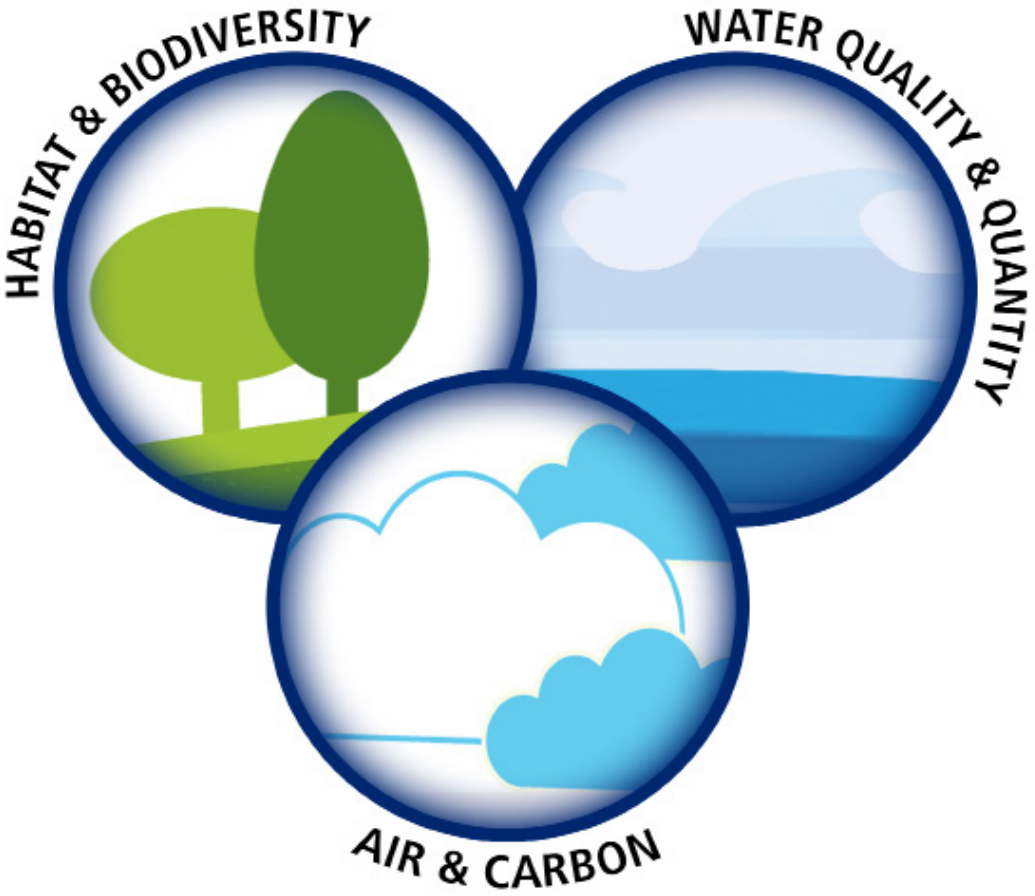
ENVIRONMENTAL MARKETS 2012:

A SURVEY AND ASSESSMENT OF ENVIRONMENTAL MARKETS IN CANADA

Sustainable Prosperity

NOVEMBER 2012



Sustainable Prosperity is a national research and policy network, based at the University of Ottawa. SP focuses on market-based approaches to build a stronger, greener economy. It brings together business, policy and academic leaders to help innovative ideas inform policy development.

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EXECUTIVE SUMMARY

- Environmental markets can deliver significant benefits to the management of natural capital, in the form of increased investment and resource stewardship. By providing a framework through which the value of natural capital can be reflected and captured, such markets can provide a powerful incentive to their prudent management and conservation.

- Canada, despite its wealth of natural capital, has traditionally been a laggard in the development and implementation of environmental markets. This means that opportunities for the sustainable development of our natural capital have sometimes been missed, and that those measures that have been taken are more costly than they need to be.

- At the same time, there are definitional and data issues that make an assessment of the scope and scale of environmental markets in Canada challenging. These issues may be holding back policy action and investor interest.

