Literature Review and Conceptual Framework for an

ENVIRONMENTAL BENEFIT INDEX FOR WETLAND RESTORATION ON PRIVATE LANDS IN THE GREENBELT REGION OF ONTARIO, CANADA

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CREDIT VALLEY CONSERVATION

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GLOSSARY OF TERMS

Command and Control Policy Instrument: The policy instrument that relies on regulating human behavior through government rules and regulations such as requirement of taking a permission to build certain structures on farmland, prohibition on hunting certain species, and protection of habitat for endangered species.

Environmental Benefit Index (EBI): EBI is a tool used to produce a composite score of multiple environmental benefits, and is commonly used to compare environmental benefits from competing suppliers of ecosystem services specifically in reverse auctions.

Information rents: In many cases of supply of ecosystem services, landowners/ providers may have information about productivity, the current state of ecosystem services, and potential of improvement in different ecosystem services, and this information may not be available to buyers. In such cases, providers may charge a fee/cost higher than the minimum required by a provider to supply a given ecosystem service. In such cases, the difference between the actual fee charged and the minimum payment required, which is due to the private information of supplier, is known as information rent.

Market Based Instruments (MBIs): Policy instruments that use markets, prices, or other economic means to address negative environmental externalities are known as MBIs. These instruments are also known as economic instruments or price-based instruments. Examples include carbon taxes, emissions trading, other tradable permit systems, and reverse auctions for ecosystem services. These instruments differ from voluntary agreements (agents voluntarily agree to address environmental externality) and regulatory (command-and-control) instruments (example – government regulations about protection of endangered species). However, implementation of a MBI may also require some government regulation.

Perverse Incentive: An incentive that has an unintended and undesirable result which is contrary to the interests of the incentive makers is known as perverse incentive. For example, a well-intentioned government policy of development restrictions on landowners who find endangered species on their property may encourage pre-emptive habitat destruction by landowners who fear losing the use of their land due to the presence of an endangered species.

Reverse auction: An auction in which the roles of buyer and seller are reversed. In an ordinary/normal (also known as a forward auction), buyers compete to buy a good/ service by increasing their bid prices. In a reverse auction, sellers compete to supply goods/ecosystem services to a buyer by decreasing their bid costs.

EXECUTIVE SUMMARY

In the Greenbelt region, wetlands cover approximately 12% of the area, and these wetlands provide multiple ecosystem services worth more than one billion dollars per year. A high proportion of these wetlands is under private ownership and requires restoration and rehabilitation. Globally, a wide range of market based instruments have been used to promote restoration and rehabilitation of degraded ecosystems, but reverse auctions (RAs) have advantages over other instruments because of the competitive bidding process involved.

The design and implantation of RAs is a complex process involving multiple steps. In the Credit River Watershed (CRW), the initial steps of valuation of ecosystem services and landowners' views and preferences for wetland restoration have been completed through previous studies. The next step is to develop a measure for improvement in ecosystem services resulting from wetland restoration activities; this study aims to achieve this. The study focuses on an developing a Greenbelt-specific Environmental Benefit Index (EBI), a composite index to measure incremental changes in multiple ecosystem services as a result of undertaking a specific restoration activity.

The study reviews economic fundamentals of RAs and different reverse auction processes and EBIs used in the USA, Australia, and Canada. The study includes reviews of key features and EBIs used in: (i) the Conservation Reserve Program and Wetland Reserve Program of the USA; (ii) the Victorian BushTender Program, the New South Wales Environmental Services Scheme, and the West Australian Auction for Landscape Recovery Program of Australia; and (iii) Wetland Restoration in the Assiniboine River Watershed Program, and Water's Edge Transformation Program of Canada. The study also reviews two key documents – the CVC Wetland Restoration Strategy and Ontario Wetland Evaluation System – to identify Greenbelt-specific features of the EBI.

The study recommends a framework for a Greenbelt-specific wetland restoration EBI that includes biological, hydrological, and social benefits, and each of three benefits has been assigned equal weight. The EBI includes 17, 7, and 9 attributes of biological, hydrological, and social benefits, respectively. It is recommended that these attributes and their maximum scores be refined as per the local conditions of a RA.

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1.0 INTRODUCTION

The Greenbelt Act, 2005 created a permanently protected area of approximately 720,000 hectares in Ontario. This act protects environmentally important lands and farmlands from urban sprawl. The Greenbelt includes the Niagara Escarpment, Oak Ridges Moraine, and lands designated as Protected Countryside, and it covers the majority of Ontario's Golden Horseshoe region – Canada's most populated and the fastest growing region. A Natural Heritage System (NHS) of about 219,000 hectares, where the main focus is on protecting, restoring, and reconnecting natural features such as wetlands and woodlands and their functions, is one of the key features of the Greenbelt (Ducks Unlimited Canada et al., 2012).

Wetlands are an integral part of any NHS and provide multiple ecosystem services including biodiversity, climate regulation, erosion control, flood control, low flow augmentation, recreation opportunities, sedimentation retention, water filtration, and waste treatment. Wetlands cover about 96,000 hectares (about 12%) of land across the Greenbelt and provide ecosystem services worth $1.3 billion (in 2005$) per year (David Suzuki Foundation, 2008). More locally, within the Credit River watershed, wetlands were shown to be the most valuable of all natural land types providing at least $187 million (in 2007$) per year in ecosystem services to the residents of the watershed (Kennedy and Wilson, 2009).

Wetlands' ecosystem services reduce the need of financial investment in basic infrastructure such as water filtration and flood and erosion control measures. A report by Marbek Resource Consultants (2011) (cited in Ducks Unlimited Canada et al., 2012) estimated a return of $35 from every dollar invested in protecting wetlands around the Great Lakes.

Land use changes, however, have resulted in the loss of and degradation of the ecosystem services wetlands provided. Ducks Unlimited Canada (2010) estimate that less than 15% of wetlands, as compared to pre-European settlement in Canada, are left in southern Ontario, and parts of eastern Ontario. The Government of Ontario has created a strong legal and policy framework to protect wetlands in the Greenbelt region, and there is some evidence that the regulatory framework is quite effective in protecting many wetlands from development activities (Ducks Unlimited Canada, 2012). However, infrastructure development, aggregate extraction, intensifying agricultural practices, peat extraction, and water takings still continue to adversely impact wetlands in the region (Ducks Unlimited Canada, 2012).

In the Greenbelt region, a high proportion of wetlands are under private ownership. Hence, effective and efficient economic instruments such as market based instruments (MBIs) are required to effectively engage farm and non-farm rural wetland owners in wetland restoration programs. MBIs, such as carbon taxes, carbon trading mechanisms, and reverse auctions for supply of ecosystem services, are policy instruments, that encourage human behavioural changes through their impact on market signals (such as prices) rather than through directing human behavior by government regulations. MBIs, as compared to command-and-control mechanisms, provide greater flexibility to landowners in resource management decisions, and therefore are preferred because they are more efficient.

Governments have used a wide range of economic instruments to influence private land management including fixed price grants and tax incentives but reverse auctions (RAs) have theoretical advantage over other MBIs because of the competitive bidding process in RAs can increase the cost effectiveness of resource management practices. RAs were found to be seven times more cost-effective than a fixed price approach for protecting native vegetation in Australia (Stoneham et al., 2003). Similarly, Selman et al. (2008) reported that in Pennsylvania, USA, phosphorous reduction management practices were delivered seven times more economic efficiently using a RA as compared to fixed pricing used in the USDA Environmental Quality incentive Program. Hence, RAs have been used in many countries, including Australia, Canada, Germany, and the USA, to positively influence human behaviour towards environmental and resource management practices.

Generally, the design of MBIs, including RAs, is based on the economic assumption that all actions of landowners are motivated by their economic self-interest only. However, there is ample evidence that people's behaviour is also motivated by other interests, such as social and environmental preferences (Lambert, 2006). In environmental decision making, environmental preferences (Agrawal, 2005) of individuals, influenced by everyday practices, social capital, technology, and other social & cultural aspects (Raffles, 2002), play a critical role. For example, environmentally conscious landowners may undertake some wetland restoration activities by themselves and recognition of such efforts may motivate these landowners to enhance their restoration activities. Hence, the inclusion of environmental preferences in the design of MBIs for environmental services is necessary. RAs that include economic, social, and environmental preferences can be termed as composite reverse auctions (CRAs). CRAs include monetary rewards based on self-interest economic preferences and non-monetary rewards/contributions

(such as landowner's recognition, information about effects of wetland loss, and technical support) based on the social and environmental preferences of landowners. In a study of landowners views on wetland enhancement and restoration in the Credit River Watershed (CRW), Trenholm et al. (2013) found that Information on how wetland loss effects them, concern over wetland loss, technical assistance, and neighbour's actions to enhance or restore wetlands are better or at least as good motivators as financial incentives.

The design and implementation of a CRA is a complex process. Generally, this process is location specific and involves many steps. Key initial steps of this process are to develop: (i) an understanding of the key ecosystem services and their relative importance for the area; (ii) an understanding of landowners' views on wetland restoration; and (iii) an understanding of economic and environmental preferences of landowners. In the case of the CRW, this information was obtained with the completion of two studies funded in part by the Friends of the Greenbelt Foundation. In 2009, Kennedy and Wilson completed a valuation of ecosystem services and in 2013 Trenholm et al. assessed landowners' views about wetland restoration and their economic and environmental preferences.

The next step towards designing the CRA for the CRW is to develop a measure for improvement in ecosystem services resulting from wetland restoration activities. An Environmental Benefit Index (EBI) is a composite index that allows for the measurement of many ecosystem services and is commonly used in RAs to measure the change in ecosystem services as a result of undertaking a specific restoration activity. The main advantage of using an EBI is that it provides the flexibility of assigning different weights for different ecosystem services but at the same time it aggregates all ecosystem services into one index.

The purpose of this project is to develop an EBI specific to wetlands and suitable for use within the local Greenbelt context. The proposed EBI will allow users to measure environmental as well as social benefits associated with undertaking a wetland restoration project. The EBI will be used to evaluate the cost effectiveness of environmental benefits from proposed wetland restoration and rehabilitation projects, specifically in rural areas of the Greenbelt. In the future, Credit Valley Conservation (CVC) hopes to administer a CRA wetland restoration program utilizing the EBI developed in this project, as the tool to assess proposed wetland restoration projects for their environmental and social benefits and base project funding decisions on.

The wetlands located in the CRW will be treated as a representative sample of the wetlands in the Greenbelt area. Therefore, the EBI will be developed for the CRW but it will be designed to be applicable to all lands across the Greenbelt. Accordingly, in the next section we present a review of literature related to economic instruments, auctions, and EBI development. In Section 3, CVC Wetland Restoration Strategy (2009) and the Ontario Wetland Evaluation System (2013) are described because they include important elements that will be considered in the proposed conceptual EBI, which is described in Section 4.

2.0 LITERATURE REVIEW

Increasing economic and human population growth has contributed to a rapid and continual decline in the abundance and health of natural features such as wetlands and forests that provide ecosystem services. The decline of many ecosystem services such as water quality, availability of water and decreased biodiversity have resulted in the recognition of the importance of ecosystem services and the development of incentive mechanisms for their provision (Wunder et al., 2008; Pagiola et al., 2008). Globally, about 290 programs for ecosystem services provision have been identified (Landell-Mills and Porras, 2002). The basic economic principle of these programs is that those who benefit from ecosystem services should pay, while the providers should be compensated (Pagiola et al., 2008). These programs consist of various MBIs such as direct payments, tradable credits and permits, and auctions (Wunder et al., 2008). Direct payment mechanisms include direct payments for inputs such as seedlings, direct payments for management practices, and direct payments for outputs/results. Carbon emission reduction credit is a good example of tradable credits. This project focuses on reverse auctions, and as such, we will limit our review to auctions.

2.1 Auctions

In the case of provision of ecosystem services, there is knowledge asymmetry - buyers know less than landowners/providers about the cost of providing ecosystem services (Ferraro, 2008; Klimek et al., 2008). Hence, the providers/landowners can use their private information to get more money for supplying less ecosystem services (Ferraro, 2008). Information rents have been observed in ecosystem services programs in the US, Europe and Central America (Ferraro, 2008). In a review of Costa Rica's watershed program, Hartshorn et al. (2005) found that 71% of forest protection contracts were on land designated for the lowest value uses, while payment rates were set to be above average returns from cattle pasture. Pagiola (2008) found that the program results in paying for the adoption of land use practices that would have been adopted anyways. Similarly Claasen et al. (2008) found that in early years (1986-1990) of the US Conservation Reserve Programme (CRP), landowners received annual payments well in excess of market rates for annual rental (Claasen et al., 2008).

Auctions can be used to combat this situation and make ecosystem services provisioning programs more cost-effective by creating a mechanism so that buyers pay land owners as per their individual opportunity costs of providing ecosystem services (Klimek et al., 2008; Schilizzi and Latacz-Lohman, 2007; Rousseau and Moons, 2008). Without the use of a competing

process in auctions, a buyer can only offer a flat rate, which is not cost-effective (Klimek et al., 2008). For example, at a flat rate, farmers who already managed their land in an environmentally sustainable way have a greater incentive to join an ecosystem services scheme than farmers with less environmental farming practices. The former will have to make fewer, less severe, and less costly changes to current farming practices (Latacz-Lohmann and Schilizzi, 2005; Jack et al., 2008). This will result in comparatively small additional environmental benefits (Ferraro, 2008; Latacz-Lohmann and Schilizzi, 2005; Rousseau and Moons 2008). Paying low-cost landowners less also makes resources available for contracts with higher opportunity cost landowners, who are more likely to provide substantially different levels of services in the absence of a contract (Ferraro, 2008; Rousseau and Moons, 2008). However, these advantages of auctions are achieved by incurring transaction costs that can be substantial in many cases. Transaction costs include information costs for surveying and designating areas of environmental sensitivity and designing management prescriptions; contracting costs including promotion of the program to farmers and other rural landowners, negotiation between landowners and agency, and administration of contracts; costs of compliance monitoring and enforcement, environmental monitoring and program evaluation. In addition, a large pool of bidders is necessary to induce competitive pressures and reduce incentives to collude or otherwise behave strategically (Latacz-Lohmann and Schilizzi, 2005; Rousseau and Moons, 2008).

2.2 Reverse Auction Mechanisms and their Attributes

An ecosystem services related auction is a process through which a buyer of ecosystem services invites bids (tenders) from suppliers of ecosystem services and then buys the provision of stipulated ecosystem services with the lowest bids (Ferraro, 2008). These are known as reverse auctions (RAs) because in these cases a buyer invites bids while in normal auctions a seller invites bids. RAs, in this way, create competition among the bidders to reduce the incentive for inflated prices (Ferraro, 2008), and induce bidders to reveal their cost of delivering ecosystem services included in bids to buyers (Jack et al., 2008). In ecosystem services related RAs, bidders are competing for either a limited number of conservation contracts or limited financial resources, and therefore they face a trade-off between a higher net gain from a higher bid and a reduced chance of winning (Jack et al., 2008). Competitive bidding thus reduces over-

compensation and increases cost-effectiveness[1] of ecosystem services provisioning contracts (Ferraro, 2008; Jack et al., 2008).

Although RAs are not commonly used in the provisioning of ecosystem services within Ontario, Table 1 below lists many examples of RA programs applied worldwide.

Table 1: Overview of Reverse Auctions for the Provisioning of Ecosystem Services

(Source: Rousseau and Moons, 2008)

	Name of Program	**Country/Region**	**Aim**
1	BushTender, EcoTender RiverTender, BushReturns Gippsland Trial	Victoria, Australia	Protect river health and native vegetation
2	CarbonTender	Victoria, Australia	Carbon sink creation
3	Auction for Landscape Recovery	Western Australia	Biodiversity enhancement, salinity control, groundwater recharge abatement
4	Catchment care	South Australia	Protect biodiversity and improve water quality
5	Liverpool plains	New South Wales, Australia	Counter dry land salinity and protect biodiversity
6	Environmental Services Scheme	New South Wales, Australia	Carbon sequestration, terrestrial biodiversity, salinity, soil erosion, water quality and acid sulphate soil mitigation
7	Landscape auction	Queensland, Australia	Counter dry land salinity and protect biodiversity
8	Vegetations incentives program	Queensland, Australia	Protect native vegetation
9	Water's Edge Transformation Program	Ontario, Canada	Improve water quality, limit nutrient leaching or runoff and reduce overall on-farm vulnerabilities
10	RA for Wetland Restoration in the	Saskatchewan, Canada	Wetland Restoration

[1] Watershed Evaluation of Beneficial Management Practices (WEBs) project, funded by Agriculture and Agri-Food Canada (AAFC) and Ducks Unlimited Canada, examined the environmental and economic performance of selected agricultural beneficial management practices (BMPs) at seven small watersheds across Canada. The findings of this project were informative but not conclusive. Some key findings were: (i) implementation and/or maintenance costs of most BMPs are high; (ii) there is some on-farm revenue potential associated with about 75 percent of the BMPs studied but the net change to farm income is generally negative except the controlled tile drainage BMP in the South Nation Watershed; and (iii) BMPs, that are economically not viable at the farm level, will not be practised without regulatory and/or financial incentives (Agriculture and Agri-Food Canada and Ducks Unlimited Canada, 2010).

	Assiniboine River watershed		
11	Grassland conservation pilot tender	Germany (North Rhine Westphalia)	Maintaining low-intensity grazing systems
12	Grassland trial auction (Northeim Pilot Project)	Germany (Lower Saxony)	Grassland protection and delivering vascular plant diversity in managed grasslands
13	Challenge Fund	Scotland, UK	Sustainable management of woodland and afforestation
14	Conservation stewardship and nitrate sensitive area	UK	Sustain landscape diversity and improve wildlife habitats
15	Conservation Reserve Program	USA	Land erosion, biodiversity
16	Flint River	Georgia, USA	Drought control
17	Swine buyout program	North Carolina, USA	Flood plain protection

RAs can have different components, which can vary and influence their effectiveness. These are described below:

a) Sequential versus once-only auctions: In some RAs, bidders can bid only once while in others they can bid sequentially more than once over time (Ferraro, 2008). In the case of sequential RAs, bidders can analyze and use the results of preceding rounds to update their bids that may reduce cost-effectiveness of subsequent RAs (Klimek et al., 2008). Analysis of the bids submitted for the Conservation Reserve Program (CRP) of the USA has shown that after a few bidding rounds the average bid was almost the same as the maximum acceptable payment from preceding rounds. This implies that bidders had learned the bid acceptance cut-off point (Klimek et al., 2008). Similar results have been reported from Northeim Pilot Project (Klimek et al., 2008).

b) Bid pools: In the case of heterogeneity of ecosystem services and costs of their supply, the use of bid pools in RAs is useful (Ferraro, 2008). Costs of ecosystem services provisioning may vary across farm types, production systems, soil types, and regions. For example, in the case of a given watershed, costs of the provisioning of the same ecosystem services may be quite different in lower and upper parts of the watershed, and in such cases one may use two separate bid pools, one for lower part and one for upper part. Such a system effectively limits competition between different sectors and areas and encourages bidders with higher opportunity costs to participate in RAs (Latacz-Lohmann and Schilizzi, 2005). Bidding pools were used in the Northeim Pilot Project in Lower Saxony (Klimek et al., 2008).

c) Eligibility criteria: Eligibility criteria can be used to exclude bidders with resource settings that may generate insufficient resource conservation/environmental benefits (Jack et al., 2008). These criteria may be related to various aspects of resource setting, such as soil type, proximity to water bodies, hydrological conditions, location in a watershed; conservation activities carried out for the provision of ecosystem services, land ownership, and environmental objectives of the program. For example, eligibility for the US CRP is limited to highly erodible lands (Claasen et al., 2008). In some cases, eligibility criteria may create perverse incentives for land use change (e.g. convert grassland into arable land) in order to become eligible for a specific ecosystem services provisioning program **(**Latacz-Lohmann and Schilizzi, 2005**)**.

d) Organization of RAs: RAs can be organized for a single or multiple land units, which can be homogenous or heterogeneous (Ferraro, 2008). RAs can be organized through sealed bids or open auctions. In RAs, buyers may also fix the number of contracts or service quantity to be bought, may have a maximum reservation price per contract or may fix financial resources for the given ecosystem service or program (Ferraro, 2008).

e) Pricing mechanisms: RAs can use discriminate or uniform pricing. In the case of discriminate pricing, payments to winning bidders are based on the applicants' price indicated in their bids (Ferraro, 2008). Hence, the payment to a bidder depends on his/her own cost estimation and his/her best guess of the highest acceptable bid. This gives an opportunity to bidders to ask for a price above their true opportunity costs and secure some profit. This overpayment is usually less than that payed under a flat-rate payment program (Ferraro, 2008; Latacz-Lohmann and Schilizzi, 2005). In the case of uniform pricing, prices for winning bids are uniform and based on either the lowest priced bid accepted or the highest priced rejected bid. In this case, a bidder's bid determines the chance of winning but not the payment received. Hence, bidders' dominant strategy is to bid their true opportunity costs (Ferraro, 2008; Latacz-Lohmann and Schilizzi, 2005).

f) Bid-evaluation systems: One of the key elements of bid evaluation systems is information about environmental benefits which are site-specific and depend upon the resource setting. Generally, environmental benefit indicators are used to quantify site-specific contributions of new and/or improved resource conservation practices. Many RAs for ecosystem service provisioning are based on a single environmental benefit indicator; identification and

measurement of a single environmental benefit indicator and monitoring of such RAs is simple. However, most environmental benefits are complementary to other environmental benefits, and new/improved resource conservation practices can provide multiple environmental benefits. In such cases, multi-criteria bid scoring systems are used to aggregate the various environmental benefits into one figure, known as an environmental benefit index (EBI) or some other index, representing an estimate of the overall environmental benefit of each bid. The choice of relative weights for each environmental benefit varies across the programs depending upon the main objectives of the program, context-specific relevance and importance of benefits, and the potential of the delivery of different benefits.

The main objective of this project is to develop an EBI for Wetlands in the Greenbelt region of Ontario, and therefore we present some details of the selected RA mechanisms and EBIs used in those mechanisms from different jurisdictions.

2.3 Details of Select Reverse Auctions and Environmental Benefit Indices

2.3.1 Use of Environmental Benefit Index in the USA[2]

The Conservation Reserve Program (CRP) and Wetland Reserve Program (WRP) are two primary agricultural land retirement programs in the USA. The main objectives of the CRP are to establish long-term conservation covers and improve farmlands' ecosystems. The program pays producers for establishing long-term plant/tree cover to improve water quality, control soil erosion, and improve wildlife habitat. The program contract duration is 10 or 15 years, and a competitive process of RA is used to award contracts. Land must be either cropland (cropped in four out of six years prior to 2008) or marginal pasture land in riparian areas. In addition, land should meet at least one of the five criteria: (a) highly erodible land; (b) located in national or state CRP conservation priority areas; (c) included in an expiring CRP contract; (d) cropped wetland, or associated with surrounding non-cropped wetlands; and (e) devoted to highly beneficial environmental practice (e.g., wetland restoration, streamside buffers, or conservation buffers) (Ferris and Siikamäki, 2009). CRP pays farmers an annual rental fee for removing land from agricultural production and cost-share assistance for the implementation of high-priority conservation practices (Ferris and Siikamäki, 2009).

