Enhancing the Flow of Ecological Goods and Services to Society

Key Principles for the Design of Marginal and Ecologically Significant Agricultural Land Retirement Programs in Canada

CANADIAN INSTITUTE FOR ENVIRONMENTAL LAW AND POLICY

L'INSTITUT CANADIEN DU DROIT ET DE LA POLITIQUE DE L'ENVIRONNEMENT

Since/depuis 1970

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Canadian Institute for Environmental Law and Policy

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Executive Summary

The environmental quality of Canadian agricultural landscapes has deteriorated consistently over many decades despite wide recognition of the need for more effective mitigation strategies. Notwithstanding successful efforts to ameliorate soil health by reducing summerfallow and promoting conservation tillage, most indicators of agri-environmental health are trending worse, from greenhouse gas emissions to air and water pollution to biodiversity loss.[1] In addition, many lands with limited capacity for sustained cultivation over the long-term continue under the till.[2] This agri-environmental degradation is primarily attributable to the intensification of agricultural production systems. The average output of products per farm has grown immensely in the post-WWII era, furnished by a greater uptake of farm machinery, wider applications of chemical inputs such as fertilizers and pesticides, and an expansion of the average farm unit.[3]

As a result, society is demanding more from farmers with respect to the environmental impact of food production, yet twenty years of poor returns has meant that few farms are able to respond in a manner that is economically viable.[4] In addition, the regulation of farm practices has generally been limited and poorly enforced.[5] This gives credence to expand the use of incentive-based policies and program instruments designed to generate agri-environmental benefits above existing regulatory requirements, to promote the uptake of practices associated with high opportunity costs and few private benefits but substantial benefits to society. The outlay of compensatory payments to farmers for provisioning agricultural products beyond food, fuel, and fibre – ecological goods and services (EG&S) – has gained heightened interest in many OECD countries but remains largely untested in Canadian jurisdictions.[6] A myriad of ecological goods and services flow in seamless procession from agricultural land to Canadians of urban and rural stripes alike, yet most aren't traded in markets or assigned prices. The absence of price signals has contributed to the neglect of these non-market or "hidden" EG&S benefits within policy and public circles, hastening and assuring their growing scarcity over time.

This research sought to examine the potential contribution of payments for retiring and restoring marginal and ecologically significant agricultural land to natural cover (forest, wetland, and

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1 Organisation for Economic Cooperation and Development. (2008). *Environmental performance of agriculture in OECD countries since 1990: Canada country section.* Retrieved January 13, 2009, from http://www.oecd.org/dataoecd/27/18/40753614.pdf

2 Statistics Canada. (2001). *Rural and small town Canada analysis bulletin*. Retrieved June 14, 2009, from http://www.statcan.gc.ca/pub/21-006-x/21-006-x2001002-eng.pdf

3 Agriculture and Agri-Food Canada. (2007). *An overview of the Canadian agriculture and agri-food system*. Retrieved January 16, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/pub/sys/pdf/sys_2007_e.pdf

4 Statistics Canada. (2004, November). *Net farm income: Agriculture economic statistics*. Retrieved January 29, 2009, from http://www.statcan.gc.ca/pub/21-010-x/21-010-x2004002-eng.pdf. See also National Farmers Union. (2005). *The farm crisis and corporate profits: A report by Canada's national farmers union.* Retrieved November 19, 2008, from http://www.nfu.ca/new/corporate_profits.pdf

5 Montpetit, E. (2002). Policy networks, federal arrangements, and the development of environmental arrangements: A comparison of the Canadian and American agricultural sectors. *Governance*, *15*(1), 1-20.

6 Gagnon, B. (2005). *Remuneration for ecological goods and services: Elements for a Quebec analysis*. Québec: Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec. Retrieved March 24, 2009, from http://www.mapaq.gouv.qc.ca/NR/rdonlyres/9673B765-8852-44DA-8A88-721894666A4D/0/BSEenmilieuagricoleENG.pdf

grassland) to enhance EG&S flows to society. Programs that provide incentives for marginal land retirement offer a strong potential to ameliorate agri-environmental quality since marginal lands generally require higher applications of nutrients to stimulate crop growth and are more susceptible to wind and rainfall induced erosion and nutrient losses, which can adversely affect ground and surface waters.[7] Six case studies from the United States and Canada were selected for evaluation. The first set of three cases are federal programs, and include the Conservation Reserve Program (US), Wetlands Reserve Program (US), and Greencover – Land Conversion (Canada). The second set of three cases are Canadian pilot projects operating at a local scale, and include Alternative Land Use Services (Blanshard, Manitoba), Payments for Environmental Goods and Services (Huron County, Ontario), and Total Phosphorus Management (South Nation River, Ontario). Eight criteria were formulated to evaluate each program and pilot project in terms of ecological, economic, and social considerations.

It is recommended that Canadian jurisdictions at federal, provincial, and municipal levels expand the use of EG&S payments for agricultural land retirement as an instrument to ameliorate the environmental performance of agricultural production systems. It is shown that such programs receive high uptake and support from the farming community and can generate considerable ecological benefits in a cost-effective manner if designed according to a list of ten key principles identified through this research:

1. *Set Clear and Measurable Program Objectives*
2. *Promote Meaningful Farmer and Local Stakeholder Involvement*
3. *Target Marginal and Ecologically Significant Lands*
4. *Encourage Benefits Above Regulatory Standards*
5. *Ensure Stewardship Activities Generate "Additionality"*
6. *Screen Enrollment with a Benefit/Cost Index*
7. *Require Competitive Bidding*
8. *Offer Permanent Easement Contracts*
9. *Ensure Contract Obligations are Transparent to Landowners and Monitored*
10. *Cap Enrollment*

[7] See pages 26-42 of: Lubowski, R.N., Bucholtz, S., Claassen, R., Roberts, M.J., Cooper, J.C., Gueorguieva, A., & Johansson, R. (2006). *Environmental effects of agricultural land-use change: The role of economics and policy*. Retrieved August 4, 2009, from http://www.ers.usda.gov/publications/err25/err25.pdf

1: An Introduction to Agriculture in Canada

Structural Evolution of the Canadian Agricultural Sector

Although many years have elapsed since wheat led Canadian exports, agriculture remains a key component of our economic and social milieu. Roughly 8% of Canada's Gross Domestic Product (GDP) is generated by agricultural production, which directly accounts for one in eight jobs and indirectly supports many more.[8] Currently there are 327,055 farm operators[9] in Canada, representing just over 1% of the population.[10]

During the centuries-long transition from export-orientation to integration with value-added industries agriculture in Canada underwent dramatic structural changes, culminating in what is frequently labeled the "farm income crisis".[11] Farm incomes have waned consistently since the mid 1970's:[12] realized net income per farm,[13] excluding off-farm earnings and government support payments, has been below zero since 1999 (Figure 1.1). The rising cost of farm inputs relative to earnings on farm products,[14] mounting pressures to compete internationally, vagaries of commodity prices as a result of oversupply and inelastic consumer demand, and an increasingly oligopolized agri-business sector[15] have made living off the land challenging for thousands of Canadian farm families.

Many farmers, roughly 60%, have responded by supplementing their income with work off-farm,[16] up from 40% in the early 1990's.[17] Copious others have left farming altogether. The total

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[8] Agriculture and Agri-Food Canada. (2007). *An overview of the Canadian agriculture and agri-food system*. Retrieved January 16, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/pub/sys/pdf/sys_2007_e.pdf

[9] A farm operator is defined by Statistics Canada as a person responsible for the day-to-day management of an agricultural operation. Up to three operators can be reported per farm.

[10] Statistics Canada. (2007). *Section 6 - Characteristics of farm operators, Canada and provinces: census years 1991 to 2006*. Retrieved January 13, 2009, from http://www.statcan.gc.ca/pub/95-632-x/2007000/t/4185586-eng.htm

[11] Skogstad, G. (2007). The two faces of Canadian agriculture in a post-staples economy. *Canadian Political Science Review*, *1*(1), 26-41. See also Bessant, K.C. (2007). Multiple discourses on crisis: Farm, agricultural, and rural policy implications. *Canadian Journal of Agricultural Economics*, *55*(4), 443-457.

[12] Statistics Canada. (2004, November). *Net farm income: Agriculture economic statistics*. Retrieved January 29, 2009, from http://www.statcan.gc.ca/pub/21-010-x/21-010-x2004002-eng.pdf. See also National Farmers Union. (2005). *The farm crisis and corporate profits: A report by Canada's national farmers union.* Retrieved on November 19, 2008, from http://www.nfu.ca/new/corporate_profits.pdf

[13] Realized net income is defined by Statistics Canada as a farmer's cash receipts (revenue) minus operating expenses and depreciation, plus income in kind (home consumed agricultural products) (Statistics Canada, 2008a). This does not include annual fluctuations in the extent and value of farm inventories.

[14] Statistics Canada. (2006). *Financial picture of farms in Canada*. Retrieved January 29, 2009, from http://www.statcan.gc.ca/ca-ra2006/articles/finpicture-portrait-eng.htm

[15] National Farmers Union. (2005). *The farm crisis and corporate profits: A report by Canada's national farmers union.* Retrieved on November 19, 2008, from http://www.nfu.ca/new/corporate_profits.pdf. See also Easter, W. (2005). *Empowering Canadian farmers in the marketplace*. Retrieved January 13, 2009, from http://www.agr.gc.ca/cb/min/pdf/rpt0705_e.pdf

[16] Agriculture and Agri-Food Canada. (2007). *An overview of the Canadian agriculture and agri-food system*. Retrieved January 16, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/pub/sys/pdf/sys_2007_e.pdf

[17] Pierce, J.T. (1994). Towards the reconstruction of agriculture: Paths of change and adjustment. *The Professional Geographer*, *46*(2), 178-190.

number of operating farms in Canada reached a high of 732,832 in 1941 and has since declined to 229,373 in 2006, a drop of almost 70%.[18] Between 2001 and 2006 alone 7.1% of Canadian farms vanished, the majority of which were amalgamated into larger operations (Figure 1.2).[19] A recent survey of farmers in the Greater Toronto Area found that almost 70% of respondents did not expect any of their children to work the farm in the future.[20] With less interest in farming, the average age of farm operators has climbed from 47.5 in 1991 to 52 in 2006, while the percentage of farmers below the age of 35 has dropped starkly, from 19.9% in 1991 to 9.1% in 2006.[21]

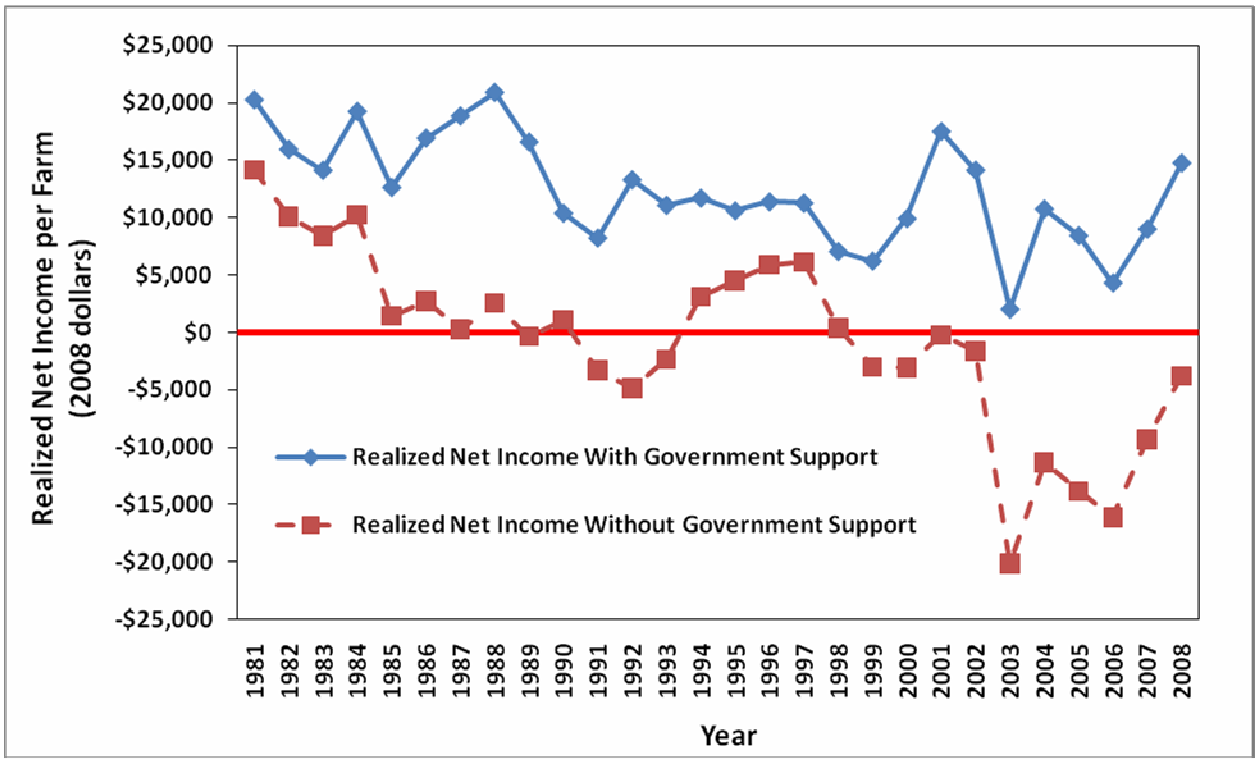

Figure 1.1: Realized Net Income per Farm in Canada from 1981 to 2008[22] [23] [24] [25]

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[18] Statistics Canada. (2007). *A statistical portrait of agriculture, Canada and provinces: census years 1921 to 2006.* Retrieved January 13, 2009, from http://www.statcan.gc.ca/pub/95-632-x/2007000/t/4185570-eng.htm

[19] Statistics Canada. (2006). *Farms classified by total farm area, census years 2006 and 2001.* Retrieved March 24, 2009, from http://www.statcan.ca/english/freepub/95-629-XIE/1/1.3.htm

[20] Bunce, M., & Maurer, J. (2005). *Prospects for agriculture in the Toronto region: The farmer perspective.* Toronto: Neptis Foundation. Retrieved March 12, 2009, from http://www.neptis.org/library/show.cfm?id=73&cat_id=6

[21] Statistics Canada. (2007). *Section 6 - Characteristics of farm operators, Canada and provinces: census years 1991 to 2006*. Retrieved January 13, 2009, from http://www.statcan.gc.ca/pub/95-632-x/2007000/t/4185586-eng.htm

[22] Statistics Canada. (2007). *A statistical portrait of agriculture, Canada and provinces: census years 1921 to 2006.* Retrieved January 13, 2009, from http://www.statcan.gc.ca/pub/95-632-x/2007000/t/4185570-eng.htm

[23] Government support included Net Income Stabilization Account, crop insurance, private hail insurance, provincial stabilization, and "other" payments. Statistics Canada. (2009). *Farm cash receipts*. Retrieved August 4, 2009, from http://www.statcan.gc.ca/pub/21-011-x/21-011-x2009001-eng.pdf

[24] Statistics Canada. (2009). *Net farm income*. Retrieved August 4, 2009, from http://www.statcan.gc.ca/pub/21-010-x/21-010-x2009001-eng.pdf

[25] Inflation adjustments calculated using the Consumer Price Index inflation calculator, found at: http://www.bankofcanada.ca/en/rates/inflation_calc.html

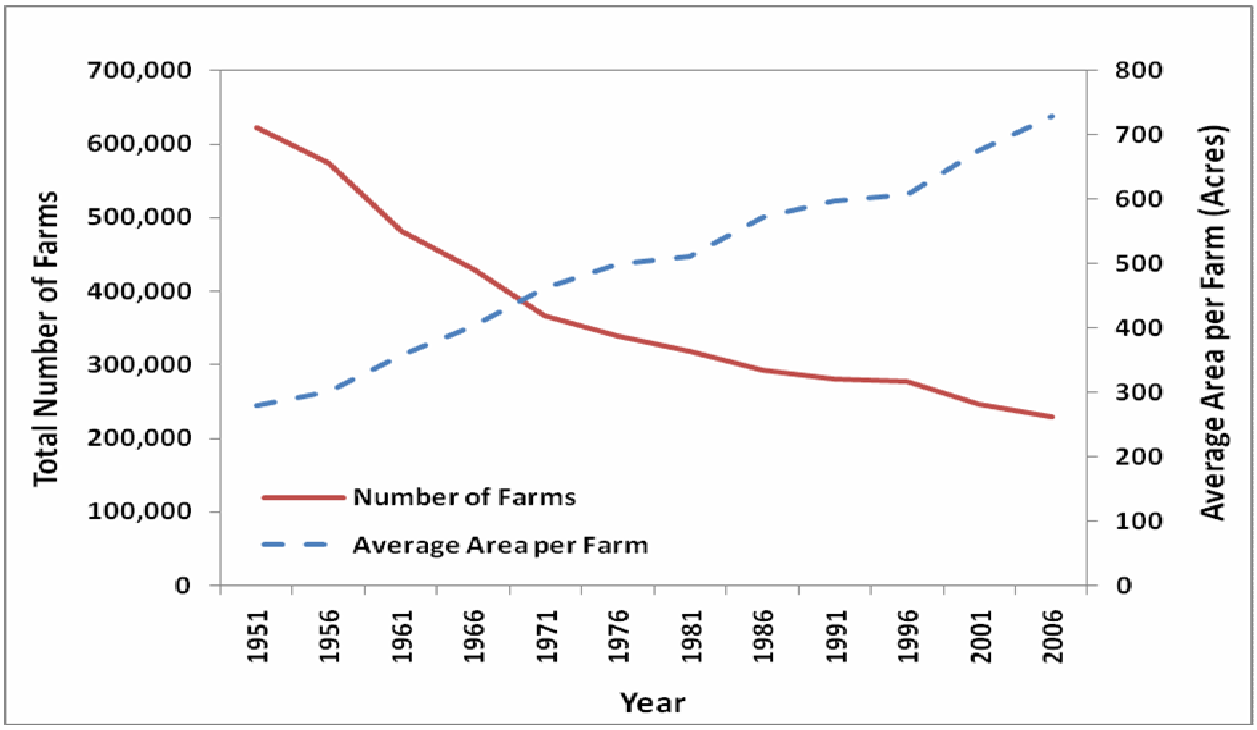

Figure 1.2: Total Number of Farms and Average Area per Farm from 1951 to 2006[26]

The farmers that remain have sought to expand income flows by intensifying their operations. The average output of grains, oilseeds, and specialty crops per farm has doubled since the 1970s.[27] Between 1971 and 2001, the number of dairy cows per dairy farm increased threefold while the number of hogs per hog farm increased fourteen-fold.[28] This intensification has been furnished by changes in farm factors of production. In 1921, there were 22 farm labourers for every tractor; today, there are 2.5 times more tractors than labourers.[29] The use of chemical inputs has shot up as inflation-adjusted pesticide and fertilizer sales have increased five times and two-and-a-half times between 1971 and 2005, respectively.[30] And, to realize economies of scale, the average Canadian farm has tripled in size since the 1950s while the number of farms generating at least $250,000 in total farm revenue (2005 dollars) increased by 13.8% between 2001 and 2006.[31]

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[26] Statistics Canada. (2007). *A statistical portrait of agriculture, Canada and provinces: census years 1921 to 2006.* Retrieved January 13, 2009, from http://www.statcan.gc.ca/pub/95-632-x/2007000/t/4185570-eng.htm

[27] Qualman, D., & Tait, F. (2004). *The farm crisis, bigger farms, and the myths of "competition" and "efficiency".* Retrieved January 13, 2009, from http://www.policyalternatives.ca/documents/National_Office_Pubs/farm_crisis2004.pdf

[28] Agriculture and Agri-Food Canada. (2006). *Economic backgrounder: Changing structure of primary agriculture.* Retrieved May 30, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/consult/econom/pdf/structure_e.pdf

[29] Statistics Canada. (2003). *The economy: Mechanization on the farm*. Retrieved January 29, 2009, from http://www43.statcan.ca/03/03b/03b_002b_e.htm

[30] Agriculture and Agri-Food Canada. (2007). *An overview of the Canadian agriculture and agri-food system.* Retrieved January 16, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/pub/sys/pdf/sys_2007_e.pdf

[31] Statistics Canada. (2006). *Financial picture of farms in Canada*. Retrieved January 29, 2009, from http://www.statcan.gc.ca/ca-ra2006/articles/finpicture-portrait-eng.htm

It is imperative to highlight that this structural evolution towards a heavily capitalized and intensified farm sector is not exclusively the outcome of market forces but also government paradigms and policies. Throughout the 1950s and 1960s, the federal government offered subsidized credit to farmers under the belief that larger and more mechanized farm operations were more efficient, productive, and competitive.[32] Moreover, government grants were offered to drain wetlands and bring marginal land into production, while fuel rebates and tax incentives promoted the incorporation of large machinery into production practices.[33]

Deterioration of Agri-Environmental Quality

The intensification of agricultural production systems in Canada has had a predictable impact on environmental quality both on and off the farm. In 2005, Agriculture and Agri-Food Canada (AAFC) released a comprehensive report that analyzed the trends in agri-environmental quality between 1981 and 2001.[34] AAFC found that Canadian farmers have made great strides in ameliorating soil quality (erosion, organic carbon, and salinity), the result of a 50% reduction in summerfallow and an increase in reduced till and no-till practices. Today, roughly 70% of Canadian cropland is cultivated under conservation tillage or no-till practices, and an upsurge in soil conservation practices such as crop rotation, windbreaks, and rotational grazing[35] bodes well for the future health of our soil base. Nevertheless, the report also documented an escalation of risks to water quality from nitrogen surpluses, a small decrease in energy use efficiency, and a deterioration of wildlife habitat on agricultural lands. In 2008, the Organisation for Economic Cooperation and Development (OECD) identified other disquieting trends: between 1990 and 2003 pesticide sales in Canada doubled, agricultural water use is increasing considerably, phosphorus and nitrogen surpluses are proliferating, and the Great Lakes have become more over-stressed by nutrients, pathogens, pesticides and soil sediments. While 10% of Canadians draw their water from private wells, roughly 15% of rural wells exceed guidelines for nitrates (45mg/litre) and many routinely fail to meet drinking water standards for bacteria.[36]

Apart from the intensity of production practices, agri-environmental quality in Canada has been adversely affected by cultivation on fragile soils with poor agricultural capacity. Only 5% of Canadian soils are considered “free from severe physical limitations and can support crop

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[32] Skogstad, G. (2007). The two faces of Canadian agriculture in a post-staples economy. *Canadian Political Science Review*, *1*(1), 26-41. See also Bessant, K.C. (2007). Multiple discourses on crisis: Farm, agricultural, and rural policy implications. *Canadian Journal of Agricultural Economics*, *55*(4), 443-457.

