1.0 Executive Summary

Currently, various Ecological Goods and Services (EG&S) are produced from Canadian agricultural landscapes. Private landowners act as the stewards of these land resources and as such have been responsible for the provision of various EG&S products. There currently are defined markets for many of the Ecological Goods produced from modern agriculture. These lands also produce various Ecological Services that do not have established markets. The provision of wildlife habitat by private landowners is one such scenario where no current value or market has been established for the provision of an Ecological Service.

The Lower Souris Watershed Committee Inc. with the financial assistance of the Advancing Canadian Agriculture and Food (ACAAF) fund have undertaken a policy/research project designed to explore how EG&S tools could be used to achieve desired environmental endpoints in an agricultural landscape.

This project included three distinct components: develop local landscape targets for the quantity and quality of wildlife habit, determine the costs borne by producers to provide wildlife habitat, and explore what EG&S policy tools could achieve the locally developed landscape targets for wildlife habitat.

The need for a detailed inventory of the project area was paramount to the successful development of locally determined landscape targets for both quantity and quality of wildlife habitat. By including local landscape knowledge and

personal values with appropriate biological science achievable landscape targets were established. When determining the associated costs borne by agricultural land owners to provide wildlife habitat it is very important that an appropriate model that utilizes relevant regional inputs be developed. To encourage the maintenance of the EG&S of wildlife habitat provision payment programs to private landowners will be required. Successful development of these programs will be extremely complex due to the dynamic relationship between the agricultural landscape and the evolving business of agriculture.

2.0 Project Background & Rationale for Investigation

Historically, the Lower Souris River Watershed was dominated by fescue grasslands and aspen parkland. Many riparian areas have been eliminated or diminished to narrow corridors along the tributaries, streams and rivers. Typical agricultural crops include cereals, oilseeds and pulse crops. Livestock production, largely beef cow-calf operations are also significant in the area. While agriculture has had a significant impact on altering the landscape of the region the landscape continues to provide diverse Ecological Goods and Services that are important to society. Private landowners currently act as the stewards of the landscape and are responsible for the provision of functional wildlife habitat as part of their regular business practices. As agricultural markets continue to evolve there have been increased economic pressures for landowners to convert natural wildlife habitat acres towards agricultural production acres.

The Lower Souris Watershed Committee Inc. (LS) is a group of rural municipalities, towns and conservation groups in the extreme corner of south eastern Saskatchewan. The LS has completed a source water protection plan for the Pipestone, Antler and Four Creeks watersheds in March 2006. LS was incorporated in 2005, however members have been working on watershed planning since 1999 as members of sub-committees of the three above-mentioned sub-watersheds. Forty-nine representatives of municipalities and local conservation groups sit as representatives of the three sub-watershed committees. Each of the chairpersons of the sub-watershed committees and a representative from the Provincial Council of Agricultural Development and Diversification Boards (PCAB) sit as members of the overarching Lower Souris Watershed Committee. The vision of the LS is, "balancing the economic, environmental, and social values to sustain and improve the watershed for future generations." In 2006, the LS submitted a proposal to the national Advancing Canadian Agriculture and Food fund to develop a pilot ecological goods and services (EGS) project. The Lower Souris EGS proposal consisted of a policy/research project conducted by a grassroots watershed group to aid the development of EGS policy at the national scale. The project resulted in a case study of how EGS tools could be used to achieve desired environmental endpoints in a working agricultural landscape. Three distinct steps were required for this process:

- Set specific landscape goals for the quality and quantity wildlife habitat in the Lower Souris Watershed using a local co-management framework
- Determine the net costs borne by agricultural producers in the Lower Souris to provide targeted quality and quantity wildlife habitat
- Conduct a policy analysis of EGS tools to achieve specific landscape goals for the quality and quantity wildlife habitat in the Lower Souris Watershed.

Achievable, realistic and sustainable project outcomes were expected by involving watershed residents in the development of local wildlife habitat targets, performing economic analysis using regional agricultural information, and including watershed residents in the development of program recommendations.