CRP auctions use an environmental benefit index (EBI) to compare bids. This index accounts

[2] The discussion in this section is based on NRCS, USDA. 2015.

for land quality heterogeneity and weights various environmental benefits according to their relative importance. The EBI system was introduced in 1991 and has been revised several times to incorporate changing conservation priorities and to improve targeting of ecosystem services (Claassen et al., 2008). The current EBI includes the projected benefits to wildlife, water quality, erosion control, air quality, longevity of environmental benefits beyond the contract period, and any potential payment reductions (relative to the maximum rental rates) accepted by the producer. Wildlife, water quality, and erosion control are given equal weights while air quality benefits, longevity of environmental benefit beyond the contract period ("Enduring Benefits Factor"), and the cost factor are given relatively lower weights. The current EBI uses the following point system:

Wildlife Factor Benefit (0 to 100 points): It includes wildlife habitat cover benefits (0 to 50 points), wildlife enhancement (0, 5, or 20 points), and wildlife priority zones (0 or 30 points).

Water Quality Benefits from Reduced Erosion, Runoff and Leaching (0 to 100 points): It includes location (0 or 30 points), ground water quality (0 to 25 points), and surface water quality (0 to 45 points).

Erosion Factor Point (0 to 100 points): It is based on the land's potential to be eroded by wind and water and is measure by using an Erodibility Index.

Enduring Benefits Factor (0 to 50 points): It is based on the likelihood for certain CRP practices to remain in place beyond the expiration of the CRP contract period.

Air Quality Benefits (0 to 45 points): It includes wind erosion impacts (0 to 25 points), wind erosion soils (0 or 5 points), air quality zones (0 or 5 points), and carbon sequestration (3 to 10 points).

Cost (0 to 35 points): It includes **(a)** Cost (point value determined after end of sign-up based on actual offer data). **(b)** Offer Less than Maximum Payment Rate (0 to 25 points): Offers equal to the maximum payment rate receive 0 points.

For details of all the factors of the CRP EBI, a fact sheet titled Conservation Reserve Program Sign-Up 41 Environmental Benefits Index (EBI) is enclosed as **Annexure 1.**

Five distinct subprograms included under the umbrella of CRP are General Signup, Continuous Signup, Conservation Reserve Enhancement Program (CREP), Farmable Wetland Program (FWP), and Emergency Forest Conservation Reserve Program (EFCRP). All these subprograms work in a similar fashion (Ferris and Siikamäki, 2009).

The WRP offers wetlands owners' opportunity to engage in restorations of wetlands. The program was introduced by the 1990 Farm Bill, and has continued with little changes in the subsequent three Farm Bills. It began in 1992 as a pilot in nine states and was offered in 1995 in all states. The program is most suitable for frequently flooded agricultural lands where restoration activities will improve habitat for migratory birds and other wildlife, and improve water quality. The USDA Natural Resources Conservation Service (NRCS) manages and finances the program, but it is administered by the states and each state can determine specific enrollment criteria and contract selection.

The program offers a permanent easement, 30-year easement or contract, and a restoration cost-share agreement. As per the enrollment options, the USDA Natural Resources Conservation Service (NRCS) may pay 75 to 100% of the easement and restoration costs. Easement compensation is based on the lower of fair market value, a geographic area rate cap, and landowner offer. Landowners retain title to the land and thus, the right to control access and recreational use, and pay property taxes. This program does not use an EBI.

2.3.2 Use of Environmental Benefit Indices in Australia

The Australian government started exploring the use of MBIs in the second phase of the National Heritage Trust (NHT) and National Action Plan (NAP) programs for Salinity and Water Quality, and the National Market-Based Instruments (MBIs) Pilot Program commenced in 2002. Eleven MBI pilot projects were conducted across Australia from 2003-2005. Some examples of these programs include:

1. The Victorian BushTender program – used a Biodiversity Benefits Index;
2. The New South Wales Environmental Services Scheme – used an EBI containing six indicators measuring six different environmental services; and,
3. The West Australian Auction for Landscape Recovery program – used an EBI containing 48 weighted indicators.

These three programs and their associated EBIs are discussed below:

The Victorian BushTender Program[3]

The main objective of the program is to improve native vegetation management or secure revegetation on private land to enhance local as well as catchment scale environmental outcomes. The process of BushTender can be summarized in eight steps. First, the Victorian government calls for expression of interest from interested landowners. Second, landowners register their interest to the respective field officers. Third, a field officer arranges a site visit to: assesses the site, advises the landowner on the environmental/conservation significance of the site, and suggests potential native vegetation management and revegetation options for the landowner's consideration. Fourth, landowners identify the management actions they are willing to take and the field officer develops a management plan. Fifth, landowners submit a sealed bid including financial assistance sought to implement the proposed management plan. Sixth, bids are assessed using Biodiversity Benefit Index (BBI) based on the estimated change in environmental outcomes, the value of the assets affected by these changes (significance), and the price proposed by the bidder. Seventh, successful bidders sign final agreements based on the previously agreed management plan. Eighth, periodic payments and reporting occur as specified in the agreement.

Similar tender process is followed in most of the MBI programs in Australia. The BBI is assessed as per the priorities of the Department of Sustainability and Environment (DSE) and with reference to the existing information on the regional distribution of native plants and animals. The BBI is calculated as follows:

BBI = Biodiversity Significance Score (BSS)*Habitat Service Score (HSS) / Bid Price submitted by landowner

The BSS is based on (i) assessment of the quality of the native vegetation; (ii) conservation status of the native vegetation (based on the rarity of that native vegetation); (iii) threatened plants and animals found on the site and threatened animals that may be using the site; and (iv) landscape significance of the site specifically the role it plays in maintaining or providing functional habitat for a range of mobile native animals.

[3] The discussion in this section is based on The State of Victoria Department of Sustainability and Environment, 2009.

The Habitat Service Score (HSS) is a measure of the improvements in the quality and security of native vegetation arising from management practices proposed in the management plan. It is based on: (i) commitments proposed to protect the current site quality (better the current quality and the more substantial the commitments, the higher the HSS); (ii) management practices proposed to improve site quality (better the management practices higher the HSS); (iii) area proposed for management (larger the area, higher the HSS); and (iv) length of the agreement including permanent protection placed on the site.

The New South Wales Environmental Services Scheme (ESS)[4]

The NSW Salinity Strategy endorsed the use of MBIs to develop sustainable long term solutions to salinity. In 2001, the Government announced the investment of $2 million to conduct a trial to establish 20 working examples of properties where ecosystem services would be identified and a value placed on them. The trial was referred as the NSW Environmental Services Scheme (ESS). The primary aim of the scheme was to examine practical issues related to the development of MBIs such as costs of including ecosystem services within rural production, ownership of the services produced, and financial, contractual and incentive arrangements necessary. The main focus of the scheme was the integration of commodity production with environmental services. The project team identified six strategies for the implementation: (i) identification of environmental services to be examined; (ii) develop best measures of a range of environmental services; (iii) develop and implement a cost-effective competitive process for selection of landowners; (iv) prepare and execute contractual arrangements with successful applicants; (v) establish monitoring systems that include compliance and the production of environmental services; and (vi) evaluate the benefits and costs to the farm business as a result of participating in the program and making land use changes to supply enhanced ecosystem services.

The identification and selection of ecosystem services emphasize the provision of public benefits, and it was agreed that only the public benefit component of ecosystem services should be captured as a ‘commodity’ suitable for trade. Hence, this partitioning of benefits was used as an important criterion for selection of ecosystem services, and the selected service was described in terms focused on the public benefits. Six ecosystem services selected for the program were:

[4] This section is based on Grieve, Uebel, and Environmental Markets Team. 2003.

a. Carbon sequestration - related to mitigation of the greenhouse effect / climate change;
b. Terrestrial biodiversity benefits - related to improvements in the habitat value of vegetation;
c. Salinity benefits - related to improvements in stream water salinity;
d. Soil benefits - related to the retention of soil on the property and associated benefits to stream water quality through reduced sediment loads;
e. Water quality - related to retention of nutrients on the property and resulting benefits to stream water quality; and
f. Acid sulfate soil benefits - related to reductions in the production and export of acid or acid products from acid sulfate soil areas and resulting benefits to water quality.

In order to have a better understanding between the land use/management activities proposed and the production of ecosystem services, a set of eight approved land use changes or activities were also identified: The set included:

(i) establishment of perennial pastures;
(ii) improved management of existing perennial pastures;
(iii) establishment of commercial tree plantings;
(iv) establishment of environmental plantings of trees or shrubs;
(v) regeneration of native vegetation;
(vi) establishment of saltbush;
(vii) engineering works (such as earthworks to control runoff or drainage); and
(viii) reintroduction of natural wetting or drying cycles in former wetlands or estuarine areas.

The second strategy was related to the measurements of incremental ecosystem services created through the scheme. In some cases incremental ecosystem services can be measured directly such as the quantity of an increased carbon sink created through tree planting. However, in many cases direct measurement of incremental ecosystem services is not possible. For example, salinity benefits arising from tree planting throughout the catchment and the impacts on stream water quality that are the outcomes of a large number of inputs from different sites. In some cases the benefits are not evident for a longtime after the original management actions; for example habitat improvement through plantations. In all these cases, it is necessary to determine suitable measures for these incremental ecosystem services. Suitable measures should provide a measure at a property level that can be related to the ecosystem services at a

catchment or regional scale, and should be simple to understand, cheap to measure, and capable of being combined into a single EBI. The ESS developed a series of six environmental services indices, equal weighting was used in the EBI, during 2002, together with toolkits to estimate these indices at a property level for each approved land use change. The toolkits were based on existing, or in some cases, newly developed biophysical models and were developed by Technical Working Groups composed of scientific experts in the relevant fields including State and Commonwealth agencies and universities.

The West Australian Auction for Landscape Recovery (ALR) Program[5]

The ALR applied an existing MBI mechanism, a conservation auction, to biodiversity conservation in a biodiverse salinizing landscape in Western Australia. The ALR, similar to other pilot projects, was designed to test a number of features of auctions as a specific MBI. The project focused on evaluating the instrument design and its implementation. The project was implemented by WWF Australia in partnership with a number of non-government organizations, government agencies, local governments, research institutions, tertiary institutions, community-based organizations and a regional natural resource management authority.

The ALR, over two rounds in 2004-2005, was conducted as a simple discriminative price auction using sealed bids. One of the objectives of the ALR was to implement a field-based trial in which an auction approach tested two methods of tender evaluation, the Environmental Benefits Index (EBI) and the Systematic Conservation Planning approach (SCP). Other objectives included an analysis of administrative efficiency of the auction approach versus fixed price schemes, analysis of communication strategies with landholders, and identification of the 'key success factors' and 'key impediments' for conservation auction schemes in Australia and the regionally sensitive factors.

The ALR used an EBI comprised of a 'native biodiversity benefits index' (NBBI) assessing biodiversity and an 'other Environmental Benefits Index' (OEBI) assessing salt and water management, soil management, and threatening processes such as livestock management, fire regime, weeds and feral animals. The indices conformed to target environmental goals, outcomes and measures defined for the project and were consistent with regional NRM goals.

[5] This section is based on WWF Australia, 2005. The equations of NBBI and OEBI are the same as presented in this report.

The NBBI used four measures of biodiversity: vegetation or habitat condition, vegetation or habitat complexity, landscape context, and conservation significance. A formula, adapted from Oliver and Parkes (2003), calculated a biodiversity significance score (BSS) and a land use change impact score (LIS) and combined these to calculate NBBI (which is equal to BSS x LIS x $\log_{10}$ (area in hectares)). The BSS combines and weights conservation significance and landscape context, and the LIS estimates the magnitude and direction of change in biodiversity value as a result of land use change.

The OEBI included two categories of benefits – benefits from management of salinity, water and soil, and benefits from management activities related to grazing, fire, weeds and feral animals. The scores from the component attributes were simply summed within each group and then added together. In the final EBI, the OEBI was weighted by 0.5 while the weight of NBBI was 1 which was due to primary focus of ALR policy being on nature conservation. The detailed design of the EBI used in Round Two of the ALR program is given in **Annexure 2** while the basic principles of the calculation are discussed below.

NBBI Calculations

Each tender comprised one or more sites and each site comprised one or more plots, and therefore the calculation of the NBBI was subject to this hierarchy of plots, sites, and tenders. Hence, the NBBI attributes and scores were calculated at the lowest level in the hierarchy and then aggregated along the hierarchy. Each group of attributes within the NBBI (*viz.* vegetation or habitat condition, vegetation or habitat complexity, landscape context, and conservation significance) were equally weighted by normalizing scores within each group. Area was taken into account by weighting the NBBI scores by the base 10 logarithm of area. To avoid inflating the indices by large areas of *'immediate area of impact'* of the works, sites larger than 10ha were treated as 10ha. Similarly, sites for *'location of works'* smaller than one hectare were treated as 1.1 hectares, to avoid deflating the indices.

The NBBI calculation had two components, one for *'location of works'* and the other for the *'immediate area of impact'* of the works. The general formula was:

NBBI = NBBIworks + NBBIinfluence

NBBIY = {Biodiversity Significance Score (BSSY)} × LOG10 (area in ha)]

where:

Y = *works* or *influence*

works = *'location of works'* at a site (as relevant to NBBI). Areas < 1 ha are included as 1.1 ha and areas > 10 ha are included as stated.
influence = *'immediate area of impact'* of the works at a site (as relevant to NBBI).
Areas < 1 ha are included as 1.1 ha, and areas > 10 ha are included as 10ha.

BSSY = {[(NormCSt0 + NormLCt0) × (NormVCOt0 + NormVCYt0)]}
Where:
NormCSt0 = Current Conservation Significance, normalized in the range 0-1 (maximum score 54)
NormLCt0 = Current Landscape Context, normalized in the range 0-1 (maximum score 90)
NormVCOt0 = Current Vegetation/Habitat Condition (before land use change), normalized in the range 0-1 (maximum score 24)
NormVCYt0 = Current Vegetation/Habitat Complexity (before land use change), normalized in the range 0-1 (maximum score = 50)

The NBBIworks was calculated for a site that was denoted as a *'location of works'* and 'remnant' (native vegetation, native revegetation and natural regeneration). Proposed native revegetation sites on cleared land (cultivated or pasture) were not included because they were not relevant to estimates of current site condition. The biodiversity significance score was calculated for each site, multiplied by the log10 (location of works, site) and then summed across sites within tender, resulting in the NBBIworks score for a tender.

The NBBIinfluence was calculated where a site was denoted *'immediate area of impact'* of the works and 'remnant' and Revegetation sites on cleared land (cultivated or pasture) were not included. The BSS was calculated for each site denoted '*immediate area of impact*' of the works and summed across sites within a tender, resulting in the NBBIinfluence score for a tender.

The final NBBI score was the sum of NBBIinfluence and NBBIworks

OEBI Calculation

The same normalizing and weighting schemes used in the NBBI were used in the calculation of OEBI. Each site or plot was classified as 'remnant' or 'cleared' for the purpose of this analysis, where 'remnant' denoted extant native vegetation, pre-existing native revegetation or natural regeneration sites. The size of projects which propose native revegetation for sites denoted

'location of works', but which were currently cleared, were also included in the OEBI calculations while they were not included in the NBBI. The general formula for the OEBI was:

OEBI = OEBIworks + OEBIinfluence

OEBIY = [salinity, water and soil management benefits (NormSWt0) + other environmental benefits and disturbance(NormOMt0)] × LOG10 (area in ha)

Where:

Y = *works* or *influence*

NormSWt0 = Current salinity, water and soil management, normalized in the range 0-1 (maximum score = 52)

NormOMt0 = Current other management and disturbances, normalized in the range 0-1 (maximum score = 44)

The OEBI*works* was calculated for a site denoted '*location of works*' and may include sites classified as 'remnant' or 'cleared'. The OEBI*influence* was calculated where a site was denoted '*immediate area of impact'* of the works, and included 'remnant' and 'cleared' sites.

The final EBI score was simply the sum of the weighted NBBI and OEBI scores:

EBI = (NBBI*works*+NBBI*influence*)* 1 + (OEBI*works*+OEBI*influence*)* 0.5

Attributes included in the NBBI and OEBI are given in Table 2.

Table 2: Attributes included in the NBBI and OEBI
(Source - WWF Australia, 2005)

Index	Component	No.	Attribute	Score (range)
NBBI	Vegetation/habitat condition (VCO)	1	Evidence of recruitment	0-4
		2	Number of large standing dead trees (or mallees) present	0-4
		3	Number of trees (or mallees) with visible hollows (>3cm diam per 50x20m plot)	0-6
		4	Evidence of tree health problems, eg. dieback, insect damage, etc	0-4
		5	Intact or interconnecting shrubland/ heathland canopy offering nesting and foraging habitat for fauna	0-6
			Sub-Total	0-24
	Vegetation/habitat Complexity (VCY)	1	Degree of woodland structural complexity (number of strata present and % projective foliage cover)	0-8

		2	Degree of shrubland structural complexity (number of strata present and % projective foliage cover	0-10
		3	Percentage projective foliage cover of herb stratum (estimated)	0-5
		4	Presence of a leaf/bark/other plant material litter layer	0-3
		5	Floristic composition: number of commonly occurring native tree and shrub species present	0-5
		6	Percentage projective foliage cover of intact cryptogam layer	0-5
		7	Presence of fallen logs and branches or other coarse woody debris	0-4
		8	Presence of rocks (>10cm diam) and/or boulders on the ground	0-4
		9	Estimated height of vegetation strata present (tree, mallee)	0-3
		10	Estimated height of vegetation strata present (shrub, heathland, edgleland)	0-3
			Sub Total	0-50
	Landscape Context (LC)	1	GIS-based: Site is part of a continuous area of native vegetation (area of remnant)	0-13
		2	Site is part of a habitat patch, where assessable (size of habitat patch)	0-11
		3	GIS-based: Proximity of site to nearest native vegetation remnant of significant size, ie. core area (of >40 ha)	0-10
		4	Condition of adjacent remnant	0-7
		5	GIS-based: Remnant area divided by perimeter length, representing reduction of habitat value due to edge effects	0-7
		6	GIS based: Proportion of existing native vegetation within 5000m neighbourhoods of site centre-points	0-10
		7	GIS based: Proportion of existing native vegetation within 1000m neighbourhoods of site centre-points	0-10
		8	GIS-based: Proportion of existing native vegetation within sites	0-10
		9	Does site include a riparian or wetland zone and what is their condition?	0-7
		10	GIS-based: Does site include a riparian or wetland zone that is associated with high salinity risk?	0-5

			Sub Total	0- 90
	Conservation Significance (CS)	1	Observed and/or previously recorded presence of threatened flora and fauna species, populations and ecological communities at site	0-12
		2	Site and GIS-based: Observed and/or previously recorded presence of locally and regionally significant flora and fauna species, populations (including 'declining' birds)	0-9
		3	GIS-based: Presence of locally and regionally significant ecological communities (threatened Beard vegetation types) at site	0-9
		4	Location of previous biodiversity survey effort and method (target, non-target)	0-3
		5	GIS-based: Site contains remnant vegetation associated with regional biodiversity conservation priority area as identified in State or regional plan or policy	0-10
		6	Site and GIS-based: Presence of granite outcrops and condition: granite outcrops are likely to harbour unique flora / fauna assemblages	0-7
		7	Presence of naturally saline wetlands and condition: naturally saline wetlands are likely to harbour unique flora / fauna assemblages	0-7
			Sub Total	0-54
OEBI	Salt, water and soil management	1	Is the site associated with a salinity occurrence (discharge area, salt outbreak)? What is the severity of the occurrence? Is the site within a natural saline wetland?	0-10
		2	GIS-based: Mapped Salinity Risk: Is the site associated with a salinity occurrence (discharge area, salt outbreak)? What is the severity of the occurrence? Is the site within a natural saline wetland?	0-10
		3	Size of salt outbreak (ha)	0-2
		4	Proximity of salt outbreak to drainage line (m)	0-5
		5	GIS-based: Proximity of High salinity risk area (RISK2000) to wetland or drainage feature (m)	0-5

		6	Time since salt outbreak was first detected and action (if any) taken	0-5
		7	Areal extent/history of waterlogging	0-5
		8	Severity and areal extent of soil erosion associated with the site	0-10
			Sub Total	0-52
	Other management activities	1	Livestock grazing intensity and access to remnant native vegetation and water	0-7
		2	Fire management regime – intensity and Frequency	0-8
		3	Extent and distribution of weeds within remnant	0-4
		4	Incursion distance (m) of weeds into native vegetation remnants up to 100m from remnant edge and in proximity to site (eg. 25m from site)	0-5
		5	Presence of feral animals on site, detected by presence of diggings, scats or direct observation	0-10
		6	Other observed disturbances, such as gravel /sand mining, rubbish dumping, firewood collection, drains etc.	0-10
			Sub Total	0-44

2.3.3 Use of Environmental Benefit Indices in Canada

Wetland Restoration in the Assiniboine River Watershed (ARW), Saskatchewan[6]:

The Assiniboine Watershed Stewardship Association (AWSA), with Ducks Unlimited Canada, and The Saskatchewan Watershed Authority, used a Reverse Auction (RA) in a pilot project for wetland restoration. The project was implemented in 2008 and 2009 and had ten steps. First, the plan to organize the RA for wetland restoration in ARW was advertised in local newspapers, magazines, and radio shows for about 6 weeks in September and October of 2008. Second, potential bidders, based on a list compiled by partner organizations, were contacted and staff members met with interested bidders to explain the logistics of RA and restoration potential on their wetlands. Third, for each interested landowner, maps of potential wetland restoration areas were created and the area of each potential wetland restoration was calculated. Fourth, interested landowners submitted their bids which included selected wetlands for restoration and a cost per acre for restoring their wetlands on each quarter section of land. Landowners had the

[6] The discussion in this section is based on Hill et al. 2011.

choice to submit their bids for a 12-year or a perpetual agreement. The bidders incurred the cost in terms of their time required to learn the RA process, processing the information provided by the auctioning agency, and developing their bid price. The cost of producing the maps was borne by the auctioning agency. Fifth, a ground verification of the area, feasibility of the area for restoration, and number of wetland restorations was conducted by the agency's staff. Sixth, staff person met with each bidder with the ground verification information, and asked the bidders to revise their bids accordingly. Seventh, revised bids that included bid price per acre, construction cost, and compliance monitoring cost were submitted. Eight, revised bids were ranked using an Environmental Benefit Index (EBI) based on wetland area restored, waterfowl density, existing wetland density, and proportion of cropland in a 4X4 mile block around each quarter section bid. Bidders knew the total budget available for RAs and that the EBI increases with number of wetland restored but did not know EBI score or ranking for their bids. Ninth, all bidders were notified about the status of their final bids. Finally, the construction of ditch plugs for successful bids was completed by November 2009.

In the first round, 20 bidders submitted bids, but only 9 bidders submitted revised bids, and bids from 7 bidders were approved. The number of approved bids was 30 that covered 211 acres of wetlands to be restored. All approved bids were for 12-year period. The total bid price was $182,723 while the total auction value (bid price plus construction cost) was $216,256.

Water's Edge Transformation Program (WET): Stewardship for Agricultural Riparian Systems in Lake Simcoe, Severn Sound and Nottawasaga watersheds, Ontario

The program is focused on adoption of Best Management Practices (BMPs) on farms having a stream, shoreline or wetland. The main purpose of the program is to lessen water quality issues, limit nutrient leaching or runoff and reduce overall on-farm vulnerabilities. Six BMPs are targeted in the program and include: (i) Upstream clean water diversion; (ii) Downslope management of contaminated runoff; (iii) Livestock removal from watercourses; (iv) Riparian naturalization; (v) Improved stream crossings for livestock or equipment; and (iv) Structural erosion control projects contributing to riparian condition (OSCIA, 2014a).

