Alternative Land Use Services (ALUS)

A Preliminary Overview of Potential Cost Reductions and Financial Benefits to Canada

Tyrchniewicz Consulting
23 Appleby Cove
Winnipeg, Manitoba R2J-4B6
E-mail: atyrch@mts.net

Prepared by

Allen Tyrchniewicz and Edward Tyrchniewicz

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Executive Summary

Alternative Land Use Services (ALUS) is an innovative rural and agricultural policy concept, arising in the grassroots farm and conservation community across Canada. ALUS presents an incentive-based approach to the conservation and protection of key environmental assets on privately-owned agricultural landscapes across Canada. Key environmental benefits of ALUS include clean water, improved flood control, fish and wildlife habitat, endangered species conservation, and carbon sequestration among others. Similar land stewardship programs have been implemented under the "Green Box" provisions of the World Trade Organization (WTO) in the United States, the European Union, New Zealand, Australia and several other countries. Land stewardship programs are allowed under WTO rules.

ALUS is designed to balance the environmental demands of Canadians with policy requirements to foster a socially and economically viable agriculture and sustainable rural communities. The principle behind ALUS is that the costs required to produce environmental benefits, such as clean air from private farmland, cannot be borne solely by farmers and ranchers. The farmers and ranchers would receive payment for supplying ecological services that provide environmental benefits to the public at large from public resources on private land. The ALUS concept builds on a base of environmental regulations, and incorporates existing environmental programs. It is envisioned that ALUS would be delivered by farm organizations in cooperation with governments and conservation groups at the community level. Accountability for ALUS would be ensured through using existing agricultural organizations such as crop insurance to monitor and evaluate the environmental benefits.

This analysis outlines potential economic benefits of ALUS to farmers and society from a cost reduction perspective. The analysis is based on an arbitrary cash payment of $20/acre/yr or approximately $740 million/yr for environmental services from Canadian agricultural landscapes. While this number will vary depending upon a variety of factors, including land values and opportunity costs, it does provide a reasonable proxy to some of the economic benefits of a national ALUS.

Overall cost reductions are determined using the ALUS ecologically sensitive lands service category because services to protect these lands would represent changes in landscape management. In this analysis the ecologically sensitive lands represent a conversion from cropped land to a permanent cover, resulting in potential cost reductions of $61 million across Canada. The remaining ALUS lands have been in their form for a longer period of time, and the positive impact of these landscapes on the environment is already underway. But existing natural lands, riparian areas and wetlands are consistently being converted to agriculture and loss rates in some regions are very significant. The overall potential benefits to society are determined to be approximately $820 million/yr using all of the ALUS lands because these lands have been supplying the benefits, or will be in the case of the ecologically sensitive lands.

Caution must be used when working with these numbers as they are estimates based on some of the first approximations of the cost reductions and potential benefits of natural capital. More work is required to verify and fine tune these estimates for Canada.

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Introduction

The purpose of this report is to determine the potential benefits and costs of a national landscape conservation initiative known as Alternative Land Use Services (ALUS).

Alternative Land Use Services (ALUS) is an innovative rural and agricultural policy concept, arising in the grassroots farm and conservation community across Canada. ALUS presents an incentive-based approach to the conservation and protection of key environmental assets on privately-owned agricultural landscapes across Canada. Key environmental benefits of ALUS include clean water, improved flood control, fish and wildlife habitat, endangered species conservation, and carbon sequestration among others. Similar programs have been implemented under the "Green Box" provisions of the World Trade Organization in the United States, the European Union, New Zealand, Australia and several other countries.

Many agricultural organizations such as the Canadian Federation of Agriculture and numerous provincial groups are vigorously promoting the need for a broad Canadian landscape policy initiative. This concept has been discussed at a number of the recent meetings of the Federal/ Provincial/Territorial Ministers of Agriculture.

The principle behind ALUS is that the costs of ecological services to the public, such as clean water, cannot be borne solely by the landowner and/or farm producer. Rather the public should meet the costs incurred by the producers for the conservation and maintenance of critically important environmental assets on their farms and ranches. Such environmental assets include wetlands (delivering clean water, flood control, biodiversity), riparian areas (delivering clean water, biodiversity, carbon sequestration) and natural areas (delivering clean water and biodiversity). These can be complemented by the judicious conversion of fragile and erodable annually cropped lands to permanent cover (delivering improved soil quality, reductions in soil loss, and biodiversity).

These environmental benefits are often referred to as "public goods" as opposed to private goods such as crops or livestock. All of the market signals to date have encouraged an intensification of agriculture, often at the expense of public goods and the overall health of the ecosystem. ALUS breaks this policy logjam and seeks to create a market for the production of public environmental goods.

This report includes a preliminary analysis of the economic impact from a benefit cost perspective of ALUS on such matters as land values, Crop Insurance, municipal infrastructure, international trade, and greenhouse gas mitigation and sequestration. The report presents a realistic path forward towards the implementation of ALUS across Canada. More detailed analyses, of course, will be required as ALUS advances.

ALUS Defined

ALUS is designed to balance the environmental demands of Canadians with policy requirements to foster a socially and economically viable agriculture and sustainable rural communities. The principle behind ALUS is that the costs required to produce environmental benefits, such as clean air from private farmland, cannot be borne solely by farmers and ranchers. The farmers and ranchers would receive payment for supplying ecological services that provide environmental benefits to the public at large from public resources on private land. The ALUS concept builds on a base of environmental regulations, and incorporates existing environmental programs. It is envisioned that ALUS would be delivered by farm organizations in cooperation with governments and conservation groups at the community level. Accountability for ALUS would be ensured through using existing agricultural organizations such as crop insurance to monitor and evaluate the environmental benefits. The principles of the ALUS concept are listed in Appendix A.