3.0 Objectives

There were three distinct yet interconnected objectives established at the onset of this project. Each distinct objective is integral to the success of the entire project. The first objective is to determine specific landscape goals for the quality and quantity of wildlife habitat in the Lower Souris Watershed. This objective required two main components: a detailed inventory and setting wildlife habitat targets for the watershed landscape. An extensive inventory of all riparian, aspen parkland and tame grassland wildlife habitat in the Lower Souris watershed needed to be completed. This step was necessary to properly set landscape goals and explore the implications of EGS policy of the case study. Secondly, specific

landscape goals needed to be established using a co-management framework. Landscape goals needed to be set by local watershed representatives using the best available science while considering the goals of wildlife habitat agencies. Secondly there was a need to determine the net costs (or lack thereof) borne by agricultural producers in the Lower Souris to provide the targeted quality and quantity of wildlife habitat in the Lower Souris Watershed. Local historical land use data from an extensive network of producers involved with the LS needed to be collected. This data in combination with agricultural census data was utilized by researchers at the University of Alberta to model the actual net costs borne producers to provide wildlife habitat.

The third project objective is to conduct a policy analysis of the various EGS and non EGS tools to achieve specific landscape targets towards the quantity and quality of wildlife habitat in the Lower Souris Watershed. The results of the previous objectives were to be utilized by members of the LS and a U of S researcher whom specializes in bio-resource policy, business and economics to present options towards EGS policy in the Lower Souris Watershed.

4.0 Funding and Partnerships

The overall success of this project was dependent upon the strong partnerships that were fostered and established during the life of this project. Local municipal and individual participation was vital to ensuring that the local perspective was represented during the duration of the project. Collaboration from provincial and

federal government organizations such as the Saskatchewan Watershed Authority (SWA), Prairie Farm Rehabilitation Administration (PFRA) and the wildlife habitat conservation minded organization, Ducks Unlimited Canada (DUC) were integral to project design and implementation. The partnerships that were fostered with the research teams at the University's of Alberta (U of A) and Saskatchewan (U of S) were paramount to the successful exploration of local concepts and analyzing project data. The major financial funding towards this project was provided by the Advancing Canadian Agriculture and Agri-Food (ACAAF) fund administered by Agriculture and Agri-Food Canada. The local residents, municipalities, SWA, DUC, and partnering Universities all provided personal resources or additional financial support towards the successful completion of this pilot project. By engaging a broad representation of our watershed community we were able to accomplish what this project set out to achieve.

5.0 Methods and Implementation

The project was designed to achieve three distinct project goals. The overall project results were dependent upon the successful completion of each of these individual goals.

5.1 Determine specific landscape goals for the quantity and quality of wildlife habitat in the watershed using a local co-management framework

In order to focus the project we divided the target setting exercise into quantity and quality of wildlife habitat. A detailed inventory of the existing landscape in addition to a co-managed target setting exercise was required to determine the local targets towards quantity and quality of wildlife habitat.

5.1.1 Quantity of wildlife habitat in the watershed

To achieve this specific project outcome there was a need to break this into two distinct steps. A detailed inventory of the current level of wildlife habitat within the watershed along with co-managed determination of local wildlife habitat targets for the watershed landscape was required.

The detailed inventory was performed by qualified project partners at DUC following an agreement to jointly develop a comprehensive land cover inventory for the Lower Souris River Watershed. Within this agreement DUC assumed responsibility for the production of a high resolution biophysical inventory to quantify the abundance and distribution of aquatic and terrestrial habitats across the LSRW. These baseline data would serve as the primary information source for the broader project.

Within this agreement a basic framework of project governance was established. LS struck a steering committee of technical experts from partner agencies, SWA and the PFRA to develop and approve functional requirements, project specifications, and project deliverables required for the broader EG&S project.

DUC assumed responsibility for the production aspects of the project such as: project management, procurement selection, quality assurance processing, and documentation of final deliverables, Boychuk (2009). Within the project governance structure, the technical advisory group provided guidance on a number of issues that arose during the project lifecycle; decisions affecting project scope were vetted through the technical advisory group before they were implemented.

