand for the public good. A detailed description of each panel follows below.

Assume, first, that a landowner simultaneously supplies and demands ecological goods and services.[15] Panel A of Figure 6.11 displays the supply (represented by S) and demand (represented by $D_1$) of ecological goods and services for a landowner. The intersection of supply and demand of for the landowner represents the point at which the internal benefits of ecological goods and services supply are equal to the internal costs.

[15] Included in this assumption is the implicit assumption that the landowner wishes to consume the goods and services it produces.

Figure 6.11 - Aggregate demand for a public good of two people where one person both produces and demands the public good



At the intersection between S and $D_1$, the quantity of goods and services produced and consumed by the landowner firm is represented by $Q_1$*. $P_1$MAX represents the maximum price that the landowner firm would pay for the first unit of good or service and $Q_1$MAX represents the maximum quantity of goods and services demanded by the landowner firm as the price approaches zero.

Panel B of Figure 6.11 displays the demand (represented by $D_2$) of the non-landowner actor. $P_2$MAX represents the maximum price that the non-landowner actor would pay for the first unit of good or service and $Q_2$MAX represents the maximum quantity of goods and services demanded by the non-landowner actor as the price approaches zero.

Panel C of Figure 6.11 displays the aggregation of demand for public goods. $D_1 + D_2$ represents the aggregated demand curve. Demand for public goods is aggregated vertically because of the nonrivalness attribute of public goods. If one unit of a public good is supplied then demand for that one unit is satisfied for all users. For the first unit of public good supplied, the aggregate price (or aggregate wiliness to pay of both users) is $P_1$MAX + $P_2$MAX. There is kink in the demand curve, $D_1 + D_2$, at $Q_1$MAX because at this point the landowner actor has no additional demand for the public good. At the intersection between S and $D_1 + D_2$, the quantity of public goods produced and consumed by the two actors is represented by Q* at a price of P*.

An important implication to derive from Figure 6.11 is that a landowner may have private rationale for providing a public good from which others benefit. Based on the landowner's own demand for and supply of the public good, the other person's demand for the public good is also partially satisfied. Notice that the equilibrium quantity and

price for the landowner firm ($Q_1$* and $P_1$*) are less than the equilibrium quantity and price in the aggregated case (Q* and P*). The landowner would supply up to $Q_1$* public goods based on his or her own demand for the public good. This is one possible explanation as to why a landowner would supply ecological goods and services that exhibit public good characteristics.

There is one final note that I would like to make in this section before moving on. There is potential for some land use decisions to lead to both the provision of public goods and private production opportunities.[16] For example, a landowner who owns a woodlot can provide myriad ecological goods and services (wildlife habitat, scenic views, biodiversity) which those outside his or her farm property can enjoy but, at the same, also provides an opportunity for private benefits through activities such as the selective harvesting of high value hardwoods. It may be the case that selective harvesting of hardwoods is a higher value activity in some areas than traditional agricultural commodity production. Therefore, the ecological goods and services provided in this situation are the positive by-products of production decisions that are privately profitable to the landowner. In this case, the production of ecological goods and services at zero price is not surprising in the least.

*Conversion costs exceed expected utility of land use change*

The second reason for landowners providing ecological goods and services at a zero price occurs when the cost of converting the land to a commercially productive use exceeds the expected utility stemming from the land use change. For example, a

[16] This is, in fact, almost always the case. There are few land use decisions that result in the production of a single private good or a single public good. Multiple public and private goods are often jointly produced.

landowner whose property contains a wetland on agriculturally productive land has the option to keep the wetland or drain it and use the land for agricultural production. I assume that landowners make decisions on land use to maximize their well-being (utility). I also assume, for this example, that the expected utility derived from the agricultural land use is greater than the utility derived from existing wetland. That is:

(1)

But, even though the expected benefits from converting the wetland to agricultural land use, there are costs incurred when converting to agricultural land. Assuming these costs are sufficiently large to give the landowner incentive to retain the wetland, adding conversion costs, represented by C, to (1) becomes

(2)

Assume that the farmer derives no utility from the wetland; $u$(wetland) = 0.[17] Therefore, the farmer will convert the wetland to agricultural production if

– (3)

or more simply,

(4)

On the other hand, if equation (4) does not hold, the farmer will face lower utility if he or she decides to convert the land to agricultural production and therefore would retain the wetland and the ecological goods and services it produces.

The two explanations of why a farmer would supply ecological goods and services at zero price are not mutually exclusive. The decision of whether to convert

[17] This assumption was made in order to distinguish the second motivation for supply at a zero price from the first motivation. If $u$(wetland) > 0 than the farmer would derive benefits from the wetland and therefore the presence of costs for converting to agricultural production may not be the deciding factor as to why the farmer is supplying ecological goods and services at a zero price.

existing natural land to agricultural land is based on both the benefits obtained from the existing land use and the cost of converting to another land use. Equation (4) can be extended to include the private benefits derived from the ecological good and service producing lands by the farmer. These benefits are represented by *u*(EGS land). Now, ecological good and service producing lands would be retained if:.

(5)

Lands currently supplying ecological goods and services in Ontario are represented by equation (5). This case, referred to from this point forward as Case 1, can potentially explain the current supply of ecological goods and services in Ontario. I calculated that there are 5.4 million acres of private land currently supplying ecological goods and services in Southern Ontario

I also calculated that an additional 4.3 million acres of potential ecological good and service producing lands exist in Ontario that are currently in agricultural production.[18] Landowners of these potential ecological good and service producing lands face the same land use decision represented by equation (5), except the inequality runs the other direction. That is

(6)

Landowners facing land use decisions represented by (6) will continue to use their land in agricultural production because the expected utility of converting to ecological good and service producing land is less than the sum of the conversion cost and utility of keeping the land in agricultural production.

[18] Potential additional acres calculated by subtracting existing ecological good and service producing lands from existing and potential good and service producing lands.

Now, suppose that landowners, who currently have their land in agricultural production, are given an incentive, represented by *I*, to convert their agricultural land to ecological good and service producing land. Two other possible cases would now arise. First, *I* could be sufficient in order to induce the landowner to convert to a ecological good and service producing land use. This case is represented by

(7)

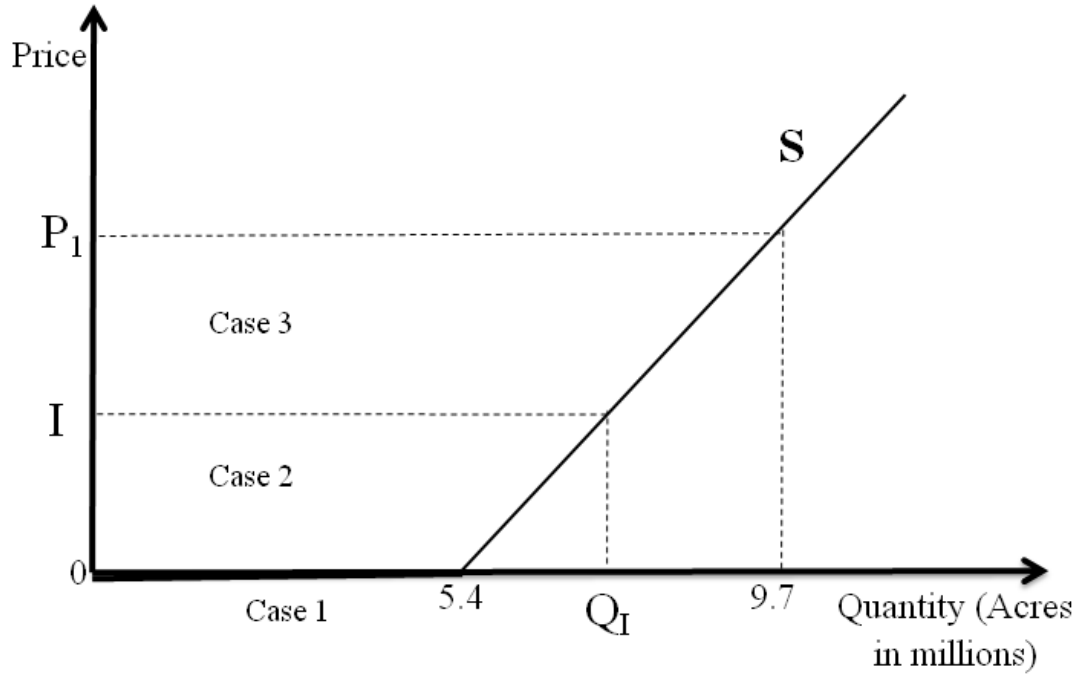
This case will be referred to as Case 2. The other case occurs when *I* is insufficient to induce land use change and the landowner retains his or her agricultural land. This case is represented by

(8)

This case will be referred to as Case 3.

Figure 6.12 shows an alternative depiction of the supply of ecological goods and services in Ontario to Figure 6.10. Case 1 represents the existing supply of ecological goods and services in Ontario. Included in this case are those landowners, for the reasons I detailed above, who supply ecological goods and services at zero price. Case 1 is represented by equation (5). Case 2 represents the scenario where landowners are given an incentive to convert agricultural land to ecological good and service producing land. In this case an incentive of *I* increases the quantity of ecological good and service producing lands in Ontario to $Q_I$ acres. This case is represented by equation (7). Case 3 represents the case where incentives were insufficient to induce the conversion of agricultural land to a ecological goods and service producing land use. Incentives up to $P_1$ would have to be given to landowner in order to secure the supply of all 9.7 million

Table 6.12 - Cases Showing the Effect of Incentives on the Supply of Ecological Goods and Services in Ontario




Notes:

1. 9.7 million acres is the quantity of existing plus potential additonal ecological good and service producing land in Ontario. This figure was dervied from Tables 6.1 and 6.3. A 50m meter riparian
2. Quantity of existing ecological goods and services in Ontario is derived from Table 6.1 excluding potential acres of ecologicallly sensitive land.

acres of existing and potential additional good and service producing lands in Ontario. Case 3 is represented by equation (8).

This section described the supply of ecological goods and services in Ontario. Ecological goods and services are currently being supplied by landowners in Ontario at a zero price. The private benefits obtained by landowner from providing ecological goods and services and the cost of converting those lands to other uses explain possible motivations this supply at zero price. Incentives given to landowners have the potential to increase the supply of ecological good and service producing lands above existing levels.

*6.5.2 Data Limitations*

This section presents the data limitations encountered during the course of this GIS analysis. Removing public lands from this analysis was limited by the fact that no layer was available at this time that identified all crown owned land. A layer detailing crown land features would enhance the relevancy of the estimates in this analysis. The effect of the absence of this data on this analysis is expected to be an overestimation of eligible lands. Note that this data would not be necessary should it be possible to differentiate between public and private ownership of land.

Data were available that identified the contiguous park boundaries of Conservation areas but there were no data available that could identify other land owned by conservation authorities. Conservation areas are areas of land actively managed by the conservation authority while conservation authorities also own land that could be leased to agricultural producers or retained in natural state. Land owned by conservation authorities was considered ineligible for payments through an ecological goods and services program. The absence of these data led to land owned by conservation

authorities outside of conservation areas being included in this analysis and the effect is likely an overestimation of eligible ecological good and service producing lands.

The land cover data used are based on circa-2000 satellite imagery. Since that time, it is likely that land cover has changed. This research can be enhanced through the use of more recent satellite imagery data reflecting recent land use and land cover.