The Alternative Land Use Services (ALUS) program is currently conducting an ecological goods and services pilot project in the Manitoba Rural Municipality of Blanshard. This pilot project is one where farmers and landowners are paid to maintain and enhance certain types of landscape. Partners for this pilot project include: Keystone Agricultural Producers, Delta Waterfowl Foundation, Agriculture & Agri-Food Canada, Manitoba Agriculture, Food & Rural Initiatives, the RM of Blanshard, Manitoba Rural Adaptation Council, Manitoba Agricultural Services Corporation, and the Little Saskatchewan River Conservation District. The States of Mississippi and Tennessee also contributed funds for this project. Payments are based on the type of ecological services provided.

Environmental goods and services (EG&S) eligible under ALUS

1. Wetland Services
   Landowners can enroll their wetland acres and receive an annual payment based on their type of agricultural and environmental use. The wetland must be less than 10 acres to be eligible.

2. Riparian Buffer Services
   Landowners can enroll their riparian areas and receive an annual payment based on their type of agricultural and environmental use. The riparian area must be at least 10m on each side of the water body and can be up to 100m.

3. Natural Area Services
   Landowners can enroll their natural areas and receive an annual payment based on their type of agricultural and environmental use. Natural areas include native grass lands, shrubs, and trees that have not been cultivated in the past 20 years.

4. Ecologically Sensitive Land Services
   Landowners can enroll up to 20% of their ecologically sensitive lands and receive an annual payment based on their type of agricultural and environmental use. For ALUS, ecologically sensitive lands are class 4 to 7 lands currently cultivated or have

been in the past 20 years, but are at risk for severe water erosion, wind erosion, flooding, salinity, runoff or leaching. Perennial cover must be established on the land to be eligible. Farm groups have suggested that no more than 20% ecologically sensitive lands should be taken out of production for this type of program.

The Blanshard pilot project, although a small pilot project will help in the design of a pan-Canada conservation program. Program delivery, methods, transaction costs, and farmer acceptance will be determined in this pilot project. Before a national program could be implemented more research will have to be conducted across a variety of conditions not covered in this pilot project. Other ALUS pilot projects are in the advanced planning stages in Ontario, Saskatchewan, Manitoba, and Prince Edward Island. Land values and social conditions will have an impact on the fee structure required to arrive at a fair market price for ALUS services, as well, many of the environmental benefits derived from ALUS will depend on the region's natural attributes.

Project Objective and Parameters

Since this is a new style of programming on the Canadian landscape, evaluations from several perspectives, including environmental, social and economic will be required for a complete assessment of ALUS. The purpose of this evaluation is to focus on specific economic questions relating to the benefits and cost of ALUS, should it be delivered as a national program, such as impacts on:

1. land values;
2. crop insurance;
3. municipal infrastructure;
4. international trade; and
5. greenhouse gas emissions and sequestrations.

The Manitoba ALUS pilot project has completed the first of a 3 year pilot project, and as such, most of these questions above cannot be answered in detail or with certainty at this time. This evaluation will address questions of economic impacts on the specific areas using information available from similar projects in Canada and other parts of the world.

To assess the potential benefits and costs of ALUS in the Canadian agriculture landscape, it is necessary to scale up the Manitoba pilot project to a national, country wide application in terms of potential payments and potential acres for each of the land types. A variety of sources were used to estimate acres of wetlands, riparian areas, natural areas and ecologically sensitive land shown in Table # 1. While these estimates need to be further researched, they do serve the purpose of providing potential acreage.

This analysis is based on a variety of existing information sources, including the standard sources, such as Statistic Canada, Environment Canada, Organisation for Economic Co-operation

and Development (OECD). This analysis also relied heavily on preliminary work on the value of natural capital, such as the recent paper by Nancy Olewiler (2004) done for Ducks Unlimited Canada and Nature Conservancy as well as undated research and personal communications. Appendix B provides information to put the Olewiler (2004) report into context for this analysis.

Table # 1 Potential Acres Enrolled in Canada Wide ALUS Land Services

Land Type	Acres
Wetlands	13,786,000[1]
Riparian Area	2,754,000[2]
Natural Area	15,398,000[3]
Ecologically Sensitive Land	5,000,000[4]
TOTAL	**36,938,000**

[1] – Wilken et al., 2003 - Wilken estimated 8,238 km^2 in the agricultural region of the Mixedwood Plains and 103,391 km^2 in the agricultural region of the Prairies. This equates to approximately 27,572,000 acres of wetlands in the agricultural region of Canada. For the purpose of ALUS, 50% of this number was used as a rough approximation of wetlands meeting the ALUS criteria.

[2] – Chekay, 2001 – Chekay estimated 2,754,000 acres of Riparian areas across Canada in his October 2001 presentation "A Conservation Cover Incentive Program for Canada". These figures were calculated by Ducks Unlimited Canada as target acres for their Conservation Cover Incentive Program.

[3] – Statistics Canada, 2002 – This estimate was developed from Farm Census land use data using the acreage of other lands not tied to agricultural production, from Table # 5 heading "All other land (including Christmas tree area)".

[4] – Environment Canada, 1978 – This estimate is derived using all class 6 land in Canada (24,996,000 acres) and uses the ALUS limitation of 20%.

