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Full Length Research

Payment for agro-ecosystem services: Developmental case-history descriptions of Canada's Grassroots 'ALUS' Programs

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Agricultural landscapes provide vital ecosystem services (ES) such as protection of wildlife, biodiversity, and water resources. Traditionally, there has been no monetary value for such non-agricultural ES that benefit society and therefore no financial incentives to private property owners to help justify their production. The Alternative Land Use Services (ALUS) concept is a grassroots approach to compensate farmers for delivering ES. Information obtained from social science approaches based on site visits, in-house technical documents, and conversations with administrators, stakeholders and participating farmers, were used to construct and present, for the first time in the international literature, the developmental case histories for the seven ALUS programs across Canada. Findings indicate that ALUS, despite lacking definitive data on environmental improvements, being administered through a variety of different frameworks, and implemented in remarkably different environmental settings and socio-political jurisdictions has been judged as successful by participants in terms of creating a process to engage farmers in grassroots initiatives of restoring natural assets.

Key words: Agriculture producers**,** ALUS, Canada, payment for ecosystem services

INTRODUCTION

Agricultural landscapes are managed ecosystems (Antle and Capalbo, 2002; Swinton, 2008) composed of human subsystems entailing anthropogenic infrastructure, productive subsystems supplying agricultural crops and livestock, and natural/semi-natural subsystems containing native vegetation and wildlife (Moonen and Bàrberi, 2008). Since the Green Revolution, the magnitude of nonpoint-source (NPS) pollution associated with agriculture has increased through the use of synthetic fertilizers, concentrated livestock production, and chemical pest control (Kareiva and Marvier, 2011). This, coupled with an historical undervaluation of natural assets (e.g. wetlands and riparian zones), leading to their subsequent conversion to agriculture, has created numerous ecological problems through the loss and overloading of natural ecological functions provided by these landscapes (Kareiva and Marvier, 2011).The undervaluation of wild areas can in part be linked to the misleading market value of the goods and services provided by the land, that have been traditionally restricted to produced commodities (Devanney and MacDonald, 2009). This limitation has left no monetary value for non-agricultural, ecosystem services (ES) that benefit society, and thus no financial incentives to private landowners to help justify their production.

Much theoretical discussion exists about the underlying concepts, frameworks, and identification of ES (e.g. Millennium Ecosystem Assessment 2005), including those pertaining to agriculture (e.g. Cooper and Keim,

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1996; Swinton *et al*., 2007; Power, 2010; Stallman, 2011). However, descriptions of the practical implementation of ES are limited (Staes *et al*., 2010), such that large methodological challenges remain (Turner *et al*., 2003; Turner and Daily, 2008). Although non-market ES have been traditionally ignored by society, in Canada, as elsewhere, there has been a recent shift toward recognizing the role that private landowners play (Kelco, 2009a,b; Devanney and MacDonald, 2009) in the delivery of such ES as riparian wildlife habitat, fertile lands, flood mitigation, water quality protection, and recreational opportunities (Olewiler, 2004). These discussions are part of a growing global phenomenon of exploring the concept and praxis of payment for ecosystem services (PES), an approach that compensates individuals or groups who deliver ES by deliberate actions or by avoidance of deleterious practices. Worldwide, there are numerous policies and programs targeted to compensate farmers for providing ES, notable examples of which include the Conservation Reserve Program (CRP) in the United States (Dunn *et al*., 2003; Shoemaker *et al*., 1989), the BushTender program in Australia (Stoneham *et al*., 2003; Windle and Rolfe, 2008), the Common Agriculture Policy in the European Union (Baylis *et al*., 2006), and the Sloping Land Conservation Program of China (Bennett, 2008; Song *et al*., 2014).

In Canada, the Alternative Land Uses Services (ALUS) program is a novel, grassroots approach to conservation and environmental stewardship in agriculture developed (largely) by and (exclusively) for farmers (Bailey and Reid, 2004; Delta Waterfowl, 2009). The approach is based on rewarding farmers who voluntarily provide ES by using a market valuation scheme wherein participants are proportionally compensated for land taken out of production on an aerial basis (Bailey and Reid, 2004; Keystone Agricultural Producers, 2004). Although the ALUS concept has expanded across the Country (Figure 1), investigation of the inception, development, and implementation of the programs is lacking. Preliminary bibliographic and on-line research conducted in February 2012, before we initiated our own survey, showed that whereas ALUS was well documented in popular media (116 press releases), there had not been any publications in the international literature. In comparison, the CRP, which is older and implemented in the United States as a national policy, has produced more than a hundred publications in fields ranging from economics, to ecology, to hydrology. The preliminary research on the ALUS programs that has been undertaken is presently available in only the grey literature (10 in-house documents and several theses) and has thus not been widely circulated. As well, the more scholarly research that exists pertains to only a single program (Johnston, 2012; Lantz *et al*., 2012).

The objective of the present study is to provide the first descriptions of the developmental case-histories of the ALUS programs across Canada. What is unusual about the present research, compared to other published analyses of agricultural PES programs, is the emphasis placed on providing the backstory to the projects discussed; in other words, a deliberate focus on the process of designing ES programs. This is something that is sorely needed, yet rarely documented, in the literature on landscape restoration (France, 2012). Focusing merely on ends (final products) while ignoring means (developmental processes) compromises true understanding and makes judgment about projects difficult and possibly superficial (France, 2012). Our motivation for this discursive paper is to provide a precedent example to aid policy makers involved in the rapid expansion of PES programs that is currently taking place in the developing world and the Global South (e.g. Tomich *et al*., 2004; Wunder *et al*., 2008; George *et al*., 2009; van Noordwijk and Leimona 2010; Rositano and Ferraro 2014).

METHODS

Descriptive case-study histories were constructed using unpublished, 'grey literature' documents and reports, meetings with program coordinators, and site visits to established, former, and future ALUS projects. Meetings and unstructured interviews with program coordinators were recorded at the time of visits in conjunction with written field notes. Anecdotal conversations, which were not formally recorded, took place with farmers who are currently or once were involved with the ALUS programs. During formal interviews with administrators and Partnership Advisory Committee (PAC) members, and anecdotal conversations with farmers, questions about the perceived strengths, benefits, weaknesses, and suggested areas for improvement of ALUS were answered honestly and without bias. The qualitative nature of such interviews and conversations enables collection of information about values and attitudes that are frequently missed by quantitative surveys (Raykov and Marcoulides, 2010; Bryman, 2012). As detailed by Greenland-Smith (2014), unstructured interviews in the form of conversations with open-ended and flexible question prompts (Zhang and Wildemuth, 2009; Bryman, 2012) are deemed most valuable to the study of agricultural ES. Such conversational acquisition of data enables researchers to obtain a wider range of attitudinal responses than through answers to set questions in surveys (Kvale and Brinkmann, 2009). In unstructured interviews, questions are generated spontaneously,

Figure 1. ALUS programs as of 2015 discussed in the text: Province-wide, PEI, County of Vermillion River, Alberta, Parkland County, Alberta, Four RM's near Regina, Saskatchewan, Little Saskatchewan River Conservation District, the Rural Municipality of Blanshard Manitoba, Norfolk County, Ontario, Grey/Bruce Counties, Ontario; and additional planned programs not elaborated on in the text. Source: www.alus.ca.

though not without meticulous prior preparation of targeted avenues of investigation (Patton, 2005), as was done in this case.

Data from the seven programs are presented as diachronic descriptions. Given the extreme rarity of cross-system analyses of landscape-based ES programs (Staes *et al.*, 2010), we believe it is critical that the comprehensive history of program development and implementation be documented in such a discursive fashion for the benefit of practitioners and future researchers. Following the lead of France (2012), all case-histories provide site descriptions and agro-environmental backgrounds (see Appendix), the various actions taken and results ensuing (both structural and nonstructural), the challenges met, and the lessons learned, based on using field notes, recordings, and any literature relevant to each individual ALUS program.

The main focus of the research was on farmer uptake, administration, and development of ALUS. Program funding, although the advantages and disadvantages of their sources are briefly touched upon, was not the focus of the research. We do not attempt to rationalize why ALUS should be funded or how funding should be allocated within individual programs.