The land cover data has a resolution of 30 meter by 30 meter pixels. This level resolution means that the land cover is generalised by the predominant land cover in each pixel. Therefore, detailed landscape features, such as hedgerows or windbreaks, are not captured by the land cover data. This has a potentially significant impact on the incidence of existing riparian buffers in the land cover data because an existing 5 meter buffer on either side of a water course would not be identified if agriculture is the predominant land use in the remainder of each 30 meter pixel.

The Water Virtual Flow data used to create riparian buffers did not include municipal and provincial drains and roadside ditches. The potential to supply ecological goods and services from these features is limited because of road salt, noise, etc. Sparling *et al.* (2008) included drainage features and ditches in their analysis because ditches and drains could potentially provide wildlife corridors if managed properly. This analysis could be improved by the inclusion of these features in the future.

Land rental rate data are from the 2006 Census of Agriculture and land rental rates have likely changed since this time. The rise in prices for agricultural commodities since 2006 has likely resulted in higher land rental rates than those used in this analysis. If this is the case, then the projected cost of a payment ecological goods and services program in Ontario would be increased over what was reported in this analysis. Rental

rates are also averaged within counties and therefore cannot account for variations in the rental rate paid for agricultural land across counties.

We need to have a better understanding of how a payment for ecological goods and services program will be designed in Ontario so that the estimates I have provided can be refined to better reflect the actual payments rates used, eligible ecological goods and services, expected participation rates and preferred width of riparian buffers. That being said, this chapter represents an important first step in calculating the cost of an ecological goods and services provision program in Ontario.

*6.5.3 Conclusions*

The purpose of this chapter was to better understand the context of ecological goods and services in Ontario. I began with using GIS to calculate the area of land that would qualify for a payment for ecological goods and services program in each county in Ontario. GIS analysis was also used to derive potential payment rates that would secure the provision of ecological goods and services in each county. The results of the GIS analysis were then used to project the potential cost of paying for ecological goods and services provision in Ontario under a variety of program design scenarios. Based on the various compensation, eligibility and participation assumptions used, program costs ranged for a low of $1.09 year/Ontario citizen to a high $24.09 year/Ontario citizen. I compared the cost projections with the annual expenditure on agricultural income support programs in Ontario and discussed potential opportunities for policy integration. I concluded this chapter with an analysis of existing and potential additional ecological goods and services supply in Ontario.

A lesson learned from this GIS analysis is that, depending on the design of a payments for ecological goods and services program, the cost of providing valuable

ecological goods and services from private Southern Ontario farmland does not necessarily have the exorbitant cost that many groups and individuals with policy responsibility in Ontario reported that they thought it would (Chapter 5). Program design and participant adoption will be the main determinants in how much such a program would cost and it certainly could be designed to have at reasonable cost while still providing valuable ecological goods and services.

There appears to be some potential to integrate a payment for ecological goods and services with existing agricultural income support programs in order to stabilize agricultural incomes. I found that the upper-bound annual cost projections of a payment for ecological goods and services program are still far less than the average annual expenditure on farm income support programs.

The analysis contained in this chapter represents an important first step in calculating the cost of rewarding landowners for the goods and services they already provide. This analysis is also important for informing the development of a framework for ecological goods and services that follows in Chapter 7.

# Chapter 7 – A Framework for Ecological Goods and Services Policy in Ontario

## 7.1 Introduction

The research gap addressed in this thesis is the, despite commitments from provincial and federal ministers of agricultural, a framework for ecological goods and services policy has not yet been developed in Canada. It appears, for the moment, that debates on ecological goods and services policy development, at both the national level and provincially in Ontario, have stalled. The purpose of this chapter is to outline general principles, based on the research in this thesis, that can guide the development of ecological goods and services policy in Ontario. This is an important contribution to this research because it offers an attempt to move the policy discussion on ecological goods and services forward and can stimulate debate on some key issues.

In this chapter I combine the results and discussion contained in Chapters 2 through 6 to provide insight on the general principles that should guide ecological goods and services policy development in Ontario and Canada. General principles were chosen based on the degree to which this research can provide meaningful implications for ecological goods and services policy based on that general principle. I propose that the following principles should be strived for in the development of ecological goods and services policy:

- Clear definition of ecological goods and services;
- Clear definition of objectives;
- Fairness;
- Cost-effectiveness;
- Policy integration; and
- Political feasibility

This list is not definitive and other general guiding principles could be added. For example, it could be argued that efficiency should be included as a general principle, but I would argue that the pursuit of efficiency in the public provision of ecological goods and services is a fruitless endeavor because it is not possible to know the preferences of every taxpayer and satisfy the ends of many possibly divergent goals. In the first section of this chapter, I discuss each of these general principles based on insights from the lessons learned in this research.

In the second section of this chapter, I propose a set of essential elements that should be included as practical characteristics of a framework for ecological goods and services policy in Ontario and Canada. The list of essential elements differs from the list of general principle because the essential elements refer to more practical aspects of program and policy design. The essential elements that should be included in ecological goods and services policy in Ontario were derived through the lessons learned from international experiences with ecological goods and services policy and the context of ecological goods and services policy development in Ontario according policy practitioners. I propose that the following essential elements should be included in Ontario ecological goods and services policy:

- Program implementation at the most local level possible, or subsidiarity;
- Collection of data on the ecological characteristics of potential participants;
- Protection of landowner privacy;
- Increased interaction between beneficiaries and providers of ecological goods and services;

This section will explain and justify why I believe the inclusion of these elements to be essential to ecological goods and services policy in Ontario and Canada.

## 7.2 General Principles Guiding Ecological Goods and Services Policy Development in Ontario

### *7.2.1 Clear definition of ecological goods and services*

The general principles proposed in the chapter are based on a clear and consistently applied definition of ecological goods and services. I define ecological goods and services as increases in environmental goods from private rural land, independent of reductions of environmental harm. The following section will justify and explain this definition.

In Chapter 5, interview participants provided varied definitions of ecological goods and services. A number of interviewees perceived the lack of clear and consistent definition of ecological goods and services as an impediment to the progress of ecological goods and services policy in Ontario. Some key concepts, discussed in Chapter 2, will be used to develop a definition of ecological goods and services that is both clear and consistent.

In Chapter 5, interviewees stated that distinguishing between the promotion of ecological 'goods' and the reduction of ecological 'bads' is an important aspect of defining ecological goods and services. The issue being that economic incentives should not be provided for activities that promote the reduction of 'bads', in the form of water or air pollution, that are already required by law. According to Elizabeth Brubaker of Environment Probe, we have a legal traditional of prohibiting pollution and we should look to legal tradition here to determine what types of activities are not acceptable.

A useful example here would be that of water use rights in Ontario. According to Christensen and Linter (2007), water use rights in Ontario are based on the riparian rights doctrine inherited from England. Under this regime a landowner whose land borders a

water source is entitled to riparian rights. These rights allow the landowner access to and limited use of the water as long as it does not affect the natural flow in its natural quality and quantity. Carpenter *et al.* (1998) state that agricultural production is one cause of nutrient (nitrogen and phosphorus) run-off into water sources. Excess nutrients in waterways cause eutrophication, which leads to an increase in the growth of algae blooms and other weeds. These blooms decrease the oxygen content in the water and can result in the death of fish and other wildlife, among other impacts. If riparian rights are protected, a landowner whose activities leads to nutrient run-off into a waterway that flows through his/her property could be liable to legal action brought against them if this nutrient loading violated the rights of a downstream owner of riparian rights. Once precedent on the protection of riparian rights is established, the threat of legal action against riparian polluters could be enough to encourage reduction of pollution. Therefore there would be no need to provide polluters with positive incentives to reduce their pollution.

A problem with using the legal system to protect riparian rights has arisen in the form of legislation that makes it more difficult to bring lawsuits against certain groups and industries. In Chapter 2, I discussed the concept of legalized nuisance. The fact that it is more difficult to bring lawsuits against certain groups and industries is because nuisance has been legalized. Ms. Brubaker stated that right-to-farm legislation in Ontario allows agricultural producers to be protected from the threat of nuisance lawsuits when producing agricultural goods. In Ontario, the Farming and Food Production Protection Act of 1998 is sometimes referred to as right-to-farm legislation. According to Fraser and Desir (2005), one of the main themes of the Ontario Farming and Food Production

Protection Act (1998) is that farmers are protected from nuisance complaints brought on by neighbours, as long as the nuisance is a result of normal farm practices. Normal farm practice is defined in the Act as one which:

a. "is conducted in a manner consistent with proper and acceptable customs and standards, as established and followed by similar agricultural operations under similar circumstances, or
b. makes use of innovative technology in a manner consistent with proper advanced farm management practices"

What constitutes normal farm practice, as used here, is dynamic and depends on location, farm type, timing of the activity in question and what other similar producers do. If the theory of strict liability for harm, as defined in Chapter 2, was adhered to in Ontario, there would be no need to assess what is defined as normal farm practices. Instead, anything that constituted invasion of the property of another would be tortuous and that would include farm practices. According to Ms. Brubaker, "riparian rights are theoretically in place, but as long as [agricultural] activities are subject to regulation, that regulation would take precedence over the common law regime". Fraser and Desir (2005) point out that the Farming and Food Production Protection Act protects agricultural producers from nuisance complaints relating to light, vibration, smoke, flies, noise, odour and dust. Fraser and Desir state that agricultural producers do not have the right to pollute or to violate other legislation including the Environmental Protection Act and the Ontario Water Resources Act. The Ontario Water Resources Act (1990), states that, "Every person that discharges or causes or permits the discharge of any material of any kind into or in any waters or on any shore or bank thereof or into or in any place that may impair the quality of the water of any waters is guilty of an offence." Agricultural

producers could face penalties for violating this law; although it does not appear that this act is enforced with respect to agricultural producers.

The definition of ecological goods and services should only recognize activities that increase the supply of beneficial ecological goods and services and should not recognize activities that reduce the supply of ecological 'bads'. A policy that provides incentives for reducing 'bads' could create perverse incentives. Perverse incentives are incentives that have unintended and undesirable results that are contradictory to the reasons the incentive was offered. For example, an incentive could exist to help farmers put up livestock fencing to keep their livestock out of a nearby waterways. A rancher whose livestock do not currently have access to a stream, but wishes to put up a fence for his own private reasons, would then have an incentive to allow his cattle enter that stream for the purposes of being eligible for the incentive. If the incentive did not exist, there is little reason for the rancher to allow his cattle to enter the stream. Additionally, there is little sense paying, with taxpayer funding, to reduce environmental harms that amount to invasions of private property. For example, a person is not allowed to steal that which belongs to another. Imagine a policy where people are paid to not to steal from one another. Providing positive incentives to reduce 'bads' is not just bad policy, it is also unjust.

Once the reduction of environmental harm is eliminated from the definition of ecological goods and services, the scope of what is considered to be ecological goods or services is narrowed profoundly. Actions the lead to the increased provision of clean water or clear air would not be considered ecological goods and services under this definition. On the other hand, wildlife habitat, biodiversity, opportunities for recreation

and scenic amenities would all be considered ecological goods and services. All of these environmental goods have consumption, existence and option values attached to them. The definition of ecological goods and services that I have proposed has implications on the other guiding principles that will be discuss further below.

This definition has fairness implications, as actions that primarily reduce environmental harm would not be considered ecological goods and services provision activities. For example, actions the reduce nutrient-loading in waterways would not be considered to provide ecological goods and services. The reduction of environmental harm could be achieved through the repeal of legislation that amounts to the legalization of nuisance and by holding polluters accountable for their actions under common law property rights.