Potential Impacts on Land Values

Numerous studies have been conducted on the impacts of government polices and programs on agricultural land values. Four main factors influence agricultural land values: expectations of land buyers and sellers, a strong cash position of the farm sector, the trend toward larger farms in pursuit of economies of size, and the increased demand for land by high value users (Carlberg, 2003). Government funding programs can be an important component in the value of

agricultural land, and expectations regarding the continuation of government programs thus influence land values.

Agriculture and Agrifood Canada (AAFC) concluded that subsidy programs, targeting commodities, such as the Western Grain Transportation Act can undermine farmers' incentives to produce for the market and thereby reduce diversification, as well as raise costs, once subsidies become capitalized in land values (AAFC, undated). When government-funded farm programs are structured in such a way that they provide a reasonable perception of permanence, then direct income transfers through these programs will have a significant affect on farm asset values over time.

On the other hand, conservation programs, in particular conservation easements, have been determined to reduce agriculture land values (Taff, 2004). Conventional valuation theory suggested that land values would not be impacted by the Conservation Reserve Program (CRP), but Taff's research conducted in Minnesota on agricultural land values concluded that the market valued CRP land less than non-restricted land. Taff's research suggested that lands with a CRP restriction sold for 19% less than lands without restrictions. A brief description of CRP is outlined in Appendix C.

One of the goals of ALUS is to protect existing wetlands, riparian corridors, and natural areas. The current market structure has not recognized the ecological values of these landscapes, and as such suggests a lower land value than is actually the case. ALUS will effectively raise the land value of the wetlands, riparian areas and the natural areas, by providing annual payments for these land types when no revenue was available before. The question is whether or not ALUS will raise the price of the wetlands, riparian areas and natural areas high enough for farmer not to convert the land into agricultural production. Assuming that a fair market value is paid to deliver ecological goods and services, the producer is not likely to convert ALUS lands back to agricultural production.

The ecologically sensitive land services component of ALUS could have a slightly different impact on land values. Based on the CRP experience in Minnesota, it could be hypothesized that ALUS would decrease the land values of ecologically sensitive land converted to a permanent cover because of the restricted use of lands that were previously in agricultural production. ALUS does differ from CRP, since haying and grazing are allowed under ALUS at a reduced payment to the farmer. This incrementally decreases production restrictions on the land, and should ease potential impacts of ALUS on land values. To determine the true economic impacts of ALUS on agriculture land values however, a long term study would be required.

There is a possibility that by removing some of the ecologically sensitive lands from production and leaving the higher quality farm land in production, the crop land could increase in value. Farmers essentially could be using ALUS to optimize their farm land values.

Impacts on Crop Insurance

Crop insurance protects farm income by insuring the crops being produced for income. Over the years, agriculture policies, including crop insurance, have provided incentives to cultivate wetlands and natural areas. A recent study in the United States noted that almost all studies on crop insurance subsidies have noted environmental damage due to expanded crop production, particularly if economically marginal land is also more environmentally sensitive (Lubowski et.al., 2006). The report highlighted that insured acreage more than doubled from about 90 million to 197 million acres between 1990-94 and 1995-99, and then rose to 212 million over 2000-03, and that program costs roughly doubled to $1.5 billion a year between 1990-94 and 1995-99, and then doubled again to $3.1 billion.

There are potential savings with crop insurance payments associated with the ecologically sensitive lands components of ALUS. Cropped ecologically sensitive lands converted to permanent cover would not receive insurance coverage for annual crops. There is a possibility however that some lands would be covered under crop insurance for perennial forages either for haying or pasture. Manitoba Agriculture Food and Rural Initiatives (MAFRI) concluded that savings in crop insurance premiums paid by farmers and government amount to roughly $3.50 and $6.00, respectively, per acre removed from production (MAFRI, 2006). MAFRI also suggested that if the removal rate of sensitive lands from production increased substantively, then greater savings in crop insurance premiums could be realized and subsequently payouts reduced.

ALUS also has the potential to reduce future crop insurance premiums and payouts by maintaining non-insured land in their current land type. Wetland, riparian and natural areas enrolled in ALUS may have been converted into agricultural production and these new lands would most likely be subjected to crop insurance coverage.

Overall, ALUS has the potential to reduce crop insurance premiums and payout for cropped ecologically sensitive lands by converting them to permanent cover. As well, ALUS has the potential to reduce future premiums and payouts by preventing the cropping of wetlands, riparian areas and natural areas.

ALUS is a new pilot project, so it would be appropriate to estimate potential uptake of the ecologically sensitive lands component, as most farmers will not be able to react to the program over the short term. Using North Dakota as an example, it currently has 11.9% of its 39.3 million acres of farm land contracted in the Conservation Reserve Program (Leier, 2006). It is appropriate to assume that there will be a greater uptake of ALUS's ecologically sensitive lands component in a longer term program as some of the agricultural production restrictions are removed.

The current ALUS pilot has limited enrollment of ecologically sensitive land to 20% of the total ecologically sensitive land on a farmer's land. Based on the land estimates from Table # 1, and the estimate from MAFRI, Table # 2 highlights potential savings across Canada. This estimate is very basic and will require further research into insurance coverage as well as determining a

refined future acreage of ecologically sensitive lands contracted by ALUS. For the calculations in Table # 2, only ecologically sensitive lands were used as the other land types covered by ALUS are not covered by crop insurance. The payment reductions are based on MAFRI's estimate of payment reduction on crop insurance premiums of $3.50/acre for farmers and $6.00/ acre for government.