Site visits were a critical research component for this project. Such in situ investigations are necessary in the landscape architecture case-study methodology of Francis (1999) and in the landscape phenomenology assessment protocol of Tilley (1994), which together served as the inspiration for our methodology. Visits to the locations of the ALUS programs allowed for documentation of qualitative data and trends such as site conditions, community impacts, and other important factors that were not conveyed through the technical

literature. Proponents for ALUS argue that these qualitative aspects, such as community empowerment, are the key reasons underlying the success of the ALUS approach (Delta Waterfowl, 2008). However, these have often been overlooked in third-party program assessments which often examine only the economics and conservation merits of the ALUS concept. Further, due to inaccuracies in the passive recollection of natural conditions by respondents in traditional surveys (Owen *et al*., 2009), we employed *in situ* 'go-along' conversations with practitioners (Carpiano, 2009; Evans and Jones, 2011), aided by using landscape features as prompts (Riley, 2010). Such an approach provides accurate assessments of farmer attitudes regarding ES (Greenland-Smith, 2014).

The ALUS programs were visited during three separate research trips. The first program visited was the province-wide ALUS program of Prince Edward Island (PEI), undertaken in August, 2012. During this research trip, ALUS projects were toured to view land enrolled for the production of riparian and wetland ES as well as land retired from cash-cropping due to high erosion potential. The two ALUS programs in Ontario (Grey/Bruce County, Norfolk County) were visited in August, 2012. While in Ontario, site visits consisted of attending meetings with program coordinators, tours of project sites within the programs, visitations of restoration projects by previous environmental programs in locations where ALUS programs were still in the developmental stage, and attending a PAC meeting. ALUS programs that were either under development, established and running, or expired, were visited in Manitoba (Rural Municipality of Blanshard), Saskatchewan (Rural Municipalities of South Qu'Appelle, Indian Head, Lajord, Francis) and Alberta (Parkland County, County of Vermilion River) during the third field trip. This research was conducted in October, 2012, and was comprised primarily of project site visits and meetings with program coordinators. Updates were obtained from all program administrators in autumn 2015.

RESULTS

The Rural Municipality of Blanshard (RMB), Manitoba

Inception of the ALUS concept

Farmers are often leery of land conservation easements, and the large scale purchasing of these are financially unfeasible for environmental non-government organizations (eNGOs) and surrounding rural economies. To promote stewardship and recognize the role that farmers play in preserving existing natural assets, Keystone Agricultural Producers (KAP) and Delta Waterfowl collaborated to find a feasible and effective solution that met the needs of farmers, the environment, and society. Following examination of the agro-environmental policies of other Countries, ALUS was developed as an alternative to environmental regulations, based on turning on-farm natural capital from being a liability to an asset.

Alternative Land Use Services program

The ALUS pilot project of Blanshard began in 2006 and continued until 2008. The first ALUS program had three goals (KAP, 2004): (1) Determine the acceptability of the ALUS concept within agricultural communities; (2) Assess the feasibility of the ALUS concept as a grassroots approach for delivering ES; and (3) Set the stage for an expansion to apply the concept across the Country.

The administration structure of the RMB ALUS program was very different from later incarnations of ALUS that formalized administrative roles of farmers, eNGOs, and government stakeholders, known collectively as a Partnership Advisory Committee (PAC). However, the administration role was filled in this case by representation and collaboration from KAP, Delta Waterfowl, Manitoba Agriculture-Food & Rural Initiatives, Manitoba Habitat and Heritage Corporation, and public officials from the municipality (KAP, 2004).

During the three years of the program, ALUS met with tremendous interest and support from farmers and the community. A total of over 8000 ha of wetlands, native prairie, and riparian areas were enrolled (Figure 2) and there was participation by 230, or 70% of the landowners. Much of this success was credited to the ALUS approach 'making sense' to the agricultural community, compensating for the opportunity costs of environmental protection. Though the PES was modest, often farmers received enough to cover their farm's property tax, which most individuals considered to be a more-than-adequate compensation. The ALUS pilot program, unlike many other regulatory programs, was able to attract both the environmentally-conscious farmers, many of whom had already been undertaking similar projects on their own, and those individuals who needed financial encouragement to make stewardship feasible in their farming operations.

Financially, the RMB ALUS was fortunate in having a $300,000 annual operating budget, of which 83 to 90%, depending on the year, was spent on annuity payments to farmers. This financial support came from many sources, including Delta Waterfowl, the Manitoba Rural Adaptation Council, various duck stamp funds from multiple U.S. states, the local municipal government, and

Figure 2. Remaining ALUS projects in the Rural Municipality of Blanshard. Upland prairies (top left), pothole wetlands (top right, bottom left), and retired marginal land (bottom right).

in-kind support from the Little Saskatchewan River Conservation District organization. During the course of the program, the generous budget meant that no applicants were rejected.

Current status and reflecting upon and advancing ALUS

The satisfaction in the ALUS program was apparent in conversations with RMB farmers and administrators, as well as a review of in-house reports and evaluations. Many of the core concepts and lessons learned from the RMB set the stage for the expansion of ALUS into Norfolk, Ontario and the province of Prince Edward Island (PEI). However, within the RMB itself, ALUS did receive some criticism.

Although the ALUS program did fill the gap in terms of protecting existing natural assets, it was unappreciated by most layers of government. Annual wetland loss in rural Manitoba is presently occurring at a rate of two percent per year, which is easily overshadowed in comparison to the cumulative historical impacts on these vital ecosystems. Emphasis on historical loss, as opposed to the ongoing degradation of wetlands, meant that ALUS conservation measures focused on creating new rather than protecting existing natural capital. This meant that ALUS did not fit well into existing policy or notions. Although there was some retirement of marginal land and thus creating new assets, the low acreage involved compared to that in protecting existing wetlands and upland habitat generated the most criticism. Future programs implemented elsewhere learned this lesson and would focus on both the protection *and* the creation

of natural assets by mandating that new on-farm ALUS projects must be undertaken to match the enrollment of existing natural capital.

Monitoring, which was undertaken by the Manitoba Crop Insurance Corporation, was another point of criticism in the RMB's ALUS program. Whereas monitoring is necessary to ensure that ALUS projects are being maintained, some farmers found the standards to be inconsistent. Anecdotal evidence suggests that individual monitors were interpreting the ALUS rules differently, causing, for example, some farmers to lose payment due to their recreational use of ALUS-enrolled lands.

Today, many farmers and conservationists in Manitoba regret that the ALUS program of the RMB was allowed to expire. As of autumn 2015, with a changing agricultural marketplace, increased prices in both land and commodity crops are making the economics of leaving land 'idle' less appealing than had been the case a few years ago. Some farmers have indicated that should they decide to sell their farm, land that had been enrolled in ALUS would be put back into agricultural production due to the recent increase in farmland value. However, if ALUS were to be reinstated, continued payments on projects would be regarded as sufficient compensation to prevent farmers from returning marginal land to production to increase the market value of the farm. The lingering support and the need to preserve existing natural assets has spurred recent efforts to reinstate ALUS, with funding being raised though support from the Garfield Weston Foundation, Manitoba Habitat Heritage Corporation, and KAP. This new ALUS program will not be a continuation, but rather a new program involving a demonstration phase and a PAC to conduct outreach and 'sell' the concept in order to create a municipality-wide program.

Norfolk County, Ontario

Alternative Land Use Services program

Norfolk County's ALUS program, established in 2007, was the second to be established and would go on to set many of the standards for other programs across Canada. Whereas the RMB's ALUS program proved the principle to be an effective approach to conservation in agricultural landscapes**,** Norfolk County honed and refined the administration of the program. Within Norfolk County, the term "Partnership Advisory Committee", or PAC, was first coined and established as a fundamental principle in the administration of subsequent ALUS programs.

ALUS was introduced to Norfolk County at a time of transition away from tobacco farming when lower profits of cash cropping produced concern about the County's financial sustainability. Industry, conservation organizations, and farmers set the initial goals of Norfolk's ALUS, based on a desire to change the mindsets of farmers and empower them to "grow better environments". By educating consumers that conservation comes at a cost, and farmers that environmental restoration can pay, ALUS in Norfolk County was established to create and protect natural assets, enhance the economic well-being of rural communities, and to set the stage for a possible expansion provincially or even nationally.