*7.2.2 Clear definition of objectives*

The primary objective of ecological goods and services policy must be clear so that the development of that policy can be consistent with that primary objective. Ecological goods and services programs used in other countries (Chapter 4) usually pursue one of two primary objectives: increasing the supply of beneficial ecological goods and services or enhancing farm income support. These objectives are not mutually exclusive. Indeed, some countries pursue ecological goods and services policy in order to satisfy both objectives (Chapter 4 and Chapter 6). The definition of a primary objective of ecological goods and services is important because it has implications with respect to cost-effectives and fairness.

The primary objective of ecological goods and services policy should be the retention, maintenance and/or enhancement of existing ecological goods and services and increased supply additional ecological goods and services. The justification for this

primary objective stems from the definition of ecological goods and services proposed above and although the rationale is circular ecological goods and services policy should have the objective of retaining, enhancing and/or increasing the supply of ecological goods and services. The general principles guiding ecological goods and services policy development that follow are proposed with respect to the primary objective of retaining, enhancing and/or increasing ecological goods and services supply.

Another important consideration when setting policy objectives is determining which ecological goods and services are being pursued, where they are demanded and in what quantity/quality. It is important to be clear about the ecological good and services provision objectives in order to remain transparent and accountable to taxpayers. A strength of the BushTender program in Australia (Chapter 4) is that it pursues a single ecological good and service objective, biodiversity, and therefore can report to taxpayers whether the program has been successful with respect to that objective. Biodiversity can mean many different things but based on how it is defined as an objective in the BushTender program (i.e. enhancement, retention and increases in natural vegetation), it fits with the scope of my definition of ecological goods and services. It will be necessary to define the ecological good and services provision objectives clearly so that Ontario taxpayers know what they should expect from ecological goods and services policy and can hold the government accountable to those objectives.

*7.2.3 Fairness*

Fairness is a normative criterion that assesses the distributional equity of benefits and costs. Fields and Field (2009, p.185) report that, "equity is, first and foremost, a matter of morality and the concerns about how the benefits and costs of environmental improvements ought to be distributed among members of society." Fairness influences a

number of characteristics of ecological goods and services policy. I begin this section by defining the scope of what is encompassed by ecological goods and services with the discussion of two issues: additionality and openness. Additionality recognizes only that ecological good and services provision that is provided in addition to a pre-determined baseline level. The openness issue relates to which landowners should be eligible to participate in a payment for ecological goods and services program. Both of these issues have direct fairness implications. I end this section with a brief discussion of fairness implication related to my proposed definition of ecological goods and services.

*Additionality*

The second issue addressed in this section is the issue of additionality. Additionality refers to the practice of compensating landholders for the provision of ecological goods and services that represents additions relative to a baseline inventory of ecological goods and services. Engel *et al.* (2008, p. 670) reports that ecological goods and services policies that lack additionality may have reduced cost-effectiveness if, "payments to land uses that would have been adopted anyway reduce funds available to induce socially-efficient land-use change elsewhere." That is, if payments to existing beneficial land-uses means that insufficient funds are available to induce beneficial land-use changes elsewhere, then the result would be a lower supply of ecological goods and services relative to what could have been supplied if payments were reserved for the provision of additional ecological goods and services.

The Norfolk ALUS pilot project requires a degree of additionality, as landowners can enroll existing ecological good and service producing lands in the pilot as long as the same is matched by the enrollment of new ecological good and service producing land. This is an interesting way of dealing with the financial constraints imposed by the lack of

additionality while, at the same time, rewarding landholders for past beneficial management. Some international ecological goods and services programs require additionality (U.S. Conservation Reserve Program and aspects of Costa Rica's *Pago por Servicios Ambientales*) while others recognized and rewarded prior management that did not contribute to the incremental supply of ecological goods and services (BushTender in Australia, Environmental Stewardship in England). I found that some individuals with policy responsibility were concerned about the fiscal implications of a province-wide ecological goods and services program in Ontario (Chapter 5). These concerns could be exacerbated if a proposed ecological goods and services program lacked additionality. But these concerns may be overblown. The estimate of the cost of a provincial ecological goods and services program (Chapter 6) represents new information that was not available to interview participants. The cost projections appear to be modest even though the assumed program design used to project costs in Chapter 6 lacked additionality.

One of the problems with including additionality as a characteristic of ecological goods and services policy design is the creation of perverse incentives. Engel *et al.* (2008, p. 668) report that paying only for additionality could induce the, "expansion of environmentally destructive activities to obtain higher subsidies later on." A landowner could decide to drain a wetland with the hope that he or she could be rewarded to recreate the wetland in the future. Engel *et al.* note that this problem could be avoided if the baseline from which additionality is calculated is based on a period prior to the design of program. Although this solution could avoid the perverse incentives of requiring additionality, it still does not recognize the contributions of landowners whose prior stewardship actions supply beneficial ecological goods and services. As a matter of

fairness, landowners should be compensated for ecological goods and services provision regardless if those goods and services are to be supplied through existing stewardship actions or new stewardship actions. In order for ecological goods and services policy to be fair to all landowners, I recommend that the concept of additionality not be required.

*Openness*

The openness issue is related to which landowners are eligible to participate in payment for ecological goods and services program or, in other words, the degree of openness in program eligibility. The question of who is eligible is often a debate between limiting eligibility to certain groups, usually agricultural producers, versus allowing any landholders who can provide beneficial ecological goods and services to participate. In Chapter 5, there was debate among individuals with policy responsibility that related to the scope of eligible suppliers of ecological goods and services.

Andy Graham stated that the definition of ecological goods and services that he heard most often but did not subscribe to himself was, "farmers providing some measure of service in terms of the soil, water, air, [and] biodiversity that is enjoyed by others off the farm." In this definition only agricultural producers are considered as only potential suppliers of ecological goods and services that are worthy of incentives. Mr. Graham had issue with this definition because of the limited scope of eligible suppliers. Mr. Graham stated that, "if [incentives go] to agriculture, why wouldn't it go to forestry and mining and people living in the city who happen to have some trees." Scott Duff expressed similar sentiments when asking, "Is it something that should apply only to farmers or should it be available to all rural landowners?" In terms of fairness, incentives for outputs of ecological goods and services should be open to all who can provide them. Agricultural producers, as private owners of substantial amounts of land in Southern

Ontario, are in a unique position to provide these goods and services, but rural non-agricultural landowners can also provide these goods and services and should eligible for the same incentives.

But there are reasons why the scope of ecological goods and services has been limited to agricultural producers. As was discussed in Chapter 4, one of the drivers of the Conservation Reserve Program in the United States was that it could be used to increase incomes of agricultural producers. So, based on pursuing the enhancement of agricultural incomes as primary objective of ecological goods and services policy, there could rationale for limiting eligibility to agricultural producers. But, in section 7.2.1, I defined the primary objective of ecological goods and services policy as the increase in supply of beneficial ecological goods and services. In terms of fairness to all landowners, and in pursuing the primary objective of this ecological goods and services policy, the preferred approach is to open the payment for ecological goods and services program to all landowners who can provide beneficial ecological goods and services.

*Definition of ecological goods and services*

The definition of ecological goods and services that I have proposed recognizes increases, enhancement and retention of environmental 'goods' from private rural land. Current approach to promote the provision of environmental 'goods' from rural land in Ontario include the Species at Risk Act and Greenbelt legislation. These regulations amount to regulatory takings for which landowners are not compensated. If we assume that the environmental 'goods' I identified in my definition of ecological goods and services are in fact valuable, current regulatory takings approaches turns them into liabilities for landowners. If the principle of fairness is pursuing as a guiding principle of

ecological goods and services policy than one of the goals should be to turn to environmental goods from liability into assets for landowners. The could be achieved by repealing legislation that create regulatory takings.

*7.2.4 Cost-effectiveness*

Cost-effectiveness is achieved when given environmental improvements are secured for the lowest cost or, alternatively, the maximum environmental benefits are secured given the resources expended. In this section I will discuss characteristics of ecological goods and services policy design that affect cost-effectiveness including: valuation of the expected benefits of ecological goods and services provision, targeting the beneficial ecological goods and services across a heterogeneous landscape and the choice of incentive mechanism.

*Valuation*

The question of the worth of species habitat and preservation and other environmental amenities is what Fox (1992, p. 245) called, "arguably, the central question of modern environmental economics". Often, economists make the mistake of looking to market price for indicators of value. The error in this approach is that prices used in market exchanges understate the value of the buyers and overstate the value of sellers but give almost no information of the values of people who are not part of the exchange. Therefore, when government assumes the responsibility of providing ecological goods and services on behalf of taxpayers, government must adopt a method of valuing the ecological goods and services it is providing. This section explores the issue of ecological good and service valuation.

Hein *et al.* (2006) found that the value attached to ecological goods and services varies based on the good and services offered and the spatial scale at which it is offered.

They use the example of ecological goods and services supplied by wetlands in The Netherlands. They found that some ecological goods and services are valued more at the local or regional level (i.e. fishing and recreation) while others are valued higher by national level interests (i.e. nature conservation). It is important to consider that the enjoyment of ecological goods and services occurs at different spatial scales depending on the good or service in question and not to generalize values across spatial scales. Since certain ecological goods and services are enjoyed more at the local or regional level, it follows that demand for those goods and services will likely be highest in areas of the highest local or regional population. This is important because it explains that there is a degree of heterogeneity in the benefits derived from ecological good and service provision. Ecological services likely have different values if located just outside the GTA than if located near Kincardine, *ceteris paribus*. This has important cost-effectiveness implications because there is little sense securing the provision of ecological goods and services when the cost exceeds the value gain by its provision.

The government must use some method to calculate the value of ecological goods and services that it provides on behalf of taxpayers. Some governments expressing this type of non-market valuation of ecological goods and services were described in Chapter 4. The design of these programs, particularly the England's Environmental Stewardship Scheme, Australia's BushTender program and the U.S. Conservation Reserve Program, suggest that the valuation of specific ecological goods and services varies spatially between regions as well. It will be necessary to adopt a mechanism that can value the expected ecological goods and services that are supplied through actions proposed by landowners. Non-market valuations methods are one such option but, as I discussed in

Chapter 2, these methods cannot replicate values obtained through market exchanges. A second option is using a mechanism to target the provision of ecological goods and services based on an index of cost and benefits. The issue of valuation is intimately connected with the issue of targeting and therefore this discussion should also include targeting. The issue of targeting is discussed below.

*Targeting*

One of the key issues with funding the provision of ecological goods and services with taxpayer funding is that it is not possible for the program administrator to target the goods and services demanded by each individual taxpayer. Engel *et al.* (2008, p. 666) state that, "as the buyers in this case are not the direct user of the [ecological good or service], they have no first-hand information on its value, and generally cannot observe directly whether it is being provided." In addition, as I have stated previously, rural lands vary in their ecological productivity; meaning that an action taken in one area may not result in the same ecological outcomes as in another area. I found in Chapter 6, that certain counties are relatively well endowed with ecological goods and services while the pressure of agriculture have led to a decrease in ecological good and service producing lands in other counties. Therefore, it is necessary that ecological goods and services policy use a mechanism that can reflect the comparative advantage in ecological goods and services provision across counties.