[33] van Kooten, G.C., & Schmitz, A. (1992). Preserving Waterfowl Habitat on the Canadian Prairies: Economic Incentives vs. Moral Suasion. *American Journal of Agricultural Economics*, 74(1), 79-89.

[34] Lefebvre, A., Eilers, W., & Chunn, B. (2005). *Environmental sustainability of Canadian agriculture*: *Agri-environmental indictor report series – report #2*. Ottawa: Agriculture and Agri-Food Canada. Retrieved November 19, 2008, from http://www4.agr.gc.ca/resources/prod/doc/env/naharp-pnarsa/pdf/2005_AEI_report_e.pdf

[35] Agriculture and Agri-Food Canada. (2007). *An overview of the Canadian agriculture and agri-food system*. Retrieved January 16, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/pub/sys/pdf/sys_2007_e.pdf

[36] Organisation for Economic Cooperation and Development. (2008). *Environmental performance of agriculture in OECD countries since 1990: Canada country section.* Retrieved January 13, 2009, from http://www.oecd.org/dataoecd/27/18/40753614.pdf at p. 245.

production", classified as Classes 1, 2, or 3 in the Canada Land Inventory.[37] Some agricultural activities occur on lands that have severe limitations or no potential for cropping (Classes 4 to 7) or pasturing (Classes 6 to 7) over the long-term.[38] Sparling et al. (2008) found that 1,517,713 acres (613,156 hectares) of ecologically sensitive land[39] in Manitoba are cultivated with agricultural or forage crops.[40] Given that there are 4.94 million hectares of cultivated land in Manitoba[41], it follows that about 12.4% of cropped land in the province could be removed from production and restored to pastureland or natural features.[42] Previous calculations by the Prairie Farm Rehabilitation Administration (PFRA) branch of AAFC estimate that 5.8 million hectares, or 15% of the total cultivated area in the Prairie Provinces, is considered marginal.[43]

Insufficient Policy Response

In June 2002, the federal, provincial, and territorial Ministers of Agriculture signed the Agricultural Policy Framework (APF), a comprehensive farm agenda that increased financial and technical support for environmental objectives.[44] Along with funding for business risk management (i.e. income support), food safety and quality, food science, and business management, the APF allocated nearly $600 million between 2003 and 2007 in federal funds (plus an additional $400 million or so in provincial monies) to a range of agri-environmental initiatives.[45] These included: improving producer access to up-to-date resource information (National Land and Water Information Service); expanding the uptake of best-management practices (Environmental Farm Plan Initiative, National Farm Stewardship Program, Greencover); reporting on key agri-environmental indicators (National Agri-Health Analysis and Reporting Program); conducting scientific research (Information Gaps in Water Quality and Nutrients); environmental certification; disseminating scientific, technical and educational information to developing countries (Agri-Environmental International Exchange); reducing pesticide risks (Pesticide Risk Reduction and Minor Use Programs); and investigating the

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[37] Environment Canada (1976). *Land capability for agriculture: Preliminary report*. Ottawa: Environment Canada, Lands Directorate at p. 1.

[38] Statistics Canada. (2001). *Rural and small town Canada analysis bulletin*. Retrieved June 14, 2009, from http://www.statcan.gc.ca/pub/21-006-x/21-006-x2001002-eng.pdf

[39] Ecologically sensitive land was considered lands classified as 4, 5, 6 or 7 in the Canada Land Inventory. These lands are subject to severe erosion, flooding, soil salinity, and/or leaching.

[40] Sparling, B., Klimas, M., Brethour, C., Bucknell, D., Richards, J.S., & Hodgson, D. (2008). *Ecological goods and services: Estimating program uptake and the nature of costs/benefits in agro-Manitoba*. Retrieved March 11, 2009, from http://www.gov.mb.ca/agriculture/soilwater/ecological/pdf/feg01s01.pdf

[41] Lefebvre, A., Eilers, W., & Chunn, B. (2005). *Environmental sustainability of Canadian agriculture*: *Agri-environmental indictor report series – report #2*. Ottawa: Agriculture and Agri-Food Canada. Retrieved November 19, 2008, from http://www4.agr.gc.ca/resources/prod/doc/env/naharp-pnarsa/pdf/2005_AEI_report_e.pdf

[42] This figure would increase (albeit only slightly) were it to include ecologically *significant* agricultural lands currently in production (riparian zones that lack vegetation, etc.).

[43] Office of the Auditor General of Canada. (1997, December). *Chapter 24 – Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration*. Retrieved May 30, 2009, from http://www.oag-bvg.gc.ca/internet/English/parl_oag_199712_24_e_8108.html

[44] Agriculture and Agri-Food Canada. (2002). *Federal-Provincial-Territorial Framework Agreement on Agricultural and Agri-Food Policy for the Twenty-First Century*. Retrieved January 16, 2009, from http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1201110596840&lang=eng

[45] Agriculture and Agri-Food Canada. (2005). *Agricultural policy framework federal-provincial-territorial programs: Spring 2005*. Ottawa: Agriculture and Agri-Food Canada.

financial impact of environmental regulations.[46] APF environmental programs were extended for an extra year in 2008 and were replaced by the Growing Forward agreement in the summer of 2009. Growing Forward will include similar environmental programs and initiatives.

A cursory evaluation of APF environmental programming reveals some degree of success. Today, 45,600 producers, or roughly 20% of Canadian farms, have implemented environmental farm plans,[47] while 545,000 acres of marginal cultivated land in the Prairies have been restored for hay production and pasture through the land conversion component of Greencover (see Chapter 2). But despite these accomplishments, APF environmental programs were largely inadequate when considered against the magnitude of environmental concerns that presently confront the agricultural sector.

First, environmental funding made available by the APF was quite low in relative terms; 90% of the five-year APF budget was absorbed by business risk programs.[49] In fact, Canadian funding for agri-environmental performance improvements lags well behind that of other industrialized countries. As a point of comparison, estimated budget expenditures on agri-environmental funding to producers over the five years of the APF equals $403 million (CAN) (nominal),[50] or roughly $80.6 million per year (Table 1.1). In the United States, 2008 fiscal year expenditures on producer focused agri-environmental programs amounted to $4.28 billion (US),[51] or $5.03 billion CAN.[52] Given that US GDP is roughly 10.5 times greater than Canada's ($13.8 trillion and $1.3 trillion, respectively)[53] it follows that US spending on agri-environmental improvements should be 10.5 times greater. In fact, expenditures are 62.4 times greater. To create parity with the US, Canada would need to increase its annual spending on producer-focused agri-environmental programs by a factor of six, or roughly $480 million.[54]

Table 1.1: Producer Focused Agri-Environmental Programs in Canada[48]

Environmental Farm Plan Initiative	$112 million
National Farm Stewardship Program	$181 million
Greencover	$110 million
Total	$403 million

[46] *Ibid.*

[47] Agriculture and Agri-Food Canada. (2007). *PFRA: A brief history*. Retrieved March 2, 2009, from http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1187379611540&lang=eng

[48] Agriculture and Agri-Food Canada. (2005). *Agricultural policy framework federal-provincial-territorial programs: Spring 2005*. Ottawa: Agriculture and Agri-Food Canada.

[49] Skogstad, G. (2008). Canadian agricultural programs and paradigms: The influence of international trade agreements and domestic factors. *Canadian Journal of Agricultural Economics*, *56*(4), 493-507.

[50] Agriculture and Agri-Food Canada. (2005). *Agricultural policy framework federal-provincial-territorial programs: Spring 2005*. Ottawa: Agriculture and Agri-Food Canada.

[51] National Wildlife Federation (2008, July 25). *Farm bill 2008 conservation & energy summary*. Retrieved March 3, 2009, from http://online.nwf.org/site/PageServer?pagename=FarmBill_Homepage. See also Cattaneo, A., Claassen, R., Johansson, R., & Weinberg, M. (2005). *Flexible conservation measures on working land*. Retrieved May 27, 2009, from http://www.ers.usda.gov/publications/err5/err5.pdf at p. 3

[52] Assuming $1.00 CAN = $0.85 US.

[53] World Bank. (2007). *Gross domestic product 2007*. Retrieved April 4, 2009, from http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP.pdf

[54] Author's calculations. These figures do not include funds allocated to environmental monitoring, research, or any other program that does not offer direct financial incentives to producer for undertaking environmental improvements. Provincial and state funds are not included due to constraints in collecting the relevant data. APF

Second, the implementation of best-management practices (BMPs) associated with APF environmental programs generally requires that a farmer front 50% to 70% of the costs, with the difference made up by the federal and provincial governments. This means that income-strapped farmers are saddled with a high proportion of the costs of voluntarily reducing their environmental impact, even though most BMPs generate limited private benefits but substantial public benefits (i.e. more biodiversity, less water pollution, more carbon sequestration, etc.) (Table 1.2).[56]

Table 1.2: Agricultural Resources Categorized by Private and Public Benefit [55]

Resource	Private	Public
Soil	X	
Crop	X	
Livestock	X	
Air		X
Water		X
Biodiversity		X
Trees/Forest	X	X
Wetland	X	X
Grassland	X	X

Apart from financial incentives, the regulatory apparatus that clarifies a farmer's minimum obligations of environmental care has also been lacking in terms of generating positive outcomes. The standards that govern farm practices at the federal level in Canada are weak when compared to those in the United States and Europe, as AAFC has relied more heavily on voluntary initiatives and moral suasion.[57] For example, the United States withholds income support payments from producers who grow crops on highly-erodible lands or drained wetlands, yet the federal government in Canada does not tie income support to environmentally deleterious production practices (though employed by the Province of Quebec).[58] And even though agri-environmental regulations tend to be more developed at the provincial level, often these standards are not strictly enforced.[59] In the late nineties, the efficacy of Quebec's relatively stringent agri-environmental standards was questioned by the province's Auditor General, who found a high level of tolerance for non-compliance among regulators.[60] Moreover, although the federal government has made great strides in eliminating output based income support payments which encourage overproduction, there is an impetus to implement full-cost accounting in the agricultural sector: provincial

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funding in Canada is split 60/40 between the federal and provincial governments, meaning that *total* government funds for agri-environmental conservation programs during the five year APF would amount to roughly $671 million, plus a few additional provincial programs that do not receive federal funding (e.g. Conservation Cover Program in Saskatchewan). However, many US states have stand-alone conservation programs apart from US federal funding as well. Therefore, the figure calculated above is a reasonable approximation of the vast discrepancy in direct funding for agri-environmental improvements between the US and Canada.

55 Adapted from Sopuck, R. D., & Greer, R. (2006, July 8). *Alternate land use services (ALUS): Rural municipality of Blanshard (MB) pilot project*. Retrieved May 29, 2009, from http://www.stewardship2006.ca/images/presentations/Sopuck_presentation.pdf

56 In actuality, all agricultural resources generate a mix of both private and public benefits (i.e. enhancing on-farm biodiversity improves pest control, which is private). The categorization scheme in Table 1.2 is meant to illustrate that certain agricultural resources are more private or public in nature.

57 Montpetit, E. (2002). Policy networks, federal arrangements, and the development of environmental arrangements: A comparison of the Canadian and American agricultural sectors. *Governance*, *15*(1), 1-20.

58 Gagnon, B. (2005). *Remuneration for ecological goods and services: Elements for a Quebec analysis*. Québec: Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec. Retrieved March 24, 2009, from http://www.mapaq.gouv.qc.ca/NR/rdonlyres/9673B765-8852-44DA-8A88-721894666A4D/0/BSEenmilieuagricoleENG.pdf

59 PEI Department of Environment, Energy and Forestry, pers. comm., May 8, 2009.

60 Montpetit, E. (2002). Policy networks, federal arrangements, and the development of environmental arrangements: A comparison of the Canadian and American agricultural sectors. *Governance*, *15*(1), 1-20.

governments grant free or nearly-free access to agricultural water use,[61] while pesticides used in commercial agriculture are exempt from the federal goods and services tax (GST) and most provincial sales taxes.[62] Finally, from a more holistic perspective, Canada's promotion of export-oriented agriculture[63] and biotechnology[64] favours specialization and industrialization over smaller-scale low-input agricultural systems that impose a smaller environmental burden.

An Alternative Approach: Compensatory Payments for Ecological Goods and Services

A recent Canada-wide survey[65] illustrates that farmers retain a keen sense of environmental awareness, believe they have a personal responsibility to protect the environment, and are committed to decreasing their environmental impact. A more downbeat finding was that the same farmers who are intent on strengthening their environmental diligence see financial impediments as the primary roadblock. Meanwhile, society is persistent in demanding a higher environmental benchmark from the farming community and international trade discussions are challenging the state-assistance paradigm that has governed agricultural policy-making since the Second World War. Paired with this is the unrelenting deterioration of every agri-environmental quality indicator barring soil quality,[66] and the equally persistent movement toward intensified production practices. Without a reformation of agri-environmental policy-making tantamount to a paradigmatic shift, the decline in environmental quality on and off Canada's farmland will persist long into the future.

Improving the environmental performance of agriculture has been addressed to varying degrees in countries that comprise the Organisation for Economic Cooperation and Development (OECD) over the past few decades.[67] One approach that has gained heightened interest in countries such as the United States, United Kingdom, France, Switzerland and others, is to offer financial incentives to farmers as remuneration for provisioning ecological goods and services (EG&S) to society beyond food, fuel, and fibre.[68] Ecological goods are the physical products

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[61] Renzetti, S. (2005). Economic instruments and Canadian industrial water use. *Canadian Water Resources Journal*, *30*(1): 21-30.

[62] Organisation for Economic Cooperation and Development. (2008). *Environmental performance of agriculture in OECD countries since 1990: Canada country section.* Retrieved January 13, 2009, from http://www.oecd.org/dataoecd/27/18/40753614.pdf

[63] Agriculture and Agri-Food Canada. (2007). *An overview of the Canadian agriculture and agri-food system*. Retrieved January 16, 2009, from http://www4.agr.gc.ca/resources/prod/doc/pol/pub/sys/pdf/sys_2007_e.pdf

[64] Canadian Institute for Environmental Law and Policy. (2002). *A citizen's guide to biotechnology*. Retrieved February 5, 2009, from http://cielap.org/pdf/citizensbiotech.pdf

[65] Environics. (2006). *National survey of farmers and ranchers: Ecological goods and services*. Retrieved January 16, 2009, from http://www.whc.org/documents/EN5742landowners1.pdf

[66] Organisation for Economic Cooperation and Development. (2008). *Environmental performance of agriculture in OECD countries since 1990: Canada country section.* Retrieved January 13, 2009, from http://www.oecd.org/dataoecd/27/18/40753614.pdf

[67] Organisation for Economic Cooperation and Development. (2003). *Agri-environmental policy measures: Overview of developments*. Retrieved January 28, 2009, from http://www.oecd.org/dataoecd/25/46/18987100.pdf

[68] Gagnon, B. (2005). *Remuneration for ecological goods and services: Elements for a Quebec analysis*. Québec: Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec. Retrieved March 24, 2009, from http://www.mapaq.gouv.qc.ca/NR/rdonlyres/9673B765-8852-44DA-8A88-721894666A4D/0/BSEenmilieuagricoleENG.pdf

either directly or indirectly consumed by citizens, such as clean air and water. Ecological services are the processes that produce or support the production of ecological goods, such as carbon sequestration by forests and water purification by wetlands. Collectively, EG&S can be defined as "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life".[69]

The EG&S approach differs substantively from regulatory standards and cost-shared assistance in the following ways:

1. It requires a contractual agreement which outlines the rights and responsibilities of purchasers (generally the government) and vendors (farmers) with respect to the provision of the agri-environmental resource/improvement being sought;
2. It recognizes that agricultural land provides public goods, and adequately compensates farmers for their provision;
3. It complements existing regulatory standards that define minimum farmer obligations and rewards farmers for voluntary stewardship activities above regulatory requirements;
4. It helps to spread the cost of improving environmental quality more evenly among all beneficiaries.

Additionally, EG&S payments are considered a "Green Box" (i.e. non or minimally trade-distorting) subsidy by the World Trade Organization, and are not subject to elimination under international trade negotiations.

Rationale for Generating and Compensating Ecological Goods and Services from Agricultural Land

Human Well-Being and Agri-Environmental Health

Perhaps the greatest utility in managing agricultural land to provision ecological goods and services is the recognition that human well-being is wholly contingent upon healthy and functioning ecosystems for survival. As sketched out above, EG&S are the benefits provided to society by functioning nature.[70] They include goods such as clean air and biodiversity, and services such as crop pollination and carbon sequestration. EG&S are frequently classified into four categories: supporting, provisioning, regulating, and cultural services.[71] Supporting services include primary production, nutrient cycling, soil formation, and water cycling. Without these services, life itself could not exist. Provisioning services are the products obtained from ecosystems such as food, fibre, and timber. Most provisioning services can also be considered ecological goods. Regulating services include the benefits of nature's regulatory functions such as flood mitigation by wetlands, and nutrient uptake by vegetation in riparian areas. Finally, cultural services include any recreational, spiritual, or aesthetic benefits from nature. Preserving agricultural/rural landscapes or farmland itself is a cultural service.

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[69] Daily, G. C. (Ed.). (1997). *Nature's services: Societal dependence on natural ecosystems*. Washington, DC: Island Press at p. 3.

[70] *Ibid.*

[71] Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Current states and trends, Volume 1*. Washington D.C.: Island Press.

Biodiversity plays a foundational role in the provision of EG&S from both ecosystems and agroecosystems. This is true for three primary reasons. First, biodiversity enables ecosystem function. Particular species occupy different niches within an ecosystem or agroecosystem, which enable different functional capabilities; soil organisms decompose dead organic matter and waste, certain insects and bats pollinate crops and plants, etc. Second, higher levels of biodiversity generally increase primary production. Tilman cites copious studies confirming that total yield or productivity in agroecosystems is increased when two or more crop species are grown in concert.[72] This is because different species capture resources in different ways, which allows more diverse communities to make better use of available energy and nutrients. Third, higher levels of biodiversity generally increase ecosystem or agroecosystem resilience, or, its capacity to withstand stress or perturbations without collapsing into a different state. Cropland in which a wide variety of crops is grown is inherently less susceptible to disease and pest outbreak, while monocultures require high volumes of pesticides to ensure some level of stability.