Table # 2 – Estimates in Crop Insurance Premium Savings

Land Type	Acres	Payment Reduction ($)	
	x 000	Farmers ($3.50/acre)	Government ($6.00/ acre)
Ecologically Sensitive Land	5,000	$17,500,000	$30,000,000

Potential Impacts on Municipal Infrastructure

One of the most critical components of a municipal infrastructure is the movement of water, and in particular storm runoff throughout the municipality. The implementation of wetlands, riparian areas, and natural areas can all slow the flow of water, helping to smooth a storm's spike of rainfall into a gradual release lasting several days. When runoff management is integrated into the municipal infrastructure of a town, it can mitigate flooding and improve the quality of water entering local waterways (Ecotrust, 2006). The flow of water through the town can be improved through a decentralized system of open spaces, restored creeks and wetlands, swales, and retention ponds.

ALUS has the potential to impact a variety of components of municipal infrastructure, including drainage, water supply, bridges, roads, etc. The majority of the impacts are associated with water, and many of the land uses promoted by ALUS has positive water impacts. The New York Catskills Watershed is a prime example of using a variety of techniques, such as wetlands, riparian areas, natural areas and ecologically sensitive land management to reduce municipal infrastructure costs (USAID Water Team, undated). The New York Watershed provides an example of infrastructure cost savings in the billions of dollars. Further information about the New York Watershed is located in Appendix D.

Wetlands in particular have been linked to several municipal infrastructure cost reductions, such as:

- Wetlands naturally filter water resources, improving the quality of the water Canadians drink and use every day.
- Wetlands act like giant sponges, slowing the flow of surface water, reducing the impact of flooding and recharging groundwater supplies.
- Wetlands and vegetation form buffers that separate land-use activities (such as agriculture) from water bodies.

- Wetlands help to prevent soil erosion and sediment build up in drainage systems. (Ducks Unlimited Canada, 2006)

Natural areas and riparian areas are also an important part of water management and indirectly infrastructure cost reductions. The National Roundtable on the Economy and the Environment (NRTEE) concluded that these social benefits include reduced public expenditures on environmental infrastructure such as:

- less silt removal needed from waterways;
- lower water treatment costs;
- reduced flood control expenditures;
- lower erosion, culvert, and crossing repairs; and
- less drain clogging (NRTEE, 2003).

NRTEE suggested that these benefits although not yet quantified, could amount to at least $1 per acre savings in public expenditures. Olewiler (2004) suggested that the net value of conserving natural capital or wetlands, riparian areas, natural areas and ecologically sensitive lands, was approximately $26.60/acre/year for the Upper Assiniboine River Basin (UARB) and $79.08/acre/year for the Grand River Watershed (GRW). For the purpose of this analysis, the Upper Assiniboine River Basin is used as a proxy for the Canadian Prairies due to the similar ecosystems. The Grand River Watershed is used as a proxy for Eastern Canada. Appendix E provides a breakdown of these estimates. Combining the improved water quality from reduced sediment and the reduction in wind erosion yields approximately $2.95/acre/year in municipal savings. Using Olewiler (2004) estimates for the Grand River Watershed in Ontario, municipal savings were calculated to be $14.00/acre/year by combining the estimates for Water Treatment for sediment and phosphorus reduction as well as decreased sedimentation of conveyance/storage and decreased flooding.

The potential municipal saving as a result of ALUS is difficult to determine as most of the ALUS services already exist, and the ecologically sensitive lands are relatively minor in uptake currently. By contracting with farmers, ALUS can prevent additional costs to the municipality however. Table # 3 provides an estimate of municipal cost reduction by using the acres of ALUS ecologically sensitive lands from Western and Eastern Canada multiplied by the estimates based on Olewiler's work. The acres are based on Environment Canada (1978) estimates for agricultural Class 6 land in each Province and applying the 20% limitation.

Table # 3 Potential Reduction in Municipal Costs

Region	Acres	Reduction in Municipal Costs
Western Canada ($2.95/acre/year)	4,400,000	$12,980,000
Eastern Canada ($14.00/acre/year)	600,000	$8,400,000
Total Canada	5,000,000	$21,380,000

Potential Impacts on International Trade

International trade is very important to agriculture in Canada, with over $26 billion in exports in 2005 (AAFC, 2006). The World Trade Organization governs most of the international trade, while trade between Canada between the United States is also governed by NAFTA. Most environmental programs are considered in the "green box" and as a result do not impact trading.