In Chapter 4, I discussed how ecological goods and services program in other jurisdictions use cost benefits indexes to address the issue of targeting. The Environmental Benefits Index used in the U.S. and the Biodiversity Benefit Index used in Australia rank program applications based on the expected costs and benefits of

ecological outcomes and selected among those application that provide the greatest ratio of benefits to costs. As I noted in Chapter 4, the Biodiversity Benefits Index used in Australia can go a step further by also considering the effect that management of a specific site have on the broader context of biodiversity at the regional level. The drawback of the Biodiversity Benefits Index relative to the Environmental Benefits Index is that only considers biodiversity in the assessment of costs and benefits, whereas the U.S. Environmental Benefits Index can assess the costs and benefits of multiple ecological goods and services simultaneously. But many of the ecological goods and services used in the Environmental Benefits Index are indicators of reduced environmental harm and therefore would not be considered eligible ecological goods and services based on the definition that I have proposed. An index that can consider multiple ecological goods and services that are environmental 'goods' would be desirable.

The cost-effectiveness of Ontario ecological goods and services policy will be enhanced with the development of a mechanism that can target valuable ecological goods and services across a heterogeneous landscape. A question that must be asked is: what ecological goods and services are deemed valuable by taxpayers in Ontario? The answer to this question will influence how ecological goods and services are targeted in Ontario. An ecological goods and services benefit/cost index could be developed, based on taxpayers demand for ecological goods and services, to aid in targeting the provision of valuable ecological goods and services. Taxpayer demand for ecological goods and services will be fluid and the targeting mechanism should be flexible in design so it can reflect changes in demand. Finally, a targeting mechanism should be able to account for

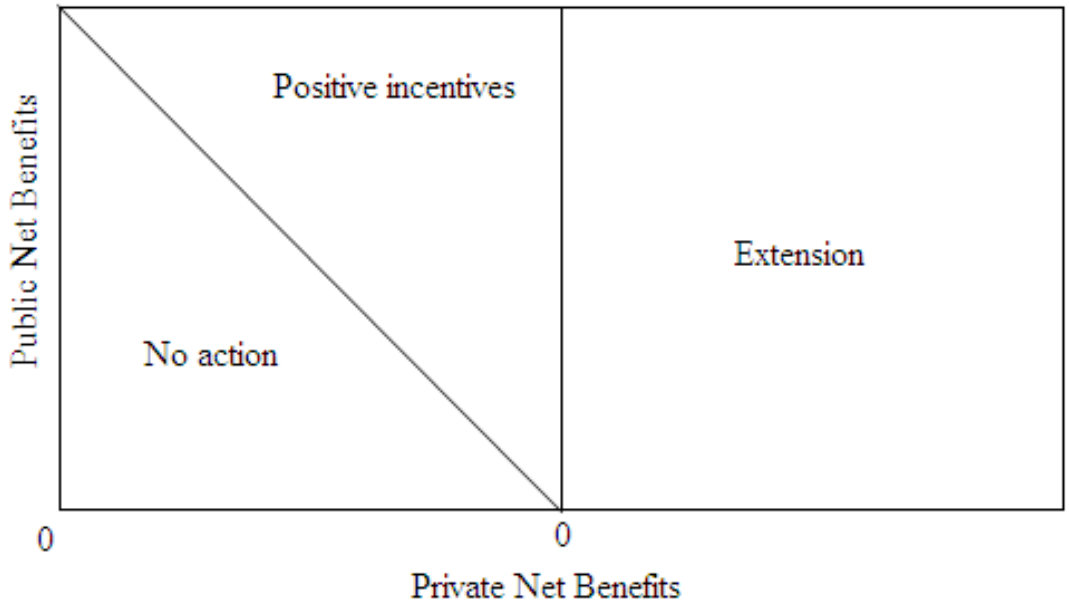
the heterogeneity of the costs and benefits of ecological good and service provision across and within counties. This is an area particularly deserving of future research.

*Choice of Policy Mechanism*

One of the lessons learned in Chapter 4 was that each policy mechanism has merits and the choice of policy mechanism will depend on the context of policy implementation in that country or region. Individuals with policy responsibility was asked about potential policy options for increasing the supply of ecological goods and services in Ontario in Chapter 5 responded with a variety of potential options including: reverse auctions, annual payments, regulation, education and outreach, cost-shares, tradable permits, tax incentives, and acreage-based performance incentives with cost-shares. In the analysis of the GIS results in Chapter 6, I estimated the cost of provincial ecological goods and services using a hypothetical program that uses an annual area-based payment mechanism, based on average country land rental rates, to reward landowners for ecological good and service provision. A number of policy options to increase the supply of ecological goods and services in Ontario are available. How can the appropriate mix of policy options be decided on from the myriad policy options?

Figure 7.1 presents a simplified version of Pannell's (2008) Private: Public Benefits Framework. This framework provides a basis for selecting among policy options based on the public and private net benefits. For the purpose of this research, public net benefits are assumed to be positive because there is little sense asking government secure the provision of ecological goods and services that of net detriment to society. There are no units provided in this Figure because the ratio net public benefits to net private benefits determines the choice of policy mechanism. Figure 7.1 shows that

Figure 7.1 Classes of Suggested Policy Options Based on Levels of Private and Public Net Benefits




Source: Modifed from Pannell (2008)

positive incentives are an appropriate policy option when the net private benefits are negative (negative net private benefits = private costs) and are less then net public benefits. When the private costs of an action exceed the net public benefits the option of no action is appropriate because the incentive required to induce the private landowner to adopt the publically beneficial management action exceeds the expected benefits to the public. Finally if the private landowner can expect some net benefit from adopted a publically beneficial management action then extension and education is the appropriate policy option.

Despite the usefulness of Figure 7.1 as a framework for choosing among classes of policy option, in practice the choice is less clear. Deciding on the appropriate policy option is a difficult task because private benefits and costs of adopting new management practices are unknown to program administrators and public benefits are at best an approximation of the expected flow of benefits from the adopted practices. In Chapter 4, I discussed the ways that existing ecological good and service programs are addressing this issue. For example, the Conservation Reserve Program in the U.S. uses the Environmental Benefits Index to rank bids based on the ecological good and service benefits that are expected to result from the actions contained in the bids. Australia's BushTender program uses the Biodiversity Benefits Index to assess the impact of a bid's proposed management changes on local biodiversity as well as the significance of that bid site at the regional level. In both of these examples, the indexes used allow the selection of bids that provide sufficient benefits for cost (based on the bid-ask price) through a reverse auction. England uses a similar approach in the Higher Level Stewardship tier of the Environmental Stewardship Scheme, although it does not use a

reverse auction. The Higher Level Stewardship program chooses amongst competing applications that address priority issues defined on a region by region basis and then gives fixed annual incentives to selected applicants.

The choice of positive incentive mechanism used as an incentive for landowners who can supply beneficial ecological goods and services is not an obvious one. As I discussed in both Chapter 2 and Chapter 4, each potential incentive mechanism has strengths and weaknesses that influence the contexts in which they are appropriate. The two positive incentive mechanisms most often employed in international ecological goods and services programs are fixed annual payments (Costa Rica's *Pago por Servicios Ambientales* and England's Environmental Stewardship scheme) and competitive reverse auctions (Australia's BushTender and U.S. Conservation Reserve Program). As I have stated in previous chapters, the choice between fixed annual payments and a reverse auction incentive system depends on the objectives of the program. Fixed annual payments are well suited for broad-based programs with the objective of high levels of landowner participation and/or farm income support. Reverse auctions are better suited for programs with the objective of securing beneficial ecological goods and services at least cost. Based on cost-effectiveness, reverse auction are the preferred positive incentive mechanism proposed by this research.

*7.2.5 Policy Integration*

In Chapter 5, I defined policy integration as opportunities to achieve administrative economies of scope by reducing overlap, duplication and inconsistencies amongst existing policies and when introducing new policies. For ecological goods and services policy integration means identifying existing policies, laws and regulations that could be impacted by the implementation of ecological goods and services policy. Policy

integration of ecological goods and services policy should ensure that, when implemented, the policy compliments the objectives of existing policies and that it does not create perverse incentives. This section discusses both of these requirements of policy integration.

*Complimenting existing policies*

Ecological goods and services policy has the potential to overlap with a number of existing policies. In Chapter 6, I explained that ecological goods and services policy could potentially be used as a method of stabilizing farm income support programs. This is an area of potential policy overlap that must be considered when implementing ecological goods and services policy. That is not to say that ecological goods and services policy can replace existing farm income support programs; but, as it is potentially a means of farm income support, it does offer an opportunity to reevaluate current farm income support policies and determine if ecological goods and services policy can be incorporated into the policy mix.

Economies of scope are potentially available by integrating ecological goods and services policy with existing policy instruments like the Environmental Farm Plan. I found that individuals with policy responsibility believe that the Environmental Farm Plan is an institution that could and probably should be integrated with ecological goods and services policy. The Environmental Farm Plan has the potential to gather important information on the potential ecological goods and services that could be supplied from Ontario farms. Since the Environmental Farm Plan is an existing instrument with which farmers are familiar, it could be an instrument used by landowner to identify opportunities for ecological good and services provision. By identifying areas where

economies of scope can be achieved, policy implementation costs and administrative costs may be reduced.

*Removing Perverse Incentives*

The implementation of ecological goods and services policy could also lead to perverse incentives for landowners. The best example of this is the conflict created between ecological goods and services policy and the Species at Risk Act. Ecological goods and services policy that pursues increased wildlife habitat as a valuable ecological good and services may lead to increased populations of species at risk on private land. Under the Species at Risk Act, landowners are subject to regulations on the use of their land if species at risk or species at risk habitat are found on their property. These regulations amount to regulatory takings. Therefore, actions taken under ecological goods and services policy could lead to landowners facing regulatory takings.

Two courses of action could be taken to rectify the above policy conflict. Landowners participating in ecological goods and services policy could be made exempt from the requirements of the Species at Risk Act. This exemption is called a safe harbor clause. The other option is removing one of the sources of conflict. In this example I would recommend the removal of the policy that forces the provision of ecological goods and services through regulatory takings. Indeed, since the objectives of ecological goods and services policy and the Species at Risk Act may overlap, ecological goods and services policy may provide an alternative method of increasing species at risk populations that could draw less ire from rural landowners than the current Species at Risk Act.

*7.2.6 Political Feasibility*

The final guiding principle for Ontario ecological goods and services policy is political feasibility. I define political feasibility as the extent to which a policy proposal has potential to be enacted as public policy. Political feasibility is a critical policy criterion because if a policy is not considered politically feasible, it was not become public policy regardless if it is fair, cost-effective and easily integrated with existing policy. In this section I will acknowledge components of ecological goods and services policy that affect its political feasibility including differing concepts of fairness, the tension between fairness and cost-effectives and the limits of government expenditures.

*Differing concepts of fairness*

In section 7.2.2, I defined fairness in ecological goods and services policy as compensation for all rural landowners who provide valuable ecological goods and services from their land with regard for the concept of additionality. Fairness may not be defined in this way by others who are affected by the implementation of ecological goods and services policy. Instead, fairness could require that all farmers are provided with the same level of payments under ecological goods and services policy, regardless of location and the expected value of ecological good and service benefits provided. Farm groups and some farmers may prefer this concept of fairness to the one I proposed because all farmers are treated equally. This definition of fairness has the potential to increase the political feasibility of ecological goods and services policy if farm groups are united behind such a definition. But such a definition of fairness would also reduce the cost-effectiveness of ecological goods and services policy. The inherent tension between cost-effectiveness and fairness is discussed below.