Dale & Polasky (2007) maintain that the services supplied by ecosystems and agroecosystems are interrelated in three ways:

1. Agroecosystems generate beneficial ecosystem services, such as soil retention, food production, and aesthetic values;
2. Agroecosystems receive beneficial ecosystem services from other ecosystems, such as pollination from non-agricultural ecosystems;
3. Ecosystem services from non-agricultural systems may be impacted by agricultural practices, such as nutrient inputs that degrade water quality downstream.[73]

Market Failure and Agri-Environmental Quality

Market systems operate by providing incentives to producers to accumulate profit by servicing the needs and wants of consumers.[74] The reason markets are believed to be desirable for allocating scarce resources is because under certain conditions markets are "efficient", meaning that the marginal costs (land, labour, capital) of producing goods equal the marginal benefits of those goods to society.[75] Efficiency is a laudable goal because it denotes the point at which the optimal quantity of a good is being produced at the lowest possible price. However, an efficient allocation requires that no "market failures" prevail: conditions in which there is an absence of a market or the price of a good does not reflect its true cost.[76] There are two particular market failures that have a direct bearing on agri-environmental quality: the provisioning of public goods and the existence of negative externalities.

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[72] Tilman (1997). Biodiversity and ecosystem functioning. In G.C. Daily (Ed.), *Nature's services: Societal dependence on natural ecosystems* (pp. 93–113). Washington, DC: Island Press.

[73] Dale, V.H. & Polasky, S. (2007). Measures of the effects of agricultural practices on ecosystem services. *Ecological Economics*, *64*(2), 286-296.

[74] Heal, G. M. (2000). *Nature and the marketplace: Capturing the value of ecosystem services*. Washington DC: Island Press.

[75] Daly, H. E., & Farley, J. C. (2004). *Ecological economics: Principles and applications*. Washington, DC: Island Press.

[76] Heal, G. M. (2000). *Nature and the marketplace: Capturing the value of ecosystem services*. Washington DC: Island Press.

Public goods lack two specific qualities that are requisite features of market goods transacted between buyers and sellers: excludability and rivalness. Excludability refers to the extent to which ownership over a resource can be conferred, allowing the owner to 'exclude' others from usage.[77] Most tangible items, such as clothing, cars, and food, and some natural resources such as forests and minerals, can be made excludable. Excludability is not an inherent trait in any resource; it must be recognized by institutions (such as the government, police, and courts).[78] Rivalness, on the other hand, *is* an intrinsic condition whereby the consumption of one unit of a resource will always leave less available for everyone else.[79] Public goods cannot be made exclusive and consuming them does not result in less availability for everyone else.

Most ecological services are in fact public goods. The service provided by forests in the form of carbon sequestration cannot be made exclusive (everyone on Earth benefits) and is not rival (the service is not affected by the number of people "consuming" sequestration). No market for carbon sequestration will develop, however, because if it did, people would "free-ride" off the purchase of that service from others.[80] Therefore, the service of carbon sequestration cannot be allocated by the market, and government policies are required to ensure its provision is adequate.

The second market failure that afflicts agri-environmental quality is the presence of negative externalities. As described above, a market is efficient when the marginal costs of production equal the marginal benefits of its consumption. In a perfectly functioning economy, all costs associated with production are incurred by producers. However, when property rights are not perfectly defined the marginal *social* costs of production can exceed the marginal costs to producers.[81] The result is an added cost which producers discredit while society must bear, and is known as a negative externality. For example, the private costs that farmers bear include the costs of inputs (fertilizers, pesticides, machinery, etc.), as well as purchasing or renting land and hiring labour. Subsequently, these costs become captured within the price they are willing to receive from the sale of their agricultural goods to marketing boards, retailers, and/or consumers. When certain costs are "externalized" onto the public (i.e. excess fertilizer runoff degrades surface water which reduces recreational fishing or necessitates higher water treatment costs), the retail price of an agricultural good fails to reflect the full costs of production and consumers end up purchasing more of a particular agricultural good than is socially efficient. Negative externalities can even be borne by future generations, referred to as "intertemporal" externalities.[82] The slow decline of soil quality that reduces the ability of future farmers to cultivate land is also a negative externality that distorts market efficiency.

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77 Daly, H. E., & Farley, J. C. (2004). *Ecological economics: Principles and applications*. Washington, DC: Island Press.

78 Bromley, D. (1991). *Environment and economy: Property rights and public policy.* Oxford, UK: Blackwell.

79 Daly, H. E., & Farley, J. C. (2004). *Ecological economics: Principles and applications*. Washington, DC: Island Press.

80 Heal, G. M. (2000). *Nature and the marketplace: Capturing the value of ecosystem services*. Washington DC: Island Press.

81 Daly, H. E., & Farley, J. C. (2004). *Ecological economics: Principles and applications*. Washington, DC: Island Press.

82 Heal, G. M. (2000). *Nature and the marketplace: Capturing the value of ecosystem services*. Washington DC: Island Press.

Tegtmeier & Duffy (2004) found the value of externalized costs associated with agricultural production in the United States per year to be between $5.7 and $16.9 billion, or $29.44 to $95.68 per hectare.[83] These costs were broken down into damage to water (treatment of surface water for microbial pathogens, etc.), soil (water conveyance costs associated with sedimentation, etc.), air (greenhouse gas emissions from cropland and livestock), biodiversity (honey bee and pollination losses from pesticide use, etc.), and human health (cost of illnesses associated with food-borne pathogens and pesticide poisonings). Empirical work has also demonstrated that improving the environmental performance of agriculture substantially decreases the externalities associated with production. Pretty et al. (2005) estimated the volume of annual externalized costs associated with agriculture in the United Kingdom to be $1.5 billion.[84] The authors then calculated the externalized costs that could be expected if all farms in the UK converted to organic farming to be $384 million, a reduction of $1.12 billion.

Research Question and Objectives

Programs that encourage farmers to enhance EG&S flows can be designed in two primary ways. They can: (1) support the uptake of and transition to environmentally improved production practices on working land, such as through payments to cover the cost of shifting to organic production or expand fixed farm assets like manure storage facilities, or (2) promote the protection and restoration of natural features on farmland through reduced taxes or retirement and restoration of fragile agricultural land.[85] This research will focus primarily on the latter strategy of retiring marginal (land that has severe crop growing limitations or requires special conservation or management strategies) and ecologically significant (riparian and other areas more suitable to alternative land-uses) agricultural land from production, which is then restored to natural cover. Programs that provide incentives for marginal land retirement offer a strong potential to ameliorate agri-environmental quality since marginal lands generally require higher applications of nutrients to stimulate crop growth and are more susceptible to wind and rainfall induced erosion and nutrient losses, which can adversely affect ground and surface waters.[86] Moreover, agricultural land retirement is well suited to the EG&S approach because it is associated with high opportunity costs and few private benefits yet generates an extremely wide range of environmental benefits to society, from expanding wildlife habitat to storing and sequestering carbon dioxide.

Six separate cases comprise this case-study policy evaluation. The first three cases, described and evaluated in Chapter Two, are examples of US and Canadian programs at the federal level that offer financial incentives to agricultural producers for retiring and restoring marginal and ecologically significant agricultural land to natural cover. The second three cases, which are

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[83] Tegtmeier, E.M., & Duffy, M.D. (2004). External costs of agricultural production in the United States. *International Journal of Agricultural Sustainability*, *2*(1), 1-20.

[84] Pretty, J.N., Ball, A.S., Lang, T., & Morison, J.I.L. (2005). Farm costs and food miles: An assessment of the full cost of the UK weekly food basket. *Food Policy*, *30*(1), 1-19.

[85] Organisation for Economic Cooperation and Development. (2003). *Agri-environmental policy measures: Overview of developments*. Retrieved January 28, 2009, from http://www.oecd.org/dataoecd/25/46/18987100.pdf

[86] See pages 26-42 of: Lubowski, R.N., Bucholtz, S., Claassen, R., Roberts, M.J., Cooper, J.C., Gueorguieva, A., & Johansson, R. (2006). *Environmental effects of agricultural land-use change: The role of economics and polic Environmental effects of agricultural land-use change: The role of economics and policy*. Retrieved August 4, 2009, from http://www.ers.usda.gov/publications/err25/err25.pdf

described and evaluated in Chapter Three, are Canadian pilot projects which trial agricultural land retirement on a smaller scale. Chapter Four expands upon the policy-related implications of the results presented in the previous two chapters. By elaborating upon each case study in detail, the purpose of this research is to evaluate the effectiveness of agricultural land retirement – and EG&S payments more generally – as an instrument to improve agri-environmental quality. Additionally, this research intends to pinpoint optimal design features and delivery mechanisms to guide the implementation of agricultural land retirement programs at all levels of government in Canada.

2: Agricultural Land Retirement in the US and Canada

This chapter offers a systematic evaluation of three agricultural land retirement programs: Conservation Reserve Program (US), Wetlands Reserve Program (US), and Greencover – Land Conversion (Canada). This evaluation is intended to inform and improve the design and implementation of agricultural land retirement programs in Canada.

Restoring Forests, Wetlands, and Forage: Three Cases of Agricultural Land Retirement

Conservation Reserve Program

The Conservation Reserve Program (CRP) was enacted under Title XII (the "Conservation Title") of the 1985 *Food Security Act*. As outlined in Section 1231(a) of the Act, the goal of CRP is "to assist owners and operators of highly erodible cropland in conserving and improving the soil and water resources of their farms or ranches". CRP is a voluntary program that offers grant funding and annual rental payments to farmers for retiring and restoring marginal cropland to perennial cover, primarily forest and grassland.

CRP eligibility requirements mandate that producers have owned and operated their lands for at least twelve months prior to application for enrollment, unless (1) the new owner acquired the land as a result of the previous owner's death, (2) the ownership changed due to foreclosure, or (3) the Farm Service Agency (FSA) is reasonably satisfied that the farmer did not purchase the land to place it in CRP.[87] Any lands cropped for 4 to 6 years between 2002 and 2008[88] and are deemed highly erodible,[89] or are located in federal or state conservation priority areas, are eligible for enrollment.[90] Farmers apply to enroll land during designated annual or bi-annual sign-up periods, which span roughly two to three weeks. CRP contracts are tendered for ten to fifteen years, and can be reauthorized once they expire.

Following a general sign-up, FSA evaluates producer applications using an index that ranks environmental benefits against land retirement and management costs, known as the Environmental Benefits Index (EBI). The index favours wildlife (100pts.), water quality (100pts.), and soil fertility (100pts.) benefits. Enduring benefits (the likelihood that a practice would continue if payments were discontinued, 50 pts.) and air pollution (45 pts.) are allotted lower index values. Producers compete for program acceptance through a process known as competitive bidding, which is intended to reveal the absolute lowest payment a farmer is willing to accept to retire land and establish permanent cover. Bids with the highest benefit to cost ratio are accepted until the total acreage is exhausted (32 million acres in each year until 2012).

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87 Farm Service Agency. (2009). *Conservation reserve program*. Retrieved February 10, 2009, from http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp

88 Marginal pasture land can also be enrolled if it is to become a riparian buffer or has a similar water quality purpose (FSA, 2008).

89 Highly-erodible lands are considered to have a weighted erosion average of "8" or higher on the Erodibility Index (EI), which considers the physical and chemical properties of the soil and local climate conditions.

90 *Ibid.*

Farmers can improve their chances of being selected by accepting lower annual payments, forgoing cost-share funding, or improving their benefit scores.[91] CRP administrators institute benefit/cost bid limits that are established after all applications have been received.[92]

Farmers can receive three sorts of funding for entering into a CRP contract. First, they receive annual rental payments based on the rate they were willing to accept. These annual payment rates range widely across the country, given variability in local land rental rates and soil productivity (i.e. opportunity costs). Second, farmers can receive cost-shared assistance which cannot exceed 50% of the cost to undertake restoration (i.e. tree planting). Cost-share funds are outlaid pending restoration of the vegetative cover.[93] Finally, farmers can also receive an additional payment of up to $4 per acre for performing certain land maintenance obligations during the life of their contract.[94] While haying and grazing is not prohibited on CRP sites, it is subject to a 25% payment reduction.[95] The average annual CRP payment across the United States is $43.81 per acre ($US; $108.25/ha).[96]

CRP is buttressed by three auxiliary programs. Continuous CRP, authorized by the 1996 *Federal Agriculture and Rural Improvement Act*, allows farmers to enroll certain highly valued land retirement and restoration activities (riparian and wetland buffers, wildlife habitat buffers, etc.) at any time throughout the year.[97] The Conservation Reserve Enhancement Program (CREP), also authorized in 1996, targets CRP funds to high-priority areas related to water quality concerns, such as the Catskill watershed (which supplies clean water to New York City) and the Florida Everglades. Finally, the Farmable Wetlands Program (FWP) targets land retirement to farmed and converted wetlands that are intended for restoration.[98] Each of these programs is offered on a continuous basis throughout the year (i.e. no sign-up period), and includes similar (though not identical) eligibility requirements and contract provisions to CRP. However, Continuous CRP, CREP, and FWP applications are neither subject to competitive bidding nor the EBI ranking process, and program payments are generally much higher and set by federal and state administrators as opposed to bids offered by farmers.

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91 Claassen, R., Cattaneo, A., & Johansson, R., (2008). Cost-effective design of agri-environmental payment programs: US experience in theory and practice. *Ecological Economics*, *65*(4), 737-752.

92 *Ibid.*

93 *Ibid.*

94 Farm Service Agency. (2009). *Conservation reserve program*. Retrieved February 10, 2009, from http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp

95 Farm Service Agency. (2009). *Emergency haying and grazing*. Retrieved March 13, 2009, from http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp-eg

96 Farm Service Agency. (2008). *Conservation reserve program: Summary and enrollment statistics*. Retrieved March 2, 2009, from http://www.fsa.usda.gov/Internet/FSA_File/annual_consv_2007.pdf

97 Farm Service Agency. (2009). *CRP sign-up*. Retrieved March 2, 2009, from http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp-sp

98 Farm Service Agency. (2009). *Farmable wetlands program*. Retrieved March 2, 2009, from http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=fwp

Wetlands Reserve Program

The Wetlands Reserve Program (WRP) began as a pilot project authorized by Title XIV of the 1990 *Food, Agriculture, Conservation, and Trade Act*, and was expanded nationally in 1995.[99] It is intended to reverse the loss of wetlands in the US. The impetus for a comprehensive wetland restoration program was clearly evident: in a 1990 report to Congress, Dahl estimated that 53% of wetlands in the coterminous US were drained between 1780 and 1980, with ten states losing over 70% of their original wetland cover.[100] Moreover, Frayer et al. estimated that 87% of wetland losses in the United States between 1950 and 1970 were attributable to conversion for agricultural uses.[101]

WRP is a voluntary program that offers contracts to farmers for enhancing, protecting and restoring wetlands through annual payments, cost-shared funding and technical assistance.[102] Like CRP, WRP enrollment is capped by an acreage limit. The 2008 *Food, Conservation and Energy Act* increased WRP's fiscal year acreage cap to 3.041 million acres until 2012, from 2.275 million acres between 2002 and 2008.[103] In addition, the 2008 act limits WRP enrollment to no more than 10% in any one county, while combined CRP and WRP enrollment cannot exceed 25%. There are no national limits on the amount of land a particular landowner can enroll WRP, however one may exist at the state level.[104]

To be eligible for enrollment, farmers are required to have owned the land being offered for at least 12 months prior to the application. This rule is subject to the same exemptions as CRP. Lands eligible for enrollment include: farmed wetlands or farmed wetland pasture, prior converted cropland, agricultural land that has become wetland as a result of flooding, rangeland/pasture/production forest where the hydrology has been degraded and can be restored, riparian areas that link to protected wetlands, lands that contribute to wetland functions, and previously restored wetlands that need long-term protection.[105] Lands ineligible for enrollment in WRP include wetlands converted after December 23, 1985, forested lands protected as part of CRP, federal lands, and lands in which restoration is unfeasible.[106]

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[99] Gray, R., & Teels, B. (2006). Wildlife and fish conservation through the farm bill. *Wildlife Society Bulletin*, *34*(4), 906-913.

[100] Dahl, T.E. (1990). *Wetlands losses in the United States: 1780's to 1980's.* Washington, D.C.: Department of the Interior & Fish and Wildlife Service.

[101] Frayer, W.E., Monahan, T.J., Bowden, D.C., & Graybill, F.A. (1983). *Status and trends of wetlands and deepwater habitats in the coterminous United States, 1950's to 1970's*. Ft. Collins, CO: Colorado State University in Dahl, T.E. (1990). *Wetlands losses in the United States: 1780's to 1980's.* Washington, D.C.: Department of the Interior & Fish and Wildlife Service.

[102] Natural Resources Conservation Service. (2007). *Wetlands reserve program: Program description.* Retrieved February 11, 2009 from http://www.nrcs.usda.gov/Programs/WRP/2007_ContractInfo/2007WRPProgramDescription.pdf

[103] United States Department of Agriculture. (2008). *2008 farm bill side-by-side*. Retrieved March 4, 2009, from http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIIConservation.htm

[104] Natural Resources Conservation Service. (2007). *Wetlands reserve program: Program description.* Retrieved February 11, 2009 from http://www.nrcs.usda.gov/Programs/WRP/2007_ContractInfo/2007WRPProgramDescription.pdf

[105] *Ibid.*

[106] *Ibid.*

WRP is implemented as a continuous program. After a WRP application is received, Natural Resources Conservation Service (NRCS) staff perform a site visit to collect data associated with its application ranking process, prepare a preliminary restoration plan, complete *National Environmental Policy Act* requirements, and check for hazardous substances.[107] Each state develops its own criteria to rank applications based broadly on national guidelines,[108] which include: the extent to which the purposes of WRP are achieved, the productivity of the land, and the on- and off-farm environmental threats of agricultural production.[109] The offers are ranked based on ecological criteria and estimated cost.

Contractual agreements offered through WRP include permanent easements, thirty-year easements, or restoration cost-sharing. Permanent easement payments are not to exceed the lowest of the following three amounts: the fair market value of the land after appraisal or an area-wide market analysis or survey, an established payment cap set at the state level, or an amount offered by the landowner. [110] NRCS provides 100% of the cost of restoring a wetland protected under a permanent easement.[111] Thirty-year easement payments equal 75% of the amount that would be paid under a permanent easement, and 75% of the restoration costs. Easements that amount to less than $500,000 are paid in 1 to 30 annual installments, and easements greater than $500,000 are paid in 5 to 30 annual installments (unless a waiver is granted allowing a lump-sum payment).[112] Finally, the restoration cost-share option is an agreement to restore degraded or lost wetland values, which must be maintained for a minimum of three years, in which the NRCS pays 75% of the restoration costs. Total restoration cost-share payments associated with WRP are capped at $50,000 annually.[113] NRCS estimates the average per acre easement, administration and technical assistance costs of WRP for the 2007 fiscal year to be $3,089 ($7,646/ha) for permanent easements, $1,104 ($2,733/ha) for thirty-year easements, and $669 ($1,656/ha) for restoration cost-shares.[114] [115]

An auxiliary WRP program is the Wetlands Reserve Enhancement Program (WREP), authorized by the 2008 *Food, Conservation and Energy Act*.[116] WREP operates in a manner similar to CREP in that certain ecologically significant areas are targeted for restoration funding. One

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[107] *Ibid.*

[108] *Ibid.*

[109] United States Department of Agriculture. (2008). *2008 farm bill side-by-side*. Retrieved March 4, 2009, from http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIIConservation.htm

[110] *Ibid.*

[111] Natural Resources Conservation Service. (2007). *Wetlands reserve program: Program description.* Retrieved February 11, 2009 from http://www.nrcs.usda.gov/Programs/WRP/2007_ContractInfo/2007WRPProgramDescription.pdf

[112] United States Department of Agriculture. (2008). *2008 farm bill side-by-side*. Retrieved March 4, 2009, from http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIIConservation.htm

[113] *Ibid.*

[114] Natural Resources Conservation Service (2009). *Interim final benefit-cost analysis for wetlands reserve program (WRP).* Retrieved March 4, 2009, from http://www.nrcs.usda.gov/programs/farmbill/2008/bca-cria/WRP_BCAnalysisInterimFinal_01-09-2009.pdf

[115] However, NRCS notes that the average per-acre costs for permanent easements are expected to decline in the 2008 fiscal year due to a change in the way program payments are allocated.