The program is funded by the Ontario Ministry of Agriculture and Food (OMAF), and delivered by the Ontario Soil and Crop Improvement Association (OSCIA) with technical support from the Lake Simcoe Region Conservation Authority, Nottawasaga Valley Conservation Authority, and Severn Sound Environmental Association. The program uses a competitive bid system

(Reverse Auction) to identify and support projects that deliver the greatest environmental benefits for public funds allocated for this program. Only bids with significant water quality benefits and moderate financial requests are funded. Cost-benefit ratio is calculated using the cost requested and environmental benefits associated with the proposed projects in a bid.

As per the Reference Guide, WET Program, application is completed in seven steps: (i) contact Program Administrator; (ii) setup an account on farmprograms.net; (iii) fill out an Enrolment Form on farmprograms.net; (iv) begin the WET application on farmprograms.net; (v) meet with a technical specialist from your conservation authority or local stewardship group; (vi) enter the information from your Enrolment Farm Plan (EFP) related to risk rating; and (vii) select and complete applicable BMP questions (OSCIA, 2014a).

Once the application is completed, an Environmental Benefit scoring system is applied to the information included in the application. The process of calculating the Environmental Benefit score is given in Figure 1.

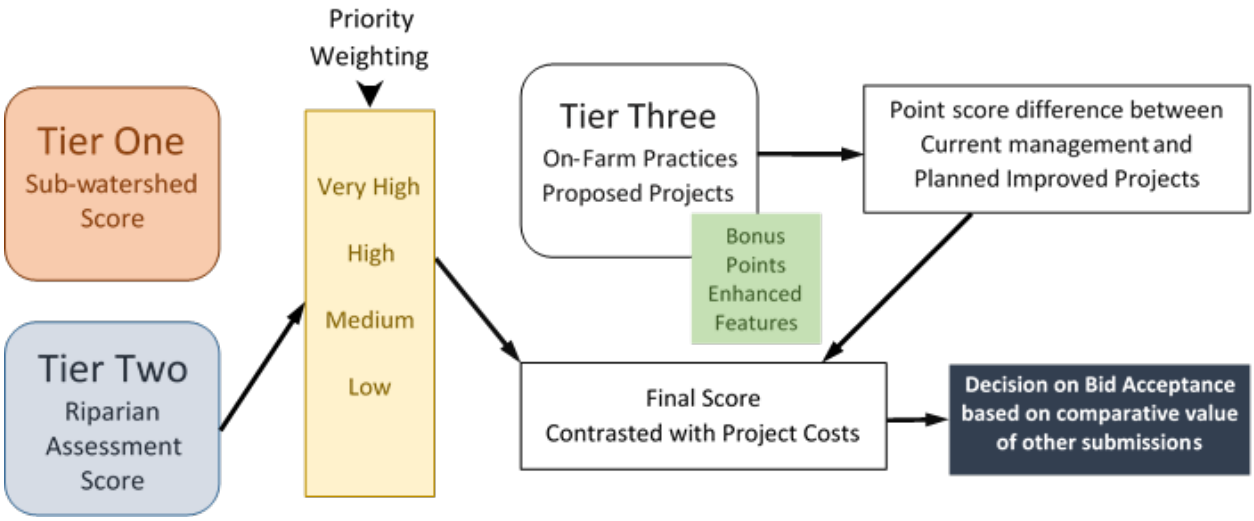

Figure 1: Calculation of Environmental Benefit Score in WET Program
(Source: OSCIA, 2014b)

The relative priority of the watershed and the farm site are calculated from the information collected by watershed specialist during his/her field visit to the site. The priority rankings are converted into a factor. The Environmental Benefit Score is calculated from the change in risk rating responses provided the applicant's responses to questions from the EFP. The Final Score is calculated by multiplying Priority Factor and Environmental Benefit Score (OSCIA, 2014b).

Further details of the WET Program are available in the WET Program Reference Guide (OSCIA, 2014a) and Brochure (OSCIA, 2014b) and have been included as **Annexure 3**.

3.0 GUIDING DOCUMENTS

EBIs that are based on existing local knowledge and/or systems have the most value to users and are able to make the most accurate measurements of ecosystem services. There are two local documents that should be considered guiding documents throughout the establishment of the proposed Greenbelt specific wetland restoration EBI. These documents are: 1) CVCs Wetland Restoration Strategy, and 2) the Ontario Wetland Evaluation System. Each of these documents is further described in the subsections below.

3.1 CVC Wetland Restoration Strategy

For the purpose of this study the CRW was divided into three separate geographic locations: (i) Greenbelt, (ii) Whitebelt (developable lands); and (iii) Urban. Furthermore, the strategy classified and prioritized wetlands into three groups: (i) priority tracts for wetland restoration, (ii) priority wetlands for rehabilitation; and (iii) priority wetlands for climate change adaptation measures. A description of classified groups is provided below.

3.1.1 Priority Tracts for Wetland Restoration

The priority tracts for wetland restoration were estimated using a combination of three types of indicators: a) high feasibility; b) low sensitivity to climate change; and c) high ability to fulfill functions needed in their sub-watersheds. *Feasibility indicators* included proximity to water, proximity to a seed source, marginal agricultural land, less disruptive current land uses, supportive policy areas and public ownership. Sensitivity to climate change indicators included water source (from least to most sensitive: groundwater, lake, stream, rain), landscape factors of floodplain or small catchments, lack of linkage to other wetlands, and severity of other stressors.

Indicators related to a tract's ability to fulfill subwatershed functional needs included inputs for the subwatershed's priority for improved wetland services; the types of improved services the subwatershed needs; and each tract's potential contributions to those services.

Subwatershed priority for improved wetland services included indicators of the current level of ecological services (percent wetland, percent degraded wetland, percent forest and percent permeable landforms) and the level of demand for, or stressors on, those services (percent urban, percent intensive agriculture or aggregate, past wetland loss, and percent tiled). The types of improved services needed in each subwatershed were rated using water quality, flood

attenuation, Natural Heritage System Improvement, and social (education and air pollution/noise pollution improvement) functions. The contributions of the potential tracts were also rated using the same four functions – water quality improvement or maintenance, flood attenuation, filling of Natural Heritage System gaps, and social functions.

3.1.2 Priority Wetlands for Rehabilitation

Existing wetlands as mapped by CVC in 2006 were used for this analysis, and these were sorted for type of functional impairment. Climate change sensitivity and ability to better fulfill subwatershed needs if rehabilitated were used for rating. For rating of wetland's ability to fulfill watershed needs, similar to priority tracts for wetland restoration category, subwatershed priority for improved wetland services, types of improved services the subwatershed needs, and the potential of rehabilitated wetland to contribute to those services were used. However, the potential of contribution of appropriately-rehabilitated wetlands were rated slightly differently than the case of restoration, and it included water quality improvement, flood attenuation; and Natural Heritage System improvement.

3.1.3 Priority Wetlands for Climate Change Adaptation Measures

This analysis also used existing wetlands as mapped by CVC in 2006. Similar to wetland rehabilitation, it also used climate change sensitivity and the importance of wetland services, and wetlands with high climate sensitivity and high importance of their services were identified as high priority wetlands.

Sensitivity to climate change indicators included (i) water source (from least to most sensitivity: groundwater, lake, stream, rain); (ii) landscape factors: flat landscape; small wetland size; floodplain in lower Credit; fine till surficial geology as an indicator of vernal pool presence; (iii) forested; (iv) lack of linkage to other wetlands; and (v) severity of other stressors.
The indicators for importance of wetland services were: (i) wetland evaluation: Provincially Significant Wetland (PSW) as High, other field-confirmed wetlands as Moderate, and Unrated wetlands as Low; (ii) relative rarity: minimum wetland polygon area thresholds adjusted for wetland prevalence in each subwatershed; and (iii) subwatershed priority for improved wetland function.

On the basis of this identification of priority sites and wetlands, the report made strategy-related recommendations that included next steps with a focus on targets and strategy monitoring, site-

level monitoring and detail on tactics. This document can be used in many ways to aid in the development of the EBI. Most notably, priority zones for wetland restoration and rehabilitation can inform EBI location-specific weightings so as to incent wetland restoration works in areas where it is in greatest need.

3.2 Ontario Wetland Evaluation System

Ontario Ministry of Natural Resources (OMNR) has developed an Ontario Wetland Evaluation System (Southern Ontario Manual 3.2, 2013) based on scientific criteria. This system was designed to meet the needs of the planning process and it is the system used to classify Provincially Significant Wetlands (PSW) under the Provincial Policy Statement, 2014 (Ontario Ministry of Municipal Affairs and Housing, 2014). The system recognizes the role of wetlands in maintaining critical ecosystem functions as well as providing social benefits. The system can be used to rate wetlands relative to each other. The application of the evaluation system includes differing values of wetland, such as values associated with the biodiversity, hydrology and recreational opportunity provided by the wetland. However, the assessment of vulnerability of wetlands is outside the scope of this system. The information collected through the application of the system can be used for evaluating management alternatives but the system does not suggest any management alternative. The results of the evaluation system can be used at different levels for different purposes including development of watershed plans by conservation authorities.

In the system, wetland values are classified into four categories - Biological, Social, Hydrological, and Special Features values. Each category of values is evaluated individually and separately. Each component is subdivided into subcomponents, and some subcomponents into attributes and some into sub-attributes. The relative value is assessed by ascribing point score to predefined values. Within each component, subcomponent, attribute and/or sub-attribute, values are weighted to reflect their importance relative to each other. Values that are considered to be of major importance, such as breeding habitat for an endangered species, have been allocated higher points (250) while values of minor importance are allocated only a few points. The sum of point scores for sub-attributes and attributes gives a measure of value at the subcomponent and component levels. The maximum score for each of four components is 250, and therefore any wetland can score a maximum of 1000 points.

The details of subcomponents, attributes, and sub-attributes of all four wetland values are given in Table 3.

Table 3: Sub-Components and Attributes of Four Categories of Wetland Values

(Source – Government of Ontario, 2013)

Component	Sub Component	Attribute and Sub-attribute	Max Score
1.0 Biological	1.1 PRODUCTIVITY	1.1.1 Growing Degree-Days/Soils	30
		1.1.2 Wetland Type	15
		1.1.3 Site Type	5
	1.2 BIODIVERSITY	1.2.1 Number of Wetland Types	30
		1.2.2 Vegetation Communities	45
		1.2.3 Diversity of Surrounding Habitat	7
		1.2.4 Proximity to Other Wetlands	8
		1.2.5 Interspersion	30
		1.2.6 Open Water Type	30
	1.3 SIZE (Biological Component)		50
	TOTAL		250
2.0 Social	2.1 ECONOMICALLY VALUABLE PRODUCTS	2.1.1 Wood Products	18
		2.1.2 Wild Rice	6
		2.1.3 Commercial Fish (Bait Fish and/or Coarse Fish)	12
		2.1.4 Furbearers	12
	2.2 RECREATIONAL ACTIVITIES		80
	2.3 LANDSCAPE AESTHETICS	2.3.1 Distinctness	3
		2.3.2 Absence of Human Disturbance	7
	2.4 EDUCATION AND PUBLIC AWARENESS	2.4.1 Educational Uses	20
		2.4.2 Facilities and Programs	8
		2.4.3 Research and Studies	12
	2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT		40
	2.6 OWNERSHIP		10
	2.7 SIZE (Social Component)		20
	2.8 Aboriginal Value and Cultural Heritage	2.8.1Aboriginal Values	30 (For both together)
		2.8.2 Cultural Heritage	
	TOTAL		278
3.0 Hydrological	3.1 FLOOD ATTENUATION		100

	3.2 WATER QUALITY IMPROVEMENT	3.2.1 Short Term Water Quality Improvement	60
		3.2.2 Long Term Nutrient Trap	10
		3.2.3 Groundwater Discharge	30
	3.3 CARBON SINK		5
	3.4 SHORELINE EROSION CONTROL		15
	3.5 GROUNDWATER RECHARGE	3.5.1 Site Type	50
		3.5.2 Soil Recharge Potential	10
	TOTAL		280
4.0 Special Features	4.1 RARITY	4.1.1 Wetland Types 4.1.1.1 Rarity within the Landscape 4.1.1.2 Rarity of Wetland Type	80+80 =160
		4.1.2 Species 4.1.2.1 Reproductive Habitat for an Endangered or Threatened Species 4.1.2.2 Traditional Migration or Feeding Habitat for an Endangered or Threatened Species 4.1.2.3 Provincially Significant Animal Species 4.1.2.4 Provincially Significant Plant Species 4.1.2.5 Regionally Significant Species 4.1.2.6 Locally Significant Species	No Maximum score for any sub attribute
	4.2 SIGNIFICANT FEATURES and Habitats	4.2.1 Colonial Waterbirds	50
		4.2.2 Winter Cover for Wildlife	100
		4.2.3 Waterfowl Staging and/or Moulting Areas	150
		4.2.4 Waterfowl Breeding	100
		4.2.5 Migratory Passerine, Shorebird or Raptor Stopover Area	100
		4.2.6 Fish Habitat 4.2.6.1 Spawning and Nursery Habitat 4.2.6.2 Migration and Staging Habitat	100+25
	4.3 ECOSYSTEM AGE		25
	4.4 GREAT LAKES COASTAL WETLANDS		75
	TOTAL		

Criteria and methods of scoring different attributes of the four categories are enclosed as **Annexure 4**.

This system can be used in many ways to aid in the development of the EBI. Most notably, priority wetland characteristics and the ecosystems services they provide may be obtained from this provincially standardized system. Many environmental practitioners from across the province are familiar with this system and basing the proposed Greenbelt specific EBI on this system would provide a level of familiarity to other users across the province.

4.0 RECOMMENDED CONCEPTUAL FRAMEWORK FOR A GREENBELT SPECIFIC WETLAND RESTORATION ENVIRONMENTAL BENEFIT INDEX

Based on a review of the literature and the multiple benefits provided by wetlands, it is recommended that a Greenbelt specific wetland restoration EBI consider the components, sub-components, attributes, sub-attributes and their associated maximum scores as listed in the table below:

Table 4: Recommended conceptual framework for a Greenbelt specific wetland restoration environmental benefit index

Component	Sub-component	Attribute and Sub-attribute	Max Score
1.0 Biological	1.1 Wetland Site Characteristics and Biodiversity	1.1.1 Wetland type (Bog, fen, swamp, and marsh)	10
		1.1.2 Site type (isolated, palustrine (permanent or intermittent flow), riverine, riverine (at river mouth), lacustrine (at river mouth), lacustrine (with barrier beach), or lacustrine (exposed to lake)	10
		1.1.3 Wetland area	20
		1.1.3 Proximity to other wetlands	10
		1.1.4 Open water types	5
		1.1.5 Interspersion	5
		1.1.6 Vegetation communities on the site	40
		1.1.7. Diversity of surrounding habitat (within 1.5 Km of wetland boundaries) (crops, pasture, forests, shelterbelts, water bodies etc.)	10
		1.1.8 Carbon Storage	15
	Subtotal		**125**
	1.2 Presence and Habitat for Rare Species	1.2.1 Reproductive habitat for an endangered and threatened species	15
		1.2.2 Traditional migration or feeding habitat for an endangered and threatened species	15
		1.2.3 Presence of locally, regionally, and provincially significant plant and animal species	20
		1.2.4 Nesting and feeding habitat for colonial waterbirds	10
		1.2.5 Waterfowl breeding, staging and/or moulting area	10
		1.2.6 Migratory passerine, shorebird, or raptor stopover area	10
		1.2.7 Winter cover for wildlife	10
		1.2.8 Fish Habitat	20
		1.2.9 Habitat for other common species	25

	Subtotal		**125**
	TOTAL		**250**
2.0 Hydrological	2.1 Flood Attenuation and Water Quality	2.1.1 Flood attenuation capacity	75
		2.1.2 Short-term water quality improvement	50
		2.1.3 Long-term nutrient trap	25
		2.1.4 Ground water discharge	25
		2.1.5 Ground water recharge	25
		2.1.6 Shoreline erosion control	25
		2.1.7 Sensitivity to climate change	25
	TOTAL		**250**
3.0 Social	3.1 Recreation and Education	3.1.1 Recreational activities a. Active recreation such as Hunting and Fishing b. Passive Recreation such as Bird Watching and Nature enjoyment	 25 25
		3.1.2 Landscape aesthetics (Distinctness and degree of human disturbance)	25
		3.1.3 Use for education and research activities	25
		3.1.4 Proximity to areas of human settlement	25
	Subtotal		**125**
	3.2 Cultural Values	3.2.1 Cultural Heritage	25
		3.2.2 Aboriginal Values	25
	Subtotal		**50**
	3.3 Human Health and Pollution	3.3.1 Air pollution abatement	25
		3.3.2 Noise pollution abatement	25
		3.3.3 Other pollution abatement	25
	Subtotal		**75**
	TOTAL		**250**
	GRAND TOTAL		**750**

5.0 CONCLUSIONS

The economic efficiency of a RA is highly dependent on the transaction cost and this includes cost of design and implementation of the RA. The cost of measurement of different attributes and sub-attributes of an EBI used in a RA is a critical component of the transaction cost of a RA. Hence, the number of attributes and sub-attributes and difficulties associated with their measurements can influence the economic efficiency of a RA drastically. At the same time, non-inclusion of the key attributes and sub-attributes may result into unsatisfactory improvement in the state of desired ecosystem services; in some cases it may also lead to a payment by a buyer for some ecosystem service that is not being delivered. Hence, the choice of an EBI for a RA is a delicate balancing act – balancing two opposite forces – one that requires inclusion of each and every relevant attribute and sub-attribute and other that requires minimization of costs associated with the measurement of an EBI. In the proposed framework of the EBI, we have attempted to strike this balance.

We would like to remind the readers that this document contains a proposed framework and not the final EBI for any specific RA. In the proposed framework, the suggested maximum values of different attributes and sub-attributes are mainly derived from Ontario Wetland Valuation Framework, but these may require refinements as per the locational context of a RA. Similarly, the proposed framework includes attributes associated with wetland site characteristics, such as wetland type and site type, as well as with ecosystem services, such as carbon storage and habitat for different species. In many wetland restoration projects, site characteristics may not change with restoration activities while ecosystem services will be expected to improve. In the choice of an EBI for such projects, it will be necessary to separate and treat differently two types of attributes and sub-attributes – those that are expected to remain the same from those that are expected to change as a result of implementing the restoration project.

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Annexure 1

A Fact Sheet of Conservation Reserve Program Sign-Up 41 Environmental Benefits Index (EBI)

USDA, January 2011

(Downloaded from the website given below on January 25, 2015)

http://www.fsa.usda.gov/FSA/newsReleases?area=newsroom&subject=landing&topic=pfs &newstype=prfactsheet&type=detail&item=pf_20110128_consv_en_crpebi.html

FACT SHEET

UNITED STATES DEPARTMENT OF AGRICULTURE
FARM SERVICE AGENCY

January 2011

Conservation Reserve Program Sign-Up 41 Environmental Benefits Index (EBI)

Overview
USDA's Farm Service Agency (FSA) will hold a Conservation Reserve Program (CRP) general sign-up from March 14 through April 15, 2011.

CRP is a voluntary program that helps agricultural producers use environmentally sensitive land for conservation benefits. Producers enrolled in CRP plant or maintain long-term, resource-conserving covers to control soil erosion, improve water and air quality and enhance wildlife habitat.

More information on sign-up 41 is available in the FSA fact sheet "Conservation Reserve Program General Sign-up 41, March 14 through April 15, 2011."

Ranking CRP Offers
FSA will rank offers for CRP sign-up 41 according to the Environmental Benefits Index (EBI). FSA collects data for each EBI factor based on the relative environmental benefits for the land offered. EBI rankings are unique for each tract of land offered into CRP.

FSA assigns each offer a point score based on the offer's relative environmental factors. Each offer competes with all other offers. FSA determines offer acceptability based on the ranking results.

For sign-up 41, FSA will use the following EBI factors to assess the environmental benefits for the land offered:

- Wildlife habitat benefits resulting from covers on contract acreage (N1);
- Water quality benefits from reduced erosion, runoff and leaching (N2);
- On-farm benefits from reduced erosion (N3);
- Benefits that will likely endure beyond the contract period (N4);
- Air quality benefits from reduced wind erosion (N5) and;
- Cost (N6).

N1 - Wildlife Factor Point score: 0 to 100
Factor N1 is an evaluation of the expected wildlife benefits of the offer and is comprised of three subfactors (N1a-c). The formula for N1 = N1a + N1b + N1c.

- **N1a - Wildlife Habitat Cover Benefits (0 to 50 points)**

This subfactor is an evaluation of the wildlife habitat cover offered. FSA assigns points for cover practice planting mixtures based on the potential value to wildlife within each state. FSA awards higher scores for cover types that are more beneficial to wildlife. Local USDA Service Centers have a list of approved planting mixes and the assigned point scores for each cover mix. Point scores are based on the weighted average score for cover mixes the producer selects. Native mixes of diverse species generally receive the highest point scores. Eligible cover practices under the N1a criteria are in Table 1.

(Producers should note that wildlife habitat cover selection is the most critical factor impacting wildlife benefits. Optimum cover types significantly increase the point score for this factor).

- **N1b - Wildlife Enhancement (0, 5, or 20 points)**

This subfactor provides up to 20 points for actions producers take to enhance the wildlife benefits for the offered acreage. Enhancement to the acreage is necessary in order to receive the points. For example, to receive 20 points producers may offer to establish a minimum of 10 percent of the acreage offered to pollinator habitat. Eligible practices under the N1b criteria are provided in Table 2.

- **N1c - Wildlife Priority Zones (0 or 30 points)**

FSA consulted with farm, commodity, wildlife and environmental groups to develop high-priority wildlife areas that would benefit from being enrolled in CRP. For land located within this defined geographic area, points are awarded for planting cover mixes to benefit wildlife species. This subfactor provides 30 points if at least 51 percent of the offered acreage is located within the wildlife priority zone and the weighted average N1a score is greater than or equal to 40 points.

N2 - Water Quality Benefits from Reduced Erosion, Runoff and Leaching Point Score: 0 to 100
One of CRP's main goals is to reduce the amount of sediment, nutrients and pollutants that enter our nation's waterways. Factor N2 is an evaluation of the potential impacts that CRP may have on both surface and groundwater quality. N2 is comprised of three subfactors (N2a-c). The formula

for N2 = N2a + N2b + N2c.

- **N2a - Location (0 or 30 points)**

This subfactor is an evaluation of the benefits of improving ground or surface water quality impaired by crop production. States have identified water quality zones for protection. At least 51 percent of the acreage offered must be within an approved water quality zone to receive 30 points. Local USDA Service Centers have detailed maps of the approved water quality zones.

- **N2b - Groundwater quality (0 to 25 points)**

This subfactor is an evaluation of the predominant soils, the potential leaching of pesticides and nutrients into groundwater, and the impact to people who rely on groundwater as a primary source of drinking water. Point scores are based on the weighted average leach index for soils offered for enrollment and the population that utilizes groundwater for drinking.

- **N2c - Surface water quality (0 to 45 points)**

This subfactor is an evaluation of the amount of sediment that may be delivered into streams or other water courses and the human population that may be affected. This factor is determined by potential water erosion, distance to the water and the watershed in which the offer is located.