The scope of the project included the photogrammetric mapping of Lentic Wetland features utilizing existing collection, quality assurance, and geoprocessing protocols developed by DUC on similar projects across Prairie Canada. Additionally, DUC in conjunction with external experts developed and applied similar procedures for mapping the lotic areas within the watershed using photogrammetric techniques and procedures. Finally, DUC remote sensing experts utilized SPOT 5 multispectral imagery with object-oriented image analysis techniques to characterize the terrestrial portion of the watershed. All base data were integrated into a number of data deliverables required to meet project objectives.

The co-managed determination of local targets towards quantity of wildlife habitat involved a process that engaged the local watershed representatives to infuse local knowledge, personal values and interests with science based information regarding the relationship between habitat quantity and wildlife

abundance. Watershed representatives were presented the wildlife abundance models that had been developed by White (2007). Participants were encouraged to express their personal values and concerns surrounding land use management and associated provision of wildlife habitat. Using all of the information available to them local watershed representatives developed collaborative wildlife habitat quantity targets for the watershed area.

5.1.2 Quality of wildlife habitat in the watershed

In order to establish locally determined targets for the quality of wildlife habitat within the LSRW a two phase exercise was utilized. The first step was to determine the current state of the various wildlife habitat types within the watershed area. The methods chosen to accomplish this were rangeland health and riparian health assessments. These assessment protocols evolved out of range management science to assess the ability of ecosystems to perform essential ecosystem functions. Theses techniques use a variety of biotic and abiotic measurements to determine the extent to which a riparian area is performing filtration, sediment trapping, biomass production, erosion control and groundwater recharge, Adams et al. (2005). These assessments are generally performed by a walk through assessment and ocular estimates of key site indicators. This is an efficient sampling method and is a good indicator of land management impacts on a site. Each indicator is given a score and scores are

summed to give a total percent health. Dependent on the percent health sites are described as either: healthy, healthy with problems or unhealthy.

Many of the variables gathered in range and riparian assessments are good correlates of habitat structure for wildlife. For example, range condition (a component of range health) was found to be a predictor of habitat quality for grassland songbirds in Saskatchewan, Davis (2005). Warren (2004) found that range health was a good predictor of habitat quality for waterfowl in east central Alberta. In general, healthy rangeland and riparian areas will have tall structure, heavy cover and little bare ground. Unhealthy rangeland and riparian areas typically will have low habitat structure. It is important to note that wildlife species preference for high or low habitat structure is variable and it may desirable to have a variety of habitat structure on the landscape, White (2007). A health assessment technique does not currently exist for cropland so cropland habitat was classified as cereal, oilseed or summer fallow.

The second phase to determining local landscape quality goals involved engaging local watershed representatives to infuse local knowledge, personal values and interests with science based information regarding the relationship between wildlife abundance and habitat quality. Watershed representatives were presented the wildlife abundance models that had been developed by White (2007) as a portion of this project. Using all of the information that was available to them the

local watershed representatives collaboratively developed wildlife habitat quality targets for the watershed area.

5.2 Determine the net costs borne by agricultural producers in the Lower Souris to provide targeted quality and quantity wildlife habitat

In order to develop a meaningful model that would simulate the costs associated with provision of wildlife habitat by landowners within the Lower Souris Watershed area local producers were surveyed regarding their historical land use practices, Entem et al (2009). The specific purpose of the survey was to collect information on the provision of wildlife habitat in many different farm settings. Rather than interviewing producers regarding their land practices on a farm-wide basis, producers were asked to provide management information regarding a piece of their land that is managed as a unit. The interview was designed to collect information on fields where wildlife habitat has been "lost", "maintained" or "enhanced" through farm activities. The survey was divided into three primary sections: identifying wildlife habitat and costs of conversion; identifying inputs, operations and production from cropping enterprise; and identifying inputs, operations and production from grazing and haying enterprise. This information in conjunction with varying crop prices, beef prices and weather trends was used to simulate a representative mixed farm from the project area. This farm was representative of mixed farms within the Lower Souris River watershed with 116 head cow beef herd, 960 acres of annual crop production and 960 acres of hay,

tame pasture and native pasture. A stochastic simulation farm model was developed, Dollevoet et al (2009) to estimate the benefits or costs of implementing various Ecological Goods and Services (EG&S) scenarios at the farm level using net present value (NPV) analysis. NPV is a measure of farm wealth in these models.