[116] United States Department of Agriculture. (2008). *2008 farm bill side-by-side*. Retrieved March 4, 2009, from http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIIConservation.htm

WREP program, the Lower Missouri River Wetland Reserve Enhancement Program, aims to restore 18,800 acres of wetlands in the Lower Missouri River basin in Nebraska.[117]

Greencover – Land Conversion

Greencover was established in 2003 as part of Canada's Federal-Provincial-Territorial Agricultural Policy Framework, and is essentially an extension of the earlier Permanent Cover Program implemented in the early nineties. Greencover provides financial and technical assistance to expand perennial forage and trees on agricultural land and promote sustainable land use practices in environmentally sensitive areas.[118] The program is divided into four components:

1. Land Conversion – converting marginal and environmentally sensitive land to perennial cover
2. Critical Areas – managing agricultural lands near water
3. Technical Assistance – helping producers adopt best-management practices
4. Shelterbelt – planting trees to reduce wind and soil erosion

Since this research is focused on retiring agricultural land, this evaluation will centre solely on Greencover's Land Conversion component.

Unlike CRP and WRP, Greencover is not limited by an annual enrollment cap. The APF allocated $110 million toward the establishment of Greencover,[119] a figure which includes each of the four components of the program. Any registered landowner or individual entitled to become a registered landowner can enroll in Greencover – Land Conversion (LC). Landowners with an agreement of purchase or sale under the *Veterans' Land Act* and "Indians" or "Indian bands" in lawful possession of farmland under relevant sections of the *Indian Act* are also eligible. Ineligible applicants include financial institutions or Farm Credit Canada, federal, provincial and local governments, and renters and leaseholders. Specific lands are eligible under Greencover LC provided they: (1) have been used for annual crop production or summerfallow as of July 1, 2002, (2) are categorized as Canada Land Inventory (CLI) classes 4, 5, 6, or 7,[120] (3), have severe limitations for growing annual crops, or (4) have the potential for severe degradation due to wind or water erosion, salinization, or loss of organic matter.[121] Forty acres on the same quarter-section or parcel of land is the minimum amount accepted for enrollment.[122]

Landowners must agree to seed their land with approved perennial cover, under contracts known as "Contribution and Land Use Agreements". These contracts last for 10 years once the cover

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[117] Natural Resources Conservation Service. (2008). *Wetlands reserve enhancement program*. Retrieved March 2, 2009, from http://www.ne.nrcs.usda.gov/wrep_index.html

[118] Agriculture and Agri-Food Canada. (2009). *Greencover Canada*. Retrieved March 2, 2009, from http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1181580137261&lang=eng

[119] Agriculture and Agri-Food Canada. (2005). *Agricultural policy framework federal-provincial-territorial programs: Spring 2005*. Ottawa: Agriculture and Agri-Food Canada.

[120] Class 1 lands have no significant limitation on growing crops. Classes from 4 to 7 have severe limitations to no capacity for arable culture. Pasturing capability, however, becomes restricted in Class 6.

[121] Agriculture and Agri-Food Canada. (2009). *Land conversion*. Retrieved March 2, 2009, from http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182367009692&lang=eng

[122] *Ibid.*

has been established. Retired lands can be used for haying, pasturing and other uses that do not destroy the integrity of the cover, but not forage seed or alfalfa for dehydration production.[123] Approved applicants receive payments in two parts: an initial one-time payment of $20 per acre for seeding or planting tame forage or trees, or $75 per acre for seeding native species, and a second one-time payment of $25 per acre following establishment and inspection of perennial cover. The maximum any landowner is eligible to receive under Greencover or the National Farm Stewardship Program is $50,000 (or $100,000 collectively).[124]

Greencover program administrators review LC applications with the use of an Environmental Sensitivity Index (ESI), which includes criteria such as soil quality, air quality, landscape drainage patterns, proximity to water, and contribution to wildlife habitat and biodiversity. The higher the ESI value, the higher the priority of the application for Greencover funds.[125] The ESI is augmented by crop insurance ratings on every quarter section of land (soil erodibility, stoniness, etc.) to provide a complete ecological picture of the parcel being offered.

Program Evaluation

Eight evaluative criteria are used to assess the efficacy of agricultural land retirement in the US and Canada as an approach to improve agri-environmental quality: uptake, ecological effectiveness, cost effectiveness, participant satisfaction, permanence, compliance monitoring, equity, and "other". The extent to which each criterion is satisfied by program design and implementation reveals land retirement's utility as an agri-environmental instrument.

Uptake

Conservation Reserve Program

As of January 2009, 746,483 CRP contracts were being implemented on 419,372 farms, which amounts to 33.6 million acres (13.6 million ha) of former cropland restored to natural cover. An estimated 19% of all US farms are currently subject to CRP contracts.[126] Slightly over half of CRP enrollment includes the entire farm acreage ("whole-farm"), while slightly under half of farms enroll only a portion of their land ("partial-farm").[127]

Wetlands Reserve Program

As of the 2008 fiscal year, 2 million acres (809,371 ha) of restored wetland have been enrolled in WRP.[128] A total of 10,165 WRP contracts are being implemented across the US,[129] with an

[123] *Ibid.*
[124] *Ibid.*
[125] *Ibid.*
[126] United States Department of Agriculture. (2007).*Conservation reserve program monthly summary – January 2009*. Retrieved March 3, 2009, from http://www.fsa.usda.gov/Internet/FSA_File/jan2009.pdf
[127] Sullivan, P., Hellerstein, D., Hansen, L., Johansson, R., Koenig, S., Lubowski, R., McBride, W., McGrananhan, D., Roberts, M., Vogel, S., & Bucholtz, S. (2004). *The conservation reserve program: Economic implications for rural America*. Retrieved March 4, 2009, from http://www.ers.usda.gov/publications/aer834/aer834.pdf
[128] Natural Resources Conservation Service. (2008). *2008 WRP cumulative contract information*. Retrieved March 4, 2009, http://www.nrcs.usda.gov/Programs/WRP/2008_ContractInfo/CumulativeContractInfo2008.html

average easement size (which includes the wetland and its accompanying vegetated buffer) of 191 acres (77ha).[130] Some easements are in excess of 15,800 acres (6,400ha).[131] A total of 74.5% of WRP contract payments are outlaid for permanent easements, with another 13.7% for 30-year easements and 11.8% for restoration and cost-share agreements.[132] States with the highest enrollment in WRP tend to be concentrated along the Mississippi River, such as Louisiana, Mississippi, and Arkansas.

Greencover – Land Conversion

Out of 11,200 applications, a total of 5,500 projects have been accepted and fully implemented into Greencover – Land Conversion, totaling 545,000 acres (220,000 ha) of land retired from crop production. The vast majority of Greencover LC acreage (~95%) is restored with tame (i.e. non-native pasture) grasses, while native grasses (~5%) and trees (<1%) compose a substantially smaller proportion of the total. Over 99% of program uptake was concentrated in Alberta, Saskatchewan, and Manitoba.[133]

Ecological Effectiveness

Conservation Reserve Program

The Farm Service Agency estimates that CRP has generated substantial environmental gains when compared against pre-program (1985) levels, including: reduced soil erosion (470 million tons per year), reduced runoff of sediment (207 million tons per year), reduced nitrogen loadings (480 million pounds per year), and reduced phosphorus loadings (108 million pounds per year).[134] Moreover, an abundance of empirical work has found that CRP generates wide-ranging benefits to wildlife. Farrand & Ryan (2005) observed that a wide variety of bird species use CRP sites in the mid-west,[135] while Reynolds (2005) found that between 1992 and 2003 CRP lands contributed an additional 25.7 million ducks in the prairie pothole region of the mid-west.[136]

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[129] Natural Resources Conservation Service. (2007). *WRP contracts enrolled: Cumulative life of the program, 1992 – 2007*. Retrieved March 4, 2009, from http://www.nrcs.usda.gov/Programs/WRP/2007_ContractInfo/WRPCumulContracts07.jpg

[130] Natural Resources Conservation Service. (2007). *Wetlands reserve program: Key points*. Retrieved March 4, 2009, from http://www.nrcs.usda.gov/Programs/WRP/2007_ContractInfo/2007WRPKeyPoints.pdf

[131] Gray, R., & Teels, B. (2006). Wildlife and fish conservation through the farm bill. *Wildlife Society Bulletin*, *34*(4), 906-913.

[132] Natural Resources Conservation Service (2009). *Interim final benefit-cost analysis for wetlands reserve program (WRP)*. Retrieved March 4, 2009, from http://www.nrcs.usda.gov/programs/farmbill/2008/bca-cria/WRP_BCAnalysisInterimFinal_01-09-2009.pdf

[133] AAFC, pers. comm., May 12, 2009.

[134] Farm Service Agency. (2008). *Conservation reserve program: Summary and enrollment statistics*. Retrieved March 2, 2009, from http://www.fsa.usda.gov/Internet/FSA_File/annual_consv_2007.pdf

[135] Ferrand, D.T., & Ryan, M.R. (2005). Impact of the conservation reserve program on wildlife in the Midwest. In J.B. Haufler (Ed.), *Fish and wildlife benefits of farm bill conservation programs: 2000-2005 update* (pp. 41-62). Bethesda, MD: The Wildlife Society. Retrieved March 4, 2009, from ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwbenefits4.pdf

[136] Reynolds, R. (2005). The conservation reserve program and duck production in the U.S. prairie pothole region. In J.B. Haufler (Ed.), *Fish and wildlife benefits of farm bill conservation programs: 2000-2005 update*, (pp. 33-40). Bethesda, MD: The Wildlife Society. Retrieved March 4, 2009, from ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwbenefits3.pdf

Studies conducted for the USDA found that bobwhite and other grassland birds[137] as well as sage grouse and other passerine birds[138] benefit immensely from CRP fields that are used as nesting sites. Other research has found that CRP has improved habitat quality and reproductive success of ring-necked pheasant, raptors, upland nesting waterfowl, neotropical migrant birds, elk, deer, eastern cottontail rabbit, game birds and non-game birds.[139] Use of the Environmental Benefits Index has been crucial in targeting CRP enrollment to areas that yield substantial ecological benefits.

More crucially, most ecological benefits associated with CRP are considered gains beyond what would have transpired in the program's absence ("additionality"). Lubowski et al. estimate that only 9.6% CRP lands would have been removed from production between 1982 and 1997 in the program's absence (largely as a result of declining net crop returns).[140] [141] Furthermore, Sullivan et al. estimate that 51% CRP parcels would have been returned to production within one year if the program had expired in 2002.[142] Still, one cause for concern is "slippage": as agricultural land is retired crop prices increase, which may induce producers to expand cropland thereby partially offsetting the ecological benefits of the program.[143] Wu estimated that for every 100 acres enrolled in CRP, 20 acres of non-cropland were brought into production;[144] however, this figure has been criticized by Roberts and Bucholtz who found no convincing evidence of CRP induced slippage.[145] Nevertheless, even if some slippage is attributable to the program, the fact that CRP is targeted to highly erodible and ecologically sensitive areas ensures that lands brought into production should be less erodible than those taken out.[146]

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[137] Riffell, S., & Wes Burger, L. (2006). *Estimating wildlife response to the conservation reserve program: Bobwhite and grassland birds*. Retrieved March 3, 2009, from http://www.fsa.usda.gov/Internet/FSA_File/quail_study.pdf

[138] Schroeder, M.A., & Vander Haegen, W. M. (2006). *Use of CRP fields by greater sage-grouse and other shrubsteppe associated wildlife in Washington*. Retrieved March 3, 2009, from http://www.fsa.usda.gov/Internet/FSA_File/sage_grouse.pdf

[139] Feather, P., Hellerstein, D., & Hansen, L. (1999). *Economic valuation of environmental, benefits and the targeting of conservation programs: The case of the CRP*. Washington DC: U.S. Department of Agriculture, Economic Research Service.

[140] Lubowski, R., Plantinga, A., Stavins, R. (2003). *Determinants of land-use change in the United States, 1982 – 1997*. Washingon, DC: Resources for the Future. Retrieved March 3, 2009, from http://www.rff.org/documents/RFF-DP-03-47.pdf

[141] And as Claassen et al. (2008) point out, a large portion of that 9.6% could have been used for grazing or timber production which generates fewer environmental benefits.

[142] Sullivan, P., Hellerstein, D., Hansen, L., Johansson, R., Koenig, S., Lubowski, R., McBride, W., McGrananhan, D., Roberts, M., Vogel, S., & Bucholtz, S. (2004). *The conservation reserve program: Economic implications for rural America*. Retrieved March 4, 2009, from http://www.ers.usda.gov/publications/aer834/aer834.pdf

[143] Heimlich, R. (2007). Land retirement for conservation: History, analysis, and alternatives. In B.L. Gardner and D.A. Sumner (Eds.), *The 2007 farm bill and beyond.* Washington DC: American Enterprise Institute Press. Retrieved February 12, 2009, from http://www.aei.org/research/farmbill/publications/pageID.1476,projectID.28/default.asp

[144] Wu, J. (2000). Slippage effects of the conservation reserve program. *American Journal of Agricultural Economics*, *82*(4), 979-992.

[145] Roberts, M., & Bucholtz, S. (2005). Slippage in the conservation reserve program or spurious correlation: A comment. *American Journal of Agricultural Economics*, *87*(1), 244-250.

[146] Baylis, K., Peplow, S., Rausser, G., & Simon, L. (2008). Agri-environmental policies in the EU and United States: A comparison. *Ecological Economics*, *65*(4), 753-764.

Wetlands Reserve Program

There is considerable evidence that restored WRP wetlands have provided substantial benefits to fish and wildlife. Rewa sites numerous unpublished reports and qualitative evidence provided by NRCS staff from across the US that reveal the abundance of waterfowl, shore-birds, songbirds, mammals, amphibians and insects that make use of WRP sites.[147] One particular WRP site in north-west Indiana is home to a total of eighteen species considered endangered or threatened.[148]

WRP has maximized its ecological effectiveness through enrollment of a variety of wetland types, such as southeastern bottomland hardwood forests, herbaceous prairie marshes, expansive floodplain wetlands, and coastal tidal marshes. Restoration site designers have been keen on emphasizing micro- and macro-topographic features (e.g. varying water depths and habitats) that mimic natural sites and encourage biological diversity.[149]

Although there is a dearth of empirical evidence to judge the extent to which WRP generates "additionality",[150] the substantial opportunity costs and expertise required to restore wetlands and hydrological functions suggests that very few wetland restoration projects would have been initiated without the program. In fact, as a result of WRP, Swampbuster, and other wetland protection programs, net wetland gains are now higher than losses for the first time in US history, with an average annual increase of 32,000 acres (12,950 ha) between 1998 and 2004.[151]

Greencover – Land Conversion

Greencover LC is primarily centred on removing and restoring marginal cropland to hayfield or pastureland. Although the ecological effectiveness of Greencover has not been subject to research, McMaster and Davis (2001) found that Permanent Cover Program sites were associated with higher frequencies of nine of the ten most common grassland birds when compared to cropped sites.[152] Thus, it can be expected that Greencover LC sites generate similar benefits to grassland birds. Furthermore, the use of an Environmental Sensitivity Index helps target the program to sensitive sites that generate benefits to soil quality, air quality, landscape drainage patterns, proximity to water, wildlife habitat and biodiversity. Additionally, Greencover LC sites would also increase carbon sequestration and storage when compared against fields sown with annual crops.

Despite these benefits, Greencover LC administrators contend that the program generates few environmental gains because payments are too low to entice new farmers to retire fragile land from production.[153] Generally speaking, most Greencover – LC applications were submitted by

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147 Rewa, C.A. (2005). Wildlife benefits of the wetlands reserve program. In J.B. Haufler (Ed.), *Fish and wildlife benefits of farm bill conservation programs: 2000-2005 update*, (pp. 133-145). Bethesda, MD: The Wildlife Society. Retrieved March 4, 2009, from ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/fwbenefits8.pdf

148 *Ibid.*

149 *Ibid.*

150 Additionality refers to the extent to which environmental benefits are generated by a particular policy put in place, and would not have transpired in its absence. Effective agri-environmental programs yield high additionality.

151 Dahl, T.E. (1990). *Wetlands losses in the United States: 1780's to 1980's.* Washington, D.C.: Department of the Interior & Fish and Wildlife Service.

152 McMaster, D.G., & Davis, S.K. (2001). An evaluation of Canada's permanent cover program: Habitat for grassland birds? *Journal of Field Ornithology*, *72*(2), 195-210.

153 AAFC, pers. comm., May 22, 2009.

landowners who had already decided to undertake land retirement,[154] and therefore the program is highly deficient in additionality.

Cost-Effectiveness

Conservation Reserve Program

Originally, CRP was neither cost-effective nor well targeted. Between 1986 and 1990, payment rates were fixed over multi-county areas, which resulted in some farmers receiving far more than the opportunity cost of retiring their poorest cropland.[155] Furthermore, it was becoming clear that the ecological effectiveness of CRP could be improved at no added cost by broadening the scope of the program to include water quality and wildlife habitat improvements.[156] As a result, the 1990 *Food, Agriculture, Trade and Conservation Act* authorized the use of benefit-cost targeting (facilitated by the Environmental Benefits Index) first utilized during the tenth general sign-up in March of 1991.

CRP's competitive bidding process ensures that conservation funds generate the highest benefit at the lowest cost, because farmers reveal to administrators the lowest payment they are willing to accept for undertaking a particular stewardship practice. Feather et al. found that shifting CRP to competitive bidding increased the program's annual environmental benefits from $464 million to $834.2 million (improved fresh-water based recreation benefits, wildlife viewing, and pheasant hunting) at no extra cost.[157]

Wetlands Reserve Program

Unlike CRP, WRP applications are not evaluated using a competitive bidding process. Given that Feather et al. estimated that competitive bidding doubled the annual environmental benefits associated with CRP without additional costs, it seems likely that WRP could be implemented in a more cost-effective manner.[158] In fact, in the 2006 fiscal year, NRCS initiated a WRP "reverse auction" pilot program which was trialed in seven states. Applications were prioritized based on an Environmental Benefits Index (EBI) in which landowner bid costs were divided by the estimated environmental benefit of the project to yield an index value. The applicants were then notified of their ranked status and were given an opportunity to lower their bid. Easement acquisition costs through this process were 14% lower, saving the NRCS nearly $820,000 in the 2006 fiscal year.[159]

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[154] *Ibid.*

[155] Claassen, R., Cattaneo, A., & Johansson, R., (2008). Cost-effective design of agri-environmental payment programs: US experience in theory and practice. *Ecological Economics*, *65*(4), 737-752.

[156] Ribaudo, M.O. (1986*). Reducing soil erosion: Off-site benefits*. Washington, DC: United States Department of Agriculture, Economic Research Service. See also Ribaudo, M.O., Colacicco, D., Langner, L., Piper, S., & Schaible, G. (1990). *Natural resources and natural resource users benefit from the conservation reserve program.* Washington DC: United States Department of Agriculture, Economic Research Service.

[157] Feather, P., Hellerstein, D., & Hansen, L. (1999). *Economic valuation of environmental, benefits and the targeting of conservation programs: The case of the CRP*. Washington DC: U.S. Department of Agriculture, Economic Research Service.

[158] *Ibid.*

[159] Natural Resources Conservation Service. (2006). *Reverse auction saves wetlands and money*. Retrieved March 4, 2009, from http://www.nrcs.usda.gov/news/releases/2006/reverseauctionpilotresults.html

Greencover – Land Conversion

Although Greencover LC's incorporation of an Environmental Sensitivity Index improves the targeting of ecological benefits, landowner applications are not subject to a competitive bidding process. More troublesome is the fact that Greencover LC lacks additionality and therefore generates virtually no environmental gains beyond what would be expected in the program's absence, consequently resulting in poor allocation of program funds.