- With that in mind, Sustainable Prosperity has undertaken a survey of environmental markets in Canada in 2012, as a means of providing a reference definition for the concept and a baseline on their size and scope.

- This report summarizes the findings of a survey and an assessment of environmental (air, water and biodiversity) markets in Canada undertaken by Sustainable Prosperity (SP).

- This survey informs policy-makers, market participants, and others on the scope and potential for environmental markets in Canada, and highlights areas for future market development and research.

- Estimates of environmental markets vary widely, depending on how "environmental market" is defined. This survey defines an environmental market as having a buyer (either private or public sector), a seller, and the exchange of an environmental attribute, such as greenhouse gases or endangered species habitat. This definition covers diverse environmental markets, from industrial cap-and-trade schemes for greenhouse gases (GHGs) to agricultural payments for ecosystem services (PES).

- The minimum value of payments in Canadian environmental markets is estimated at between **C$462 million and C$752 million** annually. Since there is little transparent information available on many environmental markets, this survey represents a first attempt to quantify Canadian environmental markets by interviewing market participants and administrators. Many markets are not transparent, so the estimate is an approximation: it can be built upon in future to include more market classes, more programs, and refinements in data collection and estimation. The survey candidly notes any uncertainties, and describes the methodology to clarify the assumptions in the estimations. Further, it does not assess the environmental impact of the spending by the various programs in the survey.

- Pending markets include the Quebec greenhouse gas cap-and-trade regime, which will begin trading in early 2013. Linked to the Western Climate Initiative, including the California cap-and-trade market, Quebec's cap-and-trade is expected to be the largest environmental market in Canada in the years to come.

- Any expansion of environmental markets requires a foundation in stable policy and strong underlying data. SP proposes five pillars that can help an environmental market to achieve the environmental protection it aims for: scarcity, scale, standards, social context, and stability. These "5 S" criteria can also help policy-makers to consider when an environmental market is a good solution to a problem of environmental degradation.

- The survey closes with analysis and recommendations for next steps that would foster the effective development of environmental markets in Canada. Investors and industry have a substantial role in providing expertise and capital, but policy-makers and researchers are also key audiences and can ensure that, where markets are the right solution to an environmental problem, they function efficiently, equitably, and effectively.

ENVIRONMENTAL MARKETS IN CANADA 2012

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ACKNOWLEDGEMENTS

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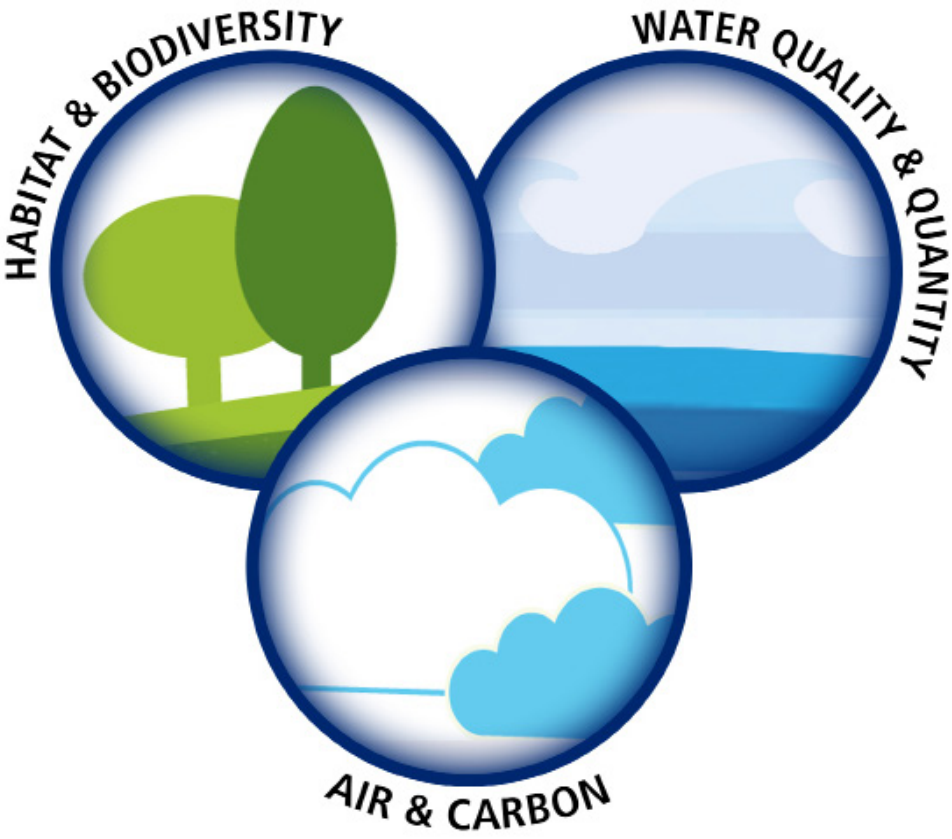
DEFINING ENVIRONMENTAL MARKETS