*Tension between cost-effectiveness and fairness*

While both cost-effectiveness and fairness should be pursued as guiding principles of ecological goods and services policy in Ontario, there is an inherent tension between them. The experiences with ecological goods and services elsewhere worldwide (Chapter 4) showed that in some cases an equitable distribution of program payments was a key component of program design (*Pago por Servicios Ambientales* in Costa Rica and Environmental Stewardship in England) while in others cost-effectiveness in the provision of valuable ecological goods and services was more important (BushTender in Australia and the Conservation Reserve Program in the U.S.). The tension between fairness and cost-effectiveness makes it difficult to pursue the complete satisfaction of either general principle. One principle must usually be sacrificed, to a degree, in pursuit of the other.

For example, if cost-effectiveness is the primary principle guiding policy development, then, assuming heterogeneity in the supply and demand of ecological goods and services, the level of payments would have to differ between program participants. Otherwise, the program would not be considered cost-effective. On the other hand, if the concept of additionality is adhered to, for the sake of cost-effectiveness, then the policy will not be fair to landowners who stewardship actions have led to existing ecological goods and services supply.

The guiding principles of cost-effectiveness and fairness that I described in sections 7.2.2 and 7.2.3 were proposed with the tension between the two principles in mind. The principle of fairness took priority over cost-effectiveness as I recommended that additionality not be adhered to, but the differentiation of program payments based on the heterogeneity of supply and demand of ecological goods and services meant that cost-

effectiveness remains as an important guiding principle. It is not within the scope of this research to assess whether these proposals will be politically feasible, but they do acknowledge that there is a tension between fairness and cost-effectiveness that can affect the political feasibility of enacting ecological goods and services policy.

*Limits of government expenditures*

Individuals with policy responsibility stated that the potential costs to taxpayers of ecological goods and services policy has been an impediment to policy development. When considering the political feasibility of ecological goods and services policy it is necessary to acknowledge that government expenditures on ecological goods and services policy are in competition with other government expenditures, such as healthcare and education spending. Therefore there must be political justification for expenditures on ecological goods and services provision over other competing government expenditures.

I compared the projected expenditures on ecological goods and services policy to government expenditures on business risk management programs in Ontario. The purpose of this comparison was to show that there is an opportunity to integrate ecological goods and services policy within existing government expenditures by complementing existing policy objectives, namely farm income support. Whether or not this is a politically feasible option is not clear. I expect that there would be initial opposition to such a proposal from farm groups but I hope that this research can temper that opposition with its explanation of the benefits of adopting such an approach.

**7.3 Essential Elements of Ecological Goods and Services Policy**

I presented five principles that should guide the development of ecological goods and services policy in Ontario above. In this section I will discuss elements of ecological goods and services policy that are essential in the practical operation of a payment for

ecological goods and services program. The essential elements of ecological goods and services policy in Ontario include program implementation at the most level possible, information gathering, protection of landowner privacy and increased interaction between beneficiaries and providers of ecological goods and services. I will discuss each essential element below.

*7.3.1 Local level program implementation and delivery*

Ecological goods and services programming should be implemented at the most local level possible. The benefits of local level implementation include opportunities for enhancing program participation and the ability to gather critical information. Explanations of these benefits of local level implementation are provided below.

First, program participation can be influenced by the delivery agent. Rural landowners, and in particular farmers, could be more likely to participate if the program is implemented by an agent that they are familiar. This may mean employing local farmers as delivery agents, as is done in the ALUS approach (Chapter 3) and the Ontario Soil and Crop Improvement Association (Chapter 5). It could also mean employing members of conservation authorities who have experience working with rural landowners (Chapter 5). In either case, if the landowner trusts the delivery agent, then the prospect of participation is enhanced (Rosenberg, 2010). Participation, or at least attempted participation, is desirable because successful applications can be picked from a larger pool of applicants and should, in turn, increase the quality of selected bids.

A second advantage of local level implementation was evident in the experiences of the BushTender program in Australia (Chapter 4). The BushTender program relied on delivery agents with extensive local ecological knowledge when assessing the expected benefits of proposed management actions. The information gathered by these agents was

essential in ranking applications through the Biodiversity Benefits Index. Delivery agents with local ecological knowledge that are also familiar to the landowner are ideal.

The delivery agent will depend on where jurisdiction over ecological goods and services policy lies in government. Individuals with policy responsibility stated that, at a provincial level in Ontario, either the Ontario Ministry of Natural Resources or OMAFRA would have responsibility for ecological goods and services policy. Both of these ministries offer opportunities for ecological goods and services program implementation to occur at local levels.

The Ministry of Natural Resources is in a position to deliver ecological goods and services policy through its connection with Conservation Ontario and Conservation Authorities across the province. Conservation Authorities could be in charge of delivering program activities in each watershed; similar to how the *Pago por Servicios Ambientales* is delivered by FONAFIFO through 8 regional offices in Costa Rica. Delivering through Conservation Authorities on a watershed basis provides a number of opportunities. Often Conservation Authorities have local ecological knowledge that could prove useful when determining the ecological goods and services that could be provided in each watershed. Additionally, Conservation Authorities have experience working with landowners and may have the trust and credibility to deal honestly with landowners who may be resistant to contracting with the government.

OMAFRA could contract delivery of ecological goods and services policy through the Ontario Soil and Crop Improvement Association. The Ontario Soil and Crop Improvement Association is in a position to deliver ecological goods and services policy through its network of 55 local associations. Should ecological goods and services policy

be integrated with the Environmental Farm Plan, the Ontario Soil and Crop Improvement Association would certainly play a role with program delivery as it is currently the delivery agent of the Environmental Farm Plan in Ontario. Representatives of the Ontario Soil and Crop Improvement association are typically farmers or from farm families and therefore may have trust of and credibility with local landowners.

*7.3.2 Information collection*

The second essential element of ecological goods and services policy is the collection of information on which to base decision making. Information should be collected on the type, location and quality of ecological goods and services that are provided through the proposed management actions of landowners. Information should also be collected on the level of payment a landowner would be willing to accept for proposed management actions. These data are essential when employing a benefits cost index to select among competing suppliers.

Data on type, location and quality of ecological goods and services can be collected in two ways. A program delivery agent could gather the information during a site-visit with the landowner or the landowner could detail the ecological characteristics of their land in standardized report either by themselves or with the support of a delivery agent. The former option is employed by the BushTender program of Australia and Environmental Stewardship in England, while the latter option is used by ecological goods and services program in Costa Rica and the United States. Site visits by delivery agents with local ecological knowledge likely provided more detailed information on the site-specific ecological goods and services but they are also likely costly to administer. On the other hand, administrative costs of collecting information through a standardized report are likely lower but the information collected may not be as detailed. In Chapter

5, Andy Graham of the Ontario Soil and Crop Improvement Association state that Ontario had moved away from the model of providing direct on-farm extension services and he did not see a return to that model because of the costs associated with it. The Environmental Farm Plan offers an existing instrument through which data on on-farm environmental risks is collected that could potentially be tailored to collect information on ecological goods and services as well.

Information on a landowner's willingness to accept proposed management action can be elicited through the use of a reverse auction. If application are selected on the basis of a benefits cost index than there is incentive for landowners to set their bid-ask price close to the minimum they are willing to accept, if they wish to be selected. As I noted in Chapter 4, not all reverse auction are equally effective. In the Conservation Reserve Program of the U.S., participants were able to determine the maximum bid price relatively easy and therefore bids at that level. In the BushTender program in Australia, important information is withheld from landowners so that collusion and price fixing would be less likely to occur. The design of a reverse auction has implications for how accurately information can be collected.

Another important set of data is information on the value of ecological goods and services. Data on the value placed on ecological goods and services can be obtained in two ways. First, value is expressed in the prices of market exchanges of ecological goods and services. Since market exchanges of ecological goods and services are limited in Ontario at this time, another source of information on ecological goods and services value may be needed. I have wrote about the pitfalls of using non-market valuation methods previous (Chapter 2), but, in the absence of market exchanges of ecological goods and

services, these methods can indicate that people place value on specific ecological goods and services in opinion if not in dollars. Values expressed in prices should take precedence over values expressed in opinion because they reflect actual transactions rather than hypothetical transactions.

### *7.3.3 Privacy and confidentiality*

The third essential element of ecological goods and services policy is maintaining the privacy and confidentiality of information provided by landowners. Landowners may be worried that providing detailed information on their property could be used against them in the future if new regulations are introduced. It is therefore necessary to assure all potential participants that all information collected will remain private and confidential and will not be used for purposes other than in the calculation of ecological benefits. This is a simple element but the communication to landowners of adherence to it in ecological goods and services policy is essential to assuage confidentiality concerns.

### *7.3.4 Increased interaction between beneficiaries and providers of ecological goods and services*

The fourth essential element of ecological goods and services policy is acknowledging that exchanges between providers of ecological goods and services and those that benefit from their provision are the ideal method of ensuring that supply meets demand. Although there is an existing supply of ecological goods and services producing lands in Ontario, demand for further supply is increasingly being expressed through market exchanges and ecological goods and services policy initiatives. Supply is increasing through market exchanges of ecological goods and services in Ontario, but these exchanges are limited in scale at this time. Increased interaction between beneficiaries and providers of ecological goods and services plays two key roles. First,

increased interaction can lead to increased opportunities to discover mutually beneficial market exchanges. And second, increased interaction can lead to increased information sharing. Information sharing can ensure that the goods and services supplied by providers are demanded by beneficiaries. In this section I discuss methods of increasing the interaction between beneficiaries and suppliers.

In Chapter 2, I discussed the role that intermediaries, as known as middlemen or brokers, can have in reducing transaction costs. The existence of high transaction costs can be a major impediment facing market exchanges of ecological goods and services. The Norfolk ALUS pilot project described in Chapter 3 is an example of an intermediary that buys ecological goods and services from suppliers and sells them to beneficiaries. The ALUS pilot project faces lower transaction costs for two reasons. First, it has an inventory of willing sellers with which to match buyers and therefore faces lower search costs. Second, the development of a standard unit of exchange (the Ontario Ecological Credit) reduces negotiation costs because purchasers know what they are receiving in each credit. If the Norfolk ALUS project can sustain itself through the sale of Ontario Ecological Credits to beneficiaries from ecological good and service provision, then it will represent an example of intermediated free-market exchanges of ecological goods and services in Ontario.

In Chapter 4, I discussed how the *Pago por Servicios Ambientales* program in Costa Rica uses licensed foresters as intermediaries between landholders and program administrators. The licensed foresters aggregated applications from groups of smallholders that potentially would face prohibitively high costs of applying for the program individually. The licensed foresters decreased the cost securing the supply of

ecological goods and services but did not interact with the demand side. Beneficiaries interact with the *Pago por Servicios Ambientales* through voluntary contributions that are directed to activities of their choice in their watershed. Although beneficiaries and providers do not interact directly in the *Pago por Servicios Ambientales*, important information is gathered from both that is used to ensure the provision of goods and services valuable to beneficiaries at low cost. This is effective at increasing the provision of ecological goods and services at low cost because its institutions support information gathering and communication to and from both suppliers and beneficiaries.

