AN EVALUATION OF THE MANITOBA ENVIRONMENTAL TAX CREDIT PROGRAM

by
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A Thesis Submitted in Partial Fulfillment
of the Requirements of the Degree of
Master of Natural Resources Management

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August, 2000

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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ABSTRACT

In 1999, a tax credit program offering a $1/acre incentive was provided by Ducks Unlimited and Canada's Prairie Farm Rehabilitation Administration to landowners undertaking conservation practices in agro-Manitoba. The program was offered as a pilot in the two rural municipalities of Strathcona and Mountain North. The intent of the program is to influence the development of policies aimed at making agriculture sustainable over the long-term. This study evaluated the program based on landowner feedback through mail-out questionnaires and interviews with the municipal reeve and administrator of both municipalities. Sixty-one thousand acres were eligible for the credit, representing 28% of the total privately-owned land base, with an average saving per landowner of $262. Landowners agreed that $1/acre was not adequate compensation for carrying out conservation practices however, many landowners participated or will participate in the program next year. Monetary compensation was cited as an important component of conservation programs, although landowners may be willing to accept less compensation in exchange for greater land use flexibility. The program will influence landowners to maintain grasslands and plant permanent forages on marginal cropland. Program participants agreed that the program would cause them to retain wetlands. The program raised participants' awareness of the importance of conservation practices and their concern for the well-being of the environment. A tax credit of $ 1/acre appears to act more as recognition and an incentive for farmers to continue using conservation practices. There was a positive reaction and strong support from landowners and participating municipal staff for incorporating conservation goals into the property tax system.

ACKNOWLEDGMENTS

This study could not have been completed without the support of many individuals and organizations. I would like to thank the Delta Waterfowl Foundation, Prairie Farm Rehabilitation Administration, Ducks Unlimited Canada, and the Northwest Soil Management Association for their financial and technical contributions to the study. I would like to thank the National Science and Engineering Research Council for the funding needed to complete this study.

I would like to express gratitude to my advisory committee: Dr. Rick Baydack, Natural Resources Institute; Dr. Kelly MacKay, Health, Leisure & Performance Research Institute; Don Sexton, Ducks Unlimited Canada; Jim Tokarchuk, Prairie Farm Rehabilitation Administration; and Jonathan Scarth, Delta Waterfowl Foundation. I am appreciative to each of these individuals for their advice, encouragement and guidance throughout the preparation and completion of this study. I would like to thank Ron Lewis, John Fitzmaurice, and Jeff Thiele, with Prairie Farm Rehabilitation Administration, and Greg Bruce, with Ducks Unlimited Canada, for their advice and assistance. A special thanks to the rural municipalities of Mountain North and Strathcona for their cooperation and interest in my work and all of the farmers who took time out of their busy schedules, and gave freely of their time to answer my questionnaire. Without your opinions and suggestions, this study would not have been possible.

Lastly, but certainly not least, I owe many thanks to my family (especially my mom Susan), my fiancé Kelly, and close friends who have provided the moral support, encouragement, and assurance necessary to complete this endeavor.

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Chapter 1 - Introduction

1.1 Background

Many conservation agencies and organizations are providing funding and technical support to landowners throughout agro-Manitoba. The availability of funds provided by programs like the National Soil and Water Conservation Program (NSWCP), the Canada-Manitoba Agreement on Agricultural Sustainability (CMAAS), and the North American Waterfowl Management Plan (NAWMP) has led to a previously unprecedented degree of cooperative programming in rural resource management (Poole 1994). There has been major overlap between the objectives of NSWCP, CMAAS and NAWMP and they have become mutually supportive of each other. One of the stated purposes of the NSWCP was "to advance environmental sustainability initiatives across Canada by targeting economic, environmental and social issues affecting land and water resources, engage in local leadership and community involvement, and form partnerships essential to the development of effective solutions " (Agriculture and Agri-Food Canada 1998). The intention of CMAAS was "to facilitate the conservation and enhancement of the natural resources that agriculture uses by minimizing the impact the agri-food sector has on the environment" (Agriculture and Agri-Food Canada 1998). The agencies responsible for coordinating activities under the NAWMP in prairie Canada, have expressed a similar sentiment - "the vision is of thousands of Canadian farmers and ranchers managing their

business in a new way, with the help from a variety of agencies to ensure agricultural sustainability while providing a more diverse and productive landscape for wildlife" (Poole 1994).

1.2 Direct Versus Indirect Conservation Strategies

The overall coordination of NAWMP within Prairie Canada is the responsibility of the Prairie Habitat Joint Venture (PHJV), whose partners include Agriculture Canada, Environment Canada, provincial Agriculture and Natural Resource departments from the three prairie provinces, Wildlife Habitat Canada, Delta Waterfowl Foundation, Ducks Unlimited Canada, as well as all participating private landowners (Manitoba Habitat Heritage Corp. 1995). During the early formative stages of the partnership, the collaborators in the NAWMP recognized that achievement of the Plan's objectives required extensive maintenance of waterfowl habitat on private lands. The partners embarked on three major initiatives directed towards the stewardship of private lands (Prairie Habitat Joint Venture Land Use Committee 1996). The first, was a strategy to move some key lands into some form of direct control through purchase and leasing arrangements. These direct conservation efforts identified conservation as a specific objective and directly provided incentives for the use of conservation techniques. The second initiative was a more extensive program directed towards developing, demonstrating and encouraging key land use changes on private lands. However, even in this case, the programs require landowners to offer some form of contractual security to be eligible for assistance (Prairie Habitat Joint Venture Land Use Committee 1996).

The partners anticipated that the first two types of programs, while necessary to immediately protect key areas of habitat, would not be sufficient to meet the Plan's waterfowl goals. Direct conservation programs have sometimes been characterized as precursors to the policy reforms necessary to effect soil, water, and habitat conservation on a significant scale and over a long-term period. Since the NAWMP was implemented, it has become apparent that the returns, in terms of additional numbers of waterfowl per acre secured, are lower than anticipated, and the cost of securing sufficient acres is high. In addition to this, the Partner's original funding projections were over-optimistic (Prairie Habitat Joint Venture Land Use Committee 1996). NAWMP recognized that its direct habitat programs would have a limited effect, and that its objectives could only be met through reforms to policies that provide indirect incentives affecting land use (Environment Canada, United States Department of the Interior, and Secretario de Desarrollo Social Mexico 1994).

These policy reforms were to take over during the latter phase of the NAWMP's 15 year life, replacing and extending the effect of direct and extensive interventions. For example, programs such as the lease or purchase of waterfowl nesting cover (the main direct program delivered by PHJV) would give way to policy reforms that support more extensive land use changes, such as conservation tillage, rotational grazing, and retirement of marginal lands. This study evaluated a pilot program exemplifying one of these policy reforms - the reform of the property tax system to achieve conservation objectives.

1.21 Direct Conservation Strategies

NAWMP and NSWCP participation by private landowners is made possible through a number of programs within Manitoba. These programs are specifically aimed at establishing and retaining cover on private agricultural land, to achieve objectives related to either wildlife populations or soil and water conservation.

1.211 NAWMP Achievements within Manitoba

Acting as the largest component of NAWMP within Manitoba, the Prairie CARE (Conservation of Agriculture, Resources, and the Environment) program offers a variety of intensive and extensive conservation options available to landowners such as lease or purchase for the purpose of habitat development and management. Financial and technical assistance required for compatible land use practices such as delayed haying and planned grazing systems may also be provided by Prairie CARE. Through purchase arrangements with landowners, Duck's Unlimited's Prairie CARE has secured and enhanced 25,200 acres of land from 1987 through to December of 1999. The program expenditure on land purchases from 1987 to 1999 was estimated at $6.85 million based on payments of $200 to $250 per acre. Land payments may vary according to assessments from an independent appraiser (Sexton 1999). This figure includes the costs of securing and enhancing land, as well as the associated staff time and legal fees. Furthermore, the Prairie CARE program has secured an additional 29,200 acres from 1987 to December of 1999, through ten year leasing arrangements with landowners. Payments to landowners are based on the cash rent which is adjusted each year. The program expenditure on land leases was estimated at $5.6 million based on $7 per acre payments for native prairie upland and $22 to $27 per

acre for croplands (Sexton 1999). The Prairie CARE program has also affected 40,600 acres of farmland through modified agricultural programs, where landowners carry out specific conservation practices on their land, such as rotational grazing or planting forages on marginal cropland. The total expenditure on modified agricultural programs from 1987 through to December of 1999 was estimated at $1.4 million (Sexton 1999).

The Adopt-A-Pothole program, delivered by Delta Waterfowl Foundation is another component of the NAWMP. Since 1993, it has secured 8,090 acres of small wetlands and upland nesting habitat through five and ten year leasing arrangements with landowners. Land acquired through this program usually amounts to less than forty acres per lease while payments to landowners are based on the acreage of native grass cover and cultivated land involved (Fisher 1999). The total program expenditure from 1993 to 1999 was estimated at $738,915 based on $7 per acre payments for native prairie upland and $27 per acre payments for croplands converted to dense nesting cover (Fisher 1999). This program has been replaced in Manitoba with the Potholes Plus Program, jointly delivered by Delta Waterfowl and The Manitoba Habitat Heritage Corporation, using the new conservation agreements legislation passed by the Province of Manitoba.

1.212 NSWCP Achievements within Manitoba

Today, NSWCP efforts within Manitoba are part of an ongoing evolution of publicly funded programming focused on encouraging agriculture to adopt sustainable means of food production. From the inception of NSWCP in 1998, Agriculture and Agri-food Canada through Prairie Farm Rehabilitation Administration (PFRA) has provided

approximately $500,500 to more than 100 projects, activities, and studies in Manitoba, addressing a range of issues from water quality testing to precision farming (Thiele 1999).

1.213 The Permanent Cover Program Achievements within Manitoba

PFRA also developed and delivered the Conservation Cover Program and the Permanent Cover Program from 1990 to 1993. In 1990, the Conservation Cover Program provided a one-time seeding payment of $20 per acre to landowners to convert eligible erodible land to perennial forage or tree cover. Under this program, there were 648 applications for 42,100 acres in Manitoba, and seeding payments amounted to $842,000. From 1991 to 1993, the Permanent Cover Program offered a seeding payment of $20 per acre to landowners to convert eligible erodible land to perennial forage or tree cover. Subsequently, a second payment of $20 per acre was offered to landowners willing to retain their land in permanent vegetative cover for a ten year period. An additional payment of $50 per acre was available to landowners who signed a 21 year contract that stated the land would remain under forage cover for that time period. Along with these contracts, a caveat was placed on the land title, so that the conditions of the contract would prevail if the land was sold to another party. In Manitoba, from 1991 to 1993, there were 1,889 applicants and 142,738 acres protected under the program. This resulted in $2,854,760 paid out to landowners for seeding costs and an additional $6,614,240 for landowners who signed contracts (Thiele 1999).

The preceding discussion and Table 1.1 summarizes the progress that has been made in delivering conservation programs to agricultural producers. The numbers reported however, are gross figures. It is important to note that the net impact of direct

conservation programs on Manitoba's landscape remains unknown, because the acres of natural lands that have been negatively affected during this period have not been accounted for.

Table 1.1 Acreage Effected and Dollars Spent on Direct Conservation Programs

Program	Years Active	Acres Enrolled	% of Land Base Affected *	Dollars Spent
Prairie CARE				
- land purchase	1987 - 1999	25,200	0.13	6,850,000
- land leasing	1987 - 1999	29,200	0.15	5,600,000
- modified agricultural practices	1987 - 1999	40,600	0.21	1,400,000
Adopt-A-Pothole /Potholes Plus	1993 - 1999	8,090	0.04	738,915
Conservation Cover Program	1990	42,100	0.22	842,000
Permanent Cover Program	1990 - 1993	142,738	0.75	9,469,000
NSWCP	1998 - 1999	100 projects		500,500

* Based on 19,106,400 acres in Manitoba. Source: Manitoba Agriculture, 1997.

The programs mentioned above have protected a substantial amount of land but at a substantial cost to conservation agencies. Because the current programs offer a relatively large amount of funding per acre and per project, the number and the duration of the programs that can be funded are limited (Poole 1994). While these programs have encouraged at least short term changes in land management practices, much remains to be done to create the most favorable circumstances for long-term, environmentally-friendly resource management (Samson and Knopf 1999).

To some extent, the very nature of the present programs mitigates against their use to encourage long-term solutions to agro-resource management concerns. Existing conservation programs are not adequately addressing the widespread soil and water conservation problems because the fragmented, discontinuous, and irregular nature of these programs has prevented them from having significant long-term impacts on

preserving natural areas (Morgan 1985). Because the agreement's funds are time-limited, there has been an understandable inclination to concentrate activities on program areas that are likely to show quick results (Poole 1994). Also, without large sums of money to back up these programs, even the best-designed programs will not effect a significant acreage in the long-term.

1.22 Indirect Conservation Strategies

For these reasons, the long-term strategy of the NAWMP partners was to rely more heavily on policy reforms as opposed to direct habitat programs and explore ways in which the broad conservation objectives outlined in NAWMP could be made more self-sustaining by a process of institutional and policy adjustment. The Prairie Habitat Joint Venture (PHJV) Land Use Committee (1996) identified the following policy areas of policy reform that would create the potential for a direct benefit to the landowner and remove any disincentives associated with maintaining wildlife on private lands:

1. "Agricultural policy reform - PHJV needs to encourage changes that lead to the removal of commodity-based subsidies to stabilize farm income. Governments need to be pressured to encourage farmers to conserve wildlife habitat and use land in a sustainable manner. There is a need for stronger recognition of the value of waterfowl and wildlife habitat in existing programs, such as those treating costs of drainage as eligible business expenditures for tax purposes, crop insurance and other safety net programs. The PHJV needs to develop inputs and positions on the sustainable development strategies for agriculture and other federal and provincial departments.

2. Wildlife policy reform - Create legal arrangements for the conservation of habitat. The concerns focus on landowner's rights and access rights to view and hunt wildlife.
3. Water policy issues - There are a number of issues that need to be reviewed surrounding the water quality impacts of diversification, wetland drainage, and the relationship between water supply and prices on the one hand and the supply of habitat on the other.
4. Crop damage prevention and compensation - The federal and provincial governments, both ministers of agriculture and wildlife, have accepted proposals of the Canadian Federation of Agriculture (CFA) and Wildlife Habitat Canada (WHC) to combine prevention and compensation activities, and to offer producers 100% loss coverage provided that their fields can be used as temporary lures crops if required. There remains a need to secure continuing funding for the new programs and methods of delivering the revised approach. Ministers of agriculture have also requested the CFA and WHC to work with Agriculture and Ari-food Canada (AAFC) officials and other parties to develop a 'national wildlife damage compensation program.'
5. Reforms and incentives related to the ownership, purchase, and transfer of land - a PHJV perspective on land taxes needs to be developed. The implications of not having land taxes on the supply of habitat and information on landowner awareness of how conservation lands are taxed. Recent changes in federal tax regulations now allow tax deductions for charitable donations of land, and for the establishment of conservation easements. PHJV should see that an information package on land sales and purchase for conservation, that incorporates these options, is developed in partnership with other interested organizations.

6. Design and adoption of farm production and land use technologies - The PHJV needs to develop an explicit research strategy that involves a strategic alliance between groups concerned with agriculture, conservation and wildlife habitat.
7. World Trade and Environmental Standards - Agriculture will be impacted by ISO 14000 and future WTO negotiations causing the incorporation of environmental standards into international trading arrangements. PHJV can provide information on the amount of environmental habitat that exists, conservation practices, and the wildlife supported by agricultural landscapes."

Little attention has been given to pursuing these policy reforms in Manitoba, in order to achieve conservation objectives over a long period of time and at a lower cost. Amongst the important policy instruments referenced by the PHJV Land Use Committee that has the potential to influence land use is the municipal tax regime (see item 5 above). It has been speculated that the landscape would be more completely protected by funding a rural municipality, that would then offer a credit on municipal land taxes to all landowners, if the required conservation practice was completed (Poole 1994). Under this type of system, a smaller amount of funding would be offered, but this funding would be made available to every taxpayer in the municipality.

Some commentators believe that the potential for the adoption of conservation practices using a municipal tax credit system is higher than with traditional incentives. Most landowners perceive property taxes as high priority, personal issues and the idea of tax relief provides some kind of a psychological benefit to the landowner (Poole 1994). Landowners may be very receptive to an Environmental Tax Credit Program, because tax

credits have a lot of appeal to landowners who feel burdened by the taxes they have to pay (Poole 1994). This is especially true in a depressed agricultural economy. According to Ed Pietruszka (2000), a provincial assessment officer in Manitoba, property taxes may have a significant effect upon landowner's land use decisions, particularly on marginal land. When farmers perceive they are paying taxes more or less equally on all parts of their holdings, they are inclined to intensify use of the areas considered less productive. If landowners were more aware of the fact that they pay less tax on marginal land and conservation lands such as wetlands, bush, and native prairie, they may not be so inclined to convert conservation lands for agricultural production.

Canadian society has established a pricing mechanism to compensate farmers for the agricultural products of the rural landscape. Annual and perennial crops, livestock and livestock products can all be sold in the market place (Poole 1994). However, the present market system does not account for the full value of our endowments of natural capital. Rural landscapes produce ecological goods and services in addition to agricultural products. Examples of ecological goods and services include: wildlife, aquifer recharge, flood and erosion control, riparian buffer zones, biodiversity, and the preservation of soil and water quality. These goods and services have non-market values, that is, they are not traded in the market and therefore, information about their benefits and contribution to society's well-being is poorly understood (Poole 1994).

Policy and market signals guide agricultural producers toward economically sound decisions. In the case of ecological goods and services, which include the range of economic and social benefits provided by a healthy environment, these signals become distorted and ineffectual because policies have not been not designed to address these

kinds of goods and services. As a result of their apparent zero or negative market value, the producer often associates conservation lands with a loss of revenue and incorporates these factors into the economic decision-making process, in a negative manner. Therefore, ecological goods and services are degraded as an unpriced cost of agricultural production (Belcher 1993). Ecological goods and services are primarily the public goods produced on private land that have been eliminated because they did not "pay their own way". This has resulted in off-farm impacts such as declining water quality and loss of species diversity. Given that society values these resources and given that landowners by and large cannot afford to maintain them, it is only right that society should bear the costs of their maintenance (Sopuck 1993). Currently, the policy framework in Manitoba does not take into account the value of ecological goods and services, nor compensate landowners for their provision.

1.3 The Environmental Tax Credit Program

The Environmental Tax Credit Pilot Program was proposed to investigate a method of delivery for conservation programming, which has never been implemented in Manitoba. This pilot program is jointly offered by Northwest Soil Management Association, Prairie Farm Rehabilitation Administration through the National Soil and Water Conservation Program, Ducks Unlimited Canada, and the Rural Municipalities of Mountain North and Strathcona. By implementing a tax credit program, land management practices that preserve or restore desirable elements of the environment can be recognized by society and made more culturally and economically acceptable.

1.4 Objectives of the Environmental Tax Credit program

1) The initial objective of the Environmental Tax Credit program is to strengthen landowner's awareness of the value of ecological goods and services and compensate landowners for the service they provide to society.
2) The second project objective is to evaluate an alternative method of delivery of conservation/environmental programming. The use of the property tax system may have potential for other types of projects in the future. Also, if the program is deemed successful, it could influence property tax policy reform which will help protect the land and water resource over the long-term.
3) The third objective of the program is to determine any economic benefit that the two municipal councils capture over the three-year pilot project. Reduced expenditures may occur in the following areas: silt removal from waterways, flood control, erosion repairs, culvert and crossing repairs, and also the loss of tax revenues from badly eroded land.
4) The fourth objective of the program is to provide an economic incentive to landowners in the target areas to maintain and preserve existing habitat and therefore lessen the cost of restoration in the future.
5) The final objective of the program is to determine the impact that $1 per acre tax credit has on landowner's attitudes and behavior regarding conservation practices.

This program offers the benefits of a $1 per acre municipal tax credit to all landowners within the municipalities of Mountain North and Strathcona, to preserve and protect the land and water resource base. Funding is provided to the rural municipalities, who then offer a credit on municipal land taxes to all landowners who apply and carry out one or more particular conservation practices. The conservation practice requires the maintenance of sufficient cover to protect the land from erosion, and provide habitat for wildlife. Eligible land cover, resulting from the conservation practice, may include tame forage, native grassland, wetlands, riparian buffer zones, and a minimum of 40% residue cover on cropland in the spring.

The Environmental Tax Credit Program proposed to offer $1 per acre tax credit to all eligible landowners within the two rural municipalities. As demonstrated in Table 1.2, a predicted 25% sign-up of total acres in both municipalities for the 1999 field season, would result in a potential total credit of $55,000 paid out to landowners and up to 55,000 acres protected by the program (Thiele 1999). It is expected that the total acres signed up will increase to 37.5% in year 2000 and 50% in the year 2001.

Table 1.2 Estimation of Acreage Enrolled in the Environmental Tax Credit Program

Land Use Class	Acres Mountain North	Acres Strathcona	Total Acres Both RM's	1999 Estimated Acres @ 25% Sign-up	2000 Estimated Acres @ 37.5% Sign-up	2001 Estimated Acres @ 50% Sign-up
Annual Cropland	57989	63697	121686	30422	45632	60843
Trees	18367	13217	31584	7896	11844	15792
Water	350	3941	4291	1073	1609	2146
Wetland	1178	6271	7449	1862	2793	3725
Grassland	16585	26539	43124	10781	16172	21562
Forage	7102	5315	12417	3104	4656	6209
Total Acres	101571	118980	220551	55138	82707	110276

Landowners apply at the appropriate municipal office by March 31 of each year for lands that are eligible for the spring of that same year. Each year on a chosen date, a satellite image of each rural municipality is acquired and the appropriate ground truthing carried out in order to confirm the eligibility of each application. The imagery is taken between May 15 and June 15 each year, depending on the progress of seeding. Eligible land is then issued the credit when landowners pay their land taxes in October.

The majority of past programs have been largely based on incentive funding to encourage landowners to shift from a "less conservation-oriented " to a "more conservation-oriented" type of land management. Most of the landowners who had already adopted conservation practices and thus, were already providing ecological services, were disqualified from participating in the programs (Poole 1994). The Tax Credit program is meant to provide recognition to those landowners already engaged in conservation practices and provide an incentive to continue carrying out these practices (Sexton 1999). The Environmental Tax Credit Program may also encourage farmers to change their farming practices (e.g. toward conservation-tillage) or land use on marginal cropland.

A major goal of the Environmental Tax Credit program is to benefit the environment. Maintaining cover on the land will help to decrease soil erosion and nutrient migration to surface water. This in turn, will help to maintain soil quality and structure and improve surface water quality. The maintenance and preservation of existing natural habitat will also benefit wildlife and lessen the costs of restoration in the future. Retained wetlands will help to reduce peak runoff flows, prevent downstream erosion and flooding, trap sediments, filter pollutants, and recharge groundwater. The removal of marginal land

from cropping will also help to reduce erosion, sustain organic matter, and provide habitat for wildlife. In addition to the environmental benefits, economic and social benefits, achieved through improved land and water management, are also anticipated. These may include: improved farm productivity and net returns; aesthetic, recreational and spiritual values to local residents and visitors; and reduced maintenance/repair costs for municipal infrastructure (Oborne 1995).

1.5 Issue Statement

The Environmental Tax Credit Program is an important step towards the development of policy reforms aimed at making agriculture sustainable in the long-term. Too often however, programs such as the Environmental Tax Credit Program are implemented without a thorough evaluation.

This study will provide a formative evaluation of the Environmental Tax Credit Program in order to determine the impact that $1 per acre tax credit has on landowner's attitudes regarding conservation practices and on their land use decisions. Additionally, the evaluation will determine the effectiveness of the property tax system as a delivery mechanism for future conservation programming. Input from landowners was necessary in order to assess how the program could improve and what changes should be made early in the three-year pilot phase. Based on the evaluation, recommendations on modifications, improvements to, and expansion of the program will be made. Results of such a study are critical for testing the effectiveness of the pilot program and to provide baseline information for decision-making by the Environmental Tax Credit Program Implementation Committee.

1.6 Study Objective

The main objective is to evaluate The Environmental Tax Credit Program after the first year of delivery in order to ascertain whether the program objectives have been addressed.

1.7 Specific Study Objectives

The following is a list of specific study objectives:

1) Determine the effectiveness of selected tax incentive programs in the United States and Canada, and determine why they did/did not continue.
2) Determine which landowners participated in the Environmental Tax Credit program and which did not and determine the reasons why and why not.
3) Determine whether a $1 per acre tax credit is sufficient compensation for landowners carrying out sustainable land management practices.
4) Determine whether a $1 per acre tax credit will influence future land management practices and land use decisions.
5) Using existing information from PFRA, determine whether the tax credits were issued on land that "requires protection" from erosion (critical land).
6) Determine the perceptions and reactions of the municipal council and landowners towards the Environmental Tax Credit program.
7) Determine the impact the Environmental Tax Credit program had on landowner awareness and attitudes regarding conservation practices.

Based on evaluation results, provide recommendations for program improvements and revisions.

Chapter 2 - Methods

2.1 Introduction

This study involved four research phases:

1) **Research Phase I** - a review of selected tax incentive programs
2) **Research Phase II** - landowner questionnaires
3) **Research Phase III** - interviews of the municipal reeves and administrators
4) **Research Phase IV** - GIS land satellite data

Research phase I involved a review of selected tax incentive programs that have been implemented in Minnesota, Iowa, North Dakota, Ontario, Saskatchewan and Alberta in order to determine whether these programs were/are effective. It was anticipated that new ideas and previous data relevant to the study would be revealed. It was hoped that current theoretical frameworks and practical applications of program evaluation would be available for consideration.

The second and most important research phase of the study involved a comprehensive survey of landowner reactions and attitudes toward the Environmental Tax Credit Program. Information from the questionnaires was used to determine the following; who participated in the Environmental Tax Credit program and who did not and their reasons why and why not; whether $1 per acre is sufficient compensation for carrying out conservation practices; the impact of $1 per acre on future land use decisions;

the overall perceptions and reactions of landowners towards the program; and the impact the Environmental Tax Credit program had on landowner's awareness and attitudes regarding conservation practices. Working with agricultural producers and the rural community is vital to the success of conservation efforts. A major challenge facing all conservation efforts is learning how to achieve desired goals compatible with and supported by landowners. In order to do this, it is extremely important to involve landowners and understand their concerns.

The third research phase of the study involved interviews with the reeves and administrators of Strathcona and Mountain North, the two municipalities where the program is being offered. The interviews were performed in order to ascertain their reactions and attitudes toward the Environmental Tax Credit program.

The fourth and final research phase comprised a very small part of the study and utilized geographic information system (GIS) land satellite data to determine whether the program was protecting erodible land.

The following section describes the methods used for carrying out the evaluation. By using this methodology, information was collected to allow for a review of the program. The following discussion is divided into seven sections; setting; evaluation framework; research design; sample; data collection; instrumentation; and data analysis. The setting describes the locations where the program is being implemented. The evaluation framework translates the study objectives into specific evaluation issues, which were used to develop questions on the questionnaires and interview. The research design, sample and data collection describe the research procedures. Instrumentation examines

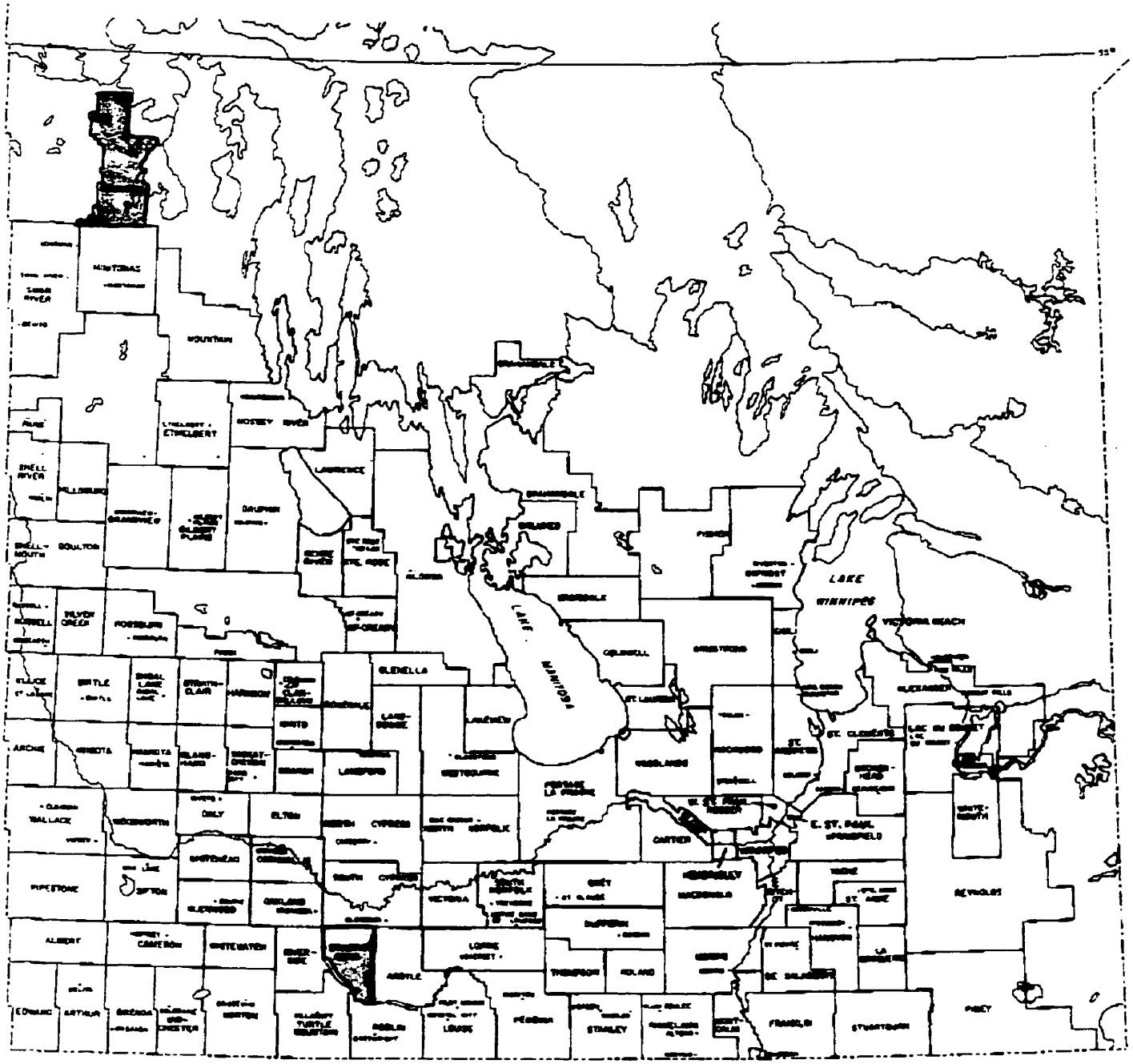
the format and nature of the questionnaires and interview components. Data analysis details the statistical program and procedures that were used.

2.2 Research Setting

In 1999, the Environmental Tax Credit program was administered in the rural municipalities of Mountain North and Strathcona, located in Manitoba (see Map 1). The program was implemented in these municipalities because they vary in geographical location, landscape features and land use/agricultural practices. Both municipalities have a large acreage of conservation lands that would qualify for the tax credits. Also, Strathcona municipality is located in the NAWMP target area of southwestern Manitoba. It was thought that landowners inhabiting certain parts of the province may exhibit different levels of support for the Environmental Tax Credit program.

2.21 The Municipality of Mountain North

The municipality of Mountain North is located in the Swan River Soil Survey Map Sheet Area (Appendix 1). The most striking relief features in the area are provided by the hilly sections of the Duck and Porcupine forest reserves and the two isolated hills locally known as Thunder Hill and Minitonas Hill. The Duck and Porcupine Mountains are separated by a U-shaped bay-like area once occupied by glacial Lake Agassiz. This bay-like area is separated into two physiographic units by the Kenville escarpment (See Appendix 2). The unit below the escarpment is part of an area called the Manitoba Lowlands and the one above is part of the Great Plains Region (Ehrlich et al. 1962).



MAP 1. Rural Municipalities of Mountain North and Strathcona.

Source: Intergovernmental Affairs, 2000.

The municipality of Mountain North is located primarily in the Manitoba Lowlands section. There are approximately 103,800 acres of private land in the municipality of Mountain North. Crown land, community pastures, Ducks Unlimited and MHHC land, as well as towns and wildlife management areas were not included in the acreage estimates. Map 2 on page 27, displays the type of land use in the Mountain North. There are; 8,968 acres of annual cropland with high crop residue, 39,534 acres of annual cropland with low residue cover, 1,250 acres of forages, 28,876 acres of grasslands, 2,213 acres of marshland, 1,184 acres of bogs, 1,034 acres of coniferous vegetation, 13,963 acres of deciduous vegetation, 1,415 acres of open deciduous, and 780 acres of water.

The municipality lies within the Boreal Forest Ecoregion and contains aspen and balsam poplar which occur in pure associations or mixed with white spruce and white birch. Jack pine in association with aspen commonly occur on sandy and gravel ridges. In poorly drained areas, the prevailing vegetation is patches of black spruce and tamarack with intervening bogs (Ehrlich et al. 1962). The distribution of forest stands and their species composition is closely related to physiographic features and surface deposits. Most of the land in the municipality has a moderately high capability for forestry however, land capability varies throughout the municipality and can range from Class 2 to Class 5 (Natural Resources Canada 2000).

The most common wild ungulates in the mixed woods and deltaic plains are moose, white-tailed deer habitat, and woodland caribou. Aerial surveys show higher moose densities in the pristine parts of this area than in any other surveyed part of Manitoba. White-tailed deer concentrate around the agricultural settlements but their numbers are limited, probably by the rigorous winters. Caribou are well adapted to the

climate and utilize large segments of this area that are generally unsuitable for other ungulates. The bogs, fens and coniferous forests provide lichens and low-growing vascular plants preferred by caribou (Natural Resources Canada 2000). Wetlands in the area provide low to moderately productive waterfowl habitat and range from Class 4 to Class 7. Some restrictions included low fertility, shallow water depths, acidity, adverse topography, stagnation of water, etc (Natural Resources Canada 2000).

Due to the diverse landscape features, the Duck and Porcupine forest reserves, and the large abundance of wildlife, there is a wide range of recreational activities that occur in the municipality. These include: camping, hiking, hunting, fishing, boating, swimming and other water-oriented activities (Natural Resources Canada 2000).

The main industries in the municipality are agriculture and forestry. There are a few people employed in secondary industries like the wholesale and retail trades, transportation and storage, educational services, health and social services, manufacturing, and construction. However, the majority of the people are employed in agriculture or forestry related occupations unique to the primary industry. The unemployment rate remains fairly high, around 16%, presumably because most of the work is seasonal.

Louisiana Pacific (LP) cuts timber in the municipality to produce Oriented Strand Board (OSB) which is like a strong plywood used mostly for flooring and siding in house construction. LP has operated here for 5 years having received its forest management license in 1995. The plant itself is very important to the local economy and it provides about 150 direct jobs and 400 indirect jobs. Many grain farmers in the municipality are employed by LP for the winter season. Logging occurs on private as well as Crown land. On Crown land, the company must follow Manitoba's Forest Management Guidelines,

however, on private land the cutting is not regulated by the government. There are farmers in the area who are in favor of LP cutting on their private land because they get paid for the wood and the clearing of land is considered beneficial for cattle grazing. There are other farmers with land located at the foot of the Duck Mountains who are irritated because they are experiencing soil erosion and flooding from water runoff as a result of some of these up slope tree cutting practices.

The municipality of Mountain North contains a wide range of soil types. Soils can also be classified into capability classes and subclasses on the basis of observed characteristics such as: soil depth, texture, structure, wetness and drainage, susceptibility to erosion or degree of erosion, stoniness, droughtiness, salinity, climate, and adapted crops. Consideration of the features in relation to the use, management, and productivity of the soils is the basis for differentiating the various units.

Some of the soils in Mountain are very well suited to agricultural production. These soils are grouped into Class I and II land, and are considered highly productive. Many attempts have been made to clear the native vegetation for an expansion of arable acres. However, much of this land is considered Class III land, which is susceptible to wind and water erosion; Class IV land, where problems are more acute and careful management practices must be carried out to prevent soil erosion. This land is mostly suitable for grazing and hay because of the high costs involved in clearing land of stone or draining land that is wet most of the year; and Class V to VIII which are not well suited to crop production. The coarse textured and steeply sloping soils and shallow and deep peat soils limit the use of the land for grazing and some hay production (Ehrlich et al. 1962).

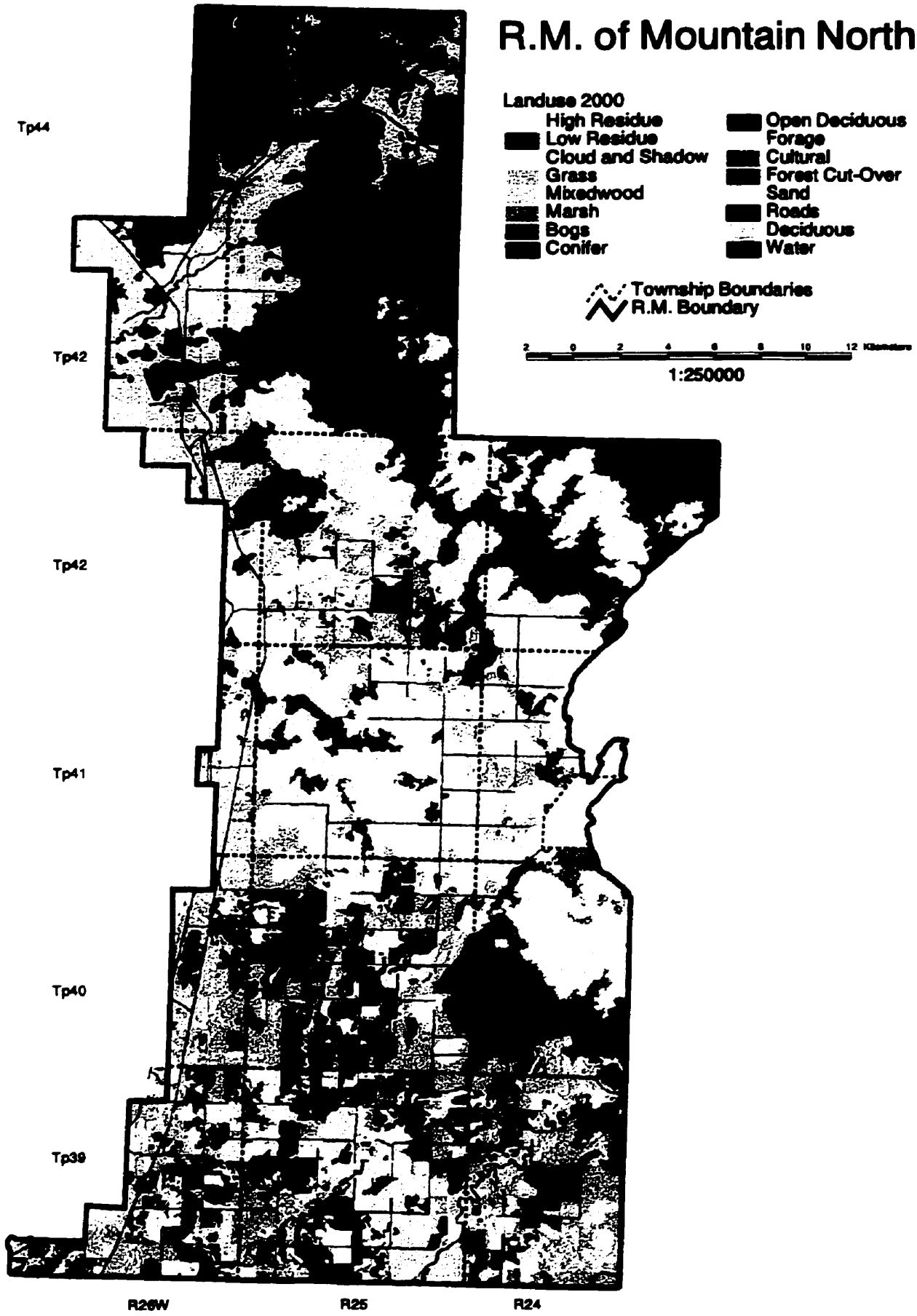
There are approximately 114 farms in Mountain and the average farm size is 817 acres. The general system of agriculture is considered one of grain production on the arable land, but a considerable amount of diversification is practiced as can be seen from the number and kind of livestock kept as a supplementary enterprise. According to Statistics Canada (1999) there are 105,453 acres of land in agricultural production in the municipality of Mountain of these, 48,849 acres of land that are suitable for crop production. The main crops grown in the Mountain municipality are wheat, oats, barley, flax, and canola (Manitoba Agriculture 1997). The area is well suited for forage production and pasture land. Beef cattle, dairy, and hogs appear to be the prominent livestock farmed. According to Statistics Canada (1999), farm capital in Mountain was estimated at $39,586,383 in the year 1995. Additionally, gross farm receipts were estimated at $6,910,660 and total farm expenses were $5,858,605.

The total population of Mountain North is 1,142 and is comprised of people with varying ethnic origins including; Aboriginal, Canadian, English, Ukrainian, French, Irish, German, and Scottish. From 1991 to 1996, there has been a 7% decrease in the population, mostly from people migrating out of the municipality (Statistics Canada 1999).

The pictures on the following pages help to depict the landscape in the municipality of Mountain North.

Figure 1. Pasture and Forested Land in Mountain North

Figure 2. Clearing Forested Land for Agricultural Production


R.M. of Mountain North
Landuse 2000
High Residue
Low Residue
Cloud and Shadow
Grass
Mixedwood
Marsh
Bogs
Conifer
Open Deciduous
Forage
Cultural
Forest Cut-Over
Sand
Roads
Deciduous
Water
Township Boundaries
R.M. Boundary
1:250000
Tp44
Tp42
Tp42
Tp41
Tp40
Tp39
R26W
R25
R24

2.22 The Municipality of Strathcona

The municipality of Strathcona is located in the South-Central Soil Survey Map sheet area (Appendix 3) and is grouped into in the *Tiger Hills Area of Mixed Woods and Prairie*, natural landscape area. This area is characterized by well-developed terminal moraines and eroded hills of shale. The topography is dominantly of the knob and basin type that is, it consists of irregular hills and hillocks, between which are undrained basins occupied by lakes, sloughs, or alkali swamps. The hills are invariably stony and tend to be droughty because of excessive run-off from the steeper slopes. This type of topography gives a patch-work pattern to the native vegetation. The southern and western slopes of the hills, which are prone to drought because of excessive run-off, were covered with grass vegetation. The northern and eastern portion of the hills, which are relatively humid, were covered in woodland vegetation (Ellis and Shafer 1943).

The soils generally are shallow in depth due to the nature of the till and of the peculiar topography. The soils occurring in this area; Heaslip, Hilton, Tiger Hills and Greenway soil associations are susceptible to wind and water erosion, salinity and alkali problems, and drought (Ellis and Shafer 1943). The general land use system followed in the past has been the result of regional adaptation, economic conditions, and practical experience. Conservation is a serious issue on arable lands where wind and water erosion is evident, especially where the topography is more strongly undulating and rolling (Ellis and Shafer 1943).

There are approximately 120,400 acres of private land in the municipality of Strathcona. Crown land, community pastures, Ducks Unlimited and MHHC land, as well as towns and wildlife management areas were not included in the acreage estimates.

Map 3 on page 33, displays the types of land use in the Strathcona municipality. There are; 24,621 acres of annual cropland with high crop residue, 31,175 acres of annual cropland with low residue cover, 7,025 acres of forages, 31,630 acres of grasslands, 6,029 acres of marshland, 11,854 acres of deciduous vegetation, 1,343 acres of open deciduous, and 3,552 acres of water.

Much of the native vegetation has been cleared for agricultural production which has reduced the number of waterfowl sites and wildlife habitat. White-tailed deer and moose are found throughout the area in native woods. The municipality lies within the PHJV target area and is part of a significant breeding and staging area for waterfowl and many other bird species. Many bird species live in the area, such as the Great Gray Owl, Golden-winged Warbler, Indigo Buntings, Sharp-tailed and Grasshopper Sparrows, Rosebreasted Grosbeak, and the Red-headed Woodpecker. Waterfowl species nesting in favorable habitats on the area are the Mallard, Blue-winged Teal, Pintail, Green-winged Teal, Lesser Scaup, Wood Duck, etc. In the municipality, habitat has a moderate to moderately high capability and are rated Classes 2, 3,4 for waterfowl production. Habitats are usually natural wetlands such as marshes, shallow streams, oxbows, fans with open pools, and drainage ditches (Natural Resources Canada 2000).

There are approximately 126 farms in Strathcona and the average farm size is 1,062 acres. The general system of agriculture is considered one of grain production on the arable land, but a considerable amount of diversification is practiced as can be seen from the number and kind of livestock kept as a supplementary enterprise. According to Statistics Canada (1999), there are 94,829 acres of land in agricultural production in the municipality of Strathcona, of these 57,956 acres of land that are suitable for crop

production. The main crops grown in Strathcona are wheat, oats, barley, flax, and canola and approximately 60% of the farms have cattle as their main livestock (MB Agriculture 1997). According to Statistics Canada (1999), farm capital in Strathcona was estimated at $47,802,807 in the year 1995. Additionally, gross farm receipts were estimated at $9,765,396 and total farm expenses were $7,836,708.

Agriculture is the only industry in Strathcona, except for a few people who are employed in secondary industries such as; wholesale and retail trades, educational services, health and social services, and accommodation/food/beverage services. The total population in the municipality is 817 and is comprised of people with varying ethnic origins including; Canadian, English, Scottish, Irish, German, French, and the Netherlands. From 1991 to 1996, there has been a 6% decrease in the population, mostly from people dying (Statistics Canada 1999).

The pictures on the following pages help to depict the landscape in the municipality of Strathcona.