PURPOSES OF ENVIRONMENTAL MARKETS

Ecosystem goods and services (EGS) support human life and quality of life by providing materials like food and fresh water, continuing natural cycles that support and regulate the environment, and through their cultural and spiritual meaning.[1] EGS have a special relevance for Canada, as a country that derives a substantial portion of its gross domestic product from its natural resources, through tourism, fishing, and extractive industries. Approximately 15% of Canada's non-financial wealth is related to the value of its stock of natural resources;[2] but the value of ecosystem services is much higher, since EGS enable all other economic activity and are not valued in current economic accounts. As population and consumption of natural resources increases, careful management is necessary to prevent scarcity and further degradation of EGS.

Market-based instruments (MBIs), including environmental markets, are one method for managing EGS. There are many types of market-based environmental instruments, including carbon taxes, traffic congestion fees, and eco-charges or deposits on goods like plastic bags. They can be as simple as requirements to release more information about environmental risks, as the Canadian Securities Administrators now require,[3] so that markets actors have the information required to invest with an eye to the reduction of environmental risks. They can be as complex as the European Emissions Trading System (EU ETS), which covers some 11,000 power stations and industrial plants in 30 countries.[4]

MBIs have several purposes, including:

1. Facilitating reductions in the environmental impacts of human activity;
2. Minimizing the costs of environmental protection and restoration; and,
3. Enhancing investment opportunities in environmental protection.

Facilitating reductions in the environmental impacts of human activity: Market-based instruments make the environmental effects of economic activity *visible* in the economy in order to "encourage behaviour through market signals rather than through explicit directives regarding pollution control levels or methods."[5] In the absence of such

1 Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (2005), http://millenniumassessment.org/documents/document.356.aspx.pdf.

2 Islam, Kazi, Patrick Adams, and Michael Wright. *Natural Resource Wealth 2010* (2011) Statistics Canada, http://www.statcan.gc.ca/pub/16-002-x/2011003/part-partie4-eng.htm.

3 Canadian Securities Administrators, "Canadian Securities Regulators Public Additional Guidance on Environmental Disclosure" (October 27, 2010), http://www.securities-administrators.ca/aboutcsa.aspx?id=928.

4 European Commission, "Emissions Trading System (EU ETS)," http://ec.europa.eu/clima/policies/ets/index_en.htm.

5 Stavins, Robert, "Experience With Environmental Market-Based Instruments"Fondazione Eni Enrico Mattei (July 2002), http://www.feem.it/

policy instruments, economic actors will likely not include environmental costs as they are making production and decisions. Instead, these costs are negative externalities that are imposed on both ecosystems and society. MBIs impose a price on pollution and environmental damage, so that market actors have an incentive to reduce their impact on others. Similarly, environmental benefits that are provided free of charge by nature, such as carbon sequestration provided by forests or pollination provided by insects, are not priced by the market. Consequently, there is no price incentive to protect them, even if replacing them by other means is impossible or expensive. Market-based instruments can build an awareness of externalities into actors' decisions, so that more efficient outcomes are reached and environmental impacts can be reduced.