Three general scenarios were modeled in this study to estimate the benefits or costs to the farm. These scenarios were defined as follows:

- landowner maintains habitat rather than converting this habitat to cropland, either by draining wetlands or clearing bush;
- landowner converts cropland to tame grass, through converting a whole field which increases EG&S
- landowner reduces grazing pressure on pasture lands, through a lower stocking rate or by adding cross fencing and off stream watering

It is recognized that representative farm modeling results are highly sensitive to model assumptions about costs, production and output prices. The base model uses input costs from 2005 although some alternative scenarios using an average of 2007 and 2008 input costs and output prices were presented.

5.3 Conduct a policy analysis of EGS tools to achieve specific landscape goals for the quality and quantity wildlife habitat in the Lower Souris Watershed

In general EGS policy instruments can be categorized as either regulatory approaches, economic instruments, market measures or advisory and institutional

measures. While each of these measures can play a role in increasing the quantity and quality of ecological goods and services provided by agriculture, economic instruments are receiving more attention as a viable policy alternative. We set out to quantify the impact that land management payments will have on the provision of wildlife habitat within a study region of the Lower Souris Watershed in South Eastern Saskatchewan. Specifically this analysis focused on the costs and habitat benefits of converting annual cropland, and to a lesser extent native grass and aspen, to perennial forage.

An analysis based on land cover data, at the quarter section scale, was performed on a sample of 3 Rural Municipalities within the Lower Souris watershed, Belcher (2009). It was recognized that opportunity costs would be variable from farm to farm and even from field to field. An indicator that was used as a partial proxy for these costs was the land assessment value for each quarter section. The magnitude of the land assessment value corresponds to the relative productivity of the land and was used to represent the opportunity cost of the land.

Following a consultation process that reviewed the overall project information the local watershed representatives formulated final policy recommendations that would aid in achieving the determined landscape targets for wildlife habitat within the project area. While developing these policy recommendations the representatives were asked to consider the following five points: are the initial targets realistic, is the recommended program achievable and practical, will the

program be socially acceptable, is this recommendation fiscally responsible and does this type of program promote unintentional actions.

6.0 Project Results

6.1 Specific landscape goals for the quantity and quality of wildlife habitat in the watershed using a local co-management framework

Establishment of targets towards the quantity and quality of wildlife habitat within the Lower Souris Watershed area followed an informative process that engaged local watershed representatives to express individual ideals and values in addition to consideration of scientifically pertinent information.

6.1.1 Quantity of wildlife habitat in the watershed

At a meeting held on April 4, 2008 initial wildlife habitat targets for the watershed were established. Members were presented the wildlife abundance models developed by White (2007). By infusing local knowledge, personal values and interests with the information produced by the report produced by White (2007), members were to develop the initial wildlife habitat quantity targets for the watershed area.

Over the course of this exercise numerous goals and values were brought forward for consideration by the group members. The group emphasized that the landscape needs viable industries that generate economic outputs in conjunction with providing sustainable wildlife habitat. An appropriate balance of industry and environment is needed to sustain quality of life and natural resources. Along

with these points the group wanted to ensure that EG&S programs would encourage the maintenance of natural resources while improving land management practices and promoting economic activity within the region. Considering all this information the watershed representative's were then asked to develop locally set targets towards what portions of the watershed they wanted to be in the following habitat classes: Lentic Riparian, Lotic Riparian, Perennial Forage, Native Grasslands, Aspen and Crop (Figure 1).