Participant Satisfaction

Conservation Reserve Program

A national survey revealed that the principle factor compelling farmer participation in CRP is the enhanced control of soil erosion.[160] Participants also cited improved surface and groundwater quality and air quality, control of drifting snow, increased hunting and wildlife viewing opportunities, income stability, enhancement of scenic landscapes, and the potential for boosted property values and future income as reasons for enrollment in CRP.[161] A total of 82% of survey respondents believed that the amount of financial assistance offered through CRP was appropriate. The more commonly expressed grievances with CRP have included: payments not adjusted to inflation, possible proliferation of weeds and pests, possible increase in fires, unkept look of CRP lands, and an increase in unwanted requests for trespass.[162] [163]

While this survey work indicates that CRP farmers are highly satisfied with participation, many non-participating farmers have expressed discontentment towards the effect of agricultural land retirement on local economies. Hodur et al. found that 43% of "community leaders" (appointed government officials, business people, etc.) in North Dakota felt that the overall effect of CRP was negative, resulting from its impact on the farm supply and service sector, its role in farm consolidation and out-migration, as well as its role in driving up local land rental rates (for further discussion, see below under the "other" category).[164]

Wetlands Reserve Program

WRP is reported to be immensely popular with landowners in states bordering the Mississippi River. There are several hundred landowners on the WRP waiting list in Arkansas, Louisiana, and Mississippi.[165] A survey of landowners enrolled in WRP in south-central Wisconsin conducted by Forshay et al. revealed that participants considered protecting the environment and

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[160] Allen, A.W., & Vandever, M.W. (2003). *A national survey of conservation reserve program (CRP) participants on environmental effects, wildlife issues, and vegetation management on program lands*. Fort Collins, CO: United States Geological Survey.

[161] *Ibid.*

[162] *Ibid.* See also Sullivan, P., Hellerstein, D., Hansen, L., Johansson, R., Koenig, S., Lubowski, R., McBride, W., McGrananhan, D., Roberts, M., Vogel, S., & Bucholtz, S. (2004). *The conservation reserve program: Economic implications for rural America*. Retrieved March 4, 2009, from http://www.ers.usda.gov/publications/aer834/aer834.pdf

[163] It is not clear whether concerns related to weeds and pests/fire/unkept look of CRP sites is more a product of farmer preference for "neat" fields, or a lack of land management skills.

[164] Hodur, N.M., Leistritz, F.L., Bangsund, D.A. (2002). *Local socioeconomic impacts of the conservation reserve program. Fargo, ND: North Dakota State University*. Retrieved March 4, 2009, from http://ageconsearch.umn.edu/bitstream/23551/1/aer476.pdf

[165] King, S.L., Twedt, D.J., & Wilson, R.R. (2006). The role of the wetland reserve program in conservation efforts in the Mississippi alluvial valley. *Wildlife Society Bulletin*, *34*(4), 914-920.

the accompanying economic incentives and recreational benefits to be the primary motivations for enrollment.[166] New landowners (those that were not involved in wetland restoration but have since bought property under a WRP easement) stressed the value of WRP's recreational and environmental benefits. This demonstrates that WRP participants believe there are significant and tangible private benefits associated with the program.

Satisfaction with WRP is related to the economic incentives offered to landowners and the extent to which they are involved during the restoration process.[167] About 17% of farmers were upset that taxes on enrolled lands had actually increased as a result of the easement. Participants also expressed grievances about the prohibition on building permanent deer stands.[168]

Greencover – Land Conversion

A recent consultative process initiated to gather feedback from participants in Greencover LC found a high rate of program satisfaction.[169] However, many participants deemed the financial incentives offered to be too small, and others suggested that land eligibility should be expanded by loosening the minimum land eligibility requirements (e.g. that enrolled tracts must be 40 hectares on the same quarter section or parcel of land).[170]

Permanence

Conservation Reserve Program

A summer 2008 spike in the price of corn illustrates that interest in CRP diminishes when opportunity costs rise.[171] Corn farmers appealed to the Secretary of Agriculture in hopes of being granted permission to terminate their CRP contract without penalty (to no avail).[172] Overall, if farmers fail to renew contracts or break contracts when higher returns can be accrued from cropping land, the ecological benefits of CRP become ephemeral.[173] Furthermore, penalties associated with breaking CRP contracts are relatively small for newly enrolled farmers. Babcock and Hart surmise that 20 million acres of lands could be removed from CRP by 2018 if corn prices remain inflated.[174]

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166 Forshay, K., Morzaria-Luna, H.N., Hale, B., & Predick, K. (2005). Landowner satisfaction with the wetlands reserve program in Wisconsin. *Environmental Management*, *36*(2), 248-257.

167 *Ibid.*

168 *Ibid.*

169 AAFC, pers. comm.., May 22, 2009.

170 *Ibid.*

171 Heimlich, R., & Claassen, R. (1998). Agricultural conservation policy at a crossroads. *Agricultural and Resource Economics Review*, *27*(1), 95–107.

172 United States Department of Agriculture. (2008). *Statement of Secretary Ed Schafer discusses conservation reserve program decision*. Retrieved March 2, 2009, from http://www.usda.gov/wps/portal/!ut/p/_s.7_0_A/7_0_1UH/.cmd/ad/.ar/sa.retrievecontent/.c/6_2_1FB/.ce/7_2_5V2/.p/5_2_4VC/_th/J_2_FB/_s.7_0_A/7_0_1UH?PC_7_2_5V2_navid=NEWS_RELEASE&PC_7_2_5V2_contentid=2008/07/0196.xml&PC_7_2_5V2_parentnav=LATEST_RELEASES

173 Wuerthner, G. (2008). Money for nothing? The problems with the conservation reserve program. *Counterpunch*. Retrieved August 4, 2009, from http://www.counterpunch.org/wuerthner04112008.html

174 Babcock, B.A., & Hart, C.E. (2008). Options for the conservation reserve program. *Iowa Ag. Review Online*, *14*(2), 6-7. Retrieved March 2, 2009, from http://www.card.iastate.edu/iowa_ag_review/spring_08/article3.aspx

Furthermore, the permanence of CRP is somewhat perpetually uncertain given that the program must be authorized by Congress each time a new farm bill is debated (every six years or so). This leaves the program especially vulnerable during times of federal belt tightening.[175] Currently, CRP is authorized until 2012. However, given that CRP funding has been expanded considerably over time (including an 80% increase under the 2002 farm bill), new programs are constantly under development, the benefits of the program are widely understood, and that opposition to cuts in conservation funding are generally vociferous,[176] there is probably little cause for concern that CRP will be omitted from a subsequent farm bill in the foreseeable future.

Wetlands Reserve Program

In a similar vein, WRP is only as permanent as the most recently authorized farm bill. Like CRP, WRP will be in place at least until the 2012 fiscal year, but there is strong evidence that the program itself along with its ecological benefits will persist long into the future. The 2008 *Food, Conservation, and Energy Act* increased the WRP program cap from 2.2 million to over 3 million acres, and expanded WREP, which indicates that government support for the program is robust. Furthermore, and more importantly, the vast majority of WRP contracts are tendered as permanent easements, which offers more or less enduring protection of wetlands from future crop-use (barring non-compliance).

Greencover – Land Conversion

Presently, it is difficult to evaluate the permanence of Greencover LC benefits. The program is focused primarily on restoring native and tame forage cover, which is much easier to reconvert back into cropland than forests or wetlands once program payments expire. Alternatively, ranchers probably derive much higher private benefits (i.e. not related to program payments) from Greencover LC sites as hayfield or pastureland than CRP or WRP sites, which could strengthen program permanence.

As agri-environmental policy transitions out of the Agricultural Policy Framework, Greencover – Land Conversion programming will be offered as part of the five-year Growing Forward agreement, however specific program details have yet to be announced.

Compliance Monitoring

Conservation Reserve Program

The NRCS is responsible for monitoring compliance with CRP and other agri-environmental program contracts. Each year, a random selection of 10% of CRP tracts is spot-checked for compliance.[177] NRCS inspectors determine whether the management practices specified under CRP or any other relevant agri-environmental regulation (i.e. cross-compliance, etc.) are being

[175] Ruhl, J. B., Kraft, S. E., & Lant, C. L. (2007). *The law and policy of ecosystem services*. Washington, DC: Island Press.

[176] Baylis, K., Peplow, S., Rausser, G., & Simon, L. (2008). Agri-environmental policies in the EU and United States: A comparison. *Ecological Economics*, *65*(4), 753-764.

[177] United States Office of Management and Budget. (2005). *Detailed information on the conservation reserve program assessment*. Retrieved May 27, 2009, from https://www.whitehouse.gov/omb/expectmore/detail/10003008.2005.html

fulfilled and adhered to.[178] Non-compliance is dealt with in one of two ways. First, NRCS can waive the violation if it is a product of severe or unusual circumstances related to weather, disease, or pests; extreme personal hardship or unusual occurrences such as illness or death; or an infraction that is minor in nature. If a violation is waived, the farmer maintains eligibility for payment for a period of 12 months, at which point the farmer is expected to have corrected the violation.[179] If a waiver is not justified, NRCS will notify FSA, which decides the amount of payment that will be withheld or some other corrective measure. In cases where the land has been returned to production, farmers are expected to forfeit the entire payment they have received as a result of the contract (annual payments, cost-sharing, etc.) as well as a penalty amounting to 25% of one year's rental payment.[180] Interest must be paid on outstanding penalties. FSA can also offer its own waiver if it feels the farmer acted in good faith and did not purposely violate the contract.

There is a dearth of information illustrating the extent to which participants in CRP have been found in breach of contract obligations. However, the USDA's monitoring of the Swampbuster, Sodbuster, and conservation compliance regulations have been criticized in the past. A US General Accounting Office report (2003) rebuked NRCS for not monitoring conservation provisions effectively due to a lack of staffing and an unwillingness to enforce the law.[181] The GAO also reported that between 1993 and 2001, even when NRCS staff reported non-compliance, FSA waived violations 61% of the time often without due justification.

Wetlands Reserve Program

All WRP easements are inspected for violations annually. Onsite inspections are assumed, at a minimum, once every three years. During intermittent years, monitoring is conducted with the aid of satellite imagery and/or aerial photography. If a violation is found, monitoring is conducted once every six months for a period of 18 months after the violation was remedied. Landowners have 30 days to correct the violation before legal action is taken.[182] No specific information on the rate of non-compliance with WRP contracts could be obtained.

Greencover – Land Conversion

Greencover LC sites are initially assessed to ensure that the vegetative cover has established and the land is not being used for a prohibited purpose (i.e. production of forage seed, etc.). If non-compliance occurs within the first 6 years, the applicant must repay 100% of the payments received. For each subsequent year, payments of 80% (year 7), 60% (year 8), 40% (year 9) and

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[178] United States General Accounting Office. (2003, April). *Agricultural conservation: USDA needs to better ensure protection of highly erodible cropland and wetlands*. Retrieved February 9, 2009, from http://www.gao.gov/new.items/d03418.pdf

[179] *Ibid.*

[180] Babcock, B.A., & Hart, C.E. (2008). Options for the conservation reserve program. *Iowa Ag. Review Online*, *14*(2), 6-7. Retrieved March 2, 2009, from http://www.card.iastate.edu/iowa_ag_review/spring_08/article3.aspx

[181] United States General Accounting Office. (2003, April). *Agricultural conservation: USDA needs to better ensure protection of highly erodible cropland and wetlands*. Retrieved February 9, 2009, from http://www.gao.gov/new.items/d03418.pdf

[182] United States Department of Agriculture. (2007). *Part 514 – Wetlands reserve program*. Retrieved May 11, 2009, from http://policy.nrcs.usda.gov/RollupViewer.aspx?hid=17111

20% (year 10) are required.[183] Greencover LC sites are assessed again after five years of the initial establishment.

Currently, there is no data to evaluate the rate of non-compliance with Greencover LC contracts. During the summer of 2009, 10% to 15% of Greencover LC tracts were slated for auditing.

Equity

Conservation Reserve Program

CRP is not designed to compensate landowners who voluntarily retired marginal lands prior to program initiation, or kept their marginal lands out of production. This raises an equity concern expressed succinctly by Claassen et al.: "If 'bad actors' receive subsidies for modest environmental improvement while 'good actors' – with much better environmental performance – are excluded, producers will be discouraged from taking any unsubsidized action that improves environmental performance".[184] However, the salience of this issue has waned given that CRP is nearing its 25th year of implementation. Furthermore, no evidence was found to suggest that CRP enrollment has had a negative impact on the uptake of other voluntary stewardship activities.

In 2003, the Healthy Forest Reserve Program became available as part of CRP. This program targets forest maintenance and restoration (particularly for endangered species and carbon sequestration) to the non-farm rural population, which enhances CRP's equitability across landowner classes.

Wetlands Reserve Program

Like CRP, WRP can be criticized for not providing compensation to farmers who have chosen to protect wetlands on their property. Furthermore, there may be sufficient grounds to allow non-farm rural landowners access to WRP wetland restoration funds.

Greencover – Land Conversion

Greencover LC also does not offer compensation to landowners who voluntarily retired land from production to expand hayed and pasturelands prior to program implementation.

Other

Conservation Reserve Program

Since its inception, copious cost-benefit analyses of CRP have been conducted. After reviewing such analyses, Heimlich found that CRP's average annual net benefit between 1985 and 2005 was $809 million (nominal).[185] In reality, this figure is conservative given that the cost-benefit

[183] Agriculture and Agri-Food Canada. (2009). *Greencover Canada land conversion component – terms and conditions*. Retrieved March 2, 2009, from http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1184865295412&lang=eng

[184] Claassen, R., Hansen, L., Peters, M., Breneman, V., Weinberg, M., Cattaneo, A., Feather, P., Gadsby, D., Hellerstein, D., Hopkins, J., Johnston, P., Morehart, M., & Smith, M. (2001). *Agri-environmental policy at the crossroads: Guideposts on a changing landscape*. Retrieved March 4, 2009, from http://www.ers.usda.gov/publications/aer794/aer794.pdf on page 37.

[185] Heimlich, R. (2007). Land retirement for conservation: History, analysis, and alternatives. In B.L. Gardner and D.A. Sumner (Eds.), *The 2007 farm bill and beyond.* Washington DC: American Enterprise Institute Press.

analyses reviewed generally only included soil productivity, water quality, wind-blown dust, and wildlife habitat benefits along with reductions in agricultural support payments. Total benefits would have increased significantly had the value of big-game hunting, reduced nutrient and flooding damages, carbon sequestration and landscape amenities been included in the calculation.

Despite the fact that CRP generates net gains, the program has been highly criticized for its impact on local communities.[186] Studies have shown that the economic impact of CRP can be considerable in farming communities heavily dependent upon the agricultural supply sector,[187] despite the existence of a per-county CRP and WRP enrollment cap at 25%.[188] That said, a Congressionally mandated report which sought to assess the economic implications of CRP across rural America found that, overall, negative impacts on local agricultural businesses were generally small and moderated by gains to non-farm businesses (i.e. outdoor recreation, etc.), and that CRP impacts in regions with low enrollment are negligible.[189] The report also found "no statistically significant evidence to support the commonly held belief that CRP encourages rural outmigration".[190]

Wetlands Reserve Program

NRCS estimates that between the 2009 and 2012 fiscal years the net benefits of WRP are between $858 million and $3.5 billion, depending upon the average per-acre costs and discount rate.[191]

Greencover – Land Conversion

As described above in the section on uptake, almost all of the land enrolled in Greencover LC is concentrated in the three Prairie Provinces. It has been suggested that the 40 acre minimum land requirement is not amenable to land ownership in eastern Canada.[192] This has resulted in considerable regional inequality, and illustrates a need to expand agricultural land retirement programs in British Columbia and eastern Canada.

Retrieved February 12, 2009, from http://www.aei.org/research/farmbill/publications/pageID.1476,projectID.28/default.asp

186 Hodur, N.M., Leistritz, F.L., Bangsund, D.A. (2002). *Local socioeconomic impacts of the conservation reserve program. Fargo, ND: North Dakota State University*. Retrieved March 4, 2009, from http://ageconsearch.umn.edu/bitstream/23551/1/aer476.pdf

187 Martin, M., Radtke, H., Eleveld, B., & Nofziger, S.D. (1988). The impacts of the conservation reserve program on rural communities: The case of three Oregon counties. *Western Journal of Agricultural Economic*, *13*(2), 225-232. See also Mortensen, T.L., Listritz, F.L., Leitch, J.A., Coon, R.C., & Ekstrom, B.L. (1990). Socioeconomic impacts of the conservation reserve program in North Dakota. *Society and Natural Resources*, *3*(1), 53-61.

188 United States Department of Agriculture. (2008). *2008 farm bill side-by-side*. Retrieved March 4, 2009, from http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIIConservation.htm

189 Sullivan, P., Hellerstein, D., Hansen, L., Johansson, R., Koenig, S., Lubowski, R., McBride, W., McGrananhan, D., Roberts, M., Vogel, S., & Bucholtz, S. (2004). *The conservation reserve program: Economic implications for rural America*. Retrieved March 4, 2009, from http://www.ers.usda.gov/publications/aer834/aer834.pdf.

190 *Ibid.* at p. iv.

191 Natural Resources Conservation Service (2009). *Interim final benefit-cost analysis for wetlands reserve program (WRP)*. Retrieved March 4, 2009, from http://www.nrcs.usda.gov/programs/farmbill/2008/bca-cria/WRP_BCAnalysisInterimFinal_01-09-2009.pdf

192 SNC pers. comm., April 20, 2009; AAFC pers. comm., May 12, 2009.

3: Three Ecological Goods and Services Pilot Projects in Canada

This chapter affords an evaluation of three Canadian pilot projects that typify the ecological goods and services approach to improving agri-environmental quality: Alternative Land Use Services (ALUS) in the Regional Municipality of Blanshard, Manitoba; Payments for Environmental Goods and Services (PEGS) in Huron County, Ontario; and Total Phosphorus Management (TPM) or phosphorus trading in the South Nation River watershed, Ontario.

Maintaining, Restoring and Trading Environmental Quality: Pilot Project Description

Alternative Land Use Services: Regional Municipality of Blanshard

The Regional Municipality of Blanshard is located in southwestern Manitoba, 64 kilometres north of Brandon. The municipality is 576km^2 in area and has a population of 586 residents. Blanshard's economic base is dominated heavily by grain and mixed-farming.[193]

The Alternative Land Use Services (ALUS) pilot project was originally conceived by Ian Wishart, current president of the Keystone Agricultural Producers (KAP; Manitoba's main agricultural producers association). KAP describes ALUS as "a voluntary, incentive-based environmental program that recognizes and rewards the positive contributions that farmers make to clean air and water and biodiversity through their land management practices".[194] The Manitoba Agricultural Services Corporation handles much of the administration and delivery of ALUS (issuing checks, conducting audits, etc.), while the Little Saskatchewan River Conservation District acts as the local arm by providing outreach and in-kind support. A number of other organizations either contributed funds to ALUS or were involved in the management and technical committees, including: Manitoba Agriculture, Food, and Rural Initiatives; Agriculture and Agri-Food Canada; Delta Waterfowl; Manitoba Rural Adaptation Council; Keystone Agricultural Producers; and the Regional Municipality of Blanshard.

ALUS is predicated on a "fee for service" approach, is farmer-driven and has received wide support from farm organizations in the local community, and hopes to build bridges between agricultural, environmental, non-governmental, and government organizations.[195] Through ALUS, farmers are offered annual payments to maintain (i.e. protect) and enhance the flow of EG&S from four landscape features: wetlands, riparian buffers, natural areas, and ecologically sensitive areas. The environmental outcomes generated by ALUS are intended to be as broad-

[193] Regional Municipality of Blanshard. (2008). *R.M. of Blanshard community profile*. Retrieved May 8, 2009, from http://www.communityprofiles.mb.ca/cgi-bin/csd/index.cgi?id=4615033

[194] Keystone Agricultural Producers. (2009). *Alternative land use services (ALUS): Farmers growing a better environment.* Retrieved May 8, 2009, from http://www.kap.mb.ca/alus.htm

[195] Keystone Agricultural Producers. (2009). *Alternative land use services (ALUS): The farmer's conservation program for Canada*. Retrieved May 8, 2009, from http://www.kap.mb.ca/alus/aboutALUS.pdf

scale as possible, and include carbon sequestration, improving water quality, and protecting wildlife habitat.[196]

Any registered landowner in Blanshard was eligible to enroll land in ALUS, assuming that the parcel of land being offered met certain conditions related to the four landscape features. For a landowner to enroll land under the "natural areas" category, it must be maintained as native grassland, shrub, or forest and cannot have been cultivated at any point over the past 20 years. Riparian areas could be enrolled providing they extended at least 10 metres from each side of a stream, river, lake, or wetland. Wetlands are eligible for enrollment if they are capable of holding water for sufficient time to enable the establishment of wetland vegetation and wildlife (and are less than 10 acres). Ecologically sensitive land was classified as Classes 4, 5, 6 or 7 in the Canada Land Inventory, and must have been cultivated at some point over the past 20 years. Any parcel of land offered that met the technical criteria was accepted into the program; no formal evaluation of the applications was undertaken. However, individual farmers could only offer to enroll 20% of their ecologically sensitive land (not total land) into ALUS, to ensure that agricultural production in the community remained unaffected by land retirement.