N3 - Erosion Factor Point score: 0 to 100

CRP helps maintain the long-term productivity of the land for future generations. Factor N3 is an evaluation of the potential for the land to erode as the result of either wind or water erosion. This factor is measured using an Erodibility Index (EI). FSA awards points for the weighted average of the higher value of either the wind or water EI, based on the results from Table 3.

N4 - Enduring Benefits Factor Point Score: 0 to 50

Factor N4 is an evaluation of the likelihood for certain practices to remain in place beyond the CRP contract period. N4 values are determined by calculating the weighted average score for all practices in Table 4.

N5 - Air Quality Benefits From Reduced Wind Erosion Point Score: 0 to 45 points

Factor N5 is an evaluation of the air quality improvements by reducing airborne dust and particulate caused by wind erosion from cropland. In addition, this factor has points for the value of CRP land that provides carbon sequestration. This factor is comprised of four subfactors (N5a-d). The formula for N5 = N5a + N5b + N5c +N5d.

- **N5a - Wind Erosion Impacts (0 to 25 points)**

FSA will determine the potential for the site to have wind erosion damage. FSA will award points based on potential wind erosion and the amount of population that may be impacted by the erosion. The potential wind erodibility is based on a climatic factor (wind speed, wind direction and duration of wind events) and soil erodibility.

- **N5b - Wind Erosion Soils List (0 or 5 points)**

A list of soils that are susceptible to wind and contribute significantly to nonattainment of air quality standards has been developed. These soils have a dominant component of volcanic or organic materials that are highly erodible and can be transported great distances on the wind. If at least 51 percent of the offered acres are comprised of these soils, the offer is awarded five points.

- **N5c - Air Quality Zones (0 or 5 points)**

FSA awards a maximum of five points if at least 51 percent of the acreage offered is located in an air quality zone that contributes to nonattainment of air quality standards and the calculated weighted wind EI is equal to or greater than three.

- **N5d - Carbon Sequestration (3 to 10 points)**

The subfactor is an evaluation of the benefits of sequestering greenhouse gases by practice over the expected life of the practice. FSA awards points based on a weighted average of carbon sequestration benefits for all practices using the value in Table 5.

N6 - Cost

Factor N6 is an evaluation of the cost of environmental benefits per dollar expended. This factor assists in optimizing environmental benefits per dollar for CRP rental payments. Factor N6 is comprised of two subfactors (N6a and N6b). The formula for N6 = N6a + N6b.

- **N6a - Cost (point value determined after end of sign-up based on actual offer data)**

Offers with lower per acre rental rates may increase chances of being accepted.

- **N6b - Offer Less Than Maximum Payment Rate (0 to 25 points)**

Offers equal to the maximum payment rate will receive 0 points. Offers below the maximum payment rate will receive points ac-

cording to the value in Table 6.

EBI Threshold for Acceptance

After sign-up 41 ends on April 15, 2011, FSA will analyze and rank all eligible offers. The Secretary will then determine the EBI threshold used to accept offers. Because CRP is a highly competitive program, producers who would have met previous sign-up EBI cutoffs are not guaranteed an offer acceptance under sign-up 41.

Making CRP Offers More Competitive

While the United States has over 360 million acres of cropland, the maximum CRP enrollment authority is 32 million acres. As such, the demand to enroll land in CRP is expected to be greater than the amount that FSA can accept.

To make offers more competitive, producers should consider the following:

- The single most important producer decision involves determining which cover practice to apply to the acreage offered. Planting or establishing the highest scoring cover mixture is the best way to improve the chances of offer acceptance.
- Producers should only offer the most environmentally sensitive land. Where possible, subdividing fields to include only the most sensitive acreage can substantially increase the point score for erosion and improve the water quality score and/or air quality score. Producers should consider enhancing covers for the benefit of wildlife by developing permanent water sources or establishing pollinator habitat. In addition, producers may plant and manage hardwood or softwood trees that increase wildlife habitat values or restore certain rare and declining habitats to increase the EBI score in subfactors N1a and N4.
- Producers should consider accepting a lower payment rate than the maximum amount FSA is willing to offer.

FSA also encourages producers to consult with local USDA experts on steps to take to maximize EBI points and increase the likelihood that an offer will be accepted.
For More Information

For more information on CRP, contact your local FSA office or visit FSA's CRP website at http://www.fsa.usda.gov/crp

Table 1 – Cover Practices (CP) for the N1a Criteria	Point Score
CP1 – Permanent introduced grasses and legumes	
Existing stand one to three species or planting new stand of two to three species of an introduced grass species	10
Existing stand or planting mixture (minimum of four species) of at least 3 introduced grasses and at least one forb or legume species best suited for wildlife in the area.	40
CP2 – Establishment of new permanent native grasses and legumes	
Existing stand (minimum of one to three species) or planting mixed stand (minimum of three species) of at least two native grass species and at least one forb or legume species beneficial to wildlife.	20
Existing stand or planting mixed stand (minimum of five species) of at least 3 native grasses and at least one shrub, forb, or legume species best suited for wildlife in the area.	50
CP3 – Tree planting (general) 2/	
Southern pines (softwoods) – Solid stand of pines/softwoods (existing, according to state developed standards, or planted at more than 550 trees per acre).	10
Northern conifers (softwoods) – Solid stand of conifers/softwoods (existing, according to state developed standards, or planted at more than 850 trees per acre).	10
Western pines (softwoods) – Solid stand of pines/softwoods (existing, according to state developed standards, or planted at more than 650 trees per acre).	10
Southern pines (softwoods) – Pines/softwoods existing or planted at a rate of 500 to 550 per acre depending upon the site index (state-developed standards) with 10 to 20 percent openings managed to a CP4D wildlife cover.	50
Northern conifers (softwoods) – Conifers/softwoods existing or planted at a rate of 750 to 850 trees per acre depending upon the site index (state-developed standards) with 10 to 20 percent openings managed to a CP4D wildlife cover.	50
Western pines (softwoods) – Pines/softwoods existing or planted at a rate of 550 to 650 per acre depending upon the site index (state-developed standards) with 10 to 20 percent openings managed to a CP4D wildlife cover.	50
CP3A – Hardwood tree planting	
Existing or planting solid stand of nonmast producing hardwood species.	10
Existing or planting solid stand of a single hard mast producing species.	20
Existing or planting mixed stand of two hardwood species best suited for wildlife in the area.	30
Existing or planting mixed stand (three or more species) of hardwood species best suited for wildlife in the area.	50
Existing or planting stand of Longleaf pine or Atlantic white cedar - Planted at rates appropriate for the site index.	50
CP4B - Permanent wildlife habitat (corridors), noneasement.	
Existing stand or planting mixed stand (minimum of four species) of either grasses, trees, shrubs, forbs, or legumes planted in mixes, blocks, or strips best suited for various wildlife species in the area. A wildlife conservation plan must be developed with the participant.	40
Existing stand or planting mixed stand (minimum of five species) of either predominantly native species including grasses, forbs, legumes, shrubs, or trees planted in mixes, blocks, or strips best suited to providing wildlife habitat. Only native grasses are authorized. Introduced grasses are not authorized for and cannot be included in cover mixes for 50-point N1a scores for CP4B. A wildlife conservation plan must be developed with the participant.	50

Table 1 – Cover Practices (CP) for the N1a Criteria		
	Point Score	
CP4D - Permanent wildlife habitat, noneasement		
Existing stand or planting mixed stand (minimum of four species) of either grasses, trees, shrubs, forbs, or legumes planted in mixes, blocks, or strips best suited for various wildlife species in the area. A wildlife conservation plan must be developed with the participant.	40	
Existing stand or planting mixed stand (minimum of five species) of either predominantly native species including grasses, forbs, legumes, shrubs, or trees planted in mixes, blocks, or strips best suited to providing wildlife habitat. Only native grasses are authorized. Introduced grasses are not authorized for and cannot be included in cover mixes for 50-point N1a scores for CP4D. A wildlife conservation plan must be developed with the participant.	50	
CP12 –Wildlife food plot 3/		
Wildlife food plots are small non-cost-shared plantings in a larger area. Wildlife food plots will never be the predominant cover.	NA	
CP25 –Rare and declining habitat restoration 4/		
Existing stand or seeding or planting will be best suited for wildlife in the area. Plant species selections will be based upon Ecological Site Description data.	50	
CP42 – Pollinator Habitat		
Existing stand or planting of a diverse mix of multiple species suited for pollinators.	50	

Footnotes:
1/ Cover that is existing or will be established must accomplish the purpose of the practice.
2/ State Conservationist may revise the Field Office Technical Guide (FOTG) on planting rate to be consistent with CRP. The opening for southern and western pines must be a minimum of two acres up to a maximum of five acres in size for fields of 20 acres and larger. For smaller fields, the size is based on a percentage. Opening in northern conifers will be one-half to two acres in size. The opening may include buffers on the interior of the field. Field edges (borders) may be used if they are irregular in shape and average 30 feet in width. Natural regeneration of native herbaceous or shrubby vegetation with required maintenance may be permitted within open areas if it is consistent with USDA Natural Resources Conservation Service (NRCS) technical standards and the Northern Bobwhite Conservation Initiative, and has concurrence from state fish and wildlife service (FWS) or U.S. FWS officials. Open areas of native grasses and/or shrub planting best suited for wildlife in the area is considered CP3 for EBI scoring and contract purposes.
3/ CP12 acreage is not included in the weighted average point score. For example, a 50-acre offer with 45 acres planted to CP25 and five acres planted to a wildlife food plot would calculate a weighted average using only the 45 acres of the CP25 planting. This calculates as follows: 45 acres x 50 points (CP 25 EBI score) = 2,250 points. 2,250 points / 45 acres = 50 points.
4/ Technical practice standards for the selected habitat type must meet applicable standards and be approved by FSA at least 30 calendar days before the beginning of sign-up.

Table 2 - Practices for the N1b Criteria

Practice	Point Score
Conversion of at least 51 percent of a primarily monoculture stand to a mixture of native species that provides wildlife benefits.	20
Establishment of pollinator habitat (CP42) that remains in the location of the CRP-1. The habitat size, shape, and composition must meet the following requirements: **Size** **CRP Parcel** — **Habitat Size Requirement** Less than 10 acres — At least one acre of pollinator habitat. Habitat areas must be at least 0.5 acre. 10 acres or greater — At least 10 percent of the parcel in pollinator habitat. Habitat areas must be at least 0.5 acre.	20
Annual or permanent food plot (CP12) that remains in the same location for the contract length, or rotated food plot (CP12) for which the location on the contract is moved during the contract length consistent with the NRCS Field Office Technical Guide up to 10 percent of a field, not to exceed 5 acres per field.	5

Table 3 - Erodibility Index Points 1/

EI	Points	EI	Points	EI	Points
4	1	10	22	16	79
5	2	11	29	17	92
6	4	12	37	18	97
7	7	13	46	19	98
8	11	14	56	20	99
9	16	15	67	21+	100

1/ EI of less than 4 = 0 points

Table 4 - Practices for the N4 Criteria

Practice	Point Score
New hardwood tree, longleaf pine, and/or Atlantic white cedar plantings (CP3A) and CP25 (Rare and declining habitat restoration) if the plant community is existing or will be established to primarily trees.	50
Existing or enhanced stand of hardwood tree, longleaf pine, and/or Atlantic white cedar plantings (CP3A).	40
New pine/softwood tree (CP3).	30
Rare and declining habitat restoration (CP25) where the plant community is existing or will be established to a primarily grass and/or shrub complex, or CP42.	25
Existing pine/softwood tree - original contract signed as CP3.	20
CP1, CP2, CP4B, CP4D.	0

Table 5 - N5d Air Quality	
Practice	**Point Score**
CP3 (Tree planting - general), CP3A (Hardwood tree planting), and CP25 (Rare and declining habitat restoration) planted to trees.	10
CP25 (Rare and declining habitat restoration) planted to grass/shrub complexes, and CP42 (Pollinator Habitat).	5
CP4B (Permanent wildlife habitat (corridors), noneasement) and CP4D (Permanent wildlife habitat, noneasement).	4
CP1 (Permanent introduced grasses and legumes) and CP2 (Establishment of permanent native grasses).	3
CP12 (Wildlife food plot).	0

Table 6 – N6b Offer Less Than Maximum Payment Rate	
Percent Below Maximum Payment Rate	**N6b Points**
1	2
2	4
3	6
4	8
5	10
6	12
7	14
8	16
9	18
10	20
11	21
12	22
13	23
14	24
>=15	25

Annexure 2

Details of the design of the EBI used in Round 2 of the West Australian Auction for Landscape Recovery (ALR) Program

Source: WWF Australia. 2005. Auction for Landscape Recovery: Final Report. (Authors - Cheryl Gole, Michael Burton, Kristen J. Williams, Helena Clayton, Daniel P. Faith, Ben White, Andrew Huggett and Chris Margules)

Note: Annexure contents are exact copies of the relevant pages from the source)

ALR Environmental Benefits Index Scorecard, Round Two

BID ID NUMBER: _____

1. Native Biodiversity Benefits Index (NBBI)

Vegetation/habitat Condition (VCO)

BID ID NUMBER:	Current points (VCO t_0)	Potential points (VCO t_n)
1. Evidence of recruitment		
Not applicable/ not assessable (e.g. cleared land)	Null	Null
No recruitment (i.e., none observed)	0	0
<5% of site with recruitment stands	1	1
5-15% of site with recruitment stands	2	2
15-30% of site with recruitment stands	3	3
>30% recruitment evident	4	4
2. Number of large standing dead trees (or mallees) present		
Not assessable (e.g. cleared land), or none observed – no large trees or mallee present	Null	Null
None (large trees or mallee present, but none dead)	0	0
All large trees and/or mallees dead	1	1
>50% of all large trees and/or mallees dead	2	2
<50% of all large trees and/or mallees dead	4	4
3. Number of trees (or mallees) with visible hollows (>3cm diam per 50x20m plot)		
Not assessable	Null	Null
Nil (none visible)	0	0
1-2 trees or mallees	2	2
3-5 trees or mallees	4	4
>5 trees or mallees	6	6

BID ID NUMBER:	Current points (VCO t_0)	Potential points (VCO t_n)
4. Evidence of tree health problems, eg. dieback, insect damage, etc		
Not assessable	Null	Null
>15% of plants showing health problems	0	0
5-15% of plants showing health problems	1	1
<5% of plants showing health problems	3	3
No trees, mallees, shrubs etc affected by dieback	4	4
5. Intact or interconnecting shrubland/heathland canopy offering nesting and foraging habitat for fauna		
Not assessable (e.g. vegetation types that do not normally have shrub/heath stratum)	Null	Null
No shrub cover (including NA, cleared areas and sites where no shrub strata recorded)	0	0
Shrub cover <5%	1	1
Shrub cover 5-10%	2	2
Shrub cover 10-30%	3	3
Shrub cover 30-50%	4	4
Shrub cover >50% (site assessment classes 50-70% or >70%)	6	6

VCO total	Total Current points (VCO t_0)	Total potential points (VCO t_n)
out of max possible of 24 points		

Vegetation/habitat Complexity (VCY)

BID ID NUMBER:	Current points (VCY t_0)	Potential points (VCY t_n)
1. Degree of woodland structural complexity (number of strata present and % projective foliage cover)		
Not assessable	Null	Null
No layers present	0	0
One layer present but <30% foliage cover per layer	1	1
Two layers present but <30% foliage cover per layer	2	2
Two layers present & >30% foliage cover per layer	3	3
3 or more layers present but <30% foliage cover per layer	6	6
3 or more layers present & >30% foliage cover per layer	8	8
2. Degree of shrubland structural complexity (number of strata present and % projective foliage cover)		
Not assessable	Null	Null
No layers present	0	0
One layer present but <30% foliage cover per layer (no missing layers =5)	1	1
One layer present & >30% foliage cover per layer	2	2
2-3 layers present but <30% cover per layer	2	2
2-3 layers present & >30% cover per layer (no missing layers=7)	3	3
>3 layers present but <30% cover per layer	6	6
>3 layers present & >30% cover	10	10

BID ID NUMBER:	Current points (VCY t_0)	Potential points (VCY t_n)
3. Percentage projective foliage cover of herb stratum (estimated)		
Not assessable	Null	Null
No layers present (none, cleared)	0	0
<2%	0	0
2-10%	1	1
10-30%	2	2
30-50%	3	3
50-70%	4	4
>70%	5	5
4. Presence of a leaf/bark/other plant material litter layer		
Not assessable	Null	Null
No litter layer present	0	0
Litter layer present	3	3
5. Floristic composition: number of commonly occurring native tree and shrub species present		
Not assessable	Null	Null
0-2 species present	1	1
3-5 species present	3	3
♦6 species present	5	5
6. Percentage projective foliage cover of intact cryptogam layer		
Not assessable	Null	Null
No layers present (none, cleared)	0	0
<2%	0	0
2-10%	1	1
10-30%	2	2
30-50%	3	3
50-70%	4	4
>70%	5	5
7. Presence of fallen logs and branches or other coarse woody debris		
Not assessable	Null	Null
Nil (absence of logs/woody debris)	0	0
<5% of site covered by fallen logs/debris	1	1
5-15% of site covered by logs/woody debris	2	2
>15% of site covered by logs/woody debris	4	4

BID ID NUMBER:	Current points (VCY t_0)	Potential points (VCY t_n)
8. Presence of rocks (>10cm diam) and/or boulders on the ground		
Not assessable	Null	Null
No rocks	0	0
<5% site covered by rocks	1	1
5-15% site covered by rocks	2	2
15-30% site covered by rocks	3	3
>30% site covered by rocks	4	4
9. Estimated height of vegetation strata present (tree, mallee)		
Not assessable (shrubland, heathland, sedgeland)	Null	Null
No trees or shrub layers present (ie cleared)	0	0
Strata height o 2 m (tree, mallee)	1	1
Strata height >2 to o3 m (tree, mallee)	2	2
Strata height >3 m (tree, mallee)	3	3

BID ID NUMBER:	Current points (VCY t_0)	Potential points (VCY t_n)
10. Estimated height of vegetation strata present (shrub, heathland, sedgleland)		
Not assessable (mallee, woodland)	Null	Null
No trees or shrub layers present (ie cleared)	0	0
Strata height o1 m (shrub, heath, sedge)	1	1
Strata height >1 to o2 m (shrub, heath, sedge)	2	2
Strata height >2 m (shrub, heath, sedge)	3	3

VCY total	Total Current points (VCY t_0)	Total potential points (VCY t_n)
out of max possible of 50 points		

Landscape Context (LC)

BID ID NUMBER:	LC Points	Feasibility (MARG)
1. GIS-based: Site is part of a continuous area of native vegetation (area of remnant)		
Not assessable	Null	Null
No remnant present (Site not part of a remnant)	0	0
Remnant <2 ha	1	1
Remnant ◊2 - <5 ha	2	2
Remnant ◊5 to <10 ha	4	4
Remnant ◊10 to <20 ha	6	6
Remnant ◊20 to <40 ha	8	8
Remnant ◊40 to <80 ha	10	10
Remnant ◊80 ha	13	13
2. Site is part of a habitat patch, where assessable (size of habitat patch)		
Not assessable	Null	Null
Site is not part of a habitat patch (ie cleared land)	0	0
Patch <1 ha	1	1
Patch ◊1 to <2 ha	2	2
Patch ◊2 to <5 ha	3	3
Patch ◊5 to <8 ha	4	4
Patch ◊8 to <12 ha	6	6
Patch ◊12 to <20 ha	8	8
Patch ◊20 ha	11	11
3. GIS-based: Proximity of site to nearest native vegetation remnant of significant size, ie. core area (of >40 ha)		
Not assessable	Null	Null
> 5000 metres	0	0
◊3000 to o5000 m	2	2
◊1000 to <3000 m	5	5
◊250 to <1000 m	8	8
>50 to <250 metres	9	9
Contiguous, connected (o 50 m)	10	10
4. Condition of adjacent remnant		
Not assessable	Null	Null
No adjacent remnant	0	0
In poor condition	2	2
In good condition	4	4
In very good condition	5	5
In excellent condition	6	6
In pristine condition	7	7

BID ID NUMBER:	LC Points	Feasibility (MARG)
5. GIS-based: Remnant area divided by perimeter length, representing reduction of habitat value due to edge effects		
No remnants present	0	0
Area (A) to perimeter (P) ratio >=1 and <10	1	1
Area (A) to perimeter (P) ratio >=10 and <20	2	2
Area (A) to perimeter (P) ratio >=20 and <40	3	3
Area (A) to perimeter (P) ratio >=40 and <100	4	4
Area (A) to perimeter (P) ratio >=100 and < 200	5	5
Area (A) to perimeter (P) ratio >=200 and < 500	6	6
Area (A) to perimeter (P) ratio >=500	7	7
6. GIS based: Proportion of existing native vegetation within 5000m neighbourhoods of site centre-points		
Not assessable	Null	Null
o5% native vegetation in 5km	0	0
>5 to o10% native vegetation in 5km	1	1
>10 to o15% native vegetation in 5km	2	2
>15 to o20% native vegetation in 5km	3	3
>20 to o30% native vegetation in 5km	4	4
>30 to o40% native vegetation in 5km	5	5
>40 to o50% native vegetation in 5km	6	6
>50 to o60% native vegetation in 5km	7	7
>60 to o70% native vegetation in 5km	8	8
>70 to o80% native vegetation in 5km	9	9
◊80% native vegetation in 5km	10	10

BID ID NUMBER:	LC Points	Feasibility (MARG)
7. GIS based: Proportion of existing native vegetation within 1000m neighbourhoods of site centre-points		
Not assessable	Null	Null
o5% native vegetation in 1km	0	0
>5 to o10% native vegetation in 1km	1	1
>10 to o15% native vegetation in 1km	2	2
>15 to o20% native vegetation in 1km	3	3
>20 to o30% native vegetation in 1km	4	4
>30 to o40% native vegetation in 1km	5	5
>40 to o50% native vegetation in 1km	6	6
>50 to o60% native vegetation in 1km	7	7
>60 to o70% native vegetation in 1km	8	8
>70 to o80% native vegetation in 1km	9	9
◊80% native vegetation in 1km	10	10
8. GIS-based: Proportion of existing native vegetation within sites		
Not assessable	Null	Null
o5% native vegetation in site	0	0
>5 to o10% native vegetation in site	1	1
>10 to o15% native vegetation in site	2	2
>15 to o20% native vegetation win site	3	3
>20 to o30% native vegetation in site	4	4
>30 to o40% native vegetation in site	5	5
>40 to o50% native vegetation in site	6	6
>50 to o60% native vegetation in site	7	7
>60 to o70% native vegetation in site	8	8
>70 to o80% native vegetation in site	9	9
◊80% native vegetation in site	10	10

BID ID NUMBER:	LC Points	Feasibility (MARG)
9. Does site include a riparian or wetland zone and what is their condition?		
Not assessable	Null	Null
Nil present	0	0
Riparian/wetland zone in poor condition	1	1
Riparian/wetland zone in good condition	3	3
Riparian/wetland zone in very good condition	5	5
In excellent condition	6	6
In pristine condition	7	7
10. GIS-based: Does site include a riparian or wetland zone that is associated with high salinity risk?		
Not assessable (No wetland or riparian feature; naturally saline feature – Beard SL code)	Null	Null
Riparian or wetland feature associated with salinity risk (Moderate)	1	1
Riparian or wetland feature associated with salinity risk (High)	3	3
Riparian or wetland feature not associated with salinity risk	5	5