### 7.4 Conclusion

The purpose of this chapter was to develop general principles guiding ecological goods and services policy development and to suggest essential elements of ecological goods and services policy that can stimulate policy debate in Ontario. Towards this end, I used the lessons learned in the Chapter 2 through 6 of this research to develop the necessary general principles and essential elements of policy. The general principles that I proposed should guide ecological goods and services policy development were:

- Clear definition of objectives;
- Fairness;
- Cost-effectiveness;
- Policy integration; and
- Political feasibility

The objectives of ecological goods and services policy need to be clearly defined so that policy can be designed in accordance with that principle. Without clear definition of objectives it is not possible to remain open and transparent to those affected by ecological goods and services policy. Fairness was proposed as the primary criteria guiding policy development based on compensating any rural landowner who provides

valuable ecological goods and services, recognizing both existing beneficial management practices and additional contributions of ecological goods and services. Cost-effectiveness of ecological goods and services can be pursued through targeting, employing a benefit cost index to reflect the value of proposed ecological good and services provision, the choice of policy mechanism and by acknowledging the heterogeneity in supply of ecological goods and services. Policy integration identifies opportunities to take advantage of economies of scope based on duplication, overlap and inconsistencies between existing policies and ecological goods and services policy. Political feasibility is the final principle guiding ecological goods and services policy development because if a proposed policy is not politically feasible it will not matter how well that proposal adheres with other general principles.

The proposed essential elements related to practical aspects of ecological goods and services design. These proposed essential elements were:

- Program implementation at the most local level possible;
- Collection of data on the ecological characteristics of potential participants;
- Protection of landowner privacy;
- Increased interaction between beneficiaries and providers of ecological goods and services;

# Chapter 8 – Conclusions

## 8.1 Introduction

The purpose of this thesis was to propose a framework for ecological goods and services policy in Ontario. In fulfilling this purpose, I tried to answer the following research questions:

1. What are the key concepts and distinctions in the economics literature that provide insight into ecological goods and services policy design?
2. What is the context of ecological goods and services policy development in Ontario, at this time?
3. What insights can be drawn from international experiences with ecological goods and services provision programs that can inform the design of ecological goods and services policy in Ontario?
4. What are the perceptions and opinions of leading ecological good and service practitioners in Ontario on critical issues in ecological good and service policy development in Ontario?
5. What general principles should guide the development of ecological goods and services policy in Ontario?

To answers these research questions I began by reviewing the literature relevant to the study and analysis of ecological goods and services policy in Chapter 2. This review included a discussion on how to apply qualitative research methods for policy research, identified and discussed concepts and distinctions from economics literature relevant to ecological goods and services policy development and a description and analysis of literature on ecological goods and services policy development in Canada. The purpose of this literature review was to describe literature relevant to the study and analysis of ecological goods and services policy in Ontario.

Next, in Chapter 3, I described the Norfolk ALUS approach to ecological goods and services provision that is being piloted in Norfolk County, Ontario. The purpose of describing the ALUS approach was to provide an example of an ecological goods and services policy option that was developed and implemented in Canada and Ontario.

In Chapter 4, I described and evaluated international experiences with ecological goods and services policy in the United States, England, Australia and Costa Rica. Programs in these countries were described according to aspects of ecological goods and services program design as well as their ability to address critical issues in ecological goods and services policy. Lessons learned from the experiences using these programs were drawn by comparing programs across areas of functional equivalence.

I conducted in-depth interviews with individuals and groups with responsibility for ecological goods and services policy development and implementation in Ontario in Chapter 5. The purpose of this chapter was to develop an understanding of the state of ecological goods and services policy development and debate in Ontario. Results from the in-depth interviews revealed the state of and obstacles to ecological goods and services policy development in Ontario.

In Chapter 6, I used a GIS analysis to estimate the inventory of existing and potential ecological good and service producing land on private land in Southern Ontario. The results from this analysis served two purposes. First, analysis of the GIS analysis provided information on the state of current ecological good and service provision in Ontario. Second, the results of the GIS analysis were used to estimate the cost of a payment for ecological goods and services program uses a number of different program scenarios.

Finally, in Chapter 7, I proposed sets of general principles and essential elements for ecological goods and services policy development in Ontario. The general principles were intended to guide the development of policy based on lessons learned from Chapters 2 through 6. The essential elements were more practical in nature and were also

suggested on lessons learned from Chapters 2 through 6. This chapter provided an opportunity to stimulate debate on ecological goods and services policy in Ontario

In the remainder of this chapter I will present the key findings of this research, the implications of the key findings on policy and policy development and identify opportunities for future research.

**8.2 Key Findings**

The first research question addressed in the fulfillment of the purpose of this thesis was: what are the key concepts and distinctions in the economics literature that provide insight into ecological goods and services policy design? The review of economics literature provided answers to this question.

The concept of transaction costs, developed by Coase (1960), is an important concept related to the development of ecological goods and services policy. Klimas (2007) identified the existence of transaction costs as an impediment to market exchanges of ecological goods and services. Therefore, an understanding of how transaction costs could be reduced is needed in order to increase market exchanges of ecological goods and services. I discussed the boundaries of a firm based on insight from Coase (1937), Coase (1988) and Rao (2003) and the ways these boundaries can be expanded, called horizontal or vertical integration, according to Perry (1989) and Williamson (1985). Klimas (2007) suggests that transaction cost could be reduced through specialized firms called intermediaries. Spulber (1996) identified the ways in which intermediaries can reduce transaction costs and specifically reduce the costs of establishing markets for ecological goods and services. The concept of intermediation was key to discussions on the ALUS concept and on international ecological goods and service programs.

I also discussed a number of key distinctions in the economics literature that provide insight for the development of ecological goods and services policy. First, Rothbard's (1982) concept of physical invasion was discussed as the standard from which the definition of ecological goods and services can be derived. Specifically, actions that lead to the reduction of environmental harm that amount to invasion of private property should not be considered ecological goods and services. Second, Rothbard (1982) suggests replacing the negligence standard of liability with a standard of strict liability for nuisance harm. Third, I discussed the concept of legalised nuisance with reference to Fox (2007), Coase (1960) and Brubaker (1995). Repealing legislation that legalises nuisance would reduce the demand for actions that reduce environmental damage to be considered ecological goods and services as polluters would be legally accountable for the pollution they create. Finally, I discussed Rothbard's (1978) suggestion that efficiency is a myth. This had important implications for the evaluation of existing ecological goods and services program as I did not believe it was possible to assess them on the basis of efficiency.

The second research question addressed in the fulfillment of this thesis was: what is the context of ecological goods and services policy development in Ontario, at this time? This research questions was addressed in all of the chapters of this thesis.

I discussed policy options for increasing the provision of ecological goods and services that were evaluation by Campbell (2009) following the conclusion of Canadian ecological goods and services pilot projects funded by Agriculture and Agri-Food Canada. I assessed Campbell's evaluation and clarified the appropriateness of the policy options for use in Ontario. Also in Chapter 2, I described Troy and Bagstad (2009) who

attempted to estimate the value of ecological goods and services in Ontario. I explained, that following from Fox (1992), that the methods used in this study using hypothetical valuations in the calculation of benefits cannot be equated with the costs represented by prices derived from the terms of markets exchanges.

I described the history and practice of the ALUS approach to ecological goods and services provision. ALUS represents an approach to ecological goods and services provision that is used in Prince Edward Island and has been piloted in three other provinces, including Ontario. The development and implementation of this approach provide insights into the state of ecological goods and services policy in Ontario and Canada.

The interviews with individuals with ecological goods and services policy responsibility (Chapter 4) allowed for the collection of information on opportunities, impediments and debates that are currently facing ecological goods and services policy development in Ontario. I found that there is currently a lack of a consistent and clear definition of ecological goods and services in Ontario. Interview participants were also worried about the potential cost to taxpayers of a government-run payment for ecological goods and services program in Ontario. Some interviewees noted that there could be potential to integrate ecological goods and services policy with existing policy and institutions like the Environmental Farm Plan.

The results from the GIS analysis (Chapter 6) provided context on the supply of existing ecological good and service producing private lands as well as the potential for new ecological good and service producing lands. Specifically, it was estimated that existing supply of ecological goods and services on private land in Southern Ontario is

around 5.4 million acres and that there is potential supply of up to 9.7 million acres. In addition, it was found that counties with higher average rental rates of land were less likely to have existing riparian buffers than counties with low average rental rates of land. This context was expanded upon in Chapter 7 with the discussion of supply and demand of ecological goods and services in Ontario. I explained that potential motivations for landowners who supply ecological goods and services at zero price could be the presence of private benefits and/or the presence of prohibitively high conversion costs to another productive use.

The third research question addressed in the fulfillment of this thesis was: what insights can be drawn from international experiences with ecological goods and services provision programs that can inform the design of ecological goods and services policy in Ontario? This research questions was addressed exclusively in Chapter 4.

I found that land set aside programs, such as the U.S. Conservation Program, can be used for the purpose of farm income enhancement in countries facing inelastic demand for their commodity exports. That is, the set aside of agricultural land can raise the world price of a commodity if the country faces inelastic demand for their exports. While the United States can benefit from pursuing such a policy outcome, Canada cannot because demand for Canadian commodity exports is elastic in general. Another option for farm income enhancement was found in England's Environmental Stewardship Scheme. The Entry Level Stewardship approach enrols whole farm payments based on agricultural producers agreeing to a set of management actions as well as meeting the standards of cross-compliance. This approach works well in a country like England that has a relatively small land area relative to its population, but in Canada, where population

is low and agricultural area is very large, this approach could prove to be prohibitively costly.

The programs I examined relied on different mechanisms for addressing the issue of ecological good and service valuation. Of the options, I believe that Australia's Biodiversity Benefits Index has the potential to be adapted for use in Ontario and Canada. This approach was favoured because it can value both existing and potential changes in the context of local and regional conditions. This is a superior approach because it offers flexibility in choice of management actions, it can value past beneficial management actions and it assesses the value of local actions in relation to the regional context. The drawback of this approach is that local ecological knowledge is required and, coupled with the need for on-site assessments, that can lead to high administration costs.

The programs I examined used either a fixed annual payment incentive or used a reverse auction to choose amongst competing bids. Fixed annual payments may be favoured because they are inexpensive to administer, but I found that drawbacks of their use include the potential to overpay for some low value ecological goods and services and also the potential that payments are insufficient to secure the provision of expensive but also valuable ecological goods and services. A reverse auction can avoid both of these problems if designed properly. Of the two reverse auctions I examined, Australia's BushTender program and the U.S. Conservation Reserve Program, I favoured the BushTender auction because it kept information private that would lead bids to better reflect opportunity costs than the Conservation Reserve Program bid system where information on maximum bid rates in each region was made public.

Finally, insights from the international ecological goods and services program were taken from the use of intermediaries. Costa Rica's *Pago por Servicios Ambientales* uses private licensed foresters in the delivery of its programs. The advantage of using private intermediaries over assuming program delivery tasks into administrative cost were easily apparent. First of all, if the cost of the intermediary comes out of the payment to the landholder, then there is an incentive for the intermediary to target landholders that are believed to generate the greatest returns from program participation and therefore offer the greatest value to program beneficiaries. Secondly, the private intermediary can offer any services that are valued by the landholders they are dealing with. If the cost of the intermediary is assumed into program administration costs that the intermediary will offer only those services that are stipulated by program administrators.

The fourth research question addressed in this thesis research was: what are the perceptions and opinions of leading ecological good and service practitioners in Ontario on critical issues in ecological good and service policy development in Ontario? This research problem was addressed exclusively in Chapter 5.

When I spoke with individuals with policy responsibility about the current state of ecological goods and services policy development in Ontario, there were a number of areas where general consensus was found. The was a general feeling amongst interviewees that the development of policy for ecological goods and services in Ontario had stagnated and was no longer a priority for provincial or federal governments. This lack of direction also extends to farm groups where some groups support certain approaches while others are resistant. Interviewees stated that regulation has been the

most common approach to ecological good and services provision and most interviewees acknowledged that this regulatory takings approach was not favoured by the agricultural sector. Some interviewees spoke of the importance of the Environmental Farm Plan as the foundation for any future ecological goods and services programming. Broad consensus amongst interviewees was found on the issue of allowing non-agricultural rural landowner to participate in any programs, the inclusion of an education and outreach component in any program and the delivery of programs through a delivery agent familiar to landowners.