Originally proposed for a nine-year project duration, ALUS in Norfolk was first implemented as a three-year pilot phase. Although it had been intended to be administered provincially, the program was reworked into a non-profit, non-government, County-based program. The Norfolk ALUS pilot was supported with funding from numerous organizations and agencies, and has captured considerable interest from farmer groups and eNGOs from across North America (Table 1). The initial budget totaled one million dollars over the three years. During this phase, initial costs included seeders, seed harvesters, and establishing wetland projects, as well as administration and farmer cost-shares and annuity payments.

The pilot project developed into an established program in 2011, with 1.3 million dollars in funding through 2014. This funding, primarily from the private corporations of the Metcalf Foundation and Garfield Weston Foundation, is directed towards program administration and farmer payments.

A model structure

Norfolk County was the first ALUS program to develop a PAC which, in this case, was comprised of 16 members, consisting of one individual representing each of Delta Waterfowl, the Norfolk Land Stewardship Council, the Long Point Conservation Authority, the Ontario Ministry of Natural Resources, two representatives from Norfolk County's municipal government, in addition to 10 local farmers. Within the farmer representation, five of the 10 members act as liaisons. These liaisons assist the ALUS coordinator in establishing communication with all farmers, and in promoting the program. Assisting the PAC is a select team of technical advisors whom remain separate from the administration of the program.

ALUS projects in Norfolk County took the form of prairie, forest, and wetland projects (Figure 3). Establishment costs, such as seeds and wetland creation, were assisted through cost-share funding, whereas other expenses such as fuel and ground cultivation were not

Table 1. Funding and supporting partners of ALUS in Norfolk County, Ontario.

Funding Partners	In-Kind Partners
Canadian Agricultural Adaptation Council	Agriculture and Agri-Food Canada
Delta Waterfowl Foundation	Christian Farmers Federation of Ontario
Long Point Region Conservation Authority	Ecometrica
Metcalf Foundation	Eman Rese
National Wild Turkey Federation	Keystone Agricultural Producers
National Wild Turkey Federation Canada	Local Food Plus
Ohio Department of Natural Resources	Long Point World Biosphere Reserve
Ontario Federation of Anglers and Hunters	Long Point Foundation
Ontario Stewardship	Long Point Waterfowl and Wetlands Research Fund
Province of Ontario	Norfolk County
Ruffled Grouse Society	Norfolk Federation of Agriculture
The Garfield Weston Foundation	Norfolk Field Naturalists
The Ontario Trillium Foundation	Norfolk Land Stewardship Council
	Norfolk Soil and Crop Improvement Association
	Ontario Federation of Agriculture
	Ontario Power Generation
	Ontario Wetland Habitat Fund
	Ontario Wildlife Foundation
	Prince Edward Island Federation of Agriculture
	TD Friends of the Environment Foundation

Figure 3. ALUS projects in Norfolk County, Ontario. Wetland (top left), tree plantings (top right), tall grass prairie (bottom left), and pollinator strip (bottom right) projects.

Figure 4. Dual purpose ALUS projects in Norfolk County, Ontario.

covered under ALUS. However, for farmers who could not afford this initial expense, arrangements could be made to cover these initial costs up-front and to deduct the amount from the first set of annuities. Payments were issued at $375/ha for non-use of ALUS-enrolled lands, an amount representative of land rental rates. However, ALUS payments do not come without financial investment or farmer responsibility. Landowners, in addition to some establishment costs, must maintain the projects as recommended through activities such as burning and mowing prairies to prevent undesired succession. Some farmers receive payments of $185/ha for delaying grazing and haying in order to accommodate nesting birds on natural lands (Figure 4). This practice is regarded by ALUS participants and administrators as one of the greatest uses of the program, in terms of providing both wildlife habitat ES as well as food products. Drawing from the criticisms of the first ALUS program in RMB, Manitoba, exiting natural areas and their natural assets were only eligible for enrollment under special conditions.

Currently, there is no method for prioritizing ALUS projects, with projects being accepted on a first-come, first-serve basis. Proposals are accepted by the project coordinator and reviewed by the PAC at an approval meeting, though the project proposal may require further investigation to determine feasibility for final approval. These proposals are generally capped at 20% of each farm's total land area in order to ensure that landscapes remain in agriculture production and contribute to the rural economy. Monitoring for proper participation in the program is administered by the ALUS coordinator and the Long Point Conservation Authority.

At the time of the initial research, 133 farms had participated, with a total of 426 ha of land being enrolled in the program. Most participants became aware of the program through 'word of mouth', although some whose farms were deemed of particular interest for conservation mandates, were approached directly. Of the enrolled land, 50% has been converted to tall-grass prairie, 30% planted as forests, and the remaining 20% converted to other habitat such as pollinator strips and wetlands. Annual recruitment goals of 30 landowners and 85 ha by 2011, were surpassed with 50 participants signing ALUS contract, of which 17 were repeat participants.

Many farmers are pleased with the projects and have seen other benefits to their farms in addition to increased wildlife habitat. Farmers have reported that corn fields adjacent to ALUS projects have experienced lower crop losses from black birds. While this claim has not been scientifically investigated, it was assumed that the birds prefer to forage on the nearby, more naturally restored food sources. The decrease in grazing losses has been substantial enough for some farmers to cease the use of noise deterrents, known as 'bangers', to keep away previously nuisance birds. Also, creations of pollinator strips have also reduced the need for some farmers to use domestic bees for pollination.

Farmers are not the only facet of the Norfolk County population that have been involved in ALUS. Outreach to showcase ALUS through tours and speaking events at colleges are being undertaken by the program, letting participants describe their ALUS experience and how it fits into their farm operations. Norfolk's ALUS has also partnered with a local initiative in which Ninth-grade students build bird houses and bat boxes. Using lumber donated by ALUS participants, these structures are placed in enrolled land to educate youth about the value of natural areas and the ES such as wildlife habitat that

they provide.

Critiques and successes

Although successful in many ways, Norfolk's ALUS is not without its shortcomings and ensuing criticisms. Program administrators and PAC members are quick to point out that there are individuals and organizations who are philosophically opposed to paying farmers for ES, believing that stewardship should be an uncompensated responsibility. Proponents of ALUS are equally quick to Counter that there is an annual opportunity cost to stewardship above and beyond the cost of establishing projects such as wetlands and prairies. A portion of the complaints come about due to competition for funding from other environmental programs in agriculture, some being of greater antecedence, though not be as popular as ALUS.

Critics also highlight that if and when ALUS payments stop, with no legal easements in place, projects will be returned to agriculture. Some farmers voiced this concern during a 2012 ALUS demonstration tour, stating that to remain in business their farm's land had to be making money through either crops or ALUS payments. However, surveys of all participating ALUS farmers in Norfolk have indicated that 75% would not disturb the established projects if payments ceased. This trend is not unique to Norfolk County, as the majority of the projects undertaken by the expired ALUS program in the RMB, Manitoba, are still intact. This is almost an exact opposite of a similar study undertaken in North Dakota concerning the United States' CRP (Bangsund *et al*., 2004).

Looking back at the success of ALUS in Norfolk County, ALUS administrators are quick to point out several reasons why the program was so successful. Communication between farmers and government can often be difficult, and in the case of Norfolk, many of the older farmers have a grade four to six reading level due to tobacco being a labour intensive crop enabling youths at that time to quit school to work on the family farm. By ensuring the program was driven by farmers, with liaisons to provide appropriate communication to interested individuals, participants were fully informed in an accessible and comprehensible manner about the economic and environmental benefits of ALUS and the operations of the administrative process.

During the pilot phase, most decisions and lessons happened 'on the fly' in terms of how to create and maintain habitat as well as how to deal with the participants. Credit must be given to capable contractors and technicians whose tacit experience enabled on-site decisions to improve the projects. Some technical issues still being dealt with include how best to manage ALUS lands in terms of which methods work best on prairie land to prevent succession. Monitoring was also one of the self-admitted shortcomings of this program, relative to the greater effort invested in establishing the program.