LC total	Total LC points
out of max possible of 90 points	

Conservation Significance (CS)

Conservation Significance (CS)		
BID ID NUMBER:	Current points (CS t_0)	Potential points (CS t_n)
1. Observed and/or previously recorded presence of threatened flora and fauna species, populations and ecological communities at site		
Not assessable	Null	Null
Nil present (none observed)	Null	Null
1-2 present	3	3
3-5 present	6	6
6-10 present	9	9
>11 present	12	12
2. Site and GIS-based: Observed and/or previously recorded presence of locally and regionally significant flora and fauna species, populations (including 'declining' birds)		
Not assessable	Null	Null
Nil present (none observed)	Null	Null
1-2 present	2	2
3-5 present	4	4
6-10 present	6	6
>11 present	9	9
3. GIS-based: Presence of locally and regionally significant ecological communities (threatened Beard vegetation types) at site		
Nil present (no pre-European extent)	Null	Null
None extant (of pre-European extent)	0	0
Extant distance < 100m	4	4
Extant distance = 0	9	9
4. Location of previous biodiversity survey effort and method (target, non-target)		
Not assessable	Null	Null
Unknown if previous surveys	Null	Null
No previous surveys in or near site (none known)	0	0
1 previous survey in/near site (surveys known / method?)	1	1
>2 previous surveys in/near site (surveys known / method?)	3	3

Conservation Significance (CS)		
BID ID NUMBER:	Current points (CS t_0)	Potential points (CS t_n)
5. GIS-based: Site contains remnant vegetation associated with regional biodiversity conservation priority area as identified in State or regional plan or policy		
Not assessable	Null	Null
No remnant vegetation	0	0
Low priority ascribed (all other areas of remnant)	3	3
Moderate priority (remnant in target landscapes, all remnant in or adjacent to other reserves – unmanaged reserves, unallocated crown land, other crown land)	6	6
High priority (remnant in potential recovery catchments of first tier, all CLW reserved lands)	10	10
6. Site and GIS-based: Presence of granite outcrops and condition: granite outcrops are likely to harbour unique flora / fauna assemblages		
Not assessable (no granite outcrops present or adjacent)	Null	Null
Granite outcrops present or adjacent but cleared for cultivation or pasture	1	1
Granite outcrops present or adjacent and in (probable) but poor condition/disturbed	3	3
Granite outcrops present or adjacent and in (probable) good condition	5	5
Granite outcrops present or adjacent and in (probable) very good or excellent condition	7	7

Conservation Significance (CS)

BID ID NUMBER:	Current points (CS t_0)	Potential points (CS t_n)
7. Presence of naturally saline wetlands and condition: naturally saline wetlands are likely to harbour unique flora / fauna assemblages		
Not assessable (no naturally saline wetlands)	Null	Null
Naturally saline wetlands (within or adjacent to site) but no remnant vegetation (cleared)	0	0
Naturally saline wetlands (within or adjacent to site) but poor condition/disturbed	1	1
Naturally saline wetlands (within or adjacent to site), disturbed but in good condition	3	3
Naturally saline wetlands (within or adjacent to site) in very good condition	5	5
Naturally saline wetlands (within or adjacent to site) in pristine condition	7	7

Conservation Significance (CS)

BID ID NUMBER:	Current points (CS t_0)	Potential points (CS t_n)
CS Total	Total Current points (CS t_0)	Total potential points (CS t_n)
out of max possible of 54 points		

Calculation of the NBBI

The NBBI calculation for Round 2 comprised two components, one based on the 'location of works' and the other based on the 'immediate area of impact' of the works.

NBBI = $NBBI_{works} + NBBI_{influence}$

$NBBI_Y$ = {Biodiversity Significance Score (BSS_Y)} × LOG_{10} (area in ha_Y)]

BSS_Y = {[($NormCS_{t0}$ + $NormLC_{t0}$) × ($NormVCO_{t0}$ + $NormVCY_{t0}$)]}

Y = works or influence

works = 'location of works' at a site (as relevant to NBBI). Areas < 1 ha are included as 1.1 ha and areas > 10 ha are included as stated.

influence = 'immediate area of impact' of the works at a site (as relevant to NBBI). Areas < 1 ha are included as 1.1 ha, and areas > 10 ha are included as 10ha.

Where:

$NormCS_{t0}$ = Current Conservation Significance, normalized in the range 0-1 (maximum score = 54)

$NormLC_{t0}$ = Current Landscape Context, normalized in the range 0-1 (maximum score = 90)

$NormVCO_{t0}$ = Current Vegetation/Habitat Condition (before land use change), normalized in the range 0-1 (maximum score = 24)

$NormVCY_{t0}$ = Current Vegetation/Habitat Complexity (before land use change), normalized in the range 0-1 (maximum score = 50)

area in ha_Y = Area of land use change in hectares attributed to the 'location of works' or the 'immediate area of impact' of the works, as relevant to the site.

BBS score	Area of land use change (ha)	NBBI outcome
Minimum Maximum Average	Remnant only, excluding cleared land even if proposed for revegetation activity	Minimum Maximum Average

2. Other Environmental Benefits Index (OEBI)

Salt, water and soil management

BID ID NUMBER:	points
1. Is the site associated with a salinity occurrence (discharge area, salt outbreak)? What is the severity of the occurrence? Is the site within a natural saline wetland?	
Not assessed (ie, site occurs in naturally saline wetland)	Null
No salt outbreaks or discharge areas evident	10
Salt outbreaks occur in local landscape (site proximity ◊100m): severity rating of S1	7
Salt outbreaks occur in local landscape (site proximity ◊100m): severity rating of S2	5
Salt outbreaks occur in local landscape (site proximity ◊100m): severity rating of S3	3
Salt outbreaks at site (site proximity <100m): severity rating of S1	2
Salt outbreaks at site (site proximity <100m): severity rating of S2	1
Salt outbreaks at site (site proximity <100m): severity rating of S3	0
2. GIS-based: Mapped Salinity Risk: Is the site associated with a salinity occurrence (discharge area, salt outbreak)? What is the severity of the occurrence? Is the site within a natural saline wetland?	
Not assessed (ie, naturally saline wetland – Beards SL code)	Null
LOW salinity risk (RISK2000)	10
Moderate salinity risk (RISK2000)	5
HIGH salinity risk (RISK2000)	0
3. Size of salt outbreak (ha)	
Not assessed (ie, naturally saline wetland)	Null
No salt outbreaks or discharge areas evident	Null
Salt outbreak occurs but size unknown	2
<0.5 ha	2
0.6-1 ha	1
>1 ha	0

BID ID NUMBER:	points
4. Proximity of salt outbreak to drainage line (m)	
Not assessed (No salt outbreaks or discharge areas evident; existence of salt outbreak not known; or naturally saline wetland)	Null
Proximity of salt outbreak to drainage line >1000	5
Proximity of salt outbreak to drainage line <1000	4
Proximity of salt outbreak to drainage line <500	3
Salt outbreaks or discharge areas not close to riparian, but distance not known	3
Proximity of salt outbreak to drainage line <200	2
Riparian and salt outbreak	1
5. GIS-based: Proximity of High salinity risk area (RISK2000) to wetland or drainage feature (m)	
Not assessed (naturally saline wetland; area of moderate salinity risk)	Null
high salinity risk site further than 1000m from riparian	5
high salinity risk site within 1000m of riparian	4
high salinity risk site within 500m of riparian	3
high salinity risk site within 200m of riparian	2
high salinity risk site proximal to riparian	1
6. Time since salt outbreak was first detected and action (if any) taken	
Not assessed (No salt outbreaks or discharge areas evident; existence of salt outbreak not known)	Null
Undetected, no action taken	1
Detected in last year, some action taken	3
Detected 2+ years ago, action taken (including naturally saline systems)	5

BID ID NUMBER:	points
7. Areal extent/history of waterlogging	
Not assessed (No waterlogging areas evident)	Null
>75% site affected by seasonal waterlogging	0
50-75% of site affected by seasonal waterlogging	1
10-50% of site prone to seasonal waterlogging	3
<10% of site affected by waterlogging	5

BID ID NUMBER:	points
8. Severity and areal extent of soil erosion associated with the site	
Not assessed (unknown)	Null
No soil erosion areas evident)	10
Minimal (<5% evidence of soil erosion at site)	8
Slight (5-15% evidence of soil erosion at site)	6
Moderate (>15-30% evidence of soil erosion at site)	4
Severe (>30% evidence of soil erosion at site)	2

Salt, water and soil mgt total	Total points
out of max possible of 52 points	

Other management activities

BID ID NUMBER:	points
1. Livestock grazing intensity and access to remnant native vegetation and water	
Not assessed (unknown)	Null
Set stocked	1
Rotationally grazed	3
Strategically grazed	5
Never or historically grazed	7
2. Fire management regime – intensity and frequency	
Not assessed (unknown)	Null
Site not burnt in past 10+ years	8
Site hazard reduction burnt in the past 10 years	4
Site subject to wild-fire or deliberately burnt every 2-3 years	0
3. Extent and distribution of weeds within remnant	
Not assessed (unknown)	Null
Obviously weedy throughout	0
Patchily weedy throughout	1
Weedy around edges	2
Not or very slightly weedy	4
4. Incursion distance (m) of weeds into native vegetation remnants up to 100m from remnant edge and in proximity to site (eg. 25m from site)	
Not assessed (unknown)	Null
Weeds occur 100m into remnant (or obviously weedy throughout)	0
Weeds occur 50-100m into remnant (or patchily weedy throughout)	1
Weeds occur 20-50m into remnant	2
Weeds occur 10-20m into remnant	4
Weeds do not occur beyond 10m into remnant	5
5. Presence of feral animals on site, detected	

BID ID NUMBER:	points
by presence of diggings, scats or direct observation	
Not assessed (unknown)	Null
Feral animals absent (no evidence of presence detected)	10
feral animals present, old or minor evidence and impact is minimal	8
feral animals present, clear evidence of several types	4
feral animals present, clear evidence of infestation, fox and/or rabbit represented	0
6. Other observed disturbances, such as gravel /sand mining, rubbish dumping, firewood collection, drains etc.	
Not assessed (unknown)	Null
No significant disturbance (no evidence of disturbance detected)	10
disturbance minor and impact is minimal	8
disturbance significant and impact is apparent, including regrowth after clearing	4
disturbance has had a major impact, or the site has been converted to pasture or cultivated)	0

Other management activities total	Total points
out of max possible of 44 points	

Calculation of the OEBI

The OEBI calculation for Round 2 comprised two components, one based on the 'location of works' and the other based on the 'immediate area of impact' of the works.

OEBI = $OEBI_{works}$ + $OEBI_{influence}$

$OEBI_Y$ = [salinity, water and soil management benefits + other environmental benefits and disturbance] × LOG_{10} (area in ha_Y)]

Where:

Y = works or influence

works = 'location of works' at a site (as relevant to NBBI). Areas < 1 ha are included as 1.1 ha and areas > 10 ha are included as stated.

influence = 'immediate area of impact' of the works at a site (as relevant to NBBI). Areas < 1 ha are included as 1.1 ha, and areas > 10 ha are included as 10ha.

Where:

$NormSW_{t0}$ = Current salinity, water and soil management, normalized in the range 0-1 (maximum score = 52)

$NormOM_{t0}$ = Current other management and disturbances, normalized in the range 0-1 (maximum score = 44)

area in ha_Y = Area of land use change in hectares attributed to the 'location of works' or the 'immediate area of impact' of the works, as relevant to the site.

SW score	OM score	Area of land use change (ha)	OEBI outcome
Minimum Maximum Average	Minimum Maximum Average	Area of land use change in hectares attributed to the 'location of works' or the 'immediate area of impact' of the works, as relevant to the site.	Minimum Maximum Average

Calculation of the overall EBI for each tender

$$EBI = (NBBI_{works}+NBBI_{influence})* w_1 + (OEBI_{works}+OEBI_{influence})* w_2$$

Variation in scores attributed to plots within sites are carried through to the final scores as the average, minimum and maximum values.

$NBBI_{works}+NBBI_{influence}$ = summed NBBI for the two site-types, summed across all sites for each tender.

$OEBI_{works}+OEBI_{influence}$ = summed OEBI for the two site-types, summed across all sites for each tender.

w_1 = 1.0 for R2 tender evaluation, a weight determined by ALR policy and applied to each tender according to the cumulative value of proposed management actions relevant to NBBI

w_2 = 0.5 for R2 tender evaluation, a weight determined by ALR policy and applied to each tender according to the cumulative value of proposed management actions relevant to OEBI

NBBI	OEBI	EBI outcome
Weight = 1.0	Weight = 0.5	

The cost-benefit of each tender was calculated as the ratio of the tender cost ($) nominated by the landholder and the EBI score, to give a 'cost per unit of benefit' score. The tenders were then ranked according to increasing cost per unit of benefit, and the set of tenders that exhausted the budget were identified, taking into account mutually-exclusive tenders.

	$ value of bid	Benefit per unit cost

Annexure 3

Water's Edge Transformation Program Brochure and reference Guide

(Source: Downloaded on April 20, 2015 from http://www.ontariosoilcrop.org/en/programs/wet.htm)

EnvironMerit

Water's Edge Transformation Program

Stewardship for Agricultural Riparian Systems in Lake Simcoe, Severn Sound or Nottawasaga Watersheds.

The Lake Simcoe, Severn Sound and Nottawasaga watersheds are home to approximately 350,000 people, with picturesque shores supporting small towns, larger cities and a thriving tourism industry. Human activities and a growing population have impacted these watersheds for more than 200 years, changing the natural landscape and influencing overall environmental health. Resulting research and monitoring efforts have identified several key environmental challenges facing this delicate ecosystem, including the presence of elevated phosphorous levels and pathogens in the lakes and watercourses. The Government of Ontario and its partners, grassroots groups and individual landowners are taking up the challenge to strengthen the health of Lake Simcoe, and surrounding watersheds.

Rich fertile soils support a number of farm business operations across the watersheds, suggesting agriculture has a key role to play in helping to improve water quality. Agricultural lands are thought to represent half of the landscape within the watershed and a number of Best Management Practices (BMPs) can be adopted to lessen water quality issues, limit nutrient leaching or runoff and reduce overall on-farm vulnerabilities.

- ***Is your farm located in the Lake Simcoe, Nottawasaga or Severn Sound watersheds?***
- ***Do you have a stream, shoreline or wetland on your property?***
- ***Are you interested in completing projects that will contribute to water quality improvements?***

If so, this program may be able to help.

Ontario

OSCIA Grassroots Innovation Since 1939

Lake Simcoe Region conservation authority

Nottawasaga Valley Conservation Authority

Severn Sound Environmental Association

Best Management Practices

The BMPs identified below have been selected for their potential to reduce the risks of nutrients entering fresh water resources. This innovative program relies on a competitive-bid system to identify and support proposed projects that show the greatest environmental merit for the public funding invested. Funding for this opportunity has been provided by the Ontario Ministry of Agriculture and Food (OMAF). WET is delivered by the Ontario Soil and Crop Improvement Association (OSCIA) on behalf of OMAF, with technical support provided by watershed specialist staff from the Lake Simcoe Conservation Authority , Nottawasaga Valley Conservation Authority and Severn Sound Environmental Association.

Upstream Clean Water Diversion

- Eaves troughs on barns to divert water from livestock yards
- Landscape based runoff diversion to divert water from livestock yards (eg. berm, surface inlet, concrete barrier etc.)
- Roofing of livestock yards

Downslope Management of Contaminated Runoff

- Constructed wetlands for runoff treatment
- Vegetative filter strip for runoff treatment
- Removal of tile drains within 15 metres of livestock facilities or greenhouse/nursery operations or constructed wetland or vegetative filter strip
- Dispersion sandwich for treatment of drainage tile effluent

Livestock Removal from Watercourses

- Fencing parallel to water's edge to protect water quality
- Alternative livestock watering systems

Riparian Naturalization

- Planting of forages, shrubs and trees within the riparian buffer or wetland restoration

Improved Stream Crossings for Livestock or Equipment

- Improved stream crossings
- Removal of harmful crossings/structures

Structural Erosion Control Projects Contributing to Riparian Condition

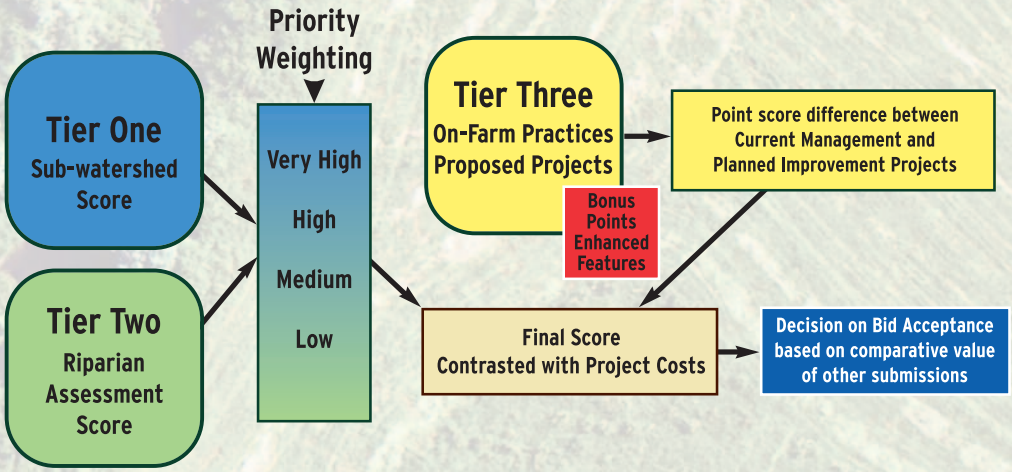
- Stabilization of streambanks or shorelines
- Drop structures: (rock chute spillways, grade control structures or drop pipe inlet structures)
- In-channel flow control structures to reduce velocity (eg. pools and riffles, natural channel design)
- Water and sediment control basins
- Grassed waterways
- Tile outlet structure retrofits

What sets this program apart?

The Water's Edge Transformation Program allows you to:

- **Get one-on-one advice from a local technical specialist**
- **Use one application for multiple projects in the 2014 cropping season**
- **Submit your competitive bid any time before March 31, 2014**
- **Apply online with the click of a mouse, at farmprograms.net**

How your score is calculated:



Each Bid Package includes:

1. **Workbook**
   - Completed by a watershed specialist from the appropriate region
   - Includes tier 1, tier 2 and bonus points
2. **Enrolment Form**
   - Completed on farmprograms.net by the farm applicant
   - Includes basic contact information for the farm business
3. **WET Application**
   - Completed on farmprograms.net by farm applicant
   - Includes tier 3 data and project cost information

- Applicants will be notified by email of the status of their application
- Approved projects must be completed and claimed by December 15, 2014

For more information about the application process or Best Management Practices please contact Brad Carberry at: 226-979-2465.

This opportunity is available for projects completed in the 2014 cropping season. Applications must be submitted by March 31, 2014.

EnvironMerit

How to submit an application:

1. To be eligible, the farm business must be located alongside a watercourse, pond, lake or wetland in the Lake Simcoe, Nottawasaga or Severn Sound watersheds, have a valid Farm Business Registration Number (FBRN) or equivalent, and have completed a current Environmental Farm Plan (EFP) (third or fourth edition) that has been reviewed by OSCIA. Call Brad Carberry at 226-979-2465 to verify your eligibility.
2. The online application process is comprised of a Bid Package which includes:
   a. Basic farm operation information and project details
   b. Project costs and funding request which must be accurate and specific, because financial compensation is determined at the application stage
   c. Change in EFP risk ratings associated with your project
   d. Riparian Field Workbook completed by a watershed specialist

   To participate in the Water's Edge Transformation Program (WET), the farm business must invite a watershed specialist to the farm to assist with completion of the Riparian Field Workbook **developed specifically for this program.** This is a great opportunity to get on-site technical advice to improve your proposed projects.

   Bid submissions are completed online by the farm business applicant through **farmprograms.net**
3. Bids received in the OSCIA provincial office by March 31, 2014 will be reviewed and evaluated collectively.
4. Only bid submissions demonstrating significant water quality benefits and moderate financial requests will be awarded funding approval to proceed. Cost/benefit ratios are determined by the costs requested and the environmental benefit associated with proposed projects (as identified by the information collected through the application process).

This program provides financial support to farmers located along riparian areas who are interested in adopting practices that improve water quality.

- Applicants will be notified of the status of the funding request by email.
- Approved projects must be completed and claimed by December 15 , 2014

Visit: www.ontariosoilcrop.org/en/programs/wet.htm
Call: Brad Carberry 226-979-2465
Email: programreview@ontariosoilcrop.org
Follow: @ontariosoilcrop

Water's Edge Transformation Program
EnvironMerit
Stewardship for Agricultural Riparian Systems

Considering applying? Some of the information you'll need includes:

- An understanding of which BMPs you'd like to complete on your property.
- A determination of how much cost-share you need to complete these projects, keeping in mind that you will be competing with other farm businesses for available funding.

Steps to Apply

See our reference guide for details

Step 1: **Contact Brad Carberry to verify eligibility for WET at 226-979-2465**

Step 2: **Setup an account on farmprograms.net**

Step 3: **Fill out an Enrolment Form**

Step 4: **Begin WET Application online**

Step 5: **Meet with watershed specialist from the applicable Conservation Authority. They will then enter info into an online application**

Step 6: **Include information from Environmental Plan (EFP) online**

Step 7: **Fill out the Best Management Practices (BMP) Questions online**

Ontario
OSCIA Grassroots Innovation Since 1939
Lake Simcoe Region conservation authority
Nottawasaga Valley Conservation Authority
Severn Sound Environmental Association

www.ontariosoilcrop.org

Reference Guide

Water's Edge Transformation Program

Stewardship for Agricultural Riparian Systems

January 2014

Grassroots Innovation
Since 1939

Water's Edge Transformation Program (WET)
Reference Guide

CONTENTS

This Reference Guide will assist you in completing a Water's Edge Transformation Program (WET) on-line application. Please refer to this guide for additional clarification on various requirements as questions arise throughout the on-line process. Steps include setting up a farm business profile and assembling a bid package. The application is available at www.farmprograms.net.

Review the four-page colour brochure for WET for additional details. Page four of the brochure outlines information required to submit an application, including critical eligibility requirements. Farm businesses must have a valid Farm Business Registration Number (FBRN) and must have a Third or Fourth Edition Environmental Farm Plan (EFP) deemed appropriate through peer review.

Step 1: Contact Brad Carberry to verify eligibility for WET

Call 226-979-2465

Step 2: Setup an Account on farmprograms.net

You will need:

1. Access to high-speed Internet
2. A working email address

   If you do not have a personal email address, you will need to either:

   a) Signup for a free account using one of the many sites offered:
      www.hotmail.com
      www.gmail.com

   b) Use an existing account from a willing friend or family member. We are supportive of this approach, but it is worth noting that all interactions between Ontario Soil and Crop Improvement Association (OSCIA) and the WET applicant will take place exclusively through email and confidential information will be exchanged. The friend/family member must be both highly trusted and relied upon throughout the process. This is critical when considering the ease of placing this responsibility in another's hands

Next you will need to create five personal security questions and verify the email address provided, finishing the account creation process. Everytime you log into the system one of these five questions will be asked to verify your identity. You will not need to answer all five questions each time, but it is important to keep the responses on hand.