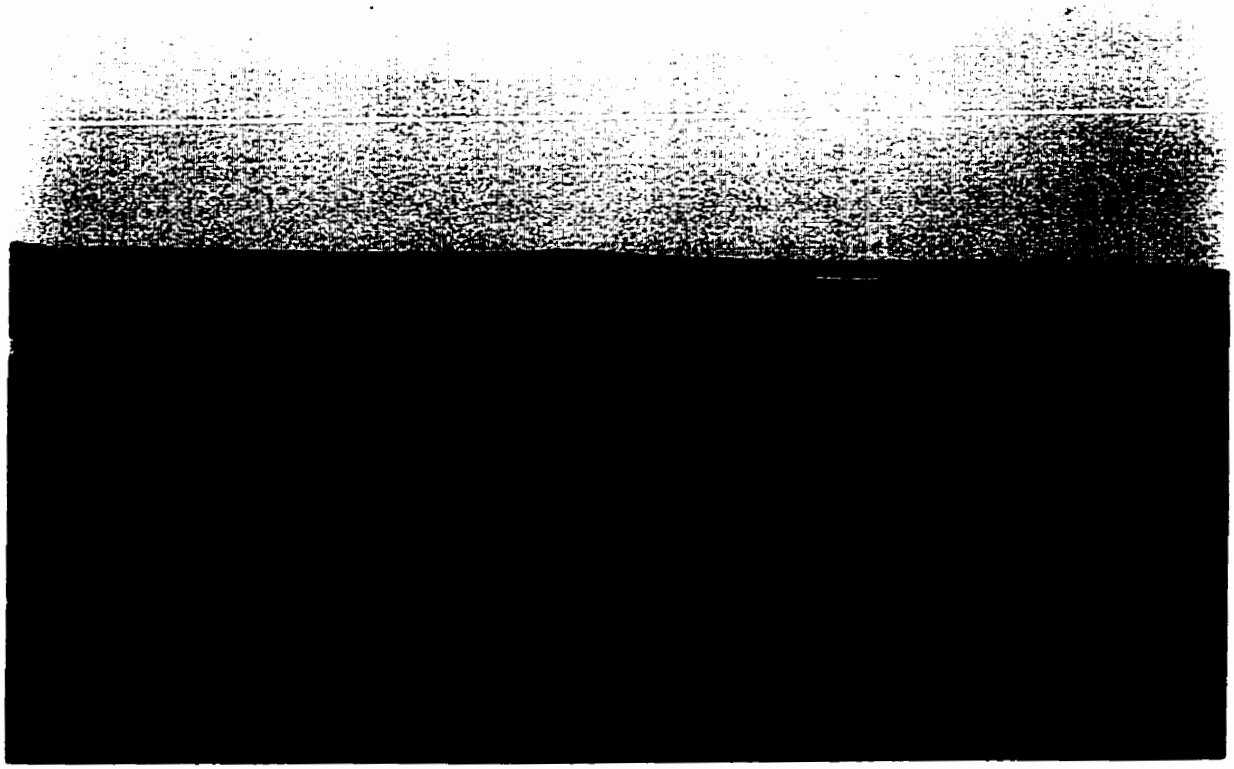


Figure 3. Wetlands and the Rolling Landscape

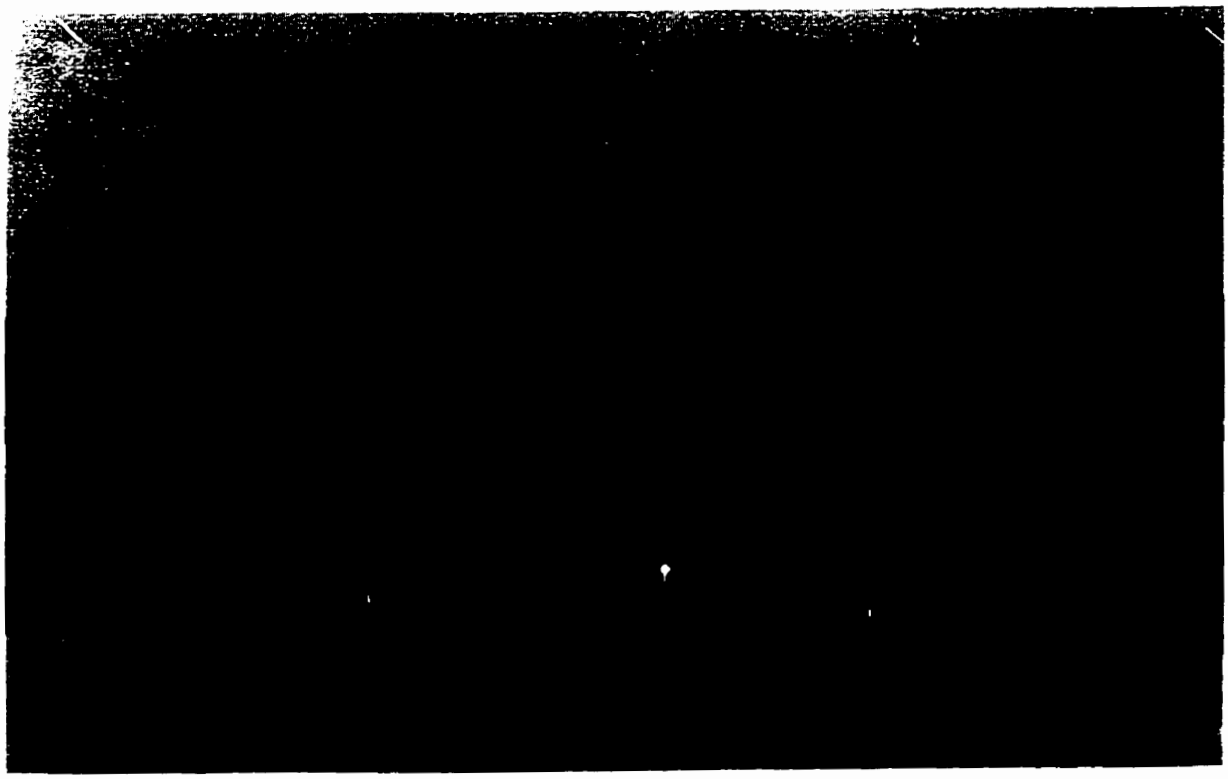


Figure 4. Pasture and Forested Land

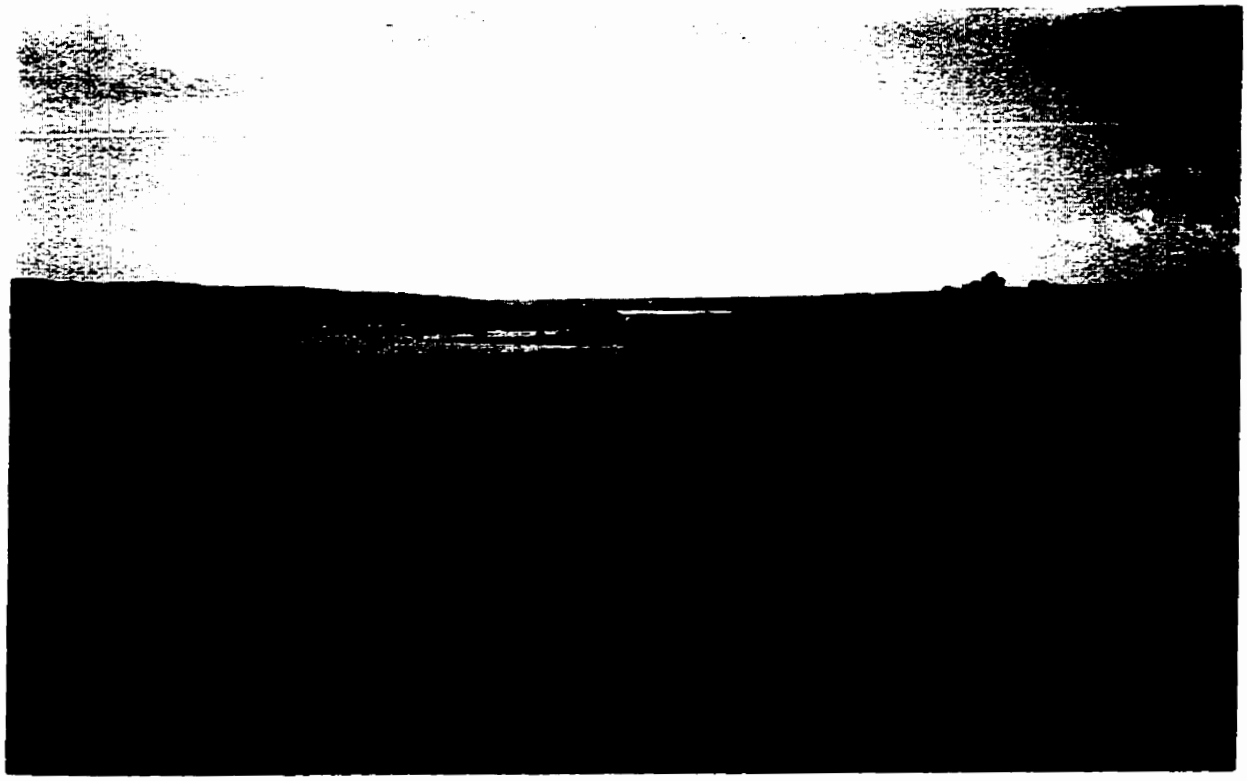


Figure 5. Crop Production in Strathcona

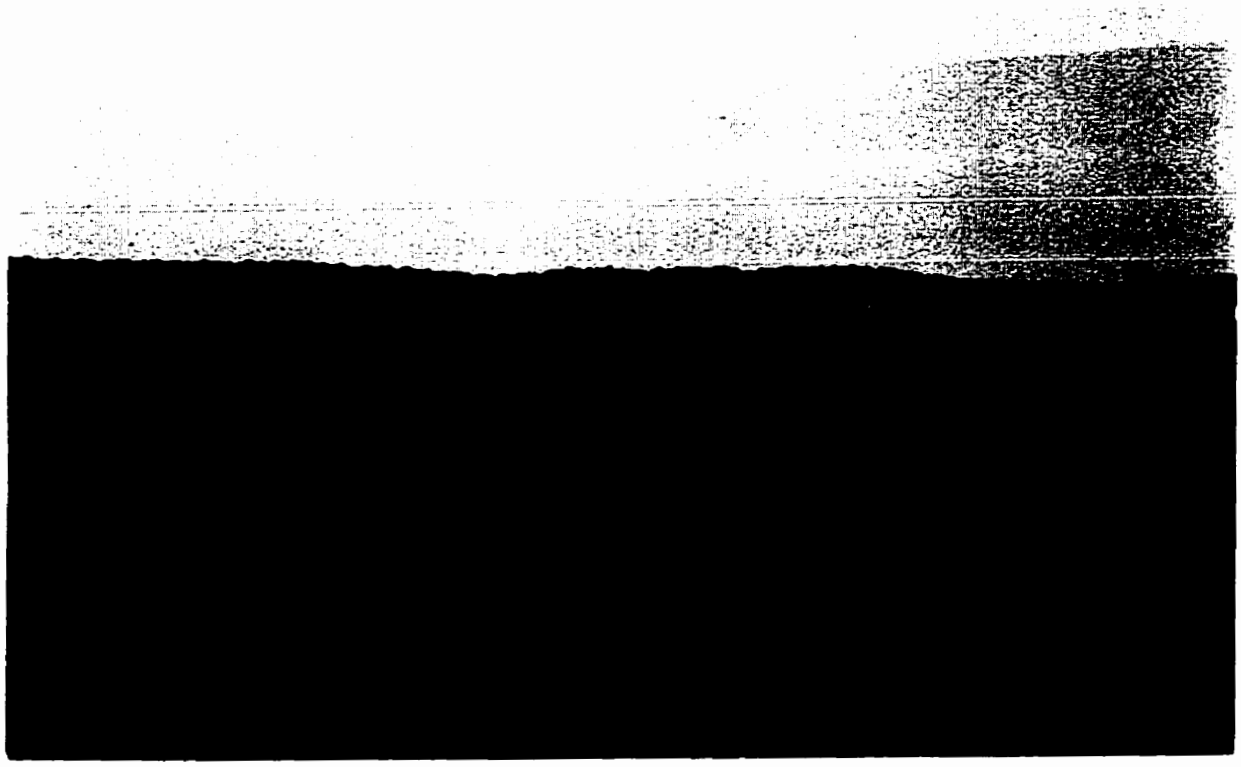
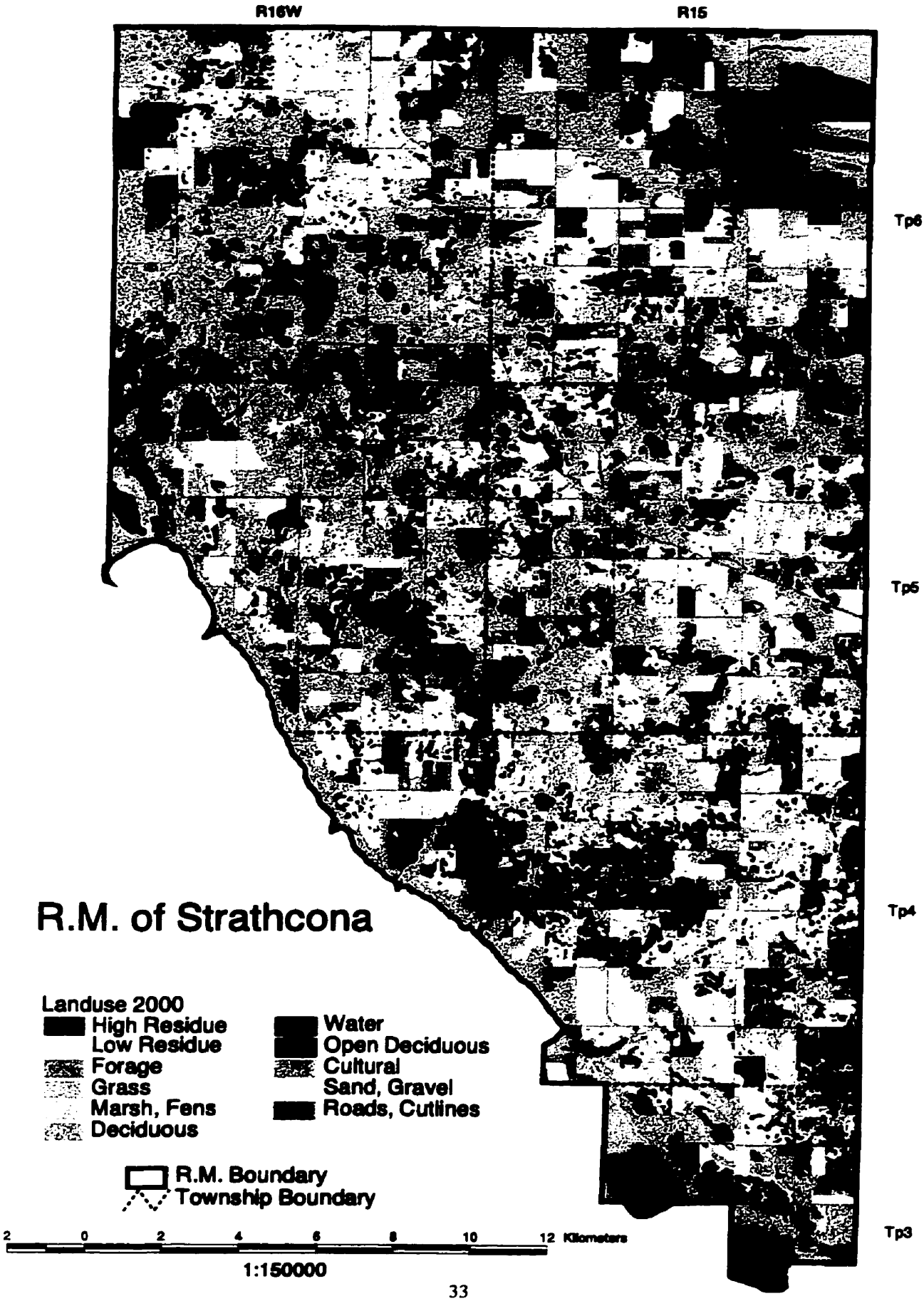


Figure 6. Pasture and Hayland


R16W
R15
Tp6
Tp5
Tp4
Tp3
R.M. of Strathcona
Landuse 2000
High Residue
Low Residue
Forage
Grass
Marsh, Fens
Deciduous
Water
Open Deciduous
Cultural
Sand, Gravel
Roads, Cutlines
R.M. Boundary
Township Boundary
2 0 2 4 6 8 10 12 Kilometers
1:150000

2.3 Program Evaluation Framework

There are two types of evaluation processes, summative and formative. A summative program evaluation is a final assessment to aid decisions regarding the continuation, termination, adoption, or rejection of a program, and involves a comprehensive assessment of each of the four possible evaluation categories. The range of categories required for summative evaluation, and their assessment components, are listed in Table 2.1. A formative approach on the other hand, is designed to isolate and assess particular aspects of a program in relation to the overall impact (Oborne 1995). In which case, only the necessary categories listed in Table 2.1 would be applicable. A formative evaluation has the following characteristics: it takes place along with the program; the evaluation is formative and intrusive, in that it presents its finding during the lifetime of the program; and the evolution and implementation of the program is of particular interest.

Table 2.1 Categories of Empirical Evaluation and their Assessment Components

Planning Evaluation	Process Evaluation	Impact Evaluation	Efficiency Evaluation
target population	staff effort	desired results	benefit-cost ratio
current/future needs	delivery mechanism	unintended results	cost effectiveness
resource requirements	information systems	explanation of results	

Source: Oborne, 1995.

This study involved a formative evaluation process and used an evaluation format containing *the basic evaluation issues* similar to that developed by the Program Evaluation Branch of the Office of the Comptroller General (McQueen 1992). The evaluation included questions relating to the program issues of: program relevance/rationale; design and delivery; program impacts and cost-effectiveness.

An evaluation framework for the Environmental Tax Credit program was formed prior to developing the landowner questionnaires and the municipal interview (see Table 2.2). Using the evaluation framework, research questions and hypotheses were developed and the appropriate statistical tests for each question were determined. See Appendix 4 for a list of research questions and hypotheses.

This was a good tool for staying focused and ensuring that the appropriate questions were included in the both the questionnaires and the interview. The evaluation framework was used to translate the study objectives into specific evaluation issues. The issues outlined in the framework, were defined through a series of questions which were supported by evaluation indicators/measures and data sources. The questions were also rated according to their relative importance from high to low. This provided a mechanism for prioritizing certain components of the evaluation.

Questions on the questionnaires and the interview were developed with reference to the following four categories of issues in the Evaluation Framework for the Environmental Tax Credit Program: 1) Program Relevance/Rationale; 2) Design and Delivery; 3) Program Impact; and 4) Program Cost Effectiveness. Each category is discussed in further detail on the following pages.

Table 2.2 Evaluation Framework for the Environmental Tax Credit Program.

Evaluation Issue	Questions	Evaluation Indicators	Data Collection	Relative Importance
Program Rationale	1. Are other tax credit programs effective?	1. - +ve response to past programs	1. telephone	1. high
	2. Who did the program impact?	2. - characteristics of participants & non-parts. - reasons for participating and not participating	2. mail survey	2. high
	3. Did conservation knowledge influence landowner's decision to participate?	3. - part.&non-part. responses to conservation questions	3. mail survey	3. moderate
	4. Can ETCP help to reduce erosion?	4. - program goals were realized	4. mail survey	4. high
	5. Is the ETCP more effective than other methods of conservation programming?	5. - # acres protected for the money spent - participation levels - interest in adjacent RM's	5. mail survey interview	5. low
	6. Is there a need for the ETCP?	6. - +VE response to tax credit - amount of interest - severity of erosion	6. mail survey interview	6. medium
	7. Were landowners aware of the ETCP?	7. - # of landowners responding to survey - # of landowner @ open house	7. mail survey	7. low
Program Design & Delivery	8. Is $1/acre tax credit adequate incentive to change farming/land use practices?	8. - proportion of farmers willing to practice conservation tillage, retain wetlands, maintain grasslands, convert marginal cropland to forages or grasses - proportion of acres qualifying for the tax credit.	8. mail survey	8. high
	9. Has the ETCP been successful @ protecting the land & water resource base?	9. - increased awareness - increased knowledge - proportion of acres enrolled	9. mail survey interview	9. high
	10. Is the property tax system an effective vehicle for conservation programming?	10. - ease of administration - proportion of acres enrolled	10. mail survey interview	10. high
	11. Was the ETCP administered efficiently?	11. - municipal council reaction	11. interview	11. moderate

Table 2.2 Evaluation Framework for the Environmental Tax Credit Program.

Evaluation Issue	Questions	Evaluation Indicators	Data Collection	Relative Importance
Program Impact	12. Was the ETCP well-received?	12. - landowner attitude & participation - municipal council attitude	12. mail survey interview	12. high
	13. What was the overall reaction @ the producer level and @ the municipal level?	13. - landowner reactions & perceptions - municipal council reaction	13. mail survey interview	13. high
	14. What are the main impacts the ETCP has had on the intended beneficiaries?	14. - program activities - landowner and municipal awareness &attitude - total acres eligible	14. mail survey interview	14. high
	15. Is there greater awareness & understanding of sustainable agriculture issues & practices among landowners & municipal council?	15. - responses to survey questions - participation next year	15. mail survey interview	15. medium
	16. Has there been an increase in knowledge regarding sustainable agriculture as a result of the program?	16. - response to survey questions - participation next year	16. mail survey	16. medium
	17. Is ETCP protecting land that requires protection?	17. - tax credits issued on erodible land	17. GIS data	17. high
	18. Is the ETCP effective from a conservation perspective?	18. - landowners willing to change farming practices to become eligible next year - total number of acres enrolled in program - understanding of the purpose of the program	18. mail survey interview	18. high
	19. Is $1/acre tax credit adequate incentive to influence landowner's future land use decisions?	19. - proportion of farmers willing to change their future farming practices	19. mail survey	19. high
	20. Did the ETCP bring organizations into partnership?	20. - # of partnerships formed - level of financial commitment	20. mail survey	20. low
	21. Did the ETCP results get communicated to the end users?	21. - # of news articles produced. - # of copies of results that are wanted.	21. PFRA	21. medium
Program Cost-Effectiveness	22. Is ETCP an efficient conservation mechanism?	22. - added staff, labor & cost to administer ETCP	22. interview	22. high
	23. Is the ETCP worthwhile and will it continue after the funding ends?	23. - municipal reeve's interest in the ETCP - adjacent R.M.'s interest in ETCP.	23. interview	23. high

2.31 Program Relevance/Rationale

This issue evaluated the purpose of the Environmental Tax Credit Program and its ability in achieving the objectives set out by the agendas involved such as Prairie Farm Rehabilitation Administration. A range of program review questions were developed for this issue. Included are the clarification of; the program objectives, the need for the program, the people targeted by the program, and the program's standing among other existing programs.

2.32 Design and Delivery

Design and delivery issues addressed questions relating to the services delivered under the Environmental Tax Credit Program by the agencies offering the program and the municipal government's role in delivering the program. The mechanism involved in delivering the program and the program strengths and weaknesses in terms of economic factors, environmental factors and community concerns, were also evaluated. A question relating to program structure was also included as it was important to evaluate whether the existing delivery mechanism was effective and efficient. Of particular interest in the area of program structure is whether or not the program was able to effectively address the intended beneficiaries' needs.

2.33 Program Impact

The program impact issues were separated into two categories: (a) recipient outcomes and (b) delivery system outcomes. This way, questions addressing the intended

beneficiaries were distinguished from those that address the delivery mechanism of the program.

Recipient outcomes focused on the impact of the program on the intended beneficiaries. The overall satisfaction of the program proponents, their reactions and perceptions, and the benefits they have gained from the program, were determined. Of particular interest is the impact the program has had on landowner awareness and understanding of the importance of incorporating environmental considerations into farm decisions. This issue also evaluated the changes in farming practices or land use that may take place as a result of the program.

Issues relating to delivery system outcomes evaluate the program from a functional perspective including partnerships developed, program satisfaction, and the overall acreage that is enrolled in the program and therefore protected from wind and water erosion. It is important to determine if the land enrolled in the program is land that is susceptible to erosion or alteration, and therefore requires protection.

2.34 Program Cost Effectiveness

This issue addresses whether or not the program is an efficient mechanism for conserving the land and water resource base, in terms of the resources (labor and financial) and added time imposed upon the municipal government to carry out the program. The questions associated with this issue draw extensively on the financial data management system and administrative work.

2.4 Research Design

Because the main objective of the study was to evaluate the Environmental Tax Credit Program, it was felt that all the potential beneficiaries should be surveyed. The study was primarily concerned with obtaining an accurate description of landowners that participated in the Environmental Tax Credit program and their attitudes toward the program, as well as a description of those landowners who did not participate. The study was also concerned with determining the municipal staff's reactions and attitudes toward the program and their perception of landowner's response to the program. The general design of the study involved survey research; research phase II used mailed questionnaires and research phase III used personal interviews. Both techniques involved a descriptive research design. Fundamentally, the purpose of a descriptive study is to provide true quantitative descriptions of aspects of a population. The questions require gathering data that are descriptive in nature, designed to present information on what exists or what is happening (Cutler Riddick and Russell 1999). This descriptive study has explanatory dimensions, where an effort was made to explain the relationships between landowner background and program participation.

Descriptive research is distinguished from experimental research as the subjects cannot be assigned or treatments manipulated (Jackson 1988). The survey instrument was administered once to the sample within a single time frame, therefore it was considered a cross-sectional study. Survey research is a useful technique for exploring the nature of personal characteristics and perceptions of large numbers of people (Jackson 1988).

2.5 Data Collection

Information regarding the evaluation of the Environmental Tax Credit program was gathered using four different techniques; a review of selected tax incentive programs; mail-out questionnaires; structured interviews; and GIS data.

2.51 Research Phase I - Review of Selected Tax Incentive Programs

Agencies in Minnesota, Iowa, North Dakota, Ontario, Saskatchewan, and Alberta were asked to forward information on tax incentive programs in order to assess whether these programs were/are effective. Information requested included acreage impacted, cost incurred, methods of fund raising, general landowner responses, and program evaluations. As the information arrived, agencies were contacted again to gather further details. Because most of the literature was found to be vague and there were no formal program evaluations conducted, most of the data gathered was through telephone conversations with municipal staff or department employees that were familiar with the programs.

2.52 Research Phase II - Mail-out Questionnaires

Two mail-out questionnaires were conducted; one questionnaire of the program participants and a separate questionnaire of non-participants in the municipalities of Strathcona and Mountain North. A large extent of the data required for the evaluation of the Environmental Tax Credit Program was obtained through the opinions and perceptions of the intended beneficiaries. The feedback from the questionnaires provided a good indication of how successful the program was in its first field season and will allow for the necessary modifications to be made in order to improve the program for the following

year. Only with extensive input from local landowners can any conservation program on private lands be successful.

A mail-out questionnaire was chosen because of the large number of landowners that had to be surveyed and the difficulty that would be encountered trying to schedule appointments and meet with landowners. Mail-out questionnaires were a relatively inexpensive way of collecting information from a large number of people. Costs were those involved in the printed matter and postage for mail out, return and follow-up. According to Jackson (1988), if the researcher wants to make extrapolations from a sample to a larger population, then a fairly large sample will be required and hence it is likely that a survey design will be used. With a mail-out questionnaire, respondents answered the questionnaire at their leisure and had more time to think over the questions. The mail survey has been identified as the method least likely to produce socially desirable response bias since there is no opportunity for a survey interviewer to affect the respondent's answers. Another advantage of the of the mail survey relates to the structure of the questions asked. Given that there is a low success with open-ended questions in mail surveys, the questions tend to be standardized. Although it may be argued that the face to face interview and telephone surveys allow for probing of respondents in order to clarify answers, question standardization in the mail survey creates minimal opportunity for personal interpretation of responses by the researcher (Babbie 1989).

It is equally important to recognize the disadvantages of mail surveys. Babbie (1989) suggested that the mail survey may be less effective in dealing with complicated issues given the lack of communication between the researcher and the respondent. Questionnaires rely heavily on the respondent who must be able to effectively complete

and return them if the study is to be successful. There is also a lack of certainty that the desired respondent has, in fact, completed the questionnaire. Generally, the mail survey typically has lower overall response rates as well as low response success with tedious questions (Babbie 1989).

Upon completion of the questionnaires, pilot testing was performed on landowners in order to; ensure that the subjects would respond in accordance with the instructions; to uncover and decide how to handle unanticipated problems; and to check the adequacy of the questionnaire (Cone and Foster 1997). Feedback from these landowners was used to make the appropriate changes to fine-tune the questionnaires (see Appendix 5 for participant and non-participant questionnaires).

A package consisting of the booklet-form questionnaire and a pre-addressed, postage paid envelope for returning the completed questionnaire, was mailed out to each landowner on July 19, 1999. A cover letter outlining the purpose and the importance of the research was also included in the package (see Appendix 6 for questionnaire cover letter). Respondents had two weeks to complete the questionnaire in order to be eligible to have their name put into a draw for a prize incentive. The prize incentive was a wildlife print provided by Ducks Unlimited, used to encourage responses. The questionnaire was accompanied by follow-up telephone calls starting on July 26 to all landowners who were sent a questionnaire. The telephone call helped to explain the purpose and importance of the questionnaire and encourage landowners to fill it out. The cut-off date for accepting surveys in the mail was October 15, 1999. Winners of the prize draw were notified August 9, 1999 with the delivery of the prize being made shortly after this time. In order

to inform landowners of the survey, a newspaper article was printed in the local papers and posters were put up in both municipalities a week prior to mailing the surveys.

Participation was voluntary and respondents were made to feel that they were being consulted and were free to express their opinions. No respondent was required to complete the entire questionnaire. The final results from the survey were made available to those landowners who were interested.

2.53 Research Phase III - Structured Interviews

Structured interviews with the municipal reeves and administrators of Mountain North and Strathcona were performed on November 4 and November 12 respectively. Conducting personal interviews was most useful in obtaining unique information and to gain an understanding of the key issues from people who were directly involved in delivering the program. Structured interviews involved face-to-face interviews where questions were read to the respondents. Such interviews provided for in-depth probes on some of the questions (Jackson 1988). Interviews also allowed the respondents to ask questions and therefore any ambiguities were clarified. The structured interview provided detailed information about the municipal staff's experiences with the program in addition to providing answers for a number of evaluation questions (see Appendix 7).

2.54 Research Phase IV - GIS Data

GIS data were obtained from PFRA and was used to determine whether the Environmental Tax Credit program was protecting land that needed protection from wind and water erosion. The computer system was used to overlay large volumes of spatial

data of soil types and their risk of being eroded, as well as the quarter sections enrolled in the Environmental Tax Credit program. The data were referenced to a set of geographical coordinates and encoded in computer (digital) format so that they could be sorted, selectively retrieved, and statistically and spatially analyzed.

2.6 Sample Size Determination for Research Phase II - the Questionnaires

There were two populations in the study; those landowners in Strathcona and Mountain North who participated in the Environmental Tax Credit program (N=216) and those landowners in Strathcona and Mountain North who did not participate in the program (N=252). Each municipality had a list of landowners which was adapted for use as sampling frame. Originally, there were 233 program participants and 428 non-participants on the lists, however for the purposes of this evaluation the lists were revised. Landowners were removed from the lists for the following reasons; moved to a different address, retired and live in city, unlisted phone number, phone number not in service, were not reachable, and deceased. There was also the problem of duplication. Duplication occurred because each municipal roll listed the landowners for each quarter section of land in the municipality. Therefore, the same landowner was listed more than once or two people from the same household were listed because each owned a different quarter section of land. After these landowners were removed, the sampling frames contained 216 program participants and 252 non-participants.

A Z-score value which includes 95% of the cases was chosen in order to be confident that the results will be within a given accuracy 95% of the time. The Z-score

value used was 1.96 (95% of the cases fall +/- 1.96 standard deviation units from the mean). Sample size formulae are usually expressed in terms of multiples of the standard error of the sample proportion. According to Cutler Riddick and Russell (1999), the sample size required to estimate the sample size proportion **p** with a fixed bound **B** on the error of estimation is

$$n = \frac{p(1-p)}{(N-1)\frac{B^2}{(1.96)^2} + p(1-p)}$$

Cutler Riddick and Russell (1999) prefer to define the bound on the error of estimation as 1.96 (rather than 2) times the standard error of **p**. The value of 1.96 is obtained from the distribution of a Standard Normal random variable and corresponds to a right tail probability of 0.025. As well, since **p** is unknown, in the formula for n it needs to be replaced by an estimated value. If no prior estimate of **p** is available, it is customary to use 0.5. This provides a conservative estimate of the required sample size, in that a value of p=0.5 maximizes the estimate for n. Also, Cutler Riddick and Russell (1999) used a bound on the error of estimation of B = 0.05. Applying the conservative formula for n and using a bound B = 0.05, the calculations of Appendix 8 yield the following results.

- For the population of Participants, N = 216 and the estimate of the required sample size is n = 138.
- For the population of Non-participants, N = 252 and the estimate of the required sample size is n = 152.

There are 216 participants included in the sampling frame. The recommended sample size for a population of 216 is 138 (Cutler Riddick and Russell 1999). However, if

the expected survey response rate for participants is 50%, a sample size requirement of 277 is needed. There are 252 landowners not participating in the program. The recommended sample size for a population of 252 is 152 (Cutler Riddick and Russell 1999). If the expected survey response rate for non-participants is 20%, a sample size requirement of 762 is needed. Given that non-response was likely to be fairly high for a mail-out questionnaire and that the required sample sizes were larger than the actual population size, a survey was sent out to the entire list of program participants and non-participants in the municipalities of Mountain North and Strathcona.

2.7 Instrumentation

The following section examines the format and/or nature of the review of selected tax incentive programs, questionnaires, interview, and GIS land data components.

2.71 Research Phase I - Review of Selected Tax Incentive Programs

Data on past/existing tax incentive programs was gathered through telephone conversations with municipal staff and department employees that were familiar with the programs. Information requested included acreage impacted, cost incurred, methods of fund raising, general landowner responses, and program evaluations. Contacts were asked about their perceptions regarding the general effectiveness and popularity of the programs. Descriptive information and evaluative comments were recorded.

2.72 Research Phase II - Mail-out Questionnaires

The mail questionnaire designed for program participants included 24 questions of which most were fixed response type questions. The mail questionnaire designed for non-participants included 17 questions of which most were fixed response type questions. Both questionnaires were identical with the exemption of several questions relating directly to the Environmental Tax Credit program, that only the participants could answer. Many of the fixed type questions were opinion/attitude-based questions that follow a format similar to the five point Likert-type scale, with possible choices of strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree. A closed question presents a fixed listing of response categories where there are no opportunities for the respondent to record an answer which is not on the list. Intermediate approaches where the category "Others (please specify)" were also used in the questionnaires in order to include verbatim information. However, these were treated as closed, since most researchers rarely examine the actual phrases or words used, unless the percentage in this response category is high relative to other responses.

2.73 Research Phase III - Structured Interviews

Interview guides were structured prior to the interview. The interview included 19 questions of which most were open-ended questions. Interviewees were provided with a list of questions prior to the interview in order to allow for answers to be well thought out. Interviews were administered to Bev Ready and Jack McKay, the municipal administrator and reeve of Mountain North and Barry McGill and John Chambers, the municipal administrator and reeve of Strathcona.

2.74 Research Phase IV - GIS Data

GIS data was obtained from PFRA and was used to determine whether the Environmental Tax Credit program was protecting land that needed protection from wind and water erosion. The computer system was used to overlay erosion risk satellite images with the quarter sections applied on in each municipality, in order to test the research question 'Is the Environmental Tax Credit program protecting land that needs protection?'.

2.8 Data Analysis

The following section describes the procedures used to analyze the data and information regarding the Environmental Tax Credit program, which was gathered in the four research phases; a review of selected tax incentive programs; mail-out questionnaires, municipal interviews, and GIS data.

2.81 Research Phase I - Review of Selected Tax Incentive Programs

The responses from the telephone conversations provided a good description of past/existing tax incentive programs and an indication of their effectiveness. Responses to program descriptive and evaluative questions were recorded, examined, and documented.

2.82 Research Phase II - Mail-out Questionnaires

The results from the questionnaires were used to provide an accurate description of landowners and their attitudes and reactions toward the Environmental Tax Credit program. Upon completion of the questionnaire, the gathered information was captured in a computer data base. The results were coded prior to the analysis of the data. The results were analyzed using the Statistical Package for Social Sciences (SPSS), version 9.0 software. Study objectives were addressed using descriptive statistics that demonstrate how many people selected each of the responses to a question. For each response, the frequency table contains the number and proportion of the people who gave each response, as well as the number of people for whom responses were not available. The frequency distributions were used to characterize the distribution of the data in the sample.

In addition to frequency distributions, SPSS performed tests of statistical significance that were used to either accept or reject hypotheses made about population parameters. See Appendix 4 for a list of the research questions and hypotheses developed to analyze the survey results and the statistical tests that were performed on each research question.

Although patterns were evident from the frequency distributions, measures of precision or statistical significance of the sample estimates were necessary in order to make inferences about the populations based on the sample data. These measures indicate the degree of confidence a person can place on statements made about a population. The following formal tests were used in the data analysis; the binomial test, the large-sample test of the difference in proportions for two populations, and the student's t-test for a difference in means of independent samples from two populations.

2.821 The Binomial Test

The binomial test is a one-sample test that is used to compare observed frequencies with expected frequencies that are derived from the binomial distribution (see Appendix 9 for an example of the binomial test). The test was performed to address a number of research questions that followed a similar format. These questions were used to test whether the majority of a population (participants or non-participants) agreed with each particular statement (i.e. the proportion of the population that agreed with a particular statement was greater than 0.5).

For the binomial test, research questions were dichotomized by classifying responses into one of two categories; landowners likely to agree with the statement in one category "1" (i.e. responses of agree or strongly agree as "1") and those landowners not likely to agree with the statement in the other category "0" (i.e. strongly disagree, disagree, or neither agree nor disagree as "0"). For convenience, let Y denote the number of participants in the sample who were classified in the category "1". The observed proportion is the number of persons in the sample that agreed with the statement divided by the total number of observations in the sample. For each binomial test conducted, the significance probability (p-value) was calculated in order to assess whether the sample proportion that agreed with a particular statement was significantly greater than the binomial assumption of equal probability (i.e. 0.5). Small p-values supported the claim that the majority of participants (non-participants) were likely to agree with a particular statement.

All of these research questions have a common theme, namely, the classical binomial experiment. In a binomial experiment, it is assumed that: the experiment consists

of n identical trials; each trial results in one of two outcomes (i.e. agree or disagree); the probability of agreement on a single trial is equal to p and remains the same from trial to trial; and the researcher is interested in Y, the number of agreements in the sample. In the context of this study, the conditions of the binomial experiment were satisfied provided that the respondents in the sample were independent of one another with respect to how they answered the question and the sample was randomly selected from a larger population. Under these assumptions, Y is approximately distributed as a binomial random variable and one may apply the binomial test (Conover 1971), to test the indicated hypotheses.

2.822 Student's t-test for a Difference in Means

Student's t-test of the difference in means of independent samples from two populations was used to address a number of research questions that follow a similar format. See Appendix 10 for an example of the student's t-test for a difference in means. This test was used to analyze the null hypothesis that their was no difference between two population means for a specified variable of interest, using a 5% level of significance. The student's t-test for a difference in means assumes independent samples from two populations; the participants and non-participants. If two populations are normally distributed, the standard procedure is student's t-test for a difference in means. In this study, the raw data were not normally distributed, as the scale of measurement is ordinal with a five-point Likert scale. However, the sample sizes (132 participants and 66 non-participants) were quite large and so, by the Central Limit Theorem of statistics, the distribution of each sample mean is approximately normally distributed and the t-test

procedure is appropriate (Khazanie 1986). SPSS automatically applied Levene's test for the equality of variances to decide whether to assume equal variances or unequal variances when conducting the t-test for a difference in means (George and Mallery 1999).

2.823 The Large Sample Test of the Difference in Proportions

The test of the difference in proportions was used to analyze one research question in order to decide whether the observed difference between two sample proportions was due to sampling error or due to the fact that the proportions in the populations from which the samples were taken were inherently different. The test of the difference in proportions tested the null hypothesis that their was no difference between two population proportions for a specified variable of interest, using 5% level of significance. See Appendix 11 for an example of the large-sample test for a difference in proportions.

For the large-sample test of the difference in proportions for two populations, the research question was dichotomized by classifying responses of Greater than as "0" and responses of Less than or Equal to as "1". According to Khazanie (1986), the large-sample test for a difference in proportions for two populations is appropriate providing that all of the following conditions hold; the original distributions are binomially distributed; the samples are independent random samples; and both samples are large enough that normal approximation provides an adequate approximation to the sampling distribution of p^1 and p^2.

2.83 Research Phase III - Structured Interviews

The results from the interview provided a good indication of the attitudes and reactions of the municipal staff towards the Environmental Tax Credit program. The same set of questions was asked to each municipality. Responses to the interview questions were examined and where their answers were similar, responses were combined. Similarly, where there were discrepancies in their responses, both viewpoints were documented.

2.84 Research Phase IV - GIS Data

Study objective five, to determine whether the tax credits were issued on land that "requires protection" from erosion, was addressed by examining the spatial data provided by PFRA.

Chapter 3

Sustainable Land Management

This chapter provides a brief overview of the impacts of agricultural expansion on the land and water resource base. This is followed by a brief description of the agricultural policy areas identified under the Manitoba Implementation Plan for the PHJV, that required realignment in order to remove any disincentives associated with maintaining wildlife habitat on private lands. This chapter goes on to explain the municipal property assessment and tax regime and potential reforms to the system, that could provide recognition and incentive to private landowners in return for carrying out conservation practices. This chapter reviews the different policy instruments that have the potential to influence land use decisions on private lands. The concept of sustainable agriculture is introduced, followed by a discussion about the need for new policy that acknowledges the environmental effects of agriculture and promotes resources conservation along with productivity. Subsequently, there is a brief discussion about externalities in agriculture and landowner attitudes towards conservation practices. Lastly, results are reported from a review of selected tax incentive programs in Ontario, Minnesota, Iowa, North Dakota, Saskatchewan, and Alberta.

3.1 Introduction

Agriculture is one of the dominant land uses on the Canadian prairies. Use of the land for this purpose can affect the environmental sustainability of the natural resource base which in turn has implications for the economic viability of farming. The Canadian prairie ecosystems (grasslands and parklands), located in the southern portions of Alberta, Saskatchewan and Manitoba, have been so radically transformed by human activity that they have become one of the most endangered natural regions in Canada. According to Environment Canada (1991), over 71% of Canada's wetlands have been drained and 82% of prairie wetland margins have been cleared or cultivated for agricultural expansion. Today, little native prairie remains in a natural state, and what little remains is rapidly disappearing. For example, less than 1% of the original tall grass prairie, 18% of the short grass prairie, 24% of the mixed grass prairie, and 25% of the aspen parkland remains (Wildlife Habitat Canada 1991). The combined effects of the production of a relatively small number of annual crops and the elimination of native vegetation for an expanding agricultural base, has altered much of the habitat for wildlife and the complexity and diversity of the prairie landscape. The presence of farming *per se* has not caused this environmental dislocation. Rather, the problem has been brought about by the substantial expansion of cultivated acreage beyond the sustainable land base onto marginal agricultural land and wetlands (Baydack et al. 1995).

There was an expansion of cultivated acreage in the Canadian prairies in the 1970s and 1980s. By and large, this expansion was not caused by increasing commodity prices and export markets. Land use decisions were the result of agriculture policy and support programs based on acreage and commodity production. The negative impact of these

policies have been the inadvertent results of responses to market-distorting and price-depressing international trade disputes (Baydack et al. 1995). The prolonged drought of the 1980s revealed that the present agriculture system was not sustainable on marginal lands. Government support programs did not provide adequate risk protection so new safety net programs were designed. Unfortunately, these new programs again were based on acreage, yield, and commodity prices. International trade disputes resulted in depressed market prices and production was being driven more by government policies than by market demands. In the 1980s and early 1990s, land use policies, farm support programs, and economic considerations tended to provide financial incentives for intensive agriculture and land management practices such as; land clearing, extensive cultivation, and widespread drainage (Oborne 1995).

The inappropriate application of some conventional farming practices during the last century, has resulted in flooding, soil erosion, and degradation of the land and water resource base (Carlyle 1980), which has led to environmental concern in many areas of Manitoba. Agriculture and Agri-Food Canada identified links between the health of the soil resources and the longer term health and economic competitiveness of the agriculture industry (Acton and Gregorich 1995). Studies have shown that 5% of cultivated Prairie farmland is at high to severe risk of water erosion, and 20% of the cultivated land continues to be at risk of moderate to severe wind erosion (Wall et al. 1995). Losses due to wind and water erosion were estimated at $368 million annually. Excessive tillage and cultivation of marginal lands were identified as major contributors to soil erosion. Losses of plant available nitrogen due to organic matter decline were assessed at $121 million annually (Prairie Farm Rehabilitation Administration 1982). Salinity was estimated to

affect approximately two million hectares of land. Resulting farm income losses were estimated at $257 million annually and were expected to increase at a rate of 10% per year (Prairie Farm Rehabilitation Administration 1982). The Science Council of Canada (1986) stated that "losses from soil degradation on the Prairies now exceed $1.0 billion annually, and could increase to $2.7 billion within 20 years. The cumulative cost to western farmers in terms of lost revenue and increased expenditures could be devastating if restorative action is not taken". Agricultural intensification has reached a point where the environmental modifications have become so extreme that they are beginning to impair the functioning of the system and raise important questions about the sustainability of the agriculture industry and the implementation of policy prescriptions.

Historically, conservation and development programs for agriculture, wildlife, and other rural resource sectors have operated in relative isolation from one another. Conservation experts have developed strategies for biodiversity conservation, while agriculture policies were modified to improve agriculture. In addition, rural development strategies were developed to attempt to arrest the decline in rural communities. The problem with these sectoral approaches is that they fail to recognize that declines in landscapes, economies, and social structures are interrelated, as are policy solutions (Sopuck 1993).

3.2 The Impact of Agricultural Expansion on Land and Water Resources

The Prairie agricultural industry must find a balance between the demands of economic viability and growth, and managing the land to ensure long-term resource sustainability. However, it is economic considerations which will drive demand for, and

production of primary and processed goods. World trade in agriculture and food commodities is expected to rise dramatically over the next 5 to 10 years in response to population growth and demand for food and non-food agricultural products. The Canadian Agri-food Marketing Council (CAMC) has challenged primary producers, processors and governments to significantly increase Canadian agriculture and agri-food exports to 4% of the world market. This target is comprised of approximately 40% primary production and 60% processed goods (Prairie Farm Rehabilitation Administration 2000). Intensifying livestock production on marginal lands and crop production on non-marginal lands may increase the risks of erosion, and soil and water quality degradation, as well as negatively impact wildlife habitat.

Increased agricultural production will require more intensive land use and improved productivity on existing crop and forage lands. One of the environmental pressures on the agricultural landscape will come from an expanding agriculture sector which expects to increase the area seeded to a more diverse mix of annual crops. In order to meet target exports, it is estimated that one million hectares of new land in Canada will be brought into agriculture production (AAFC, Policy Branch, Economic and Policy Analysis Directorate 1998). There is the risk that more marginal lands will be brought into cultivated agricultural production. Unless properly managed, agricultural intensification has the potential to increase erosion, reduce soil organic matter quality and quantity and increase salinity causing a reduction in soil productivity. Erosion depletes the soil's capacity to grow crops, increases crop yield variability within fields, and causes off-farm environmental impacts such as reduced water and air quality. Not only is soil organic matter an essential component of the soil, it also provides a valuable sink for atmospheric

carbon and plays an important role in off-setting greenhouse gas emissions through carbon sequestration. Soil salinity reduces the moisture extracting capability of plants and can hinder the growth of most crop plants. Higher use of inputs such as pesticides, fuels, fertilizers and irrigation have the potential to contribute to environmental degradation if improperly managed. With more specialized crops being grown, there is an increasing interest in irrigation and demand for local water supplies. Leaching of land-applied nutrients and chemical to underground aquifers may pose a problem. Irrigated lands support intensive crop and livestock production and resultant value-added industries. However, expansion of irrigated lands requires significant capital output and may have perceived environmental consequences (Prairie Farm Rehabilitation Administration 2000).

The recent trend in government policy towards the removal of government subsidies is resulting in increased diversification. The removal of the grain transportation subsidies may encourage a more sustainable land use through conversion of areas which are less suitable for annual crop production to perennial forages. There are also plans to significantly expand the livestock sector in Prairie Canada. The Environmental Policy Branch and Analysis Directorate projects that the number of hogs could increase by 5.5 million head (30%) and cattle could increase by 700,000 head (15%) to meet the export target identified by the CAMC (AAFC, Policy Branch, Economic and Policy Analysis Directorate 1998). An increase in the amount of livestock production will put more pressure on existing rangeland. Proper range management will reduce erosion potential, create wildlife habitat, and replenish deteriorated soil carbon levels. Large, intensive livestock operations can result in the deterioration of riparian areas which can result in increased soil erosion, sedimentation and contamination of river systems by pollutants

such as nutrients and pesticides. Increased manure production and associated nutrient management and waste disposal requirements, and the increasing hazard of non-point water pollution from run-off and leaching of cultivated lands may also contribute to land resource degradation, unless properly managed.