Current status and moving ALUS forward

As of autumn 2015, there are 900 active ALUS projects, totaling 506 ha, and involving 175 farm families. The overwhelming success and participation in ALUS by farmers in Norfolk County has strained the program's administration. Moving forward, there will have to be more staff and an office created as the program grows in terms of acreage and participants. Although funding has continued past the original 2014 end-date, participants and administrators are looking at other sources of sustainable long-term funding. The ALUS concept is in a unique position to develop a market for ES production to real estate developers and other industries that would benefit by investing in environmental offsets. For example, the ALUS program has recently signed a MOU (memorandum of understanding) with a group of Ontario wine growers resulting in market branding for participating wineries as well as advertising signage placed in situ. Norfolk's ALUS program was one of nine submissions from the province to earn the 2013 Minister's Award for Environmental Excellence.

The County of Vermillion River (CVR), Alberta

Alternative Land Use Services program

Initiated in 2010, the County of Vermillion River's ALUS program is overseen by a part-time coordinator and a PAC consisting of farmers and representatives from the County, and regional eNGO's, and has become the reference for other programs in Western Canada. The PAC and coordinator used the pilot project to showcase the concept with a goal of creating a base of support for developing the full-fledged program, similar to that in Norfolk County, Ontario. By September 2012, the CVR ALUS pilot consisted of 18 participating farmers and over six hundred ha enrolled.

The ALUS program in the CVR enrolls marginal land in a variety of projects, including: wetland restoration by plugging drains and naturalization, riparian zone enhancement, native prairie management, and the creation and protection of shelter belts (Figure 5). These projects must be managed by farmers through mowing or by controlled burns to maintain habitat and prevent unwanted succession in adjacent lands. In addition to enrolling marginal land, to accommodate the logistics of

Figure 5. ALUS projects in the County of Vermillion River, Alberta. Wetland creation (top left), shelterbelts with managed native prairie (top right), and wildlife food plots projects (bottom left and right).

farmers using large equipment, adjacent productive lands can also be enrolled to reduce spatial overlap during agricultural operations.

To enter into ALUS, farmers prepare project proposals, which are then reviewed by the PAC to determine if they are a good fit for the program and the needs of the County. These proposals are submitted anonymously by farmers, through the ALUS coordinator, to the PAC, and reveal only the acreage, project type, and some physical features of the land parcel. In this manner, projects are selected in an unbiased manner, adding credibility to the PAC, and protecting interested farmers from discrimination and rejection unrelated to the merits of the proposal. However, due to being a grassroots program, the finances of the CVR ALUS lack the relative stability of long-term funding. Program budgets therefore vary from year-to-year depending on the grants and funding received, which of course influences the number of new ALUS projects undertaken by the County. One best management practice (BMP) unique to the CVR, is a wildlife food plot project in marginal lands (Figure 5). Consisting of plants selected to produce grain, these plots were planted and allowed to go through a natural succession. While not entirely natural compared to true restored prairies, these projects still encourage the retirement of marginal land and demonstrate farmer willingness to promote wildlife in their landscapes.

Current status and moving ALUS forward

During the administration of the CVR ALUS program, the coordinator, PAC, and participants have faced many challenges requiring ongoing learning. Because weather can dramatically affect agriculture, it also impacted the implementation of ALUS projects. In 2011**,** various ALUS projects were unable to be established due to a wet spring that prevented planting, which was followed by a

Table 2. Partnership Advisory Committee representation of the Grey/Bruce ALUS program. Source: Reid (2012).

Partnership Advisory Committee Representation	
ALUS Project Coordinator	National Farmers Union – Bruce County
Christian Farmers Federation of Ontario	National Farmers Union –Grey County
Conservation Ontario – Saugeen Valley Conservation Authority	Ontario Bee Keepers Association
Conservation Ontario – Grey Sauble Conservation Authority	Ontario Federation of Agriculture – Bruce County
County Council – Bruce County	Ontario Federation of Agriculture –GreyCounty
County Council – Grey County	Ontario Soil and Crop Improvement Organization
Ducks Unlimited Canada (DUC)	Stewardship Council – Grey County
Grey Agricultural Services	Stewardship Council – Bruce County
Innovative Farmers Association of Ontario	

drought that killed off seedlings. In these cases where the clear intent to install the ALUS projects was demonstrated, the PAC decided that payments would still be issued on the condition that the pilot projects could be established as soon as conditions permitted.

With the exception of these weather-delayed cases, other projects in the CVR are annually monitored for compliance before annuity payments are made. Baseline studies were conducted prior to the establishment of ALUS projects by Cows and Fish, a provincial group dedicated to protecting riparian habitat, and other environmental experts. However, post-establishment monitoring for biophysical assessments in terms of biodiversity, ecosystem health, and overall environmental improvements has been lacking and inconsistent. With limited financial and technical resources, there have been some biophysical assessments of ALUS projects, but not the annual assessments that ALUS administrators had hoped for. The scale of modern agriculture has also created issues for the management of ALUS projects. With large machinery sized to work in fields of hundreds of ha, small ALUS projects, often being less than 30 ha, can often be problematic for farmers to work around.

One constraint faced by the CVR ALUS program is the County's geography, both in terms of size and variation. The large size of the County has made networking with experts and farmers difficult for the coordinator and the PAC. Compounding this problem is the County's variation in agriculture, with cereal production being concentrated in the south and ranching in the north, necessitating the need for multiple experts. This difficulty of operating at the County level strengthens the argument of many ALUS proponents across Canada that the programs, in order to be effective, should be managed at a smaller, local level.

As of autumn 2015, ALUS has evolved beyond its pilot phase into a full-fledged program with a coordinator in place and an expanded base of external funding. There is an increased focus on protecting wetlands by establishing riparian buffers or limiting proximal agriculture. A provincial wetland restoration agency, still in its development stage, has been created. And there is now a tri-County collaboration among CVR's ALUS program and those in neighbouring Counties.

Grey and Bruce Counties, Ontario

Alternative Land Use Services program

Based out of the city of Markdale, Ontario, the ALUS program of Grey and Bruce Counties is administered by Grey Agricultural Services, a grassroots agricultural information service developed in 2000 to assist local farmers and rural industry. Since its conception in 2012, the PAC has become well established and is comprised of representatives from the municipal and provincial governments, conservation organizations, and farmer groups (Table 2), in addition to a hired ALUS coordinator who handles daily operations (Reid 2012). The PAC of the Grey/Bruce predominantly employs consensus decision making, though when this is not possible, formal voting is conducted with majority rule. The ALUS coordinator reports and provides input at PAC meetings, but does not have voting power.

While there are no serious environmental problems associated with agriculture in the Counties, the PAC intends to use ALUS as a means to educate the public as well as to demonstrate to farmers that there can be alternatives to traditional conservation models (Reid, 2012). Through this education, PAC members hope to be able to put in place preventative measures and to set

Figure 6. Grey County Stewardship Network Projects. Riparian fencing and enhancement (top left), livestock river crossing (top right), river armouring (bottom left) and stream restoration (bottom right).

standards that will prevent the development of regulations.

To introduce the ALUS concept, the PAC established four demonstration farms, two in each of the Counties, to educate about the variety of ALUS mitigation measures and the availability of potential funding sources (Reid, 2012). The purpose of this pilot phase was to emphasize that: (1) Stewardship does not have to be an economic burden for producers; (2) ALUS is a viable program to meet the needs of both conservationists and farmers; and (3) ALUS and its expansion within the Counties is a good investment for funding agencies working towards a goal of environmental sustainability.

BMPs that appeal to farmers are based on other environmentally successful programs that have previously been widely accepted by farmers in the Counties (Figure 6). By building on these local past successes in Ontario, as well as those demonstrated in ALUS programs from elsewhere across Canada, the PAC hopes to move towards their goal of fostering stewardship and sustainability that they believe ALUS can provide.

Current status and moving ALUS forward

Integration into existing policy and programs is one of the core principles of ALUS (Bailey and Reid, 2004; Keystone Agricultural Producers, 2004; ALUS 2011a) To ensure efficient use of funding, the PAC for Grey/Bruce intends to integrate ALUS with cost-share assistance offered by programs such as Environmental Farm Plans as well as local organizations such as the Sydenham Sportsmen Association. Such partnering with local organisations and their existing programs will allow ALUS to be able to focus on regionally important issues.