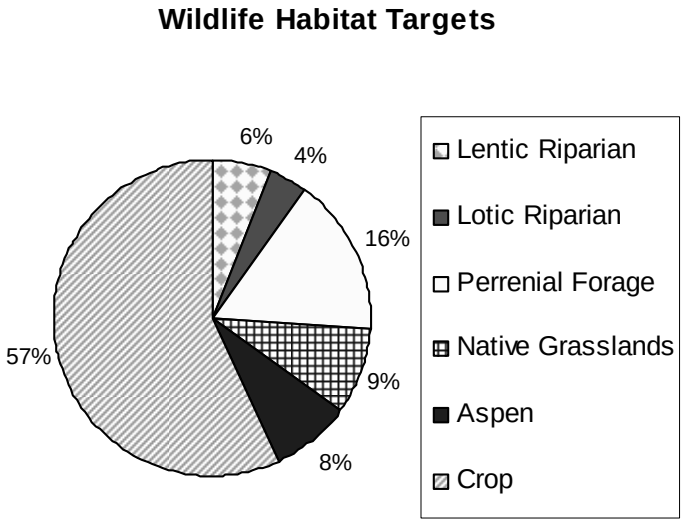

Figure 1 *– Landscape type targets towards the provision of wildlife habitat within the Lower Souris Watershed.*

The results of the detailed inventory (Figure 2) that was performed by DUC, Boychuk (2009) were presented to the watershed representatives collectively on February 25, 2009.

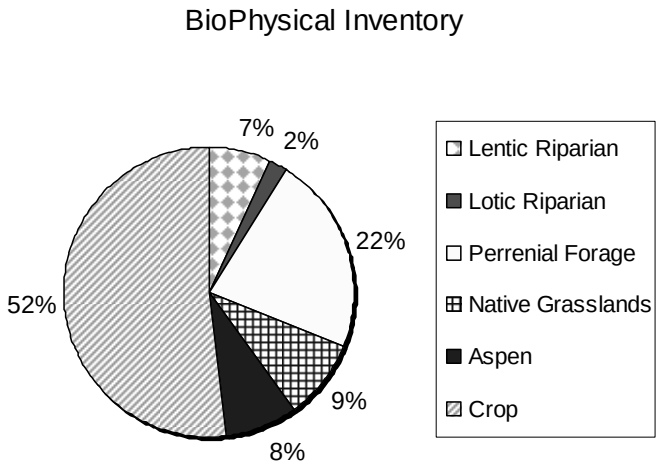

Figure 2 *– Landscape types as determined by DUCS detailed inventory of the Lower Souris Watershed.*

Members discussed the results of the biophysical inventory. Upon review of this information the watershed representatives were to determine if they wanted to adjust any of the initial wildlife targets that they had established. The group reach consensus that the wildlife habitat quantity targets that they previously determined were achievable, responsible and realistic. The watershed representatives were astonished with how closely the bio-physical inventory conducted by DUC mirrored the landscape targets that they had established. They noted that there is a portion of agricultural lands that will adapt between perennial forage and annual crop in response to fluctuating agricultural markets.

6.1.2 Quality of wildlife habitat in the watershed

At the target setting meeting hosted on April 4, 2008 watershed representatives were introduced to the concepts of range, riparian and forest health assessments as discussed in Soulodre (2008) then asked to develop targets for the state of habitat quality within the watershed for the following land classes: Lentic Riparian, Lotic Riparian, Perennial Forage, Native Grasslands, and Aspen (Table 1).

	HEALTHY	HEALTHY WITH PROBLEMS	UNHEALTHY
PERRENIAL FORAGE	30%	63%	7%
NATIVE GRASSLANDS	36%	57%	7%
ASPEN	42%	53%	5%
LOTIC RIPARIAN	75%	22%	3%
LENTIC RIPARIAN	67%	23%	10%

Table 1 *– Wildlife Habitat Quality Targets for the Lower Souris Watershed*

Habitat quality assessments were performed across the entire watershed by the Lower Souris Watershed, Soulodre (2008). The compiled results of these 379 individual health assessments are presented below (Table 2).