The greater the level of agricultural intensity in an area, the greater the risk to underground and surface water quality. Agricultural sources of water contamination include: erosion and runoff from fields to which fertilizers, pesticides and manures are applied; runoff and wastewater from livestock operations; and leaching of land-applied nutrients and chemicals to groundwater. Significant land resource pressures may also arise in other areas. Urbanization, production of feed grains for livestock versus crops for processing and export, and marginal and better quality land competing for pasture or annual crop production (Prairie Farm Rehabilitation Administration 2000).

Growing awareness of the general public concerning environmental issues, along with increasingly stringent environmental legislation and monitoring, will pose a challenge to the future expansion of the agricultural industry. In order for agriculture to remain sustainable into the future, policies and programs need to be designed that encourage the use of sustainable land management practices. This will involve giving much more attention to the environment and the social and economic consequences than in the past in order to ensure that policies and programs encourage the development of practices which are sustainable or lead to sustainability in Agriculture. The definition of "Sustainable Agriculture" adopted by the International Institute of Sustainable Development, is "one, that over the long term, enhances environmental quality and the resource base on which agriculture depends, provides for basic human food and fiber needs, is economically viable

and enhances the quality of life for farmers and society as a whole" (Wilson and Tyrchniewicz 1995). One of the primary factors which affect sustainable agriculture is government policy, since producers react to agricultural policies, as part of their land use decision-making process to ensure adequate economic returns from production. Presently, the potential for policy and social infrastructure changes to create a climate for long-lasting, ecologically appropriate resource management is great because of poor farm economics, the diminishing capability of the soil to sustain agriculture, a reduction in agricultural subsidies, and the environmental movement.

3.3 Removing the Perverse Effects of Government Agricultural Policies

Concern regarding the degradation of the natural land and water resource base on the Canadian Prairies has stimulated two responses by public and private conservation agencies: programs that provide a direct payment to acquire a property interest in land or encourage modifications to land under agricultural use; and an increasing interest in public policies that influence land use. One of the main initiatives proposed by the PHJV was the promotion of subtle changes in land use in prairie Canada. This approach would involve developing a closer integration of agricultural programs and policies with those of other resource interests, including wildlife. The techniques would include; developing wildlife habitat components in programs of other land and water management agencies, planning and implementing integrated soil and water conservation initiatives with other agencies, and modifying government incentives and policies that directly and indirectly contribute to habitat destruction (Macaulay 1991).

Under the Manitoba Implementation Plan for the PHJV, policy areas were identified that required realignment in order to run in concert with the objectives of the PHJV program. In the past, low commodity prices as well as government policies have encouraged the cultivation, draining and clearing of marginal land that was prime habitat for wildlife, and not well suited to agriculture production. Van Kooten and Schmitz (1992) argue that many natural areas would not have been converted to production in the absence of Canadian government policies. The message received by many farmers on the Canadian prairies was to expand production into marginal cropping land and export raw material out of Canada. Some of these policies include; the delivery quota system under the Canadian Wheat Board Act; income stabilization programs like the Gross Revenue Insurance Program; grain freight subsidies under the Western Grain Transportation Act; and the land taxation system under the Municipal Assessment Act. Some of the policies that discourage sustainable land use have been changed, primarily as a result of fiscal pressures and international trade agreements. This change has encouraged the diversification of land use, secured marginal land and improved cultivated land (Manitoba Habitat Heritage Corporation 1996).

Today, for example, the Canadian Wheat Board (CWB) has a quota system for grain delivery that is based on grain volume (bushels per acre), rather than cultivated acreage. This modification has removed the incentive for producers to cultivate marginal land in order to qualify for increased delivery quotas.

It has been argued that agricultural stabilization programs have also had negative effects on resource conservation by creating an artificial financial environment. These programs were designed to stabilize farm income against price and yield fluctuation. The

Gross Revenue Insurance Program (GRIP) was an income insurance program administered by Provincial Crop Insurance. By paying subsidies on the basis of seeded acreage, this program encouraged farmers to carry out farming practices that had some negative environmental consequences. It guaranteed a minimal production on marginal lands and therefore, encouraged farmers to clear and cultivate marginal land. This program was considered to have a negative impact on marginal land (Environmental Management Associates 1993), and has been abandoned as a result of fiscal and international trade discussions.

It is thought that where the production of a particular commodity is subsidized, the lowered cost of production can also influence land use decisions, such as permitting the relatively inefficient use of marginal land (Barber 1991). Grain freight subsidies under the Western Grain Transportation Act (WGTA), were paid out to the CN and CP railway, to cover the cost of transporting grain to export position at shipping ports in Thunder Bay and the west coast of Canada. This transportation subsidy did not encourage optimum use of the land, since the economics of production were distorted by the reduced cost of grain transportation (Wilson and Tyrchniewicz 1995). Because farmers did not have to pay transportation costs, they attempted to produce more grain by adding to the number of acres worked, often on soils that were marginal for annual crops. When the WGTA was discontinued in 1995, the government provided a one-time payment to farmers based on seeded acreage. Some farmers, aware of this several years in advance, anticipated the pay out and converted most of their marginal land into cultivated acreage (Wilson 1993).

With the removal of government support, the cost of transportation of all grains and oilseeds has increased throughout western Canada. The loss of transportation

subsidies has created new markets and new business opportunities. Manitoba producers have responded with the local production of feed, increased livestock production, and diversification into non-traditional crops (Agriculture and Agri-Food Canada 1998). It is expected that over a 10 to 15 year period, 23% of Manitoba cropland will be converted to perennial crops. Also, within this time period, the prairie agricultural economy will become less reliant on grain and oilseed exports and the cattle population will expand by 55% in Manitoba (Kraft and McPhee 1995). This will increase the potential for preservation of soil and water quality and the additional acres in grass, bush and wetlands is expected to improve wildlife habitat. However, some expansion of livestock, particularly the hog industry, has negatively affected habitat, as natural lands are converted to grow feed grain such as barley (Mason 1996).

3.31 The Municipal Assessment Act

In 1880, municipal governments were established on the Prairies. The municipal revenue base was the land, which was evaluated according to its perceived potential for agricultural production. Land that failed to meet the criteria for cultivation was designated wasteland, and was taxed at a lower rate. According to Sawatsky (1993), this was the first mistake in Canadian prairie conservation, as this land likely should not have been taxed at all. The fact that this land was an ecological reservoir, vital to the well-being of the environment and society-at-large was ignored, or at least not understood at the time.

The *municipal assessment* and *tax system* in prairie Canada is administered under provincial legislation by the municipal level of government. It is based on the assessment

of the market value of land under private ownership, which in most rural areas is determined by provincial land assessors according to the principles and processes established under The Municipal Assessment Act. The assessed value of real property is the "market value" which is defined in Section 1 of the Municipal Assessment Act as:

> *... the amount that the property might reasonably be expected to realize if sold in the open market in the applicable reference year by a willing seller to a willing buyer.*

Individual municipal governments then apply a specific rate of tax in the form of a percentage of the assessed value (referred to as the mill rate), and revenue from the taxes levied and collected are applied to municipal purposes. There is in some provinces a parallel tax, also based on assessed value, levied for local school purposes.

Each year property assessment notices are mailed out to landowners around February. A landowner may apply for a revision of their assessment to the Board of Revision, which is established annually by the municipality. The amount of assessed value, the liability for taxes, and/or the property class may be appealed. Subsequently, tax notices are mailed out to landowners in mid June. Landowners usually have until the end of October to pay their taxes and there is no legal provision for appealing taxes.

Municipal taxation of conservation lands and the method by which landowners are notified of their tax liability may be the major constraints to an accelerated adoption of environmentally-sustainable land management. The present municipal assessment method may have a negative impact on property owner's land use decisions.

Under the past assessment structure, a landowner used to receive a notice which showed property assessment as one lump sum for a parcel of land, most often a quarter-

section. The assessment notice did not clearly illustrate the differing rates of assessment assigned to each land class and often landowners ascribe an artificially high cost to each acre of conservation land (e.g. the average per acre tax for the quarter section). Landowners have the tendency to "average" their tax bill over the entire acreage, thereby generating a feeling that every acre should be paying its way. When farmers perceive they are paying taxes more or less equally on all parts of their holdings, they are inclined to intensify use of the areas considered non-productive. If landowners were more aware of the fact that they pay very little tax on the non-cultivated, conservation lands such as wetlands, bush, and pasture, they may not be so inclined to convert conservation lands for agricultural production (Barber 1991). Much of the "land improvement" motivation caused by the property tax system appears to be the result of landowner's misconceptions regarding the per acre assessment rate of natural areas.

The issue of a property tax exemption for conservation lands has been considered by the province of Manitoba. In 1979, the 'Weir Committee' was established to review the assessment of real property in Manitoba. The Committee heard from a number of organizations who proposed a reduced assessment for wildlife habitat. In response, the committee noted that wildlife habitat is already assessed at a much lower value than neighboring arable lands (Manitoba Assessment Review Committee 1982). The committee recommended that (Recommendation IV-I-1):

> *Wildlife habitat should continue to be assessed in accordance with its use. If it is considered necessary to provide any assistance to encourage the retention of such properties in their natural state, such assistance should be provided through other means. Any arbitrary reduction in the assessment of the property would result in a reduction of taxes which would be insufficient to encourage such retention.*

The Committee proposed that landowners be made aware of the difference in valuation that exists between wildlife habitat and adjoining arable soils (Recommendation IV-I-2). Indication of this fact on assessment notices was recommended as a means of encouraging the retention of habitat areas (Manitoba Assessment Review Committee 1982).

The Municipal Assessment Act revisions of 1993 made provision for modifications to the assessment form, which would permit the identification of "conservation lands" (Manitoba Assessment Review Committee 1982). Today, the assessment form shows the percentage of the total assessment value that relates to conservation lands. Conservation Lands are defined in Section 9.8 of the Municipal Assessment Act as:

> *...farm property, not used for agricultural purposes, but left in an undeveloped and natural state by the registered owner and/or occupier of the land, for the purpose of preserving or restoring the quality of the land as a natural environment or habitat.*

Conservation lands produce ecological goods and services which include; wildlife, aquifer recharge, flood and erosion control, riparian buffer zones, biodiversity, and the preservation of soil and water quality. The products of conservation lands, and the benefits they confer, accrue primarily to the environment and as such to all of society, rather to the individual landowner. Because the benefits of conservation lands accrue predominately to society rather to any one individual, taxation of those lands has been a contentious issue in Manitoba for some time.

Property tax policy which provides landowners with incentives to "improve" marginal and non-arable land is not in the best interests of the taxing authority. Although the additional cultivated area created by these "improvements" will in the short term

generate a larger tax revenue, there will also be a loss of the protective functions that these non-arable lands perform, such as erosion and flood prevention. Over the long-term, this will result in a gradual decline in the productivity of adjacent cropland which translates into a lower assessment value, a reduced tax base, and a decline in tax revenue (Oborne 1995). Other disadvantages of natural land conversion include; local and regional flooding, erosion, silting of ditches, clogging of drains, and the pollution of domestic water supplies which all translate into the maintenance cost portion of general municipal levies (Poole 1994).

There is increasing interest in developing policy options which will maintain or improve ecological goods and services. As it currently is, the land taxation system detracts from the conservation of marginal agricultural land and native wildlife habitat. A redesign of The Municipal Assessment Act has a major role to play in the transition to sustainable development. Reforms to the municipal tax system could provide recognition and incentive to private landowners in return for the retention of wetlands, native prairie and other conservation land uses. It is essential that future reviews be better informed of the principles of sustainable development if we are to link environmental, economic, and social factors in a beneficial fashion. The land taxation system was developed for conditions on the prairies that no longer exist and is not practical today given the current concern for the environment. By changing the tax system, we can create a legislative/policy climate that could stimulate more environmentally sensitive land use.

3.4 Policy Instruments Affecting Land Use

The next section summarizes the different policy instruments that affect land use on private lands. In general, the instruments that affect land use can be placed into one of four categories: **information and extension** efforts, which disseminate information with the goal of promoting certain land uses; **public acquisition**, where land is purchased to preserve it through public ownership; and **economic incentives/disincentives**, which influence land uses through financial incentives and disincentives; and **land use regulation**, which regulate land uses through an approval process (Leitch and Baltezore 1992).

3.41 Information and Extension Efforts

Programs in this category use the policy instrument of persuasion to promote conservation on private lands. These programs depend on the voluntary compliance of the landowner to achieve their objectives. Small incentives may be provided, but they are not intended to significantly compensate the landowner for the costs of the production of ecological goods and services. Education and extension programs are the two general types of programs that use this approach (Scarth 1984).

In general, the greatest amount of conservation on private lands will result from voluntary action by the landowner. In order for landowners to want to manage resources in a sustainable manner, those landowners need to first value and have a concern for well-being of the environment. This concern will lead them to seek knowledge about stewardship and what can be done in terms of conservation practices.

Education is used to persuade landowners to modify their land use practices for the benefit all of society. It is most frequently successful through having landowners first realize how they personally, will benefit from the program. Many wildlife and agricultural agencies have programs aimed at disseminating information about conservation of habitat and protecting the soil and water resource base. The basic goal of these programs is to make landowners aware of the issues and promote conservation farming practices so that landowners take into account environmental factors in their every-day land use decisions. Proper encouragement, special designation, and public recognition of these landowners and their lands may be all that is needed to encourage conservation efforts (Haigis and Young 1983).

Programs may also include technical assistance that demonstrate different land use techniques that promote soil and water conservation. These techniques, with so-called 'spin-off' benefits for wildlife, are more likely to be implemented than those practices developed strictly for wildlife (Scarth 1984). Technical assistance programs help reduce information or knowledge gaps and complement other strategies. Extension efforts are inherently limited in the effect they can have on land uses, given the market forces that may favor agricultural development. However, they play a significant role in encouraging conservation land uses that produce on-farm benefits, and to that extent their effectiveness as communication vehicles should be maximized (Scarth 1998).

3.42 Public Acquisition

Land acquisition is the purchase of the entire 'bundle of rights' over land and is ongoing on a very limited scale. Purchasing land is thought to be the most effective

method in terms of protecting habitat and the land and water resource base, because land owned by the public or a conservation organization is less vulnerable to short-run economic trends than privately owned land. However, purchasing is not always a viable option. Although landowners may be interested in preserving natural features of their land, they may not be interested in selling their property. Furthermore, there is often political opposition to habitat acquisition, especially in agricultural communities. Local governments and landowners are often wary of land acquisition, because such efforts are perceived to threaten local commerce by decreasing the local sale of farm inputs (Trottier 1993). Concern regarding land acquisition by conservation organizations was expressed in a resolution to the Minister of Natural Resources, by the Association of Manitoba Municipalities. In this resolution, it was proposed that legislation be introduced to allow municipalities the right to limit the amount of land that may be purchased or leased for conservation purposes (Association of Manitoba Municipalities 1996). Public ownership and management is meeting with resistance in a number of areas, particularly when land is taken out of agricultural production, made unavailable to young or future farmers, and removed from the local tax rolls. Once land is purchased by these groups, chances of the land returning on the market and becoming available for agricultural purposes is very slim.

There is a general decline in the acquisition of land because limited funding and high real-estate values form a barrier for conservation organizations and government agencies interested in protecting conservation lands. These agencies have to compete in the land market with other buyers and there are also additional costs of managing the land. Because land acquisition is a very expensive and time-consuming option, it is often used to secure outstanding or rare examples of habitat (Buesseler 1999). Land acquisition may

be necessary to deal with some of the irreversible changes that are now taking place in land use or to retire very fragile land from crop production or other agricultural use.

3.43 Economic Incentives

Financial incentives for different land uses may arise from a variety of policy instruments, sometimes as an indirect consequence of policies directed at objectives unrelated to land use. Economic incentives are provided to private landowners through: limited use agreements, which are negotiated contracts or easements that represent appropriation of only development rights over land; direct cash payments to landowners from a conservation agency; and credits and rebates provided through the tax structure in order to encourage certain land uses (Scarth 1984).

3.431 Leasing Land

Leasing to protect habitat is a major activity common to several existing or former provincial wildlife programs and the NAWMP, including the Adopt-a-Pothole, the HELP (Habitat Enhancement Land Use Program) program and Prairie CARE (Trottier 1993). Leasing is a type of limited use agreement where a contract is negotiated that represents the appropriation of only development rights over land. The perceived advantage of leasing land is its lower cost relative to land acquisition. Land leases may attract landowners that are unwilling to make long-term commitments to retire their land but wish to retain the option for farming in the future. Leasing also attracts farmers who are only willing to enroll part of their land or enroll into conservation programs for a fixed time period. Leasing provides landowners with an opportunity to profit from uncultivated

acreage or in some cases conversion of marginal cropland into grassland. Landowners are paid a fair rental rate for leased land while retaining long-term control over the use of their land. Leasing however, requires additional costs of enforcement because areas must be checked periodically to ensure that agreements are honored. The technology for monitoring these types of programs may be in place and effective, but without large sums of money to back them, even the best designed programs will not influence a significant acreage in the long term (Scarth 1984). Leasing land is therefore seen as a gamble, as it protects land only when money is available. Under the habitat lease component of the NAWMP, landowners are compensated for setting aside wetlands and uplands as waterfowl habitat under ten-year leases (Sexton 1999). The Permanent Cover Program also provided a payment to landowners to convert eligible erodible land to perennial forage or tree cover and retain it in that state for a 10 or 21 year period (Thiele 1999).

3.432 Conservation Easements

There is a role for private contracts in developing controls on natural landscapes, ecologically sensitive areas, or heritage property. Conservation Easements have been introduced through legislation in all of the Prairie Provinces in Canada. A Conservation Easement is a legal document noting the rights of the landowner to keep the land in a natural state, or some other defined condition, for the purposes of conserving important environmental features for terms ranging up to perpetuity. The contract allows the property owner to commit himself or herself to the protection of the property without relinquishing title to it (National Round Table on the Environment and the Economy, Canadian Wetlands Conservation Task Force, and North America Wetlands Conservation

Council 1992). Conservation easements involve landowners voluntarily accepting certain restrictions on the way land is used. An easement is filed with the Provincial Land Titles Office, and binds current and future landowners to follow the conditions for the term of the agreement. The restrictions on land use and development will vary depending on the nature and ecological features of the land (e.g. wetland, forest or native upland). Easements can either be donated by a landowner or purchased by the Provincial Government or an authorized conservation agency, and may be for a specified term or in perpetuity, depending on the needs of the landowner and the receiving agency. Revenue Canada views donated conservation easements as charitable gifts which can result in tax deductions on federal income taxes. The annual allowable tax credit is based on the market value of the gift shown on a tax receipt, up to a maximum of 100% of net income (Trombetti and Cox 1990).

The Conservation Agreements Act was passed in 1998 by the Manitoba Legislature and came into force in 1999. This new legislation enables conservation organizations like Delta Waterfowl, Ducks Unlimited and the Nature Conservancy of Canada to enter into agreements that will provide protection of land in its natural state in perpetuity. The receiving agency is responsible for monitoring and enforcement of the terms of the agreement. If the terms of the easement are breached, the organization holding the easement has the right to enforce the restrictions and require restoration of the property to its prior condition (Trombetti and Cox 1990).

3.433 Direct Cash Payments to Landowners

Public subsidization of land use practices commonly takes the form of Cost-Sharing agreements with private landowners. These programs usually encourage the revegetation of cultivated lands and integrate both soil conservation and wildlife habitat considerations (Scarth 1984). Madsen (1981) classifies cost sharing programs as development oriented. The objective of these programs is to create or restore, rather than preserve quality habitat areas. The format of cost sharing programs is a contract by which landowners agree to practice certain land use techniques, that benefit both the soil and wildlife. Funding is the limiting factor to the success of these programs and despite positive landowner reactions, only a relatively small part of the target agricultural areas have been affected.

Technical consultation is provided through these programs, and the economic costs of the conservation efforts are shared by the agency and farmers. It is not uncommon for the agency to assume a very high percentage of the cost of conservation programs. The "matching" costs for the farmer may be paid in kind through the use of farm equipment or through landowner labor. With little personal investment, the landowner may receive, through these programs, considerable improvement in the farming operations because of increased fertility and long-term productivity of the land.

The use of public economic resources to enhance private property is justified on the basis of for example, cleaner water resulting from subsidies for soil erosion control, which benefits the public and future generations, who will rely on soil resources for production of food and fiber (Napier and Forster 1982). This method for conservation is

best suited to deal with cases where the benefits for society exceed those to the individual farmer and where a farmer needs an incentive to start a new farming practice.

The subsidy or cost sharing strategy has probably reached more farmers than any other federal conservation effort. There are efforts to provide producers with financial incentives in the form of direct cash payments for modified agricultural land use or conservation farming practices. Direct cash payments are being used to support on-farm projects and demonstrate conservation farming techniques. Under the Prairie CARE, CMAAS and other programs, planned grazing systems, stubble mulching, chemical fallow, underseed clover, zero-till, and winter wheat projects are funded so that farmers can experiment with new technology without incurring the financial risk (Trottier 1993).

3.434 Tax Incentives - Credits and Exemptions Provided Through the Tax Structure

Income and property tax structures have been used as vehicles providing economic incentives for habitat protection and soil and water conservation.

3.4341 The Income Tax System

According to Scarth (1984), the income tax structure has potential for providing incentives that will encourage desired land uses. The income tax system in Canada is within the federal legislative authority in all provinces except Quebec, where it is a shared responsibility. It potentially influences land use in two ways: through its treatment of expenses associated with drainage activities by private landowners, and through its treatment of land donations for environmental purposes.

The Federal Income Tax Act allows the deduction of expenses related to drainage activity against current income, although it is not clear how important this deduction is in encouraging wetland drainage. In the United States, President Carter's Executive Order 11990 in 1977 ended all direct federal assistance for wetland conversion, including assistance with drainage and channelization. Some indirect incentives, such as farm program benefits, were eliminated by the "swampbuster" provision of the 1985 Food Security Act, which denied program benefits to farmers who plant annual crops on wetlands converted after 1985. Other indirect incentives were eliminated by the Tax Reform Act of 1986, which eliminated favorable treatment of capital gains from land conversion and restricted landowner's ability to write off drainage costs, thereby reducing incentives for the conversion of wetlands (Wiebe et al. 1995). An evaluation of this policy reform concluded that the elimination of the deduction, significantly reduced the attractiveness of drainage activity within the Mississippi Delta region (Wiebe et al. 1995).

The growing awareness that stewardship of private lands is the key to environmental conservation in Canada, has lead to the emergence of an entirely new breed of statutes that enable a voluntary, non-regulatory approach to conservation. For example, statutes have been enacted that provide legal frameworks for landowner conservation agreements, or tax incentives for the donation of ecologically sensitive land to both government and private agencies (Rubec 1997). These changes provide a tangible example of policy reforms that provide voluntary mechanisms to protect conservation lands.

Madsen (1981) advocated the provision of tax deductions for private landowners that bear the costs of maintaining wetlands on their land. This type of system would

recognize the value people place on wetlands and the cost to landowners for maintaining them, is borne by the public. Incentive programs that make use of the taxation system have the advantage of providing a 'broad brush' capable of affecting a large acreage. The difficulty with this approach lies in its implementation, as it would require a combination of considerable effort and political timing to amend the federal Income Tax Act.

3.4342 The Property Tax System

The property tax framework is attractive in that it could provide, like the income tax approach, a 'broad brush' capable of affecting a large acreage while incurring relatively low costs of administration. The price of this extensive coverage is a relatively modest incentive to individual landowners. Property tax programs may be similar to technical assistance programs in that their primary purpose may be one of advertisement of the values of ecological goods and services, rather than its protection. A property tax credit program may not likely be a significant deterrent to those landowners intent on converting their native lands for crop production. The value of the program may lie in its encouragement and recognition of conservation-minded landowners and in the publicity it generates for preservation of conservation lands (Scarth 1984).

The difficulty with this approach also lies in its implementation, as it would also require a combination of considerable effort and political timing to amend the Provincial Municipal Assessment Act. In addition, there may be a real or perceived loss to tax revenue by local administration (e.g. municipality) and translating potential into realized conserved acres may prove more time consuming and costly from a staff resource view than anticipated.

3.44 The Regulatory Approach

More "traditional" statutes aimed at managing or controlling human activity for particular purposes, require compliance with specific regulations and specify punishment for contravention. For example, some statutes provide the authority to: acquire or designate lands as "protected areas"; develop regulations for what can or cannot be done in designated areas; or design acceptable effects on certain species of wildlife and their habitat. Other statutes regulate the use of resources such as water and the impact on the environment of activities such as agriculture. Other statutes set out how processes, such as environmental assessment or land use planning, must be carried out, and specify how the public will be able to participate in those processes (Rubec et al. 1998).

The public benefits provided by natural lands can be protected by limiting what landowners can do with their land. All of the Prairie provinces have water legislation that defines the rules and process relating to wetland drainage, along with provincial policy statements that outline in general terms the province's approach to water management decisions.

Other regulatory mechanisms that affect land use include, land use planning mechanisms and the environmental approval processes that exist in each province. Municipal and community planning acts control land use and development in the provinces. Municipal planning, zoning, and bylaws all have a major impact on land conservation because it is at this jurisdictional level that many decisions regarding land use are made. Also, provinces across Canada have environmental assessment legislation which can potentially be used for the conservation of natural lands. These acts establish a

legal process for assessing the environmental impacts of a public undertaking (Rubec et al. 1998).

Although work is needed to evaluate the enforcement efforts associated with the licensing/permitting processes and their concomitant effect on land use decisions, the policy statements issued by the prairie provinces implied that the provision of incentives was preferred to strict enforcement of the regulatory approach (Scarth 1998). Political and social acceptance of regulation may present problems with the implementing of this approach. The issue of 'taking' is central in considering regulatory approaches. Mandatory regulations face strong resistance from landowners if they are not accompanied by some form of incentive. Furthermore, regulations provide little or no incentive to reduce adverse agricultural activities beyond what is specified in the regulations. With respect to achieving environmental objectives, regulations are inefficient when compared to providing incentives (Van Kooten and Porter 1993).

3.5 Public Policy

The study of the policy process focuses on public problems and how they are dealt with by government. Public policies result from political decisions made by governments to undertake some course of action, whether it be creating and implementing programs to achieve societal goals or the decision to do nothing and maintain the status quo. Policy is the sum of government activities, whether acting directly or through agents, which have an influence on people's lives. William Jenkins defines public policy as, "a set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a

specified situation, where those decisions should, in principle, be within the power of those actors to achieve" (Howlett and Ramesh 1995). Policy action may manifest itself in a variety of forms, including legislation providing governments with authority to act, regulations issued pursuant to that authority, operational policy statements guiding the application of legislation and regulations, and programs delivered with public funds and staff (Scarth 1998).

In Canada, the constitutional jurisdiction over agriculture is shared between the federal and provincial governments, and therefore important political decisions with policy implications for conservation on private agricultural land will involve both levels of government. By virtue of the British North American Act, the provinces were given the power to make laws in relation to; the management and sale of the public lands belonging to the Province and of the timber and wood thereon; property and civil rights in the province; and matters of a merely local or private nature (Hogg 1992). The province exercises proprietary rights over water within their boundaries, and their legislative authority over property and civil rights gives them a dominant role with respect to the direct regulation of land and water use. Wetland drainage on the majority of lands within each province and the frameworks within which municipal governments regulate land use are important policy areas that fall within provincial powers. Federal authority applicable to conservation on private land, includes a general jurisdiction over the environment and specific responsibility for migratory birds.

Conservation on private agricultural land within the Canadian prairies, falls within the ambit of three main policy areas: wetlands policy, agricultural policy, and the

framework within which municipal governments regulate land use. Public agencies have used these policies to influence land use in ways that accomplish public objectives.

The main objective of "wetland policy" is to promote the conservation of wetlands in order to sustain their ecological and socioeconomic functions. This will be done through: a no net loss of wetland functions on lands and waters through mitigation of all impacts of development related to these wetlands; and through the enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands has reached critical levels (Rubec et al. 1998). Each of the Prairie provinces have water legislation that regulates the use of freshwater within a province though licenses and permits. These statutes often contain clauses protecting water in its natural state and can therefore be used to protect the hydrology that sustains wetlands. The term "wetland policy" is sometimes used in the narrow sense to refer to the operational policies that govern the regulation of wetlands drainage. However, a broader definition of wetland policy calls for: the conservation of wetland values; retention of wetlands primarily by the provision of incentives but with regulation where required; and special consideration for waterways with values of provincial or national significance (Rubec et al. 1998).

Another policy area that affects conservation on private land is the regulation of land use by municipal governments. Municipal and planning legislation control the use and development of most privately-owned land within the provinces. They play a significant role in the protection of natural lands because it is at this jurisdictional level that many decisions regarding wetlands, farmland, etc. are made. Municipal planning,

zoning, park and land acquisition, bylaws, and environmentally sensitive areas statutes can all have a major impact on conservation on private lands (Rubec et al. 1998).

Agricultural policy also influences land use and conservation on private land and has four main objectives: to keep prices stable; to guarantee supplies of food; to keep farming vibrant and to support farm incomes; and to keep rural communities alive. Agricultural policy has shifted over time - from the "frontier" manner of thinking, where policy was designed to promote the cultivation and expansion of agriculture, to policies aimed at making agriculture more sustainable through maintaining and enhancing ecological services (Wilson and Tyrchniewicz 1995).

The process by which public policy is formed is a complex interplay involving elected officials and their advisors, professional staff, advocacy groups, the media, judiciary and members of the public. The federal government and all three Prairie provinces have undertaken public consultations to develop agriculture policies (Scarth 1998). Most conservation efforts occur on private agricultural land and therefore, these policy development processes have involved agricultural interests and municipal governments in addition to natural resource and environmental advocacy groups.

3.6 Sustainable Agriculture Policy and the Multifunctional Role of Agriculture

The long term ability of agricultural lands to provide for the food, fiber, recreational, and wildlife needs of people are endangered by the lack of sound conservation policies. According to Acton and Gregorich (1995), agricultural policies should have the following characteristics:

- recognize agriculture as a human activity that affects both the local and the broader environment.
- maintain and improve agricultural soil health as an essential step in maintaining and improving environmental health and ensuring long-term farm profitability, by promoting practices that build soil organic matter and protect soil structure.
- foster increased understanding of the factors affecting soil health and the means to maintain and improve it through continued research and monitoring programs.
- conserve agricultural lands and soils by curtailing their non-agricultural uses and by protecting against soil losses resulting from erosion.
- promote practices that conserve resources including the recycling of organic wastes, reducing the use of fossil fuels and agro-chemicals, and conserving water quality.
- support producers during their transition to conservation farming systems.

Built on the foundation of these objectives, the goal of policy should be to diminish the degradation of agricultural soil and the broader environment and to maintain soil health by targeting programs to problem areas and problem farms (Acton and Gregorich 1995). In contrast, traditional agriculture policy has typically focused on high production and has viewed agriculture as a closed system. The concept of sustainable agriculture creates a need for new policy that acknowledges the environmental effects of agriculture and promotes resource conservation along with productivity.

There is a multifunctional role of farmers as stewards of our renewable resources and our rural heritage. Agriculture maintains a built-in cultural heritage in the countryside. It safeguards and enhances rural landscapes, protects the environment, maintains biodiversity, purifies the air, contributes to the socioeconomic viability of rural areas, adds recreational amenities and enables balanced regional development. Agriculture provides a lot of public goods and services in addition to the private goods - the food and fibre. For both the European Union and Japan, multifunctionality is not about the consequences, side effects or externalities of production agriculture. They have decided that farming's

contribution to environment, landscape and rural community is just as important as the production of food and fibre. Furthermore, they are willing to increase support for the farmers who provide these public goods and services (Van Donkersgoed 2000). It may not be possible to have urban consumers pay for that multifunctionality in the price of their food. But if Canadians are prepared to spend tax dollars on maintaining professional sports teams and theaters and symphony orchestras, certainly they should not hesitate at paying to maintain the source of their fresh air and healthy recreational landscape (Heald 2000).

3.7 Externalities in Agriculture

In a competitive market, the market price will always move toward an equilibrium price where the quantity demanded equals the quantity supplied. This equilibrium point is where the market is most efficient because there is neither a shortage nor a surplus of goods. The economic system will not always sustain efficient allocations, however. Tietenberg (1994) addresses the existence and nature of market failure whereby the outcomes of free market activity result in an inefficient use of resources. Specific circumstances that may lead to inefficient allocations include externalities and improperly defined property-right systems, such as with public goods.

Externalities occur when resource users create costs that others have to bear or, less commonly, where they create benefits for which others do not have to pay. Batie (1986) reviews the relationship between conventional agriculture and external environmental costs associated with conventional farming practices. The application of inappropriate field practices in soil regions where any cultivated agriculture is sustainably

questionable, is the root cause of most human-induced erosion. For example, Carlyle (1980) describes the long-time practice, and inappropriateness, of summerfallowing on the Canadian prairie, a practice which became increasingly popular after the turn of the century. In summerfallow, a field is cultivated in the Spring to minimize weed growth and left uncropped for a season. The purpose is to increase soil moisture and nutrients via organic matter oxidation. Ironically, on prairie soils, summerfallowing is destructive; as fragile soils are left open to the eroding forces of wind and water. Organic material breakdown occurs, resulting in lost nutrients and soil matter itself. Coupled with widespread drainage of natural wetlands and removal of native vegetation, soil erosion increased dramatically during the past century (Coote 1983).

Damage resulting from soil erosion occurs in two forms: 1) direct on-farm losses in soil productivity through loss of water retention ability, deterioration of soil structure, loss and division of croplands by gullies, salinization, loss of organic material, and acidification which all contribute to decreasing yields, crop quality, and eventually land value and; 2) indirect off farm air and water pollution caused by eroding soil particles carrying soil nutrients, dissolved minerals, animal waste, and herbicide/pesticide residues (Batie 1986). Various problems associated with conventional farming practices, as with many other environmental concerns, may be characterized as "externalities," as they have not been "internalized" within any economic markets, within the accounts of individual landowners, or within the natural resource accounts of society at large (Batie, 1986). Evidence suggests that soil erosion and runoff elicit important off-site costs that increasingly have made soil conservation an ecological and political issue outside of farming (Lovejoy and Napier 1986).

Conservation farming practices on the other hand, help to preserve natural lands that provide ecological goods and services that benefit all of society. These ecological goods and services include the range of economic and social benefits provided by a healthy environment. In this case society receives the benefits from ecological goods and services without contributing to their supply. Farmers feel that they alone should not have to bear the cost of providing these goods and services to all of society. Such environmental externality problems are often chronic effects and comprehensive solutions have typically been slow to emerge from the public policy realm. Despite this, governments must achieve a more efficient allocation of resources in the case of externalities, like decreasing production where there are external costs and increasing production where there are external benefits.

Externalities also arise because of an absence of natural resource-use rights, which govern resource use and development, disposal of factors of production, and the maintenance of environmental integrity. Environmental problems arise because there is a lack of rights to environmental protection of most natural resources. Environmental goods and services are public goods that are susceptible to over-exploitation through market failure. Public goods are defined as those that exhibit consumption indivisibilities and are fully accessible to all. Public goods (i.e. many resources) are characterized by "attenuated" (weakened) property rights (Tietenberg 1994). Public goods may include: migratory birds, fish, wildlife, ambient air, soil, water in stream and lakes, etc.. Largely due to the characteristics of the goods themselves, appropriate pricing does not occur because it is difficult to establish a market and collect prices for resource use. Without a

price, these resources cannot be rationed among users and revenue cannot be raised to pay for necessary maintenance and conservation (Tietenberg 1994).

There has been much debate over the pivotal role of property rights in natural resources management. Landowners have a mixture of complete, partial, and non-existent property-rights. They own the soil but not the wildlife, they own the wetland bottom but not the water, and they own the surface rights but not the mineral rights (Sopuck 1993). The specific mix of property rights varies across Canada but the principle remains the same. Pearse (1988) has documented the critical role of property rights in natural resource management, suggesting the human understanding of ownership is entrenched within Western thought. He suggests that the goal for progressive natural resource planning and management should be an effective, organized relationship between publicly valued resources and their maintenance by private individuals owning the land on which these ecological goods and services are located.

The rights associated with the ownership of property have changed over time. The "frontier" or resource exploitation mentality has gradually begun to disappear and a "stewardship" or caring ethic has become more common among many property owners (Chan 1989). The public consciousness has also been raised in recent times about the stewardship of resources, whether publicly or privately owned. The emerging ethic seems to be that those who control resources have the responsibility to manage those resources in the public interest. This ethic requires that resources not be wasted, their quality be guarded, their services be more widely available and accessible, and adverse effects from their use that is detrimental to others be remedied or compensated, and that those who control resources are accountable publicly for their stewardship (McCorkle 1981).

3.8 Landowner Attitudes Regarding Conservation Practices

The on-farm and off-farm degradation effects of conventional agriculture gives rise to a controversial debate which may well be at the heart of the land and water management externality case. A clear understanding of the negative environmental effects of conventional agriculture seem to have been understood by legislators and even many farmers since the dust storms of the 1930s. This was evidenced by the creation of a prairie conservation agency under the Prairie Farm Rehabilitation Act of 1935 (Coote 1983).

Farmer acceptance for various types of soil conservation appears to have generally increased since the 1980's, although widespread improvements in agricultural practices have been slower to materialize (Esseks and Kraft 1993). Essentially all agricultural land is privately owned, and landowners have traditionally retained all rights to its management. Sampson (1992) however, explains the historical dilemma of attempting to achieve public or social values on private land. The key element is time; conservation practices typically do not immediately provide measurable returns. When considered over a long time frame - a minimum of 5 to 10 years has been suggested - practices such as conservation tillage and the maintenance of native grassland and wetlands may become directly profitable to individual landowners. The problem is that the immediate on-farm costs can result in external benefits both on and off the farmland (i.e. wildlife users, downstream property owners, and society at large), while real or perceived losses of revenue may be accrued by the individual landowner and returns only come much later (Oborne 1995).

Many conservation practices not only benefit the broader environment and help to improve soil and water quality, but also may increase economic returns to farmers in the long-term. A study on the economic evaluation of land use changes in southwest

Manitoba (Josephson 1992) showed that farmers undertaking conservation practices realized an average additional net income of $13.27 per acre per year on 47,042 surveyed acres for a total income improvement of $624,191. This benefit came from the combination of an average net increase in profits of $5.14 per acre as well as $8.13 per acre reduction in costs. These benefits excluded all incentive payments received for carrying out land use modifications, as well as safety net payments received and premiums paid by farmers.

Conservation tillage is a method designed to keep most crop residue on the soil's surface, where it protects against soil loss caused by erosion and reduces water loss by runoff and evaporation. This type of tillage concentrates organic matter at the soil's surface because crop residues are not mixed into the soil (Gregorich et al. 1995). Researchers and conservation organizations have conducted many studies to compare the on-farm costs of conventional versus conservation agriculture. There is now substantial agreement that the total farmer costs of conservation tillage are similar, and in some cases comparatively less, than the costs of conventional methods of agriculture. Capital and variable costs per acre are higher for most forms of conservation tillage because of required investments in equipment and higher herbicide treatment costs. However, these costs are offset by lower production costs stemming from reduced fuel consumption, reduced machinery investment and repair costs, and an increased number of acres farmed per hour of labor, therefore reducing costs by up to 61% annually when compared to conventional systems (Manitoba-North Dakota Zero Tillage Farmer's Association 1992). The economic analysis of land use changes carried out by Josephson, (1992) revealed that net farm income increased by $16.20 per acre with the adoption of minimum tillage.

Similarly, net farm income increased by $19.66 per acre with the adoption of zero tillage practices.

Agricultural practices may increase erosion by disrupting the protection afforded by native vegetation. This may have serious effects on soil productivity, crop yields, the environment, and results in much damage to property and farmland due to sedimentation (Prairie Farm Rehabilitation Administration 1982). Marginal land used for crop production is especially vulnerable to erosion. Planting permanent grasses or forages on marginal land that is easily erodible and not well suited to crop production may also become profitable to landowners. The economic analysis of land use changes carried out by Josephson (1992) also revealed that an increase in net farm income of $25.16 per acre came from increased forage production. In this study, landowners indicated that the most important factors influencing their decision to adopt conservation practices was the potential profit and a strong sense of maintaining their land in a state as good or better than they found it (Josephson 1992). Over the long-term, net income should increase and productivity should improve using conservation practices so that individual farmers can afford choices that conserve soil and preserve water quality.

Studies of landowner attitudes about wildlife and farming practices in the rural Manitoba municipalities of Harrison (Dixon 1970) and Odanah (Garrioch and Andrews 1983) have shown that farmers are generally favorable toward wildlife, however, economic considerations have forced them to convert as much wildlife habitat as possible to cropland. A lack of information about the long term effects of conservation farming practices has fostered misconceptions that ultimately result in a reduction of the land's ability to support agriculture and wildlife. Education can play a role in encouraging

conservation land uses that attract on-farm benefits. However, information and extension efforts are limited in the effect they can have on land use, given that market forces may favor agricultural production (Scarth 1998). These studies suggest that education and economic incentives are necessary to stimulate landowner participation in any conservation program.

Many farmers are becoming more conservation-minded and are interested in participating in conservation programs. The issue is that farmers have never had viable options because they profit from agricultural production, while there is no money to be made in raising wildlife or visible dollars for conserving water and soil quality. Farmers are only making rational decisions when they choose to eliminate public resources on their farms. Farmers are not antagonistic to conservation; many farmers have become concerned about what they see happening to the landscape; it is just that they do not feel the burden of conservation should be borne by them alone (Sopuck 1993). In this day and age, farmers absolutely cannot bear any additional costs. Programs, like the Environmental Tax Credit program, that contribute to a farmer's "bottom line" and potentially benefit the regional economy as a whole should be widely supported by farm, rural, and urban people. If we expect farmers to raise wildlife or provide soil and water quality for the benefit of society, society has to be prepared to compensate farmers for the provision of ecological goods and services (Sopuck 1993). Society benefits directly from the sustained maintenance of the land and water resource base and continued ecological diversity provided by various natural areas and therefore, the burden of ensuring long-term agricultural and wildlife habitat viability should not rest solely on the landowner. To catalyze this, public funding should be used wherever the economic framework runs in

accordance with overall social objectives (Morgan 1985). The Environmental Tax Credit program, which provides some compensation for landowners who carry out conservation practices, will constitute a start. Through the provision of ecological services and natural habitat, these landowners have benefited not only wildlife, but society as well.

3.9 Results from Research Phase I - Review of Selected Tax Incentive Programs

Although tax credit programs have been instituted in several states, they have only been introduced in Canada in a limited manner within the Province of Ontario, which provides an exemption for wetlands designated as "environmentally significant" under provincial planning legislation (see below). Also, a few municipalities in prairie Canada have introduced municipal tax rebates for conservation practices, on a pilot basis.

A review of literature was completed on selected Tax Credit/Exemption programs that have been implemented in Minnesota, Iowa, North Dakota, Ontario, Saskatchewan and Alberta in order to determine whether these programs were/are effective. It was anticipated that new ideas and previous data relevant to this study would be revealed. Also, it was hoped that current theoretical frameworks and practical applications of program evaluation would be available for consideration. Agencies in Minnesota, Iowa, North Dakota, Ontario, Saskatchewan, and Alberta were asked to forward information on tax credit programs. Information requested included acreage impacted, cost incurred, methods of fund raising, general landowner responses, and program evaluations.

It was difficult to locate the people who were familiar with these programs and were involved in their administration. Most of the information gathered was through

personal communication over the telephone. The literature was found to be very vague and no formal evaluations of the selected programs were found. There were informal evaluations that took place amongst municipal staff and department employees, but no formal evaluations were done to ascertain the landowner's reactions to the program. Program success or failure was presumed by administrators, primarily from anecdotal information.

3.91 Ontario's Conservation Land Tax Incentive Program and Managed Forest Tax Incentive Program

In 1986, the Ontario Municipal Tax Assessment Act was modified to create the Conservation Land Tax Rebate program, which was available to owners of farms, woodlands, and wetlands. For land to be eligible, owners had to manage it according to the criteria set out in the program. The rebate for woodlands was 75% of the assessed tax rate and required the completion of a woodland management plan by the landowner. The tax rebate for conservation lands was 100% and did not require the completion of a formal plan. The rebate system which applied to farmlands, woodlands, and other conservation lands, was problematic because of systematic over-assessments of some lands and an annual wait by landowners to see whether the provincial government would extend the rebate system for another year (Personal Communication, Heldner 2000). Also, the Ontario Ministry of Municipal Affairs and Housing had to confirm that the person the rebate was offered to, was in fact the owner of the land.

In 1998, changes were made to the Ontario property-tax system so that rebates were replaced with tax exemptions that are directly taken off a landowner's tax bill. This

way, the department can be sure that the taxpayer is the person receiving the tax exemption. Under the new system, woodlands enrolled in the program, are no longer assessed as residential lands. Instead, they are assessed in a manner similar to that used for farmland. Farmland is assessed and taxed on the basis of its value as farmland as opposed to the higher assessment which reflects the development influence. Farmland is assessed according to soil productivity, agricultural potential, land sales value, location, and physical characteristics such as topography, drainage, erosion, etc. Because woodlands are now assessed similar to farmland under the program, the assessment value for woodlands is lower than if it were assessed as residential land. The tax rate on woodlands has been set by the province at 25% of the municipal rate set for residential land, the same level set for farmlands under the new tax system. The new program for woodlands is called the Managed Forest Tax Incentive Program (Ontario Ministry of Natural Resources 1999).

Similarly, conservation lands are no longer assessed as residential lands. Instead they are assessed in a manner similar to farmlands and woodlands, but the actual tax rate has been set at 0% of the residential rate. As the current tax rebate for conservation lands is 100%, this change has not affected the tax levels landowners pay. However, the types of land qualifying as conservation lands has been widened to include not only provincially significant wetlands, provincially significant areas of natural and scientific interest and land designated as escarpment natural area in the Niagara Escarpment Plan, but also the conservation lands of private landowners and non-profit conservation groups, and the habitats of endangered species. To be eligible for the program, the conservation land must be considered highly significant by the Ministry of Natural Resources (MNR). The new

program for conservation lands is called the Conservation Land Tax Incentive program (Ontario Ministry of Natural Resources 1999).

These programs were created by the Ontario MNR and administered by the Ontario Ministry of Municipal Affairs and Housing. Individuals with eligible land identified by the MNR, who wish to participate in the program, must agree to maintain the property as conservation land and not carry out activities that would degrade, destroy, or result in the loss of natural values of the site. Consequently, the tax exemption is taken directly off the assessed land value on a landowner's municipal tax notice. The municipality covers the costs of the tax exemption but can submit a claim for reimbursement of tax revenue lost from the exemption. The province reimburses the municipality an amount equal to the lost tax revenue through the Community Relief Fund. Heldner (2000), an employee of the Ontario Ministry of Municipal Affairs and Housing, says the Conservation Lands Tax Incentive program is very popular and is gaining much interest. More people perceive the protection of conservation lands as an important part of landscape management and community planning. There are over 20,000 clients enrolled in the program. Some of these include; conservation authorities, non-profit organizations, farmers, The Nature Conservancy of Ontario, The Federation of Ontario Naturalists, The Bruce Trail Association, etc. . Presently, the program is protecting hundreds of thousands of acres of land and there is a 30% participation rate.