Like ALUS programs located elsewhere, the one in Grey/Bruce will no doubt have its own unexpected problems that must be accommodated. For example, one of the constraints that the program currently faces in its early stage is a lack of interest shown by farmers to become involved in establishing one of the demonstration

sites. In particular, many farmers feel that they would be opening themselves up to scrutiny from a public touring their demonstration farmers whom might be unfamiliar with agriculture. This caused a temporary setback for the ALUS coordinator and the PAC, as some of the potential candidate farmers, whose properties had been identified as being best suited to demonstrate ALUS, have been wary of becoming involved.

As of autumn 2015, there are half a dozen demonstration projects underway, including retiring marginal land, planting riparian buffer strips, and installing livestock exclusion fencing along streams. This is part of the PAC strategy of attempting to tailor potential projects to suit wildlife conservationists and farmers, such as enhancing bobolink habitat, given that these grassland birds are currently threatened in Ontario. Whereas biologists have been promoting the idea of placing fallow strips in the centre of hay fields to encourage breeding habitat for the birds, farmers have been very reluctant to adopt this practice. Farmers are concerned that plants that they consider to be weeds, and which they have traditionally kept under control through mowing, could become established in these fallow strips and spread their seeds to the adjacent fields, thus infesting the commodity crop. In this respect, it is hoped that developing ALUS programs may help to facilitate important conversations between farmers and conservationists in relation to designing management practices that can provide bobolink habitat without jeopardizing farm productivity. The ALUS program was one of nine Ontario entities to earn the 2013 Minister's Award for Environmental Excellence.

The Rural Municiplaties of Francis, Lajord, Indian Head, and South Qu'appelle, Saskachewan

Alternative Land Use Services program

Unlike other ALUS programs which have been designed to be administered in just one provincial County, Saskatchewan's first program encompasses four rural municipalities overseen by the Agricultural Producers Association of Saskatchewan (APAS), a grassroots agricultural advocacy organization formed in 2000 to incentivize on-farm ES production. Upon the completion of the RMB's pilot program in 2008, APAS entered into conversations with the eNGO Delta Waterfowl about establishing their own program. In December 2011, ALUS was launched by APAS and in spring 2012, a program coordinator was hired to manage the program on behalf of the PAC.

The ALUS concept, being farmer and community driven, has been viewed by APAS as a means to promote preventative stewardship instead of a reactive approach to environmental degradation. The rural areas were strategically selected by Delta Waterfowl for their importance in harbouring nesting waterfowl and their proximity to the city of Regina in order to increase the visibility of the ALUS program and concept, something that is lacking in many of the other programs existing in strictly rural settings.

Although APAS supports ALUS and works to raise funding, it does not actively manage or administer the program. The ALUS program is administered by its own PAC, consisting of two members from the four rural municipalities, as well as two representatives from each of the following: APAS, Saskatchewan Wildlife Federation, Saskatchewan Association of Watersheds, Delta Waterfowl, and Saskatchewan Urban Municipalities Association (SUMA). Groundwork and office work is done by the program coordinator, who reports to the PAC and farmers.

ALUS projects in Saskatchewan are working to create, enhance, and protect native prairie, wetlands, upland habitat, and wetland buffers (Table 3). Farmers are drawn to these projects as a means to retire marginal land from production, control the spread of alkaline soils, and redefine field boundaries to accommodate larger equipment. Working around wetland sloughs and uneven field boundaries is an expensive nuisance for farmers, increasing their cost of production. Using ALUS to enroll wetlands as well as adjacent land ensures the farmer is not being financial penalized for environmental stewardship. Farmers, municipal officials, eNGO's, and other stakeholders state their attraction to the program based on benefits ensuing for wildlife habitat and water quality.

Unexpected support for ALUS

At the time of our initial research, the PES concept was still relatively new to Saskatchewan's agricultural community. Although farmers are the most exposed to and appreciative of natural areas on their farms, ALUS administrators in Saskatchewan have found that farmers are the least familiar with the concept of ES, contradicting the findings of a national survey of farmers (Environics Research Group, 2006). The urban populace, on the other hand, are often more educated and thus excited about the environmental benefits of ES delivered through ALUS. Evidence for this can be found through reported conversations between program administrators and citizens of Regina, and in the participation of SUMA, who independently sought to partner with the ALUS program. This is positive for both the program's development and financial stability, as urban residents seem very willing to

Table 3. A real amounts of new ALUS projects and pre-existing natural assets in the rural municipalities of Francis, Lajord, Indian Head and South Qu'Appelle, Saskatchewan as of spring 2013.

	Project area (thousands of ha)				
Year Established	**Shelterbelt**	**Wetlands**	**Native Prairie**	**Upland**	**Buffers**
2013	2.25	-	13.94	15.94	10.00
2012	5.58	86.24	98.67	30.49	12.78

support ES production in the adjacent, periurban landscape. Ironically, despite being invited to initial developmental meetings, and the demonstrated interest shown from SUMA, their urban Counterparts, the Saskatchewan Association of Rural Municipalities decided not to be involved with the ALUS program.

ALUS administrators and proponents found that many segments of both federal and provincial governments are unclear about the concept of a grassroots approach to compensate for the production and delivery of ES. This has resulted in a present lack of governmental financial support, which in this case, however, has been generously provided by local decision-makers.

Current status and moving ALUS forward

As of autumn 2015, the ALUS program has expanded to include 65 small rural municipalities inside the Assiniboine and Wascana/Upper Qu'Appelle watersheds. BMPs have been primarily directed to protecting wetlands, and including preserving existing and expanding riparian buffers, and installing livestock exclusion fencing, in addition to some grassland restoration. Private funding is provided by the Garfield Weston Foundation, Mississippi duck stamps, and support is being sought, in the form of environmental offsets, from the lucrative potash industry which sustains agricultural productivity in the region.

Parkland County, Alberta

Alternative Land Use Services program

Differing from Saskatchewan's ALUS program, which is completely rural despite a similar proximity to an urban center agriculture in the eastern region of Parkland County is intersected by encroaching suburbs. Therefore, unlike the other case-studies visited and examined in our study, Parkland County's addresses the potential for ALUS to incentivize production of ES in non-agricultural settings as well as to be a tool to reduce conflict between farmers and non-farmers in densely populated, periurban areas.

The ALUS program of Parkland County, officially launched in October 2012 during our site visit, was originally administered through the municipal government with oversight by a Sustainability Services Coordinator to manage and balance the often conflicting social, environmental, and economic needs of the municipality. Until a PAC became established, the County's Agriculture and Rural Life Committee filled this role during the developmental phase. Drawing on lessons from nearby County of Vermillion River**,** Parkland County developed its PAC once the ALUS program was established, and this was designed, as elsewhere, to bring together landowners with representatives from various levels of government and eNGOs. By involving these diverse stake-holders, ALUS was developed in a manner to appeal to both farmers and non-farming residents of the County, as well as to bring in financial and in-kind support for the program.

Parkland County's ALUS program uses cost-share measures and annuity payments. For projects that require one-time costs, such as the purchase of fencing supplies (Figure 7), a 50/50 cost-share is used to reduce the burden to the farmer, and for land taken out of production, annuity payments are made based on the opportunity cost by land area on the areal amount of land.

One unique trait that has not occurred in other jurisdictions that have running ALUS programs, is the inclusion of residential areas whose remnant natural assets still provides wildlife habitat, aesthetics, and many other services to the County. Interestingly, during development of the Parkland County's program, acting coordinators were approached numerous times by non-agricultural landowners interested in undertaking ALUS-type projects on their own properties.

Happenstance is known to play a role in innovation diffusion (Richman 2005). In this regard, the ALUS concept was brought to Parkland County, almost accidently, by the current Sustainability Services Coordinator, who, during his graduate studies, had undertaken his co-op placement in Norfolk County, Ontario, where he became acquainted with the concept and key players of the ALUS program there. After accepting the position in Parkland County, Alberta, this individual actively promoted and successfully 'sold' ALUS

Figure 7. Parkland County, Alberta's first ALUS project, riparian zone fencing at the Tomahawk Cattle Company.

as a way to address environmental issues associated with agriculture that farmers had not yet been able to address due to economic constraints.