ASSESSMENT TYPE	# OF ASSESSMENTS	AVERAGE % HEALTH
NATIVE GRASSLANDS	62	33
PERRENIAL FORAGE	78	73
ASPEN	42	39
LOTIC RIPARIAN	79	73
LENTIC RIPARIAN	118	75
	379	

Table 2 *- Summary of health assessments in the Lower Souris River Watershed*

The data from these 379 individual site assessments was reviewed and compared to the Wildlife Habitat Quality Targets that had previously been determined by the watershed representatives (Table 3).

	HEALTHY	HEALTHY WITH PROBLEMS	UNHEALTHY
PERRENIAL FORAGE	46%	49%	5%
NATIVE GRASSLANDS	2%	18%	80%
ASPEN	5%	29%	66%
LOTIC RIPARIAN	28%	62%	10%
LENTIC RIPARIAN	41%	41%	18%

Table 3 *– Results of detailed Wildlife Habitat Quality Survey for the Lower Souris Watershed*

The watershed representatives were collectively gathered on February 25, 2009 to discuss the results of the wildlife habitat quality survey. Upon review of this information the group recognized that the results of the wildlife habitat quality survey do not align well with the quality targets that were established. They chose not to alter the initial targets due to belief that the quality targets established are achievable, responsible, realistic, and will have a benefit to the long term sustainability of agricultural enterprises.

6.2 Net costs borne by agricultural producers in the Lower Souris to provide targeted quality and quantity wildlife habitat

The producer survey results were compiled from a total of 87 distinct parcels of land operated by 62 individual farms totaling 154,980 acres, Entem et al (2009). The farms surveyed by the Lower Souris Watershed Committee averaged 2,626 acres. On average, a farm would manage 1,616 acres of annual cropland. Forty of the 62 farms (65%) manage livestock. Amongst those 40 farms, the size of the livestock operation varied between 39 animals and 882 animals. The surveyed farms contained on average 483 acres of tame forage that could be used for

haying, grazing or a combination of the two. The farms also averaged 640 acres of native land that could be used for livestock production. On the 87 units of land surveyed, annual cropland made up the largest percent of land use during 1998-2008. Tame forage occupied the second largest percentage of land, and Aspen Parkland and riparian areas were the third most common land uses. Many producers in the area often stated economic reasons for their current land use division. Even ecological reasons (productive capacity of the soil, poor cropping soil, light soil etc.) often had an economic basis.

In order to understand the biophysical and economic results of implementing practices that promote EG&S development of a working simulation model, Dollevoet et al (2009) was required. A model that defined all the basic working relationships within a representative farming operation was needed. The representative farm was developed based on expert opinion and data from the 2006 Canadian Census of Agriculture.

The model then predicted out comes for the three defined EG&S scenarios at the farm level. It was determined that converting riparian habitat to annual cropland provides significant positive benefits to the farm. The model suggests that the benefits may be in the range of $70/acre/year for each acre converted. However if the riparian areas are already being used for grazing, converting riparian areas to pasture would not be economic with the benefits to the farm being a net cost of -$38/acre/year for each acre converted. The additional grazing capacity after

conversion is not sufficient to offset the costs of conversion from riparian habitat to pasture. Converting forested habitat to either annual cropland or pasture provides a significant positive benefit to the farm if the converted acres have similar productivity to the adjacent cropland.

The net benefits to the farm of converting existing annual cropland to tame pasture or hay is highly dependent upon annual crop prices (e.g. canola, wheat, barley) relative to calf prices or the price of tame hay. Under the model scenarios evaluated, there may be a small benefit to the farm to convert more crop land to pasture. However, due to the relatively lower market price for hay in the model, the benefits of converting annual cropland to hay land are negative at -$49/acre/year of land converted.

Management of existing farm resources such as native pasture and tame pasture carrying capacities are important to the financial health of the business. If the pasture is in a reduced carrying capacity, strategies to improve the grazing capacity can be implemented. For example the farm could decrease stocking rates under the assumption that pasture forage production would then increase over time. The economic outcome of this strategy is highly dependent upon how quickly the grazing capacity improves. Adding cross fencing and off stream waters (e.g. rotational grazing) can provide a small economic benefit to the farm if it results in improved forage production of at least 1%/year for six years. If management practices are joined with cross fencing and off- stream waters such

that forage production can be increased by 7% or more then these investments may have a positive economic impact on the representative farm.