Ontario's Conservation Land Incentive program is successful because the program is well promoted. The MNR actively contacts landowners on an annual basis to inform them that their land qualifies for the program and makes program participation relatively effortless. Landowners essentially sign an agreement and send it back in the mail and

there are no up-front costs involved. Previously, farmers felt that a 25% tax reduction was not sufficient to make up for the restrictions placed on land use. However, recently, there has been an increase in the number of farmers participating in the program. This is because farmland values and taxes have increased in Ontario, and now a 25% tax break is perceived to be more substantial. The program has also been gaining the attention of older farmers who want to retire and cannot find anyone who is interested in renting out or purchasing their land for agricultural purposes (Personal Communication, Heldner 2000).

3.92 Minnesota's Wetland and Native Prairie Tax Exemption Program

In 1979, a bill was passed through the Minnesota legislature creating both a property tax exemption and a property tax credit designed to protect wetland areas in the State. Taxes that landowners normally pay on eligible wetlands are instead paid by the State and therefore counties did not lose out on local tax revenue (Personal Communication, Buesseler 1999). Landowners were also given a tax credit equal to 0.75% of the average value per cultivated acre, for each acre of wetland preserved. In return, landowners agreed not to drain wetlands during that tax year. The credit was applied to taxes on the same quarter section as the wetlands, or any adjoining quarters. The agreement remained in place until wetlands were drained and therefore landowners automatically received the credit for subsequent years without having to reapply (Personal Communication, Buesseler 1999).

In 1980, in order to encourage the maintenance of land in its natural state, the Minnesota legislature amended the wetland tax credit law to include a property tax

exemption and credit for the preservation of native prairie. Because native prairie is more agriculturally productive, the credit was increased to 1.5% of the market value per acre of nearby cropland. The agreement was simply to maintain land in its native state. These programs left full ownership and management of the land in the control of the landowners. Areas could be grazed or cut and landowners were not obliged to allow hunter access to wetlands and uplands enrolled in the program (Scarth 1984). In 1987, grazing was no longer permitted because of numerous complaints about large ranch operations taking advantage of the tax credit and not maintaining their land under optimal conditions.

Landowners applied for lands which they consider eligible. The Department of Natural Resources in turn, determined the eligibility of each application. Land was reviewed annually by a local assessor who monitored compliance with the agreements. County assessors had adequate records on where wetlands and native prairie tracts were located and how large they were. Wetland and native prairie preservation agreements were solicited by the county assessor on forms attached to each landowner's tax statement.

In 1987, under this system, the wetland tax exemption resulted in $336,000 being paid out by the State to local governments to reimburse them for revenue lost. 90,000 acres of wetlands were enrolled for the tax credit which resulted in $302,000 of credits being taken off the local tax roll. The native prairie tax exemption resulted in $46,000 being paid out to the local government to replace the lost revenue. Over 12,000 acres of land was enrolled under the native prairie tax credit which resulted in a total credit to landowners of $110,000 (Personal Communication, Caufield 2000). Minnesota's property

tax program was unique in providing an exemption from taxes and a concomitant tax credit to encourage habitat preservation.

In 1988, the tax credit and reimbursement by the State was discontinued because of financial restraints (Personal Communication, Buesseler 1999). Since this occurred, local assessing authorities have been systematically over-assessing the market value of wetlands and native prairie, by giving these lands a higher agricultural use and productivity appraisal and/or sales value. By assessing native prairie and wetlands at a higher rate, landowners have to pay higher taxes on these lands. Consequently, the municipality receives more tax revenue that can be directed at municipal operations. In response to this, and to the public's view that landowners willing to preserve wetlands for the benefit of society, should be compensated - the Board of Water and Soils Agency initiated the Wetlands Preservation Areas Program (WPA) in 1998. This program requires counties to take inventory of all wetlands in order to make sure these lands are assessed as wetlands and are tax exempt (Personal Communication, Walther 2000). The required minimum size of an enrolled area is the wetland area owned and a 16.5 foot strip of upland buffer. As incentive for protection, a wetland area enrolled as a WPA is exempt from property tax. Once a parcel of land is enrolled as a WPA, a restrictive covenant is placed on the land which is considered permanent. County participation in the WPA program is optional. If the county chooses to participate in the program, the county will be reimbursed by the State of Minnesota Department of Revenue (DOR) for the actual lost tax revenue. There is standing appropriation from the general fund to the DOR in an amount necessary to make payments to cover the WPAs enrolled under the tax exemption program (Personal Communication, Walther 2000).

3.93 Iowa's Wetland and Native Prairie Tax Exemption Program

In 1990, a bill was passed through the Iowa legislature creating a property tax exemption designed to protect wetland areas and native prairie in the State. According to Chapter 427 of the Code of Iowa, land designated as native prairie or protected wetland by the Department of Natural Resources is eligible for a tax exemption. Application forms for the tax exemption are provided by the Department of Revenue and Finance. The application is accompanied by an affidavit signed by the applicant that if the exemption is granted, the property will not be used for economic gain during the assessment year in which the exemption is granted. The first annual application is accompanied by a certificate from the Department of Natural Resources indicating that the land is native prairie or protected wetland (Personal Communication, Joens 1999). Land in Iowa, is assessed in 40 acre parcels and therefore, the tax exemption is based on the assessment value of the land where the wetland or native prairie is located.

The local county assessing authority each year may submit to the Department of Natural Resources a claim for reimbursement of tax revenue lost from the exemption. The department reimburses the assessing authority an amount equal to the lost tax revenue based on the value of the protected wetland and native prairie, as determined by the assessing authority. This money comes from the Recreational Enhancement Appropriation Program (REAP), which is annually set by legislators and constitutes approximately $7 million dollars. Of this, $1.6 million goes to the Iowa Department of Natural Resources to fund their programs. Fiscal restraint may become a problem in the future if participation levels increase. The Department of Natural Resources is already struggling to meet the

demands for services with the dollars they have and may not be able to sustain this program (Personal Communication, Joens 1999).

There are approximately 36 million acres in Iowa and the tax exemption program affects less than 1 percent of the total land base each year. Since 1996, there had been approximately 900 acres enrolled in the program per year. Currently, there are 99 counties in Iowa and only four of these are actively involved in the program. The state of Iowa acting through the Department of Natural Resources is returning approximately $2,000 to the four counties to replace lost tax revenue. There has not been a lot of discourse about the program since the legislation was passed in 1990 (Personal Communication, Joens 1999). The program has not been well publicized and promoted and thus participation levels are modest and remain fairly constant. The program is protecting a small number of wetland and native prairie acres that have absolutely no agricultural potential and the tax exemption is not enough to influence farmer's land use decisions (Personal Communication, McCrabb 2000).

According to Capps, project coordinator for the Iowa DNR (2000), the program is not worthwhile for the hours of work involved in program administration. There are too many restrictions and regulations concerning the program. The department has to be very definitive when it comes to determining landowner eligibility, wetland and native prairie verification, and ensuring that the tax exemption program does not overlap with the Wetland Reserve Program. For example, native prairie is land that has never been cultivated, is unimproved, is primarily a mixture of warm season grasses, and meets the other criteria established by the commission for native prairie. Wetlands are issued a certificate for tax exemption if the department finds the land is a protected wetland as

defined in legislation, or if the wetland was previously drained and cropped but has been restored under a non-permanent restoration agreement with the department or other county, state, federal agency or private conservation group.

Iowa also has a tax exemption for natural conservation or wildlife areas. This includes recreational lakes, forest covers, river and streams, river and stream banks, and open prairies as designated by the board of supervisors of the county in which located. This land must be utilized for the purposes of providing soil erosion control or wildlife habitat. The board of supervisors annually designates the real property for which the tax exemption will apply. There is a limitation on the maximum acreage of real property that may be granted exemptions.

3.94 North Dakota's Wetlands Tax Credit Program

In 1991, bill numbers 2050 and 2211 were passed through the North Dakota legislature creating a property tax credit designed to protect wetland areas in the State. According to Section 57-02-08.4 through to Section 57-02-08.6 of the North Dakota Century Code, land designated as wetlands by local county assessment officials is eligible for a tax credit. This program was to be administered through the local counties and they in turn could apply to the State to be reimbursed for the tax revenue lost as a result of the tax credits. The local county assessment officials were to determine the eligibility of wetlands for the tax credit. The State Treasurer and Tax Commissioner, the Commissioner of Agriculture and the North Dakota Game and Fish Department all had input into the qualification guidelines and approval over applications. According to Hasti (1999), the State Supervisor of Assessments, the legislation was meaningless. The State

has never appropriated any funds towards the program because it was not viewed as a major priority. When budgets are tight, environmental programs seem to be receive less priority. In order to fund the Wetlands Tax Credit program, money from old programs would have to be cut which the State is often reluctant to do. Because the State has never allocated any funds toward the Wetlands Tax Credit program, the program has never been implemented by local counties. Presently, there is little discourse about the program and zero acres have been enrolled.

3.95 Rural Municipality of Weyburn (Saskatchewan) Stewardship Program

The rural municipality of Weyburn, Saskatchewan has offered a tax incentive for planting field shelterbelts since 1989. The municipality offered a rebate of up to $200 per quarter section for planting shelterbelts. Approximately, 114 miles of trees under the past Save Our Soils conservation program were planted in the municipality (Personal Communication, Muma 1999).

The municipality proposed an expansion of this concept into a ten year pilot project which expanded the scope to more diverse conservation practices. The following was a list of the pilot project activities that were funded under the Stewardship program and the level of tax refunding available for each activity:

Field shelterbelts	$100/mile
Green manure	$10/acre
Forage planting	maximum $20/acre
Grassed waterway	$20/acre to establish or maintain
Wildlife habitat	$20/acre
Upkeep of residences, yards	50% up to $300 maximum

The municipality of Weyburn Stewardship pilot project offered incentives, up to the value of the taxes paid on the quarter section, for the landowner to adopt long-term practices that were beneficial to the individual, the municipality, and society in general. The Agriculture District Development (A.D.D.) Committee, comprised of PFRA staff and local landowners, was given the responsibility of developing ideas for projects, reviewing applications and recommending approval of funding.

Landowners submit an application, attaching all relevant receipts and pictures, after the conservation practices are complete. The A.D.D. Committee reviewed projects for completeness, program acceptability, and availability of funds. The Municipal Council then reviewed recommendations of the A.D.D. Committee and submitted for payment.

This program continued for four years, from 1993 to 1996. The pilot program was funded up to a maximum of $42,000, by the federal government under the Canada - Saskatchewan Agriculture Green Plan Agreement. The final results of the program over four years, in terms of total costs and acres of land affected by the program can be seen in Appendix 12. Under this system, 1500 acres of forages were planted and enrolled for the tax credit which resulted in a cost of $10,855. Approximately, 300 acres of land were enrolled under the wildlife habitat tax credit which resulted in a total credit to landowners of $1,300. There was also 4.25 acres of shelterbelts, 30 acres of grassed waterways, 22 acres of green manure, and 9 farm improvement projects that resulted in a total credit to landowners of $2,158. From 1993 to 1996, there were approximately 1,850 acres enrolled in the program, which resulted in $15,000 paid out to the local government to replace lost tax revenue over the four year period (Personal Communication, McKegney-

Clay 2000). There are approximately 204,480 acres in the municipality of Weyburn and thus, the tax exemption program affected less than 1 percent of the total land base.

The municipal council I spoke with agreed that the project was worthwhile and were pleased with the permanent landscape changes that have been implemented. There was general agreement among municipal staff, that there had been very good value for the time and money invested. The municipal administrator of Weyburn, felt that the program was very effective from both an administrative and conservation perspective. He stated that in the first two years the program was offered, landowners were very receptive to the program and there was a high level of participation. This was thought to be due to the enthusiasm of the municipal staff and the municipal Reeve, who was progressive, a good leader, and well-respected in the community. The municipal Reeve had a huge influence over landowner participation. However, after two years, the level of landowner interest and the number of applications began to decrease. Therefore, fewer payment claims were made by the municipality and less funding was provided by the federal government. The program was discontinued in 1997, mainly due to a lack of interest on the part of the landowners (Personal Communication, Muma 1999).

According to the district manager with PFRA, a formal evaluation of the program was never completed. It was difficult to ascertain whether the program was successful or not, because people's perceptions regarding the program changed over time. At the outset of the program, landowners were very excited to be receiving a tax break, although there were no farmers inclined to maintain more residue cover on crop land. The program was well-liked by landowners and the municipality while the external funding was available from the Green Plan. Subsequently however, when the funding was discontinued the

municipality showed no interest in taking over the program and covering the cost of the tax credits, or seeking other sources of revenue (Personal Communication, McKegney-Clay 2000).

3.96 Rural Municipality of Rocky View (Alberta) Tax Incentive Program

The municipal district of Rocky View administers almost a million acres of land containing many diverse land uses. This diversity can be attributed to the municipality's geographic location and its proximity to the city of Calgary. The municipality is located in a transition zone between the prairies and the Rocky Mountains resulting in a wide range of agricultural and resource extraction activities which provide the basis for the municipal economy. This area has favorable soil for crop and forage production and good rangelands (Personal Communication, Dietzler 1999).

Rocky View municipality offered landowners property tax incentives of $150 per quarter section for carrying out sustainable farming practices on at least 80 acres on the quarter section. The program was based on a tax incentive of $150 per quarter section to encourage farmers to implement sustainable farming practices such as; the retention of 45% residue on cropland, seeding forage on marginal land, and establishing shelterbelts. Applicants were accepted on a first-come-first serve basis and were required to take part in a Farm Resource Management Planning Meeting (Personal Communication, Dietzler 1999).

The Tax Incentive Program continued for five years, from the year 1993 to 1998. From 1993 to 1995, the program was funded by federal/provincial money under the Canada-Alberta Environmentally Sustainable Agriculture Agreement (CAESA). During

the first three years of the program, a tax incentive of $150 per quarter section per landowner was offered for the retention of 45% residue cover on cropland. A minimum of 80 acres on the quarter section had to have 45% residue cover. Farmers could reapply the following year but only on a different quarter. From 1996 to 1998, the municipality began funding the program and the total amount of money available for tax incentives was limited to $5000 per year (Personal Communication, Dietzler 1999). In the fourth year of the program, a farmer could reapply for the tax credit but for a conservation practice that had not previously been undertaken. For example, there was a tax incentive to encourage farmers to seed forages on marginal land and establish shelterbelts. In the fifth year of the program, farmers who had previously applied for the tax credit could no longer be eligible.

According to the agricultural fieldman with the Municipal District of Rocky View, the program was very effective from an administrative perspective. The program was kept very simple and no additional staff had to be hired to carry out the program. Inspections of applications began in mid-May and continued into June and were conducted by the Conservation co-ordinator and two weed inspectors. The program was very much accepted by landowners and there was a relatively high level of participation. By 1995-96, the third year of the program, there were 130 applicants and the program was fully subscribed. One hundred fourteen applicants qualified on the basis of maintaining 45% residue cover after seeding, eight qualified for seeding marginal land to grass, and eight qualified for planting shelterbelts. When the program was fully subscribed, 17,000 acres were enrolled, which resulted in approximately $19,500 paid out to the local government to replace tax revenue lost that year. There are approximately 540,000 cultivated acres in the municipality of Rocky View and therefore, the tax exemption program affected

approximately 3 percent of the total land base per year (Personal Communication, Dietzler 1999).

The program was effective from a conservation perspective because many landowners adopted conservation tillage practices and the majority of the forages and trees planted still remain, protecting the land from erosion. 1999 was the first year the program was not be implemented. The municipality had not initiated any new conservation practices that were eligible for the tax incentive and so, a saturation point was reached in terms of the landowners who are interested in participating in the program and the landowners who remain eligible for the money (Personal Communication, Dietzler 2000).

Chapter 4 - Results

4.1 Limitations to this Study

Some questionnaires were only partially completed or not completed at all, usually due to landowner's absence during the survey period or a refusal to complete the questionnaire. This situation is referred to as non-response bias and is very common with most surveys (Satin and Shastry 1983). The primary limitation to this study, is that the population estimates were made assuming that the questionnaire respondents and non-respondents have the same characteristics. Therefore, there is potential for bias in the estimations if the non-respondents differ from the respondents. The standard approach in this situation, is to try to decrease the non-response rate. In order to do this, follow-up telephone calls were made to all landowners who were sent a questionnaire.

There was no evidence of any prominent differences between the non-respondents and respondents. There were approximately the same number of non-respondents in both Strathcona and Mountain North and these landowners owned land in various locations within both municipalities. Eighty four of the non-respondents were participants in the Environmental Tax Credit program and 186 of the non-respondents did not participate in the program. The majority of the non-respondents that did not participate in the Environmental Tax Credit program had not heard of the program. The majority of non-respondents ranged in age from 41 to 60 years of age. The size of their farming operations varied and the majority of non-respondents had some type of livestock as a

supplementary enterprise. Landowner's reasons for not responding to the questionnaire are documented in Table 4.1. According to this table, the main reasons for not responding to the questionnaire were; landowners do not want to fill out surveys and landowners have no time to fill out surveys. Also note that 25% of landowners seemed interested in the program and said they were going to fill out the survey but never did. Eight percent of landowners said that they owned a small acreage and applying for the program would not be worthwhile, and 2% of landowners owned forested land that would not qualify for the program. Approximately, 8% of landowners were not interested in the Environmental Tax Credit program because the $1 per acre was not enough money or they felt their land would not qualify for the program.

Table 4.1 Reasons For Not Responding to the Questionnaire

Reason	Frequency
Will Fill Survey Out at a Later Date	24.8
*Left a Message	18.5
Do Not Want to Fill Out A Survey	19.6
No Time to Fill Out a Survey	13.7
Only Own a Small Acreage	8.1
Not Interested in the Program	7.8
Only Own Forested Land	2.2
Wanted to Know if They Received a Tax Credit Prior to Filling Out the Survey	1.1
Would Not Talk	3.3
In Hospital	0.4
Hates the Organizations Involved	0.4

* message was left with a family member or on an answering machine.

Another limitation connected to the study is social desirability and politeness bias. This occurs when landowners have the tendency to feel one thing, but try to please the surveyor by slanting their answers towards those that they feel the surveyor wants to hear.

Landowners may slant their answers to be cooperative with surveyors, to fit social norms, or to ensure the tax credit program continues (Satin and Shastry 1983).

It is important to recognize that this study represents the opinions of landowners and the municipal staff at a particular snap-shot in time. Economic and social conditions at this time, may have affected both the enthusiasm of responding to questions and responding favorably to questions. For example, financial hardships and the associated stress were detected from conversations with landowners. With grain prices being at an all-time low and the water-logged conditions experienced in the spring of 1999, many landowners were unable to plant a crop and were unsure if their farming operation would persist. One quote from a farmer that attests to the stress felt throughout the farming community was, "Farmers are supplying the most important human need and they are only breaking even or losing money - we may lose our farm if this keeps up".

Lastly, there may be insufficient data to assume that by and large, there is a lack of support from assessment authorities for incorporating conservation goals into the property tax system. This perception was based on information gathered in the review of selected tax incentive programs, and one personal interview with a provincial assessment officer. If more time and money was available, it would be useful to perform further interviews of assessment authorities in order to obtain a more accurate representation of the general attitude of assessment authorities toward the Environmental Tax Credit program.

4.2 Survey Response Rate

The proportion of the land area in Strathcona and Mountain North covered by the survey is approximately 68%. Table 4.2 provides target and actual response rates for both program participants and non-participants surveyed. The target response for participants, based on a 50% response rate was 108 completed surveys. This was achieved given a total actual response of 132 returned surveys or an overall response rate of 61%. The target response rate for non-participants, based on a 20% response rate was 50 completed surveys. This was achieved given a total actual response of 66 returned surveys or an overall response rate of 26%.

Table 4.2 Survey Response Rates

Population	Population Number	Target Response Rate	Target Response	Actual Response Rate	Actual Response
Participants	216	50%	108	61%	132
Non-participants	252	20%	50	26%	66

4.3 Research Phase II - Results from the Mail-out Questionnaires

The responses to individual survey questions were reported in this chapter in accordance with the research question to which they applied. The research questions are reported according to the evaluation category they fall under in the Evaluation Framework. The evaluation framework categories include; 1) Program Relevance/Rationale; 2) Design and Delivery; 3) Program Impact; and 4) Program Cost Effectiveness.

4.31 Program Rationale

The results presented in this section relate to the purpose of the Environmental Tax Credit program and its ability to achieve the objectives set out by the agendas involved. The questionnaire included a number of questions which provided information on the clarification of; the people targeted by the program, the need for the program, the purpose of the program, and the program's standing among other existing programs.

4.311 Landowner Demographics

The surveys included a number of questions which provided information on the landowners. Table 4.3 displays the number and percentage of survey respondents in each age category. The majority of program participants ranged in age from 41 to 50 years old. The majority of non-participants ranged in age from 51 to 60 years old. The median age for participants (51.7) is slightly lower than the median age for non-participants (55.2). It is also interesting to note that there are very few respondents in the lower age categories from 15 to 30 years old.

Table 4.3 Age of Participants and Non-Participants

		Participants		Non-Participants	
	Age (years)	Frequency	Valid Percent	Frequency	Valid Percent
Valid	15-20	2	1.6	0	0
	21-30	6	4.8	4	6.8
	31-40	21	16.7	8	13.6
	41-50	32	25.4	10	16.9
	51-60	29	23.0	18	30.5
	61-70	18	14.3	12	20.3
	Over 70	18	14.3	7	11.9
	Total Response	126	100.0	59	100.0
	Missing	90		193	
Total		216		252	
	Median Age	**51.7**		**55.2**	

Table 4.4 displays the average length of time landowners have been involved in the farming operation. The mean length of time that participants had been involved in the farming operation was 26 years. The mean length of time that non-participants had been involved in the farming operation was 29 years.

Table 4.4 Length of Time Involved in the Farming Operation		
	Participants	Non-Participants
Mean	26.1	29.3
Standard Deviation	15.0	16.6
Range	68	60
Minimum	2	0
Maximum	70	60

Tables 4.5 and 4.6 are related to levels and sources of household income. It should be noted that there is a large number of participants (104) and non-participants (195) who did not respond to this question. This was expected, as many landowners are reluctant to give out information on their earnings. Of the 112 participants who answered this question, the median income was $28,000. The majority (60%) of participants relied on farming as their primary source of this household income. Of the 57 non-participants who answered this question, the median income was $17,000. The majority (59%) of non-participants relied on another occupation as their primary source of income.

Table 4.5 Income Level of Participants and Non-Participants					
		Participants		Non-Participants	
	Income Level	Frequency	Valid Percent	Frequency	Valid Percent
Valid	less than $10,000	26	23.2	25	43.9
	$10,000-19,999	18	16.1	5	8.8
	$20,000-$29,999	15	13.4	8	14.0
	$30,000-$39,999	13	11.6	7	12.3
	$40,000-$49,999	2	1.8	1	1.8
	$50,000-$59,000	4	3.6	0	0
	$60,000-$69,000	3	2.7	2	3.5
	$70,000-$79,000	1	.9	3	5.3
	$80,000 or over	30	26.8	6	10.5
	Total Response	112	100.0	57	100.0
	Missing	104		195	
Total		216		252	
	Median Income	**$28,000**		**$17,000**	

Table 4.6 Farming as the Primary Source of Income					
		Participants		Non-Participants	
		Frequency	Valid Percent	Frequency	Valid Percent
Valid	Yes	75	60.0	25	41.0
	No	50	40.0	36	59.0
	Total Response	125	100.0	61	100.0
	Missing	91		191	
Total		216		252	

4.312 Land Characteristics

The surveys included a number of questions which provided information on landowner's farming operations. Table 4.7 displays the average number of acres per landowner that were enrolled in the Environmental Tax Credit program. According to the survey results, the mean acreage that was enrolled in the program was 336 acres with the smallest number of acres enrolled being 16 acres and the largest number of acres enrolled being 1700 acres.

Table 4.7 Acreage Enrolled in the Environmental Tax Credit Program				
Mean	Standard Deviation	Range	Minimum	Maximum
369.3398	335.7	1684	16	1700

Tables 4.8 provides information on the characteristics of the farming operation including the average farm size and the number of acres in crop production, pasture land, hayland, idle land, and wetlands. It is interesting to note that the average farm size and the average number of acres of crops, pasture, hayland, idle land, and wetlands was greater for participants than non-participants. According to Table 4.8, the mean acreage of participant's farming operations was 962 acres with the smallest operation being 10 acres and the largest operation being 7000 acres. The mean acreage of non-participants farming

operations was 587 acres with the smallest operation being 1 acre and the largest operation being 3000 acres.

The mean acreage of participants that was in crop production was 510 acres. The number of acres in crop production ranged from 0 acres to 3600 acres. The mean acreage of non-participants that was in crop production was 312 acres. The number of acres in crop production ranged from 0 acres to 2400 acres.

The mean acreage of participants that was in pasture was 207 acres. The number of acres in pasture ranged from 0 acres to 1400 acres. The mean acreage of non-participants that was in pasture was 121 acres. The number of acres in pasture ranged from 0 acres to 1400 acres.

The mean acreage of participants that was used for hayland was 150 acres. The number of acres used for hayland ranged from 0 acres to 1100 acres. The mean acreage of non-participants that was used for hayland was 101 acres. The number of acres used for hayland ranged from 0 acres to 540 acres.

The mean acreage of participants that was left idle was 74 acres. The number of acres that were idle ranged from 0 acres to 1000 acres. The mean acreage of non-participants that was left idle was 29 acres. The number of acres that were idle ranged from 0 acres to 160 acres.

The mean acreage of participants that was wetlands was 52 acres. The number of acres of wetlands ranged from 0 acres to 1400 acres. The mean acreage of non-participants that was wetlands was 37 acres. The number of acres of wetlands ranged from 0 acres to 400 acres.

Table 4.8 Total Number of Acres For Each Type of Land Use										
	Participants					Non-Participants				
Type of Land Use	Mean	Standard Deviation	Range	Min.	Max.	Mean	Standard Deviation	Range	Min.	Max.
Farming Operation	962.2	1204.7	6990	10	7000	586.9	574.9	3000	1	3000
Crop Production	510.2	736.2	3600	0	3600	312.1	400.5	2400	0	2400
Pasture Land	207.2	300.9	1400	0	1400	121.5	247.4	1400	0	1400
Hayland	149.8	212.8	1100	0	1100	100.9	120.7	540	0	540
Idle Land	73.9	170.7	1000	0	1000	28.9	39.1	160	0	160
Wetlands	51.6	152.8	1400	0	1400	37.4	65.0	400	0	400

4.313 Reasons for Participating Or Not Participating in the Program

As previously mentioned, one of the purposes of this study was to determine the main reasons why landowners participated or did not participate in the program. Table 4.9 demonstrates the reasons why landowners participated in the Environmental Tax Credit program. Sixty two percent of participants said the main reason they participated in the Environmental Tax Credit program was for a tax break. Twenty percent of participants said they participated in the program to prevent soil erosion. Seventeen percent of participants said their reason for participating in the program was to benefit wildlife.

Table 4.9 Reasons For Participating in The Environmental Tax Credit Program			
	Response	Frequency	Valid Percent
Valid	Tax Break	104	61.9
	To Prevent Soil Erosion	33	19.6
	To Benefit Wildlife	28	16.7
	Other Reason	3	1.8
	Total Response	168	100.0
	Missing	85	
Total		253	

* Counts may not sum to the sample size because some respondents checked off more than one response. Also, the percentages may not sum to 100 percent because respondents checked off more than one response.

Table 4.10 shows the reasons why landowners did not participate in the Environmental Tax Credit program. Fifty two percent of non-participants said that their main reason for not participating in the Environmental Tax Credit program was because they had not heard of the program. In follow-up telephone calls made to landowners, this was made apparent. Many landowners were not aware of the program and asked many questions, including how to sign up for the program for next year.

Twenty two percent of non-participants said their reason for not participating was that $1 per acre was not adequate compensation for carrying out conservation practices. One respondent did not participate in the program because they did not want to encourage wildlife to dwell on their property. Nine percent of non-participants said that erosion was not a problem on their farm and therefore, there was no need for them to participate in the program. Additional reasons for not participating in the program included: landowners were leery and had suspicions about the "strings attached" to the tax credit; landowners disliked the organizations involved in the program; landowners only owned forested land that didn't qualify; and landowners only owned a small acreage and the money saved would not be worthwhile.

Table 4.10 Reasons For Not Participating in the Program

	Response	Frequency	Valid Percent
Valid	Not Aware of the Program	36	52.2
	$1/acre is Not Adequate Compensation	15	21.7
	Do Not Want Wildlife On My Farm	1	1.4
	Erosion is not a Problem On My Farm	6	8.7
	Other Reason	11	15.9
	Total Response	69	100.0
	Missing	186	
Total		255	

* Counts may not sum to the sample size because some respondents checked off more than one response. Also, the percentages may not sum to 100 percent because respondents checked off more than one response.

4.314 The Affect of Soil and Water Conservation Knowledge on Participation

There was an interest in determining whether landowner's understanding about soil and water conservation had an effect on their decision to participate in the Environmental Tax Credit program. The following questions were asked in order to gain some insight into participant's and non-participant's understanding of soil and water conservation. Responses were very similar for both participants and non-participants. Table 4.11 shows that of the 131 participants who answered this question, 98% agreed or strongly agreed that preventing soil erosion and loss of organic material is important for good crop production. Of the 62 non-participants that answered this question, 92% agreed or strongly agreed that preventing soil erosion and loss of organic material is important for good crop production.

Table 4.11 Prevention of Soil Erosion and Organic Matter Loss Increases Crop Productivity

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	0	0	1	1.6
	Disagree	0	0	0	0
	Neither Agree nor Disagree	3	2.3	4	6.5
	Agree	69	52.7	29	46.8
	Strongly Agree	59	45.0	28	45.2
	Total Response	131	100.0	62	100.0
	Missing	85		190	
Total		216		252	

Table 4.12 shows that of the 130 participants who answered this question, 87% agreed or strongly agreed that over the long-term, conservation tillage and the maintenance of vegetative cover on erodible land will help to improve the quality of land and crop production. Of the 61 non-participants that answered this question, 85% agreed or strongly agreed that over the long-term, conservation tillage and the maintenance of

vegetative cover on erodible land will help to improve the quality of land and crop production.

Table 4.12 Conservation Tillage and Maintenance of Vegetative Cover on Erodible Land Will Improve Crop Productivity

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	0	0	0	0
	Disagree	2	1.5	2	3.3
	Neither Agree nor Disagree	15	11.5	7	11.5
	Agree	80	61.5	30	49.2
	Strongly Agree	33	25.4	22	36.1
	Total Response	130	100.0	61	100.0
	Missing	86		191	
Total		216		252	

Table 4.13 shows that of the 131 participants who answered this question, 79% agreed or strongly agreed that maintaining land for wildlife and protecting the land and water resource base can be complementary to agricultural production. Of the 60 non-participants that answered this question, 70% agreed or strongly agreed that maintaining land for wildlife and protecting the land and water resource base can be complementary to agricultural production.

Table 4.13 Wildlife, Soil and Water Conservation Can Be Complementary to Agricultural Production

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	0	0	1	1.7
	Disagree	5	3.8	1	1.7
	Neither Agree nor Disagree	22	16.8	16	26.7
	Agree	73	55.7	34	56.7
	Strongly Agree	31	23.7	8	13.3
	Total Response	131	100.0	60	100.0
	Missing	85		192	
Total		216		252	

A student's t-test for a difference in means of two independent samples was performed in order to determine whether landowners who are knowledgeable about soil

and water conservation were more likely to participate in the Environmental Tax Credit program. According to Table 1 of appendix 14, there was insufficient evidence to accept the alternate hypothesis. The p-value of 0.13 suggests that at a 5% level of significance, landowners knowledge about soil and water conservation had no affect on their decision to participate in the program.

4.315 Landowner Attitudes Concerning the Taxation of Conservation Lands

The surveys contained questions that provided information on landowner's attitudes about municipal taxation of conservation lands. Table 4.14 shows that of the 130 participants who answered this question, 55% agreed or strongly agreed that municipal taxation of conservation lands is a major reason why landowners drain wetlands and clear forested land and native prairie for crop production. Of the 61 non-participants that answered this question, 66% agreed or strongly agreed that municipal taxation of conservation lands is a major reason why landowners drain wetlands and clear forested land and native prairie for crop production.

Table 4.14 Taxation is Major Reason Why Landowners Convert Conservation Lands

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Disagree	19	14.6	4	6.6
	Neither Agree nor Disagree	39	30.0	17	27.9
	Agree	47	36.2	26	42.6
	Strongly Agree	25	19.2	14	23.0
	Total Response	130	100.0	61	100.0
	Missing	86		191	
Total		216		252	

Table 4.15 shows that of the 130 participants that answered this question, 87% agreed or strongly agreed that society should compensate landowners for preserving natural lands such as wetlands and grasslands. Of the 61 non-participants that answered this question, 77% agreed or strongly agreed that society should compensate landowners for preserving natural lands such as wetlands and grasslands.

Table 4.15 Society Should Compensate Landowners for the Benefits of Sustainable Land Management

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Disagree	3	2.3	3	4.9
	Neither Agree nor Disagree	14	10.8	11	18.0
	Agree	57	43.8	21	34.4
	Strongly Agree	56	43.1	26	42.6
	Total Response	130	100.0	61	100.0
	Missing	86		191	
Total		216		252	

Binomial tests were performed in order to determine whether the sample results are statistically significant and the alternate hypothesis, that the majority of participants and non-participants feel that society should compensate landowners for the benefits of sustainable land management through the tax system, can be accepted. At a 5% significance level, there was sufficient evidence to accept the alternate hypothesis. The p-values of 0.000, in Tables 1 and 2 of appendix 13, indicate that the majority of participants and non-participants felt that society should compensate landowners for the benefits of sustainable land management through the tax system.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that society should compensate landowners for the benefits of sustainable land management through the tax system. According to Table 2 in appendix 14, there is

insufficient evidence to accept the alternate hypothesis. Therefore, at a 5% significance level the p-value of 0.148, suggests that participants and non-participants are equally likely to agree that society should compensate landowners for the benefits of sustainable land management through the tax system.

4.316 Landowner Awareness of the Taxes Paid on Conservation Lands

A question was asked to determine whether landowners were aware that the taxes they pay on conservation lands are approximately equal to or less than $1 per acre. In actual fact, landowners pay approximately $0.40 per acre on wetlands and $0.80 per acre on bush/scrub land. Table 4.16 demonstrates that 81% of participants think that the taxes they pay on conservation lands are greater than $1 per acre, while only 19% of participants think that they pay less than or equal to $1 per acre in taxes on conservation lands. 67% of non-participants think that the taxes they pay on conservation lands are greater than $1 per acre, while only 33% of non-participants think that they pay less than or equal to $1 per acre in taxes on conservation lands. These results seem to suggest that the majority of landowners were not aware that they pay equal or lower taxes than $1 per acre on conservation lands (such as wetlands and bushland).

Table 4.16 Property Taxes Paid on Conservation Lands Are < / > / = $1 per acre

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Greater Than	92	80.7	34	66.7
	Less Than	14	12.3	12	23.5
	Equal To	8	7.0	5	9.8
	Total Response	114	100.0	51	100.0
	Missing	102		201	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results are statistically significant and we can accept the alternate hypothesis that the majority of participants and non-participants are aware of the taxes they pay on conservation lands. According to Table 3 of appendix 13, there was insufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of >0.999, indicates that the majority of participants are unaware that the taxes they pay on conservation lands are equal to or less than $1 per acre. Similarly, in Table 4 of appendix 13, the p-value of 0.987 indicates that the majority of non-participants are unaware that the taxes they pay on conservation lands are equal to or less than $1 per acre.

A large-sample test for a difference in proportions of two independent populations was performed in order to determine whether participants are more likely than non-participants to be aware that they pay equal to or less than $1 per acre tax on conservation land. According to Table 1 of appendix 15, there was insufficient evidence to accept the alternate hypothesis. Therefore, at a 5% level of significance, the p-value of 0.966 suggests that participants and non-participants were equally likely to be aware that they pay the same or lower taxes on conservation land. Based on responses to the survey, it is speculated that landowner's awareness of their tax breakdown had no affect on their decision to participate in the program. Most landowners are not aware of the taxes they pay on different types of land. However, from talking to landowners, it was made apparent that the program has helped to make them more observant of their tax breakdown. Property taxes especially on marginal and native land, may have a significant influence over farmer's land use decisions.

4.317 The Need For the Environmental Tax Credit Program

There was an interest in identifying whether there was a problem with wind and water erosion on farms and in the municipalities and therefore, a need for the Environmental Tax Credit program. Tables 4.17, 4.18, 4.19, and 4.20 show the proportion of participants and non-participants that have a problem with erosion. Table 4.17 indicates that 22% of participants and 24% of non-participants either agreed or strongly agreed that soil erosion from wind is a problem on their farm. Table 4.18 indicates that 32% of participants and 35% of non-participants either agreed or strongly agreed that soil erosion from wind is a problem in their municipality. According to these percentages, wind erosion does not appear to be a serious concern in either municipality.

Table 4.17 Wind Erosion on the Farm

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	23	17.7	8	12.9
	Disagree	54	41.5	32	51.6
	Neither Agree nor Disagree	25	19.2	7	11.3
	Agree	27	20.8	15	24.2
	Strongly Agree	1	0.8	0	0
	Total Response	130	100.0	62	100.0
	Missing	86		190	
Total		216		252	

Table 4.18 Wind Erosion in the Municipality

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	9	6.9	2	3.2
	Disagree	36	27.7	23	37.1
	Neither Agree nor Disagree	44	33.8	15	24.2
	Agree	40	30.8	19	30.6
	Strongly Agree	1	0.8	3	4.8
	Total Response	130	100.0	62	100.0
	Missing	86		190	
Total		216		252	

Water erosion appears to be more of a problem in both municipalities with 58% of participants and 52% of non-participants either agreeing or strongly agreeing that soil erosion from water is a problem on their farm (Table 4.19). Table 4.20 also indicates that 66% of participants and 65% of non-participants either agreed or strongly agreed that soil erosion from water is a problem in their municipality. It is interesting to note, that some farmers would admit to there being erosion problems in the municipality but not on their farm. Water erosion was expected to be more of a problem than wind erosion because both municipalities have very rolling topography and Mountain North receives a lot of water runoff, especially in the spring and during heavy rainfalls, off the Duck and Porcupine Mountains. Due to the somewhat moderate levels of erosion experienced in the municipalities, there appears to be a need for the Environmental Tax Credit program.

Table 4.19 Water Erosion on the Farm

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	4	3.1	7	11.3
	Disagree	27	20.6	15	24.2
	Neither Agree nor Disagree	24	18.3	8	12.9
	Agree	62	47.3	28	45.2
	Strongly Agree	14	10.7	4	6.5
	Total Response	131	100.0	62	100.0
Missing	System	85		190	
Total		216		252	

Table 4.20 Water Erosion in the Municipality

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	1	0.8	4	6.5
	Disagree	13	9.9	5	8.1
	Neither Agree nor Disagree	31	23.7	13	21.0
	Agree	72	55.0	34	54.8
	Strongly Agree	14	10.7	6	9.7
	Total Response	131	100.0	62	100.0
	Missing	85		190	
Total		216		252	

Binomial tests were performed in order to determine whether the sample results were statistically significant and there was support for the alternate hypothesis that the majority of participants and non-participants will identify having a problem with erosion. At a 5% level of significance, there was sufficient evidence to accept the alternate hypothesis. The p-values of 0.000 in Tables 5 and 6 of appendix 13, indicate that the majority of participants and non-participants identified having a problem with erosion.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely to have erosion problems than non-participants. According to Table 3 of appendix 14, there is insufficient evidence to accept the alternate hypothesis. The p-value of 0.216 suggests that at a 5% level of significance, participants and non-participants were equally likely to experience erosion problems.

4.318 The Effectiveness of the Environmental Tax Credit Program

Landowners were questioned as to whether they believed the Environmental Tax Credit program would be effective at reducing erosion over the long-term. Table 4.21 shows that of the 129 respondents that answered this question, 62% of participants either agreed or strongly agreed that the Environmental Tax Credit program will help to reduce erosion over the long term by maintaining vegetative cover on the land. Of the 56 non-participants that answered this question, 43% of non-participants either agreed or strongly agreed that the Environmental Tax Credit program will help to reduce erosion over the long term by maintaining vegetative cover on the land.

Table 4.21 The Environmental Tax Credit Program Will Reduce Erosion					
		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	0	0	2	3.6
	Disagree	8	6.2	5	8.9
	Neither Agree nor Disagree	41	31.8	25	44.6
	Agree	58	45.0	20	35.7
	Strongly Agree	22	17.1	4	7.1
	Total Response	129	100.0	56	100.0
	Missing	87		196	
Total		216		252	

Binomial tests were performed in order to determine whether the sample results were statistically significant and there was support for the alternate hypothesis that the majority of participants and non-participants agree that the Environmental Tax Credit program will help to reduce erosion. At a 5% level of significance, there was sufficient evidence to accept the alternate hypothesis. The p-value of 0.004 in Table 7 of appendix 13, indicates that the majority of program participants agreed that the Environmental Tax Credit program will help to reduce erosion. On the contrary, the p-value of 0.825 in Table 8 of appendix 13 indicates that there was insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the majority of non-participants did not agree that the Environmental Tax Credit program will help to reduce erosion. However, note that a sizable minority of non-participants (43%) did agree that the program will help to reduce erosion over the long term.

A student's t-test for a difference in means was performed in order to determine whether participants are more likely than non-participants to agree that the program will help to reduce erosion. According to Table 4 of appendix 14, there was sufficient

evidence to accept the alternate hypothesis at a 5% level of significance. The p-value of 0.002 suggests that participants were more likely than non-participants to agree that the program will help to reduce erosion. This may be one of the reasons why participants enrolled their land in the program.

4.319 The Environmental Tax Credit Program's Rank Among Other Conservation Approaches

Landowners were asked to rank the Environmental Tax Credit program amongst eight other existing conservation approaches based on a scale from 1 to 8 (with 1 being their most preferred and 8 being their last preferred). Table 4.22 shows how frequently participants ranked each conservation approach in each class from 1 to 8. According to the mean rank (2.2), direct payments for conservation practices was the overall most preferred conservation approach because it was ranked number one 40 times and was also ranked number two the most number of times. The second most preferred conservation approach was the Environmental Tax Credit program with a mean rank of 2.4. It is also interesting to note that the tax credit program was ranked number one (the most preferred conservation approach) the most number of times (48 times). The third most preferred conservation approach was the provision of conservation farming equipment and materials with a mean rank of 3.6. According to the survey results, the least preferred conservation approach is land acquisition by conservation agencies with a mean rank of 5.9.

Table 4.22 Ranking of Different Conservation Approaches by Participants										
	Rank								Count	Mean Rank
Conservation Approach	1	2	3	4	5	6	7	8		
Direct Payment for Conservation Practices	40	41	19	6	3	1	2	1	113	2.2
The Environmental Tax Credit program	48	21	19	11	10	3	2	0	114	2.4
Provision of Conservation Farming Equipment & Material	12	25	31	15	10	6	10	4	113	3.6
Conservation Easements	7	8	22	23	19	14	17	3	113	4.5
Short-term Land Leasing (2yrs)	2	2	15	21	23	36	12	2	113	5.0
Long-term Land Leasing (10yrs)	4	6	15	11	25	24	21	7	113	5.1
Land Acquisition by Conservation Agencies	7	3	6	10	15	17	23	32	113	5.9
Other Methods	0	5	8	9	11	8	12	60	113	6.5

Table 4.23 shows how frequently non-participants ranked each conservation approach in each class from 1 to 8. According to the mean rank, direct payments for conservation practices was the overall most preferred approach with a mean rank of 2.4. The second most preferred conservation approach is the Environmental Tax Credit program with a mean rank of 3.0. The third most preferred conservation approach was the provision of conservation farming equipment and materials with a mean rank of 4.0. The least preferred conservation approach was land acquisition by conservation agencies with a mean rank of 5.0. Overall, it is very interesting to note that participants and non-participants have rated the different conservation approaches in a very similar fashion.

Table 4.23 Ranking of Different Conservation Approaches by Non-Participants										
	Rank								Count	Mean Rank
Conservation Approach	1	2	3	4	5	6	7	8		
Direct Payment for Conservation Practices	20	9	11	3	1	4	1	0	49	2.4
The Environmental Tax Credit program	16	7	10	5	4	4	0	3	49	3.0
Provision of Conservation Farming Equipment & Material	5	12	5	8	5	5	6	3	49	4.0
Conservation Easements	1	6	5	16	12	4	4	1	49	4.3
Long-term Land Leasing (10yrs)	5	5	3	5	12	11	8	0	49	4.6
Short-term Land Leasing (2yrs)	2	5	11	4	6	9	10	2	49	4.7
Land Acquisition by Conservation Agencies	3	6	4	5	11	2	11	7	49	5.0
Other Methods	0	1	4	1	3	6	5	29	49	6.9

4.32 Program Design and Delivery

The results presented in this section relate to questions which provided information relating to the services delivered under the Environmental Tax Credit Program by the agencies offering the program. The mechanism involved in delivering the program and the program strengths and weaknesses in terms of economic factors, environmental factors and community concerns, were also evaluated. A question relating to program structure was also included as it was important to evaluate whether the existing delivery mechanism was effective and efficient. Of particular interest in the area of program structure is whether or not the program was able to effectively address the intended beneficiaries' needs.

4.321 The Acceptability of $1/acre Compensation for Using Conservation Practices

The questionnaire contained questions that provided information on the services delivered under the Environmental Tax Credit program. Table 4.24 indicates that 28% of participants and 33% of non-participants felt that $1 per acre is adequate incentive for them to retain wetlands. Many landowners said it would depend on the type of wetland under consideration. However, the majority did not think that $1 per acre was sufficient money. When asked what would be an adequate amount, most respondents answered anywhere between $2-10 per acre. However, there was one respondent that thought $50 per acre would be a more appropriate amount.

Table 4.24 $1/acre is Adequate Incentive to Retain Wetlands

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	20	15.7	11	18.3
	Disagree	36	28.3	13	21.7
	Neither Agree nor Disagree	35	27.6	16	26.7
	Agree	34	26.8	18	30.0
	Strongly Agree	2	1.6	2	3.3
	Total Response	127	100.0	60	100.0
	Missing	89		192	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the majority of participants and non-participants feel that $1 per acre is adequate incentive to retain wetlands. According to Tables 9 and 10 of appendix 13, there was insufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of >0.999 in Table 9 of appendix 13, indicates that the majority of participants felt that $1 per acre was not adequate incentive for them to retain wetlands. However, note that a sizable minority of participants (28.4%) felt that $1 per acre was adequate incentive. Likewise, the p-value

of 0.993 in Table 10 of appendix 13, indicates that the majority of non-participants felt that $1 per acre was not adequate incentive to retain wetlands. Nevertheless, a sizable minority of non-participants (33%) felt that $1 per acre is adequate incentive.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that $1 per acre was adequate incentive for them to retain wetlands. According to Table 5 of appendix 14, there was insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-value of 0.683 suggests that participants and non-participants were equally likely to agree that $1 per acre was adequate incentive for them to retain wetlands.

Table 4.25 shows the 38% of participants and 48% of non-participants felt that $1 per acre was adequate incentive for them to maintain grasslands. However, the majority of respondents did not think that $1 per acre was enough money to maintain grasslands. When asked what they though was more appropriate compensation, most respondents answered anywhere between $2-10 per acre.