Annual payments are staggered such that ecologically sensitive lands receive the highest payment ($25/acre), while wetlands, riparian buffers and natural areas receive $15/acre. Payments are reduced if the lands were hayed or grazed, while a general framework for haying and grazing was stipulated within the contracts (i.e. haying could only be carried out between July 15th and August 31st; no grazing before July 1st, etc.).[197] Contracts were carried out over a three year period which ended in 2008, and included other provisions such as allowing program administrators access to enrolled lands.

Payments for Environmental Goods and Services: Huron County

Huron County is located in southwestern Ontario along the eastern shores of Lake Huron. The county is 3,396km^2 with a population of 59,325 residents. Agriculture in Huron County is a dominant land-use, and the county leads all others in Ontario in terms of its total value of agricultural production.[198]

Initiated in 2008, the Payments for Environmental Goods and Services (PEGS) pilot project has two goals: 1) to introduce a model of providing annual payments to compensate producers for environmental services in Huron County, and 2) to determine if providing annual financial compensation for a period of five years will increase the adoption of best-management practices to improve water quality.[199] The program is jointly implemented by Huron County, the Ausable-Bayfield Conservation Authority, and the Maitland Valley Conservation Authority, with funding from the Huron Clean Water Project, Ontario Ministry of Natural Resources, Huron Stewardship

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196 ALUS committee member, pers. comm., May 6, 2009.

197 Hamm, S. (2008). *ALUS: Alternative land use services – An ecological goods & services research project in the rural municipality of Blanshard, Manitoba*. Retrieved May 8, 2009, from http://www.redriverbasincommission.org/Conference/25th_Proceedings/Steve_Hamm.pdf

198 Huron County. (1999). *Huron County official plan*. Retrieved May 27, 2009, from http://www.huroncounty.ca/plandev/downloads/Huron_County_Official_Plan.pdf

199 Monk, K. (2008). *Case study: Huron County payment for ecological goods and services pilot project.* Retrieved April 24, 2009, from http://www.cielap.org/pdf/HuronCounty_KateMonk.pdf

Council, and Maitland Watershed Partnership Terrestrial Action Team. PEGS is expected to improve water quality in the region through retirement of marginal agricultural land within riparian areas followed by establishment of a permanent vegetated buffer.

PEGS land eligibility requirements include: the land was actively farmed, a water quality issue was present or that the project would improve water quality, and that farmers would consent to public tours and signage if accepted. Applicants were not required to own a registered farm business (i.e. applications from hobby farms were acceptable).[200] Nine individual projects were offered for enrollment in the program.[201] The Rural Water Quality Committee, which had been previously established to provide oversight for funding of best-management practices in Huron County, was responsible for evaluating applications. Each submission was assessed with the assistance of a benefits index which included: distance to a bathing beach, runoff, slope, and width of proposed buffer. The scores were augmented by qualitative criteria, such as whether the site was located adjacent to a road (allowing for easier access as a demonstration site).[202]

Of the nine original applications (all from livestock farmers), four were approved. Contracts were signed for a five year period, with farmers receiving annual payments of $250 an acre. Payments were set to reflect land rental rates across Huron County. Farmers have the option to withdraw from the program at any time, but are required to pay back all funds received through PEGS. Furthermore, participating farmers are obligated to permit conservation authority staff reasonable access to the enrolled lands, as well as access to the public during demonstration events.

Total Phosphorus Management: South Nation River Watershed

The South Nation River watershed drains an area of roughly 3,900 km^2 in eastern Ontario between the cities of Ottawa and Cornwall, and is home to a population of about 125,000.[203] Roughly 60% of the watershed is devoted to agricultural land uses,[204] notably mixed-farming, dairy, and cash crop corn and soybeans.[205]

The Province of Ontario's *Water Management Policies: Guidelines for Provincial Water Quality Objectives* Policy 2 (s. 3) states that "Water quality which presently does not meet the Provincial Water Quality Objectives (PWQO) shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the Objectives". Phosphorus levels in the South Nation River watershed, however, have exceeded the PWQO (0.03mg/L) for a number of decades, and

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200 ABCA & MVCA, pers. comm., April 22, 2009.

201 A number of applications were also offered from outside Huron County, as well as after the call for applications had expired.

202 *Ibid.*

203 South Nation Conversation & Kassirer, J. (2005). *South Nation River watershed total phosphorus management: 5- year program evaluation.* Berwick, ON: South Nation Conservation.

204 Conservation Ontario. (2003). *Watershed economic incentives through phosphorus trading and water quality*. Retrieved May 8, 2009, from http://www.conservation-ontario.on.ca/projects/pdf/fact%20sheets/PHASE%20I/watershed_economic_incentives_english.pdf

205 South Nation Conversation & Kassirer, J. (2005). *South Nation River watershed total phosphorus management: 5- year program evaluation.* Berwick, ON: South Nation Conservation.

are currently as much as four times the PWQO at the mouth of the river.[206] Through most of the 1990s, the Ontario Ministry of the Environment (MOE) allowed new and expanding industrial facilities in the watershed (primarily municipal sewage lagoons and landfills) to deviate from Policy 2, given that the costs of not degrading water quality further were too high or that adequate mitigation technology was unavailable. But in 1998, MOE discontinued the allocation of deviation permits for increased phosphorus loads as it became clear that they compromised the value of the water quality objectives.[207]

South Nation Conservation (SNC; the local conservation authority) was compelled to develop alternative program instruments to enable the construction and expansion of industrial facilities without breaching Policy 2. Initial discussions in 1997 facilitated by SNC concerning the creation of a phosphorus trading program were met with skepticism: some stakeholders felt that trading gave industrial dischargers the "right to pollute", while landowners were concerned that funds could be withheld if a verified reduction in phosphorus could not be linked directly to their operation.[208] After three years of deliberation between various stakeholders (SNC, MOE, OMAFRA, municipalities, and farmers), a phosphorus trading program (referred to as Total Phosphorus Management, or TPM) was established as a pilot project in 2000, which allowed new or expanding dischargers to release phosphorus into the South Nation River watershed providing that their phosphorus load was offset through controls on non-point sources (i.e. agricultural runoff). The legal basis for TPM was established by the MOE, which tied payments for offsetting phosphorus to Certificates of Approval to discharge pollution.

TPM is jointly administered by South Nation Conservation (responsible for program delivery), Ontario Ministry of the Environment (regulation of water quality standards through Certificates of Approval), Ontario Ministry of Agriculture, Food and Rural Affairs (technical assistance to landowners for completing non-point source water quality improvements), and the Clean Water Committee (body of SNC board members, farm organizations, local farmers, municipalities, and industries which evaluates TPM applications). Currently, new or expanding dischargers must recompense $390 per kilogram of phosphorus added to the watershed to SNC, which amalgamates the money into its overall Clean Water Program.[209] The TPM program is not in any way distinct from SNC's Clean Water Program, which provides funding for best-management practices in the watershed. However, through TPM, SNC only funds a specific set of best-management practices – manure storage, milkhouse wastewater treatment and disposal, septic system repair, barnyard runoff conversion, and fencing. Buffer strips (and therefore agricultural land retirement) are excluded from TPM funds because a reliable phosphorus reduction figure cannot be accurately predicted (due to varying soil and weather conditions, etc.).[210]

Landowners are eligible for TPM funds if: the project protects and improves surface and/or ground water quality; landowners apply for funds prior to commencing work on a project; and the land is owned or leased in the South Nation River watershed, provided that the owner signs a

[206] SNC, pers. comm., April 20, 2009.
[207] *Ibid.*
[208] *Ibid.*
[209] *Ibid.*
[210] *Ibid.*

letter approving the project.[211] Applications are evaluated by the Clean Water Committee, based on an environmental scoring index (Table 6.2). Any project that does not receive at least 60% of the total available points is deferred to a later date to ensure that funds are targeted to projects yielding the highest phosphorus reduction.[212] Some of the deferred applications receive funding, others do not.

Landowners are obligated to maintain the completed BMP for a minimum of five years. Payments for BMPs associated with TPM have been adjusted over the years, but are currently offered at a cost-share rate of 50% and are capped (manure storage, for example, is capped at $5,000). Once a BMP has been implemented, SNC calculates the amount of phosphorus offset using an algorithm. Milkhouse wastewater treatment and disposal, for example, is predicted to decrease phosphorus loads for a particular farming operation by: the number of cows x 0.69 kg/year (excluding manure), or the number of cows x 2.76 kg/year (including manure). The offset ratio is set at 1:4, meaning that each additional kilogram of phosphorus from point sources is offset by four kilograms removed from non-point farming operations. This staggered ratio ensures that a net environmental gain has been attained.

Pilot Project Evaluation

Uptake

Alternative Land Use Services – Blanshard

The Alternative Land Use Services pilot project completed its three year mandate in 2008. A total of 175 landowners in the Regional Municipality of Blanshard (roughly 75%) entered into ALUS contracts, which protect 21,471 acres (8,674ha) of natural features (or about 15% of the municipality).[213]

Payments for Environmental Goods and Services – Huron

The Payments for Environmental Goods and Services pilot project is currently in its second year of implementation. Four livestock farmers are enrolled in PEGS, resulting in 35 acres (14ha) of retired pasture and restored forest.[214]

Total Phosphorus Management – South Nation River

Between 2000 and 2008, ten new or expanding dischargers (including one repeat) have opted to offset their increased phosphorus loads through trading. A total of 231 best-management practices have been implemented by landowners, generating 3,107 kg of phosphorus offset credits that have been distributed to dischargers.[215] [216] About 20 to 25 BMP projects associated with TPM are undertaken each year.[217]

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[211] *Ibid.*

[212] *Ibid.*

[213] Hamm, S. (2008). *ALUS: Alternative land use services – An ecological goods & services research project in the rural municipality of Blanshard, Manitoba*. Retrieved May 8, 2009, from http://www.redriverbasincommission.org/Conference/25th_Proceedings/Steve_Hamm.pdf

[214] ABCA & MVCA, pers. comm., April 22, 2009.

[215] SNC, pers. comm., April 20, 2009.

Ecological Effectiveness

Alternative Land Use Services – Blanshard

Approximately 75-80% of ALUS enrollment consists of wetlands, with 10% for natural areas, 5-10% for riparian areas, and 2% for ecologically sensitive areas. Because the ALUS program offers payment to landowners for protecting preexisting natural features (and therefore preexisting EG&S flows), ecological outcomes associated with the program are limited. Restoration of natural features is only achieved under the "ecologically sensitive areas" component of the program, which amounts to only 2% of program acreage. Although ALUS payments may have prevented certain high-risk natural features from being brought into production, the extent to which this has occurred is unknown and probably minimal; a sizeable portion of ALUS payments would have protected natural features at no immediate risk of being cleared or drained. More targeting of program payments to highly vulnerable natural features or restoration activities could have improved the ecological effectiveness of the program.

Payments for Environmental Goods and Services – Huron

PEGS is intended to improve water quality in Huron County. Retiring and restoring agricultural land within riparian areas can be expected to decrease sediment and pesticides from entering the water (the increased tree cover will also provide wildlife habitat and sequester carbon, however these were not specifically targeted by the program). Unfortunately, PEGS is implemented on such a small scale that tangible water quality benefits cannot be monitored or necessarily expected. Program administrators are more interested in observing how EG&S payments affect a farmer's willingness to implement a BMP.[218]

That said, the PEGS application evaluation process incorporates a benefits index, which ensures program funds are targeted to particular environmental outcomes. Furthermore, PEGS generates a high degree of additionality given that much of the land enrolled in the program has been grazed for decades despite the availability of cost-shared funding to improve vegetative cover along the stream and fence cattle out. The more substantial annual EG&S payments helped "tip the scales" in favour of conservation.[219]

Total Phosphorus Management – South Nation River

Water quality monitoring in the South Nation River watershed has demonstrated that the concentration of phosphorus has leveled out over the past five years, and may be in slight decline.[220] However, whether this is attributable to TPM or to myriad other factors (increased use of municipal sewage lagoons, decreased phosphorus concentration in laundry detergent, etc.) is difficult to ascertain. Furthermore, a large reserve of phosphorus particles are currently bound to the predominately clay soils of the watershed, which can be released during heavy rainstorms. These confounding factors, as well as the fact that phosphorus levels fluctuate very slowly over time (10 to 20 years), preclude program administrators from estimating the extent to which TPM

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[216] SNC also has accumulated another 7,000 kg worth of credits that have not been distributed. Whether the conservation authority owns the rights to these banked credits, and therefore, whether they can be distributed to new or expanding dischargers, is currently under debate.

[217] O'Grady, D. (no date). *Total phosphorus management incentives*. Berwick, ON: South Nation Conservation.

[218] ABCA & MVCA, pers. comm., April 22, 2009.

[219] *Ibid.*

[220] SNC, pers. comm., April 20, 2009.

has been ecologically effective.[221] Furthermore, it is difficult to conjecture the extent to which TPM generates additionality without querying farmers as to their willingness to undertake their best-management practice in lieu of cost-shared assistance.

Despite the difficulties in evaluating the ecological effectiveness of TPM, the program is highly targeted to projects that generate the greatest decrease in phosphorus loads through use of a benefits index. Furthermore, applications estimated to yield fewer ecological benefits are set aside until it can be determined whether enough money exists to fund them.

Cost Effectiveness

Alternative Land Use Services – Blanshard
Payments associated with ALUS were set to reflect local land rental rates. As a general rule, rental rates approximate the opportunity cost of removing and keeping land out of production, and are therefore cost-effective. However, ALUS lacks a benefit/cost scoring index, and therefore does not target program funds to projects that yield the highest benefit at lowest cost. Furthermore, incorporating competitive bidding into the process could have helped to reduce the payments outlaid per individual. And, as mentioned above, focusing the program on restorative efforts rather than payments for maintaining preexisting natural features would ensure that the program is oriented towards generating additionality.

Payments for Environmental Goods and Services – Huron
PEGS is largely cost-effective given that payments are set to reflect local land rental rates. Furthermore, annual payments are only outlaid exclusively for land retirement and restoration rather than maintaining existing natural cover. However, the incorporation of competitive bidding could have reduced annual rental payment costs.

Total Phosphorus Management – South Nation River
When compared with other available methods to stabilize and reduce phosphorus levels in the South Nation River watershed, TPM is quite cost-effective. For instance, SNC has calculated that technological control options for new or expanding dischargers in the watershed (for example, building tertiary treatment plants) cost $4,000 per kilogram. The trading program, however, only levies $390 per kilogram from dischargers, a $3,610 reduction per kilogram. When the municipality of North Dundas had to address the added phosphorus load associated with expanding its sewage treatment plant in 2003, the cost to improve technological treatment at the facility was estimated at $640,000. As a result of trading, North Dundas achieved their phosphorus offset requirement at $192,000, a cost savings to taxpayers of $448,000.[222] Since the MOE discontinued the allocation of deviation permits in the watershed in 1998, every single regulated discharger has chosen the option to offset their phosphorus loadings as opposed to improving on-site technology or constructing wetlands.[223] However, it is not altogether clear whether other best-management practices (no-till, buffer strips etc.) could generate a more cost-effective (or ecologically effective) reduction in non-point phosphorus loads. TPM is limited to

[221] *Ibid.*
[222] O'Grady, D. (no date). *Total phosphorus management incentives*. Berwick, ON: South Nation Conservation.
[223] SNC, pers. comm., April 20, 2009.

practices that reduce phosphorus at a verifiable rate to enable the creation and allocation of offset credits.

Unlike the case of ALUS and PEGS, the use of competitive bidding to allocate TPM funds may not considerably improve its cost-effectiveness because the funding offered is already fairly low (cost-shared at 50% with a small absolute cap). In fact, producers involved in TPM routinely shoulder far greater than 50% of total project costs: in 2003, total grants associated with 12 manure storage projects totaled $114,086, while total project costs were $721,428.[224] It cannot be expected that producers would be willing to accept funding much below what is currently being offered.

Participant Satisfaction

Alternative Land Use Services – Blanshard

ALUS participants have expressed high satisfaction with the program.[225] Indeed, many landowners consider this type of program "long overdue", and the involvement of local agricultural and conservation organizations helped to build capacity and trust in the program's implementation.[226] The incredibly high uptake associated with ALUS is a testament to its high approval rating in Blanshard (as well as its liberal eligibility requirements). Only minor grievances associated with the program (i.e. the timing of program payments) have been expressed.[227]

Payments for Environmental Goods and Services – Huron

PEGS participants seem to be satisfied with program implementation.[228] Since enrolling in PEGS, one of the four farmers has undertaken additional BMP projects, which implies a high level of satisfaction with the outreach and assistance services offered by the local conservation authorities. However, program administrators suggested that more information could have been provided to landowners regarding taxation of enrolled lands, which triggered early criticisms of the program from participants.[229]

Total Phosphorus Management – South Nation River

Landowners have expressed a high degree of satisfaction with TPM. A comprehensive evaluation found that nine in ten participating landowners had recommended the program to a friend or neighbor (85.7%) or intended to do so in the future (3.9%), while almost all were either mostly or completely satisfied with TPM.[230] Furthermore, the program has given rise to many ancillary benefits: almost four in ten landowners (36.8%) have developed an environmental farm

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[224] Additional funds for manure storage projects can be attained through the Environmental Farm Plan/National Farm Stewardship Program, but this is extraneous to the issue of TPM's cost-effectiveness.

[225] ALUS Committee Member, pers. comm., May 6, 2009.

[226] Hamm, S. (2008). *ALUS: Alternative land use services – An ecological goods & services research project in the rural municipality of Blanshard, Manitoba*. Retrieved May 8, 2009, from http://www.redriverbasincommission.org/Conference/25th_Proceedings/Steve_Hamm.pdf

[227] ALUS committee member, pers. comm., May 6, 2009.

[228] ABCA & MVCA, pers. comm., April 22, 2009.

[229] *Ibid.*

[230] South Nation Conversation & Kassirer, J. (2005). *South Nation River watershed total phosphorus management: 5- year program evaluation.* Berwick, ON: South Nation Conservation.

plan as a result of the program, while 79.4% and 51.5% said that TPM had improved their relationship with South Nation Conservation and the Ontario Ministry of the Environment, respectively. However, 55.9% of participants were unsatisfied with the level of financial assistance being offered.

Permanence

Alternative Land Use Services – Blanshard
The ALUS pilot project was officially completed in 2008. Administrators intend to monitor the enrolled lands in the coming years to determine if they are drained/cleared for agricultural purposes once payments cease.[231]

Payments for Environmental Goods and Services – Huron
The PEGS pilot project ends in 2012. Administrators intend to monitor the enrolled lands following program completion to determine whether they remain vegetated.[232]

Total Phosphorus Management – South Nation River
The TPM program, originally established as a pilot project, has been so successful that it is now standard operating procedure in the watershed. Furthermore, given that the majority of projects funded through TPM are capital-based and cost-shared, there is little reason to believe that they would be rescinded following the five year contract period. Subsequent evaluations of TPM will address this issue by determining, through on-site inspections, whether funded practices are being maintained.[233]

Compliance Monitoring

Alternative Land Use Services – Blanshard
Of the 80% of ALUS contracts audited during the first year of implementation, a compliance rate of 97.7% was found. In the second year, compliance was slightly lower at 91.7%. Most of the incidences of non-compliance were issues of miscommunication with contract terms, or of landowners voluntarily removing land from the program.[234]

Payments for Environmental Goods and Services – Huron
Monitoring of PEGS sites is undertaken during the general extension duties of the Ausable-Bayfield and Maitland Valley Conservation Authority. Impromptu site visits may be conducted at different times throughout the year, but more detailed discussions with farmers generally occur once annually. Furthermore, each participating farmers is required to complete a form detailing any modifications to farm production practices that occurred over the past year. No incidences of non-compliance have occurred thus far.[235]

[231] ALUS Committee Member, pers. comm., May 6, 2009.
[232] ABCA & MVCA, pers. comm., April 22, 2009.
[233] SNC, pers. comm., April 20, 2009.
[234] ALUS Committee Member, pers. comm., May 6, 2009.
[235] ABCA & MVCA, pers. comm., April 22, 2009.