As is the case elsewhere, the goals of Parkland County's ALUS program are to encourage stewardship in agricultural landscapes by offering an ES program of high appeal to local farmers based on the voluntary aspect of the program, its grassroots administration, and the financial incentives. By removing the financial burden from environmental stewardship, farmers' decision making will become a more environmentally conscious process.

In addition to financially and socially empowering farmers to produce ES, ALUS in Parkland County will also educate the periurban and urban community about the role that farmers play in managing the landscape. Once the communication gap about the realities of farming and how urban residents benefit from the ES provided by farmers is bridged, it is hoped that smoother relations between these two, frequently estranged, communities may attract additional, long-term sustainable financial support for the program from urban, non-agricultural sources.

Current status and moving ALUS forward

One issue faced by the Sustainability Services Coordinator and other ALUS proponents in Parkland County was related to the miscommunication and lack of enthusiasm from the Agricultural and Rural Life Committee, acting as the interim managers, about the value of the ALUS program for farmers and the County. With a lack of understanding about the ALUS concept and how incentives could be a useful stewardship approach, the committee actually became viewed as a hindrance to the development of Parkland County's program. Proponents from within the County as well as those from other ALUS programs, view this as an example which emphasizes the importance of establishing a knowledgeable, stake-holder PAC right from the start.

At the time of our initial investigation, the Parkland County ALUS had no formal monitoring program in place, although one was and still is planned. By partnering with Cows and Fish, an eNGO specializing in stream and riparian management in Alberta's agricultural landscapes, Parkland County plans to establish long-term monitoring

Table 4. Members of Prince Edward Islands ALUS External Advisory Committee.

Organizations Represented	
Friends of Covehead and Brackley Bay	PEI Tourism Industry Association
National Farmers Union	PEI Roadbuilder's Association
PEI Federation of Municipalities	PEI Potato Board
PEI Aquaculture Alliance	PEI Federation of Agriculture
PEI Fisherman's Association	Souris Wildlife Federation
PEI Shellfish Association	University of Prince Edward Island

of both physical (that is, water quality, erosion, etc.) and biological (that is, biological integrity, diversity, etc.) impacts of agriculture and their mitigations by their ALUS program. As of autumn 2015, an ALUS coordinator has been hired and many demonstration projects have been implemented, focusing on installing livestock exclusion fencing and building alternative livestock watering sites, in addition to some reforestation work. Future project are planned to focus on establishing buffer strips, and restoring native prairies and pollinator habitat. The marked acceptance of the ALUS concept has led to its local expansion. An ALUS offshoot, Green Acres, has been created to meet the demand for rebuilding ES in the periurban areas. Parkland County has partnered with an adjacent County on an ALUS project on a mutual wetland, and three other neighbouring Counties are initiating their own pilot projects. Parkland's municipal government has identified ALUS as a priority policy and provides full support. In the future, ALUS projects will be targeted for areas deemed to be environmentally sensitive, at the same time as continuing to accept farmers on a first-come, first-serve basis.

The Province of Prince Edward Island

Alternative Land Use Services program

Different from all the other ALUS programs in Canada, but similar to the CRP in the United States, ALUS in the province of PEI is structured as a top-down system that is administered, in this case, jointly by PEI's Departments of Environment, Labor and Justice, and Agriculture and Forestry, with payments issued by the latter. The program, initiated in 2008, is overseen by an ALUS Implementation Committee (AIC) consisting of management staff of the departments, and is chaired by the ALUS coordinator. This group administers the program in consultation with the External Advisory Committee (EAC) (Table 4), itself comprised of representatives from major commodity boards, conservation and watershed groups, and the provincial university. The EAC has a loose membership and meets annually to provide community input for the AIC, although during the initial development phases it was consulted monthly.

Given PEI's numerous environmental problems, the AIC and EAC opted to use an approach of tackling the 'low hanging fruit' or issues that were of well-known public concern, and whose mitigation were financially and logistically achievable. In particular, PEI's ALUS program focused on the goals of reducing soil erosion, improving water quality, increasing the amount of wildlife habitat and quality, and reducing the impacts of climate change.

The ALUS program of PEI is financially fortunate to be stable due to ongoing support from the provincial government. Initially given a budget of $750,000 annually for five years, the program's funding was increased to one million dollars per annum in the second year for the remainder of the initial five-year term (Delta Waterfowl, 2009). There has been a decline in new applicants, indicating that the program is approaching full implementation within the set goals and objectives. At the end of its first five-year term, the program is being restructured for future payments.

Payments are exclusively for annuities for the ALUS program, with access to funding for tree plantings and other expenses being made available by other sources such as the federal government's Growing Forward program. To meet the goals set out by the AIC and EAC, a suite of activities (Table 5) were included. High-slope land that was prone to erosion was eligible for retirement from production, and waterway riparian zones were grassed to reduce erosion's impact on land that would remain in production. These projects targeted enhancing existing 15 m buffer strips with vegetation, and expanding mandated setbacks with an additional 15 m grassed buffer. To reduce erosion in adjacent fields, large conservation terraces, which permanently remove the land out of production upon which they are constructed, were eligible and received a higher payment as there were more opportunity costs in their establishment. PEI is the only province to exclude livestock from all waterways, and to help enforce this regulation, maintenance of

Table 5. ALUS projects and payment rates in PEI.

Projects	Annuity Payment
Maintenance of Waterway Livestock Exclusion Fencing	0.30 $/m
Regulated Buffer Zone Tree Panting	185 $/ha
Expanded Buffer Zones	185 $/ha
Non-regulated Grassed Headlands	185 $/ha
High Slope Land Retirement	185 $/ha
Land under Conservation Structures	250 $/ha

Table 6. ALUS enrollment in PEI.

Activity	Amount of Land/ Fencing
Tree Planting in Legislated Buffer Zones	251 ha
Grassed Headlands	455 ha
Expanded Buffer Zone	553 ha
Land Under Soil Conservation Structures	784 ha
High Slope Land Retirement	1411 ha
Livestock Exclusion Fencing from Waterways	200,000 m

Source: ALUS (2011)

exclusionary fencing was eligible under the ALUS program as a means to remove the financial burden from farmers.

Developmental challenges and farmer involvement

One issue that emerged during program development was how to deal with land that was leased or rented. Initially such land was to be ineligible for the ALUS program due to the legally grey nature and informal verbal contracts between owners and renters. However, due to the large amount of rented agricultural land in PEI (57,639 ha or 28% in 2011), this was restructured to appease the agricultural industry, provided receipt of a letter stating the rental agreement and identifying to whom the ALUS payments would be given. Leased land was also more heavily monitored by program administrators to ensure that all land enrolled in ALUS was properly maintained.

In terms of environmental stewardship, the ALUS program quickly realized that education is important for both farmers and program staff. Program staff found that farmers are often willing do environmental work in small steps, an approach that allows farmers to gradually evolve into becoming environmental stewards, while providing the benefit of enabling the progressive education of ALUS staff about the realities of agricultural business.

PEI's ALUS program is Canada's most successful one, with the greatest participation in terms of both the total number of farmers and the total areal amounts of land enrolled (Table 6). However, the environmental problems the program had set out to resolve have yet to be permanently resolved. To meet the erosion, water quality, and wildlife habitat goals, there must be an ongoing progress of working with landowners to ensure that ALUS projects (Figure 8) remain a more viable and lasting option than returning enrolled marginal land back to agriculture.

Currently, ALUS applicants are accepted on a first-come, first-serve basis. Given that the program is operating under budget, there is no need for a system to ensure fair allocation amongst farmers or to prioritize the types and locations of ALUS BMPs to maximize impact. However, it is acknowledged by ALUS staff that in the future, should ALUS continue to expand, a process of prioritizing environmental targets will need to be developed. PEI's ALUS also has no cap on the total amount of land enrolled per farm, which differs from the other programs across Canada.