Table 4.25 $1/acre is Adequate Incentive to Maintain Grasslands

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	5	3.9	7	11.5
	Disagree	34	26.8	8	13.1
	Neither Agree nor Disagree	40	31.5	17	27.9
	Agree	45	35.4	25	41.0
	Strongly Agree	3	2.4	4	6.6
	Total Response	127	100.0	61	100.0
	Missing	89		191	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the majority of participants and non-participants feel that $1 per acre is adequate incentive to maintain grasslands. According to Tables 11 and 12 of appendix 13, there was insufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.996 in Table 11 of appendix 13, indicates that the majority of participants felt that $1 per acre was not adequate incentive to maintain grasslands. However, note that a sizable minority of participants (38%) felt that $1 per acre was adequate incentive to maintain grasslands. At a 5% level of significance, the p-value of 0.601 in Table 12 of appendix 13, indicates that the majority of non-participants felt that $1 per acre was not adequate incentive to maintain grasslands. Nonetheless, a sizable minority of non-participants (48%) felt that $1 per acre was adequate incentive to maintain grasslands.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that $1 per acre is adequate incentive for them to maintain grasslands. According to Table 6 of appendix 14, there was insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-value of 0.789 suggests that participants and non-participants were equally likely to agree that $1 per acre was adequate incentive for them to maintain grasslands.

Table 4.26 shows that 45% of participants and 39% of non-participants felt that $1 per acre was adequate incentive for them to leave more crop residue on their fields. However, the majority of respondents felt that $1 per acre was not enough money to

cause them to leave more residue cover on cropland. When asked what would be more adequate compensation, most respondents answered $2-10 per acre.

Table 4.26 $1/acre is Adequate Incentive to Leave More Crop Residue

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	6	4.8	6	9.8
	Disagree	25	19.8	16	26.2
	Neither Agree nor Disagree	38	30.2	15	24.6
	Agree	55	43.7	20	32.8
	Strongly Agree	2	1.6	4	6.6
	Total Response	126	100.0	61	100.0
	Missing	90		191	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the majority of participants feel that $1 per acre is adequate incentive to leave more crop residue on their fields. According to Tables 13 and 14 of appendix 13, there was insufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.837 in Table 13 of appendix 13, indicates that the majority of participants felt that $1 per acre was not adequate incentive for them to leave more crop residue on their fields. However, note that a sizable minority of participants (45%) felt that $1 per acre was adequate incentive for them to leave more crop residue on their fields. Likewise, the p-value of 0.938 in Table 14 of appendix 13, indicates that the majority of non-participants felt that $1 per acre was not adequate incentive for them to leave more crop residue on their fields. Nevertheless, a sizable minority of non-participants (39%) felt that $1 per acre was adequate incentive for them to leave more crop residue on their fields.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants

to agree that $1 per acre is adequate incentive for them to leave more crop residue cover on fields. According to Table 7 of appendix 14, there was insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-value of 0.132 suggests that participants and non-participants were equally likely to agree that $1 per acre was adequate incentive for them to leave more crop residue cover on fields.

4.322 Program's Ability to Achieve the Objectives Set Out by the Agendas Involved

There was an interest in determining whether participants thought the Environmental Tax Credit program encouraged them to carry out sustainable farming practices that will protect the land and water resource base and thus maintain and enhance the condition of the environment. Table 4.27 demonstrates that of the 130 participants that answered this question, 62% agreed or strongly agreed that the Environmental Tax Credit program had been successful at encouraging them to protect the land and water resource base from erosion.

Table 4.27 Tax Credit Program Encouraged Participants to Protect the Land & Water Resource Base

	Response	Frequency	Valid Percent
Valid	Strongly Disagree	2	1.5
	Disagree	6	4.6
	Neither Agree nor Disagree	42	32.3
	Agree	68	52.3
	Strongly Agree	12	9.2
	Total Response	130	100.0
	Missing	86	
Total		216	

A binomial test was performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that $1 per acre is adequate incentive to encourage the majority of participants to carry out sustainable

farming practices that will protect the land and water resource base. According to Table 15 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.006 indicates that the Environmental Tax Credit program encouraged the majority of participants to carry out sustainable farming practices that protect the land and water resource base.

Landowners were asked whether they thought the program would help to maintain and enhance the environment over the long-term. Table 4.28 shows that 84% of participants and 77% of non-participants felt that the Environmental Tax Credit program would help to maintain and enhance the condition of the environment over the long term.

Table 4.28 Tax Credit Program will Help Maintain the Condition of the Environment

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	0	0	1	1.6
	Disagree	1	0.8	0	0
	Neither Agree nor Disagree	20	15.6	13	21.3
	Agree	96	75.0	36	59.0
	Strongly Agree	11	8.6	11	18.0
	Total Response	128	100.0	61	100.0
	Missing	88		191	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the majority of participants and non-participants agree that the Environmental Tax Credit program will help to maintain and enhance the condition of the environment over the long term. According to Tables 16 and 17 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-values of 0.000 indicate that the majority of participants and non-participants agreed that the Environmental Tax Credit

program will help to maintain and enhance the condition of the environment over the long term.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that the Environmental Tax Credit program will help to maintain and enhance the condition of the environment over the long-term. According to Table 8 of appendix 14, there was insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-value of 0.515 suggests that participants and non-participants were equally likely to agree that the program will help to maintain and enhance the condition of the environment over the long-term.

4.323 The Mechanism Involved in Delivering the Program - the Property Tax System

In order to evaluate the program delivery mechanism, landowners were asked whether the property tax system was an effective means of promoting conservation practices. Table 4.29 shows that 88% of participants and 66% of non-participants felt that the property tax system was an effective means of compensating landowners who carry out conservation practices.

Table 4.29 Property Tax System is an Effective Delivery Mechanism

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Strongly Disagree	1	0.8	3	4.9
	Disagree	4	3.1	3	4.9
	Neither Agree nor Disagree	11	8.5	15	24.6
	Agree	93	71.5	35	57.4
	Strongly Agree	21	16.2	5	8.2
	Total Response	130	100.0	61	100.0
	Missing	86		191	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the majority of participants and non-participants feel that the property tax system is an effective means of compensating landowners who carry out conservation practices. According to Tables 18 and 19 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.000 in Table 18 of appendix 13, indicates that the majority of participants felt that the property tax system was an effective means of compensating landowners who carry out conservation practices. Similarly, the p-value of 0.011 in Table 19 of appendix 13, indicates that the majority of non-participants felt that the property tax system was an effective means of compensating landowners who carry out conservation practices.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to perceive the property tax system as an effective means of compensating landowners who carry out sustainable farming practices. According to Table 9 of appendix 14, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.001 suggests that participants were more likely than non-participants to perceive the property tax system as an effective means of compensating landowners who carry out sustainable farming practices. Participants presumably took part in the program because they supported the idea of using the property tax system as a means of compensating landowners who use conservation practices. These responses correspond with the findings that participants were more likely than non-participants to agree that the Environmental Tax Credit program will help to reduce erosion over the long term.

4.324 Administration of the Environmental Tax Credit Program

Landowners were asked questions regarding the administration of the Environmental Tax Credit program. Table 4.30 demonstrates that 74% of participants agreed or strongly agreed that the Environmental Tax Credit program, as administered, was easy to understand. Table 4.31 demonstrates that 74% of participants agreed and strongly agreed that the program applications were easy to fill out.

Table 4.30 The Program Was Easy to Understand

	Response	Frequency	Percent
Valid	Strongly Disagree	1	0.8
	Disagree	7	5.4
	Neither Agree nor Disagree	26	20.2
	Agree	89	69.0
	Strongly Agree	6	4.7
	Total Response	129	100.0
	Missing	87	
Total		216	

Table 4.31 Applications Were Easy to Fill Out

	Response	Frequency	Valid Percent
Valid	Disagree	4	3.1
	Neither Agree nor Disagree	29	22.5
	Agree	93	72.1
	Strongly Agree	3	2.3
	Total Response	129	100.0
	Missing	87	
Total		216	

A binomial test was performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the majority of participants feel that the Environmental Tax Credit program, as administered, was easy to understand. According to Table 20 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.000

indicates that the majority of participants felt that the Environmental Tax Credit program, as administered, was easy to understand.

4.325 Most Effective Method of Program Announcement

Table 4.32 shows how landowners became aware of the Environmental Tax Credit program. Fifty two percent of participants said that they became aware of the program through mail-out brochures. Twenty seven percent of participants became aware of the program through newspaper advertisements and 19% of participants became aware of the program through word of mouth. According to the survey results, the most effective method of program advertisement was the mail-out brochures. Many program participants also mentioned that the open house held in each municipality was very effective at introducing the program and helping landowners fill in their applications.

Table 4.32 Most Effective Method of Program Advertisement

	Response	Frequency	Valid Percent
Valid	Newspaper article	43	27.0
	Mail-out brochure	82	51.6
	Word of mouth	30	18.9
	Other	4	2.5
	Total Response	159	100.0
	Missing	85	
Total		244	

* Counts may not sum to the sample size because some respondents checked off more than one response. Also, the percentages may not sum to 100 percent because respondents checked off more than one response.

4.33 Program Impact

The program impact issues were separated into two categories: (a) recipient outcomes and (b) delivery system outcomes. This way, questions addressing the intended beneficiaries were distinguished from those that address the delivery mechanism of the program.

The results presented in this section relate to a number of questions which provided information on the impact of the program on the intended beneficiaries. The overall satisfaction of the program proponents, their reactions and perceptions, and the benefits they have gained from the program, were determined. Of particular interest is the impact the program has had on landowner awareness and attitudes regarding conservation practices and incorporating environmental factors into farm management decisions. There were also survey questions that provided information on the changes in farming practices or land use that may take place as a result of the program.

4.331 Landowner's Reactions Towards the Program

Questions were asked to determine the overall reaction at the producer level and whether the program was well-received. Frequency Table 4.33 indicates the extent to which participants felt the Environmental Tax Credit program was worthwhile. Of the 125 respondents that answered this question, 66% agreed and 20% strongly agreed that the program was worthwhile. There were no landowners that thought the program was not worthwhile. These numbers are very encouraging, especially for the first year of the program.

Table 4.33 Environmental Tax Credit Program is Worthwhile

	Response	Frequency	Valid Percent
Valid	Neither Agree nor Disagree	17	13.6
	Agree	83	66.4
	Strongly Agree	25	20.0
	Total Response	125	100.0
	Missing	91	
Total		216	

Frequency Table 4.34 shows how participants rated the program. Of the 127 respondents that answered this question, 72% rated the program as good and 10% rated the program as very good. This is extremely encouraging for the first year of the program and clearly shows that landowners support the program and the idea behind the program. There were no landowners that rated the program as poor.

Table 4.34 Overall Rating of Tax Credit Program

	Response	Frequency	Valid Percent
Valid	Neither Good nor Poor	23	18.1
	Good	91	71.7
	Very Good	13	10.2
	Total Response	127	100.0
	Missing	89	
Total		216	

A binomial test was performed in order to determine whether the sample results were statistically significant and there is support for the alternate hypothesis that the majority of participants will have a positive reaction towards the Environmental Tax Credit program. According to Table 21 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.000 indicates that that the majority of participants had a positive reaction toward the Environmental Tax Credit program.

4.332 Landowner's Perceptions of the Environmental Tax Credit Program

This question was asked to uncover what landowners considered the purpose of the program to be. Frequency Table 4.35 indicates how participants and non-participants perceived the Environmental Tax Credit program. Twenty one percent of participants and 19% of non-participants viewed the program as an economic incentive to change farming

practices. Thirty seven percent of participants and 32% non-participants view the program as compensation for those farmers who carry out good farming practices. The majority of participants (42%) and the majority of non-participants (49%) view the program as an awareness program with the primary purpose of encouraging people to think about conservation and the environment.

Table 4.35 Landowner Perceptions of the Environmental Tax Credit Program

		Participants		Non-Participants	
		Frequency	Valid Percent	Frequency	Valid Percent
Valid	Economic Incentive to Change Farming Practices	49	20.9	20	18.5
	Compensation for Carrying Out Good Farming Practices	87	37.0	35	32.4
	Conservation Awareness Program	99	42.1	53	49.1
	Total Response	235	100.0	108	100.0
	Missing	89		193	
Total		324		301	

* Counts may not sum to the sample size because some respondents checked off more than one response. Also, the percentages may not sum to 100 percent because respondents checked off more than one response.

4.333 Program Impact on Landowner Awareness & Attitudes Regarding Conservation Practices

There was an interest in determining, if any, the impact the program had on landowner's awareness and attitudes regarding conservation practices. Table 4.36 indicates that half of the participants agreed or strongly agreed that the program has helped to increase their awareness about taking care of their land (being good stewards of the land). Table 4.37 indicates that over half of the participants agreed or strongly agreed that the program has made them more environmentally conscientious. Table 4.38 indicates that 66% of participants said that the program has not changed their opinion on the importance of land and water conservation issues. However, the other 34% of participants said that the program has increased the importance they place on land and

water conservation issues. Table 4.39 indicates that over half of the participants agreed or strongly agreed that the program had caused them to become more aware of the importance of conservation farming. Lastly, Table 4.40 indicates that 72% of participants would continue to carry out conservation farming practices if the tax credit was removed.

Table 4.36 Program Increased Awareness about Taking Care of My Land

	Response	Frequency	Valid Percent
Valid	Strongly Disagree	1	0.8
	Disagree	10	7.9
	Neither Agree nor Disagree	52	40.9
	Agree	58	45.7
	Strongly Agree	6	4.7
	Total Response	127	100.0
	Missing	89	
Total		216	

Table 4.37 Program Made Me More Environmentally Conscientious

	Response	Frequency	Valid Percent
Valid	Strongly Disagree	3	2.4
	Disagree	8	6.3
	Neither Agree nor Disagree	46	36.2
	Agree	61	48.0
	Strongly Agree	9	7.1
	Total Response	127	100.0
	Missing	89	
Total		216	

Table 4.38 Program's Impact on the Importance Landowners Place on Soil & Water Conservation

	Response	Frequency	Valid Percent
Valid	Less Important to Me	0	0
	No Change	86	66.2
	More Important to Me	44	33.8
	Total Response	130	100.0
	Missing	86	
Total		216	

Table 4.39 Program Caused Me to be More Aware of the Importance of Conservation Farming			
	Response	Frequency	Valid Percent
Valid	Strongly Disagree	1	0.8
	Disagree	13	10.2
	Neither Agree nor Disagree	46	36.2
	Agree	57	44.9
	Strongly Agree	10	7.9
	Total Response	127	100.0
	Missing	89	
Total		216	

Table 4.40 I Would Continue to Carry Out Conservation Practices if Tax Credit was Removed			
	Response	Frequency	Valid Percent
Valid	Disagree	3	2.3
	Neither Agree nor Disagree	33	25.8
	Agree	81	63.3
	Strongly Agree	11	8.6
	Total Response	128	100.0
	Missing	88	
Total		216	

A binomial test was performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the Environmental Tax Credit program is likely to affect the majority of participant's awareness and attitudes regarding the importance of conservation practices. According to Table 22 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-value of 0.000 indicates that the Environmental Tax Credit program affected the majority of participant's awareness and attitudes regarding conservation land management decisions.

4.334 The Impact of $/acre on Landowner's Future Land Use Decisions

One of the main objectives of this study was to determine whether the tax credit will influence producer's future land management decisions. Table 4.41 shows that 49% of participants and 38% of non-participants were somewhat or extremely likely to maintain more residue on cropland in order to become eligible for the Environmental Tax Credit program next year. Approximately, 17% of participants and 29% of non-participants were somewhat unlikely or extremely unlikely to maintain more residue on cropland. When asked why not, reasons stated were; the added cost of changing farming equipment and using more herbicides under a minimum tillage operation; and the ground does not dry up fast enough in the spring under a minimum tillage operation.

Table 4.41 Maintain More Residue Cover on Cropland

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Extremely Unlikely	10	7.7	10	17.2
	Somewhat Unlikely	12	9.2	7	12.1
	Neither Likely nor Unlikely	45	34.6	19	32.8
	Somewhat Likely	56	43.1	15	25.9
	Extremely Likely	7	5.4	7	12.1
	Total Response	130	100.0	58	100.0
Missing	System	86		194	
Total		216		252	

Binomial tests were performed in order to determine whether the sample results were statistically significant and we can accept the alternate hypothesis that the Environmental Tax Credit program is likely to cause the majority of participants and non-participants to maintain more residue cover on cropland in order to become eligible for the program next year. According to Tables 23 and 24 of appendix 13, there was insufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.604 in Table 23 of appendix 13, indicates that the program was not likely to affect the

majority of participant's future decisions to maintain more crop residue cover. However, note that a sizable minority of participants (49%) said they were somewhat or extremely likely to maintain more residue on cropland in order to become eligible for the program next year. Likewise, the p-value of 0.956 in Table 24 of appendix 13, indicates that the program was not likely to affect the majority of non-participant's future decision to maintain more crop residue cover. However, note that a sizable minority of non-participants (38%) said they were somewhat or extremely likely to maintain more residue on cropland in order to become eligible for the program next year.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that the program will cause them to maintain more residue on cropland in order to become eligible for the program next year. According to Table 10 of appendix 14, there was insufficient evidence to accept the alternate hypothesis at a 5% significance level. The p-value of 0.065 suggests that participants and non-participants were equally likely to agree that the program will cause them to maintain more residue on cropland in order to become eligible for the program next year.

Table 4.42 shows that 77% of participants and 72% of non-participants were somewhat likely or extremely likely to maintain grasslands in order to become eligible for the Environmental Tax Credit program next year.

Table 4.42 Maintain Grasslands					
		Participants		Non-Participants	
		Frequency	Valid Percent	Frequency	Valid Percent
Valid	Extremely Unlikely	3	2.3	1	1.7
	Somewhat Unlikely	2	1.5	1	1.7
	Neither Likely nor Unlikely	25	19.1	15	25.0
	Somewhat Likely	60	45.8	29	48.3
	Extremely Likely	41	31.3	14	23.3
	Total Response	131	100.0	60	100.0
	Missing	85		192	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the Environmental Tax Credit program is likely to cause the majority of participants and non-participants to maintain grasslands in order to become eligible for the program next year. According to Tables 25 and 26 of appendix 13, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.000 in Table 25 of appendix 13, indicates that the program was likely to affect the majority of participant's future decisions to maintain grasslands. Correspondingly, the p-value of 0.001 in Table 26 of appendix 13, indicates that the program was likely to affect the majority of non-participant's future decision to maintain grasslands in order to be eligible for the Environmental Tax Credit program next year.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that the program will cause them to maintain grasslands in order to become eligible for the program next year. According to Table 11 of appendix 14, there is insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-

value of 0.183 suggests that participants and non-participants were equally likely to agree that the program will cause them to maintain grasslands in order to become eligible for the program next year.

Table 4.43 shows that 65% of participants and 56% of non-participants were somewhat or extremely likely to retain wetlands in order to become eligible for the Environmental Tax Credit program next year. Approximately, 8% of participants and 9% of non-participants were somewhat unlikely or extremely unlikely to retain wetlands. When asked why not, reasons stated were; it was inconvenient to farm around wetlands; the groundwater table was too high and potholes become a major source of salinity; and farmers can make more money from draining wetlands and cropping them. It is important to recognize that 27% of participants and 36% of non-participants took a neutral position (neither likely or unlikely). Many landowners said that their response depended on the type of wetland implied. Many farmers were willing to retain large wetlands with little or no agricultural potential. On the other hand, farmers felt that $1 per acre was not adequate incentive to retain small potholes in fields that can be drained and cropped.

Table 4.43 Retain Wetlands

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Extremely Unlikely	5	3.8	3	5.1
	Somewhat Unlikely	5	3.8	2	3.4
	Neither Likely nor Unlikely	35	26.9	21	35.6
	Somewhat Likely	39	30.0	24	40.7
	Extremely Likely	46	35.4	9	15.3
	Total Response	130	100.0	59	100.0
	Missing	86		193	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the

Environmental Tax Credit program is likely to cause the majority of participants to retain wetlands in order to become eligible for the program next year. According to Table 27 of appendix 13, there was sufficient evidence to accept the alternate hypothesis at a 5% level of significance. The p-value of 0.001 indicated that the program was likely to affect the majority of participant's future decision to retain wetlands in order to be eligible for the Environmental Tax Credit program next year. On the contrary, Table 28 of appendix 13, indicates that there was insufficient evidence to accept the alternate hypothesis at a 5% level of significance. The p-value of 0.218 indicates that the program was not likely to affect the majority of non-participant's future decision to retain wetlands in order to be eligible for the Environmental Tax Credit program next year. However, a sizable minority of non-participants (56%) said they were somewhat or extremely likely to retain wetlands in order to become eligible for the program next year.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that the program will cause them to retain wetlands in order to become eligible for the program next year. According to Table 12 of appendix 14, there was sufficient evidence to accept the alternate hypothesis. At a 5% level of significance, the p-value of 0.026 suggests that participants were more likely than non-participants to agree that the program will cause them to retain wetlands in order to become eligible for the program next year.

Table 4.44 shows that 69% of participants and 66% of non-participants were somewhat or extremely likely to plant permanent grasses or forages on marginal land rather than annual crops in order to become eligible for the Environmental Tax Credit program next year.

Table 4.44 Plant Permanent Grasses/Forages on Marginal Cropland

		Participants		Non-Participants	
	Response	Frequency	Valid Percent	Frequency	Valid Percent
Valid	Extremely Unlikely	9	6.9	4	6.8
	Somewhat Unlikely	6	4.6	6	10.2
	Neither Likely nor Unlikely	26	19.8	10	16.9
	Somewhat Likely	59	45.0	24	40.7
	Extremely Likely	31	23.7	15	25.4
	Total Response	131	100.0	59	100.0
	Missing	85		193	
Total		216		252	

Binomial tests were performed in order to determine whether our sample results were statistically significant and we can accept the alternate hypothesis that the Environmental Tax Credit program is likely to cause the majority of participants and non-participants to plant permanent grasses or forages on marginal land rather than annual crops in order to become eligible for the program next year. According to Tables 29 and 30 of appendix 13, there was sufficient evidence to accept the alternate hypothesis at a 5% level of significance. The p-value of 0.000 in Table 29 of appendix 13, indicates that the program was likely to affect the majority of participant's future decisions to plant permanent grasses or forages on marginal land rather than annual crops. The p-value of 0.010 in Table 30 of appendix 13, indicates that the program was likely to affect the majority of non-participant's future decision to plant permanent grasses or forages on marginal land rather than annual crops in order to be eligible for the Environmental Tax Credit program next year.

A student's t-test for a difference in means of two independent samples was performed in order to determine whether participants are more likely than non-participants to agree that the program will cause them to plant permanent grasses or forages on marginal cropland rather than annual crops in order to become eligible for the program next year. According to Table 13 of appendix 14, there was insufficient evidence to accept the alternate hypothesis. At a 5% significance level, the p-value of 0.360 suggests that participants and non-participants were equally likely to agree that the program will cause them to plant permanent grasses or forages on marginal cropland rather than annual crops in order to become eligible for the program next year.

4.4 Research Phase III - Results from the Municipal Staff Interviews

Interviews were conducted with the administrator, Barry McGill, and reeve, John Chambers, of the Strathcona municipality and the administrator Bev Ready, and reeve, Jack McKay, of the Mountain North municipality. Interviews were performed in order to determine their reactions and attitudes about the Environmental Tax Credit program. The same set of questions were asked to each municipality and where their answers were similar, responses were combined. Similarly, where there are discrepancies in their responses, both viewpoints are documented. The interview questions are reported according to the evaluation category they fall under in the Evaluation Framework. The evaluation framework categories include; 1) Program Relevance/Rationale; 2) Design and Delivery; 3) Program Impact; and 4) Program Cost Effectiveness.

4.41 Program Rationale

In this section, the results presented relate to questions addressing the purpose of the Environmental Tax Credit program and its ability to achieve the objectives set out by the agendas involved. The interview included a number of questions which provided information on the clarification of; the people targeted by the program, the need for the program, the purpose of the program, and the program's standing among other existing programs.

4.411 The People Targeted by the Program

The municipal staff was asked whether they thought the type of farming operation (i.e. viability in terms of size or number of productive acres versus unproductive acres); farm income; or landowner age had an effect on program participation.

Both municipalities agreed that age, farm income, or size of the farming operation had little influence over participation in the program. There was a mix of landowners enrolled in the program - people that own anywhere from 10 to three thousand acre grain, livestock or mixed farms were applying. If anything, it was thought that larger operations would be more likely to participate because they have the equipment (e.g. large air seeders) suitable for minimum tillage. Participants ranged in age from 40 to 60 years. There are not a lot of young farmers in either municipality. According to Barry, "We are going to lose a whole generation of young farmers because of the economic situation in the farming community".

The municipal staff was asked whether they thought the majority of farmers were aware of the amount of taxes they pay on conservation lands (eg: wetlands, forested land) as opposed to good quality land that is suitable for crop production.

The Mountain staff thought that landowners were very aware of the taxes they pay on different types of land. Bev Ready stated, "when farmers come into the office to complain about their taxes they seem to know exactly what they are talking about". The Strathcona staff on the other hand, thought that the majority of landowners were unaware of the taxes they pay on conservation lands. According to Barry McGill, "farmers average their tax bill over their entire acreage - thinking they pay roughly the same amount of tax on each acre whether it is productive or not". He believes the Environmental Tax Credit program has and will continue to cause farmers to inquire about this type of information.

4.412 The Need for the Environmental Tax Credit Program

The municipal staff was asked whether soil erosion from wind and water was a problem in the municipality and if so, what effect it had on municipal operations and costs. This question was asked in order to determine whether there was a need for the program.

Both municipalities agreed that soil erosion, especially from water, was a problem. Mountain North receives a lot of water runoff from the Duck Mountains. In Strathcona, water erosion is becoming more of a problem especially in recent years when annual precipitation has been high. Both municipalities have rolling topography which seems to contribute to the erosion problems.

Neither municipality was aware of the exact cost of prevention and maintenance associated with erosion. For the purposes of future evaluation efforts, it would be useful

to have actual dollar amounts that could be attributed to the cost of soil erosion within each municipality.

4.413 The Purpose of the Environmental Tax Credit Program

When questioned as to whether they felt the Environmental Tax Credit program could help to reduce erosion over the long-term, both municipalities agreed that the program will help to reduce both wind and water erosion by maintaining some type of cover on the ground and influencing farmers to plant permanent vegetation on marginal farmland.

The municipal staff was asked how important each of the following reasons for preserving natural lands were: decreasing wind and water erosion; maintaining quality of water; maintaining natural beauty; and preserving wildlife habitat.

Decreasing wind and water erosion was the most important reason for preserving natural lands and protecting erodible farmland. The municipalities were also very concerned about maintaining good water quality but recognized that this was an indirect consequence of reducing soil erosion. The municipalities were not as concerned about maintaining wildlife habitat and natural beauty. However, they do value wildlife and having a healthy, aesthetically pleasing landscape.

When questioned as to whether ecological goods and services like wildlife, groundwater recharge, flood and erosion control, soil and water quality, etc. require a defined monetary value to make them worth preserving, both municipalities thought that ecological goods and services required a dollar value in order to make landowners want to preserve them. If ecological goods and services had an economic value they could be

more easily included in a producer's farm decisions. Most farmers need some type of economic incentive in order to encourage them to maintain natural areas. If farmers knew how much these goods and services were worth to society and were compensated for them even in a small way, they would be more likely to carry out sustainable farming practices that benefit the environment. This was thought to be especially true for wetlands. Farmers can make money from draining and cropping wetlands. If farmers were aware of how little taxes they actually pay on wetlands or if they were given money for retaining wetlands, they may not be so inclined to drain them.

When questioned as to whether they thought that participation in conservation programs such as the Environmental Tax Credit program was necessary in order to protect the land and water resource base, both municipalities agreed that if the farming situation today was more promising, an economic incentive may not be needed to encourage farmers to carry out conservation practices. However, due to extremely low grain prices and high input costs, farmers cannot tolerate any extra costs. Most farmers seem to be conservation-minded but the reality is that economics drives everything. Conservation programs must be economically viable to the farmer.

The municipal staff was asked what they thought the major reason was for landowners draining wetlands and clearing forested land and native prairie for crop production. They were also asked if conservation lands were not taxed, would farmers still convert them.

Landowners drain wetlands and clear forested land and native prairie for crop production, for economic reasons only. Farmers can make some economic gain by cropping this land or converting it to pasture land for livestock. However, in many cases

the cost to the farmer and to the environment makes the draining and clearing of natural lands questionable. A tax break on natural lands could make landowners reevaluate the economics of such actions. Landowners must be encouraged to weigh out the pros and cons of increased erosion, loss of productive top soil, wear and tear on equipment, difficulty in farming the land itself, marginal income with a tax break and the maintenance of good conservation practices. Barry says, "most farmers realize after the fact, that they don't profit from farming marginal land - the cost of production is too high to make farming on marginal land profitable".

4.414 The Environmental Tax Credit Program's Rank Among Other Conservation Approaches

The municipal staff were asked to rank the Environmental Tax Credit program amongst other existing conservation approaches. They were also questioned about the advantages or disadvantages of the Environmental Tax Credit program over other existing conservation methods.

Jack Mackay and Bev Ready, the Mountain North staff, were not very familiar with the details of different conservation methods. However, they rated the tax credit program as one of their most preferred methods and land acquisition as their last choice. They believe that landowners prefer conservation methods that pay out the greatest amount of money without diminishing the farmer's ability to control and manage their land. Bev Ready thinks that, "the Environmental Tax Credit program was well liked because of the direct economic benefit to the farmer". Mountain North favored the

Environmental Tax Credit program because of the extensive amount of acres protected by the program for the total amount of money spent.

Barry McGill and John Chambers, the Strathcona staff, rated the Environmental Tax Credit program, direct payments for conservation practices and provision of farming equipment as their three most preferred conservation methods. Barry McGill stated, "we like the idea of a tax credit program because all landowners can become involved and can try out the program without a big capital investment. Farmers don't have to change their farming practices to be eligible for the program and those farmers that are already carrying out conservation practices are rewarded for their efforts".

4.42 Program Design and Delivery

In this section, results presented relate to interview questions that provided information relating to the services delivered under the Environmental Tax Credit program by the agencies offering the program and the municipal government's role in delivering the program. The mechanism involved in delivering the program and the program strengths and weaknesses in terms of economic factors, environmental factors and community concerns, were also evaluated.

4.421 Municipal Staff's Opinion of the $1 per acre Tax Credit

The municipal staff were asked whether $1 per acre was adequate incentive to carry out the following farming practices; maintain grasslands, retain wetlands, maintain more residue on cropland, and plant permanent forages/grasses on marginal croplands.

Both municipal administrators thought that $1 per acre was adequate incentive for maintaining grasslands and planting permanent forages/grasses on marginal cropland rather than annual crops. This was because the majority of landowners are or already have decided to undertake these farming practices. Both administrators did not feel that $1 per acre was adequate incentive for maintaining more crop residue on fields or retaining wetlands. $1 per acre incentive to retain wetlands could be seen in two ways by landowners. For example, a farmer with a large wetland suitable for wildlife habitat and having no farming potential, could benefit from the $1 per acre tax credit. Conversely, if the wetland was a small pothole which could be drained and farmed then the credit was inadequate to prevent the landowner from draining it.

Bev Ready liked the fact that $1 per acre was consistent for each conservation practice because it made administering the program easier. Barry McGill thought that most landowners viewed the tax credit as an extra bonus. He stated that, "landowners who felt that $1 per acre was adequate incentive had already made a management decision to carry out the farming practices encouraged by the program. However, for those farmers thinking about changing their practices, a tax credit could be that extra push that gets them to change."

4.422 The Mechanism Involved in Delivering the Program - the Property Tax System

The municipal staff were questioned as to whether they thought the property tax system was an effective means of compensating landowners who carry out conservation practices. Both municipalities agreed that the property tax system was an effective and

fair way of compensating landowners who carry out environmentally-friendly farming practices. "Taxes are a burden - everybody has to pay them and everybody hates doing it," says Bev Ready.

4.423 The Administration of the Environmental Tax Credit Program

The municipal staff were questioned about the administration of the Environmental Tax Credit program and what changes, if any, could have been made.

The municipality of Mountain North thought the program was an "administrative nightmare" but only because the money from the Northwest Soil Conservation Association was not available on time. The money was delivered to the municipality in payments instead of one lump sum. The payments were as follows; $10,000 in August, $5,000 in September and then the remainder in November. The municipality of Mountain did not send out receipts to landowners informing them of the tax credit amount. Instead, the tax credit was taken directly off the amount owing on the tax bill of those landowners who came into the office to pay their taxes. Those landowners who paid their tax bill by mail paid the full amount and were sent a cheque in November, for the tax credit amount and a letter explaining that this money was courtesy of the Environmental Tax Credit program. The tax revenue that was lost because of paying out the tax credits, was left outstanding on the municipal roll until the external funding came in.

Similarly, the municipality of Strathcona was not pleased that the money wasn't in on time. They were told that the money and eligibility forms would be in by June. Farmers pay their taxes from mid-July to October 31st, and Strathcona offers a discount for early payments made by the end of July. "We had landowners coming in to pay their

taxes in July and we didn't know whether they were even eligible for the tax credit - and we did not have the money to pay them," says Barry. Therefore, farmers were billed for the full amount and had to be sent a cheque for the tax credit amount when the external funding came in. The external funding was given to the municipality in payments of $10,000 in August, $10,000 in September and then the remainder in October. When the external funding was available, the tax credit was taken directly off the balance owing for those landowners who came into the municipal office to pay their taxes. Those landowners who paid their taxes by mail, paid the full amount and were sent a cheque for the tax credit amount in December. All landowners in Strathcona were sent a tax receipt that specified how much money was credited to their account from the Environmental Tax Credit program.

Strathcona was also unhappy with the eligibility list that was faxed to them because the client number and beginning of last names were cut off the sheet. This made the administrative process more time consuming because Barry had to look up each landowner. Both municipalities concluded that in order to avoid a lot of confusion, the municipality and landowners should be notified about eligibility and the amount of tax credit they are going to receive prior to the tax notices being mailed out to landowners. The funding should be credited to the municipal tax roll by mid-July at the latest so that the tax credit can be taken directly off the landowner's tax bill and the municipality is assured of the funding.

4.43 Program Impact

The program impact issues were separated into two categories: (a) recipient outcomes and (b) delivery system outcomes. This way, questions addressing the intended beneficiaries were distinguished from those that address the delivery mechanism of the program. In this section, results presented relate to interview questions which provided information on the impact of the program on the intended beneficiaries. The overall satisfaction of the program proponents, their reactions and perceptions, and the benefits they have gained from the program, were determined. Of particular interest is the impact the program has had on the municipal staff's awareness and attitude regarding conservation practices.

4.431 Municipal Government's Reaction Towards the Program

Overall the municipal staff of Mountain North and Strathcona felt the program is very good and worth continuing in the future. Both municipalities received feedback from landowners that was all very positive. Landowners felt the program was a good idea and were very pleased to get a tax break. Many farmers were happy to get some recognition and wanted to know who they could acknowledge for the tax break. Most of the feedback came from landowners that did not participate in the program this year because they were not aware of it. These landowners came into the municipal office to inquire about the program.

4.432 Benefits of the Environmental Tax Credit Program

There was also an interest in determining, if any, the main benefits of the program. Therefore, questions were asked about the economic, environmental, and social benefits of the Environmental Tax Credit program and who would obtain these benefits.

The Mountain North staff said the Environmental Tax Credit program was beneficial because it has the potential of providing financial benefits to both landowners and the municipality. Strathcona liked the program because it made landowners aware that they are paying less tax on natural lands, which may get them to think twice before making decisions to convert these lands for crop production. Both municipalities anticipate that society will benefit from the sustainable land management practices encouraged by the program. Some of the benefits they talked about were; improved air and water quality, wildlife (for both hunting and viewing), and the beauty and aesthetics of natural places. Farmers benefit as well, because improved soil quality will help to increase crop yields in the long-term and bring economic benefits. By acknowledging farmers who are good stewards of the land, the program will also help to increase personal satisfaction and encourage farmers to continue practicing sustainable farming.

The municipality expects to see cost reductions in road and crossing repairs, silt removal from ditches, as well as other related infrastructure costs. "We are hoping to see changes in our costs after the second year of the program," says Barry McGill. Barry not only sees cost reductions that may result from the program but also thinks the tax credit will help to reduce the number of tax-related complaints received each year due to the fact that landowners will be more content. Both municipalities also mentioned that they were pleased with the large number of acres that were protected by the program.

4.433 Program Impact on Municipal Staff's Awareness & Attitudes Regarding Conservation Practices

When asked whether the Environmental Tax Credit program made them more aware of the importance of conservation farming, the Mountain staff felt the program had made them more aware of good soil and water conservation practices and of the opportunities the municipality may have to save money from reduced erosion. Strathcona staff has always tried to promote good farming practices in the past. John Chambers, the municipal reeve, is also a local farmer and has always tried to carry out sustainable farming practices. The Environmental tax Credit program has however, made them more observant of the tax breakdown on various types of land.

4.44 Program Cost-Effectiveness

In this section, the results presented relate to whether or not the program was an efficient mechanism for conserving the land and water resource base, in terms of the resources (labor and financial) and added time imposed upon the municipal government to carry out the program. The questions asked focused mainly on the financial data management system and administrative work.

When questioned as to whether it would be cost-effective for a municipality to carry out this type of program, both municipalities agreed that the Environmental Tax Credit program would be cost-effective in its present from. If the municipal government had to fund the tax credits - it would be farmers paying farmers. This is because the vast majority of taxes in the municipality are being paid by the farmers themselves. The municipalities thought that funding should come from an outside source like senior levels

of government. The municipalities were willing to take on extra work and hours of administration but do not have extra funding to allocate towards the program. Bev Ready commented that the cost savings to the municipality would not be equivalent to the lost tax revenue of approximately $22,000 in tax credits that would have to be paid out to landowners. In other words, the overall benefits do not outweigh the costs.

When questioned about the additional expenses or added work load as a result of the program, the municipal staff said that there had not been any additional staff hired or expenses as a result of the program. There was however, a lot of additional work hours added to the existing staff to administer the program. This was thought to be attributed to this year being the first field season of the program and the administration was essentially trial-and-error. The additional work hours resulted from the disorder that took place because the funding was not available on time.

There was an ongoing discussion in regards to where the program funds should stem from if the property tax system was changed and the Environmental Tax Credit program ran province wide. The municipal government felt that if they were to adopt the program, the funding would have to come from the provincial and federal governments. It was agreed upon that both the provincial and federal governments should reimburse the municipalities for the tax revenue lost as a result of the Environmental Tax Credit program. The municipal staff were unable to suggest where this funding should originate, however, they did mention that it would be totally inappropriate to fund this program through increased taxation.

4.5 Research Phase IV - Results from Examining GIS Land Data

The program impact issues were separated into two categories: (a) recipient outcomes and (b) delivery system outcomes. This way, questions addressing the intended beneficiaries were distinguished from those that address the delivery mechanism of the program. In this section, the results presented relate to questions that addressed the delivery mechanism of the program. Issues relating to delivery system outcomes evaluate the program from a functional perspective including partnerships developed, program satisfaction, and the overall acreage that was enrolled in the program and therefore protected from wind and water erosion. GIS data was also used to determine if the land enrolled in the program was susceptible to erosion and therefore requires protection.

Project partners include the rural municipalities of Strathcona and Mountain North, Ducks Unlimited Canada, Prairie Farm Rehabilitation Administration, Northwest Soil Management Association, and the Delta Waterfowl Foundation. According to Jeff Thiele, a soil conservationist with PFRA (1999), there was an opportunity to reduce costs by sharing with other organizations information gathered and analysis performed. Collaborative partnerships encouraged joint decision-making with regard to planning and program design, delivery, monitoring and evaluation. The partnerships formed were essential for encouraging the sharing of resources such as information, labor, and money and maximizing the benefits of any government and private funding. In the future, these organizations hope to develop formal and informal partnerships with other federal departments and agencies, other levels of government, industry and organizations interested in the continuation of Environmental Tax Credit program.

The following table (4.45) indicates the number of landowners that participated in the Environmental Tax Credit program and the number of acres that were protected under the program in each municipality. The total applicants for both municipalities was 233 which represents approximately 33% of all landowners in the two municipalities. Table 4.45 shows the program is protecting 6,538 acres of wetlands, 15,116 acres of land under conservation tillage, and 39,334 acres of tame forage, native prairie and riparian zones. The total number of acres enrolled in the program for both municipalities was 60,988 acres, which represents approximately 28% of the total privately owned land base. The number of acres enrolled in the program surpassed the original 25% sign-up rate for the 1999 field season. Furthermore, it is important to recognize that the average tax credit per landowner was $261.80 though, the tax credit payments ranged anywhere from $1 to $1628. Based on these numbers alone, the program has surpassed its targeted number of acres for the first year and appears to have been very favorable. It should be noted that for the 1999 field season, no eligible landowners were excluded from the program due to a lack of funding.

Table 4.45 1999 Outcomes of the Environmental Tax Credit Program

	Wetland (acres)	Cropland >40% (acres)	Forage/ Riparian/ Native (ac)	Total (ac)	% of RM protected	Clients (#)	Ave. / Client (ac)	Quarter Sections (#)	Ave./ Quarter (ac)
Strathcona									
applied	5356	16631	24646	46633		140	333.1	420	111.0
eligible	4205	11363	22702	38270	32.2	138	277.3	417	91.8
Mountain N									
applied	2840	8775	18221	29836		95	314.1	274	108.9
eligible	2333	3753	16632	22718	22.4	95	239.1	269	84.5
Totals									
applied	8196	25406	42867	76469		235	325.4	694	110.2
eligible	**6538**	**15116**	**39334**	**60988**	**27.7**	**233**	**261.8**	**686**	**88.9**

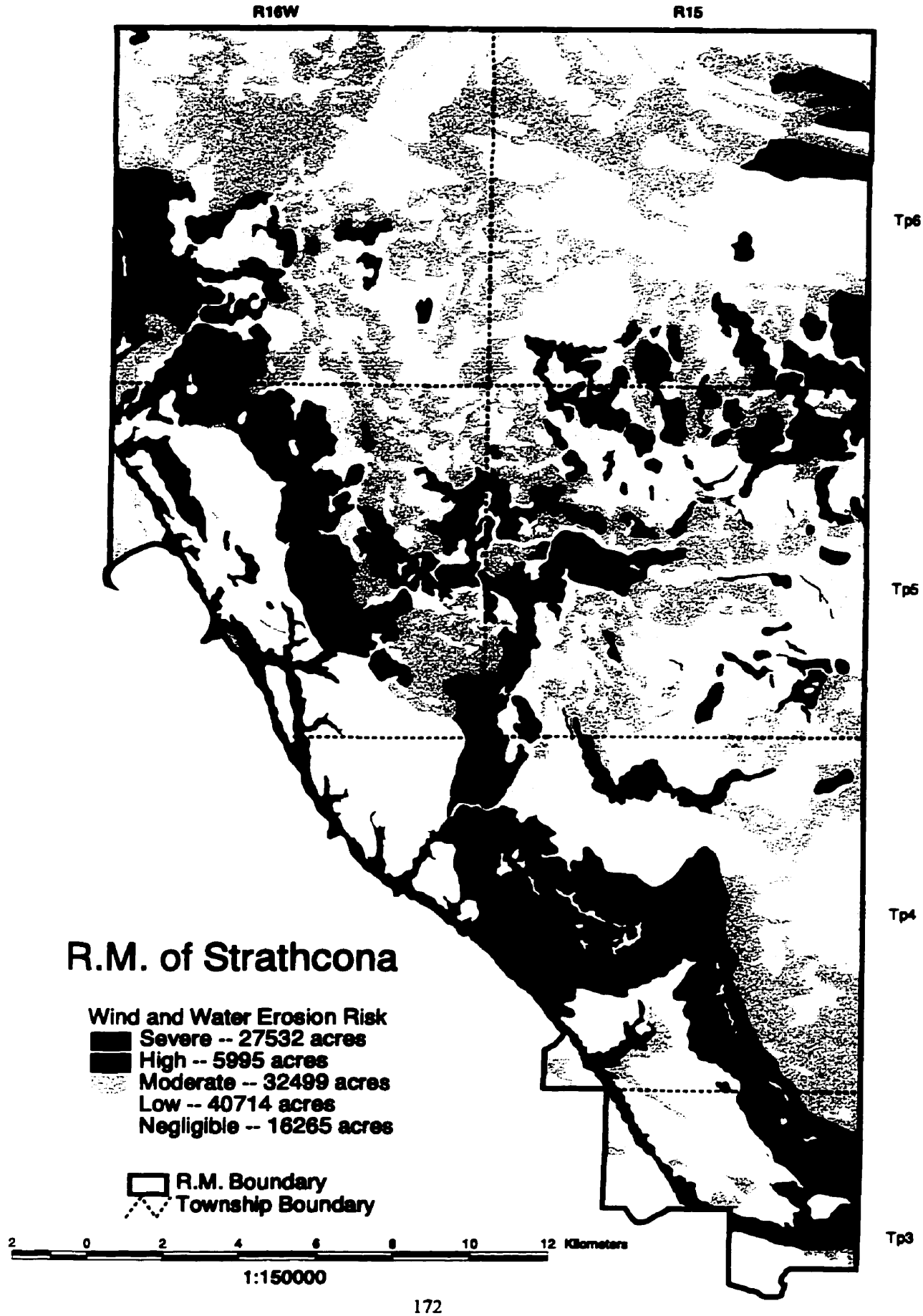
The maps on the following pages, were obtained from PFRA in order to determine whether the program is protecting land that "requires protection" from erosion. Maps 4 and 7 classify land in each municipality under the Erosion Risk categories; Severe, High, Moderate, and Low. Soils are sampled throughout the area and the samples are analyzed for chemical and physical properties. These properties are described and interpreted as to their susceptibility to erosion. Maps 4 depicts the risk of soil erosion by both wind and water in Strathcona. Map 7 depicts the risk of soil erosion by both wind and water in Mountain North. Evaluating the risk of water erosion was completed using the Universal Soil Loss Equation. The annual soil loss due to water erosion is a function of soil erosivity, rainfall intensity, topography, vegetative cover, and conservation practices. Evaluating the risk of wind erosion was completed using the wind erosion equation. The annual soil loss due to wind is a function of surface roughness and aggregation factor, soil resistance to movement, wind velocity at the soil surface, and soil moisture content.