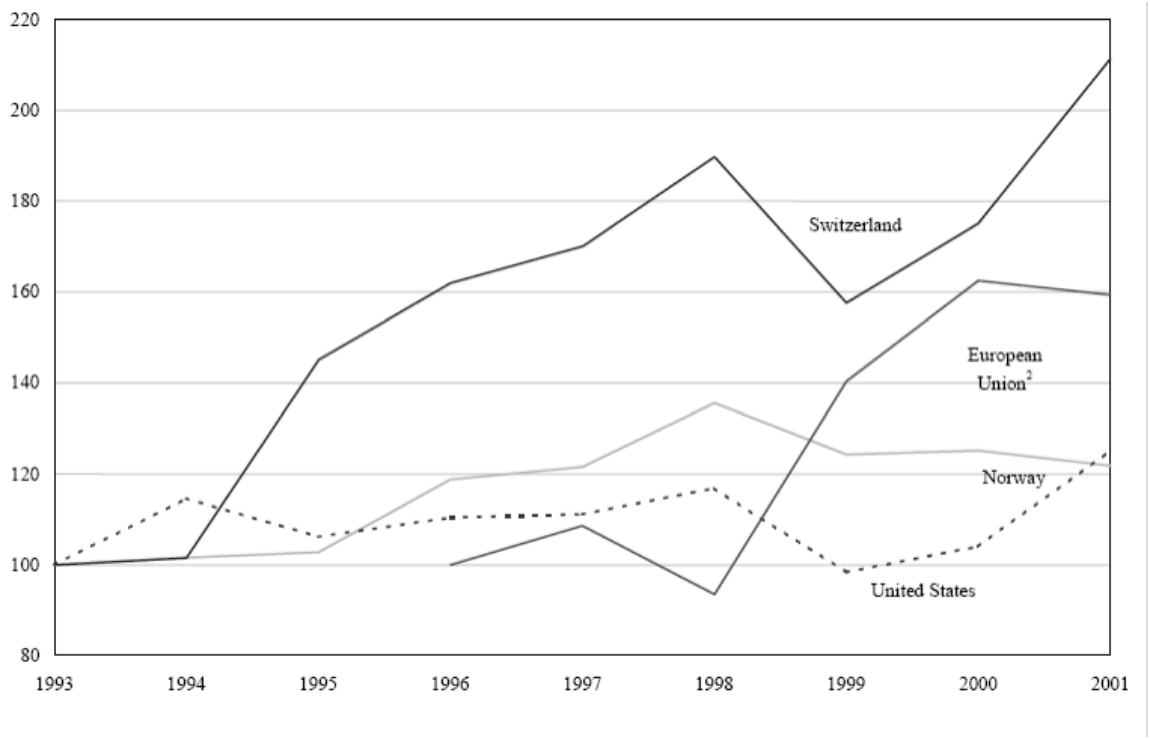
WTO does have rules for payments under environmental programs:

(a) Eligibility for such payments shall be determined as part of a clearly-defined government environmental or conservation program and be dependent on the fulfillment of specific conditions under the government program, including conditions related to production methods or inputs.

(b) The amount of payment shall be limited to the extra costs or loss of income involved in complying with the government program (WTO, 1994).

A number of countries, including the European Union, Norway, Switzerland and the United States, have substantially increased the use of direct payments to farmers to improve environmental outcomes (OECD, 2003). These include payments to support the adoption of less-intensive farming practices, set a-side payments, and payments to assist farmers in implementing structural changes for environmental purposes. Figure # 1 outlines public expenditures on agri-environmental payments based on an index. Canada's programs were not reported in this Figure.

Figure # 1 Public expenditure on agri-environmental payments: 1993 to 2001
Index 1993 = 100



Source: OECD, 2003

The impacts of ALUS on trade need to be addressed from a grain producer perspective and a livestock producer perspective. The only payment of consequence for grain farmers is the ecologically sensitive lands payment. The potential concern is focused on the set-aside aspect of the program. The argument, much like that around supply management, is that setting land aside will increase grain price by limiting production. Given the payment is based on a fair market value for the ecologically sensitive lands component and the current recommendation under ALUS to only allow farmers to enroll 20% of their total ecologically sensitive lands, this should not be an issue.

The issues for livestock producers, particularly cattle producers can be more complicated. Payments received for lands that allow haying or grazing can be interpreted as input subsidies for beef production. Although this payment would be considered quite small, the United States considers all subsidy programs to determine the countervailable subsidies for cattle production.

Impacts on Greenhouse Gas Emissions and Reductions

Greenhouse gas emissions from the Agriculture Sector accounted for 7.3% of total national emissions or 55Mt, with agricultural soils contributing 23Mt, enteric fermentation contributing 24Mt and manure management contributing 8.4Mt (Environment Canada, 2006).

Natural and agricultural landscapes impact the amount of greenhouse gas emissions and potential sequestration. Permanent cover, such as uplands around wetlands, riparian and natural areas, hold carbon in storage and have the ability to sequester carbon depending on their age. Converting crop land to permanent cover can sequester between 0.88 to 3.3 tonnes CO2/ha/yr depending on the soil type (Boehm, 2003). Emissions reductions are also possible by reducing tilling and fertilizing of crops. N2O emissions result from soils when nitrogen entering the soil system is higher than the plants can use efficiently and tillage increases the amount of N2O released from the soil (Environment Canada, 2006).

The acres of uplands around the wetlands, riparian areas and natural areas enrolled under ALUS can sequester carbon dioxide (CO_2), but if they have been in existence for over 20 years, they will not increase carbon sequestration rates. After 20 years, it is expected that the rate of CO_2 sequestration will be equal to the rate of CO_2 release from decomposition. Their benefits with respect to climate change however, is that they store large quantities of carbon. ALUS can contribute to this carbon being held in storage and not released to the atmosphere.

The ecologically sensitive lands have the potential to reduce greenhouse gas emissions by limiting the agricultural crop production, which in turn reduces N_2O emissions from the soils. These lands also reduce greenhouse gas emissions by sequestrating more CO_2 because of the conversion of crop land to permanent cover. The amount of N_2O reduced and CO_2 sequestrated through these ecologically sensitive lands will depend on the acres enrolled in ALUS however. Table # 4 uses Olewiler's estimates for the savings from reduction in GHG emissions and the savings from carbon sequestration for Western and Eastern Canada and applied these against the acres of ecologically sensitive lands.