Total Phosphorus Management – South Nation River
Monitoring of TPM best-management practices is conducted by randomly selecting 10% of the projects funded through the Clean Water Program (including, but not exclusively, TPM) each year. Certain best-management practices (capital based projects like septic system repair, and erosion control) associated with TPM are actually monitored at a higher rate because they are also inspected separately. Landowner non-compliance has not been an issue.[236]

Equity

Alternative Land Use Services – Blanshard
ALUS is the most equitable program evaluated in this research. Landowners that were involved in voluntary stewardship activities prior to the initiation of the pilot were eligible for program payments. Furthermore, program eligibility is accessible to any landowner in the regional municipality, and is not restricted to farmers.

Payments for Environmental Goods and Services – Huron
PEGS does not provide remuneration to farmers who undertook land retirement prior to program implementation. However, administrators attempted to broaden the scope of the program by allowing any farmer (i.e. including hobby farmers) the opportunity to apply for enrollment.

Total Phosphorus Management – South Nation River
Eligibility for inclusion in TPM is open to any landowner in the watershed. Although certain BMP's associated with TPM are ostensibly restricted to farmers (e.g. milkhouse wastewater, manure storage, etc.), non-farm landowners are eligible for funding under septic system repair.

Other

Alternative Land Use Services – Blanshard
The ALUS program clearly exemplifies the trade-offs implicit in the design of agri-environmental instruments. Although ALUS outmatches or scores well when compared with the six other cases on uptake, participant satisfaction and (especially) equity, high performance in these areas has come at a cost to the program's ecological and cost-effectiveness.

Payments for Environmental Goods and Services – Huron
Uptake in PEGS was restricted to livestock farmers, as program payments were not sufficient to entice cash crop producers. This illustrates a fundamental limitation with the use of local land rental rates to set EG&S payments: some of the most ecologically damaging production practices are often associated with high opportunity costs. While it cannot be assumed that cash crop farmers in Huron County were responsible for higher rates of erosion and sedimentation in the watershed than livestock farmers, the use of local land rental rates to peg EG&S payments will result in a bias towards low benefit but low cost projects being accepted at the expense of high valued but high cost projects. This issue can best be overcome through use of competitive bidding.

[236] SNC, pers. comm., April 20, 2009.

Total Phosphorus Management – South Nation River

The implementation of TPM illustrates that agricultural land retirement is not necessarily the most preferable agri-environmental instrument available. Administrators were unable to include buffer strips as an eligible practice under TPM because a reliable phosphorus reduction figure could not be calculated, yet this may not have adversely affected program outcomes.

4: Discussion, Conclusion, and Recommendations

Discussion

Two matrices summarize the basic program characteristics (Table 4.1) and results of the case study evaluation (Table 4.2). By evaluating the design and execution of each program, it becomes possible to isolate those features key to the design of agricultural land retirement programs.

The Limits of Agricultural Land Retirement

Each case study evaluated here utilized marginal and ecologically significant agricultural land retirement as the dominant stewardship activity to improve EG&S flows with one exception: Total Phosphorus Management in the South Nation River watershed. TPM remunerates practices that reduce non-point source phosphorus pollution in a way more characteristic of working land programs, such as improved manure storage and milkhouse wastewater treatment and disposal. Administrators are unable to offer agricultural land retirement through TPM because a reduction in phosphorus loadings associated with establishing riparian buffers cannot be reliably predicted.

This leads to a question originally offered by Heimlich: what goals are best served by retiring land from production?[237] If non-point source pollution can be adequately addressed by expanding manure storage and fixing leaky septic systems, there is no need to remove land from production. However, if particular lands are so vulnerable to leaching and/or runoff that it becomes unfeasible to reduce non-point source pollution in a cost-effective manner, then agricultural land retirement becomes necessary.[238] In fact, this subject was breached during a discussion with administrators of Payments for Environmental Goods and Services in Huron County. Though the program is fixated on retiring marginal pasture land within riparian areas, one administrator acknowledged that it was unknown whether retiring land was the most effective strategy for improving water quality in the watershed, and that other practices such as decommissioning wells might generate greater benefits at lower costs.

As a general rule, land retirement is particularly well-suited to: (1) ameliorating a wide range of agri-environmental issues, or (2) issues that cannot be mitigated through changes to production practices.[239] For example, expanding wildlife habitat and protecting species at risk most often entails restoring natural areas and is therefore well-suited to land retirement.[240] As such, program

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[237] Heimlich, R. (2007). Land retirement for conservation: History, analysis, and alternatives. In B.L. Gardner and D.A. Sumner (Eds.), *The 2007 farm bill and beyond.* Washington DC: American Enterprise Institute Press. Retrieved February 12, 2009, from http://www.aei.org/research/farmbill/publications/pageID.1476,projectID.28/default.asp

[238] *Ibid.*

[239] *Ibid.*

[240] Of course, this is less true for certain species that thrive in grasslands, or aquatic species adversely affected by pesticide runoff. In these cases, a mix of working land improvements and land retirement are necessary.

Table 4.1: Basic Program Characteristics

Case	Implementation Period	EG&S Targeted	Contract	Payment	Payment based on	Practices Paid For
Conservation Reserve Program	1985-	Biodiversity, water quality, soil fertility, less so air quality	10-15 years	Annual; roughly $43 (US) per acre (FY 2007)	Competitive bidding	Marginal land retirement and restoration to forests and grasslands
Wetlands Reserve Program	1995-	Wetland goods and services (wildlife, water quality and quantity)	Permanent easement, 30-year easement, cost-sharing	Annual, roughly $3,089 for permanent, $1,104 for thirty year, $669 for cost share (US) per acre (FY 2007)	Lowest of: local land rental rates, state payment cap, amount offered by landowner	Marginal land retirement and restoration to wetlands
Greencover - Land Conversion	2003-	Water quality, soil fertility, reduction of GHG's, biodiversity	10 years	$20 per acre for tame forage and trees, $75 for native forage, $25 following establishment (CAN)	Seeding cost	Marginal land retirement and restoration to tame and native forage, and trees
ALUS - Blanshard	2006-2008	Biodiversity, water quality, soil fertility, reduction in GHG's	3 years	Annual; $15-$25 no use, $7.50-$10 haying, $5 grazing per acre (CAN)	Local land rental rates	Maintenance of wetlands, riparian buffers, and natural areas, ecologically sensitive land retirement and restoration
PEGS - Huron	2008 - 2012	Water quality	5 years	Annual; $250 (CAN) per acre	Local land rental rates	Marginal pastureland retirement and restoration to trees in buffer zones
TPM - South Nation R.	2000-	Water quality (phosphorus reduction)	5 years	Cost-shared (50%) with funding cap	n/a	Manure storage, milkhouse wastewater treatment, septic repair, barnyard runoff conversion, and fencing

Table 4.2: Summary of Case Study Evaluation

Case	Uptake	Ecological Effectiveness	Cost Effectiveness	Participant Satisfaction	Permanence	Compliance Monitoring	Equity	Other
Conservation Reserve Program	19% of all US agriculture producers	Numerous environmental benefits, well-targeted, high additionality	Use of EBI and competitive bidding	Most believe payments acceptable, some minor grievances (i.e payments not adjusted to inflation)	Environmental benefits adversely affected by high commodity prices, program requires reapproval	10% of contracts monitored annually, evaluation of cross-compliance suggests enforcement needs improvement	Compensation not awarded for previous stewardship, Healthy Forest Reserve Program allows non-farm rural enrollment	CBA's demonstrate benefits > costs, negative impacts on communities dominated by ag. sector
Wetlands Reserve Program	2 million acres of restored and enhanced wetland	Numerous environmental benefits, well-targeted, high additionality	Use of competitive bidding could improve	High support, some minor grievances (i.e. tax increases)	Must be reapproved, but most benefits secured through permanent easements	Once every three years for onsite visits, satellite imagery/aerial photography in intermittent years	No compensation for previous stewardship, eligibility restricted to farmers	CBA showed benefits greater than costs
Greencover – Land Conversion	Good in Prairies, negligible in BC/eastern Canada	Moderate environmental benefits, well-targeted, very low additionality	Use of competitive bidding could improve	High support, but discontent with payments and eligibility requirements	Permanence of hayed and pastured land unknown, will be offered in *Growing Together*	10% - 15% of contracts monitored in the fifth year after vegetation established	No compensation for previous stewardship, eligibility restricted to farmers	Very low uptake in eastern Canada
ALUS – Blanshard	75% of eligible producers	Extensive areas protected, but no targeting and low additionality	Low - all applications accepted regardless of vulnerability, no competitive bidding	Very high support, only minor grievances (i.e. late program payment)	Completed in 2008, enrolled sites will be monitored in the future	Over 90% compliance rate, only minor issues of non-compliance (i.e. voluntary removal of land from the program)	Compensation for maintaining preexisting natural features, eligibility open to all landowners	High program uptake, participant satisfaction and equity, but low ecological/cost-effectiveness
PEGS - Huron	Only four livestock farmers (but low operating budget)	Some environmental benefits (low uptake), well-targeted, high additionality	Use of competitive bidding could improve	Seemingly high support, only minor grievances (i.e. taxation of land)	Completed in 2012, enrolled sites will be monitored in the future	No issues thus far	No compensation for previous stewardship, eligibility open to all farmers (inc. hobby farmers)	Extra payments "tipped the scales", but no interest from cash croppers
TPM – South Nation R.	20-25 BMP's employed annually	Effective in mitigating point-source phosphorus loadings, but difficult to verify	Quite cost-effective compared with other phosphorus reduction options	Very high support, but over half of participants see financial assistance as too low	Now standard operating procedure in watershed, recidivism unlikely	No issues thus far	Most eligible activities targeted to farmers, septic repairs open to all landowners	Unable to incorporate agricultural land retirement (i.e. riparian buffer)

administrators should identify the particular environmental problem or objective at hand and then determine whether agricultural land retirement is an ideal mitigation strategy.

Improving Environmental Benefits through Precision Targeting

Agricultural land retirement enhances a very wide range of environmental benefits. After 25 years of implementation, considerable benefits to wildlife, soil retention, water quality, and air quality have been realized as a result of the Conservation Reserve Program. Nevertheless, the fact that land retirement yields such copious environmental benefits can also be a design flaw. Heimlich asserts that in targeting a wide array of benefits, CRP's Environmental Benefit Index is a blunt instrument that selects projects that deliver a range of outcomes over those that generate extremely high benefits in only one category. [241] The author then showed how the average and minimum score under each of the three main benefits categories targeted by the EBI (wildlife, soil, water) could be improved if the best individual scores were accepted for one-third of the total each. It follows that the ecological effectiveness of agricultural land retirement can be enhanced if the index used to evaluate applications is "precision targeted";[242] that is, the index is structured to deliver environmental benefits best addressed by land retirement as well as those that are most pressing within the purview of a particular watershed or jurisdiction.

The Need for Competitive Bidding

The value of targeting agricultural land retirement to particular environmental benefits has added relevance to considerations of cost-effectiveness. Cattaneo et al. have put forth three principles considered integral to a cost-effective agri-environmental program design:[243] 1) structure the application process as a "request for proposals" such that only certain applications are accepted, 2) rank the proposals by benefit/cost criteria with the use of an index, and 3) promote competitive financial assistance (i.e. competitive bidding) in order to stretch program budgets as far as possible.[244] ALUS is the only program reviewed here in which the application process does not satisfy the first two criteria above; every application was accepted and no formal benefit/cost index was incorporated into the application evaluation process. It is unlikely that provincial and federal agricultural departments possess the resources to protect preexisting natural features on farmland across the country.

The only program that has implemented all three principles of cost-effectiveness including competitive bidding is the Conservation Reserve Program. Competitive bidding is a process whereby landowners (sellers) submit bids to the government (the buyer) for undertaking particular land management activities at a particular cost. The government accepts only those applications that maximize ecological and cost-effectiveness, usually up to the point where financial resources (or in the case of CRP, the acreage allotment) are exhausted. Competitive bidding is often referred to as a "reverse auction", because it ties multiple sellers to a single

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[241] *Ibid.*
[242] *Ibid.*
[243] Technically, these principles were offered as key to working land programs rather than land retirement programs, but they are equally applicable here.
[244] Cattaneo, A., Claassen, R., Johansson, R., & Weinberg, M. (2005). *Flexible conservation measures on working land*. Retrieved May 27, 2009, from http://www.ers.usda.gov/publications/err5/err5.pdf

buyer. Reverse auctions are considered more cost-effective than fixed payment schemes – where the government offers a price based on some metric (i.e. local land rental rates) to producers – because it helps to reveal hidden information about what governments want and what landowners can actually offer given their financial constraints.[245] Governing agencies are well aware of the state of the local environment, and therefore know which actions or changes in land-use would facilitate the most environmentally beneficial outcomes. Landowners understand how much certain activities will cost, which is not known by the government or the public. When this asymmetry in objectives and financial constraints is eliminated through use of a reverse auction, the most ecological and cost-effective solution comes into fruition.

Time and again, the use of competitive bidding has been shown to improve the cost-effectiveness of agri-environmental programming. As mentioned earlier, Feather et al. found that shifting CRP to competitive bidding in 1990 increased its annual environmental benefits from $464 million to $834.2 million at no added cost.[246] Although WRP's current machination does not incorporate competitive bidding into the application evaluation process, a 2006 reverse auction pilot project found that easement acquisition costs were 14% lower with the use of competitive bidding.[247] The World Resources Institute initiated a reverse auction in Pennsylvania's Conestoga watershed to evaluate applications offered into the Environmental Quality Incentives Program (EQIP) – a US working land program which currently does not utilize competitive bidding – and found that the cost per pound of phosphorus reduced in the watershed dropped from $26.19 using the EQIP evaluation process to $5.06 using a reverse auction.[248] The government of Australia is an avid supporter of competitive bidding, which plays a foundational role in its Bush Tender program.[249] The use of reverse auctions to allocate conservation funds in Canada, however, has seen limited use. The Assiniboine Watershed Stewardship Association (AWSA) in partnership with Ducks Unlimited launched perhaps Canada's first reverse auction pilot project in September 2008 to restore wetlands in Saskatchewan's Assiniboine River watershed.[250] Contracts are being tendered as either 12 year or permanent agreements.

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[245] Crowe, M., Todd, J., Parkes, D., Burmeister, S., Stoneham, G., Strappazzon, L., & Buchan, A. (2008). *Bushtender: Rethinking investment for native vegetation outcomes*. Retrieved August 4, 2009, from http://www.dse.vic.gov.au/CA256F310024B628/0/E8653777854ADDC8CA25747100005E2C/$File/BushTender_rethinking+investment_web.pdf

[246] Feather, P., Hellerstein, D., & Hansen, L. (1999). *Economic valuation of environmental, benefits and the targeting of conservation programs: The case of the CRP*. Washington DC: U.S. Department of Agriculture, Economic Research Service.

[247] Natural Resources Conservation Service. (2006). *Reverse auction saves wetlands and money*. Retrieved March 4, 2009, from http://www.nrcs.usda.gov/news/releases/2006/reverseauctionpilotresults.html

[248] Selman, M., Greenhalgh, S., Taylor, M., & Guiling, J. (2008, June). *Paying for environmental performance: Potential cost-savings using a reverse auction in program sign-up*. Retrieved May 27, 2009, from http://pdf.wri.org/paying_for_environmental_performance_reverse_auctions_in_program_signup.pdf

[249] Crowe, M., Todd, J., Parkes, D., Burmeister, S., Stoneham, G., Strappazzon, L., & Buchan, A. (2008). *Bushtender: Rethinking investment for native vegetation outcomes*. Retrieved August 4, 2009, from http://www.dse.vic.gov.au/CA256F310024B628/0/E8653777854ADDC8CA25747100005E2C/$File/BushTender_rethinking+investment_web.pdf

[250] Assiniboine Watershed Stewardship Association. (2008). *Why restore a wetland?* Retrieved June 23, 2009, from http://www.assiniboinewatershed.com/index.php?option=com_content&task=view&id=38&Itemid=68

Determining How Much to Remunerate

An auxiliary benefit of competitive bidding apart from its cost advantage is that it abrogates the messy process of deciding how much to remunerate producers for undertaking land retirement, since producers simply reveal what they are willing to accept as part of the application process. Conversely, some affirm that producers should be offered a payment reflecting the estimated monetary value of the goods and services yielded by the natural capital protected/restored or production practice employed.[251] While this approach is theoretically the most efficient, the trouble is that: 1) it assumes that the valuation process generates a reliable approximation of EG&S benefits to society, and 2) there is simply not enough money to fully remunerate producers for the value of EG&S flows.

The process by which environmental economists price the value of a particular natural capital asset is fraught with problems and uncertainties. For example, the monetary value of wetland filtration supplied by wetlands can be inferred by estimating the increase in water treatment costs if wetland cover and its associated forest buffer declines by some percentage.[252] The monetary value of wetlands, then, becomes the avoided cost of increased water treatment. But generating a precise monetary value from this approach assumes that our knowledge of ecosystem function is robust, when in reality it is not.[253] We can only hypothesize how long it will take before wetland loss and the subsequent increase in nutrient loadings will amplify treatment costs, while the valuation methodology itself does not account for the possibility that nutrient loading may cause abrupt (i.e. nonlinear) damage after accumulating beyond a certain threshold.[254] Furthermore, the use of contingent valuation surveys to estimate a person's willingness to pay for wetland protection is equally troublesome, given that wetland protection is fundamentally a question of ethics and aesthetics which is not amenable to the pricing process.[255]

Secondly, even if EG&S flows could be given a precise dollar figure, governments lack the money to actually pay the "real" amount for said services. Wilson estimated that the average monetary benefit of forest cover *per hectare* and *per year* in Ontario's greenbelt is $5,414.[256] Paying farmers and rural landowners over $5,000 per hectare to maintain forest cover would quickly exhaust operating budgets! The use of economic techniques to value unpriced natural capital assets is still beneficial from the standpoint of demonstrating to policy-makers and society that nature has considerable monetary value, but they mustn't be used to set EG&S payments. As put pointedly by Chan et al.: "[t]he real test…of whether an ecosystem service will

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[251] See Manitoba Cattle Producers Association. (2008). *Environmental and rural stewardship: Remuneration for agriculture in Manitoba*. Retrieved August 4, 2009, from http://www.scribd.com/doc/9693748/Mcpa-Egs-Proposal

[252] Wilson, S. (2008). *Ontario's wealth Canada's future: Appreciating the value of Canada's eco-services*. Retrieved from http://www.ourgreenbelt.ca/sites/ourgreenbelt.ca/files/DSF-Greenbelt-Web1.pdf.

[253] Daly, H. E., & Farley, J. C. (2004). *Ecological economics: Principles and applications*. Washington, DC: Island Press.

[254] *Ibid.*

[255] Sagoff, M. (2008). *The economy of the Earth: Philosophy, law, and the environment* (2nd Ed.). Cambridge: Cambridge University Press.

[256] Wilson, S. (2008). *Ontario's wealth Canada's future: Appreciating the value of Canada's eco-services*. Retrieved from http://www.ourgreenbelt.ca/sites/ourgreenbelt.ca/files/DSF-Greenbelt-Web1.pdf

facilitate conservation is not whether academics can valuate it, but whether someone – or some organization – is able and willing to do what is necessary to secure it".[257]

Other remuneration options include the use of local land rental rates, which is employed in WRP, ALUS and PEGS. This method is far superior to estimating EG&S values, but is still a relatively blunt instrument. Land rental rates do not always reflect the opportunity cost of converting working lands to natural cover, as demonstrated in the PEGS pilot project which saw no uptake from cash crop producers who yielded higher benefits from production. Furthermore, the use of land rental rates has the tendency to select against the retirement of lands associated with high opportunity costs but potentially the highest ecological benefit. Moreover, payments amounting to the seeding cost/restoration cost of land, as in the case of Greencover LC, work reasonably well when the lands continue to generate income from haying or grazing, but would not be sufficient to entice producers to restore forests and wetlands. In sum, obliging producers to reveal their willingness to accept a particular level of payment for undertaking a stewardship practice through competitive bidding is simply the best way to allocate conservation funds.

The Need to Consider Local Involvement and Context

Most of the participating landowners expressed high satisfaction with program implementation, and articulated only minor grievances mostly related to payments (i.e. taxation of enrolled lands in WRP, PEGS; timing of payments in ALUS; payments not adjusted to inflation in CRP; insufficiency of payments in Greencover LC, TPM). However, the importance of directly involving farmers and other local stakeholders in major programming decisions cannot be overstated. Farmers and farming organizations played an integral role in various technical committees tasked with developing program protocol in each of the three pilot projects. Farmer and community involvement are also core principles adopted in the Norfolk County ALUS pilot project not evaluated in this research.[258] Furthermore, Forshay and others discovered that the main concern raised by landowners participating in WRP in Wisconsin (notwithstanding financial matters) pertained to a lack of communication and participation by farmers in the restoration process.[259] Farmer and community involvement is thus essential to build trust among stakeholders and to ensure program support remains ongoing, and may help to improve strained relationships among farmers, environmentalists, and regulators.