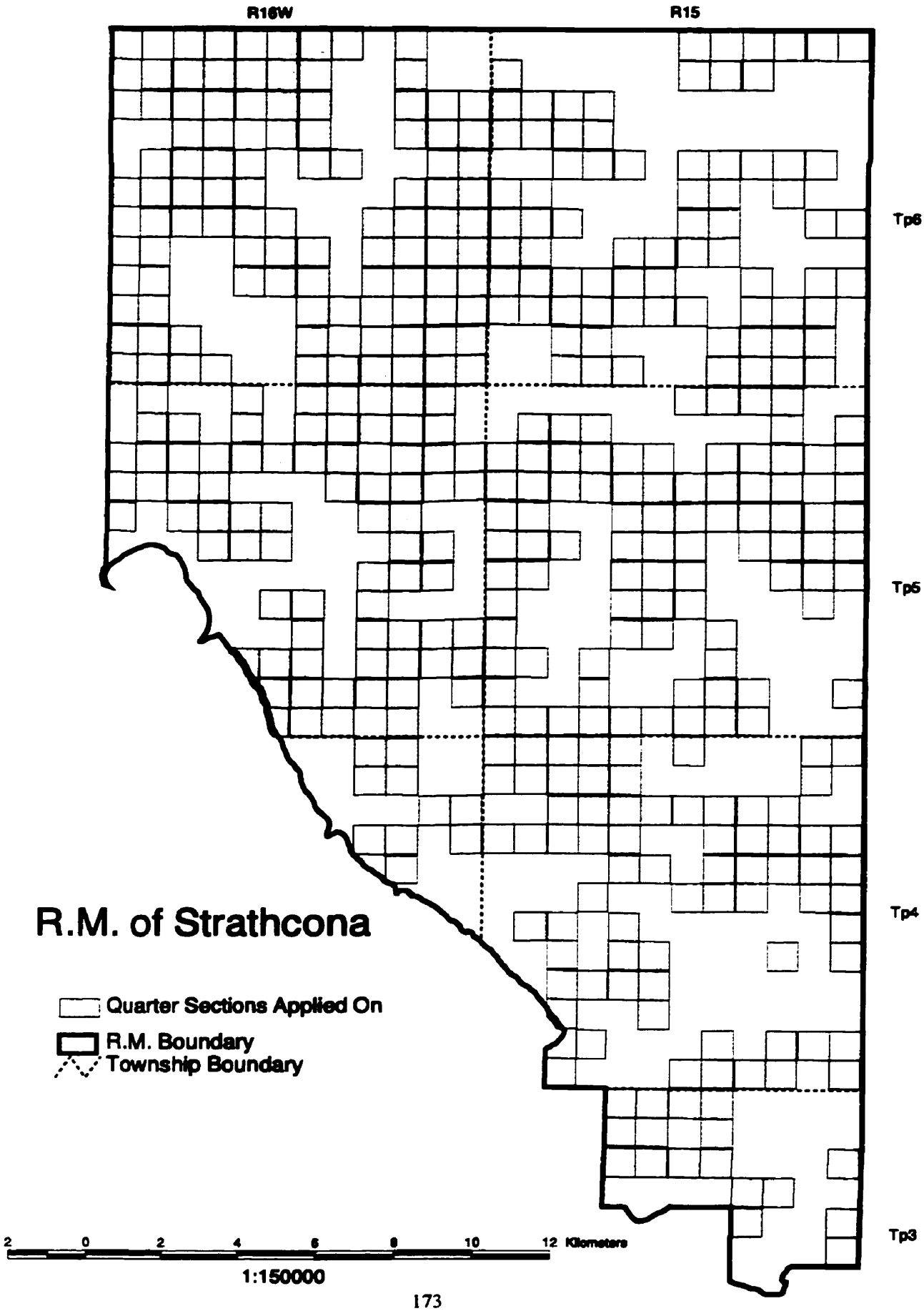
The amount of land effected in each erosion risk category cannot be compared for each municipality. This is because the Strathcona map is a semi-detailed survey, based on a large number of observations of soils in the area (one observation per 30 hectares), and is published at a scale of 1:50,000. The Strathcona map provides more comprehensive soil resource information and a more accurate representation of the actual erosion taking place in the municipality. The Mountain North map is a reconnaissance survey, based on fewer observations, and mapped at a scale of 1:125,000.

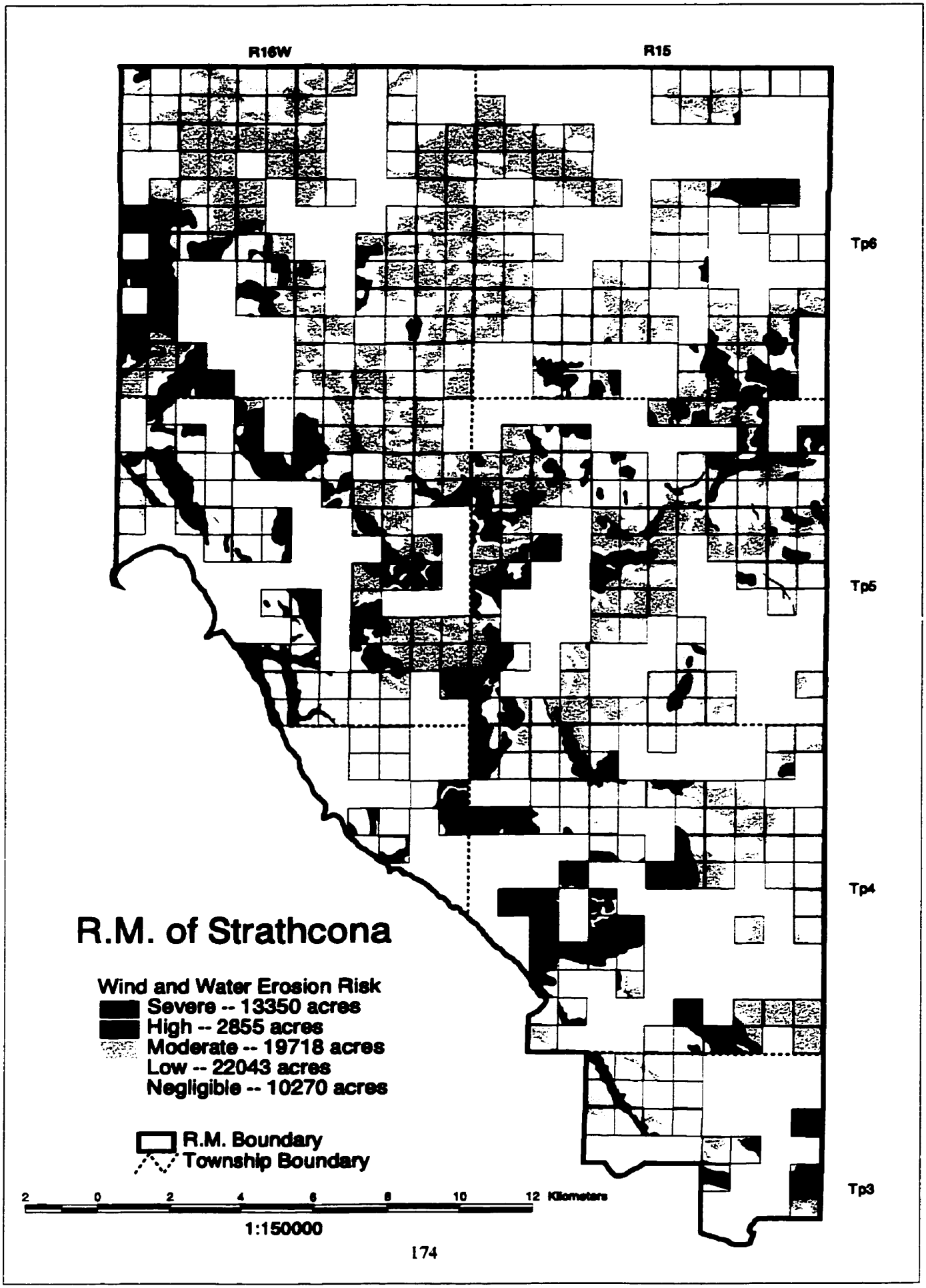
Maps 5 and 8 demonstrate the quarter sections that were enrolled and therefore, protected by the program. In Strathcona, 417 quarter sections were enrolled in the

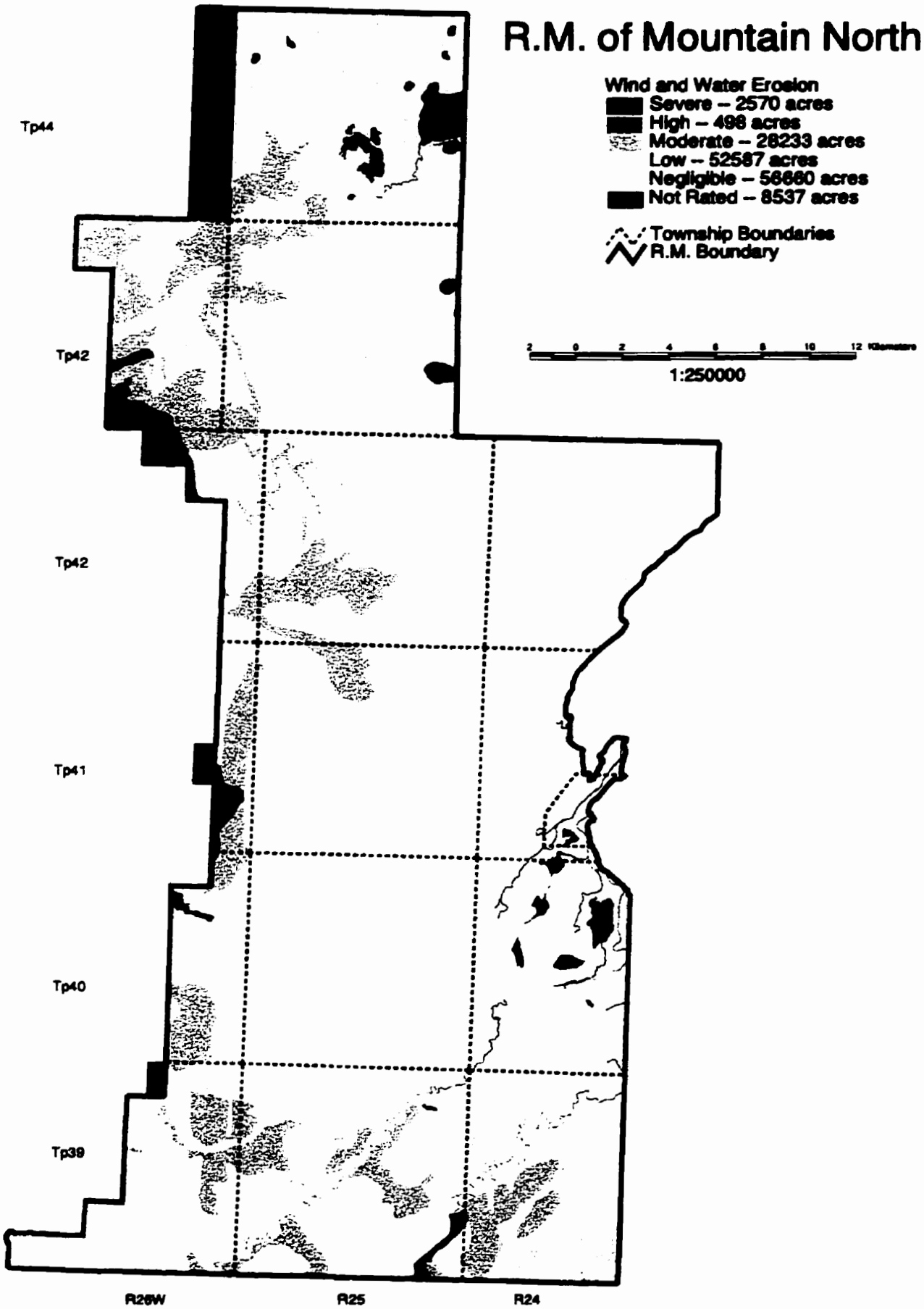
program and in Mountain North, 269 quarter sections were enrolled in the program. When the erosion risk map is superimposed with the map of the quarter sections enrolled in the program, for each municipality, the result is Maps 6 and 9. From Map 6, it can be seen that in the municipality of Strathcona the program is protecting: 13,872 acres (50%) of land at risk of severe wind and water erosion; 2,927 acres (49%) of land at risk of high wind and water erosion; 18,424 acres (57%) of land at risk of moderate wind and water erosion; and 20,363 acres (50%) of land at risk of low wind and water erosion.

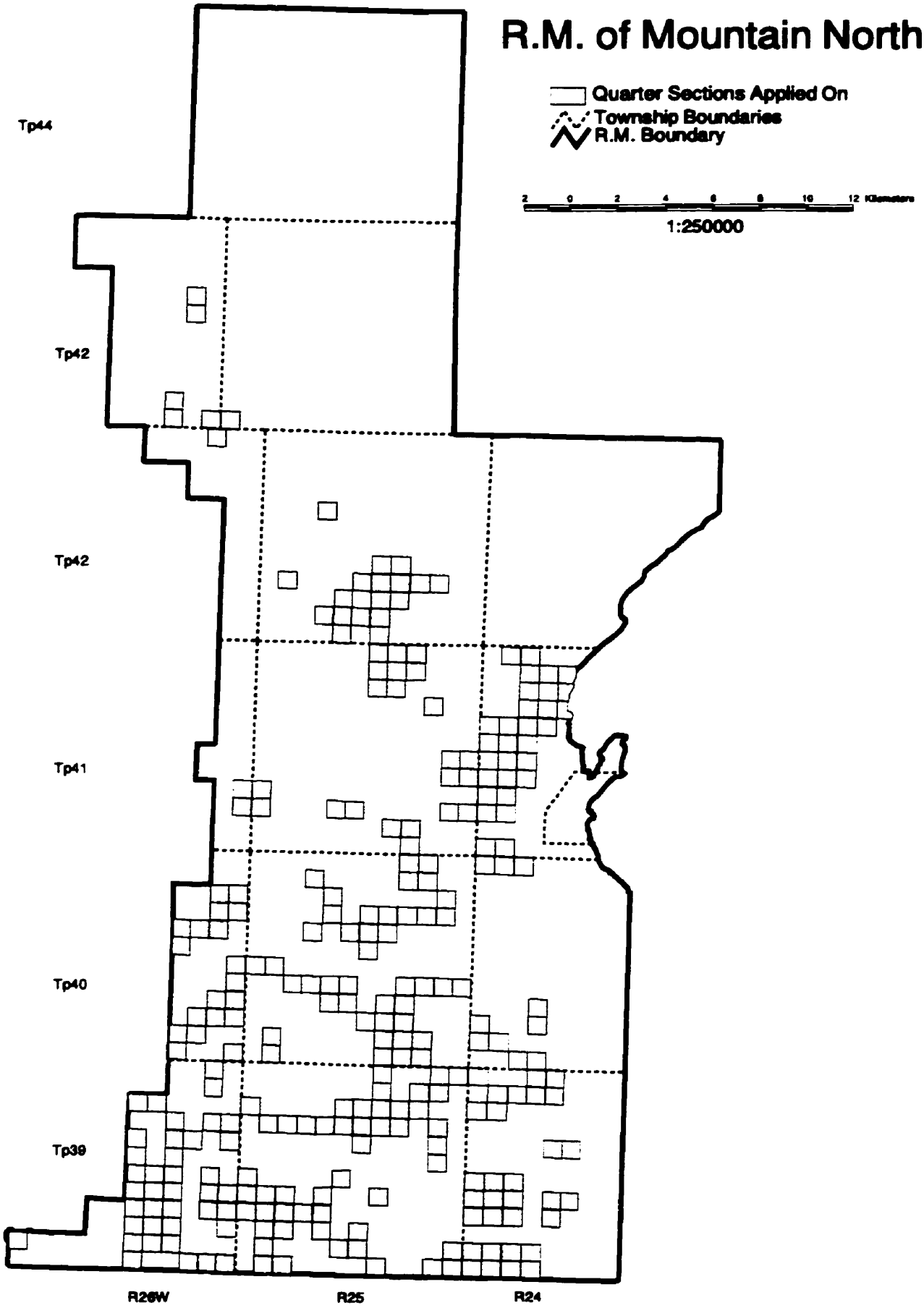
From Map 9, it can be seen that in the municipality of Mountain North, the program is protecting: 258 acres (10%) of land at risk of severe water erosion; 139 acres (28%) of land at risk of high water erosion; 5,689 acres (20%) of land at risk of moderate water erosion; and 15,744 acres (30%) of land at risk of low erosion.

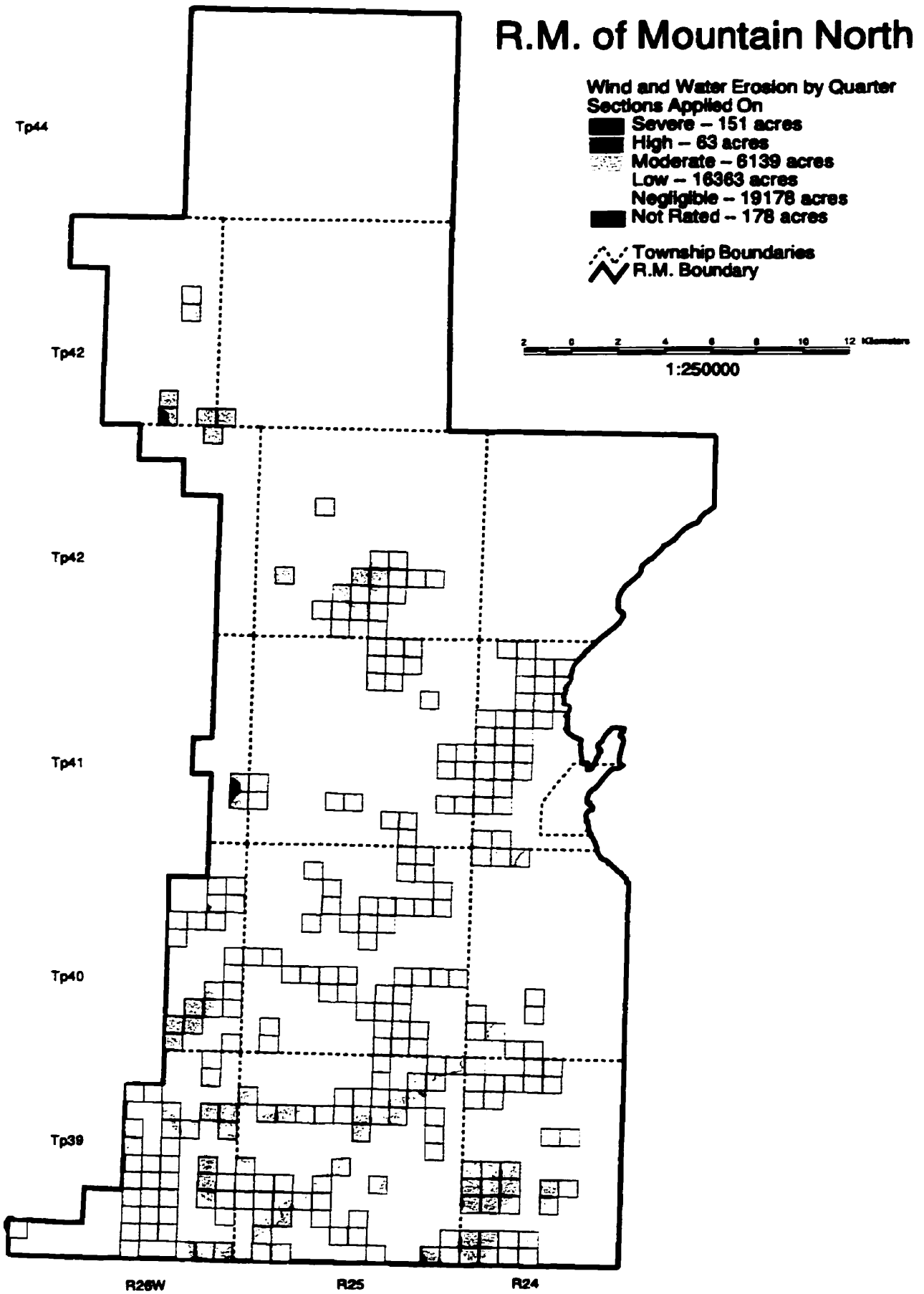

R16W
R15
Tp6
Tp5
Tp4
Tp3
R.M. of Strathcona
Wind and Water Erosion Risk
Severe -- 27532 acres
High -- 5995 acres
Moderate -- 32499 acres
Low -- 40714 acres
Negligible -- 16265 acres
R.M. Boundary
Township Boundary
2 0 2 4 6 8 10 12 Kilometers
1:150000


R16W
R15
Tp6
Tp5
Tp4
Tp3
R.M. of Strathcona
Quarter Sections Applied On
R.M. Boundary
Township Boundary
2 0 2 4 6 8 10 12 Kilometers
1:150000


R16W
R15
Tp6
Tp5
Tp4
Tp3
R.M. of Strathcona
Wind and Water Erosion Risk
Severe -- 13350 acres
High -- 2855 acres
Moderate -- 19718 acres
Low -- 22043 acres
Negligible -- 10270 acres
R.M. Boundary
Township Boundary
2 0 2 4 6 8 10 12 Kilometers
1:150000


R.M. of Mountain North
Wind and Water Erosion
Severe – 2570 acres
High – 498 acres
Moderate – 28233 acres
Low – 52587 acres
Negligible – 56660 acres
Not Rated – 8537 acres
Township Boundaries
R.M. Boundary
1:250000
Tp44
Tp42
Tp42
Tp41
Tp40
Tp39
R26W
R25
R24


R.M. of Mountain North
Quarter Sections Applied On
Township Boundaries
R.M. Boundary
2 0 2 4 6 8 10 12 Kilometers
1:250000
Tp44
Tp42
Tp42
Tp41
Tp40
Tp39
R26W
R25
R24


R.M. of Mountain North
Wind and Water Erosion by Quarter Sections Applied On
Severe – 151 acres
High – 63 acres
Moderate – 6139 acres
Low – 16363 acres
Negligible – 19178 acres
Not Rated – 178 acres
Township Boundaries
R.M. Boundary
1:250000
Tp44
Tp42
Tp42
Tp41
Tp40
Tp39
R26W
R25
R24

Chapter 5 - Discussion

The following is a list of the specific study objectives:

1) Determine the effectiveness of the selected tax incentive programs and why they did/did not continue.
2) Determine which landowners participated in the Environmental Tax Credit Program and which did not and determine the reasons why and why not.
3) Determine whether a $1 per acre tax credit is sufficient compensation for landowners carrying out sustainable land management practices.
4) Determine whether a $1 per acre tax credit will influence future land management practices and land use decisions.
5) Using existing information from PFRA, determine whether the tax credits were issued on land that "requires protection" from erosion (critical land).
6) Determine the perceptions and reactions of the municipal council and landowners towards the Environmental Tax Credit Program.
7) Determine the impact the Environmental Tax Credit program had on landowner awareness, knowledge, and attitudes regarding conservation practices.

This chapter discusses the results gathered from the research, in accordance with the study objective to which they pertain.

5.1 The Effectiveness of Selected Tax Incentive Programs

The majority of previous tax credit programs have been discontinued, or not implemented subsequent to the passage of the enabling legislation. Many of the programs were not well publicized and promoted and therefore, participation levels were modest and attracted little political support. Governments are hard pressed to provide significant funding for major new programs and in order to fund the tax incentive programs, money from other existing programs has to be cut, which the State/Province is often reluctant to do. As funds become restricted, government intervention with respect to agriculture and conservation can be expected to decline (Wilson and Tyrchniewicz 1995).

This was the case in North Dakota, where legislation was passed in 1991 to create the property tax credit to protect wetlands in the State. However, the State has never allocated any funds toward the Wetlands Tax Credit program and therefore, the program has never been implemented by local counties. In Iowa and Minnesota, bills were passed to create a property tax exemption to protect wetlands and native prairie. In Iowa, counties are reimbursed by the State through the Recreational Enhancement Appropriation Program (REAP). However, the program is not well funded and is protecting a small number of acres. This is mainly because the tax exemption is not enough to influence farmer's land use decisions and is inadequate to encourage them to carry out conservation practices. Minnesota, on the other hand, has discontinued the tax credit and reimbursement by the State due to fiscal restraints. Today, there are problems with local assessing authorities over-assessing land in order to guarantee a minimal amount of tax revenue is accrued on wetlands and native prairie.

In the United States, there is no single authority over land assessments and the assessment system is driven more locally (i.e. county level) than in Canada. Each county in the United States has its own land assessors. Land assessors are either appointed by the Governor of the State or elected by the local public, depending on the Property Tax Code in each State. Because land assessors are elected, they may have to act in a politically expedient manner in order to gain the majority vote of the public. Land assessors tend to have varied backgrounds and training (i.e. real estate versus appraisals) and use their own software packages for assessing land. Although the assessment system is based on state legislation, local assessing authorities may have a vested interest in the amount of tax revenue generated in their county. All of these factors tend to increase the potential for inequities (ie: over-assessments or under-assessments) in tax payments (Pietruszka 2000). Canada on the contrary, has an assessing authority in each province, (in Manitoba this is the Land Assessment Branch of the Department of Intergovernmental Affairs), that operates under the guidelines set out in each province's Municipal Assessment Act. Land assessments are based on the market value of the land, which is affected by productivity, location, and sales figures across the province. Sales analyses are performed to ensure that assessment rates are consistent across municipal boundaries. This type of tax regime results in a more equitable application of the tax system.

Pilot tax incentive programs tested in Weyburn, Saskatchewan and RockyView, Alberta, were very favorably received in the first few years. Thereafter, participation levels dropped due to a lack of interest on the part of the landowners and a lack of any long-term commitments on the part of the municipalities to take over the program. It may be that the negative attitude of municipal administrators, who believe the program is not in

their best interest, can sway landowner's opinions. Based on the review of selected tax incentive programs, Ontario is the only province in Canada that has a stable and systematic tax credit program that is successful. This may be due to the heightened awareness of the importance of conservation within Ontario, and the large number of conservation organizations participating in the program. Also, land market values are high in Ontario because the farmland has a high soil productivity rating and ability to grow specialized crops. Farmlands in close proximity to major centers or recreation areas often have higher sale values than similar farmland located in more remote areas of the Province. The potential for development in Ontario has elevated farmland values. Land assessments and taxes are high due to their location near more intensively developed land. Hence, farmers may be more likely to participate in the program because the property tax exemption realized could be substantial.

5.11 Lack of Formal Evaluations

The lack of formal evaluations of selected tax incentive programs made it difficult to determine whether these programs were successful. There were informal evaluations that took place among municipal staff and department employees, but no formal evaluations were done to ascertain the landowner's reactions to the program. Program success or failure was presumed by administrators, primarily from anecdotal information. Most of the tax incentive program evaluations were informal and based on subjective appraisal of the program's achievements which has been considered adequate by program supporters. Among these supporters are landowners who participated in programs, local

and provincial politicians, taxpayers, and organizations that provide technical and financial assistance from outside or within the government.

Some of the comments received from Maureen McKegney-Clay, district manager for PFRA in Weyburn, Saskatchewan (1999), that were typical of informal evaluations of the tax credit program were as follows:

- "There was a consensus that there has been very good value for the time and money invested".
- "We approached individuals that had completed eligible projects, but had not applied for the program, and asked them why. Their answer was "I was going to do it anyway".
- "I believe that rural municipality's are valuable partners in delivery of this type of program, They watch the pennies and want value for dollars spent".
- Landowners with wildlife acres became more aware of their value - I was told - "I was going to break that land, but I'll leave it if it isn't costing me money". In our area many old farmsteads and small acres of wasteland have been bulldozed and included into cultivated fields. These areas could be significant habitat for many types of wildlife if they are not destroyed. Covering the taxes on a few acres, costs very little, but could have significant long term impacts on wildlife habitat.

The lack of formal evaluations conducted by conservation/agricultural agencies administering programs, was also encountered in an interim evaluation of the PHJV. In this evaluation, it was found that the PHJV had not established a tracking mechanism for evaluating goals and achievements, particularly as these applied to the socioeconomic and land change elements of the program. This made it difficult for the program Partners to make strategic decisions based on impact data stemming from program tracking systems (Mason 1996). Monitoring program activity is an often-overlooked feature of program administration. While most programs (including PHJV) regularly monitor their revenues

and expenditures, few track how expenditures are converted into outputs and then into outcomes. Because of this break between inputs and outputs, it is often difficult to obtain a clear picture of a program's success (Mason 1996).

This situation is also similar to that found in a feasibility study performed by FT-Ecologistics Ltd., a study team who reviewed the operation and overall direction of the Conservation Districts Program in Manitoba. In this study, it was found that in the past, conservation districts have had a false sense of security in that they have not had to be accountable to public funding. Formal evaluations and program monitoring are expensive and time-consuming and therefore are not customarily carried out (Cressman et al. 1999). Some Districts still believe that results-based accountability is not important or not worth the effort. They would rather see the money that goes into evaluation distributed to more programs instead. Cressman et al. (1999) established a need to develop better information systems that track expenditures and program outcomes and monitor and evaluate program effectiveness.

In a time of fiscal difficulties, governments are becoming increasingly selective about their spending (Mason 1996). Fiscal difficulties currently being experienced in Canada, Manitoba, and many other jurisdictions are causing government decision-makers to increasingly demand clear and concise rationalizations of all publicly financed expenditures, including the provision of conservation related programs (Cressman et al. 1999). The ability of conservation agencies to retain and increase public and private funding can be strongly influenced by their ability to demonstrate results.

In order to properly assess the effectiveness of the Environmental Tax Credit program, conservation agencies could convey an understanding of the broader benefits of

the Environmental Tax Credit program from a farm management perspective and from a community perspective. For example, in an economic evaluation of land use changes in southwest Manitoba, Josephson (1992) determined that an increase in annual net farm income of $50 million dollars could be generated, if all farmers were to adopt conservation techniques in the NAWMP target area of southwestern Manitoba. The prospects of up to $50 million being generated across this region, should justify both public and private expenditures on extension, research and demonstration to help bring about sustainable land use changes (Josephson 1992). This realization of additional income is consistent with the farmer's profit objective and this income will in turn be invested and multiplied in a political region seeking greater economic activity.

Habitat initiatives which enhance the rural economy by creating additional opportunities for economic activity or which contribute to soil and water conservation without diminishing economic opportunities, will enjoy the highest degree of acceptability with the rural public (Scarth 1998). Of equal importance to the success of the Environmental Tax Credit program will be the support of the urban public, which must be assured that there are environmental spin-offs which either contribute to soil and water conservation or enhance the biodiversity of the rural landscape (Scarth 1998). If the public has a positive perception of the program and the program's objectives, this will translate into positive support for the Environmental Tax Credit program.

5.12 Future Evaluation Work

The progress of the program should be closely monitored for effectiveness and the results evaluated, particularly with regard to the amount of cover maintained and its conservation value. Baseline land use numbers from satellite images can be used to monitor changes in land use over the life of the program.

The impact of modified land use practices on the incomes of participating farmers could be estimated by calculating the opportunity cost of program participation. This could be done through the development of enterprise budgets determining net farm income, defined as returns to land and capital, for a representative crop rotation (or land use) in the project area. The changes in farming practices required for the Environmental Tax Credit program could then be applied to the representative budget to calculate the resulting change in net income. Specified research prices and costs could be applied to general descriptions of farming operations. Farmers could be asked what they were producing, average yields, and details of their farming operation such as inputs and tillage sequence. Subsequently, producers could be questioned on what they were producing on these same acres after adopting conservation practices, and the same details about their current production practices. Before and after situations could be made comparable by using constant prices and costs. The economic evaluation of land use modifications for the Environmental Tax Credit program could be similar to those conducted to evaluate NAWMP activities in southern Manitoba (Josephson 1992) and Saskatchewan (Gray et al. 1992). Net income before land use change was compared to net income after the changes for each scenario to arrive at an overall economic impact of land use change.

Data on land and input use practices collected from a landowner survey, as well as additional information supplied by Statistics Canada, Manitoba Agriculture, provincial crop insurance agencies and a literature review can be statistically analyzed using simulation models such as EPIC (Erosion-Productivity Impact Calculator) (Environmental Management Associates 1993). EPIC consists of: physically based components for simulating wind and water erosion, plant growth, and related processes; and economic components both for assessing the cost of erosion and for determining optimal management strategies. The model was designed to aid in decision-making, ranging in scope from farm-level to national-level decisions and is capable of examining drainage, irrigation, water yield, erosion control, weather, fertilizer and lime applications, tillage and crop residue management. EPIC could be used to determine the environmental impacts of the Environmental Tax Credit program on erosion control, soil productivity, non-point source pollution, and water quality. The economic component of EPIC could be used to assess the on-farm costs associated with erosion and different conservation farming techniques (Environmental Management Associates 1993).

The local impact on the community should be determined. Tangible benefits and costs of programs could be found using municipal data. If possible, determine on average what the municipal expenditures were before the pilot project began, on silt removal, flood control, erosion repairs, culvert and crossing repairs, etc. Compare this figure with municipal expenditures after the fifth year of the program (adjusted for inflation). Also, the direct income loss in the local community resulting from the changes in land use could be calculated as the total value of reduced farm inputs and elevator handling revenue. To offset these effects, there may also be increased input sales resulting from increased cattle

due to the increased availability of forage and grazing land as a result of the program. Additionally, there may be increased income from other income opportunities such as hunting and tourism.

In order to enhance the analysis, a sociological component could assess the attitudes and beliefs of participating farmers, the local community and the general public. Intangible or perceived environmental and social benefits and costs of the programs could be interpreted from qualitative results gathered in surveys (Oborne 1995). For example, questions about perceived changes in water quality, soil erosion, runoff time period, wildlife, aesthetic values, recreation, quality of life for families, all may assist in determining whether the program was beneficial. Quantifying in financial terms, the environmental and social benefits and costs of the program will be expensive, time consuming, and complicated. By doing this however, a more accurate representation of the true value of the program will be determined which helps to strengthen its economic case.

5.2 A Description of Program Participants and Non-Participants

The median age for non-participants was slightly greater than the median age for participants. Also, the mean length of time that non-participants had been involved in the farming operation was greater than that of participants. The median income of participants ($28,000) was greater than that of non-participants ($17,000). Furthermore, 60% of participants relied on farming as their primary source of this household income whereas, 59% of non-participants relied on another occupation, aside from farming, as their primary source of this household income. Based on the responses to demographic

survey questions, it is speculated that younger landowners may be more likely to participate in the Environmental Tax Credit program because they are more receptive to incorporating environmental factors into their farming decisions, new ideas, and conservation farming methods. Also, farmers with a greater income may be more likely to participate in the Environmental Tax Credit program, because they have the resources (both financial and technical) to change their farming practices (e.g. towards conservation tillage).

An explanation for the results observed may be that people in the age bracket 36-45 are generally in the mid-family stage. Financial pressure from living consumption and from long-term financing may be the greatest during this period of time. People in this age bracket are probably the most likely to commit large financed purchases simply because they may perceive a long work life ahead during their most financially productive years. Alternatively, this age group may also be the group most willing to experiment with changes in their farming practices and take small risks since they do have a longer work planning horizon and more financial pressure (Gray et al. 1992). The other age bracket, 56 and over, are entering into or are in the retirement stage. These people may be more concerned with retirement security and either the transfer of a viable farm to the younger generation or the liquidation of the farm. In any case, one of their primary concerns is to retain their equity and thus, provide more security for their retirement years. Therefore, the incentive to take risks or change their farming practices may be low (Gray et al. 1992).

The availability of capital has a direct impact on land management. It determines what type of farming system is used and usually affects the type of farm machinery and infrastructure held by the farmer. The average farm income in Strathcona is $15,000 and

the average farm income in Mountain North is $9,000 (Statistics Canada 1999). This lack of capital may force a farmer to use the resources at hand such as older equipment and less efficient farming techniques that could result in lower yields and lower income. Ready capital might allow a farmer to increase machinery size and thereby manage a larger land base. It may also allow a farmer to adopt new technology into the farming system such as direct seeding and conservation tillage (Prairie Farm Rehabilitation Administration 2000). This may explain why landowners with higher income levels are more likely to participate in the Environmental Tax Credit program.

The average farm size and the average number of acres of crops, pasture, hayland, idle land, and wetlands was greater for participants than non-participants. According to the survey results, farmers with a larger number of acres that will qualify for the tax credit, may be more likely to participate in the Environmental Tax Credit program. This may be because the tax credits realized could be substantial enough to convince landowners to sign-up for the program and applying is worth the effort.

These survey results contrast with findings from a study by Haney et al. (1991) analyzing the Landowner Habitat Program in Alberta, which offered incentives to private landowners to retain and enhance wildlife habitat on their lands. In this study, older landowners who have lower household net incomes, were more likely to either voluntarily preserve wildlife habitat or enroll in a wildlife habitat program. Also, an evaluation of PHJV program showed that older farmers tend to be more concerned about protecting wildlife and those managing smaller farms tend to have smaller equipment and so are able to weave between sloughs and potholes during their fieldwork. This made them more willing to consider leaving sloughs and other natural areas untouched (Mason 1996).

An explanation for the contrast between the findings of Haney et al. (1991) and Mason (1996), and the results from this study, may be that landowners inhabiting certain parts of the country with different lands characteristics and land uses may exhibit different levels of support for conservation programs. The municipalities of Strathcona and Mountain North have a large acreage of wetlands and native prairie and the majority of the farms have some kind of livestock as a supplementary enterprise. Consequently, farmers would be less likely to perceive wetlands and native prairie as being worthless, both from an economic and a psychological perspective. Because these acres can be used for grazing cattle or hay production, farmers may be less inclined to convert them. Furthermore, the Landowner Habitat Program had a narrower focus, wildlife habitat, compared to the Environmental Tax Credit program which is promoting a wide range of conservation practices from retaining habitat to practicing minimum tillage.

Based on the survey results, both participants and non-participants were unaware that they pay equal or lower taxes than $1 per acre on conservation lands (such as wetlands, bushland, etc.). These results correspond with a study by Dixon (1970), where the majority of farmers were unaware of the varying rates at which their property was assessed and taxed. Survey results suggest that landowner's awareness of their tax breakdown had no affect on their decision to participate in the Environmental Tax Credit program. However, from talking to landowners, it was made apparent that the program has helped to make them more cognizant of the tax breakdown. It is speculated that when landowners realize that they are only paying an average of $1 per acre tax on conservation lands, they may not be so inclined to cultivate these lands. While landowners have agreed that $1 per acre does not significantly compensate them for the costs of carrying out

conservation practices, they are beginning to realize that it offsets some of the direct cash costs to landowners for conserving these areas.

The survey results seem to suggest that landowner's knowledge about soil and water conservation had no affect on their decision to participate in the program. Based on the survey results and telephone conversations with landowners, it can be seen the majority of landowners recognize the environmental benefits of conservation practices and would like to carry out the farming practices promoted by the program. These findings correspond with those found in an agricultural producers' survey which asked farmers a series of questions to gauge their awareness and concern for wildlife and conservation. In general, the findings suggested a high awareness and concern for wildlife and conservation among agricultural producers (Mason, 1996). Nevertheless, farmers are usually forced to look at the short-term economic profits rather than the long-term effects of conservation practices.

Mason (1996) revealed the reality that perceived economic considerations are of paramount importance to landowners when making decisions concerning the use and protection of their land. A high percentage of agricultural producers agreed that while farmers are concerned about conservation, the impact on profits and losses was the major factor in considering whether or not to participate in conservation farming (Mason 1996). These results are similar to those of Van Kooten and Schmitz (1990) which showed that the economic realities of farming operations often cause landowners to behave inconsistently with their own value systems. Farmers are facing many challenges when modifying current production practices. Most farmers concentrate their efforts on the

pursuit of short-term economic returns, regardless of the consequences to land (Prairie Farm Rehabilitation Administration 1982).

The fact that farmers do not feel the burden of conservation should be borne by them alone - was confirmed by the large percentage of both participants and non-participants who agreed that society should compensate landowners for preserving natural lands through the tax system. According to Morgan (1985), society benefits directly from the sustained maintenance of the land and water resource base and continued ecological diversity provided by various natural areas and therefore, the burden of ensuring long-term agricultural and wildlife habitat viability should not rest solely on the landowner. This corresponds with results from a study funded by The Manitoba Habitat Heritage Corporation that determined landowner attitudes towards the NAWMP in southwestern Manitoba. In this study, 91% of landowners agreed that if society expects farmers to save the prairie environment, then society should provide incentives to farmers for sustainable land and water resource management (Sprung 1999).

From the survey questions, it is clear that the main reason why landowners participated in the program was for the tax break. These results suggest that monetary compensation is a continued requirement for encouraging conservation practices. Nevertheless, 20% of landowners said they participated in the program to prevent soil erosion and 17% of landowners said they participated in the program to benefit wildlife.

The main reason why landowners did not participate in the program was because they were not aware of it. From speaking with landowners, it is anticipated that the participation levels will increase for the year 2000. Landowners could be better informed about the Environmental Tax Credit program and its intentions, using multiple media

mechanisms. When seeking information on land use practices, 63% of landowners turn to farm newspapers and slightly more than half talk to the local extension agrologist. With the exception of 47% of landowners learning about the NAWMP activities through conversations with neighbors, all other forms of information transfer reach less than 40% of the farming population (Gray et al. 1992). The timing of the message is also critical. It may be more effective to remind landowners of the Environmental Tax Credit program at the time they pay their property taxes in the early fall, so that the $1 per acre tax credit is a consideration when making their land use decisions for the following year.

5.3 The Acceptability of $1/acre Compensation for Using Conservation Practices

The third objective of the study was to determine whether landowners thought that $1 per acre was sufficient compensation for landowners carrying out conservation practices and if not, what level of credit would be required to achieve the conservation objectives. According to the survey results the majority of landowners felt that $1 per acre tax credit was not adequate incentive to retain wetlands, maintain grasslands, or maintain more residue cover on cropland. Most landowners thought that $2 to $10 per acre was a more appropriate amount to cover the costs of; the foregone revenue from draining and cropping wetlands; and increased herbicide use and changing of equipment under a minimal tillage operation. These findings seem to stress the importance of monetary compensation as a component of conservation programs and correspond closely with those found in a study which was evaluating incentives to promote waterfowl habitat in the prairie pothole region of Saskatchewan (Van Kooten and Schmitz 1990).

Landowners in this study, expressed positive attitudes toward monetary compensation as a prerequisite for addressing concerns regarding the environment, the adverse effects of certain farming practices, and the destruction of wildlife habitat (Van Kooten and Schmitz 1990). A study by Josephson (1992) similarly showed an interest in increasing the use of conservation practices on private lands, provided there was a profit incentive to do so. Another study by Gray et al. (1992) revealed that the majority of landowners in the Quill Lakes NAWMP project area of Saskatchewan, supported the idea of financial incentives for farmers to maintain and enhance wetland areas, as the preferred policy in the management of wetlands and waterfowl habitat.

Ecological services are not a traditional farm commodity but if the experience of the NAWMP is any indication, farmers are willing to enroll their lands in conservation programs that provide incentives. To date, over a million acres of land have been enrolled in NAWMP programs and there are more applicants than there are funds. The concept of receiving compensation (i.e. economic incentives) for using conservation practices, is well-accepted and farmers are becoming accustomed to the strange idea of ecological services as the newest farm product (Sopuck 1993). Until agricultural markets recognize the ecological goods and services associated with conservation practices, farmers will tend to under-utilize conservation farming techniques. One of the initial benefits of the Environmental Tax Credit program was to make landowners aware of the value of ecological goods and services and to partially compensate them for the service they provide to society.

Although the majority of landowners agreed that $1 per acre was not adequate compensation for carrying out sustainable farming practices, many landowners have

participated or will participate in the program next year. Most landowners were extremely pleased to receive a tax break. These results also stress the importance of monetary compensation as a component of conservation programs, although they do suggest that landowners may be willing to accept less compensation in exchange for greater land use flexibility. Although the compensation is limited, the fact that the landowners remain in control of their land makes the Environmental Tax Credit program attractive. Many landowners mentioned that they liked the program because there were no restrictions on the land uses permitted and there were no long-term contracts to sign. These findings are similar to those found in an analysis of landowner attitudes and behavior regarding NAWMP leases in southwestern Manitoba (Sprung 1999). Sprung (1999) found that over half of the surveyed landowners were likely to consider a lease which would include decreased monetary compensation but which would allow for livestock activities such as delayed haying and grazing while still maintaining permanent cover. Correspondingly, in an socioeconomic evaluation of land use options in the Saskatchewan Implementation Plan of NAWMP, landowners were fundamentally opposed to being forced to manage their land in accordance with policy restrictions and "do not like government or other organizations to have control over the farm operation" (Gray et al. 1992). Farmers in this study also disagreed with making conservation practices a requirement for the eligibility for government subsidies because such a policy structure infringed on their property rights as landowners (Gray et al. 1992).

It is important to recall that there was a lack of knowledge about the tax payments on conservation lands. If landowners were aware that they are paying around $1 per acre tax on wetlands and bushland, they may be more likely to maintain these lands and

participate in the Environmental Tax Credit program. According to Pietruszka, a provincial assessment officer, having to pay property taxes, especially on marginal and native land, has a significant influence over farmer's land use decisions (Personal Communication, Pietruszka 2000). In addition to this, $1 per acre from the property tax system appears to have more credibility than payments made from conservation agencies. This finding is consistent with Poole's statement (1994), that the potential for the adoption of conservation practices using a municipal tax system may be higher than with traditional programming because most landowners perceive taxes as high priority personal issues and the idea of tax relief on municipal taxes provides some kind of psychological benefit to the landowner, who feel burdened by the taxes they have to pay.

The Environmental Tax Credit program may affect landowners land use decisions but only to a certain extent. It may be that the program is only effective when the land uses being advocated create on-farm economic benefits that can be captured by the landowner. For example, the landowner has already decided to plant permanent forages on marginal cropland, because grain prices are very low and more money can be made from increasing their cattle numbers and forage acreage. In these cases, the foregone opportunities are perceived by the landowner to be very small. On the other hand, the program may be limited in the effect it can have on land uses, if market forces favor particular kinds of agricultural production. As grain prices increase, the effectiveness of the Environmental Tax Credit program may decrease and the level of compensation for using conservation practices may need to be increased. However, it is becoming more apparent, especially among younger producers, that with the abolition of the Crow Benefit it is too costly to transport grain out of the province for the export market. Producers are

looking for local markets in livestock operations. Agriculture is evolving, and Manitoba is becoming a livestock-producing province. There has been a large increase in livestock numbers and marginal and grassland are becoming more valued for livestock production. For example, beef and purebred cattle numbers have increased from 1,236,000 animals in 1994, to about 1,450,000 animals in 1997 (Manitoba Agriculture 1997). In addition to this, there are no agricultural programs left that would encourage the cultivation of marginal land. Crop Insurance coverage is minimal on marginal farmland, GRIP has been discontinued, and farm subsidies eradicated. Also, high crop input costs, low grain prices, and improving cattle prices are causing more farmers to plant perennial forages and increase their cattle numbers (Manitoba Agriculture 1997).

The Environmental Tax Credit program is looked upon favorably today, because the realities of farming are forcing landowners to look at more sustainable land use strategies. According to the PHJV Land Use Committee (1996), some of the greatest gains for waterfowl have occurred from farmers voluntarily adopting conservation farming techniques such as rotational grazing and the planting of forages. Reasons for these land use changes lie in on-farm economics, as input prices have increased faster than commodity prices, and as farms have grown larger, farmers face significant labor constraints. At the same time, farmers are recognizing their stewardship responsibilities (PHJV 1996). Producers have the option of whether or not to participate in the Environmental Tax Credit program. Those who choose to participate indicate that this is to their economic advantage because it will contribute to their net returns. Increased net returns may be the result of erosion prevention and improved crop yields; increased sales of forage and livestock when more land is seeded to permanent vegetation, etc. There is

also an added benefit to the producer, in knowing that this land use is the best treatment for the quality of these soils.

5.4 The Impact of $1/acre on Landowner's Future Land Use Decisions

The fourth objective of the study was to determine whether the $1 per acre tax credit influences landowner's future land management practices. Although a sizable minority of participants (49%) and non-participants (38%) said that they were likely to maintain more crop residue, the Environmental Tax Credit program is not likely to affect the majority of landowner's future decisions to maintain more residue on cropland. Reasons for not maintaining more residue on cropland were; the added cost of changing farming equipment and using more herbicides under a minimum tillage operation; and the ground does not dry up fast enough in the spring under a minimum tillage operation.