Interviewees also identified a number of obstacles to ecological goods and services policy development in Ontario. The obstacle most often stated by interviewees was the lack of a clear and consistent definition of ecological goods and services to be used in policy debates. Interviewees also did not agree on the appropriate policy response. As stated above, it was generally agreed that the existing regulatory takings framework is not adequate, but the choice amongst other policy options was divided. Part of the reason for this division may be the fact that a number of interviewees were worried about the potential costs of implementing a province-wide ecological goods and service policy. Finally, interviewees noted that jurisdiction over the issue of ecological goods and services was not clear in government and this is an obstacle in the policy development process.

The fifth research question addressed in this thesis was: what general principles should guide the development of ecological goods and services policy in Ontario? This question was addressed in Chapter 7 but took insight from all the preceding chapters.

The first general principle stated that clear definitions of the objectives of ecological goods and services policy in Ontario should be developed. The ecological goods and services policy experiences in other countries have the primary objective of either increasing the supply of ecological goods and services or enhancing farm income support. Defining the objective of ecological goods and services policy clearly is important in order for such policy to remain transparent and accountable to those funding it. It is necessary to define the ecological goods and services outcomes that are expected to result from implementing ecological goods and services policy.

Fairness was the second general principle proposed to guide the development of ecological goods and services policy. The definition of ecological goods and services is intimately related to the criterion of fairness. I defined ecological goods and services as the benefits that humans derive from ecosystems independent of the ability of ecosystems to reduce environmental harm. Providing incentives for the reduction of environmental harm does not meet the criterion of fairness and therefore is not included in the definition of ecological goods and services. The issue of additionality was also addressed with respect to fairness. I suggested that for an ecological goods and services policy to be considered fair, landowners should be reward for both existing and additional provision of ecological goods and services. The final issue addressed with respect to fairness was the issue of openness. I suggested that a fair ecological goods and services policy would be open to all rural landowner and not limited to agricultural producers, as some international ecological goods and services programs are.

Cost-effectiveness was the third general principle proposed to guide the development of ecological goods and services policy in Ontario. Connected to cost-

effectiveness is the issue of valuation of ecological goods and services. There is heterogeneity in both the supply of and demand for ecological goods and services that must be recognized in order to secure the cost-effective provision of those goods and services. International ecological goods and services employ various methods to address the issue of ecological good and service valuation including employing benefit cost indexes and regional targeting. I suggested that it is necessary to employ a mechanism that can target valuable ecological goods and services across a heterogeneous landscape. The final issue addressed with respect to cost-effectiveness was the choice of policy mechanism. I showed that there is rationale for employing positive incentives, extension and education initiatives or taking no action when deciding among policy option for increasing the provision of ecological goods and service based on the expect private and public benefits. In terms of cost-effectiveness I suggested that reverse auctions were the ideal choice of positive incentive policy mechanism.

The fourth general principle that should guide ecological goods and services policy development is policy integration. I suggested there are a number of areas where ecological goods and services policy could compliment existing policies and policy objectives, especially with respect to integrating with farm business risk management programs. Ecological goods and services policy could also be integrated with the Environmental Farm Plan. There are also areas where the implementation of ecological goods and services policy could create perverse incentives with existing policies. I noted the perverse incentives that could potentially exist between ecological goods and services policy and the Species at Risk Act in Ontario. I suggested that such perverse incentives

could be removed by repealing regulation that attempt to secure the provision of ecological goods and services through regulatory takings.

The fifth and final general principle that I proposed should guide ecological goods and services policy development is political feasibility. With respect to political feasibility I acknowledged that there may be differing concept of what constitutes fair policy and that tensions exist between pursuing the criteria of fairness and cost-effectiveness simultaneously. It is important to acknowledge these issues because if it not feasible to enact public policy because of issues such as these it does not matter how well a policy proposal adheres to the other general principles,

**8.3 Policy Implications**

The main policy implication of this research I have provided general principles that can guide future ecological goods and services policy off of which future policy debates can be based. It is not my suggestion that the principles I have proposed can or will influence Ontario policy, but it does provide a platform from which specific points can be debated. This is important because it allows policy development, thought by leading practitioners to be stagnant, to move forward.

This thesis also contains a number of policy implications that are more specific and have a more narrow impact. For example, the suggestion that ecological goods and services policy should be open to all rural landowners and not limited to agricultural producers means that jurisdiction over policy development may lie with the Ministry of Natural Resources, at the provincial level, instead of OMAFRA. This is in contrast to what has taken place in the past with both provincial and federal ministries of agricultural taking the lead in ecological goods and services policy discussions.

I believe the exclusion of additionality in my proposed framework has both positive and negative policy implications. On one hand, if ecological goods and services policy requires taxpayer funding, than I can envision a backlash against the lack of additionality because more ecological goods and services good be secured for a given amount of resources if additionality were adhered to. On the other hand, I can envision rural landowners, both agricultural producers and non-agricultural landowners, expressing displeasure if the results of their existing stewardship and good management is not taken into account when deciding who is deserving of incentives. This is certainly going to be a point of debate as ecological goods and services policy develops further.

My finding that intermediaries are more effective if their revenues are obtained through program payments may not be a popular one. On the landowners side, they may not like the idea of paying for intermediation services out of the program payments that they believe they have earned. At the same time, existing institutions like the Ontario Soil and Crop Improvement Association may feel threatened if outside groups are allowed to take on the delivery of programs to agricultural producers.

I believe that my finding that private landowners are estimated to be owners and stewards of many ecological good and services producing lands than is contained in conservation areas, provincial parks, nature and wildlife reserves and other provincially protected areas will be of surprise to many. That implication of this finding is that rural landowners contribution to environmental and ecological well-being of Ontario should finally be recognized. It will be necessary to engage the people who are both owners and stewards of a majority of the land in Southern Ontario if there is a desire to increase the provision of ecological goods and services in Ontario, as I believe there is.

The finding that the potential for investment in new riparian areas in counties with the highest average land rental rates carries important policy implication as well. Ontario is a vast province and if a system of fixed payments rates, similar to the one used in Costa Rica's *Pago por Servicios Ambientales*, was used in Ontario, it could have massive financial implications. Instead, this finding indicates that there are some counties in Southern Ontario that will require relatively high payments rates in order to garner participation while there are other counties where relatively low payments rates would be sufficient to compensate landowners for their ecological goods and services provision. This once again underscores the need for a mechanism that can differentiate between high value and low value ecological goods and services. Though I have suggested basing such a mechanism on the Biodiversity Benefits Index in Australia, further research and time will be needed to ensure that a mechanism can be designed to meet the needs of Ontario ecological goods and services policy.

A final policy implication stemming from my research is that a taxpayer funded payment for ecological goods and services program is a means to an end and not an end in and of itself. The ideal method of securing ecological goods and services provision is if supply can meet demand through voluntary market exchanges. My proposed policy framework will hopefully put producers in a position to meet demand for ecological goods and services if and when a viable market develops. Allowing intermediaries to participate in my proposed policy will make it easier for beneficiaries to locate and secure the supply they demand if and when they decide to do so.

### 8.4 Opportunities for Future Research

In this section I present some opportunities for future research that expands on this research. The first and probably most obvious opportunity for future research relates

to the GIS analysis in Chapter 6. I noted in Chapter 6 many of the shortcomings of the data I used and predicted that my estimate of existing ecological goods and services supply is likely an overestimate of actual supply. The key shortcoming of this analysis was that data do not exist to differentiate between public and privately owned land parcels in Southern Ontario. As I noted, there are indications that this data is being developed and will, in the future, be available for conducting a more accurate GIS analysis. More detailed data for the other data layers would also certainly be helpful. Higher resolution land cover data would make my analysis more accurate. Also the development and inclusion of data that identifies land that is protected by conservation easements would be helpful, although I am not sure if such data exists or can be developed. This is an important area of future research because a more accurate estimate of existing and potential ecological good and service producing private lands is very useful for estimating potential program costs as well as providing information on the inventory of ecological goods and services lands in Ontario.

A more comprehensive sample of interviewees is a possible avenue for future research. I was able to draw some broad conclusions from the interviews I conducted, but it is possible that certain interests could have been better represented. For example, it would be helpful to get opinions on ecological goods and services from all the general farm organizations in Ontario as well as specific producer groups. Information gathered in this way may show that certain producer groups perceive the impacts of ecological goods and services policy to be negative while others may view it as a positive. A more thorough sample of Conservation Authorities may also have led to similar results. Based on my sample I was unable to draw these types of conclusions.

There is a wealth of knowledge that can be gained from examining international experiences with ecological goods and services policy as well as relevant literature. I gave a broad overview of how four ecological goods and services programs are design but this review could be expanded to include many more examples that provide insight for Canadian policy development. The literature on payments for ecological goods and services programs, ecosystem service valuation and other ecological goods and services issues is rich, current and relevant to policy development in Ontario and Canada. One area that I think will be of particular importance for the development of ecological goods and services policy in Ontario is literature on means of targeting and valuing benefits. Engel *et al.* (2008) suggest the research done by Munoz-Pina *et al.* (2008), Ferraro (2008), Wunscher *et al.* (2008), Wunscher *et al.* (2006), Engel *et al.* (2007) and Watzold and Drechsler (2005) for further insight on this issue.

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**Appendix A – Interview Guide**

| | |
|---|---|
| • Background and Organizational Information | • What is your position at your organization?<br>• How long have you worked at here?<br>• What mission of your organization?<br>• How does your work further this mission? |
| • Perceptions of the ALUS approach | • What do you know about the Alternative Land Use Services approach to land stewardship?<br>• Does the ALUS concept fit within the mission of your organization?<br>• If so, why?<br>• If not, why not?<br>• What principles of the ALUS approach does your organization like (support)?<br>• What principles of the ALUS approach does your organization oppose? |
| • Ecological goods and services definition | • How do you define ecological goods and services?<br>• What are the in consistencies in how ecological goods and services is defined? |
| **Probing Themes**<br>• Current Programs | • How does <u>(organization)</u> support the provision of EG+S in Ontario?<br>• How are these programs delivered? |
| • Policy integration | • What existing programs will a new ecological goods and services program have to be integrated with?<br>• How does your organization see ALUS integrating into existing environmental programs and stewardship activities? Species at Risk stewardship activities? The Environmental Farm Plan?<br>• What is the potential for integrated delivery of these programs? What are potential obstacles to integrated delivery?<br>o What are the advantages to delivery of agri-environmental programs through an intermediary between government and farmers? Disadvantages?<br>• How can a new ecological goods and services provision approach be integrated and delivered with existing |

| | |
|---|---|
| | government agri-environmental programs?<br>○ What are the prospects for an organization like ALUS to be the delivery agent for government agri-environmental programs? |
| • Program design and delivery | • What instruments are best for securing provision of EG+S from private farmland in Ontario? Canada? |
| • Jurisdiction | • What is the nature of the shared jurisdiction over natural resources between MNR, OMAFRA and other government ministries?<br>• How does MNR collaborate with OMAFRA on EG+S policy?<br>• Does the ALUS approach address issues that are under the jurisdiction of MNR?<br>○ What other government organizations and agencies would have stake in the adoption of the ALUS approach?<br>○ Is there potential for conflict based on the jurisdictional boundaries between different levels of government and government ministries?<br>○ Is this potential conflict a hindrance to ALUS adoption? |
| • Monitoring and verification | • How should ecological goods and services programs be evaluated?<br>• How should outputs of ecological goods and services program be monitored and evaluated? |
| • Funding | • What are the potential sources of funding for an ecological goods and services program?<br>• What is the potential for financing a provincial ecological goods and services program through taxpayers funding?<br>• What is the potential for funding an ecological goods and services program through participation in a carbon market? |
| • EG+S Policy Framework | • What are the universal elements that should be included in an EG+S framework, should it be developed for Canada?<br>• What should be excluded? |

**Appendix B – Differential Effects of a Supply Shift with Inelastic Versus Elastic Demand**

To see the differential effects of a supply shift with inelastic versus elastic demand I will use a simple numerical example. Assume that corn is worth $3.00 per bushel and that 10 million bushels are being sold. Total revenue in this base scenario is $30 million. If elasticity of demand is assumed to be perfectly elastic, elasticity of demand of -5, what happens to total revenue if supply is reduced by 10%?

$$E_D = (\Delta Q_D / Q_D) / (\Delta P_D / P_D) \quad (1)$$

Where,

$E_D$ = Elasticity of Demand

$Q_D$ = Quantity of Demanded Good

$P_D$ = Price of Demanded Good

Given the above elasticity of demand, quantities and original price the change is the price of corn as a result of the reduced supply of corn to 9 million bushels is $0.06. The new price of corn following this reduction of supply is $3.06. Total revenue with this decrease in price and reduction in supply is $27.54 million.