Step 3: Fill out an Enrolment Form on farmprograms.net

Within the next series of questions in the online application, you will be asked to provide general information on your farm operation (address, FBRN, business number etc.) that will be relied upon when preparing cheques. Information on this form will only be required once.

- Farm business name - legal entity with banking privileges (name under which you file your farm taxes)
- Name of signing authority (person who has legal authority to bind the farm business)
- Full farm business mailing address
- FBRN or proof of equivalent
- Business number or Social Insurance Number
- Additional farm business partners - If there are none, please leave blank. If more than three additional partners, provide names of three major shareholders
- Identification of where the EFP workbook was peer reviewed and deemed appropriate, and when (month and year)
  - Primary and secondary farm commodities - if no secondary commodity exists simply check N/A
- Number of livestock - as applicable, please provide aggregated figures for past twelve months for each species
- Number of acres owned, rented and/or leased

This record will enable OSCIA to effectively deliver cost-share cheques.

Step 4: Begin the WET Application on farmprograms.net

Step 5: Meet with a technical specialist from your conservation authority or local stewards

OSCIA will put you in contact with an experienced technical specialist from the Nottawasaga, Lake Simcoe or Severn Sound region.

The technical specialist will use the information gathered during the site visit to complete the Riparian Workbook. They will then enter your information into the online account through their special log in procedure.

Step 6: Enter the information from your Environmental Farm Plan (EFP)

When you re-enter your online application you will be asked to answer a series of questions from your Environmental Farm Plan (EFP) (Third or Fourth Edition). Please have your EFP workbook close at hand so you can easily lookup each question and the corresponding responses.

For each question you will be asked to select the Risk Rating for your current site (existing condition) and then asked to answer the same question thinking about how the site will look after your project has been completed (anticipated result).

Tip: Only answer questions that pertain to your project. If completing your project will not change your risk rating, skip the question.

EFP Questions Include:

EFP Question	Risk Rating 4	Risk Rating 3	Risk Rating 2	Risk Rating 1
Page 93 - 7. Control of runoff from solid manure/prescribed solid material storage on a paved base (e.g. concrete)	Storage is covered, or all liquid runoff is collected and properly handled in a storage system and upslope surface water diverted	Runoff is not collected and stored, and a properly designed and approved vegetated filter strip system is used to manage runoff, or for stored manure 30% DM or greater and contained in a storage less than 300 sq. m in floor area, a physical barrier consisting of a permanently vegetated flow path that is at least 300m long is maintained between the storage and surface water, and tile inlets, and upslope surface water diverted.	Runoff is not collected and stored, and for stored manure 50% DM or greater and contained in a storage less than 300 sq. m in floor area, a physical barrier consisting of a permanently vegetated flow path that is at least 50m long is maintained between the storage and surface water **and tile outlets, or for stored manure 30% DM or greater and contained in a storage less than 300 sq. m in floor area, a physical barrier consisting of a permanently vegetated flow path that is at least 150m long is maintained between the storage and surface water, ** and tile inlets, and upslope surface water diverted **.	Runoff is not managed, or storage built or expanded after September 30, 2003 and does not meet minimum requirements in) Reg, or upslope surface water not diverted.
Page 94 - 8 Control of runoff from solid manure/prescribed solid material storage stacked on a soil base	Storage is covered, or all liquid runoff is collected and properly handled in a storage system, and the soil based includes a layer of soil greater than 1 m thick with 15% or more clay content or has an engineered earthen base, and upslope surface water diverted.	Runoff is not collected and stored. A properly designed and approved vegetated filter strip system is used to manage runoff, or for stored manure 30% DM or greater and contained in a storage less than 300 sq. m in floor area, a physical barrier consisting of a permanently vegetated flow path that is at least 300m long is maintained between the storage and surface water and tile inlets, and the soil base includes a layer of soil greater than 1 m thick with 15% or more clay content or has an engineered earthen base, and upslope surface water diverted.	Runoff is not collected and stored, and for stored manure 50% DM or greater and contained in a storage less than 300 sq. m in floor area, a physical barrier consisting of permanently vegetated flow path that is at least 150m long is maintained between the storage and surface water, ** and tile inlets, and the soil base includes a layer of soil greater than 0.5 m thick with 15% or more clay content or has an engineered earthen base, and upslope surface water diverted.	Runoff is not managed, or upslope surface water not diverted. Storage built or expanded after September 30, 2003 and does not meet minimum requirements as outlined in O. Reg. 267/03 (as amended), and associated protocols.
Page 97 - 12 Preventing roof water or upslope clean water from entering liquid or solid storage.	All upslope surface and roof water diverted to prevent from entering storage.		Some control over amount of clean water entering	No control over the amount of clean water entering storages. storages.
Page 106 3 Distance from livestock yard to subsurface perforated or clay drainage tile	Greater than 30 m from yard edge	24-30 m from yard edge, or any drainage tile located beneath and near the storage is made of non-perforated pipe and all surface joints are properly sealed, or observation and shut-off station installed, or tile water collected is stored or treated.	15-23 m from yard edge, and no observation and shut-off observation and shut-off station instead, and tile water is not collected, stored, or treated.	Less than 15 m from yard edge, and no observation and shut-off station installed and tile water is not collected, stored, or treated.
Page 106 - 4 Clean water diversion	All upslope surface and roof water diverted away from livestock yard.	Most upslope surface and roof water diverted away from livestock yard.	Some upslope surface water diverted away from livestock yard, and some upslope roof water collected and/or redirected.	All upslope water from surface and roof runs through the livestock yard.

EFP Question	Risk Rating 4	Risk Rating 3	Risk Rating 2	Risk Rating 1
Page 107 - 5 Control of livestock yard runoff	Livestock yard is roofed, or all liquid runoff is collected and properly handled in a storage system.	Runoff is collected and treated with a properly designed and approved vegetated filter strip/constructed wetland, or a physical barrier consisting of a permanently vegetated flow path that is at least 300 m long is maintained between the livestock yard and any storage water, and the yard surface area is less than or equal to 2000 sq. m. and nutrient units are less than 150, or livestock are fed on pasture fields that remain usable for pasture after the feeding period ends and a 30 m or wider permanently vegetated buffer is present between the field and surface water.	Runoff is not collected and stored, and a permanently vegetated flow path that is at least 150 m long is maintained between the yard and any surface water, and the yard surface area is less than or equal to 2000 sq. m. and nutrient units are less than 150, or livestock are fed on pasture fields that require tillage or re-establishment of pasture vegetation after the feeding period or there is less than a 30 m permanently vegetated buffer between the field and surface water.	Yard runoff is not managed, or OCA built or expanded after September 30th, 2003 and does not meet minimum requirements as outlined in O. Reg. 267.03 (as amended), and associated protocols.
Page 221 - 1 Buffer strips for stream and ditch bank stabilization	More than 3 m of natural vegetation (trees, shrubs, grasses) - requires little maintenance.	More than 3 m of any type of permanent vegetation that is deep rooted and moderate density can be planted and maintained.	.3-3 m of any type of shallow rooted permanent vegetation.	No buffer strip, or area is tilled to the top of the bank of the stream or ditch.
Page 221 - 2 Entry of surface water	No bank damage from entry of surface water, or minimum number of washouts replaced with drop structures and berms direct water to structures for erosion- protection.	Numerous washouts replaced with drop structures and no berms to direct water.	Bank damage caused by entry of surface water, or protection at entry points not adequate to prevent damage.	Severe bank damage due to entry of surface water, or surface water containing sediment enters watercourse.
Page 221- 3 Tile outlets	No erosion, and minimum number of tile outlets (e.g. header tile collects water from several tile runs). Good protection against erosion.	Some erosion and numerous tile outlets - one outlet for each tile run. Good protection against erosion.	Soil is eroding around outlets, or minimum number of tile outlets but not protected against erosion.	Soil is eroding around the outlets and sediment enters watercourse, or numerous tile outlets - no protection against erosion.
Page 222 - 4 Bank conditions (streams and ditches)	No evidence of erosion, and bank is completely covered with vegetation with thick dense roots, and no maintenance required.	Banks are slumping in a few locations, and most of the banks are covered with vegetation.	Banks are slumping in a few locations, or banks are covered with vegetation.	Slumping in many locations, or banks are not covered with vegetation (bare soil) and sediment enters watercourse.
Page 222 - 5 Stream and ditch inspection	Streams and ditches are inspected in the spring and fall each year for visual signs of erosion. Inspection includes: condition of banks, tile outlets, surface water entry points, and visual quality of tile outlet water.	Banks inspected once a year. Tile outlets, drop structures etc. inspection twice a year.	Streams and ditches inspected once a year in spring or fall.	Streams and ditches are not inspected for signs of erosion.
Page 223 - 6 Extensive livestock production system (low density i.e.. Pasture provides all nutritional requirements)	Banks have good cover of vegetation, and no damage to bank, and livestock don't spend any time in the watercourse, and water supply available away from the watercourse, and shade and salt located well away from watercourse, or fencing to keep livestock away from watercourse.	Banks have good cover of vegetation, and no damage to bank, and livestock spend little time near the watercourse. No muddy areas or fouling in the water, and constructed drinking area in watercourse or alternative water supply, and shade and salt located well away from watercourse.	Banks have little vegetation, or some damage to bank, or livestock spend some time near watercourse, or shade and salt located near watercourse.	Banks have no vegetation, or severe damage to bank, or livestock spend a lot of time in watercourse. Some muddy areas and fouling of water, or watercourse is only water supply
Page 224 - 7 Intensive livestock production system (high density i.e.. Pasture will not provide nutritional requirements and supplemental feed needed)	All livestock completely fenced from watercourses and buffer strips, and buffer zones are wide enough to prevent manure from entering watercourses, and water supply available away from watercourses, and gated bed-level or high-level/high-flow watercourse crossings are used every time livestock cross watercourse. .	All livestock completely fenced from watercourses and the buffer strips, and buffer zones are wide enough to prevent manure from entering watercourses, and water supply available away from watercourses, and bed-level or mid-level structures are used anytime livestock cross the watercourses.		Livestock free to enter the watercourses, or no buffer zone, or presence of animals obvious: fouling of water, trampling of stream banks, destruction of vegetation or no structure available if livestock have to cross watercourse.

EFP Question	Risk Rating 4	Risk Rating 3	Risk Rating 2	Risk Rating 1
Page 225 - 8 Extensive livestock production system (low density)	Floodplain has good cover of natural vegetation. No damage, and well managed rotational grazing system in place, and water supply available away from watercourse and floodplain area, and shade and salt located well away from floodplain.	Floodplain has good cover of natural vegetation. Little evidence of damage, and well managed rotational grazing system in place, and constructed drinking area or alternate water supply available within floodplain, and shade and salt located well away from floodplain.	Little vegetation in floodplain area. Some evidence of damage, or shade and salt located within floodplain.	No vegetation on severely damaged floodplain, or watercourse is only water supply or shade and salt located within floodplain.
Page 226 - 10 Cropping of floodplain area	Flood plain is used for woodlot or forage hay crop. No nutrients applied, or floodplain remains idle.	Floodplain is used for forage hay crop with nutrients applied.	Floodplain is used for row crops in rotation with forages (with or without nutrients applied).	Floodplain is used for row crops with or without nutrients applied.
Wetlands and Wildlife Ponds				
Page 231 - 1 Upland buffer strip between wetland or pond and cropland	Wide permanently vegetated upland buffer strip 16 m or more.	Narrow permanently vegetated upland buffer strip 5-16m.	Narrow upland buffer strip 3-5 m or not permanently vegetated.	No buffer or upland buffer strip less than 3 m between agricultural cropland and the wetland or pond.
page 231 - 2 Buffer strip management	A natural permanent trees/shrubs or grassland buffer, and buffer strip contains mostly native species, and buffer strip is retired and managed to fit with agriculture.	A natural permanent trees/shrubs, or grassland buffer with practices such as: hay harvest delayed until after the first week of July, or use flushing bar when mowing to scare off nesting birds, and rotational grazing with restricted access to water.	Permanent vegetation is cut or grazed with minimal attention to habitat and environmental values, or buffer may contain noxious weeds or undesirable invasive species.	Heavily grazed or traffic areas, removal of existing vegetation, or buffer contains areas of bare soil, severe compaction, excess of invasive species, or evidence of erosion.
Page 232 - 3 Sustainable management of forest resources in wetlands	Healthy, undisturbed wetland is left to function on its own, or sustainable harvest of forest resources done according to a forest management plan using appropriate best management practices in consultation with recognized forestry professionals.	Sustainable, renewable forest resources managed for regeneration to pre-harvest level, and seasonably limited livestock across (for shelter) that does not impair wetland function.	Forest resources harvested in an unsustainable way with no long-range plan (exploitive), or little restriction of access of livestock.	Wetland function and future forest production is lost with indiscriminate removal of trees (destructive), or unrestricted access by livestock.
Page 233 - 4 Wetlands and ponds - wildlife management	Healthy, undisturbed wetland is left to function on its own, or wetland/ponds enhanced by having a habitat plan for such things such as adding nesting structures, planting desirable plant species, and restoring natural flooding patterns, in consultation with conservation organizations, drainage superintendents and MNR, and highly sensitive habitats are avoided when harvesting/management activities are conducted (e.g. trees are not removed from an active Heronry), and problem wildlife managed and control methods reviewed annually.	Alterations to wetland/ponds still permit a great diversity of plants and animals, or wetland/ponds maintained by planting desirable species and highly sensitive habitats are moderately affected by harvesting/management activities, and land owners attended meetings or read material to learn and implement effective methods of: managing habitat for species that rely on wetlands for survival, problem wildlife control.	Alterations on wetland/ponds permit some diversity of plants and animals, or wetland/ponds damaged by removing buffer vegetation, or minimal effort to learn about wetland pond dependent species or problem wildlife control.	Alterations to wetland/ponds permit little diversity of plants and animals (e.g. monoculture of cattails), or wetland/ponds degraded by drainage with habitats negatively affected because water is no longer present, or harvest management activities are done during summer, or no effort to learn about wetland/pond dependent species or problem wildlife control.
Page 234 - 5 Wetlands and farm ponds - water management	No irrigation water is taken from wetland, and wetlands and farm ponds enlarged, are-designed or re-established in consultation with conservation organizations to enhance resource and wetland or pond values, or resources and wetland values enhanced by increasing water retention in consultation with conservation organizations, and farm ponds or wetlands with livestock access are fenced and have an alternate watering system installed.	If practical, water is not taken from wetlands during critical periods of nesting and spawning, and planning water table management in wetlands to balance environmental and production values, and farm ponds or wetlands with livestock access are fenced with a controlled hard-surfaced access point.		Unrestricted use of water with no regard for wildlife habitats, or filling in the wetland or pond, or indiscriminate removal of peat and muck, or discharge of farmstead wastewater into wetland or pond, or indiscriminate artificial drainage causing permanent reduction in water table, or farm ponds or wetlands have unrestricted livestock access resulting in fouled water, trampling banks, and little or no vegetation.

Step 7: Select and complete applicable Best Management Practice Questions

The following questions deal with your project specifically. Below, all of the BMPs are outlined, along with the information required to complete an application for each.

Costs to complete the proposed project must be carefully investigated by the producer through reputable quotes. It is critical that all details related to the project are carefully researched prior to submitting your online Bid Package. Cost-share determinations will be finalized at the application stage, so requests must be accurate and specific.

BMP 1.0 Upstream Clean Water Diversion

1.1 Eaves Troughs on Barns to Divert Water from Livestock Yards

This BMP provides an opportunity to put up or build upon eaves trough structures to divert fresh water away from livestock yards. The goal is to prevent water from mixing with manure and washing into watercourses.

Information requested on this type of project includes:

- The roof dimensions where the eaves troughs will be installed
- Metres of eaves troughing to be implemented
- Current conditions of the livestock yard and why it might be important to prevent freshwater from entering this area
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why you think your request is competitive

1.2 Landscape-based Runoff Diversion to Divert Water from Livestock Yards (eg. Berm, Surface Inlet, Concrete Barrier)

This BMP allows for ground-based diversion of fresh water from livestock yards, in the form of a berm, surface inlet, or concrete barrier to stop surface run-off from entering livestock yards and being carried to watercourses. Information required for this BMP includes:

- The type of diversion you would like to build
- The length of the proposed diversion in metres
- Description of the livestock yard's condition and why its important to prevent clean water entry
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

1.3 Roofing of Livestock Yards

This BMP provides an opportunity to address issues associated with clean rain-water entering livestock yards and creating contaminated run-off. Information required for this BMP includes:

- Dimensions of the yard to be covered
- A letter of support required from an OMAF Nutrient Management Specialist (to be uploaded digitally with the application)
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

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BMP 2.0 Downslope Management of Contaminated Run-Off

2.1 Constructed Wetland for Run-Off Treatment

This BMP provides an opportunity to treat contaminated runoff through a constructed wetland with the help of a Professional Engineer. Information required for this BMP includes:

- Dimensions of the constructed wetland
- Purpose of the proposed project including current conditions and why it is necessary
- A drawing of the proposed project designed by a Professional Engineer
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

2.2 Vegetative Filter Strip for Runoff Treatment

This BMP provides an opportunity to treat contaminated run-off by establishing vegetative filter strips. Information requested on this type of project includes:

- Dimensions of the vegetative filter strip in metres
- The purpose of the project, including current conditions and why it is necessary
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

2.3 Removal of Tile Drains Within 15 Metres of Livestock Facilities or Greenhouse/Nursery Operations or Constructed Wetland or Vegetative Strip

This BMP provides an opportunity to prevent contaminated run-off from reaching ponds, wetlands, streams and rivers through tile drain outlets, by removing improperly placed tile drains. Information requested on this type of project includes:

- A description of the project and why it is important
- The total length of tile drains to be removed and location of adjacent agricultural facility
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

2.4 Dispersion Sandwich for Treatment of Drainage Tile Effluent

This BMP provides the opportunity to treat contaminated run-off through the implementation of a dispersion sandwich, reducing nitrates entering wetlands, rivers, streams and ponds by utilizing woodchips to absorb and filter contaminants. Information requested on this type of project includes:

- Description of the project and why it is important
- Size of the tiles that outlet to the dispersion sandwich
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

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BMP 3.0 Livestock Removal from Watercourses

3.1 Fencing Parallel to Water's Edge to Protect Water Quality

This BMP provides an opportunity to establish livestock fencing along watercourses, to stop livestock from entering and contaminating rivers, streams, ponds and wetlands in order to protect water from contaminants. Information requested on this type of project includes:

- A description of why this project is important
- The type and length (metres) of fencing you will be implementing
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

3.2 Alternative Livestock Watering Systems

This BMP provides an opportunity to add new watering options for livestock that were previously reliant on natural water sources (i.e. entering and drinking from a stream, pond or wetland). Information requested on this type of project includes:

- A description of why this project is necessary
- Identification of what water source you will be drawing water from
- Identification of the system type you are relying upon
- An indication of the maximum number of livestock that can be supported by the system according to the manufacturer
- The number of livestock that will be serviced by the watering facility.
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

BMP 4.0 Riparian Naturalization

4.1 Purchasing and Planting of Forages, Shrubs, and Trees within the Riparian Buffer or Wetland Restoration

This BMP provides the opportunity to enhance, maintain or build a riparian buffer strip made of forages, shrubs, and trees for the benefit of streams, rivers, ponds and wetland areas existing on farmland. Buffer strips help filter runoff that may contain contaminants. These buffers also stablize stream banks and offer added benefit associated with bank shading and habitat provision.

- A site sketch of the project (uploaded digitally)
- Identification of how many plants and which species you are hoping to establish
- Additional resources to be used (eg. stakes, mulch or weed control systems)
- Number of acres of permanent vegetation that will be established by the project
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

BMP 5.0 Improved Stream Crossings for Livestock or Equipment

5.1 Improved Structures to Enhance Riparian Condition

This BMP provides the opportunity to strengthen stream crossings, reducing vulnerabilities associated with fresh water contamination as livestock and equipment pass from one side of the watercourse to the other. Information requested on this type of project includes:

- Justification as to why this project is necessary
- Description of the existing crossing
- Identification of the type of crossing you are going to build
- Drawings from a qualified professional
- A support letter from a local CA or Department of Fisheries and Oceans (DFO), if applicable
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

5.2 Removal of Harmful Crossings/Structures from Stream Channel

This BMP provides an opportunity to remove degraded or improper crossing structures, restoring the natural riparian system and preventing further contamination. Information requested on this type of project includes:

- Justification as to why this project is important
- Description of proposed actions
- A site sketch of the proposed project (to be uploaded digitally)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

BMP 6.0 Structural Erosion Control Projects Contributing to Riparian Condition

6.1 Stabilization of Streambanks or Shorelines

This BMP provides an opportunity to address shoreline erosion based issues, preventing further freshwater contamination issues and stabilizing riparian banks. Information requested on this type of project includes:

- Description of proposed actions
- Identification of shoreline length to be protected
- Drawings from a qualified professional (CA, OMAF or Professional Engineer)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

6.2 Drop Structures: (rock chute spillways, grade control structures or drop pipe inlet structures)

This BMP provides an opportunity to address erosion issues with drop structures, preventing further contamination to freshwater resources. Information requested on this type of project includes:

- Description of proposed project
- Identification of structural dimensions
- Drawings from a qualified professional (CA, OMAF, or Professional Engineer)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

6.3 In-channel Flow Control Structures to Reduce Velocity (eg. pools and riffles, natural channel design)

This BMP provides an opportunity to address erosion issues with in channel structures, preventing further damage to freshwater resources. Information requested on this type of project includes:

- Description of proposed project
- Identification of length of shoreline that will receive protection
- Drawings from a qualified professional (CA, OMAF, or Professional Engineer)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

6.4 Water and Sediment Control Basins

This BMP provides and opportunity to address erosion issues by collecting and storing waterborne sediment, protecting freshwater resources. Information requested on this type of project includes:

- Structural dimensions
- Drawings from a qualified professional (CA, OMAF, or Professional Engineer)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

6.5 Grassed Waterways

This BMP provides and opportunity to address erosion issues by establishing vegetated filter strips, through which contaminated runoff will flow, prior to reaching freshwater resources. Information requested on this type of project includes:

- Structural dimensions
- Drawings from a qualified professional (CA, OMAF, or Professional Engineer)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

6.6 Tile Outlet Structure Retrofits

This BMP provides an opportunity to stabilize tile drainage outlets that release water from fields into freshwater resources. Information requested on this type of project includes:

- Number of tiles to be stabilized
- Why the project is important
- Drawings from a qualified professional (CA, OMAF, or Professional Engineer)
- An itemized list of total project costs using detailed quotes from a reputable third party
- Funding being requested and why your request is competitive

Project Cost and Financial Requests

Once you have the costs for each BMP that you are applying for, a summary page will be displayed identifying the total Bid Package cost and the total funding requested. If you are not satisfied with the funding level requested, or do not feel it will be competitive enough to secure your bid, you can always use the "go back" button to return to the BMPs that you would like to change and make the necessary adjustments.

Environmental Benefits Scoring

A scoring system has been developed and applied to information provided throughout this application. The summary page will identify the relative priority of the watershed and the farm site itself, from information collected during the watershed specialist's site visit. These priority rankings are then converted into a factor that can be multiplied with the applicant's overall score. The score itself is built from the change in risk rating responses provided by the applicant's responses to questions from the EFP.