Compliance monitoring of enrolled land in the PEI ALUS program is administered by random audits. Annually, 10% of enrolled farmers are contacted and their farms visited and assessed to ensure land has not been returned to agricultural production. In the event of a total

Figure 8. Representative ALUS projects located in the Tyne Valley, Prince Edward Island. Forested riparian buffer strips (left) and high slope land retired from cultivation (right).

non-compliance, there is no attempt at cost recovery and the farmer will be indefinitely excluded from the program. Fortunately, the program has never had to deal with such a situation, and most instances of non-compliance are due to simple miscommunication between farmer and labourers, that are easily rectified. The ALUS approach of management flexibility allows administrators to accommodate farmers when weather conditions have caused non-compliance, as similar to the arrangements in place in Alberta's CVR program.

Lessons learned and current status

PEI's ALUS was fortunate in that it had a previous ES delivery pilot project, undertaken in the province's Souris River Watershed, to provide a base from which to develop the current, province-wide program. This pilot project, undertaken from 2007-09, had the objective of evaluating the effectiveness of an ES delivery system in an agricultural landscape (Crane *et al*., 2009). Sub-objectives of the project included assessing the value of natural assets, estimating the cost to producers for delivering ES, understanding the roles of community, industry, and government in delivering ES, and the overall cost/benefits of the program. This pilot project stage was used to develop the PEI ALUS program by helping program administrators and farmers avoid the growing pains experienced in the RMB, Manitoba's pioneering ALUS program**.**

Like all of Canada's ALUS programs, PEI's has been woefully deficient in collecting preliminary quantitative data at project sites in order to enable before-and-after comparisons of BMP efficacy. Managers regret this absence of data, although it has been anecdotally noted by farmers, researchers, and government officials that there have been "observable" environmental improvements. Further, PEI government officials also state that they feel there has been more environmental progress brought about by implementing ALUS projects in four years (at the time of our visit) than occurred in the decades of attempting to regulate agriculture through enforcement.

Findings from an independent survey have also noted that PEI farmers, although pleased with the ALUS program overall, would like to have more consultation in future developments, better monitoring, and increased outreach on the benefits of the program to non-participants (Lantz *et al*. 2012).

Due to the inferred environmental success and demonstrated widespread popularity of ALUS throughout the province, no changes are envisioned in the near future.

DISCUSSION

In many rural communities, there has been a shift in the environmental attitudes of residents. In Canada, a new generation of farmers are beginning to change the way they view natural assets. The consequences of intensive agriculture are no longer being ignored and there is an effort to balance the needs of nature and agriculture. ALUS is working to find this balance, acknowledging the opportunity costs of delivering ES, while keeping the needs of farmers in mind. This approach not only empowers those already willing to do environmental work but also encourages projects to be undertaken by producers who in the past had overlooked and undervalued natural assets on their farms. Therefore, the overall

Table 7. Ten key elements to consider to increase the likelihood of success with planning, administering, and implementing an ALUS program.

1. Ultimately the governance structure, whether administered by a central government department or a 'bottom-up' grassroots entity, does not affect program delivery of ES
2. For grassroots or hybrid governance models, creation of a PAC with strong farmer contribution is essential
3. Partnership with an established (regional, national, or international) eNGO helps to select and coordinate the most appropriate BMPs
4. Imagination and outreach are necessary to attract support from a diverse, and hopefully sustainable, funding base
5. A pilot project phase with demonstration farms is critical to help educate all participants
6. Flexibility in annuity payments (for example, in relation to inclement weather, infrastructure advances, leased land consideration, etc.) encourages enrollment in the program
7. Recognition and prioritization of environmental problems and a diverse toolbox of permissible BMPs to mitigate those problems is advisable
8. Limits on the amount of land permissible for enrollment may be necessary to ensure that agriculture is maintained as the dominant land-use
9. Prioritization of periurban sites will raise awareness and support for ALUS programs amongst the wider populace and will provide sought-for recognition by farmers for their efforts in delivering ES
10. Capable contractors are needed for construction of BMPs

Table 8. Ten mistakes to avoid to increase the likelihood of success with planning, administering, and implementing an ALUS program.

1. Failure to include farmers in all stages of the developmental process
2. Ignore educating government officials (municipal, County/township, regional) about the philosophy and strategy for PES programs
3. Insecure funding base in place before program commences to assure farmers wary of participating in a perceived non-sustainable program
4. Informal, inconsistent, and poorly communicated compliance monitoring
5. Too large an administrative area means too many diverse farming practices and environmental concerns
6. Unclear explanation of whether protection of existing natural land is permissible for enrollment as a BMP in addition to creation of restored land
7. Uncertainty about permissible recreational activities in enrolled land
8. Resistance to creation of demonstration farms in the pilot project phase due to failure to assuage farmer concerns about public criticism of agricultural practices through failing to adequately educate non-agricultural visitors
9. Logistic problems in spatial scaling of enrolled land for BMPs in relation to the physical size and operational scale of operating farmers' machinery
10. Lack of investigation of the efficacy of implemented BMPs to scientifically determine whether ALUS programs deliver ES

favorability of the various programs, implemented under a diversity of conditions, suggests the expansion of the ALUS approach to other Countries is a strategy to be encouraged.

Tables 7 and 8 distill the cross-system findings from our survey to highlight the most important elements to consider, and the most important mistakes to avoid, in order to increase the likelihood of achieving success in

the planning, administering, and implementation of an ALUS program.

Five, over-arching themes and 'take-home' messages emerge from our survey:

1. Better environmental conditions in managed agro-ecosystems can come about through a program of grassroots PES rather than through traditional, 'top-down' enforcement. In other words, 'carrot' approaches such as ALUS can be more effective than regulatory 'stick' approaches.
2. Because farmers are generally independently-minded and like to control their own destinies, they greatly appreciate the voluntary nature of the ALUS program that allows them, if so motivated, to participate in the delivery of ES.
3. Being dependent on the vagaries of weather, droughts and floods often cause marginal lands to be financially unreliable, leading to loses rather than profits. The opportunity to take an annual ALUS payment, rather than 'gamble' on marginal lands, has been well received by farmers.
4. Whereas the PES are very modest, farmers appreciate the recognition they receive for undertaking environmental stewardship activities. Indeed, for some, it is the increased societal valuation of their roles as environmental stewards that is the major reason for their decision to participate in an ALUS program.
5. The ALUS strategy of PES is heuristically appealing to non-agricultural stakeholders. Environmental NGOs are often impressed enough to sign on as participants and, in some cases, even as contributing sponsors. And because periurban dwellers are likewise embracing of the concept, ALUS can be a unifying influence in the integrated management of watersheds that straddle the rural and urban divide.

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APPENDIX

Agricultural and environmental backgrounds to ALUS program locations

Rural Municipality of Branshard, Manitoba

i. Six townships with area of 350 km^2 located 40 km NW of city of Brandon
ii. Settled in late 19th century with a present population of 526
iii. Situated at boundary between true prairie and parkland prairie ecoregions
iv. Economy entirely dependent on agriculture (40,000 ha cash crops, 5,400 ha animal fodder and pasture including 1,690 ha as native prairie)
v. Two-year rotation of fallowing but with continual weed control, thereby creating erosion and declining water quality
vi. Increased frequency of cropping negatively affected wildlife due to habitat fragmentation and loss, in particular decreased breeding success of waterfowl using agriculture fields for nesting
vii. Great loss of natural grasslands, and wetlands reduced to only 20-40% of their original surface area due to drainage (Figure A.1)