Now, using the same example, let us assume an elasticity of demand of -0.5; that is relatively inelastic but is not negative. The price of corn would increase by $0.60 in this scenario. Total revenue with this decrease in price and reduction of supply would be $32.4 million.

This numerical example shows that reduced supply has a negative effect on total revenues when the elasticity of demand is relatively elastic and a positive effect on total revenue when it is inelastic. Therefore, the United States, facing relatively inelastic

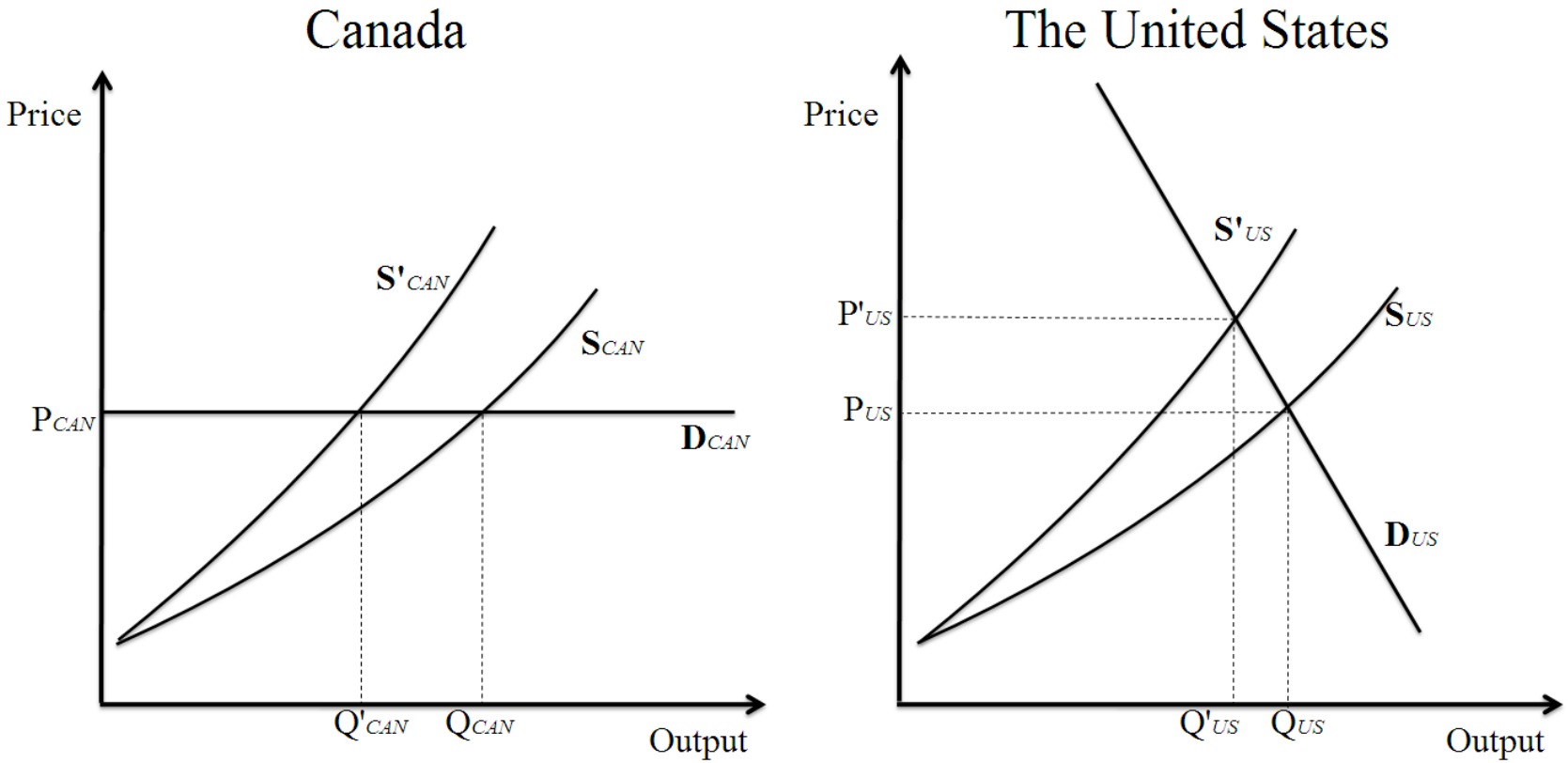
demand for important agricultural commodities, has more to gain from instituting a policy that results in reduced supply than Canada.

This example is displayed graphically in the figure below. It shows the effect that reduced supply of agricultural output would have on the welfare Canadian and American farmers. $S_{CAN}$ and $S_{US}$ represent the aggregate supply curve of agricultural output in Canada and the US, respectively. $D_{CAN}$ represents the aggregate demand for Canadian agricultural output. It is horizontal because Canada, as a small open economy, is subject to the prevailing world demand for its production and world demand is relatively elastic. Therefore, it follows that $P_{CAN}$ is equal to the prevailing world price. $D_{US}$ represent the aggregate demand for American agricultural output. It is highly sloped because demand for American agricultural output is generally assume to be inelastic. $P_{US}$ represents the initial price of American agricultural output and $Q_{CAN}$ and $Q_{US}$ represent the initial quantity of agricultural output before supply is reduced.

When a program like the Conservation Reserve Program, is introduced that reduces the supply of agricultural output the aggregate supply curve rotate inwards as represented in Figure 4.2 by $S'_{CAN}$ and $S'_{US}$. In Canada this results in quantity produced to decrease to $Q'_{CAN}$. In the United States the result is that the quantity produced falls to $Q'_{US}$ while price increases to $P'_{US}$.

The effect of this shift in Canada is a reduction of producer gross income of the value of lost production, or more formally, $(Q_{CAN} - Q'_{CAN}) * P_{CAN}$. If Canadian producers do not receive financial compensation for this reduction of supply, they are unambiguously worse as a result of this change because the change in price is not great enough to offset the decrease in production.

# The Effect of Reduced Supply of Agricultural Output in Canada and the United States



The effect in the United States is quite different. While producers in the US are still subject to losses from decreased production, these losses are ameliorated by the gains brought by increased price for remaining production. The change in American producer welfare is represented by $[(P'_{US} + P_{US}) * Q'_{US}] - [(Q_{US} - Q'_{US}) * P_{US}]$. If aggregate demand for American agricultural output is indeed inelastic, (elasticity of demand < 1) as assumed here, than producers will be better off than before the program was introduced, regardless of the fact that output has been reduced. The effect of the price change resulting from inelastic demand for agricultural goods results in increased total revenue even without including income generated from incentives to set aside the land.

**Appendix C – Interview Log**

| Name | Date | Affiliation | Location |
|---|---|---|---|
| John Clement | 27-May-2009 | Christian Farmers Federation of Ontario | CFFO Offices, Guelph |
| Kristen Thompson | 4-Jun-2009 | ALUS Coordintaor | Norfolk County Building, Simcoe |
| Dave Reid | 4.-Jun-2009 | ALUS Organizer/Ministry of Natural Resources | OMAFRA Research Station, Simcoe |
| Dave Reid | 10-Jun-2009 | ALUS Organizer/Ministry of Natural Resources | OMAFRA Research Station, Simcoe |
| Bryan Gilvesy | 10-Sep-2009 | ALUS Organizer/Norfolk Farmer | OMAFRA Research Station, Simcoe |
| Bryan Gilvesy | 16-Sep-2009 | ALUS Organizer/Norfolk Farmer | YU Ranch |
| Steve Scheers | 16-Sep-2009 | ALUS Organizer/Norfolk County | Norfolk County Building, Simcoe |
| Kristen Thompson | 16-Sep-2009 | ALUS Coordinator | Norfolk County Building, Simcoe |
| Dave Reid | 10-Oct-2009 | ALUS Organizer/Ministry of Natural Resources | OMAFRA Research Station, Simcoe |
| Dennis O'Grady | 19-Oct-2009 | South Nation Conservation Authority | Brewed Awakening, Merrickville |
| Paul Smith | 30-Oct-2009 | Ontario Ministry of Agriculture Food and Rural Affairs | 1 Stone Rd W. (OMAFRA Building), Guelph |
| Matt Wilson | 13-Jan-2010 | Ontario Ministry of Agriculture Food and Rural Affairs | 1 Stone Rd W. (OMAFRA Building), Guelph |
| Maxine Kingston | 14-Jan-2010 | Agriculture and Agri-Food Canada | AAFC Building, Guelph |
| Dave Reid | 27-Jan-2010 | ALUS Organizer/Ministry of Natural Resources | OMAFRA Research Station, Simcoe |
| Bryan Gilvesy | 27-Jan-2010 | ALUS Organizer/Norfolk Farmer | Boston Pizza, Simcoe |
| Elizabeth Brubaker | 3-Feb-2010 | Environment Probe | Environment Probe Building, Toronto |
| Eric Miller | 3-Feb-2010 | Ministry of Natural Resources | Whitney Block, Toronto |
| Tracey Ryan | 10-Feb-2010 | Grand River Conservation Authority | GRCA Complex, Cambridge |
| Anne Loeffler | 10-Feb-2010 | Grand River Conservation Authority | GRCA Complex, Cambridge |

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|---|---|---|---|
| Jo-Anne Rzadki | 11-Feb-2010 | Conservation Ontario | Conservation Ontario Building, Newmarket |
| Andrew Graham | 1-Mar-2010 | Ontario Soil and Crop Improvement Association | 1 Stone Rd W. (OMAFRA Building), Guelph |
| David Cooper | 3-Mar-2010 | Ontario Ministry of Agriculture Food and Rural Affairs | 1 Stone Rd W. (OMAFRA Building), Guelph |
| Scott Duff | 3-Mar-2010 | Ontario Ministry of Agriculture Food and Rural Affairs | 1 Stone Rd W. (OMAFRA Building), Guelph |