This information will be used to assess the site's level of priority in comparison with other applications and the reduction in vulnerability associated with proposed projects. Cost-share allocation will be based on this information and cost request details. Competitive proposals will demonstrate significant need for the projects, reduction in water quality vulnerability and efficient use of dollars requested.

Key Program Element	Date/Description
Eligible Invoice Date	On or after April 1, 2014
Application Submission Deadline	March 31, 2014
Claim Submission Deadline	December 15, 2014
Conservation Agreement	Signed between OSCIA and applicant to indicate commitment to complete proposed projects and receive agreed upon compensation.
Number of BMPs per Bid Package	Unlimited number of BMPs per Bid Package - however - collective approval or rejection will be applied Only one bid package can be completed per farm business applicant
Producer Cap	Unlimited
BMP Cap	Unlimited
Number of Successful Bid Packages per Farm Business	One for duration of 2014 WET Program
Online Applications Available	January 15, 2014 - March 31, 2014

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Annexure 4

Criteria and Methods of Scoring of different Sub Components and their Attributes of Four Values of Wetlands of Southern Ontario

(Source: Ontario Wetland Evaluation System (Southern Ontario Manual 3.2, 2013)

<u>Note:</u> Annexure contents are exact copies of the relevant pages from the source)

1.0 BIOLOGICAL COMPONENT

1.1 PRODUCTIVITY

1.1.1 Growing Degree-Days/Soils *(max: 30 pts)*

Refer to page 43 of manual for further explanation.

1. Determine the correct GDD value for your wetland (use Figure 5).
2. Circle the appropriate GDD value from the evaluation table below.
3. Determine the Fractional Area (FA) of the wetland for each soil type.
4. Multiply the fractional area of each soil type by the applicable score-factor in the evaluation table.
5. Sum the scores for each soil type to obtain the final score (maximum score is 30 points).

NOTE: *In wetland complexes the evaluator should aim at determining the fractional area occupied by the categories for the complex as a whole.*

Growing Degree-Days	Clay-Loam	Silt-Marl	Lime-stone	Sand	Humic-Mesic	Fibric	Granite
<2800	15	13	11	9	8	7	5
2800-3200	18	15	13	11	9	8	7
3200-3600	22	18	15	13	11	9	7
3600-4000	26	21	18	15	13	10	8
>4000	30	25	20	18	15	12	8

Soil Type	FA of wetland in soil type	Enter appropriate score-factor from above table	
Clay/Loam		X	=
Silt/Marl:		X	=
Limestone:		X	=
Sand:		X	=
Humic/Mesic:		X	=
Fibric:		X	=
Granite:		X	=
Total			

GDD/Soils score *(maximum 30 points)* _____

1.1.2 Wetland Type

(Fractional Areas = area of wetland type/total wetland area)

	Fractional Area		Score
Bog		x 3 =	
Fen		x 6 =	
Swamp		x 8 =	
Marsh		x 15 =	
Total		=	

Wetland type score *(maximum 15 points)* _____

1.1.3 Site Type

(Fractional Area = area of site type/total wetland area)

	Fractional Area		Score
Isolated		x 1 =	
Palustrine (permanent or intermittent flow)		x 2 =	
Riverine		x 4 =	
Riverine (at rivermouth)		x 5 =	
Lacustrine (at rivermouth)		x 5 =	
Lacustrine (with barrier beach)		x 3 =	
Lacustrine (exposed to lake)		x 2 =	
Total		=	

Site Type Score *(maximum 5 points)* _____

1.2 BIODIVERSITY

1.2.1 Number of Wetland Types

(Check only one)

	One	=	9 points
	Two	=	13
	Three	=	20
	Four	=	30

Number of Wetland Types Score
(maximum 30 points) _____

1.2.2. Vegetation Communities

Use the data sheet provided in Appendix 4 to record and score vegetation communities (the completed form must be attached to this data record)

Scoring *(circle only one option for each of the columns below):*

Total # of communities with **1-3 forms**		
1	=	1.5 pts
2	=	2.5
3	=	3.5
4	=	4.5
5	=	5
6	=	5.5
7	=	6
8	=	6.5
9	=	7
10	=	7.5
11	=	8
+ 0.5 *for each additional community*		
	=	

Total # of communities with **4-5 forms**		
1	=	2 pts
2	=	3.5
3	=	5
4	=	6.5
5	=	7.5
6	=	8.5
7	=	9.5
8	=	10.5
9	=	11.5
10	=	12.5
11	=	13
+ 0.5 *for each additional community*		
	=	

Total # of communities with **6 or more forms**		
1	=	3 pts
2	=	5
3	=	7
4	=	9
5	=	10.5
6	=	12
7	=	13.5
8	=	15
9	=	16.5
10	=	18
11	=	19
+ 1.0 *for each additional community*		
	=	

Vegetation Communities Score
(maximum 45 points) _____

1.2.3 Diversity of Surrounding Habitat

Check all appropriate items. Only habitat within 1.5 km of the wetland boundary and at least 0.5 ha in size are to be scored.

	row crop
	pasture
	abandoned agricultural land
	deciduous forest
	coniferous forest
	mixed forest*
	abandoned pits and quarries
	open lake or deep river
	fence rows with deep cover, or shelterbelts
	terrain appreciably undulating, hilly or with ravines
	creek flood plain

* *"Mixed forest" is defined as either 25% coniferous trees distributed singly or in clumps in deciduous forest, or 25% deciduous trees distributed singly or in clumps in coniferous forest. Note that Forest Resource Inventory (FRI) maps can be misleading since 25% conifer within a unit could be entirely concentrated around a lake.*

Score 1 point for each feature checked, up to a maximum of 7 points.

Diversity of Surrounding Habitat Score
(maximum 7 points) _____

1.2.4 Proximity to Other Wetlands

Check highest appropriate category. (Note: if the wetland is lacustrine, score option #1 at 8 points).

✓		Points
	Hydrologically connected by surface water to other wetlands different dominant wetland type), or to open lake or deep river within 1.5 km	8
	Hydrologically connected by surface water to other wetlands (same dominant wetland type) within 0.5 km	8
	Hydrologically connected by surface water to other wetlands (different dominant wetland type), or to open lake or deep river from 1.5 to 4 km away	5
	Hydrologically connected by surface water to other wetlands (same dominant wetland type) from 0.5 to 1.5 km away	5
	Within 0.75 km of other wetlands (different dominant wetland type) or open water body, but not hydrologically connected by surface water	5
	Within 1 km of other wetlands, but not hydrologically connected by surface water	2
	No wetland within 1 km	0

Name and distance (from wetland) of wetlands/waterbodies scored above:

_____

_____

Proximity to other Wetlands Score
(maximum 8 points) _____

1.2.5 Interspersion

Number of Intersections = _____

✓	Number of Intersections *(Check one only)*		Points
	26 or less	=	3
	27 to 40	=	6
	41 to 60	=	9
	61 to 80	=	12
	81 to 100	=	15
	101 to 125	=	18
	126 to 150	=	21
	151 to 175	=	24
	176 to 200	=	27
	>200	=	30

Interspersion Score *(maximum 30 points)* _____

1.2.6 Open Water Types

NOTE: *this attribute is only to be scored for permanently flooded open water within the wetland (adjacent lakes do not count). Check one option only.*

✓	Open Water Type	Characteristic		Points
	Type 1	Open water occupies < 5 % of wetland area	=	8
	Type 2	Open water occupies 5-25% of wetland (occurring in central area)	=	8
	Type 3	Open water occupies 5-25% (occurring in various-sized ponds, dense patches of vegetation or vegetation in diffuse stands)	=	14
	Type 4	Open water occupies 26-75% of wetland (occurring in a central area)	=	20
	Type 5	Open water occupies 26-75% of wetlands (small ponds and embayments are common)	=	30
	Type 6	Open water occupies 76%-95% of wetland (occurring in large central area; vegetation is peripheral)	=	8
	Type 7	Open water occupies 76-95% of wetland (vegetation in patches or diffuse open stands)	=	14
	Type 8	Open water occupies more than 95% of wetland area	=	3
	No open water		=	0

Open Water Type Score *(maximum 30 points)* _____

1.3 SIZE (BIOLOGICAL COMPONENT)

Total Size of Wetland = _____ ha

Sum of scores from Biodiversity Subcomponent

1.2.1
+ 1.2.2
+ 1.2.3
+ 1.2.4
+ 1.2.5
+ 1.2.6

Circle the appropriate score from the table below.

Wetland size (ha)	Total Score for Biodiversity Subcomponent									
	<37	37-47	48-60	61-72	73-84	85-96	97-108	109-120	121-132	>132
<20 ha	1	5	7	8	9	17	25	34	43	50
20-40	5	7	8	9	10	19	28	37	46	50
41-60	6	8	9	10	11	21	31	40	49	50
61-80	7	9	10	11	13	23	34	43	50	50
81-100	8	10	11	13	15	25	37	46	50	50
101-120	9	11	13	15	18	28	40	49	50	50
121-140	10	13	15	17	21	31	43	50	50	50
141-160	11	15	17	19	23	34	46	50	50	50
161-180	13	17	19	21	25	37	49	50	50	50
181-200	15	19	21	23	28	40	50	50	50	50
201-400	17	21	23	25	31	43	50	50	50	50
401-600	19	23	25	28	34	46	50	50	50	50
601-800	21	25	28	31	37	49	50	50	50	50
801-1000	23	28	31	34	40	50	50	50	50	50
1001-1200	25	31	34	37	43	50	50	50	50	50
1201-1400	28	34	37	40	46	50	50	50	50	50
1401-1600	31	37	40	43	49	50	50	50	50	50
1601-1800	34	40	43	46	50	50	50	50	50	50
1801-2000	37	43	47	49	50	50	50	50	50	50
>2000	40	46	50	50	50	50	50	50	50	50

Size Score (Biological Component)
(maximum 50 points) _____

2.0 SOCIAL COMPONENT

2.1 ECONOMICALLY VALUABLE PRODUCTS

2.1.1 Wood Products

Check the option that best reflects the total area (ha) of forested wetland (i.e., areas where the dominant vegetation form is h or c). Note that this is the area of all the forested vegetation communities, not total wetland size. Do not include areas where harvest is not permitted. Check only one option.

Area of wetland used for scoring 2.1.1: _____

	< 5 ha	=	0 pts
	5 - 25 ha	=	3
	26 – 50 ha	=	6
	51 – 100 ha	=	9
	101 – 200 ha	=	12
	> 200 ha	=	18

Source of information:

_____

_____

Wood Products Score *(maximum 18 points)* _____

2.1.2 Wild Rice

Check only one.

	Present (min. size 0.5 ha)	=	6 pts
	Absent	=	0
	Harvest not permitted	=	0

Source of information:

_____

_____

Wild Rice Score *(maximum 6 points)* _____

2.1.3 Commercial Bait Fish

Check only one.

	Present	=	12 pts
	Absent	=	0
	Fishing not permitted	=	0

Source of information:

_____

_____

Commercial Fish Score *(maximum 12 points)* _____

2.1.4 Furbearers

Only species recognized as furbearers under the Fish & Wildlife Conservation Act may be scored here. Score 3 *points for each furbearer species listed, up to a maximum of 12 points.*

	Name of furbearer	Source of information
1.		
2.		
3.		
4.		
5.		
6.		

Furbearer Score *(maximum 12 points)* _____

2.2 RECREATIONAL ACTIVITIES

Sources of information and reasons for scoring a wetland under high or moderate use below, must be included below.

Circle one score for each of the activities listed. Score is cumulative – add score for hunting, nature enjoyment and fishing together for final score.

Intensity of Use	Type of Wetland-Associated Use		
	Hunting	Nature Enjoyment/ Ecosystem Study	Fishing
High	40 points	40 points	40 points
Moderate	20	20	20
Low	8	8	8
Not Possible/ No evidence	0	0	0

Sources of information (include evidence/criteria forming basis for score and any relevant reference used to obtain that information):
- e.g., Hunting scored at 20 points: 5 hunting blinds observed; hunters using area frequently monitored for compliance (source: D. Black, MNR Conservation Officer)

Hunting: _____

Nature: _____

Fishing: _____

Recreational Activities Score
(maximum 80 points) _____

2.3 LANDSCAPE AESTHETICS

2.3.1 Distinctness

Check only one.

	Clearly Distinct	=	3 pts
	Indistinct	=	0

Landscape Distinctness Score
(maximum 3 points) _____

2.3.2 Absence of Human Disturbance

Check only one.

	Human disturbances absent or nearly so	=	7 pts
	One or several localized disturbances	=	4
	Moderate disturbance; localized water pollution	=	2
	Wetland intact but impairment of ecosystem quality intense in some areas	=	1
	Extreme ecological degradation, or water pollution severe and widespread	=	0

Details regarding type, extent and location of disturbance scored:

_____

_____

_____

Source of information:

_____

_____

Absence of Human Disturbance Score
(maximum 7 points) _____

2.4 EDUCATION AND PUBLIC AWARENESS

2.4.1 Educational Uses

Check highest appropriate category.

	Frequent	=	20 pts
	Infrequent	=	12
	No visits	=	0

Details regarding the type and frequency of education uses scored above:

_____

_____

_____

Source of information:

_____

_____

Educational Uses Score *(maximum 20 points)* _____

2.4.2 Facilities and Programs

Check all appropriate options, score highest category checked.

	Staffed interpretation centre	=	8 pts
	No interpretation centre or staff, but a system of self-guiding trails or brochures available	=	4
	Facilities such as maintained paths (e.g., woodchips), boardwalks, boat launches or observation towers, but no brochures or other interpretation	=	2
	No facilities or programs	=	0

Additional Notes/Comments:

_____

_____

_____

Source of information:

_____

_____

Facilities and Programs Score
(maximum 8 points) _____

2.4.3 Research and Studies

Check all that apply; score highest category checked.

	Long term research has been done	=	12 pts
	Research papers published in refereed scientific journal or as a thesis	=	10
	One or more (non-research) reports have been written on some aspect of the wetland's flora, fauna, hydrology, etc.	=	5
	No research or reports	=	0

List of reports, publications, research studies etc. scored above:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Research and Studies Score
(maximum 12 points) _____

2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT

Name of Settlement: _____

Distance of wetland from settlement: _____

Population of settlement: _____ (Source: _____)

Circle only the highest score applicable

Distance of wetland to settlement	population >10,000	population 2,500-10,000	population <2,500 or cottage community
within or adjoining settlement	40 points	26 points	16 points
0.5 to 10 km from settlement	26	16	10
10 to 60 km from settlement	12	8	4
>60 km from nearest settlement	5	2	0

Proximity to Human Settlement Score
(maximum 40 points) _____

2.6 OWNERSHIP

FA of wetland held by or held under a legal contract by a conservation body (as defined by the *Conservation Land Act*) for wetland protection	_____ x 10 = _____
FA of wetland occurring in provincially or nationally protected areas (e.g., parks and conservation reserves)	_____ x 10 = _____
FA of wetland area in Crown/public ownership, not as above	_____ x 8 = _____
FA of wetland area in private ownership, not as above	_____ x 4 = _____

Source of information:

_____

Ownership Score *(maximum 10 points)* _____

2.7 SIZE (SOCIAL COMPONENT)

Total Size of Wetland = _____ ha Sum of scores from Subcomponents 2.1, 2.2, and 2.5 = _____

Circle the appropriate score from the table below.

	Total for Size Dependent Social Features									
	<31	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	>150
<2 ha	1	2	4	8	10	12	14	14	14	15
2-4	1	2	4	8	12	13	14	14	15	16
5-8	2	2	5	9	13	14	15	15	16	16
9-12	3	3	6	10	14	15	15	16	17	17
13-17	3	4	7	10	14	15	16	16	17	17
18-28	4	5	8	11	15	16	16	17	17	18
29-37	5	7	10	13	16	17	18	18	19	19
38-49	5	7	10	13	16	17	18	18	19	20
50-62	5	8	11	14	17	17	18	19	20	20
63-81	5	8	11	15	17	18	19	20	20	20
82-105	6	9	11	15	18	18	19	20	20	20
106-137	6	9	12	16	18	19	20	20	20	20
138-178	6	9	13	16	18	19	20	20	20	20
179-233	6	9	13	16	18	20	20	20	20	20
234-302	7	9	13	16	18	20	20	20	20	20
303-393	7	9	14	17	18	20	20	20	20	20
394-511	7	10	14	17	18	20	20	20	20	20
512-665	7	10	14	17	18	20	20	20	20	20
666-863	7	10	14	17	19	20	20	20	20	20
864-1123	8	12	15	17	19	20	20	20	20	20
1124-1460	8	12	15	17	19	20	20	20	20	20
1461-1898	8	13	15	18	19	20	20	20	20	20
1899-2467	8	14	16	18	20	20	20	20	20	20
>2467	8	14	16	18	20	20	20	20	20	20

Total Size Score (Social Component) _____

2.8 ABORIGINAL VALUES AND CULTURAL HERITAGE

Either or both Aboriginal or Cultural Values may be scored. However, the maximum score permitted for 2.8 is 30 points.

Full documentation of sources must be attached to the data record.

2.8.1 Aboriginal Values

	Significant	=	30 pts
	Not Significant	=	0
	Unknown	=	0

Additional Comments/Notes:

2.8.2 Cultural Heritage

	Significant	=	30 pts
	Not Significant	=	0
	Unknown	=	0

Additional Comments/Notes:

Aboriginal Values/Cultural Heritage Score
(maximum 30 points) _____

3.0 HYDROLOGICAL COMPONENT

3.1 FLOOD ATTENUATION

Check one of the following four options.

- [ ] If wetland is a single contiguous coastal wetland, ➡ score 0 points for this section.
- [ ] If all wetland units of a wetland complex are coastal wetland units, ➡ score 0 points for this section.
- [ ] If wetland or wetland complex is entirely isolated in site type, ➡ score 100 points automatically.
- [ ] Wetland not as above – proceed through 'steps' A through L below.

(A) Total wetland area = _____ ha

(B) Size of wetland's catchment = _____ ha

(C) Size of other detention areas in catchment = _____ ha

(D) Size of 'isolated' portions of wetland = _____ ha (FA = _____)

(E) Size of coastal units of wetland complex = _____ ha (FA = _____)

Points for Isolated Portion of Wetland (If not applicable, enter '0'):
(F) (FA of D) x 100 pts = _____ pts

Points for Coastal Portion(s) of Wetland (if not applicable, enter '0')
(G) (FA of E) x 100 pts =_____ pts

(H) Size of wetland minus the isolated and coastal portions = {A – D – E} = _____ ha

(I) Number of points available to score 'rest' of wetland = {100 – F – G} = _____ pts

(J) Total area of upstream detention areas = {A + C } = _____ha

(K) Upstream Detention Factor = {(H/J) x 2} = _____ (maximum 1.0)

(L) Attenuation Factor = {(H/B) x 10} = _____ (maximum 1.0)

Flood Attenuation Final Score = {[((K + L) /2) x I] + F} = _____

Flood Attenuation Score *(maximum 100 points)* _____

3.2 WATER QUALITY IMPROVEMENT

3.2.1 Short Term Water Quality Improvement

Step 1: Determination of maximum initial score

	Wetland on one of the 5 defined large lakes or 5 major rivers (Go to Step 5A)
	All other wetlands (Go through Steps 2, 3, 4, and 5B)

Step 2: Determination of Watershed Improvement Factor (WIF)

Calculation of WIF is based on the fractional area (FA) of each site type that makes up the total area of the wetland.

(FA = area of site type/total area of wetland)

FA of isolated wetland	=	x 0.5 =	
FA of riverine wetland	=	x 1.0 =	
FA of palustrine wetland with no inflow	=	x 0.7 =	
FA of palustrine wetland with inflows	=	x 1.0 =	
FA of lacustrine on lake shoreline	=	x 0.2 =	
FA of lacustrine at lake inflow or outflow	=	x 1.0 =	

Sum (*WIF cannot exceed 1.0*) _____

Step 3: Determination of catchment Land Use Factor (LUF)

(Choose the first category that fits upstream land use in the catchment.)

	Over 50% agricultural and/or urban	=	1.0
	Between 30 and 50% agricultural and/or urban	=	0.8
	Over 50% forested or other natural vegetation	=	0.6

LUF *(maximum 1.0)* _____

Step 4: Determination of Pollutant Uptake Factor (PUF)

Calculation of PUF is based on the fractional area (FA) of each vegetation type that makes up the total area of the wetland. Base assessment on the dominant vegetation form for each community except where dead trees or shrubs dominate. In that case base assessment on the dominant live vegetation type.

(FA = area of vegetation type/total area of wetland)

FA of wetland with live trees, shrubs, herbs or mosses (c, h, ts, ls, gc, m)	= x	0.75 =	
FA of wetland with emergent, submergent or floating vegetation (re, be, ne, su, f, ff)	= x	1.0 =	
FA of wetland with little or no vegetation (u)	= x	0.5 =	

Sum *(PUF cannot exceed 1.0)* _____

Step 5: Calculation of final score

	Wetland on defined 5 major lakes or 5 major rivers	0
	All other wetlands – calculate as follows	
	Initial score	60
	Watershed Improvement Factor (WIF)	_____
	Land Use Factor (LUF)	_____
	Pollutant Uptake Factor (PUF)	_____
	Final score: 60 x WIF x LUF x PUF =	_____

Short Term Water Quality Improvement Score
(maximum 60 points) _____

3.2.2 Long Term Nutrient Trap

Step 1:

	Wetland on defined 5 major lakes or 5 major rivers = 0 points
	All other wetlands (Proceed to Step 2)

Step 2: Choose only one of the following settings that best describes the wetland being evaluated

	Wetland located in a river mouth	=	10 pts
	Wetland is a bog, fen, or swamp with more than 50% of the wetland being covered with organic soil	=	10
	Wetland is a bog, fen, or swamp with less than 50% of the wetland being covered with organic soil	=	3
	Wetland is a marsh with more than 50% of the wetland covered with organic soil	=	3
	None of the above	=	0

Long Term Nutrient Trap Score
(maximum 10 points) _____

3.2.3 Groundwater Discharge

Circle the characteristics that best describe the wetland being evaluated and then sum the scores. If the sum exceeds 30 points, assign the maximum score of 30). Note: for wetland type, wetland type scored does not have to the dominant type in the wetland.

Wetland Characteristics	Potential for Discharge		
	None to Little	Some	High
Wetland type	Bog = 0	Swamp/Marsh = 2	Fen = 5
Topography	Flat/rolling = 0	Hilly = 2	Steep = 5
Wetland area: Upslope catchment area	Large (>50%) = 0	Moderate (5-50%) = 2	Small (<5%) = 5
Lagg development	None found = 0	Minor = 2	Extensive = 5
Seeps	None = 0	≤ 3 seeps = 2	> 3 seeps = 5
Surface marl deposits	None = 0	≤ 3 sites = 2	> 3 sites = 5
Iron precipitates	None = 0	≤ 3 sites = 2	> 3 sites = 5
Located within 1 km of a major aquifer	N/A = 0	N/A = 0	Yes = 10 No = 0

Additional Comments/Notes:

_____

_____

_____

Groundwater Discharge Score
(maximum 30 points) _____

3.3 CARBON SINK

Check only one of the following:

	Bog, fen or swamp with more than 50% coverage by organic soil	=	5 pts
	Bog, fen or swamp with between 10 to 50% coverage by organic soil	=	2
	Marsh with more than 50% coverage by organic soil	=	3
	Wetlands not in one of the above categories	=	0

Source of information:

_____

_____

Carbon Sink Score
(maximum 5 points) _____

3.4 SHORELINE EROSION CONTROL

From the wetland vegetation map determine the dominant vegetatino type within the erosion zone for lacustrine and riverine site type areas only. Score according to the factors listed below.