Table # 4 Potential Climate Change Savings (Ecologically Sensitive Lands)

Region	Acres	Reduction in GHG Emissions	Carbon Sequestration
Western Canada	4,400,000	$16,715,000[1]	$34,927,000[3]
Eastern Canada	600,000	$4,666,000[2]	$4,350,000[4]
Total Canada	**5,000,000**	**$21,381,000**	**$39,277,000**

[1] - from Upper Assiniboine River Basin study ($3.80/acre/yr)
[2] - from Grand River Watershed study ($7.78/acre/yr)
[3] - from Upper Assiniboine River Basin study ($7.94/acre/yr)
[4] - from Grand River Watershed study ($7.25/acre/yr)
Source: Olewiler, 2004

Overall Potential ALUS Economic Benefits and Cost Savings

This analysis has outlined several areas where ALUS could prove to be beneficial to farmers and society. Table # 5 is an attempt to summarize the existing information on ALUS landscapes and potential benefits from the maintenance of natural areas and the conversion of environmental

sensitive lands to more permanent cover. Caution must be used when working with these numbers as they are estimates based on some of the first approximations of the cost reductions and potential benefits of natural capital. More work is required to verify and fine tune these estimates for Canada.

The analysis is based on an arbitrary cash payment of $20/acre/yr or approximately $740 million/yr for environmental services from Canadian agricultural landscapes derived from discussions with Delta Waterfowl Foundation. While this number will vary depending upon a variety of factors, including land values and opportunity costs, it does provide a reasonable proxy to some of the economic benefits of a national ALUS.

The Cost Reduction columns were calculated using the high, best and low estimates from Olewiler's Tables 7 and 8, outlining the research for the Grand River Watershed in Ontario and the Upper Assiniboine River Basin in Saskatchewan and Manitoba. To determine the overall cost reductions only the ALUS ecologically sensitive lands can be used as the cost reductions are based on changes in landscape management. In this analysis the ecologically sensitive lands represent a conversion from cropped land to a permanent cover. The remaining ALUS lands have been in their form for a longer period of time, and the impact of the landscape on the environment is already underway.

The Potential Benefits to Society columns were calculated using the high, best and low estimates from Olewiler's Tables 7 and 8, outlining the research for the Grand River Watershed in Ontario and the Upper Assiniboine River Basin in Saskatchewan and Manitoba. To determine the overall potential benefits to society all of the ALUS lands are used because these lands have been supplying the benefits, or will be in the case of the ecologically sensitive lands.

Table # 5 – Overview of Potential Cost Reductions and Potential Benefits to Society

Region	**ALUS Acres[1] (000)**	**ALUS Payments $ (000)**	**Cost Reductions[2] $ (000) Based on ALUS Ecologically Sensitive Lands (ESL)**			**Potential Benefits to Society[3] $ (000) Based on All ALUS Lands**		
		($20/acre/ yr)	High	Best Est.	Low	High	Best Est.	Low
Western Canada	31,767 (4,400)-ESL	$635,340	$67,485 ($15.34/ ac/yr)	$42,109 ($9.57/ac/ yr)	$19,352 ($4.40/ac/ yr)	$905,740 ($28.51/ ac/yr)	$575,865 ($18.13/ ac/yr)	$288,061 ($9.07/ac/ yr)
Eastern Canada	5,171 (600)-ESL	$103,420	$32,445 ($54.08/ ac/yr)	$19,693 ($32.82/ ac/yr)	$7,273 ($12.12/ ac/yr)	$441,678 ($85.41/ ac/yr)	$244,881 ($47.36/ ac/yr)	$113,215 ($21.89/ ac/yr)
Total	**36,938**	**$738,760**	**$99,930**	**$61,802**	**$26,625**	**$1,347,418**	**$820,746**	**$401,276**

[1] – ALUS acres from Table # 1. The ratio of Western to Eastern ALUS land is based on the estimates of total agricultural land from Statistic Canada (2002) Table # 5. This assumes that the ratio of total agriculture land applies to ALUS acres. The bracketed acres represent the ALUS ecologically sensitive lands.

[2] – From Olewiler Table 7 and Table 8, Western Canada includes: Saved government payments, saved crop insurance premiums, improved water quality and reduced wind erosion. Eastern Canada includes: saved government payments, water treatment, decreased sedimentation and decreased flooding. These columns are only applied to ALUS Ecologically Sensitive land acres because the cost reductions assume a shift in production.

[3] - From Olewiler Table 7 and Table 8. Western Canada includes: Water recreation, reduction in GHG emissions, carbon sequestration, increased wildlife hunting, and increased wildlife viewing. Eastern Canada includes: increased recreational fishing, other river based recreation, reduction in GHG emissions, carbon sequestration, increased wildlife hunting, and increased wildlife viewing.

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Appendix A – the ALUS Principles

The Key Principles of ALUS

Alternate Land Use Services (ALUS) is an ecological goods and services program proposal that is unique because it's designed by farmers, for farmers. It recognizes the value of conserving and restoring Canada's natural capital while respecting and rewarding the important role that farmers play in environmental management.

ALUS is also unique because it is incentive-based. Farmers have always acted as land stewards and have provided environmental services to Canadians, though this generally comes as an expense to the farming operation. While ALUS won't compensate farmers for the impact of environmental regulations, it will provide them with the tools and capacity to build on their already sound environmental practices.