6.3 Policy analysis of EGS tools to achieve specific landscape goals for the quality and quantity wildlife habitat in the Lower Souris Watershed

The watershed representatives were provided background information on the various policy tool classifications that may be used to increase the quantity and quality of EGS provided by agriculture. In general these EGS policy instruments were categorized as either regulatory approaches, economic instruments, market measures or advisory and institutional measures. The watershed representatives decided that economic instruments were the most viable policy alternative in order to achieve the determined landscape targets. As such the analysis provided by the University of Saskatchewan focuses upon the efficacy of such a program in the Lower Souris Watershed area, Belcher (2009).

For the purpose of this project three representative Rural Municipalities within the Lower Souris Watershed (Silverwood, Reciprocity and Storthoaks) were studied. Project results show that for an extensive program of converting approximately 350,000 acres of annual cropland, grass and aspen to perennial forage within the study area, will require in the range of $0.75 to $1.25 million in annual payments. A more moderate program of converting 95,000 acres of annual cropland to perennial forage will require from $240 to $390 thousand in annual payments. The analysis also shows that the conversion of annual cropland to perennial

forage conserves significant areas of wetlands. To conserve equal areas of wetlands through a direct wetland payment would cost approximately $2 million and $778,000 for the extensive and moderate program respectively. The policy analysis provides support for targeting lower value land in habitat programs, for both economic and ecological good and service reasons.

The complete project information was reviewed with the local watershed representatives and they were tasked to develop final policy recommendations. The watershed representatives concluded that it is evident that if the current level of wildlife habitat is to be maintained within the Lower Souris Watershed there is a need for annual payments to be made across all landscape types. These annual payments need to align with the opportunity costs borne by the individual landowner who continues to provide EG&S services. It was discussed that these payments will not only have a positive effect on the current quantity of wildlife habitat but there may be a positive shift in the associated quality of these areas.

7.0 Conclusions

It must be understood that agricultural land and wildlife habitat are not separate and mutually exclusive entities. Agricultural practices have varying effects on wildlife habitat provision. In order for realistic, achievable, responsible and sustainable targets towards wildlife habitat to be established for local landscapes, broad representation of all effected individuals and organizations need to be involved in the establishment of these values. Landscape targets need to consider

local knowledge, societal goals, relevant biological science and individual values. Paramount to the success of developing local landscape targets is the requirement to have a detailed bio-physical inventory that acts as the benchmark to measure future landscape changes.

The economic conclusions regarding EG&S farm level costs and benefits in the Lower Souris region are mixed. Farms generally have clear market incentives to reduce EG&S habitat (i.e. riparian or forested) when this land can be converted to production of annual crops, Dollevoet et al (2009). In the case of forested land there is also a positive economic benefit to convert this land to pasture. Adding cross fencing and off stream watering site provides an economic benefit to the farm only if the associated pasture management changes (i.e. improved rotational grazing) lead to significant increases in the carrying capacity of the native and tame pasture.

It is evident that if the current level of wildlife habitat is to be maintained within the Lower Souris Watershed there is a need for annual payments to be made. Developing an EG&S program that will effectively address the ever evolving business of agriculture and the ever changing landscapes where agriculture is practiced will be extremely difficult and complex.

8.0 Future Considerations

As the discussions surrounding EGS evolve it needs to be recognized that the continued reliance upon landowners to be responsible stewards of ecological

services that hold undefined market values is an unsustainable policy. EGS are as highly variable as the ecosystems that provide them, regional and ecosystem based programs need to be developed. Therefore, scaling up of policy recommendations for the Canadian agricultural landscape should be done with caution. In addition, in the absence of detailed, spatially referenced information, implications of EGS program scenarios can only be predicted based on general trends of land cover and as such will not precisely reflect the landscape. EGS programs need to recognize there are associated opportunity costs associated with alternative land use practices to be effective.

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