Participants are more likely than non-participants to retain wetlands in order to become eligible for the program next year. The Environmental Tax Credit program is likely to affect the majority of participant's future decisions to retain wetlands. On the contrary, the program is not likely to affect the majority of non-participant's future decision to retain wetlands in order to be eligible for the Environmental Tax Credit program next year. However, there was a sizable minority of non-participants (56%) that were somewhat or extremely likely to retain wetlands in order to become eligible for the program next year. Reasons for not retaining wetlands were; the inconvenience and nuisance cost of farming around wetlands; the groundwater table was too high and potholes become a major source of salinity; increased crop damage due to waterfowl; and farmers can make more money from draining wetlands and cropping them. It is important

to recognize the large number of landowners (63%) who responded neutrally (i.e. neither likely nor unlikely) to this question. Many landowners said that their response depended on the type of wetland implied. Farmers were willing to retain larger wetlands with little or no agricultural potential. On the other hand, farmers felt that $1 per acre was not adequate incentive to retain small potholes in fields that could be drained and cropped.

While it could be argued that marginal agricultural land is already assessed and taxed at rates which are so low as to render an incentive program based on tax concessions ineffective, the results of this study and those found by Zittlau (1979), suggest that many farmers are motivated by small economic incentives. The Environmental Tax Credit program is not likely to be a significant consideration for those landowners who are intent on cropping marginal land. However, the majority of landowners agreed the Environmental Tax Credit program would cause them to maintain grasslands and plant permanent forages or grasses on marginal cropland. The majority of participants also agreed that the program would cause them to retain wetlands. These results are somewhat similar to those found in a landowner survey conducted as part of a socioeconomic evaluation of the Saskatchewan NAWMP Implementation Plan (Gray et al. 1992). In this study, 68% of landowners maintained grasslands, wetlands, and woodlands and 64% of landowners implemented farming practices that decrease soil erosion without any financial incentive to do so. Also, 48% of landowners reported converting low quality cropland to permanent grass or legume cover and 39% of landowners increased their forage acreage. Continuous cropping, direct seeding and chemical fallow were commonly reported as land use practices implemented to reduce soil erosion. Increased awareness of the environmental damage sustained through traditional farming practices has influenced

many landowners to undertake conservation practices without financial incentives from NAWMP (Gray et al. 1992).

Although landowners agreed that $1 per acre may influence some of their future farming decisions, it is only in the second year of the program that we can validate whether landowners behaved consistently with their survey responses. It may be that landowners opt to convert previously non-cultivated acreage to crop production because they feel that the tax credit is not adequate and their economic situation pressures them to do so.

A large percentage of landowners agreed that even if the tax credit was removed, they would continue to carry out the conservation practices promoted by the Environmental Tax Credit program. This seems to suggest that landowners may have already made the decision to use the conservation farming practices encouraged by the program. If this is the case, $1 per acre is not enough to get farmers to change their farming practices, but instead acts as an added incentive to encourage farmers to continue carrying out the sustainable farming practices that they have previously adopted. Hence, the value of the program lies in its recognition of conservation-minded landowners. The Environmental Tax Credit program may be similar to Minnesota's Wetlands and Native Prairie Tax Exemption program, in that it is not likely to be a significant deterrent to those landowners intent on draining their wetlands for agricultural production. The program's value lies in its encouragement of conservation-minded landowners and in the publicity it generates for preservation of conservation lands (Scarth 1984).

5.5 The Program's Effectiveness at Protecting Erodible Land

The Environmental Tax Credit program has the potential to affect land use over a vast area at a relatively low cost to conservation agencies. Although there is a tendency to conclude from the data that the Environmental Tax Credit program is more cost effective than the remaining conservation approaches, this conclusion is inaccurate in the absence of data about the quality of the acres secured or their conservation value (e.g. wildlife populations benefited or erosion prevented). Therefore, without a biological evaluation, there is no basis to conclude that one method is better than the other. For example, within the PHJV program, intensive wetland and upland conservation activities account for 93% of Ducks Unlimited's expenditures, but only 56% of the number of acres secured. The modified agricultural use program, on the other hand, uses only 7% of their resources but contributes 44% of the number of acres secured. However, this says nothing about the effectiveness of the acres secured or of the waterfowl produced (Mason 1996).

Based on this evaluation however, the fifth objective of the study, whether the program was protecting land that "required protection" from erosion, can be answered. Survey findings indicate that the majority of participants and non-participants identified having a problem with erosion. The GIS spatial data confirmed that the Environmental Tax Credit program is protecting land at risk of erosion. The program is affecting 60,988 acres of land representing approximately 28% of the privately held land in both municipalities. In the municipality of Strathcona, half of the land in the severe erosion risk category and half of the land in the high erosion risk category is being protected by the program. As well, over half of the land in the moderate erosion risk category and half of the land in the low erosion risk category are protected. In Mountain North, the

Environmental Tax Credit program is protecting only 10% of land at risk of severe water erosion, 28% of land at risk of high water erosion, 20% of land at risk of moderate water erosion, and 30% of land at risk of low erosion.

5.6 The Reaction of Landowners and the Municipal Council Towards the Program

The sixth objective of the study was to determine landowner and municipal staff reaction and perceptions of the Environmental Tax Credit program. Based on the study results, property tax credits appear to be a successful mechanism for conservation programming, to be used along with other existing conservation tools.

5.61 Landowner's Reactions Towards the Program

The majority of participants (over 80%) had a positive reaction toward the Environmental Tax Credit program. The majority of landowners thought that the property tax system was an effective means of compensating landowners who carry out conservation practices and the Environmental Tax Credit program will help to maintain and enhance the condition of the environment over the long term. These results correspond with those found in several studies.

A telephone survey of residents in the Prairie Pothole Joint Venture, Rainwater Basin Joint Venture, and Playa Lakes Joint Venture areas indicated that 80% of landowners supported the idea of tax incentives for private landowners who actively conserve waterfowl and wetlands on their property (Young et al. 1996). Mason (1996) revealed that the majority of farmers felt that a reduction in property taxes on the affected

land would cause them to carry out conservation practices. In addition to this, O'Grady's (1990) survey respondents mentioned that reduced taxes on marginal lands could stimulate the establishment of more passive land use practices, such as maintaining forage or trees which would benefit wildlife.

An analysis of landowner attitudes toward techniques of wetland preservation by Morgan (1985), also suggested that support for removing wetlands and other marginal lands from municipal property tax rolls was strong (76% in favor). Landowners felt that the tax burden should not be shifted to cultivated lands, but removed altogether, perhaps being paid for by wildlife agencies. Provision of a breakdown of land types and their relative assessments on property tax bills was also seen as a positive step towards preserving habitat by 80% of the respondents (Morgan 1985).

Landowners displayed a preference for the Environmental Tax Credit program when they rated it as their second most preferred conservation approach, just after direct payments to landowners for conservation practices. It is also interesting to note that the tax credit program was most frequently ranked number one (the most preferred conservation approach). Findings reported in an environmental assessment of agricultural practices and policies by Zittlau (1979), showed that Manitoba landowners in the municipalities of Strathcona and Odanah revealed a strong support for tax incentive programs as a means of conservation programming.

According to the survey results, the most effective method of program advertisement was the mail-out brochures. Many program participants also mentioned that the open house held in each municipality was very effective at introducing the program and helping landowners fill in their applications. The majority of participants felt

that the Environmental Tax Credit program, as administered, was easy to understand and the application forms were easy to fill out.

5.62 Municipal Council's Reaction Towards the Program

Overall, both municipalities were very pleased with the program and indicated strong support for its continuation. Both municipalities received positive feedback from landowners that came into the municipal office to inquire about the program and to apply for next year. The results from the Mountain North municipal staff interview were very similar to those results discovered in the Strathcona municipal staff interview, as can be seen in Table 5.1 .

Table 5.1 Municipal Staff's Opinions of the Environmental Tax Credit Program

Statements Made Regarding the Program	Strathcona	Mountain North
Support for program continuation	X	X
Positive feedback from landowners	X	X
Increased soil and water conservation awareness	-	X
Directly benefits landowner without reducing control over land use decisions	X	XX
Increases awareness of tax breakdown	XX	-
Society, landowners and municipality benefits	X	X
Additional administrative work	X	XX
Cost-effective in present form	X	X
Not willing to allocate funding towards the program	X	X
Cost-saving not in an amount equal to lost tax revenue	X	X
Funding should come from both private agencies and provincial and federal government	XX	X

*X indicates the degree to which the municipal staff agreed with each particular statement.

Both municipalities spoke of many positive benefits of the Environmental Tax Credit program, including; increased awareness of conservation and tax breakdown on conservation lands. Both municipalities anticipate that society will benefit from the sustainable land management practices encouraged by the program. Some of the benefits

they talked about were; improved air and water quality, wildlife (for both hunting and viewing), and the beauty and aesthetics of natural places. Farmers benefit as well, because improved soil quality will help to increase crop yields in the long-term which in turn will bring economic benefits. By acknowledging farmers who are good stewards of the land, the program will also help to increase personal satisfaction and encourage farmers to continue practicing sustainable farming.

There had not been any additional staff hired or expenses as a result of the program. A complaint from both municipalities was that there were many additional work hours added to the existing staff to administer the program. This was attributed to the fact that this year was the first field season of the program and administration was essentially trial-and-error. The additional work hours resulted because the funding was not available on time and therefore, the tax credits could not be taken directly off the landowner's tax bill. Instead, landowners had to be sent a separate cheque in the mail when the funding became available. Nevertheless, incorporating conservation goals through the property tax system appears to be effective and efficient because the administrative system is already in place. The current municipal taxation infrastructure could administer a conservation tax credit system without requiring the development of new/additional infrastructure. This keeps administrative costs to a minimum in order to ensure that maximum funding is available to support conservation efforts.

From conversations with landowners, it can be affirmed that using the municipality to administer the program was more effective than delivering a separate extension effort through a wildlife agency. Farmers are sometimes opposed to conservation programs (e.g. land acquisition) delivered by wildlife agencies (as indicated on page 72, Chapter 3).

The municipality appears to be capable of effectively delivering the program, gaining the attention and support of landowners, and influencing landowner's opinions relating to land use. This may be because landowners perceive the municipality as having no vested interest in the program, unlike agencies such as Ducks Unlimited or the Delta Waterfowl Foundation. For the following reasons this may not be the case. The municipality is interested in the Environmental Tax Credit program because of the external money introduced into the municipality and the opportunity to reduce long-term operating costs for road and crossing repairs, silt removal from ditches, as well as other related infrastructure costs. In addition to this, the municipality believes the tax credit will help to reduce the number of tax-related complaints received each year due to the fact that landowners will be more content.

Political support and the support of the wider community will be limited unless the benefits of the program are seen as serving a broader conservation objective that extends beyond waterfowl (Mason 1996). Municipal council members, by and large, know the landscape, understand and respect agriculture, are sympathetic to the farm community, and are in very close contact with rural ratepayers. Involving the local government and agencies in the delivery of the programs has also enhanced local support for PHJV conservation initiatives. In an interim evaluation of the PHJV, program managers were praised by producers for working closely with local communities and the municipal government. Producer groups, as well as policy experts said that the partnership building at the local level lends credibility to the PHJV among farm groups and individual farmers (Mason 1996).

The municipalities agreed that the Environmental Tax Credit program would be cost-effective in its present form. If the municipality had to fund the tax credits - it would be "farmers paying farmers". This is because the vast majority of taxes in the municipality are being paid by the farmers themselves. The municipalities thought that funding should come from an outside source like the provincial government. The municipalities were willing to take on extra work and hours of administration but do not have extra funding to allocate towards the program. This may be similar to the situation experienced in Weyburn, Saskatchewan. When the external funding for the Weyburn Stewardship program was discontinued, the municipality showed no interest in taking over the program or seeking additional sources of funding.

Although the municipal staff expects to see cost-savings in terms of reduced infrastructure costs due to erosion over the next 3 to 5 years, the municipality does not expect the cost-savings to be equivalent to the lost tax revenue of approximately $22,000 in tax credits that would have to be paid out to landowners. The municipality may not realize the substantial volumes of soil that can be eroded and the amount of money spent on mitigating and restoring the damage caused by wind and water erosion. For example, in 1988 the municipality of Morris in south central Manitoba, spent approximately $250,000 removing about 250,000 tonnes of wind-eroded topsoil from roadside ditches (Prairie Farm Rehabilitation Administration 2000).

It was agreed upon that both the provincial and the federal government should reimburse the municipalities for the tax revenue lost as a result of the Environmental Tax Credit program. However, the municipal staff were unable to suggest where the provincial and federal funding should originate. They did mention that it would be totally

inappropriate to fund this program through increased property or income taxes. The municipalities were somewhat contradictory in the fact that they felt funding for the Environmental Tax Credit program should come from the government but in no way should the levels of taxation be increased to fund the program. In general, there was a reluctance on the part of the municipalities to discuss funding. Perhaps they were afraid that this could end up being a bit of a political "hot potato" - if farmers come to like the program and the funding is cut, the municipality could bear the brunt of the criticism. Or maybe it's the fact that with government cutbacks, money is being put toward social programs and environmental programs receive less priority.

True integration of conservation objectives into the municipal property tax structure will require funds from a variety of sources - federal, provincial, municipal, and private sources. If the Environmental Tax Credit program was to run province-wide, the Provincial-municipal tax sharing program (PMTS) could be used as a vehicle for reimbursing municipalities for lost tax revenue. Through the PMTS program, the province obtains a percentage of the total income tax collected within that province. Subsequently, the province grants a certain percentage of that money to municipalities on a per capita basis. The money can be used by the municipality for multiple purposes. The main intent of the PMTS program is to keep property taxes down in municipalities (Bouvier 2000). In order to fund a program such as the Environmental Tax Credit program, the province could recover a larger share of the income taxes raised within the Province. This money could then be transferred to the municipal government in order to reimburse them for lost tax revenue, as a result of paying out tax credits for conservation practices.

Ed Pietruszka, (Personal Communication 2000) agreed that if the Environmental Tax Credit program was to be implemented on a provincial basis, the federal and provincial governments, as well as private organizations might have to share both financial and technical resources. The provincial land assessor's responsibilities would remain much the same. However, their software would have to be re-programmed and there would be more administrative work to determine program eligibility. Property assessment may be performed using satellite images in addition to soil survey maps. Although, in the case of appeals and complaints about the assessment notice, on-site inspections are preferred (Pietruszka 2000). Pietruszka further felt that the breakdown of the land assessment notice, to show the different assessment values assigned to various land use types, would confuse landowners, increase the number of assessment inquiries and complaints, and add to the workload of the existing staff. This type of confusion and inquiry occurred in 1993, when the assessment notice was changed to identify the percentage of the total assessment value that related to conservation lands (see page 68, Chapter 3).

5.7 Impact of the Environmental Tax Credit Program on Landowner Awareness and Attitudes Regarding Conservation Practices

The seventh objective of the study was to determine the impact of the Environmental Tax Credit program on landowner awareness and attitudes regarding conservation practices. If landowners become more aware of the importance of ecological goods and services in the prairie ecosystem and to a more sustainable form of agriculture, they may be more likely to adjust their farming practices to include careful management of

conservation lands. This would create an agricultural system that integrates profitable farming and enhanced soil and water quality and wildlife habitat.

Based on the responses to survey questions, the Environmental Tax Credit program affected the majority of participant's awareness and attitudes regarding conservation practices. Of prime significance was the finding that half of the participants agreed that the program has helped to increase their awareness about being good stewards of the land and made them more environmentally conscientious. The survey results also showed that over half of the participants agreed that the program had caused them to become more aware of the importance of conservation farming, and 34% of participants said that the program had increased the importance they place on soil and water conservation issues. These findings are similar to an economic and sociological evaluation of land use options offered under the Saskatchewan Implementation Plan of NAWMP (Gray et al 1992). Gray et al. (1992) found that 60% of Prairie CARE and Habitat Purchase participants believed that NAWMP activities increased their awareness of the effects of conventional agricultural practices on wetlands and wildlife habitat and increased their environmental awareness.

Survey findings demonstrate that the Environmental Tax Credit program has made landowners more aware of the importance of conservation practices and made them more concerned for the well-being of the environment. This is very encouraging because in order for landowners to want to manage resources in a sustainable manner, those landowners need to first value and have a concern for the well being of the environment. This concern leads them to seek knowledge about stewardship and what can be done in terms of conservation practices. The Environmental Tax Credit program was perceived as

more of an awareness program, teaching landowners about the importance of conservation practices, rather than an economic incentive to encourage farmers to change their farming practices. This new level of environmental awareness is an important prerequisite to the modification of farming practices. It is hoped that over the long-term, evidence of the environmental and economic benefits of conservation farming practices will influence landowners to an extent where financial incentives will no longer be necessary to motivate landowners to adopt or continue such practices.

Although the Environmental Tax Credit Program has had a positive impact on producers attitudes, this does not necessarily imply that farmers will change their farming practices. Sprung (1999) demonstrated that although landowners showed genuine concern for the continued existence of wildlife on their property and willingly accredited the leasing programs with creating an environment conducive to this, some landowners still intended to convert their previously non-cultivated acreage to cropland once the lease expired. These survey results provide strength to the conclusion that general attitudes may not predict specific behavior with great amounts of precision.

Chapter 6 - Conclusions And Recommendations

The primary purpose of this study was to evaluate the Environmental Tax Credit program after the first field season. The evaluation was necessary in order to ascertain whether the program objectives have been met. Input from landowners and the municipal reeves and administrators of Strathcona and Mountain North, was necessary in order to assess in which direction the program could improve and what changes could be made early in the three year test period. The following chapter discusses the conclusions drawn from this study.

6.1 The Effectiveness of Selected Tax Incentive Programs

The review performed of selected tax incentive programs indicated that there have been no strong evaluations conducted to demonstrate program effectiveness and results. Agencies seem to be poorly equipped to account in a specific, systematic, and scientific way for what they have accomplished (i.e. the results they have achieved) rendering these programs vulnerable to budget cutting. This evaluation dealt with the opinions of landowners and municipal staff towards the Environmental Tax Credit program. However, the next step will be to: perform an analysis of the financial feasibility of the program from the farmers point of view; determine the local economic impacts within the community; and look at the overall environmental and social impacts of the program. This

could help to prove the worth of the Environmental Tax Credit program and gain more public support for the integration of conservation objectives into the property tax system.

6.2 Landowner's Reasons for Not Participating in the Program

The main reason landowners did not participate in the program was because they were not aware of it. Therefore, in order to gain the support of these landowners, the Environmental Tax Credit program needs to be advertised more effectively. When the Environmental Tax Credit program has a high awareness value among its stakeholders, maintaining this awareness and improving the program's profile will depend on keeping stakeholders and beneficiaries informed about the program's progress and successes. This can be done through developing an effective communications strategy that distributes information to the local community, the general public, program supporters, and local politicians.

6.3 Targeting Potential Participants for the Tax Credit Program

Younger landowners may be more likely to participate in the program because they are more receptive to incorporating environmental factors into their farming decisions and are looking to diversify their farming methods. Farmers with a greater income may be more likely to participate in the program, because they have the resources (both financial and technical) to change their farming practices. Also, farmers with a larger number of acres that will qualify for the tax credit, may be more likely to participate in the program. This may be because the financial returns realized could be substantial enough to convince landowners to sign-up for the program and applying is worth the effort. Program

participants have a larger acreage of conservation lands and are already carrying out the conservation practices promoted by the Environmental Tax Credit program. If farmers perceive natural lands to be contributing economically to their farm operations (e.g. use for grazing cattle or hay production), they will be less likely to drain and clear them to produce more acres for cultivation. When targeting potential participants for the Environmental Tax Credit program, evidence indicates that younger landowners with larger farming operations and higher income levels are more likely to be receptive to the program. If funding for the program is limited, landowners with these characteristics should be the focus of future conservation efforts.

6.4 The Acceptability of $1/acre Compensation for Using Conservation Practices

Monetary compensation is a continued requirement for encouraging landowners to use conservation techniques. Although the majority of landowners agreed that $1 per acre was not adequate compensation for carrying out sustainable farming practices, the fact that the landowners remain in control of their land makes the Environmental Tax Credit program more attractive than many other conservation programs. Landowners may be willing to accept less compensation in exchange for greater land use flexibility.

6.5 The Impact of $1/acre on Landowner's Future Land Use Decisions

Based on the survey findings, the Environmental Tax Credit program will influence the majority of landowners to maintain grasslands and plant permanent forages or grasses on marginal cropland. The majority of participants also agreed that the program would

cause them to retain wetlands. Although, the Environmental Tax Credit program raised participant's awareness of the importance of conservation practices and made them more concerned for the well-being of the environment, $1 per acre may not be enough money to get farmers to change their behavior. $1 per acre is not adequate incentive to encourage farmers to modify their farming practices, unless a farmer has been seriously considering using a conservation technique because it creates on-farm economic benefits that can be captured by the landowner. In this case, $1 per acre tax credit could be that extra push that gets landowners to change their farming practices. In general, $1 per acre tax credit acts more as recognition and an added incentive to encourage farmers to continue carrying out the sustainable farming practices. The Environmental Tax Credit program is looked upon favorably today, because the realities of farming are forcing landowners to look at more sustainable land use strategies.

6.6 The Program's Effectiveness at Protecting Erodible Land

The Environmental Tax Credit program is protecting land that is susceptible to wind and water erosion. With limited funding, the program could be better targeted so as to protect more land in the high and severe erosion risk categories and less land in the low erosion risk category.

6.7 The Reaction of Landowners and Participating Municipal Staff Towards the Program

The evaluation revealed that the Environmental Tax Credit program was well delivered and very well received by landowners and the municipal staff of Strathcona and Mountain North. In light of the findings, there appears to be strong support from landowners and the municipal councils for incorporating conservation goals into the property tax system. This is promising because the chances for a successful program are enhanced by local support. The municipality appears to be very favorable towards the Environmental Tax Credit program, as it is presently administered. However, given the mindset that the cost-savings to the municipality will not be equivalent to the lost tax revenue, external funding will be needed to continue the program. On the contrary, there seems to be a lack of support for tax incentive programs from assessment authorities. This may be due to; the added workload imposed on the land assessors; the extra time and costs involved in hiring and training new employees or re-training the existing staff to administer such a program; and the assessment branch perceiving the program to be addressing objectives (i.e. conservation) that are outside their mandate.

The municipality appears to be in the best position to deliver the Environmental Tax Credit program, to influence landowner's opinions relating to land use, and gain the support of landowners. This may be because landowners perceive the municipality as having no vested interest in the program, unlike agencies such as Ducks Unlimited or the Delta Waterfowl Foundation. Political support and the support of the wider community for the Environmental Tax Credit program will strengthen, when the benefits of the

program are seen as serving a broader conservation objective which extends beyond waterfowl.

6.8 Impact of the Program on Landowner Awareness and Attitudes Regarding Conservation Practices

Although the Environmental Tax Credit Program has had a positive impact on producers attitudes regarding conservation practices and increased their environmental awareness, this does not necessarily imply that farmers will change their farming practices.

6.9 Recommendations for Modifications to the Environmental Tax Credit Program and Future Program Undertakings

The following recommendations for modifications to the Environmental Tax Credit program and future program undertakings are based on conclusions drawn from the results of this study and on the results of other similar studies.

1) This study represents the opinions of landowners and the municipal staff at a particular snap-shot in time. The earth is a highly dynamic system whose atmospheric, biological, physical, economic, and social conditions change over the course of time. Landowner's responses to the Environmental Tax Credit program may have short-term and long-term effects that may be quite different. In order to realize the environmental, economic, and social effects of the program and provide a meaningful test of the concept in the program, the duration of the Environmental Tax Credit program needs to extend beyond three years. Program operation, monitoring and evaluation should be ongoing so that the

environmental, economic, and social effects of the program, as well as landowner's responses to the program, can be studied over time scales from years through decades.

2) Methodology needs to be developed for identifying the benefits and costs of the Environmental Tax Credit program. After the fifth year of the Environmental Tax Credit program, and every five years thereafter, evaluation work could be done regarding the physical and socio-economic effectiveness of the Environmental Tax Credit program. This study may provide a useful framework for future program evaluations. Performing a benefit-cost analysis would be useful in order to; estimate the effects of the program's land use options on the incomes of farmers participating in the program; place a dollar value on the cost savings to the municipalities; and assess the environmental and social benefits of the program. After five years, determine whether the Environmental Tax Credit program is generating enough benefits in the local community to pay back the costs associated with administering the program and the loss of local tax revenue.

3) Since accountability for the use of public and private resources is vital to long-term support of the Environmental Tax Credit program, a framework should be developed to establish performance targets, goals and indicators. Indicators need to be established for assessing the progress towards performance targets. Biological indicators are the most obvious factors upon which to base an assessment of the Environmental Tax Credit program. Land use/land cover trends, number of acres effected in the erosion risk categories, water quality, wildlife populations, groundwater recharge etc. could all be used as biological indicators. Socioeconomic indicators such as; landowner attitudes and

practices; program participation levels; municipal cost savings; increased sales created for local businesses from the purchase of services and products such as grass seed, fence post, livestock inputs etc.; net returns from production, can all be used to assess the programs effectiveness. Note that biological and socioeconomic impacts of the program may not be visible for a number of years. As a result, it may be premature to evaluate them at this time. However, administrative and structural indicators such as municipal attitudes, partnerships formed, funds secured, communication efforts, etc. can be developed and used to determine whether the program is effective from an administrative and structural perspective.

The role of performance indicators and targets has become increasingly important in a world that places increased emphasis on accountability. It is advantageous for conservation agencies to assess progress and know whether programs are effective, valuable and have the ability to achieve the goals set out. Without knowing in specific terms what one is setting out to accomplish, one is hard pressed to say when or to what degree it is accomplished - thus the rationale for targets and indicators (Cressman et al. 1999).

4) The main reason landowners did not participate was because they were unaware of the program. In order to gain the attention of these landowners, there is a need to develop a strong and effective communications strategy for the Environmental Tax Credit program. A mailer in each landowner's tax package may be effective at reminding landowners about the Environmental Tax Credit program. Municipal property tax notices should include a listing of the conservation practices eligible for tax credits and the value of the credit for

each practice. This would clearly remind the landowner of the direct value of the conservation practice each time their taxes are paid. Multiple media mechanisms could be used to gain the attention of farmers such as mail brochures, local papers and radio stations.

There is also a need for a variety of communications products designed to present factual information to the public and/or policy makers. In order to maintain funding for the Environmental Tax Credit program, the partners should continue to support communication activities designed to inform audiences within Manitoba, primarily rural residents and provincial politicians, of the benefits of the program. Factual information generated from the evaluation activities (biological and socio-economic) will serve as the basis for an effective, ongoing flow dialogue with the public and politicians. Additionally, opportunities should be sought to cooperatively support communications initiatives of potential partners in policy reform.

5) Landowners recognize the environmental benefits of using conservation practices, yet on the other hand, they may be unaware of the economics of using conservation practices. There should be more consultation between conservation agencies, agricultural agencies, municipal staff, and landowners regarding the availability, suitability, and rewards of using conservation techniques. Ease of access to relevant research and information on land use practices is critical in increasing participation in programs such as the Environmental Tax Credit program. Information which would enhance landowner's ability to make educated decisions regarding the appropriate land use options, should be made available in rural areas such as in municipal offices and agricultural representative offices. Educational

material such as step-by-step worksheets that allow landowners to determine income and expenses when cropping marginal land as compared to practicing conservation techniques on the same land is essential. Such a tool would help to eliminate some of the speculation that takes place when landowners are determining how they will use their land.

6) The Municipal Assessment Act was modified in 1993 to show that conservation lands are assessed and taxed at a lower rate than arable farmland. The assessment form shows the percentage of the assessment value that relates to conservation lands (as indicated on page 25). However, based on the survey results, it can be seen that the majority of landowners are unaware of the taxes they pay on conservation lands. The tax assessment form should be modified, to show the different rates of assessment assigned to different land types. This would help make farmers more aware of the actual taxes they pay on natural lands. If farmers are aware that they pay less tax on natural lands, they may not be so inclined to convert them.

7) The Environmental Tax Credit program is well-liked because it allows increased land use flexibility. When planning programs, conservation agencies should consider arrangements that allow the landowner increased flexibility as to how the land will be used. Activities which could generate income from land enrolled in conservation programs include: the harvesting and marketing of native seed, the promotion of native acreage for ecotourism purposes, cutting of native areas for hay production, the use of land for well-managed grazing purposes, and the use of conservation tillage techniques.

8) It is critical to have a monitoring capability against which to measure progress. It is important to keep a monitoring system and assess the land use changes that take place during the duration of the program. This would help validate whether landowners behaved consistently with their survey responses and whether the program persuades landowners to change their existing farming practices. Since baseline land use numbers from satellite images are available, land use changes can be monitored over the duration of the Environmental Tax Credit program.

9) Consideration should be given to granting differential rates of credits for different conservation practices. The payment per acre for maintaining more residue on croplands could be increased, in order to encourage more farmers to carry out this practice. Not all the conservation practices proposed for the tax credits carry the same initial investment "cost" to the landowner. For example, the value of the credit for maintaining more residue on cropland, could logically be higher than the value of the credit granted for maintaining native prairie that is used for grazing livestock, since the former requires more initial "out of pocket" expense to the landowner. Over the long-term, the benefits of conservation practices may offset the initial costs to the farmer for adopting the conservation practice. However, there may be real/perceived costs to the landowner in the short term that discourage farmers from adopting conservation practices and thus, need to be mitigated.

10) There are still a significant number of areas in annual cultivation that are defined as environmentally sensitive and that should be converted back to pasture and forage. It may be useful to determine which landowners own land in the high and severe erosion risk categories and target the Environmental Tax Credit program at these farmers.

11) Based on the municipal staff interview, the Environmental Tax Credit program could operate on a province-wide basis, under the following criteria:

i) The program should be funded through taxation of the general population because the program benefits society as a whole. This could be done through the Income Tax Act because everybody is contributing and taxes are based on wealth. This however, should be accomplished without increasing taxes.

ii) The tax credit would be applied to municipal property taxes.

iii) There would have to be municipal, provincial and possibly private administration of the program in order to coordinate the sharing of technical, financial, and labor resources.

iv) Municipalities should submit a statement of tax credits granted to a senior level of government and be reimbursed for tax revenue foregone. Given that ecological goods and services are a benefit to society, it would be logical to expect that both the federal and provincial governments participate in providing the funds to reimburse the municipality.

v) For simplicity, it would be desirable for the municipal government to only have to deal with one funding source, most likely the provincial government. The province could recover cost-shared funds from the federal government, through a percentage of the

total income taxes collected within the province. Subsequently, the province could grant municipalities this money to reimburse them for lost tax revenue as a result of paying out tax credits.

vi) The role of the provincial land assessor should probably remain the same but they could also determine the eligibility of landowners based on land cover, using satellite imagery.

12) Based on the municipal interviews, it is suggested that in order to avoid extra administrative work and confusion, the municipality and landowners should be notified about eligibility and the amount of tax credit each landowner is eligible for, prior to the tax notices being mailed out to landowners. The funding should be credited to the municipal tax roll by mid-July at the latest so that the tax credit can be taken directly off the landowner's tax bill and the municipality is assured of the funding.

13) Before implementing the Environmental Tax Credit program on a province-wide basis, a survey should be conducted of municipal officials across the province, in order to determine their general attitudes toward the Environmental Tax Credit program and provide an indication of the support for incorporating conservation objectives into the property tax system.

14) Neither municipality was aware of the exact cost of prevention and maintenance associated with erosion. For the purposes of future evaluation efforts, it would be useful to have actual dollar amounts that could be attributed to the cost of soil erosion within

each municipality. It may be a useful exercise for agencies and municipalities to develop a method to keep track of the costs associated with various aspects of municipal maintenance so that the municipality recognizes the cost savings over the next three year period as a result of the Environmental Tax Credit program.

6.10 Encouraging Property Tax Reform

Because land and water are limited resources that must be used forever, there exists a right and an obligation on the part of the government to protect these resources and maintain their quality and productivity for the use of future generations. The development of a favorable public attitude towards sustainable soil and water conservation practices and the promotion of this new consciousness with initiatives to encourage farmer adoption of conservation techniques, must be the responsibility of the government (Prairie Farm Rehabilitation Administration 1982). Government policies and programs need to promote agriculture that is sustainable and be consistent with the goal of protecting the productive capacity of the land for future generations.

Within the context of natural resource policy development, an important role of the scientific and research community is to provide information upon which policy decisions and actions can be based (Scarth, 1998). In order to support property tax reform, an analysis of the benefits and costs of the Environmental Tax Credit program may be very useful. If the tax credit program is successful over the three year test period, there may be an opportunity to influence the amendment of the property tax system so that farmers are compensated for carrying out sustainable farming practices.

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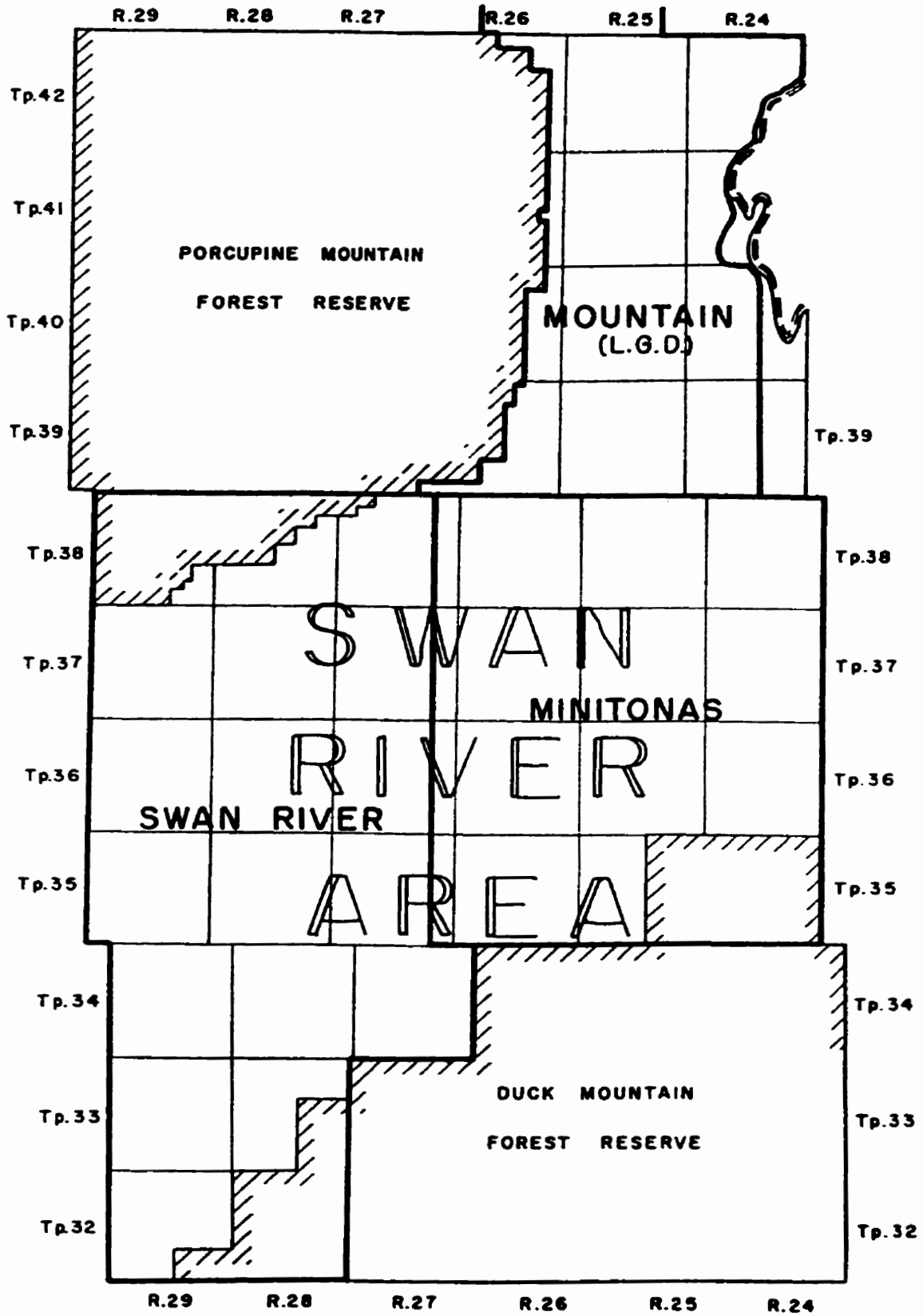
APPENDIX 1

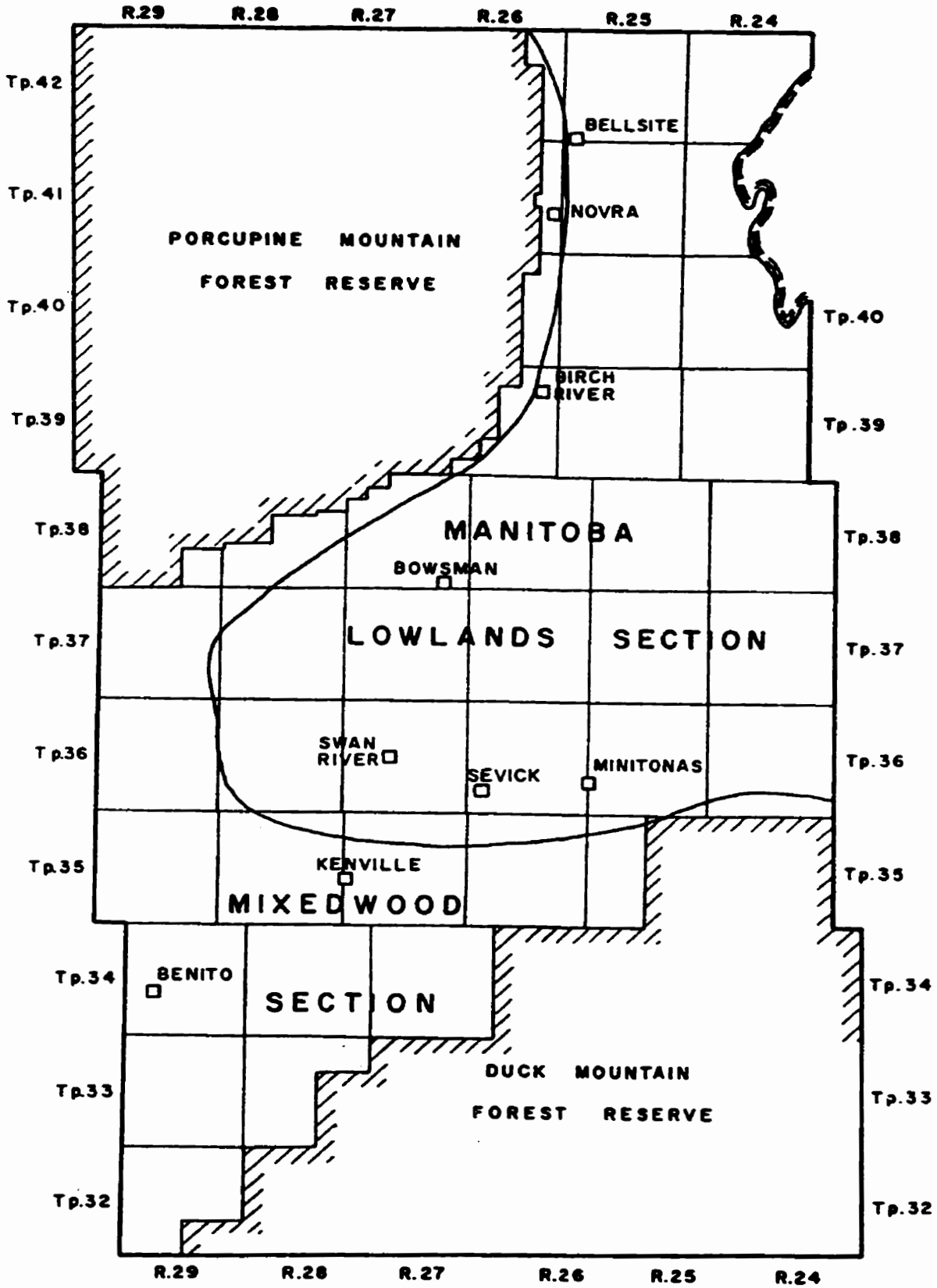
Municipalities in the Swan River Map Sheet Area



Municipalities in the Swan River Map Area.

APPENDIX 2

Physiographic Regions in the Swan River Map Sheet Area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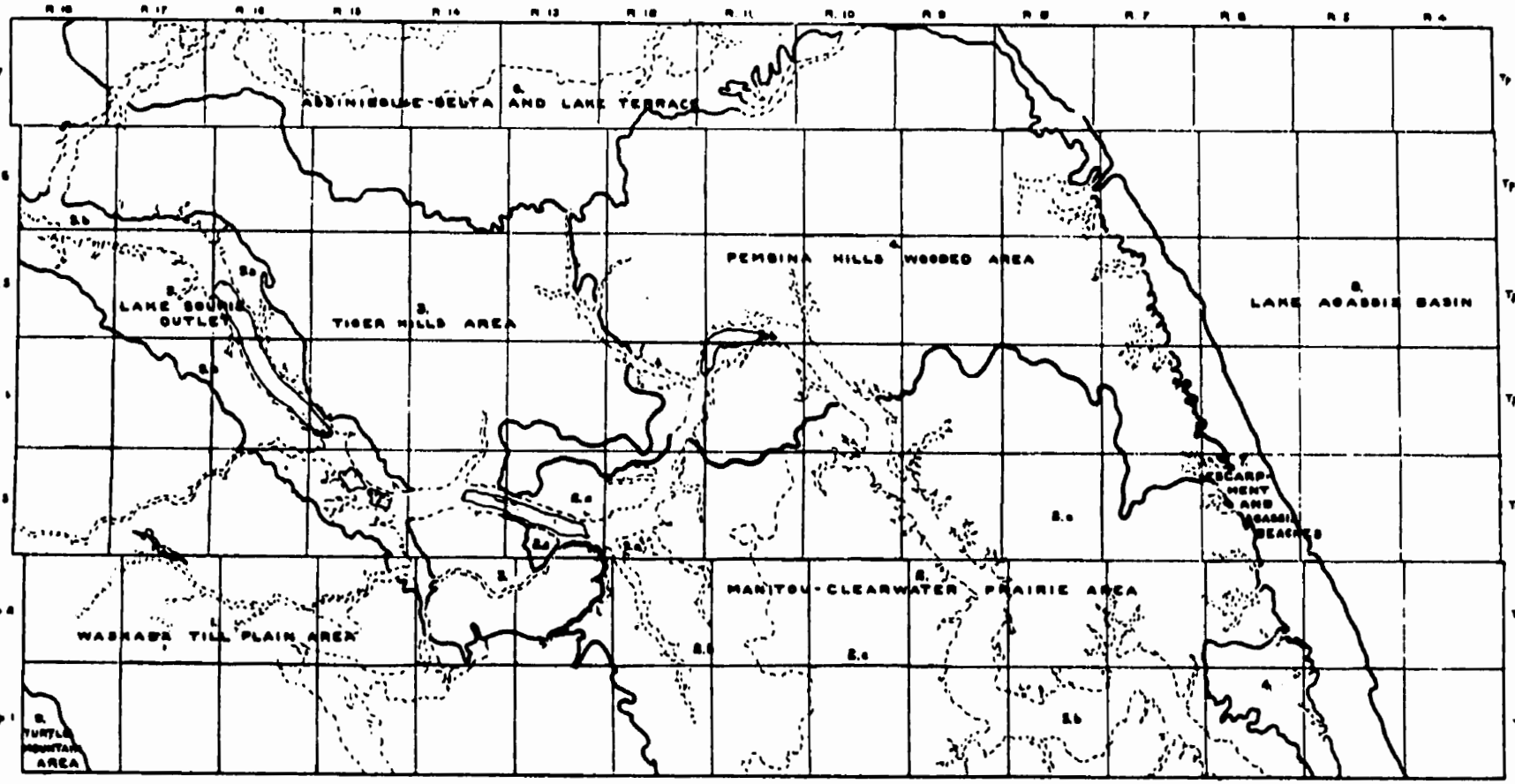
Tp.38
Tp.37
Tp.36
Tp.35
Tp.34
Tp.33
Tp.32
BELLSITE
NOVRA
PORCUPINE MOUNTAIN
FOREST RESERVE
BIRCH RIVER
MANITOBA
BOWSMAN
LOWLANDS SECTION
SWAN RIVER
SEVICK
MINITONAS
KENVILLE
MIXEDWOOD
BENITO
SECTION
DUCK MOUNTAIN
FOREST RESERVE

APPENDIX 3

Landscape Areas in South Central Manitoba

LANDSCAPE AREAS IN SOUTH-CENTRAL MANITOBA



APPENDIX 4

Research Questions and Statistical Tests Used to Analyze Survey Results

Research Questions & Statistical Analysis

PROGRAM RATIONALE

Landowner Demographics

Part. Survey Reference: 20, 21
Non-Part. Survey Reference: 13, 14

Research Question (Words):
What was the median age of participants and non-participants? And what percentage of landowners fall in each age category?

Procedure:
Frequency Distribution and Median

Landowner Demographics

Part. Survey Reference: 22, 23
Non-Part. Survey Reference: 15, 16

Research Question (Words):
What was the median annual farm income of participants and non-participants? And what percentage of landowners fall in each income category?

Procedure:
Frequency Distribution and Median

Land Characteristics

Part. Survey Reference: 17, 18, 19
Non-Part. Survey Reference: 11, 12

Research Question (Words):
What was the average size of operation for participants and non-participants?
What percentage of this acreage was cropland; pasture land; hayland; idle land; and wetlands?

Procedure:
Frequency Distributions and Means

Reasons For Participating or Not Participating in the Environmental Tax Credit Program

Part. Survey Reference: 1
Non-part. Survey Reference: 1

Research Questions (Words):
Why did landowners participate or not participate in the Environmental Tax Credit program?

Procedure:
Frequency Distributions

Affect of Soil and Water Conservation Knowledge on Program Participation

Part. Survey Reference: 12a,b
Non-Part. Survey Reference: 8a,b

(a) Comparing Populations
Research Question (Words):
Ho: Landowner knowledge about soil and water conservation has no affect on participation in the program.
Ha: Landowners who are knowledgeable about soil and water conservation are more likely to participate in the program.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

Landowner Attitudes About Municipal Taxation of Conservation Lands

Part. Survey Reference: 12c
Non-Part. Survey Reference: 8c

(a) Within a Population
Research Question (Words):
Ho: The majority of participants (non-part.) do not agree that society should compensate landowners for the benefits of sustainable land management through the tax system.
Ha: The majority of participants (non-part.) agree that society should compensate landowners for the benefits of sustainable land management through the tax system.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who agree that society should compensate landowners for the benefits of sustainable land management through the tax system.
- score answer of 4 or 5 as 1; score other answers as 0.

Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words):
Ho: The mean level of support for the claim that society should compensate landowners for the benefits of sustainable land management through the tax system is the same for participants and non-participants.
Ha: The mean level of support for the claim that society should compensate landowners for the benefits of sustainable land management through the tax system is greater for participants than for non-participants.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

Landowner Awareness of the Taxes Paid on Conservation Lands

Part. Survey Reference: 7
Non-Part. Survey Reference: 6

(a) Within a Population
Research Questions (Words):
Ho: The majority of participants (non-part.) are not aware that they pay equal to or less than $1 per acre tax on conservation land.
Ha: The majority of participants (non-part.) are aware that they pay equal to or less than $1 per acre tax on conservation land.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who are aware that they pay equal to or less than $1 per acre tax on conservation lands.
- score answer of "greater than" as 0; score answer of "less than" or "equal to" as 1.

Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words):
Ho: Program participants and non-participants are equally likely to be aware that they pay equal to or less than $1 per acre tax on Conservation lands.
Ha: Program participants and non-participants are not equally likely to be aware that they pay equal to or less than $1 per acre tax on Conservation lands.