Experience in Canada and abroad has shown that environmental regulations alone cannot effectively preserve and enhance our environment. They are more costly and less effective over the long term, which makes ALUS a positive alternative to create a healthy and sustainable landscape.

ALUS would complement the current agricultural and environmental programs that are undertaken by a wide range of organizations in government and the private sector. ALUS will not absorb the identity or integrity of these programs, but extend the benefits delivered by environmental initiatives on farmland.

By its nature as a farmer-led initiative, ALUS encourages the active participation of farmers and ranchers in conserving natural capital and environmental benefits. ALUS would mobilize producers as conservationists. It would also provide a national opportunity to communicate the environmental benefits of agriculture and the ecological services that farmers provide to all Canadians.

At its core, ALUS follows these key principles:

1. A mix of public and private ownership of resources exists on private land, so the stewardship of natural capital and environmental resources must be a shared responsibility of governments and landowners. Due to this shared nature, environmental services should be cost-shared with producers. Farmers should receive annual payments or other forms of compensation to deliver and maintain environmental services.
2. Stewardship and conservation are services, therefore they must be assigned a fair market value.
3. ALUS will consider payments for the maintenance of existing natural assets, particularly where a viable alternative exists for converting natural assets into other (agricultural) uses. ALUS will also provide incentives for landscape improvement.
4. ALUS will produce measurable environmental goods and services, and associated socio-economic benefits for all Canadians.

5. Investment in the capacity of citizens and rural communities is integral to conservation. ALUS will build on this capacity, to allow flexible decision-making at the community level that respects local agricultural and environmental priorities.
6. Farmers and ranchers are in the best position to deliver environmental goods and services on their land. ALUS allows farmers to lead the environmental agenda and develop workable solutions in co-operation with their communities, farm organizations, governments, non-government agencies, and the Canadian public.
7. ALUS will be independently monitored and audited by trusted farm organizations and existing institutions that have the capabilities required to perform this role.
8. ALUS development and delivery will be transparent and accountable, from the conceptual stages to service delivery. Community leadership in ALUS planning, delivery, and reporting will ensure accountability and value.
9. ALUS will meet Canada's international trade obligations, and shall remain consistent with ecological goods and services delivery programs undertaken by our trading partners.
10. ALUS will complement the policies of the Agricultural Policy Framework, the emerging Environmental Policy Framework, and with provincial policies influencing natural capital and environmental resource conservation.
11. ALUS is an environmental goods and services delivery program that uses a "fee-for service" concept to provide environmental benefits to all Canadians. ALUS is designed to provide these benefits at a fair market value, and will not provide environmental subsidies that artificially increase farm incomes.

Appendix B - Executive Summary of "The Value of Natural Capital in Settled Areas of Canada"

This paper illustrates the services provided by, and the importance of valuing, natural capital in the settled areas of Canada. Natural capital consists of natural resources, environmental and ecosystem resources, and land. It is capital in the sense that these resources are assets that yield goods and services over time – goods and services that are essential to the sustained health of our environment and the economy. Protection and enhancement of natural capital will improve water quality and decrease water treatment costs, increase recreational opportunities, mitigate flooding, decrease net greenhouse gas emissions, lower dredging costs of waterways, improve air quality, provide habitat, sustain food production and produce many more tangible and intangible benefits to society.

Destruction and degradation of natural capital occurs continually across Canada. Yet, we may not recognize the full value of these losses until it is too late. Case studies in this paper illustrate that governments may be making inefficient choices in allocating land to uses that destroy or degrade natural capital. For example, protecting the existing natural capital in the Lower Fraser Valley may save society hundreds of millions, if not billions, of dollars every year.

Yet, natural capital continues to be destroyed in this area. The agricultural lands case studies revealed that the estimated net value of conserving or restoring natural areas is about $195/ha/yr in the Grand River Watershed of Ontario, about $65/ha/yr in the Upper Assiniboine River Basin in eastern Saskatchewan and western Manitoba, and about $126/ha/yr in the Mill River Watershed in P.E.I. These case studies reinforce that ignoring the value of natural capital when making decisions about land use will likely result in the degradation and destruction of natural capital and lead to outcomes that are very costly to society both now and into the future.

This paper does not propose specific policies or programs for the protection of natural capital; rather, it identifies that governments have the following important roles to play:

• Provide essential data on the physical quantities and attributes of natural capital and their changes over time. Efficient management of our natural capital resources requires knowing how much we have. No company would stay in business long if its management did not know how much product was being produced, how much it cost to produce it, or the market price for the product. Why should we treat our natural capital – capital that sustains life on the planet – any differently?

• Assist in better decision making by co-ordinating and funding efforts to measure and value natural capital. Many agencies, public and private, are engaged in measurement and valuation processes. A national clearing house for information would greatly assist these efforts.

• On Crown lands, ensure that estimates of the value of the many benefits from natural capital attributes are compared to market values of the land before releasing that land for housing, commercial or industrial uses.
• When land is privately held, design policies that provide incentives for landowners to conserve their land when the value of the natural capital from that land equals or exceeds its value in other uses.

The federal government should take a strong leadership role by creating a national task force to: (1) fund and co-ordinate the comprehensive measurement of baseline data on the state of Canada's natural capital, to estimate its loss over the past decades and to ensure sustained measurement into the future; (2) ensure traditional economic analyses and forecasting approaches are revised to properly account for the services provided by natural capital and integrate the true cost of its degradation with economic decision making; and (3) co-ordinate efforts to conserve and restore natural capital.