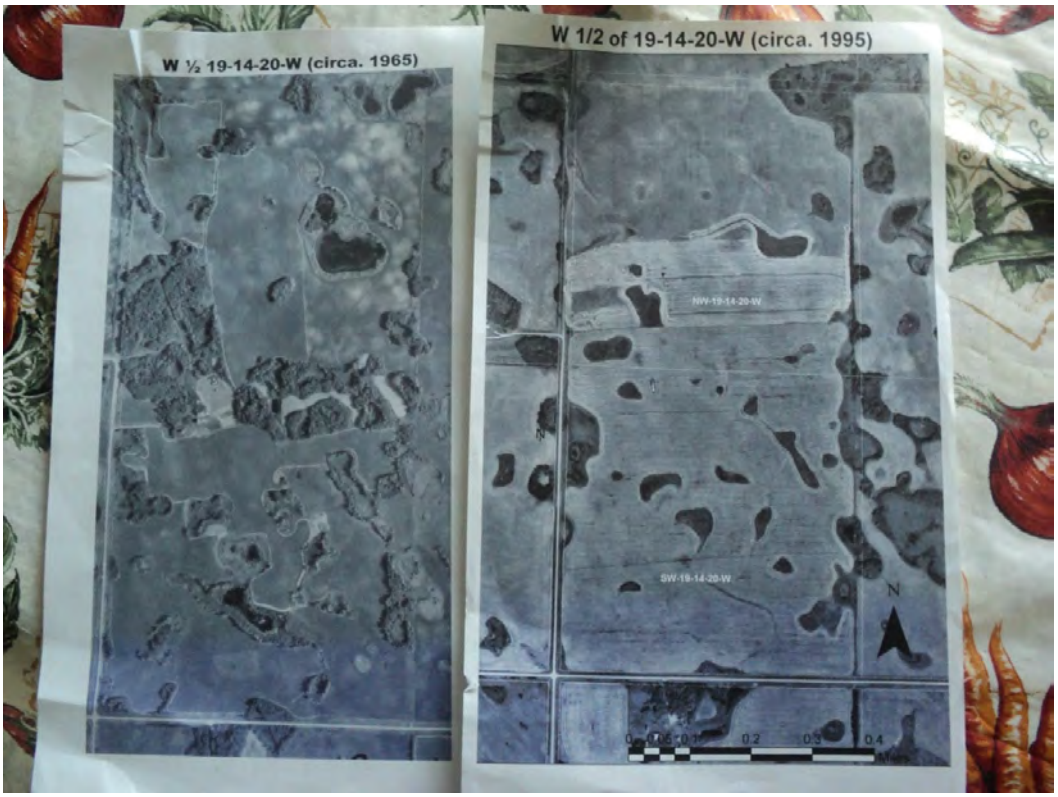

Figure A.1 . Historical maps showing the changes on a land parcel due to intensified agriculture from 1965 to 1995 in the Rural Municipality of Blanshard, Manitoba.

Norfolk County, Ontario

i. County of 1.6 million ha located 150 km SW of city of Toronto on the shore of Lake Erie
ii. Population of 63,000 of which 20% being dependent on agriculture with 1,322 farms situated on 94,000 ha
iii. Presence of Canada's only Carolinian forests as well as several wetlands of international importance results in both

high levels of biodiversity and also of species at risk
iv. Former dominance of site-intensive growing of tobacco (Figure A.2), which has shifted in recent years to cash crops, fruits and vegetables, as well as diversification to alternative crops such as lavender, ginseng and hazelnuts together with vineyards (Figure A.3)
v. Pessimistic opinions of farmers about the future of their profession in the County due to shifting production markets
vi. Presence of highly erodible soil and cultivation right to the water's edge results in declines in water quality
vii. Shift from site-intensive tobacco to other cash crops has resulted in deforestation
viii. Between 70-90% of wetlands have been drained

Figure A.2. Tobacco agriculture in Norfolk County, Ontario.

Figure A.3. Alternative agricultural crops in Norfolk County, Ontario. Ginseng production (left) and viticulture (right).

The County of Vermillion River, Alberta

i. County of 5,518 km^2 near the border with Saskatchewan
ii. Settled in early 20^{th} century with a present population of 7,905
iii. Aspen parkland ecoregion
iv. Agriculture is prominent with close to 300,000 ha of canola and cereal cropland and about 200,000 ha of beef pasture of which 56% is natural vegetation

v. Historical dominance of mixed-use farms which have now become specialized and highly mechanized
vi. Oil and gas extraction on farms has been an important source of additional income to producers but recent increases in commodity prices has meant the petroleum industry is being looked upon unfavorably (due to increased traffic, loss of rural aesthetics, and concerns of potential environmental damage)
vii. Outbreaks of bovine disease has caused shifts to cash cropping and consequent destruction of native prairie pastureland
viii. Progressive increase in the size of farm machinery has led to removal of shelterbelts, loss of small wetlands, and fragmented forests

Grey and Bruce Counties, Ontario

i. Located in southern Ontario, 150 km W from city of Toronto
ii. Settled in mid-18th century and now a popular weekending destination for city dwellers due to proximity to large city and presence of beaches on Lake Huron and Georgian Bay
iii. Varied topography (Figure A.4) and mixed plains ecoregion with deciduous-dominated forests containing some of the highest plant and animal biodiversity in Canada
iv. Heavily dependent on agriculture with beef and cash cropping the mainstay (expansion of corn and soybeans, and particularly canola oilseed, Table A.1), and recent increased diversification to orchards and vineyards
v. Declines in agriculture due to increased purchase of rural properties (now at 14% of total farmland) by weekending city dwellers
vi. Increase in cash crops has led to deforestation, wetland drainage, and cultivation of marginal (sloped) pasture and riparian land
vii. Cattle have unregulated access to streams thereby causing erosion
viii. Increased concern among farmers about the spread of weeds due to the natural succession of retired and unmanaged farmland by out-of-County vacationers

Figure A.4. The topography of Grey and Bruce County, Ontario. Flat agricultural fields (left) and rolling hills (right).

Table A.1. Increases in the areal production of grain corn, canola, soybean and wheat in Bruce County and Grey County from 2006 to 2011.

Crop	Bruce County (ha)		Increase	Grey County (ha)		Increase
	2006	2011	%	2006	2011	%
Canola	294	2582	778.2	358	4475	1150.0
Grain Corn	19113	25868	35.3	5658	8961	58.8
Soybean	27116	38819	43.2	7335	12674	72.8
Wheat	21855	23465	7.4	7067	10021	41.8

The Rural Municipalities of Francis, Lajord, Indian Head, and South Qu'Appelle, Saskatchewan

i. Four rural municipalities located 20 km east of city of Regina
ii. Moist, mixed grassland ecoregion (Figure A.5)
iii. Increased specialization and consolidation has caused mosaic of small, mixed-use farms to disappear in recent decades with the replacement of large farms (Figure A.5) with cash crops (cereals and oilseeds) cultivated on marginal lands right beside streams
iv. Concerns about increased foreign ownership of property
v. Shift form biannual to continuous crop production with no summer fallowing has decreased available nesting habitat and increased extent of agrochemical use
vi. Native prairie vegetation reduced to isolated pockets adjacent to wetlands (Figure A.5) and pasture for cattle grazing
vii. Deep societal memories of severe erosion in the 'dust bowl' of the 1930s

Figure A.5. Cereal agriculture dominates the landscape in southern Saskatchewan (top), with a permanent slough and a potential ALUS project (middle), and remnant native prairie in a public park near Regina (bottom).

Parkland County, Alberta

i. Periurban County of a quarter million ha and 36,000 people on the western edge of city of Edmonton

ii. Agriculture began in the late 19th century and now consists of 782 farms
iii. Transitional between aspen parkland, grassland prairies, and boreal forest ecoregions
iv. Extensive industrial presence of oil/gas extraction, gravel mining, and coal burning
v. Predominant beef ranching with native grasses as pasture, followed by cash crops (cereals and oilseeds), with some dairy, sheep, and fruit and vegetable farms
vi. Loss of shallow prairie lakes has resulted in flooding
vii. Groundwater source contamination due to agriculture and industry has resulted in 70% of residents needing to rely upon cisterns filled by water trucks
viii. Urban sprawl creating conflict with city dwellers upset about noises, odours, and practices associated with working farms

The Province of Prince Edward Island

i. Agriculture is widespread, leading to province being referred to as Canada's 'million acre farm'
ii. The 30% of the Acadian forest that remains is a mixture of coniferous and deciduous trees
iii. Estuaries support extensive shellfish aquaculture, and recreational and commercial salmonid fisheries are important
iv. Cash crops predominate (principally potatoes, but also fruits, vegetables, organic produce, cereals, soybeans, and oilseeds), and 40% of farms have livestock (dairy and beef cattle)
v. Landscape very productive but also very prone to environmental problems due to presence of highly erodible soil which has resulted in severe sedimentation in receiving waters
vi. Transport of nutrients and agrochemicals in runoff has caused groundwater pollution and human health concerns as well as periodic fish kills and shellfish bed closures