Minimizing the costs of environmental protection and restoration: Abatement and avoidance of environmental degradation can be less expensive with flexible market-based policy instruments. They specify an outcome, rather than a technology or method, which allows for the creation of new ways of reducing an activity's environmental impact. Market players have differing options and opportunities when it comes to reducing their own environmental impact, and so they will also have differing marginal costs to improve their environmental impact. This means that it is often more efficient to allow trading than to mandate that everyone comply with a single standard.[6]

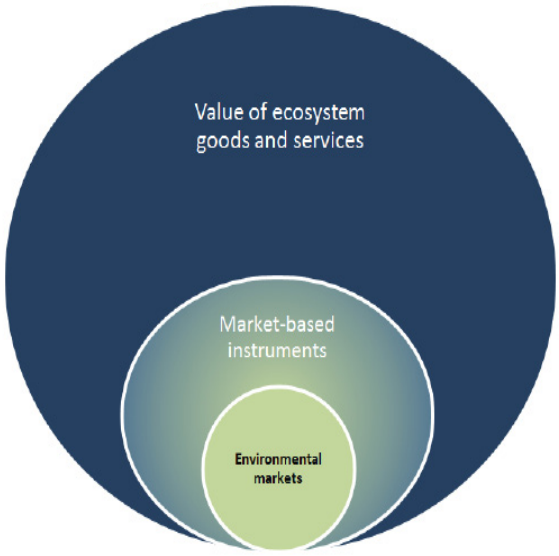
Much has been written on the potential for market-driven environmental instruments to create innovative ways of reducing environmental impact. The Porter hypothesis even suggests that innovation resulting from environmental regulation leads to commercial gains.[7] While evidence on the theory is mixed, an OECD study based on a survey of manufacturers in seven countries found that flexible, market-based instruments were effective in encouraging environmental R&D spending.[8] One notable real-world example of the efficiency of market-based programs is the United States' Acid Rain Program, which used allowance trading to reduce acid rain-causing emissions from electricity plants faster than expected, creating significant health and environmental benefits, and at about half the cost projected at the start of the program.[9]

Enhancing investment opportunities in environmental protection: MBIs have several uses for investors. They allow investors to more realistically assess environmental risks, and can create new financing opportunities, both of which contribute to the maintenance or improvement of EGS. The financial sector can be involved in environmental markets as advisors, lenders, investors, and insurers.

SCOPING ENVIRONMENTAL MARKETS IN CANADA

The environmental markets covered in this report are a sub-set of the broader category of MBIs, which themselves only reflect a very small proportion of the value of EGS.

FIGURE 1: ENVIRONMENTAL MARKETS IN THE CONTEXT OF EGS AND MBIs



Note: Not to scale
Source: Sustainable Prosperity

userfiles/attach/Publication/NDL2002/NDL2002-052.pdf (Retrieved June 18, 2012).

6 It should be noted, though, that this presupposes the existence of adequate social and regulatory capacity, e.g. for enforcement, to ensure that the market established operates in a manner that is efficient and achieves its environmental objectives.

7 Porter, Michael and Claas Van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship" (2006) Journal of Economic Perspectives 9, p. 97-118.

8 Johnstone, Nick and Julien Labonne, "Environmental Policy, Management and R&D" (OECD: Paris, 2006), http://www.oecd.org/eco/economicpoliciestofostergreengrowth/38698195.pdf.