On a similar note, it has become clear that agricultural land retirement programs must be tailored to local conditions and priorities. In the early years of the Conservation Reserve Program, annual payments were fixed over multi-county areas resulting in some farmers receiving well above the opportunity cost of retiring marginal land.[260] The program became more cost-effective when competitive bidding was introduced in 1990. Likewise, Greencover – Land Conversion received

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[257] Chan, K.M.A., Pringle, R.M., Ranganathan, J., Boggs, C.L., Chan, Y.L., Ehrlich, P.R., Haff, P.K., Heller, N.E., Al-Khafhaji, K., & Macmynowski, D.P. (2007). When agendas collide: Human welfare and biological conservation. *Conservation Biology*, *21*(1), 59-68. Quote at p. 61.

[258] Norfolk Alternative Land Use Services. (2009). *ALUS key principles*. Retrieved May 21, 2009, from http://www.norfolkalus.com/index.php?option=com_content&view=article&id=10&Itemid=7

[259] Forshay, K., Morzaria-Luna, H.N., Hale, B., & Predick, K. (2005). Landowner satisfaction with the wetlands reserve program in Wisconsin. *Environmental Management*, *36*(2), 248-257.

[260] Claassen, R., Cattaneo, A., & Johansson, R., (2008). Cost-effective design of agri-environmental payment programs: US experience in theory and practice. *Ecological Economics*, *65*(4), 737-752.

virtually no uptake outside the Prairie Provinces, owing to its land eligibility requirement of 40 acres. As such, while it is integral to cultivate as much local involvement as possible, it is equally important to incorporate local realities into program design.

Securing Benefits for the Long-Term

The programs examined here employ a variety of contract lengths, including three years (ALUS), five years (PEGS, TPM), ten years (Greencover LC), ten to fifteen years (CRP), and thirty years to permanent easements (WRP). When promoting the retirement of agricultural land, one unremitting concern is that the retired land will be returned to production once program payments are discontinued. Without ongoing payments, retired land no longer accrues (or accrues substantially fewer) financial benefits to the farmer. One survey found that 63% of farmers would return their CRP lands to crop production (based on prevailing commodity prices at the time) if their contracts were not reauthorized.[261] And when the price of corn soared in the summer of 2008, farmers lobbied (unsuccessfully) the Minister of Agriculture to nullify their CRP contracts without penalty to enable them to expand corn production. It is clear that securing long-term environmental benefits through land retirement requires that contractual obligations, and the payments that accompany them, be made as protracted as possible.

Rather than outlaying annual payments ad infinitum, Heimlich advocates the use of permanent easements to secure ecological benefits.[262] He contends that permanent easements are not only a more cost-effective alternative to annual rental payments over the long-term, but they also ensure that the environmental benefits generated with public funds last in perpetuity.

The Trouble with Equitability

While enrollment in ALUS was made available to all landowners in the Regional Municipality of Blanshard, the other five programs offer very limited to no opportunities to involve other rural landowners through program design. Although agricultural land retirement as a stewardship activity is ostensibly tailored to the farming community, a case can be made in favour of loosening the eligibility requirements associated with EG&S programs to include non-farming rural landowners. This could be accomplished by targeting the restoration of ecologically significant lands (i.e. along streams, highly sloped, near protected areas, etc.) or those that are associated with high opportunity costs (i.e. establishing habitat for species-at-risk which could reduce property values).

More problematic from an equity standpoint is that agricultural land retirement programs must be initiated at a particular point in time, and stewardship activities undertaken prior to that baseline are often excluded from compensation. Of the programs examined here, ALUS alone compensates landowners for maintaining preexisting natural features, but this has adversely

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[261] Osborn, C.T., & Heimlich, R. (1994). Changes ahead for conservation reserve program. *Agricultural Outlook*, *209*, 26-30.

[262] Heimlich, R. (2007). Land retirement for conservation: History, analysis, and alternatives. In B.L. Gardner and D.A. Sumner (Eds.), *The 2007 farm bill and beyond.* Washington DC: American Enterprise Institute Press. Retrieved February 12, 2009, from http://www.aei.org/research/farmbill/publications/pageID.1476,projectID.28/default.asp

affected its cost-effectiveness as well as its ability to generate additionality. As a rule of thumb, EG&S payments should be restricted to activities that generate at least some additionality (i.e. payments could be used to reward prior activities if they are expanded in some substantive way), or if it can be demonstrated that particular natural features on particular properties are highly threatened. That said, if governments do not have the envelope to compensate previous stewardship activities, it is probable that the salience of this issue will wane after a few years of program implementation.

Net Benefits and Costs

Cost-benefit analysis is widely employed in US program evaluation, and such analyses have consistently shown that the net benefits of both CRP and WRP exceed costs by a wide margin.[263] While neither Greencover LC nor the three pilot projects have been subject to a detailed assessment of costs and benefits, the potential contribution of an agricultural land retirement program (predicated on restoring natural capital, not hay/pastureland) in Canada in terms of its costs and benefits has been evaluated a few times. Ducks Unlimited found that retiring marginal agricultural land in the Prairie Provinces as well as lands that abut waterways (i.e. to create a riparian buffer) across the country through its Conservation Cover Incentive Program would yield a net benefit of $93.3 million per year.[264] Benefits included: reduced program costs (i.e. crop insurance); reduced water treatment, flood and air pollution; increased wildlife viewing, hunting, fishing, and recreation; and reduced GHG emissions. Costs included: program administration; increased wildlife predation; and payments to producers. A preliminary cost-benefit analysis performed by Tyrchniewicz Consulting estimated that an annual benefit of $820 million can be expected from retiring marginal agricultural land across Canada.[265] [266] Finally, Sparling et al. estimated that the annual net benefits associated with a Manitoba-wide ALUS program range from an average of $11.5 billion (benefits discounted in annuity) to $59 billion (benefits discounted in perpetuity).[267] These benefits are considerably larger than those calculated by the two previous reports because Sparling et al. included the benefits of maintaining preexisting natural capital along with retiring marginal agricultural land.

Anticipating Negative Impacts in Rural Communities

Notwithstanding the substantial net benefits described above, the costs of agricultural land retirement are primarily concentrated in rural communities heavily reliant upon the agricultural

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[263] Of course, the estimation of precise ecological values is fraught with problems and uncertainties, as elaborated earlier.

[264] Ducks Unlimited. (2001). *A conservation cover incentive program for Canada*. Retrieved February 5, 2009, from http://www.pollutionprobe.org/whatwedo/FCM/workshop2/chekay.pdf

[265] Tyrchniewicz Consulting (2007). *Alternative Land Use Services (ALUS): A preliminary overview of potential cost reductions and financial benefits to Canada.* Retrieved from http://www.deltawaterfowl.org/alus/TychniewiczConsultingALUSReportJan2007.pdf

[266] It should be noted that the Tyrchniewicz Consulting cost-benefit analysis likely underestimates the payment rate required to entice farmers to undertake land retirement. The authors used a payment rate of $20/acre/year, which may reflect land rental rates in sparsely populated regions but is far below what would be needed in areas like southern Ontario. The payment rate used in PEGS in Huron County, for instance, is $250/acre/year.

[267] Sparling, B., Klimas, M., Brethour, C., Bucknell, D., Richards, J.S., & Hodgson, D. (2008). *Ecological goods and services: Estimating program uptake and the nature of costs/benefits in agro-Manitoba*. Retrieved March 11, 2009, from http://www.gov.mb.ca/agriculture/soilwater/ecological/pdf/feg01s01.pdf

supply sector for employment.[268] To mitigate these impacts, administrators of CRP and WRP have established a per-county enrollment cap of 25% for lands offered into both programs (the cap is 10% for WRP exclusively, and ALUS has an enrollment cap of 20% on ecologically lands removed from production). Program administrators should anticipate and lessen the impacts of land retirement on local communities prior to implementation.

Insights from Prince Edward Island

In the spring of 2008, Prince Edward Island proclaimed its intention to put in place an incentive-based program to improve agri-environmental quality across the province. The program – Alternative Land Use Services[269] – is the first province wide-program in Canada founded upon enhancing EG&S flows through agricultural land retirement that is not primarily targeted to restoring hay and pastureland (such as the Permanent Cover Program, Greencover – Land Conversion, or Saskatchewan's Conservation Cover Program). PEI ALUS has two goals:

1) Directly empower farmers in conservation, and increase the supply of ecological goods and services across the province.
2) Improve land management by:
   - Reducing soil erosion to acceptable levels;[270]
   - Reduce the incidence of pesticide-related fish kills;
   - Improve and increase wildlife habitat and landscape biodiversity;
   - Improve water quality.[271]

Enrollment in PEI ALUS, currently in its second year of implementation, is open to any farmer that owns or leases land in the province, has worked the land since the year 2000, and agrees to a five year contract (which will be reviewed and probably open for extension after it expires).[272] The program offers three options for annual payment: establishing trees within the riparian buffer zone, retiring sensitive land (riparian zones, grassed headlands outside of the 200m buffer zone requirement, and sloped land at 9% or higher) and restoring natural cover (trees or grass), and building conservation structures (diversion terraces, farmable berms, and grassed waterways). Landowners receive $185 per hectare ($75 per acre) for buffer zone tree establishment, $185 per hectare for retiring grassed headlands, $100 per hectare ($40 per acre) for retiring highly sloping land, and $250 per hectare ($101 per acre) for building soil

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[268] Martin, M., Radtke, H., Eleveld, B., & Nofziger, S.D. (1988). The impacts of the conservation reserve program on rural communities: The case of three Oregon counties. *Western Journal of Agricultural Economic*, *13*(2), 225-232. See also Mortensen, T.L., Listritz, F.L., Leitch, J.A., Coon, R.C., & Ekstrom, B.L. (1990). Socioeconomic impacts of the conservation reserve program in North Dakota. *Society and Natural Resources*, *3*(1), 53-61.

[269] Prince Edward Island's program was inspired by the original ALUS program in Blanshard, Manitoba, but contains considerable design differences.

[270] On some potato fields, fifty tons of soil are lost per acre following a large rainfall (PEI Dept. of Environment, Energy, & Forestry, pers. comm., May 8, 2008).

[271] PEI Dept. of Environment, Energy and Forestry, pers. comm., May 8, 2008.

[272] Prince Edward Island Department of Environment, Energy, and Forestry. (2009). *Alternative land use services (ALUS) program: Guidelines, applicant information, and application form*. Retrieved June 1, 2009, from http://www.gov.pe.ca/photos/original/af_alusguide.pdf

conservation structures. Payments are set to approximate the median land rental rate across the province.[273]

In the year 2000, PEI required farmers to establish a ten metre vegetated buffer zone along streams and rivers to reduce nutrient loadings and sedimentation into local waterways. In 2008, the buffer was extended to fifteen metres (by far the strongest provincial buffer zone regulation in Canada). The economic impact of the extended buffer impelled PEI ALUS administrators to consider whether EG&S payments should be used to assist farmers in meeting the stronger standard. It was decided that farmers impacted by the expanded buffer could receive payment ($185 per hectare) to expand their buffer from ten to fifteen metres,[274] but that lands within the original ten metre standard were not eligible for payment. Furthermore, PEI's *Environmental Protection Act* prohibits the cultivation of land on slope's of 9% or greater (unless a management plan is put in place). The province was unable to enforce this regulation, and it was determined that ALUS payments would also be offered to entice producers to retire such lands (at $100 per hectare). These two activities are not intended to be permanent features of the ALUS program.

As of May, 2009, 50 PEI ALUS contracts have been signed out of approximately 130 applications received, amounting to roughly 50,000 to 60,000 acres (20,200 to 24,300 ha) of retired land. There is a wide mix of small, medium, and large producers enrolled in the program. Administrators are pleased with uptake thus far.[275]

PEI's experience with agricultural land retirement, though nascent and ongoing, confirms that agricultural land retirement can complement and improve compliance with existing agri-environmental regulations that are not easily enforced.

Implementing Agricultural Land Retirement: Three Main Challenges

Although this research has demonstrated a need to expand the use of marginal and ecologically significant agricultural land retirement in Canada, three issues distinct to its implementation have been identified.

Defining Minimum Regulatory Standards

The ecological goods and services approach is predicated on rewarding farmers for undertaking *voluntary* stewardship activities. Farmers should not receive payment for land-use activities mandated by regulatory standards; doing so would leverage a farmer's ability to demand compensation following the implementation or strengthening of any environmental law regardless of its financial burden. As one example, wetlands that were drained subsequent to 1985 are ineligible for wetland restoration payments through WRP because the practice had become illegal as a result of the Swampbuster cross-compliance provision of the 1985 *Food Security Act*.

[273] PEI Dept. of Environment, Energy and Forestry, pers. comm., May 8, 2009.
[274] Payments are also eligible for up to 15 metres beyond the buffer zone.
[275] *Ibid.*

Of course, one of the main impulses behind the EG&S approach is that environmental regulation has not been particularly effective in the agricultural sector. Non-point source pollution has always presented certain problems to regulators due to its highly dispersed nature, and the fact that farmers are generally hostile to restrictions on private property rights. Cropping has continued within Ontario's mandated three metre vegetated buffer zone stipulated in the *Nutrient Management Act*[276] as well as on land with a slope of 9% and above which is prohibited in PEI.[277] In cases where regulatory standards have not been strongly enforced, a case can be made to outlay EG&S payments even for non-stewardship based activities providing that the purpose is to assist producers in meeting those standards and the payments are only offered temporarily. An alternative approach is to offer compensation for undertaking activities mandated by regulations as long as they are exceeded by a substantial margin. This was the approach used in PEGS, where program eligibility required farmers to plant a thirty foot (nine metre) vegetated buffer along stream-sides, which is three times the width of the three metre buffer mandated by the *Nutrient Management Act*.

To recap, while producers should not be offered funding for undertaking legally mandated activities, direct regulation in the agricultural sector has been ill enforced and the use of EG&S payments can assist producers in meeting said standards as long as payments are temporary and intended to improve compliance.

Determining Whether to Reward Past Stewardship

An inherent weakness implicit in the EG&S approach is that good stewards generally do not receive credit for previous action, while producers who chose to crop marginal lands receive generous payments to retire them. Although it may be ideal to remunerate past stewardship activities, the case of ALUS has proven that this will substantially reduce operating budgets and debase the ecological effectiveness of land retirement as an agri-environmental instrument.

One way this issue has been addressed is to offer payments for previous stewardship providing that producers undertake additional activities. In the Norfolk County ALUS pilot project (not reviewed in this research), program administrators permitted farmers to receive payment for certain lands voluntarily vegetated subsequent to 1990 as long as the producer doubled its extent. This is a thoughtful and effective strategy which works well at a small scale, but is less likely to be successful at the provincial or national level (i.e. how does a landowner prove that such lands were restored within the eligible time period?). Either way, the question of whether to remunerate past stewardship activities engenders a trade-off between equity and ecological/cost-effectiveness, and there is no easy way to remedy it.

Effect of EG&S Payments on the Uptake of Best-Management Practices

When financial incentives are elevated for certain high opportunity cost activities, the uptake of other best-management practices may be adversely affected. This was not found to be a concern relevant to the implementation of CRP or WRP, but it is difficult to speculate how Canadian

[276] ABCA & MVCA, pers. comm., April 22, 2009.
[277] PEI Department of Environment, Energy, and Forestry, pers. comm., May 8, 2009.

farmers will react if land retirement activities receive funding approximating its opportunity cost while other practices continue to receive only 30% to 50% in cost-shared assistance.

Recommended Design Principles for Agricultural Land Retirement

The purpose of this research was to identify the key principles vital to ensuring the effective delivery of agricultural land retirement programs in Canada. Ten design principles are put forth as recommendations for federal, provincial and municipal governments who are looking to expand the use of agricultural land retirement in their jurisdictions:

1. *Set Clear and Measurable Program Objectives*

Agricultural land retirement programs are best suited to attain particular ecological benefits, especially those that cannot accrue from changes in agricultural production practices. Policy-makers should decide whether agricultural land retirement is a desired tool through careful consideration of the environmental concern at hand. When land retirement is the preferred option, clear and measurable program objectives should be defined to focus the program on outcomes and enable assessment of the efficacy of program implementation. Both general objectives (i.e. reduce nutrient loadings into local waterways) and specific objectives (reduce ambient phosphorus levels in a particular watershed by 10%) can be used depending upon the extent to which the ecological benefit can be monitored precisely.

2. *Promote Meaningful Farmer and Local Stakeholder Involvement*

Farmer and local stakeholder involvement in the formulation of agricultural land retirement programs is necessary to ensure that the realities of farming as well as local economic conditions are well understood by policy-makers and the public. The use of multi-stakeholder committees compromised of program administrators and local organizations is a valuable tool to communicate program objectives to those ultimately involved in land retirement, gain feedback from farmers and communities, and foster support for the program itself. Agricultural land retirement should be implemented by local groups previously involved in agricultural extension and outreach, such as conservation authorities/districts or soil and crop improvement associations. While agricultural land retirement programs should be locally-developed and tailored to prevailing environmental concerns, the general program structure and objectives should be made relatively consistent across the province/country.

3. *Target Marginal and Ecologically Significant Lands*

Agricultural land retirement should be exclusively targeted to lands least suitable to agriculture, particularly marginal and ecologically significant lands under production. Marginal agricultural lands can be classified in a variety of ways, including Classes 4,5,6 or 7 in the Canada Land Inventory (ALUS), having a 9% slope or above (PEI ALUS), and/or areas that are annually flooded (WRP). Specifying what classifies as “marginal” requires consideration of local environmental and resource concerns. Similarly, ecologically significant lands such as riparian areas or species-at-risk habitat are sensible targets for agricultural land retirement.

4. *Encourage Benefits Above Regulatory Standards*

As mentioned, payments for provisioning EG&S should be focused on voluntary stewardship activities and not those mandated by regulatory standards, except in extreme circumstances. Such

circumstances can include standards that are not readily enforced, or standards that are being strengthened but are expected to impose a significant financial burden on farmers.

5. *Ensure Stewardship Activities Generate "Additionality"*

It is not possible to remunerate all farmers for past stewardship activities given limited program budgets and the need to ensure agri-environmental programs are predicated on generating outcomes. Nevertheless, program administrators should endeavor to find innovative ways to compensate farmers for past stewardship activities if such activities can be enhanced. If a previous activity cannot be enhanced, it probably should not receive payment. Alternative instruments can be employed to reward farmers and rural landowners for protecting preexisting natural features (i.e. property tax reductions, etc.)

6. *Screen Enrollment with a Benefit/Cost Index*

Finite program budgets necessitate the targeting of funds to agricultural land retirement projects that generate the greatest environmental benefit at lowest cost. This is best accomplished through an application review process assisted by an environmental benefits index that ranks applications based on the projected ecological benefits they will generate and their associated costs. The index should be structured to ensure that the most pressing environmental concerns in a particular area are rewarded with the highest index value.

7. *Require Competitive Bidding*

The use of competitive bidding/reverse auctions substantially improves the cost-effectiveness of agri-environmental programs by revealing to program administrators the lowest price a farmer is willing to accept for undertaking one particular or a range of land management practices. This increases the availability of funds for other programs.

8. *Offer Permanent Easement Contracts*

The use of permanent easement contracts (rather than payments for five or ten year intervals) yields more stable and perpetual ecological benefits. An easement is far cheaper than an outright land purchase, keeps enrolled land under private ownership, and only imposes certain restrictions on land use. Permanent easements should be offered alongside a shorter contract (i.e. ten years, fifteen years) to afford landowners a range of contract options and enable administrators to observe if asymmetries in uptake occur.

9. *Ensure Contract Obligations are Transparent to Landowners and Monitored*

Ensuring that landowner obligations, as sellers of EG&S, are made transparent will prevent incidences of non-compliance. Similarly, contracts must be monitored to ensure that these obligations are being adhered to.

10. *Cap Enrollment*

Agricultural land retirement can adversely affect rural economies dominated by the agricultural supply sector by reducing demand for local agricultural implements such as machinery, seed and fertilizer. Therefore, a land enrollment cap should be placed at either the regional municipality/county or watershed level to mitigate any unforeseen economic impacts on local economies before they transpire.