Step 1:

	Wetland entirely isolated or palustrine	=	0 pts
	Any part of the wetland is riverine or lacustrine	=	Go to step 2

Step 2: *Choose the one characteristic that best describes the shoreline vegetation (see page 109 for description of "shoreline".)*

	Trees and shrubs	=	15 pts
	Emergent vegetation	=	8
	Submergent vegetation	=	6
	Other shoreline vegetation	=	3
	No vegetation	=	0

Shoreline Erosion Control Score
(maximum 15 points) _____

3.5 GROUNDWATER RECHARGE

3.5.1 Site Type

Wetland > 50% lacustrine (by area) or located on one of the five major rivers		= 0 pts	
Wetland not as above. Calculate final score as follows:			
■ FA of isolated or palustrine wetland	=	x 50 =	
■ FA of riverine wetland	=	x 20 =	
■ FA of lacustrine wetland (not dominant site type)	=	x 0 =	

Groundwater Recharge/Wetland Site Type Score
(maximum 50 points) _____

3.5.2 Soil Recharge Potential

*Circle only one choice that **best** describes the soils in **the area surrounding the wetland** being evaluated (the soils within the wetland are not scored here).*

		Group A, B, C (sands, gravels, loams)	Group D (clays, substrates in high water tables, shallow substrates over impervious materials such as bedrock)
Dominant Wetland Type	Lacustrine or major river	0	0
	Isolated	10	5
	Palustrine	7	4
	Riverine (not on a major river)	5	2

Groundwater Recharge/Wetland Soil Recharge Potential Score *(maximum 10 points)* _____

4.0 SPECIAL FEATURES COMPONENT

4.1 RARITY

4.1.1 Wetland Types

Ecodistrict	Rarity within the Landscape (4.1.1.1)	Rarity of Wetland Type (4.1.1.2)			
		Marsh	Swamp	Fen	Bog
6E-1	60	40	0	80	80
6E -2	60	40	0	80	80
6E-4	60	40	0	80	80
6E-5	20	40	0	80	80
6E-6	40	20	0	80	80
6E-7	60	10	0	80	80
6E-8	20	20	0	80	80
6E-9	0	20	0	80	80
6E-10	20	0	20	80	80
6E-11	0	30	0	80	80
6E-12	0	30	0	60	80
6E-13	60	10	0	80	80
6E-14	40	20	0	40	80
6E-15	40	0	0	80	80
6E-16	60	20	0	80	60
6E-17	40	10	0	30	80
7E-1	60	0	60	80	80
7E-2	60	0	0	80	80
7E-3	60	00	0	80	80
7E-4	80	0	0	80	80
7E-5	60	20	0	80	80
7E-6	80	30	0	80	80

4.1.1.1 Rarity within the Landscape

Choose appropriate score from 2nd column above.

Score *(maximum 80 points)* _____

4.1.1.2 Rarity of Wetland Type

Score is cumulative, based on presence/absence. Circle all appropriate scores from above table and sum.

Score *(maximum 80 points)* _____

4.1.2 Species

4.1.2.1 Reproductive Habitat for an Endangered or Threatened Species

Under the "Activity" column, when scoring animal species, record what the animal was doing when observed (e.g., nesting, courtship, singing, etc).

Common Name	Scientific Name	Activity	Date Observed	Info Source

For each species score 250 points. (Score is cumulative, no maximum score)

Additional Notes/Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Reproductive Habitat for Endangered or Threatened Species *(no maximum)* _____

4.1.2.2 Traditional Migration or Feeding Habitat for an Endangered or Threatened Species

Under the "Activity" column, when scoring animal species, record what the animal was doing when observed (e.g., nesting, courtship, singing, feeding, resting etc). Dates that species has been recorded using the wetland must be included in the table below.

Common Name	Scientific Name	Activity	Dates Observed	Info Source

For one species score 150 points; for each additional species score 75 points. (Score is cumulative)

Additional Notes/Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Traditional Habitat for Endangered or Threatened Species *(no maximum)* _____

4.1.2.3 Provincially Significant Animal Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source

Additional Notes/Comments:

One species	=	50 pts	9 species	=	140 pts	17 species	=	160 pts
2 species	=	80	10 species	=	143	18 species	=	162
3 species	=	95	11 species	=	146	19 species	=	164
4 species	=	105	12 species	=	149	20 species	=	166
5 species	=	115	13 species	=	152	21 species	=	168
6 species	=	125	14 species	=	154	22 species	=	170
7 species	=	130	15 species	=	156	23 species	=	172
8 species	=	135	16 species	=	158	24 species	=	174
						25 species	=	176

Add one point for every species past 25 (for example, 26 species = 177 points, 27 species = 178 points etc.)

Provincially Significant Animal Species
(no maximum) _____

4.1.2.4 Provincially Significant Plant Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source

Additional Notes/Comments:

One species	=	50 pts	9 species	=	140 pts	17 species	=	160 pts
2 species	=	80	10 species	=	143	18 species	=	162
3 species	=	95	11 species	=	146	19 species	=	164
4 species	=	105	12 species	=	149	20 species	=	166
5 species	=	115	13 species	=	152	21 species	=	168
6 species	=	125	14 species	=	154	22 species	=	170
7 species	=	130	15 species	=	156	23 species	=	172
8 species	=	135	16 species	=	158	24 species	=	174
						25 species	=	176

Add one point for every species past 25 (for example, 26 species = 177 points, 27 species = 178 points etc.)

Provincially Significant Plant Species
(no maximum) _____

4.1.2.5 Regionally Significant Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source

One species= 20 pts	4 species = 45 pts	7 species = 58 pts
2 species = 30	5 species = 50	8 species = 61
3 species = 40	6 species = 55	9 species = 64
		10 species = 67

For each significant species over 10 in wetland, add 1 point.

Regionally Significant Species Score
(no maximum score) _____

4.1.2.6 Locally Significant Species

Common Name	Scientific Name	Activity	Dates Observed	Info Source

One species= 10 pts	4 species = 31 pts	7 species = 43 pts
2 species = 17	5 species = 38	8 species = 45
3 species = 24	6 species = 41	9 species = 47
		10 species = 49

For each significant species over 10 in wetland, add 1 point.

Locally Significant Species Score
(no maximum score) _____

4.2 SIGNIFICANT FEATURES AND HABITATS

4.2.1 Colonial Waterbirds

Record all available information. Score the highest applicable category. Include additional information as possible (e.g., nest locations, etc).

Activity	Species	Info Source	Points
Currently nesting			= 50
Known to have nested within the past 5 years			= 25
Active feeding area (great blue heron excluded)			= 15
None known			= 0

Additional Notes/Comments:

_____

_____

_____

_____

Colonial Waterbird Nesting Score
(maximum 50 points) _____

4.2.2 Winter Cover for Wildlife

Score highest appropriate category. Include rationale/sources of information.

	Provincially significant	=	100 pts
	Significant in Ecoregion	=	50
	Significant in Ecodistrict	=	25
	Locally significant	=	10
	Little or poor winter cover	=	0

Species/habitat/vegetation community scored *(e.g., winter deer cover in hemlock swamp, S3 and S4b)*:

_____

_____

_____

Source of information:

_____

_____

Winter Cover for Wildlife Score
(maximum 100 points) _____

4.2.3 Waterfowl Staging and/or Moulting Areas

Check highest level of significance for both staging and moulting; add scores for staging and for moulting together for final score. However, maximum score for evaluation under this section is 150 points.

	Staging	Moulting
Nationally/internationally significant	= 150 pts	= 150 pts
Provincially significant	= 100	= 100
Significant in the Ecoregion	= 50	= 50
Significant in Ecodistrict	= 25	= 25
Known to occur	= 10	= 10
Not possible/Unknown	= 0	= 0

Species/habitat/vegetation community scored *(e.g., approx 20 mallards in W3)*:

_____

_____

Source of information:

_____

Waterfowl Staging/Moulting Score
(maximum 150 points) _____

4.2.4 Waterfowl Breeding

Check highest level of significance.

	Nationally/internationally significant	= 150 pts
	Provincially significant	= 100
	Significant in the Ecoregion	= 50
	Significant in Ecodistrict	= 25
	Habitat Suitable	= 5
	Habitat not suitable	= 0

Species/habitat/vegetation community scored *(e.g., mallard in W3)*:

_____

_____

Source of information:

_____

Waterfowl Breeding Score
(maximum 100 points) _____

4.2.5 Migratory Passerine, Shorebird or Raptor Stopover Area

Check highest level of significance.

	Nationally / internationally significant	= 150 pts
	Provincially significant	= 100
	Significant in Ecoregion	= 50
	Significant in Ecodistrict	= 25
	Known to occur	= 10
	Not possible / Unknown	= 0

Species/habitat/vegetation community scored:

_____

_____

Source of information:

_____

Passerine, Shorebird or Raptor Stopover Score
(maximum 100 points) _____

4.2.6 Fish Habitat

4.2.6.1 Spawning and Nursery Habitat

Area Factors for Low Marsh, High Marsh and Swamp Communities.

No. of ha of Fish Habitat	Area Factor
< 0.5 ha	0.1
0.5 – 4.9	0.2
5.0 – 9.9	0.4
10.0 – 14.9	0.6
15.0 – 19.9	0.8
20.0 +	1.0

Step 1:

☐	Fish habitat is not present within the wetland	Go to Step 7, Score 0 points
☐	Fish habitat is present within the wetland	Go to Step 2

Step 2: *Choose only one option*

☐	Significance of the spawning and nursery habitat within the wetland is known	Go to Step 3
☐	Significance of the spawning and nursery habitat within the wetland is not known	Go through Steps 4, 5 and 6

Step 3: *Select the highest appropriate category below, attach documentation:*

☐	Significant in Ecoregion	Go to Step 7, Score 100 points
☐	Significant in Ecodistrict	Go to Step 7, Score 50 points
☐	Locally Significant Habitat (5.0+ ha)	Go to Step 7, Score 25 points
☐	Locally Significant Habitat (<5.0 ha)	Go to Step 7, Score 15 points

Source of information:

_____

Step 4: Low Marsh = the '**permanent**' marsh area, from the existing water line out to the outer boundary of the wetland.

☐	Low marsh not present	Go to Step 5
☐	Low marsh present	Continue through Step 4, scoring as noted below

Scoring of Low Marsh:

1. Check the appropriate **Vegetation Group** (see Appendix 7) for each Low Marsh community. (Based on the one most clearly dominant plant species of the dominant form in each Low Marsh vegetation community.)
2. Sum the areas (ha) of the vegetation communities assigned to each **Vegetation Group**.
3. Use these areas to assign an **Area Factor** for each checked **Vegetation Group**.
4. Multiply the **Area Factor** by the **Multiplication Factor** for each row to calculate **Score**.
5. Sum all numbers in Score column to get **Total Score for Low Marsh**.

Scoring for Presence of Key Vegetation Groups – Low Marsh

Vegetation Group Number	Vegetation Group Name	Present as a Dominant Form (check)	Total Area (ha)	Area Factor (from Table 8)	Multiplication Factor	Score
1	Tallgrass				6	
2	Shortgrass-Sedge				11	
3	Cattail-Bulrush-Burreed				5	
4	Arrowhead-Pickerelweed				5	
5	Duckweed				2	
6	Smartweed-Waterwillow				6	
7	Waterlily-Lotus				11	
8	Waterweed-Watercress				9	
9	Ribbongrass				10	
10	Coontail-Naiad-Watermilfoil				13	
11	Narrowleaf Pondweed				5	
12	Broadleaf Pondweed				8	
	Total Score for Low Marsh (*maximum 75 points*)					

Continue to Step 5

Step 5: High Marsh = the 'seasonal' marsh area, from the water line to the inland boundary of marsh wetland type. This is essentially what is commonly referred to as a wet meadow, in that there is insufficient standing water to provide fisheries habitat except during flood or high water conditions.

	High marsh not present	Go to Step 6
	High marsh present	Continue through Step 5, scoring as noted below

Scoring of High Marsh:

1. Check the appropriate **Vegetation Group** (see Appendix 7) for each High Marsh community. (Based on the one most clearly dominant plant species of the dominant form in each High Marsh vegetation community.)
2. Sum the areas (ha) of the vegetation communities assigned to each **Vegetation Group**.
3. Use these areas to assign an **Area Factor** (from Table 8) for each checked **Vegetation Group**.
4. Multiply the **Area Factor** by the **Multiplication Factor** for each row to calculate **Score**.
5. Sum all numbers in Score column to get **Total Score for High Marsh**.

Scoring for Presence of Key Vegetation Groups – High Marsh

Vegetation Group Number	Vegetation Group Name	Present as a Dominant Form (check)	Total Area (ha)	Area Factor (from Table 8)	Multiplication Factor	Score
1	Tallgrass				6	
2	Shortgrass-Sedge				11	
3	Cattail-Bulrush-Burreed				5	
4	Arrowhead-Pickerelweed				5	
	Total Score for High Marsh (*maximum 25 points*)					

Continue to Step 6

Step 6:

	Swamp containing fish habitat not present	Go to Step 7
	Swamp containing fish habitat present	Continue through Step 6, scoring as follows

Scoring of Swamp:

1. Determine the total area (ha) of seasonally flooded swamp communities within the wetland containing fish habitat and record below.
2. Determine the total area (ha) of permanently flooded swamp communities within the wetland containing fish habitat and record below.
3. Use these areas to assign an **Area Factor** (from Table 8).
4. Multiply the Area Factor by the **Multiplication Factor** for each row to calculate **Score**.
5. Sum all numbers in Score column to get **Total Score for Swamp**.

Scoring Swamps for Fish Habitat (Seasonally flooded; Permanently flooded)					
Swamp Containing Fish Habitat	Present (check)	Total Area (ha)	Area Factor (from Table 8)	Multiplication Factor	Score
Seasonally Flooded Swamp				10	
Permanently Flooded Swamp				10	
		Total Score for Swamp (*maximum 20 points*)			

Continue to Step 7

Step 7: CALCULATION OF FINAL SCORE

NOTE: Scores for Steps 4, 5 and 6 are only recorded if Steps 1 and 3 have not been scored.

A. Score from Step 1 (fish habitat not present) = _____
B. Score from Step 3 (significance known) = _____
C. Score from Step 4 (Low Marsh) = _____
D. Score from Step 5 (High Marsh) = _____
E. Score from Step 6 (Swamp) = _____

Calculation of Final Score for Spawning and Nursery Habitat = A or B or Sum of C, D, and E

Score for Spawning and Nursery Habitat
(maximum 100 points) _____

4.2.6.2 Migration and Staging Habitat

Step 1:

☐	Staging or Migration Habitat is not present in the wetland	Go to Step 4, Score 0 points
☐	Staging or Migration Habitat is present in the wetland, significance of the habitat is known	Go to Step 2
☐	Staging or Migration Habitat is present in the wetland, significance of the habitat is not known	Go to Step 3

Step 2: Select the highest appropriate category below. Ensure that documentation is attached to the data record.

☐	Significant in Ecoregion	Score 25 points in Step 4
☐	Significant in Ecodistrict	Score 15 points in Step 4
☐	Locally Significant	Score 10 points in Step 4
☐	Fish staging and/or migration habitat present, but not as above	Score 5 points in Step 4

Source of information:

_____

_____

Step 3: Select the highest appropriate category below based on presence of the designated site type (i.e. does not have to be the dominant site type). Refer to Site Types recorded earlier (section 1.1.3). Attach documentation.

☐	Wetland is riverine at rivermouth or lacustrine at rivermouth	Score 25 points in Step 4
☐	Wetland is riverine, within 0.75 km of rivermouth	Score 15 points in Step 4
☐	Wetland is lacustrine, within 0.75 km of rivermouth	Score 10 points in Step 4
☐	Fish staging and/or migration habitat present, but not as above	Score 5 points in Step 4

Step 4: Enter a score from only one of the three above Steps.

Score for Staging and Migration Habitat
(maximum 25 points) _____

4.3 ECOSYSTEM AGE

		Fractional Area		Score
Bog	=		x 25 =	
Fen, on deeper soils; floating mats or marl	=		x 20 =	
Fen, on limestone rock	=		x 5 =	
Swamp	=		x 3 =	
Marsh	=		x 0 =	
	Total		=	

Ecosystem Age Score *(maximum 25 points)* _____

4.4 GREAT LAKES COASTAL WETLANDS

Choose one only. Only coastal wetland units may be scored.

	Wetland < 10 ha	=	10 pts
	Wetland 10-50 ha	=	25
	Wetland 51-100 ha	=	50
	Wetland > 100 ha	=	75

If the wetland is a complex, identify which wetlands units or wetland communities are being scored as coastal:

_____

_____

_____

_____

_____

_____

Great Lakes Coastal Wetland Score
(maximum 75 points) _____

5.0 DOCUMENTATION OF WETLAND FEATURES NOT INCLUDED IN THE EVALUATION

5.1 INVASIVE SPECIES

Attach documentation of invasive species found in wetland (include location information and a coarse estimate of abundance [F = few, C = fairly common, A = abundant]):

5.2 VERNAL POOLS

Documentation of information on vernal pools encountered during the wetland evaluation but not included as part of the evaluated wetland.

5.3 SPECIES OF SPECIAL INTEREST

5.3.1 Osprey

Check all that apply:

- [ ] Present and nesting
- [ ] Known to have nested in last 5 years
- [ ] Feeding area for Osprey
- [ ] Not as above

5.3.2 Common Loon

Check all that apply:

- [ ] Nesting in wetland
- [ ] Feeding at edge of wetland
- [ ] Observed or heard on lake or river adjoining the wetland
- [ ] Not as above

5.4 IMPORTANT DRINKING WATER AREA

Wetland located within:
(check all that apply)

- [ ] Wellhead Protection Area
- [ ] Intake Protection Zone
- [ ] Significant Recharge Area
- [ ] Vulnerable Aquifer Area

Source of information:

Additional Comments:

5.5 AREA OF WETLAND RESTORATION POTENTIAL

Check all that apply. Attach additional pages if necessary.

	Area of wetland restoration potential adjacent to evaluated wetland unit(s)
	Area of wetland restoration potential within 750m of evaluated wetland unit(s), but not adjacent
	Area of wetland restoration potential encountered elsewhere
	Area currently functioning as wetland (e.g., showing signs of degradation but still mapped as wetland).
	Adjacent Wetland Unit (if applicable): _____
	GPS Coordinates of Site: _____

Description of site (e.g., current land use, wetland characteristics of site, etc) and why it is identified as an area of restoration potential:

Additional Notes/Comments (e.g., adjacent lands, etc)

General Information

Wetland Evaluator(s)

Name: _____ Affiliation: _____

Name: _____ Affiliation: _____

Name: _____ Affiliation: _____

Name: _____ Affiliation: _____

Name: _____ Affiliation: _____

Date(s) wetland visited (in field): _____

Date evaluation completed: _____

Estimated time devoted to completing the field survey in person hours: _____

Weather Conditions

i) at time of field work: _____

ii) summer conditions in general: _____

WETLAND EVALUATION SCORING RECORD

WETLAND NAME: _____

1.0 BIOLOGICAL COMPONENT

1.1 PRODUCTIVITY

_____ 1.1.1 Growing Degree-Days/Soils
_____ 1.1.2 Wetland Type
_____ 1.1.3 Site Type

1.2 BIODIVERSITY

_____ 1.2.1 Number of Wetland Types
_____ 1.2.2 Vegetation Communities
_____ 1.2.3 Diversity of Surrounding Habitat
_____ 1.2.4 Proximity to Other Wetlands
_____ 1.2.5 Interspersion
_____ 1.2.6 Open Water Type

_____ 1.3 SIZE (Biological Component)

_____ TOTAL (Biological Component)

2.0 SOCIAL COMPONENT

2.1 ECONOMICALLY VALUABLE PRODUCTS

_____ 2.1.1 Wood Products

_____ 2.1.2 Wild Rice

_____ 2.1.3 Commerical Fish (Bait Fish and/or Coarse Fish)

_____ 2.1.4 Furbearers

_____ 2.2 RECREATIONAL ACTIVITIES

2.3 LANDSCAPE AESTHETICS

_____ 2.3.1 Distinctness

_____ 2.3.2 Absence of Human Disturbance

2.4 EDUCATION AND PUBLIC AWARENESS

_____ 2.4.1 Educational Uses

_____ 2.4.2 Facilities and Programs

_____ 2.4.3 Research and Studies

_____ 2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT

_____ 2.6 OWNERSHIP

_____ 2.7 SIZE (Social Component)

_____ 2.8 ABORIGINAL VALUES AND CULTURAL HERITAGE

_____ 2.8.1 Aboriginal Values

_____ 2.8.2 Cultural Heritage

_____ TOTAL (Social Component)

3.0 HYDROLOGICAL COMPONENT

_____ 3.1 FLOOD ATTENUATION

3.2 WATER QUALITY IMPROVEMENT

_____ 3.2.1 Short Term Water Quality Improvement

_____ 3.2.2 Long Term Nutrient Trap

_____ 3.2.3 Groundwater Discharge

_____ 3.3 CARBON SINK

_____ 3.4 SHORELINE EROSION CONTROL

3.5 GROUNDWATER RECHARGE

_____ 3.5.1 Site Type

_____ 3.5.2 Soil Recharge Potential

_____ TOTAL (Hydrological Component)

4.0 SPECIAL FEATURES COMPONENT

4.1 RARITY

_____ 4.1.1 Wetland Types

_____ 4.1.1.1 Rarity within the Landscape

_____ 4.1.1.2 Rarity of Wetland Type

_____ 4.1.2 Species

_____ 4.1.2.1 Reproductive Habitat for an Endangered or Threatened Species

_____ 4.1.2.2 Traditional Migration or Feeding Habitat for an Endangered or Threatened Species

_____ 4.1.2.3 Provincially Significant Animal Species

_____ 4.1.2.4 Provincially Significant Plant Species

_____ 4.1.2.5 Regionally Significant Species

_____ 4.1.2.6 Locally Significant Species

4.2 SIGNIFICANT FEATURES AND HABITATS

_____ 4.2.1 Colonial Waterbirds

_____ 4.2.2 Winter Cover for Wildlife

_____ 4.2.3 Waterfowl Staging and/or Moulting Areas

_____ 4.2.4 Waterfowl Breeding

_____ 4.2.5 Migratory Passerine, Shorebird or Raptor Stopover Area

_____ 4.2.6 Fish Habitat

_____ 4.2.6.1 Spawning and Nursery Habitat

4.2.6.2 Migration and Staging Habitat

_____ 4.3 ECOSYSTEM AGE

_____ 4.4 GREAT LAKES COASTAL WETLANDS

_____ TOTAL (Special Features Component)

SUMMARY OF EVALUATION RESULT

Wetland _____

_____ 1.0 TOTAL FOR BIOLOGICAL COMPONENT

_____ 2.0 TOTAL FOR SOCIAL COMPONENT

_____ 3.0 TOTAL FOR HYDROLOGICAL COMPONENT

_____ 4.0 TOTAL FOR SPECIAL FEATURES COMPONENT

_____ TOTAL WETLAND SCORE

FOR MNR USE ONLY

MNR Reviewer (Name & Position) _____

Reviewer Comments _____

MNR Approver (Name & Position) _____

Approval Date _____