Source: Olewiler, 2004

Appendix C – Description of the United States' Conservation Reserve Program

"The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation (CCC). CRP is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, conservation planning and practice implementation.

The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices."

Source: NRCS, undated

Appendix D – New York Watershed

"In January 1997, New York City initiated a unique and innovative long-term management plan that, via creative institutional arrangements, advances the socio-economic objectives of residents living in distant watershed lands while protecting the quality of the City's water supply.

The impetus for New York City's watershed management plan was the Surface Water Treatment Rule issued by the United States Environmental Protection Agency (EPA) in 1989. The rule, in essence, requires all municipalities to filter public water obtained from surface sources unless stringent public health criteria are met and an approved watershed management strategy that minimizes risks to the water supply is in place. For New York City, the costs of filtration would have been prohibitively expensive. The City readily acknowledged the need to filter water from the Croton watershed. Constructing a filtration system for water originating in the Catskills and Delaware River systems, however, was estimated to cost up to $6 billion; another $200-$300 million per year would be necessary for operation and maintenance (NYT, 1996). Faced with the exorbitant cost of filtering its water supply, New York City instead chose to devise a $1.5 billion environmental protection plan.

New York City's watershed management plan is the product of seven years of intense and often heated negotiations between New York City, upstate watershed communities, the New York State Department of Health, several non-governmental environmental organizations, and the EPA. The agreement commits New York City to a long-term strategy that combines land acquisition, new watershed rules and regulations, and financial assistance to watershed communities to promote environmental quality and their local economies. A cornerstone of the agreement is a package of initiatives designed to improve the economic viability of agriculture in watershed communities.

Relative to residential land use or other forms of development, low-density agriculture presents the least danger to water quality. In more urbanized areas, water quality is threatened by the presence of wastewater treatment plants and runoff from roads, lawns, and golf courses. Agriculture, on the other hand, has the potential to maintain many of the land's natural buffering and filtering capacities. Indeed, for this very reason New York City has identified agriculture as the 'preferred' land use in watershed areas.

Despite agriculture's designation as the preferred land use in the watersheds, if not practiced properly it can be a potential nonpoint pollution source. Water quality may be jeopardized through cropland drainage or

fields receiving applications of manure fertilizer, barnyard runoff, and soil erosion. Due to their precarious economic situation, many farmers in the Catskills and Delaware River watersheds are unable to implement practices that control these pollution risks; those farmers who are forced out of business often sell their lands to commercial developers. Thus, a priority of New York City's watershed management plan is twofold: to improve the economic viability of agriculture in the Catskill and Delaware Watersheds and to implement environmentally sound practices on watershed farms.

The cornerstone of New York City's agricultural strategy is the Watershed Agricultural Program (WAP). The objective of the voluntary program is to standardize and improve environmental practices on watershed farms. New York City covers all costs associated with the implementation of practices on participating farms; practices in clude structural improvements to the farms, purchasing equipment for farmers, and providing farmers with operational and management assistance. Farmers who participate in WAP are eligible to partake in a number of other water-quality initiatives that enhance their economic well-being: the Conservation Reserve Enhancement Program pays farmers for removing sensitive streamside land from agricultural production; the Whole Farm Easement Program compensates farmers for forgoing the development rights to their land; the Natural Resource Viability Program offers marketing assistance for watershed farmers; and the Catskill Family Farms Cooperative provides the capital equipment and organizational body necessary for produce farmers to achieve economies of scale and market power."

Source: Isakson, 2002

Appendix E– The Net Value of Conserving Natural Capital in the Upper Assiniboine River Basin and The Grand River Watershed

Upper Assiniboine River Basin

Benefits (costs) $/hectare/ year	High	Best Estimate	Low
Saved government payments	19.25	12.83	6.42
Saved crop insurance premiums	5.27	3.51	1.76
Improved water quality - decreased sediment	9.34	4.62	1.34
Water-based recreation	1.37	0.91	0.46
Reduced wind erosion	4.01	2.67	1.34
Reduction in GHG emissions	14.07	9.38	4.69
Carbon sequestration	29.40	19.60	9.80
Increased wildlife hunting	19.11	10.71	5.36
Increased wildlife viewing	6.45	4.16	2.08
Gross benefits	**108.25**	**68.39**	**33.23**
Program administration costs	(1.04)	(2.08)	(3.12)
Wildlife depredation compensation	(0.32)	(0.64)	(0.96)
Net benefits	**106.89**	**65.67**	**29.15**

Source: Olewiler, 2004

Grand River Watershed

Benefits (costs) $/hectare/ year	High	Best Estimate	Low
Saved government payments	69.98	46.45	23.23
Water Treatment: sediment reduction	10.27	5.60	1.87
Water Treatment: phosphorus reduction	44.50	23.50	2.50
Decreased sedimentation of conveyance/storage	1.27	0.69	0.23
Decreased flooding	7.50	4.80	2.10
Increased recreational fishing	48.44	26.42	8.81
Other river-based recreation	2.80	1.40	0.70
Reduction in GHG emissions	28.80	19.20	9.60
Carbon sequestration	26.85	17.90	8.95
Increased wildlife hunting	35.04	17.52	8.76
Increased wildlife viewing	68.97	34.49	17.24
Gross benefits	**344.12**	**197.97**	**83.99**
Program administration costs	(1.04)	(2.08)	(3.12)
Wildlife depredation compensation	(0.32)	(0.64)	(0.96)
Net benefits	**342.76**	**195.25**	**79.91**

Source: Olewiler, 2004