Hypotheses:
Ho: $p_1 = p_2$
Ha: $p_1 = p_2$
- where p_1 = true proportion of participant population who are aware that they pay equal to or less than $1 per acre tax on conservation lands; and p_2 = true proportion of non-participant population who are aware that they pay equal to or less than $1 per acre tax on conservation lands.
- score answer of "greater than" as 0; score other answers of "less than" or "equal to" as 1.

Test Procedure:
Test for difference in proportions for two populations, two independent samples

The Need for the Environmental Tax Credit Program

Part. Survey Reference: 4a,b,c,d
Non-Part. Survey Reference: 3a,b,c,d

(a) Within a Population
Research Question (Words):
Ho: The majority of program participants (non-part.) will not identify having a problem with erosion.
Ha: The majority of program participants (non-part.) will identify having a problem with erosion.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who identify having a problem with erosion.
- score answer of 4 or 5 as 1; score answer of 1, 2 or 3 as 0.

Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words):
Ho: Participants and non-participants are equally likely to have erosion problems.
Ha: Participants are more likely to have erosion problems.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

The Effectiveness of the Environmental Tax Credit Program

Part. Survey Reference: 4e
Non-Part. Survey Reference: 3e

(a) Within a Population
Research Question (Words):
Ho: The majority of participants (non-part.) do not agree that the Environmental Tax Credit program will help to reduce erosion.
Ha: The majority of participants (non-part.) agree that the Environmental Tax Credit program will help to reduce erosion.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who agree that the program will help to reduce erosion.
- score answer of 4 or 5 as 1; score answer of 1, 2 or 3 as 0.

Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words):
Ho: The mean level of agreement for the claim that the Environmental Tax Credit program will help to reduce erosion is the same for participants and non-participants.
Ha: The mean level of agreement for the claim that the Environmental Tax Credit program will help to reduce erosion is greater in the participant population than in the non-participant population.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

The Environmental Tax Credit Program's Rank Among Other Conservation Approaches

Part. Survey Reference: 5
Non-Part. Survey Reference: 4

Research Question (Words):
How did the Environmental Tax Credit program rank relative to other existing conservation methods on private land?

Procedure:
Frequency Distribution (Count) and Mean Rank

PROGRAM DESIGN & DELIVERY

The Acceptability of $1/acre Compensation for Using Conservation Practices

Part. Survey Reference: 6a,b,c
Non-Part. Survey Reference: 5a,b,c

(a) Within a Population
Research Questions (Words):
Ho: Less than a majority of participants (non-part.) agree that $1 per acre is adequate incentive for them to retain wetlands.
Ha: The majority of participants (non-part.) agree that $1 per acre is adequate incentive for them to retain wetlands.

Ho: Less than the majority of participants (non-part.) agree that $1 per acre is adequate incentive for them to maintain grasslands.
Ha: The majority of participants (non-part.) agree that $1 per acre is adequate incentive for them to maintain grasslands.

Ho: Less than the majority of participants (non-part.) agree that $1 per acre is adequate incentive for them to leave more crop residue on their fields.
Ha: The majority of participants (non-part.) agree that $1 per acre is adequate incentive for them to leave more crop residue on their fields.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who agree that $1 per acre is adequate compensation.
- score answer of 4 or 5 as 1; score answer of 1, 2 or 3 as 0.
Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words)
Ho: The mean level of support for the claim that $1 per acre is adequate incentive to retain wetlands is the same for participants and non-participants.
Ha: The mean level of support for the claim that $1 per acre is adequate incentive to retain wetlands is greater for participants than for non-participants.

Ho: The mean level of support for the claim that $1 per acre is not adequate incentive to maintain grasslands is the same for participants and non-participants.
Ha: The mean level of support for the claim that $1 per acre is adequate incentive to maintain grasslands is greater for participants than for non-participants.

Ho: The mean level of support for the claim that $1 per acre is not adequate incentive to leave more crop residue on their fields is the same for participants and non-participants.
Ha: The mean level of support for the claim that $1 per acre is adequate incentive to leave more crop residue on their fields is greater for participants than for non-participants.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

<u>The Program's Ability to Achieve the Objectives Set Out By the Agendas Involved</u>

Part. Survey Reference: 15b
Non-Part. Survey Reference: 10

(a) Within a Population
Research Question (Words):
Ho: The majority of participants (non-part.) do not agree that the Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term.
Ha: The majority of participants (non-part.) agree that the Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who agree that the ETC can help to maintain and enhance the condition of the environment over the long term.

- score answer of 4 or 5 as 1; score other answers as 0.

Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words):
Ho: The mean level of support for the claim that the Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term is the same for participants and non-participants.
Ha: The mean level of support for the claim that the Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term is greater for participants than for non-participants.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

<u>The Program's Ability to Achieve the Objectives Set Out By the Agendas Involved</u>

Part. Survey Reference: 10c

Research Question (Words):
Ho: The Environmental Tax Credit program will not encourage the majority of participants to carry out sustainable farming practices that will protect the land and water resource base.
Ha: The Environmental Tax Credit program will encourage the majority of participants to carry out sustainable farming practices that will protect the land and water resource base.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who agree that the program will encourage sustainable farming practices.
- score answer of 4 or 5 as 1; score other answers as 0.

Test Procedure:
Binomial test

The Mechanism Involved in Delivering the Program - the Property Tax System

Part. Survey Reference: 11
Non-Part. Survey Reference: 7

(a) Within a Population
Research Question (Words):
Ho: The majority of participants (non-part.) do not perceive the property tax system as an effective means of compensating landowners who practice sustainable land management.
Ha: The majority of participants (non-part.) perceive the property tax system as an effective means of compensating landowners who practice sustainable land management.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who perceive that the property tax system as an effective means of compensating landowners who practice sustainable land management.
- score answer of 4 or 5 as 1; score other answers as 0.

Test Procedure:
Binomial test

(b) Comparing Populations
Research Question (Words):
Ho: The mean level of support for the claim that the property tax system is an effective means of compensating landowners who carry out sustainable farming practices is the same for participants and non-participants.
Ha: The mean level of support for the claim that the property tax system is an effective means of compensating landowners who carry out sustainable farming practices is greater for participants than for non-participants.

Hypotheses:
Ho: $\hat{u}^1 = \hat{u}^2$
Ha: $\hat{u}^1 > \hat{u}^2$
- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:
Student's t-test for a difference in means of two independent samples

The Administration of the Environmental Tax Credit Program

Part. Survey Reference: 8, 9

Research Question (Words):
Ho: Less than the majority of participants find the Environmental Tax Credit program, as administered, easy to understand.
Ha: The majority of participants find the Environmental Tax Credit program, as administered, easy to understand.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who find the program easy to understand.
- score answer of 4 or 5 as 1; score answer of 1, 2 or 3 as 0.

Test Procedure:
Binomial test

The Most Effective Method of Program Announcement

Part. Survey Reference: 2

Research Question (Words):
What was the most effective method of program announcement?

Procedure:
Frequency Distribution

PROGRAM IMPACT

Landowner Reactions to the Program
Part. Survey Reference: 15d, 16

Research Question (Words):
Ho: The majority of participants will have a neutral or negative reaction towards the Environmental Tax Credit program.
Ha: The majority of participants will have a positive reaction towards the Environmental Tax Credit program.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$

- where p = true proportion of population who have a positive reaction towards the Environmental Tax Credit program.
- score answer of 4 or 5 as 1; score other answers as 0.

Test Procedure:
Binomial test

Landowner Perceptions of the Program
Part. Survey Reference: 13
Non-Part. Survey Reference: 9

Research Question (Words):
How do landowners perceive the Environmental Tax Credit program?

Procedure:
Frequency Distribution

Program Impact on Landowner Awareness and Attitudes Regarding Conservation Practices
Part. Survey Reference: 10a,b, 14, 15c

Research Question (Words):
Ho: The Environmental Tax Credit program is not likely to affect the majority of participant's awareness and attitudes regarding conservation practices.
Ha: The Environmental Tax Credit program is likely to affect the majority of participant's awareness and attitudes regarding conservation practices.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of population who's awareness and attitudes regarding conservation practices are affected by the program.
- score answer of 4 or 5 as 1; score answer of 1, 2 or 3 as 0.

Test Procedure:
Binomial test

The Impact of $1/acre on Landowner's Future Land Use Decisions

Part. Survey Reference: 3a,b,c,d
Non-Part. Survey Reference: 2a,b,c,d

(a) Within a Population
Research Questions (Words):
Ho: The Environmental Tax Credit program is not likely to affect the majority of participant's (non-part.) future decisions to maintain more residue cover on cropland in order to become eligible for the program next year.
Ha: The Environmental Tax Credit program is likely to affect the majority of participant's (non-part.) future decisions to maintain more residue cover on cropland in order to become eligible for the program next year.

Ho: The Environmental Tax Credit program is not likely to affect the majority of participant's (non-part.) future decisions to maintain grasslands in order to become eligible for the program next year.
Ha: The Environmental Tax Credit program is likely to affect the majority of participant's (non-part.) future decisions to maintain grasslands in order to become eligible for the program next year.

Ho: The Environmental Tax Credit program is not likely to affect the majority of participant's (non-part.) future decisions to retain wetlands in order to become eligible for the program next year.
Ha: The Environmental Tax Credit program is likely to affect the majority of participant's (non-part.) future decisions to retain wetlands in order to become eligible for the program next year.

Ho: The Environmental Tax Credit program is not likely to affect the majority of participant's (non-part.) future decisions to plant permanent grasses or forages on marginal land rather than annual crops in order to become eligible for the program next year.
Ha: The Environmental Tax Credit program is likely to affect the majority of participant's (non-part.) future decisions to plant permanent grasses or forages on marginal land rather than annual crops in order to become eligible for the program next year.

Hypotheses:
Ho: $p \leq 0.5$
Ha: $p > 0.5$
- where p = true proportion of the population that is likely to change the specified farming practice.
- score answer of 4 or 5 as 1; score answer of 1, 2 or 3 as 0.

Test Procedure:
Binomial test

(b) Comparing Populations

Research Questions (Words):

Ho: Participants and non-participants are equally likely to maintain more residue cover on cropland in order to become eligible for the program next year.

Ha: Participants are more likely to maintain more residue cover on cropland in order to become eligible for the program next year.

Ho: Participants and non-participants are equally likely to maintain grasslands in order to become eligible for the program next year.

Ha: Participants are more likely to maintain grasslands in order to become eligible for the program next year.

Ho: Participants and non-participants are equally likely to retain wetlands in order to become eligible for the program next year.

Ha: Participants are more likely to retain wetlands in order to become eligible for the program next year.

Ho: Participants and non-participants are equally likely to plant permanent grasses or forages on marginal land rather than annual crops in order to become eligible for the program next year.

Ha: Participants are more likely to plant permanent grasses or forages on marginal land rather than annual crops in order to become eligible for the program next year.

Hypotheses:

Ho: $\hat{u}^1 = \hat{u}^2$

Ha: $\hat{u}^1 > \hat{u}^2$

- where $\hat{u}^1$ is the true mean of the participants population and $\hat{u}^2$ is the true mean for the non-participant population.

Test Procedure:

Student's t-test for a difference in means of two independent samples

APPENDIX 5

Participants and Non-Participant Questionnaires

PARTICIPANT SURVEY

PART I

1. What was your **main** reason for participating in the Environmental Tax Credit Program? **(please check one)**

   _____Tax break
   _____To prevent soil erosion
   _____To benefit wildlife
   _____Other reason please specify_____

_____

2. How did you become aware of the Environmental Tax Credit Program? **(please check all that apply)**

   _____Newspaper article
   _____Mail-out brochure
   _____Word of mouth
   _____Others, please specify_____

_____

For the following questions, please indicate how likely or unlikely it is that you would consider the following scenarios by circling the appropriate response.

3. In its present format, how likely is it that the Environmental Tax Credit program would cause you to change the following farming practices, in order to become eligible for the program next year?

   a) Maintain more residue cover on cropland (e.g. move toward conservation tillage)

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

   If you circled 1 or 2, please explain why_____

_____

   b) Maintain grasslands

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

   If you circled 1 or 2, please explain why_____

_____

c) **Retain wetlands**

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

If you circled 1 or 2, please explain why_____

_____

d) Plant permanent grasses or forages on marginal cropland rather than annual crops.

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

If you circled 1 or 2, please explain why_____

_____

4. ***Please indicate, by circling the appropriate number, the extent to which you agree or disagree.***

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) On my farm, soil erosion from wind is a problem.	1	2	3	4	5
b) In my Municipality, soil erosion from wind is a problem.	1	2	3	4	5
c) On my farm, soil erosion from water is a problem.	1	2	3	4	5
d) In my Municipality, soil erosion from water is a problem.	1	2	3	4	5
e) By maintaining vegetative cover on my land, the Environmental Tax Credit program will help to reduce erosion.	1	2	3	4	5

5. Rank the conservation approaches from 1 to 8, according to your preference (e.g. 1=first choice, 8=last choice).

_____ The Environmental Tax Credit Program
_____ Land Acquisition by Conservation Agencies
_____ Short-Term Land Leasing Agreements (e.g. 2 years)
_____ Long-Term Land Leasing Agreements (e.g. 10 years)
_____ Conservation Easements
_____ Direct Payment for Conservation Practices
_____ Provision of Conservation Farming Equipment or Materials
_____ Other Methods

PART II

For the following questions, please indicate, by circling the appropriate number, the extent to which you agree or disagree with the statement.

6. a) The current tax credit amount **($1 per acre)**, is adequate incentive not to drain wetlands.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

_____

b) The current tax credit amount **($1 per acre)**, is adequate incentive to maintain grasslands.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

_____

c) The current tax credit amount **($1 per acre)**, is adequate incentive to leave more crop residue cover on my fields.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

_____

7. The taxes I pay **per acre**, on natural lands (such as forest-covered land and wetlands), are _____ the $1 per acre tax credit offered through the Environmental Tax Credit Program **(Check one response)**.

_____ Greater than
_____ Less than
_____ Equal to

8. As administered, The Environmental Tax Credit program was easy for me to understand.

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

9. The program application forms were easy to fill out.

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

If you Disagree/Strongly Disagree, then why were the application forms difficult to fill out? **(Check all that apply).**

_____Too much time was spent filling them out.
_____Applications were difficult to understand.
_____Others, please specify_____

---

10. In your opinion, has the Environmental Tax Credit program been successful at:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) increasing my awareness about taking care of my land.	1	2	3	4	5
b) making me think more about the environment.	1	2	3	4	5
c) encouraging me to protect the land and water resources base from erosion.	1	2	3	4	5

11. Using the property tax system is an effective means of compensating landowners who carry out conservation practices.

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

PART III

12. ***For the following questions, please indicate, by circling the appropriate number, the extent to which you agree or disagree with the statement.***

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) Preventing soil erosion and loss of organic matter, is important for good crop production.	1	2	3	4	5
b) Over a long term period, conservation tillage and the maintenance of vegetative cover on erodible land will help to improve the quality of my land and therefore crop production.	1	2	3	4	5
c) Society should compensate landowners for preserving natural lands such as wetlands, grasslands, and forested land.	1	2	3	4	5
d) Municipal taxation of Conservation Lands (e.g. bushland and wetlands) is a major reason why landowners drain wetlands and clear forested land and native prairie for crop production.	1	2	3	4	5
e) Maintaining land for wildlife and protecting the land and water resources base can be complementary to agricultural production.	1	2	3	4	5

13. In my view, the Environmental Tax Credit Program: **(Check all that apply).**

_____ Provides an economic incentive to change farming practices.
_____ Provides compensation for those farmers carrying out good farming practices.
_____ Is an awareness program to get you thinking about conservation and the environment.

14. Since the implementation of the Environmental Tax Credit program, how has your opinion on the importance of land and water conservation issues changed?

Less important to me	No change	More important to me
1	2	3

15. ***For the following questions, please indicate, by circling the appropriate number, the extent to which you agree or disagree with the statement.***

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) If the tax credit was discontinued, I would continue to carry out good conservation practices.	1	2	3	4	5
b) The Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term.	1	2	3	4	5
c) As a result of participating in the Environmental Tax Credit program, I am more aware of the importance of conservation farming.	1	2	3	4	5
d) The Environmental Tax Credit program is worthwhile.	1	2	3	4	5

16. Overall, how would you rate the Environmental Tax Credit program.

Very Poor	Poor	Neither Good nor Poor	Good	Very Good
1	2	3	4	5

PART IV

Learning more about you and your operation may help us to guide future conservation programs. (Please provide numbers where it is appropriate).

17. Approximately, how many acres did you enroll in the Environmental Tax Credit program?
_____ acres.

18. How many acres of farmland are involved in your operation? _____ acres.

19. Please specify the approximate number of acres on your farm, for each type of land use.

_____ Crop Production
_____ Pasture land
_____ Hayland
_____ Idle land
_____ Wetlands

20. How many years have you been farming? _____ years.

21. For yourself and then for each person who contributes to your household income, please indicate your sex (M = Male, F = female) and age range.

		AGE (years) Check one.						
SEX Circle one.		15-20	21-30	31-40	41-50	51-60	61-70	over 70
You	M F	___	___	___	___	___	___	___
Per. 1	M F	___	___	___	___	___	___	___
Per. 2	M F	___	___	___	___	___	___	___
Per. 3	M F	___	___	___	___	___	___	___

22. For the year 1998, what was your approximate total farm income before taxes and deductions? **(Please check one)**

___less than $10,000
___$10,000-$19,999
___$20,000-$29,999
___$30,000-$39,999
___$40,000-$49,999
___$50,000-$59,000
___$60,000-$69,999
___$70,000-$79,999
___$80,000 or over

23. Is farming your primary source of household income?

_____Yes _____No

24. Would you be interested in receiving a copy of the survey results?

_____Yes _____No

NON-PARTICIPANT SURVEY

PART I

1. What was your **main** reason for not participating in the Environmental Tax Credit Program? **(please check one)**

   _____Not aware of the program
   _____$1 per acre is not adequate compensation
   _____Too much effort to apply
   _____Don't want wildlife on my farm
   _____Erosion is not a problem on my farm
   _____Other reason, please specify_____

For the following questions, please indicate how likely or unlikely it is that you would consider the following scenarios by circling the appropriate response.

2. In its present format, how likely is it that the Environmental Tax Credit program would cause you to change the following farming practices, in order to become eligible for the program next year?

   a) Maintain more residue cover on cropland (e.g. move toward conservation tillage)

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

   If you circled 1 or 2, please explain why_____

---

   b) Maintain grasslands

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

   If you circled 1 or 2, please explain why_____

---

   c) Retain wetlands

Extremely Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Likely
1	2	3	4	5

   If you circled 1 or 2, please explain why_____

---

d) Plant permanent grasses or forages on marginal cropland rather than annual crops.

Extremely Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Extremely Likely
1	2	3	4	5

If you circled 1 or 2, please explain why_____

_____

3. ***Please indicate, by circling the appropriate number, the extent to which you agree or disagree with the statements below.***

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) On my farm, soil erosion from wind is a problem.	1	2	3	4	5
b) In my Municipality, soil erosion from wind is a problem.	1	2	3	4	5
c) On my farm, soil erosion from water is a problem.	1	2	3	4	5
d) In my Municipality, soil erosion from water is a problem.	1	2	3	4	5
e) By maintaining vegetative cover on my land, the Environmental Tax Credit program has helped to reduce erosion.	1	2	3	4	5

4. Rank the conservation approaches from 1 to 8, according to your preference (e.g. 1=first choice, 8=last choice).

_____ The Environmental Tax Credit Program
_____ Land Acquisition by Conservation Agencies
_____ Short-Term Land Leasing Agreements (e.g. 2 years)
_____ Long-Term Land Leasing Agreements (e.g. 10 years)
_____ Conservation Easements
_____ Direct Payment for Conservation Practices
_____ Provision of Conservation Farming Equipment or Materials
_____ Other Methods

PART II

For the following questions, please indicate, by circling the appropriate number, the extent to which you agree or disagree with the statement.

5. a) The current tax credit amount ($1 per acre), is adequate incentive not to drain wetlands.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

---

b) The current tax credit amount **($1 per acre)**, is adequate incentive to maintain grasslands.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

---

c) The current tax credit amount **($1 per acre)**, is adequate incentive to leave more crop residue cover on my fields.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

---

6. The taxes I pay **per acre**, on natural lands (such as forest-covered land and wetlands), are _____ the $1 per acre tax credit offered through the Environmental Tax Credit Program **(Check one response)**.

   _____ Greater than
   _____ Less than
   _____ Equal to

7. Using the property tax system is an effective means of compensating landowners who carry out conservation practices.

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

PART III

8. ***For the following questions, please indicate, by circling the appropriate number, the extent to which you agree or disagree with the statement.***

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a) Preventing soil erosion and loss of organic matter, is important for good crop production.	1	2	3	4	5
b) Over a long term period, conservation tillage and the maintenance of vegetative cover on erodible land will help to improve the quality of my land and therefore crop production.	1	2	3	4	5
c) Society should compensate landowners for preserving natural lands such as wetlands, grasslands, and forested land.	1	2	3	4	5
d) Municipal taxation of Conservation Lands (e.g. bushland and wetlands) is a major reason why landowners drain wetlands and clear forested land and native prairie for crop production.	1	2	3	4	5
e) Maintaining land for wildlife and protecting the land and water resources base can be complementary to agricultural production.	1	2	3	4	5

9. In my view, the Environmental Tax Credit Program: **(Check all that apply).**

_____ Provides an economic incentive to change farming practices.
_____ Provides compensation for those farmers carrying out good farming practices.
_____ Is an awareness program to get you thinking about conservation and the environment.

10. The Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term.

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

If you Disagree/Strongly Disagree, then what do you feel would be an adequate amount?_____

PART IV

Learning more about you and your operation may help us to guide future conservation programs. (Please provide numbers where it is appropriate).

11. How many acres of farmland are involved in your operation? _____ acres.

12. Please specify the approximate number of acres on your farm, for each type of land use.

_____ Crop Production
_____ Pasture land
_____ Hayland
_____ Idle land
_____ Wetlands

13. How many years have you been farming? _____ years.

14. For yourself and then for each person who contributes to your household income, please indicate your sex (M = Male, F = female) and age range.

		AGE (years) Check one.						
SEX Circle one.		15-20	21-30	31-40	41-50	51-60	61-70	over 70
You	M F	__	__	__	__	__	__	__
Per. 1	M F	__	__	__	__	__	__	__
Per. 2	M F	__	__	__	__	__	__	__
Per. 3	M F	__	__	__	__	__	__	__

15. For the year 1998, what was your approximate total farm income before taxes and deductions? **(Please check one)**

___less than $10,000
___$10,000-$19,999
___$20,000-$29,999
___$30,000-$39,999
___$40,000-$49,999
___$50,000-$59,000
___$60,000-$69,999
___$70,000-$79,999
___$80,000 or over

16. Is farming your primary source of household income?

_____Yes _____No

17. Would you be interested in receiving a copy of the survey results?

_____Yes _____No

APPENDIX 6

Questionnaire Cover Letter

July 19, 1999

Dear Landowner,

The Environmental Tax Credit Program is a three year pilot program that is evaluating a new method of delivery for conservation programming in Manitoba. The program is jointly offered by:

- Prairie Farm Rehabilitation Administration;
- Ducks Unlimited Canada;
- The Northwest Soil Management Association;
- and the Rural Municipalities of **Strathcona and Mountain North.**

The program offers the benefits of a **$1 per acre municipal tax credit** to all landowners within the two municipalities, to preserve and protect the land and water resource base. The Environmental Tax Credit Program is meant to provide recognition to those landowners who are already doing a good job of rural resource management and to serve as an incentive to continue carrying out these practices.

The Environmental Tax Credit Program is an important step toward developing consistent policies aimed at making Agriculture sustainable in the long term. If the Environmental Tax Credit Program is successful, there is a chance to change the taxation system so that farmers can be compensated fairly for making good land management decisions. This survey, which we are asking you to fill out, will help provide an evaluation of the program. It is important that we receive your input in order to assess how the program can be improved, and if you think it is valuable and worth continuing in the future.

This package consists of a booklet form survey and a pre-addressed, postage paid envelope for returning the completed survey in the mail. There will also be a drop-off box at the Strathcona and Mountain North municipal offices, if this is more convenient for you. If the survey is completed by August 2nd, **you can qualify to have your name put in a draw for a wildlife print** donated by Ducks Unlimited.

If you have any concerns or questions regarding the survey, contact Christine Van De Velde @ **836-2613**. **Thank you very much for your cooperation in this matter**.

Sincerely,

Christine Van De Velde
Natural Resource Institute

John Chambers
Municipal Reeve

APPENDIX 7

Municipal Interview

Municipal Staff Interview

PART I - Program Rational

1. Do you think the type of farming operation (its viability in terms of size or number of productive acres versus natural/unproductive acres or farm income will have an effect on program participation? What about farmer age?

2. Do you think that most farmers know the amount of taxes they are paying on conservation Lands (e.g. wetlands, forested land) as opposed to good quality land that is suitable for crop production?

3. Is soil erosion from wind and water a problem in the municipality? If so, does soil erosion have an effect on municipal operations and costs?

4. By maintaining vegetative cover on the land, do you feel the Environmental Tax Credit Program can help to reduce erosion over the long-term?

5. Decreasing wind and water erosion, maintaining quality of water, maintaining natural beauty, and preserving wildlife habitat are some reasons for preserving natural forestlands, wetlands, and grasslands on your land. How important would you consider each of these reasons to be?

6. Do you think Ecological goods and services like wildlife, groundwater recharge, flood and erosion control, riparian zones(riverbanks), and the preservation of soil and water quality - require a defined monetary value to make them worth preserving? Why?

7. Do you think your participation in conservation programs such as the Environmental Tax Credit Program is necessary to protect the land and water resource base and wildlife habitat?

8. What is the major reason why landowners drain wetlands, clear forested land and native prairie for crop production? If conservation lands were not taxed do you think farmers would get rid of them?

9. Compared to these other conservation approaches, how does the Environmental Tax Credit Program ranks? What are the advantages and disadvantages over other conservation methods?

____The Environmental Tax Credit Program
____ Land Acquisition by Conservation Agencies
____ Short-Term Land Leasing Agreements (e.g. 2 years)
____ Long-Term Land Leasing Agreements (e.g. 10 years)
____ Conservation Easements
____ Direct Payment for Conservation Practices
____ Provision of Conservation Farming Equipment
____ Other Methods

PART II - Program Design and Delivery

10. Do you think $1 per acre tax credit is adequate incentive to carry out the following conservation practices?/ if no then what is?

    a) to maintain grass lands;
    b) not to drain wetlands;
    c) to maintain crop residue cover on fields;
    d) to plant permanent forages/grasses on marginal cropland

11. Do you think using the property tax system is an effective means of compensating landowners who carry out conservation practices?

12. In its present form, was the Environmental tax Credit program administered easily and efficiently? Was it easy to understand? What changes would you have made?

PART III - Program Impact - Satisfaction

13. Overall, what did you think of the program? Is the program worth continuing? Did you receive any feedback from landowners about the program?

14. In your opinion, what are benefits of the Environmental Tax Credit program? Who do you think benefits from The Environmental Tax Credit program? Society as a whole? Farmers? Municipality?

15. Do you feel that as a result of participating in the Environmental Tax Credit Program that you are more aware of the importance of conservation farming?

Part IV - Program Cost-Effectiveness

16. Would it be cost effective for an RM to carry on this type of program?

17. Have there been any additional expenses as a result of the program? How much has the program added to the work load of the municipal staff?

18. If the Environmental Tax Credit Program is successful and the Municipal Assessment Act and the Property Tax System was changed so the program ran province wide - where do you think the program funding should come from?
    - Would you support the program if it meant raising taxes in your municipality or in all of Manitoba? What are the chances of the province adjusting the payments made to the R.M based on the percentage of conservation lands? Or compensating municipal government for lost tax revenue?

19. How difficult would it be to implement this type of program on a permanent basis? How do you think this program could be run province-wide?

APPENDIX 8

Sample Size Calculations

Sample Size Calculations

Conservative formula for the required sample size for estimating a proportion:

$$n = \frac{p(1-p)\,N}{(N-1)\,\frac{B^2}{(1.96)^2} + p(1-p)}$$

in which: n = required sample size
N= population size
B= bound on the error of estimation (= 0.05 in Cutler et al. 1999).

A. **For Participants (N = 216)**

$$n = \frac{0.25\,(216)}{(216-1)\,\frac{(0.05)^2}{(1.96)^2} + 0.25}$$

n = 138.50

@ at 50% Response Rate = 138.5 / 0.5 = 277
The required sample size with a 50% response rate is 277.

B. **For Non-Participants (N = 252)**

$$n = \frac{0.25\,(252)}{(252-1)\,\frac{(0.05)^2}{(1.96)^2} + 0.25}$$

n = 152.39

@ at 20% Response Rate = 152.39 / 0.2 = 762
The required sample size with a 20% response rate is 762.

APPENDIX 9

The Binomial Test

The Binomial Test

Research Question:

The Environmental Tax Credit program can help to maintain and enhance the condition of the environment over the long term.

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

Let I be a random variable which is defined for each participant as follows:

I = 0 if answer is 1, 2, or 3 (not likely to agree)
I = 1 if answer is 4 or 5 (likely to agree)
Working with the random variable I amounts to classifying the sample respondents into two categories: "not likely to agree" and "likely to agree".

Let **Y** denote the sum of the I values for the entire sample. Then Y counts the number of respondents who are "likely to agree" with a particular statement.
Let **N** denote the size of the population of participants.
Let **n** denote the size of the sample of participants.
Let **A** denote the number of participants in the population who are "likely to agree" with a particular statement.
Let **p** denote the true proportion of participants who are "likely to agree".

$$\hat{p} = \frac{A}{N}$$

Example of a Binomial Test:

$n = 129$, $A = 80$, $\hat{p} = 0.62$

Hypotheses:

H_o: $p \leq 0.5$
H_a: $p > 0.5$
where p is the true proportion of the population who agree with the statement

Test Statistic:

$$Z_{observed} = \frac{\hat{p} - p_o}{\sqrt{\frac{p_o(1-p_o)}{n}}}$$

$$= \frac{0.62 - 0.5}{\sqrt{\frac{0.5\,(1-0.5)}{129}}}$$

$$= 2.73$$

P-value:

$P(Z > Z_{observed}) = P(Z > 2.73)$

From the Standard Normal Distribution table:
$P\,(Z > 2.73) = 0.0033$

Conclusion:

Compare to α, which is equal to 0.05
Reject H_o if p-value < 0.05
In this case, 0.0033 is < 0.05 therefore, we reject the H_o at 0.05 significance level.

APPENDIX 10

Student's t-test for a Difference in Means

Student's T-test for a Difference in Means of Two Independent Samples

We have two independent random samples, one from each of the two normal populations.

	Sample 1	Sample 2
Sample size	n_1	n_2
Observations	$x_1, x_2, \ldots x_{n1}$	$y_1, y_2, \ldots y_{n2}$
Mean	$\bar{x} = \frac{£ x_1}{n_1}$	$\bar{y} = \frac{£ y_1}{n_2}$
Variance	$s_1^2 = \frac{£ (x_1 - \bar{x})^2}{n_1 - 1}$	$s_2^2 = \frac{£ (y_1 - \bar{y})^2}{n_2 - 1}$

We are interested in making inferences about the difference in means from the two populations, $u_1 - u_2$. A natural choice as a point estimator of this parameter is the difference in sample means, $\bar{x} - \bar{y}$. It can be shown mathematically that $\bar{x} - \bar{y}$ is a minimum variance unbiased estimator of $u_1 - u_2$, is normally distributed, and has variance $\frac{\delta_1^2}{n_1} + \frac{\delta_2^2}{n_2}$

The variance is assumed to be equal for both populations, so we could estimate the common variance δ_2 from each sample separately. However, the best unbiased estimator of δ_2 is obtained by pooling the information from the two samples.
We denote this pooled estimate of variance by S_p^2 :

$$S_p^2 = \frac{£(x_1 - \bar{x})^2 + £(y_1 - \bar{y})^2}{n_1 + n_2 - 2}$$

which is equivalent to the weighted mean of the two sample variances:

$$S_p^2 = \frac{(n_1 - 1) S_1^2 + (n_2 - 1) S_2^2}{n_1 + n_2 - 2}$$

Recall that the best point estimator of $u_1 - u_2$ is $x - y$, which has variance $\frac{\delta_1^2}{n_1} + \frac{\delta_2^2}{n_2}$

Under the assumption of common variance, $\delta_1^2 = \delta_2^2 = \delta^2$ so that

$$S^2_{x-y} = S^2_p \frac{(1 + 1)}{n_1 + n_2}$$

Example of Student's T-test for a Difference in Means of Two Independent Samples:

$n_1 = 5$, $x = 5$, $S_1^2 = 0.0250$
$n_2 = 5$, $y = 4.86$, $S_2^2 = 0.0130$
Pooled estimate of common variance: $S_p^2 = 0.019$

Hypotheses:

H_o: $u_1 = u_2$
H_a: $u_1 > u_2$

Test Statistic:

$$t = \frac{x - y}{S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$= \frac{5 - 4.86}{.138\sqrt{\frac{1}{5} + \frac{1}{5}}}$$

$$= 1.606$$

P-value:

$P(t_{n1+n2-2} > t_{calc}) = P(t_8 > 1.606)$

From the Student's t-Distribution table:

$P(t_8 > 1.397) = 0.10$
$P(t_8 > 1.860) = 0.05$
$P(t_8 > 1.606)$ lies between .05 and 0.10

Conclusion:

Do not reject the H_o at 0.05 significance level.

APPENDIX 11

The Large Sample Test of the Difference in Proportions

Large Sample Test for a Difference in Proportions for Two Populations, Two Independent Samples

Research Question:

The taxes I Pay per acre, on natural lands (such as wetlands, bushland, etc.), are _____ the $1 per acre tax credit offered by the Environmental Tax Credit program.

__ Greater than __ Less than __ Equal to

In order to dichotomize the answers into two categories:

Answer of "Greater than" = 1 (landowner is not aware)
Answer of "Less than" or "Equal to" = 0 (landowner is aware)

Let n_1 = sample size for participants
Let n_2 = sample size for non-participants
Let y_1 = number of landowners in the participant sample who are aware of the taxes they pay on natural lands.
Let y_2 = number of landowners in the non-participant sample who are aware of the taxes they pay on natural lands.

Let $\hat{p}_1 = \frac{y_1}{n_1}$

Let $\hat{p}_2 = \frac{y_2}{n_2}$

We estimate $p_1 - p_2$ by $\hat{p}_1 - \hat{p}_2$.
Assume that the two samples are independent random samples. Then, as noted by McClave and Dietrich (1988), if the sample sizes n_1 and n_2 are large, the sampling distribution of $(\hat{p}_1 - \hat{p}_2)$ is approximately normal with mean

$$E(\hat{p}_1 - \hat{p}_2) = p_1 - p_2$$

and variance

$$Var(\hat{p}_1 - \hat{p}_2) = \frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}$$

Example of a Large Sample Test for a Difference in Proportions for Two Populations:

$n_1 = 114$, $n_2 = 51$, $y_1 = 22$, $y_2 = 17$, $\hat{p}_1 = 0.193$, $\hat{p}_2 = 0.333$

Hypotheses:

H_o: $p_1 = p_2$
H_a: $p_1 > p_2$
where: p_1 is the true proportion of the participant population who are aware that they pay less than or equal to $1 per acre tax credit on natural lands.
p_2 is the true proportion of the non-participant population who are aware that they pay less than or equal to $1 per acre tax credit on natural lands.

Test Statistic:

$$Z_{observed} = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}}$$

$$= \frac{0.193 - 0.333}{\sqrt{\frac{0.193(0.807)}{114} + \frac{0.333(0.667)}{51}}}$$

$$= -1.84$$

P-value:

$P(Z > Z_{observed}) = P(Z > -1.84)$

From the Standard Normal Distribution table:
$P(Z > -1.84) = 1.0 - 0.0329 = 0.9671$

Conclusion:

Compare to α, which is equal to 0.05
Reject H_o, if the p-value < 0.05
In this case, 0.9655 is > 0.05 therefore, we accept the H_o at a 0.05 significance level.

APPENDIX 12

Results from Weyburn Stewardship Program

WEYBURN R.M. STEWARDSHIP PROGRAM SUMMARY

PROJECT	YEAR	ACRES	COST
Forages	1993	608	$3580.39
	1994	244	$2027.60
	1995	428	$3288.00
	1996	220	$1958.68
	Total	1500	$10,854.67
Wildlife	1993	54	$485.63
	1994	77	$234.87
	1995	140	$487.83
	1996	22	$92.02
	Total	293	$1,300.35
Shelterbelts	1993	2.25 mi	$225.00
	1994	2.00 mi	$200.00
	1995	wildlife program 40 miles	
	1996	———	———
	Total	4.25	$425.00
Grassed Waterway	1993	30	$600.00
Farm Improvements	1993	9 projects	$865.45
Green Manure	1995	22	$267.60
Wildlife Enhancement	1996	50 pheasants	$300.00

GRAND TOTAL: $14,613.07

APPENDIX 13

Results from The Binomial Test

Results from Binomial Tests

Table 1. Binomial Test for Participants: Society Should Compensate Landowners for the Benefits of Sustainable Land Management

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	113	.87	.50	8.44	.000
Group 2	Disagree	17	.13			
Total		130	1.00			

a Based on Z Approximation.

Table 2. Binomial Test for Non-Participants: Society Should Compensate Landowners for the Benefits of Sustainable Land Management

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	47	.77	.50	4.22	.000
Group 2	Disagree	14	.23			
Total		61	1.00			

a Based on Z Approximation.

Table 3. Binomial Test for Participants: Property Taxes Paid on Conservation Lands Are < / > / = $1 per acre.

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Greater than	92	.81	.50	-6.62	>.999
Group 2	Less than or equal to	22	.19			
Total		114	1.00			

a Based on Z Approximation.

Table 4. Binomial Test for Non-Participants: The Taxes Paid on Conservation Lands Are < / > / = $1 per acre.

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Greater than	34	.67	.50	-2.43	.987
Group 2	Less than or equal to	17	.33			
Total		51	1.00			

a Based on Z Approximation.

Table 5. Binomial Test for Participants: Identification of an Erosion Problem

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	101	.78	.50	6.39	.000
Group 2	Disagree	29	.22			
Total		130	1.00			

a Based on Z Approximation.

Table 6. Binomial Test for Non-Participants: Identification of an Erosion Problem

	Category	N	Observed Prop.	Test Prop.	Z- value	P-value (1-tailed)
Group 1	1	46	.74	.50	3.78	.000
Group 2	0	16	.26			
Total		62	1.00			

a Based on Z Approximation.

Table 7. Binomial Test for Participants: The Environmental Tax Credit Program Will Reduce Erosion

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	80	.62	.50	2.73	.004
Group 2	Disagree	49	.38			
Total		129	1.00			

a Based on Z Approximation.

Table 8. Binomial Test for Non-Participants: The Environmental Tax Credit Program Will Reduce Erosion

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	24	.43	.50	-1.05	.825
Group 2	Disagree	32	.57			
Total		56	1.00			

a Based on Z Approximation.

Table 9. Binomial Test for Participants: $1/acre is Adequate Incentive to Retain Wetlands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	36	.28	.50	-4.96	>.999
Group 2	Disagree	91	.72			
Total		127	1.00			

a Based on Z Approximation.

Table 10. Binomial Test for Non-Participants: $1/acre is Adequate Incentive to Retain Wetlands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	20	.33	.50	-2.63	.993
Group 2	Disagree	40	.67			
Total		60	1.00			

a Based on Z Approximation.

Table 11. Binomial Test for Participants: $1/acre is Adequate Incentive to Maintain Grasslands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	48	.38	.50	-2.70	.996
Group 2	Disagree	79	.62			
Total		127	1.00			

a Based on Z Approximation.

Table 12. Binomial Test for Non-Participants: $1/acre is Adequate Incentive to Maintain Grasslands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	29	.48	.50	-.31	.601
Group 2	Disagree	32	.52			
Total		61	1.00			

a Based on Z Approximation.

Table 13. Binomial Test for Participants: $1/acre is Adequate Incentive to Leave More Crop Residue

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	57	.45	.50	-1.12	.837
Group 2	Disagree	69	.55			
Total		126	1.00			

a Based on Z Approximation.

Table 14. Binomial Test for Non-Participants: $1/acre is Adequate Incentive to Leave More Crop Residue

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	24	.39	.50	-1.72	.938
Group 2	Disagree	37	.61			
Total		61	1.00			

a Based on Z Approximation.

Table 15. Binomial Test for Participants: Tax Credit Program Encouraged Landowners to Protect the Land & Water Resource Base

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	80	.62	.50	2.74	.006
Group 2	Disagree	50	.38			
Total		130	1.00			

a Based on Z Approximation.

Table 16. Binomial Test for Participants: Tax Credit Program Will Help Maintain the Condition of the Environment

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	107	.84	.50	7.69	.000
Group 2	Disagree	21	.16			
Total		128	1.00			

a Based on Z Approximation.

Table 17. Binomial Test for Non-Participants: Tax Credit Program Will Help Maintain the Condition of the Environment

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	47	.77	.50	4.22	.000
Group 2	Disagree	14	.23			
Total		61	1.00			

a Based on Z Approximation.

Table 18. Binomial Test for Participants: Property Tax System is an Effective Delivery Mechanism

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	114	.88	.50	8.67	.000
Group 2	Disagree	16	.12			
Total		130	1.00			

a Based on Z Approximation.

Table 19. Binomial Test for Non-Participants: Property Tax System is an Effective Delivery Mechanism

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	40	.66	.50	2.50	.011
Group 2	Disagree	21	.34			
Total		61	1.00			

a Based on Z Approximation.

Table 20. Binomial Test for Participants: The Program was Easy to Understand.

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	104	.81	.50	7.04	.000
Group 2	Disagree	25	.19			
Total		129	1.00			

a Based on Z Approximation.

Table 21. Binomial Test for Participants: Positive Reaction Towards the Program

	Category	N	Observed Prop.	Test Prop.	Z-Value	P-value (1-tailed)
Group 1	Agree	112	.90	.50	8.91	.000
Group 2	Disagree	12	.10	.50		
Total		124	1.00			

a Based on Z Approximation.

Table 22. Binomial Test for Participants: Program's Impact on Landowner Awareness & Attitudes Regarding Conservation Practices.

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Change	109	.89	.50	8.62	.000
Group 2	No Change	13	.11			
Total		122	1.00			

a Based on Z Approximation.

Table 23. Binomial Test For Participants: Program Impact on Landowner's Decision to Maintain More Crop Residue

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	63	.48	.50	-.46	.604
Group 2	Disagree	67	.52			
Total		130	1.00			

a Based on Z Approximation.

Table 24. Binomial Test For Non-Participants: Program Impact on Landowner's Decision to Maintain More Crop Residue

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	22	.38	.50	-1.83	.956
Group 2	Disagree	36	.62			
Total		58	1.00			

a Based on Z Approximation.

Table 25. Binomial Test for Participants: Program Impact on Landowner's Decision to Maintain Grasslands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	101	.77	.50	6.18	.000
Group 2	Disagree	30	.23			
Total		131	1.00			

a Based on Z Approximation.

Table 26. Binomial Test for Non-Participants: Program Impact on Landowner's Decision to Maintain Grasslands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	43	.72	.50	3.41	.001
Group 2	Disagree	17	.28			
Total		60	1.00			

a Based on Z Approximation.

Table 27. Binomial Test for Participants: Program Impact on Landowner's Decision to Retain Wetlands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	85	.65	.50	3.42	.001
Group 2	Disagree	45	.35			
Total		130	1.00			

a Based on Z Approximation.

Table 28. Binomial Test for Non-Participants: Program Impact on Landowner's Decision to Retain Wetlands

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	33	.56	.50	.92	.218
Group 2	Disagree	26	.44			
Total		59	1.00			

a Based on Z Approximation.

Table 29. Binomial Test for Participants: Program Impact on Landowner's Decision to Plant Permanent Vegetation on Marginal Cropland

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	90	.69	.50	4.35	.000
Group 2	Disagree	41	.31			
Total		131	1.00			

a Based on Z Approximation.

Table 30. Binomial Test for Non-Participants: Program Impact on Landowner's Decision to Plant Permanent Vegetation on Marginal Cropland

	Category	N	Observed Prop.	Test Prop.	Z-value	P-value (1-tailed)
Group 1	Agree	39	.66	.50	2.46	.010
Group 2	Disagree	20	.34			
Total		59	1.00			

a Based on Z Approximation.

APPENDIX 14

Results from the Student's t-test for a Difference in Means

Results from Student's t-test for a Difference in Means

Table 1. T-test for Equality of Means: The Effect of Conservation Knowledge on Program Participation

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	130	12.53	1.44	1.13	188	.130
Non-Participants	60	12.27	1.62			

Table 2. T-test for Equality of Means: Society Should Compensate Landowners for the Benefits of Sustainable Land Management

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	130	4.28	.75	1.05	189	.148
Non-Participants	61	4.15	.89			

Table 3. T-test for Equality of Means: Identification of an Erosion Problem

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	130	12.43	2.75	.790	190	.216
Non-participants	62	12.08	3.11			

Table 4. T-test for Equality of Means: The Environmental Tax Credit Program Will Reduce Erosion

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	129	3.73	.82	2.91	183	.002
Non-Participants	56	3.34	.88			

Table 5. T-test for Equality of Means: $1/acre is Adequate Incentive to Retain Wetlands

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	127	2.70	1.08	-.476	185	.683
Non-Participants	60	2.78	1.17			

Table 6. T-test for Equality of Means: $1/acre is Adequate Incentive to Maintain Grasslands

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	127	3.06	.94	-.805	186	.789
Non-Participants	61	3.18	1.12			

Table 7. T-test for Equality of Means: $1/acre is Adequate Incentive to Leave More Crop Residue

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	126	3.17	.93	1.12	185	.132
Non-Participants	61	3.00	1.13			

Table 8. T-test for Equality of Means: Tax Credit Program Will Help Maintain the Condition of the Environment

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	128	3.91	.52	-.038	89.21	.515
Non-Participants	61	3.92	.74			

Equal Variances not assumed.

Table 9. T-test for Equality of Means: Property Tax System is an Effective Delivery Mechanism

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	130	3.99	.66	3.11	91.74	.001
Non-Participants	61	3.59	.90			

Equal Variances not assumed.

Table 10. T-test for Equality of Means: Program Impact on Landowner's Decision to Maintain More Crop Residue

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	130	3.29	.98	1.52	186	.065
Non-Participants	58	3.03	1.26			

Table 11. T-test for Equality of Means: Program Impact on Landowner's Decision to Maintain More Grasslands

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	131	4.02	.88	.909	189	.183
Non-Participants	60	3.90	.84			

Table 12. T-test for Equality of Means: Program Impact on Landowner's Decision to Retain Wetlands

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	130	3.89	1.06	1.95	187	.026
Non-Participants	59	3.58	.97			

Table 13. T-test for Equality of Means: Program Impact on Landowner's Decision to Plant Permanent Vegetation on Marginal Cropland

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	131	3.74	1.09	.359	188	.360
Non-Participants	59	3.68	1.17			

APPENDIX 15

Results from The Large Sample Test of the Difference in Proportions

Results from the Large Sample Test of the Difference in Proportions

Table 1. T-test for Equality of Means: Property Taxes Paid on Conservation Lands Are _____ $1 per acre

Population	N	Mean	Std. Deviation	Test Statistic	df	P-value (1-tailed)
Participants	114	0.1930	0.3964	-1.84	82.32	.966
Non-Participants	51	0.3333	0.4761			

Equal Variances not assumed.