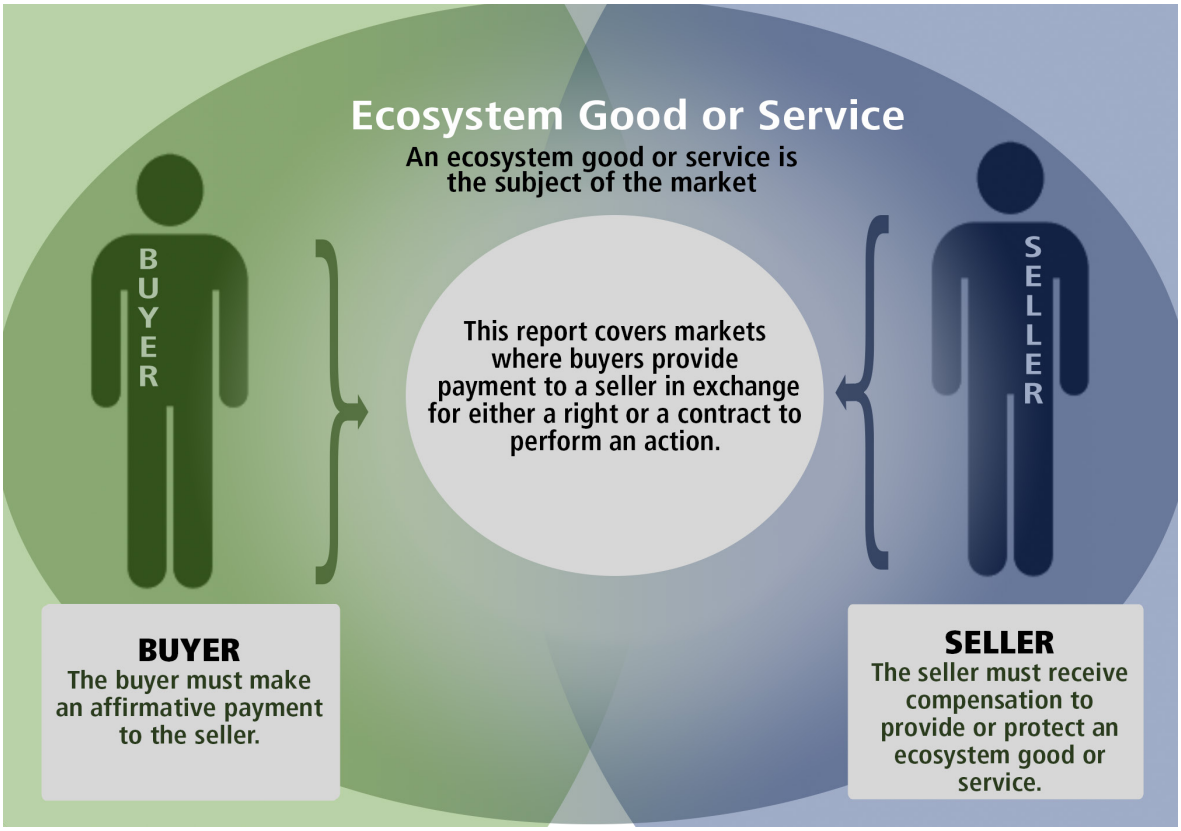
9 Burns, Douglas A. et al, National Acid Precipitation Assessment Program Report to Congress 2011: An Integrated Assessment, (National Science and Technology Council: Washington, DC, 2011), http://ny.water.usgs.gov/projects/NAPAP/.

While this survey's definition of environmental markets covers only a part of EGS and MBIs, the price signals these markets send can be important drivers of other investments. In addition to direct spending in environmental markets, there is investment in mitigation technologies, process design, and other pollution prevention and sustainability areas. Canadian firms' environmental protection expenditures were C$9 billion in 2008.[10] Global spending on low-carbon goods and services, renewable energy, and environmental goods and services was estimated at £3.3 trillion in 2010-11.[11] Markets are also growing for consumer goods and services promising protection of environmental attributes (e.g. wind power or organic food).

The markets in the survey have several key criteria, as shown in Figure 2 below.

SP's survey considers markets in three environmental areas: air and carbon, water, and habitat and biodiversity. These categories are not discrete. Each market is categorized according to the primary environmental purpose it was designed for, but readers should bear in mind that these purposes are interconnected. For instance, a market that sequesters carbon through reduced deforestation, such as REDD (Reducing Emissions from Deforestation and Degradation), can also have biodiversity conservation benefits, though the offset producer does not always receive compensation for this "bundled" biodiversity preservation.[12] When this "bundling" is accounted for, the aggregate benefits from conservation are substantial; for example, a Ducks Unlimited study estimates the net present value of a wetland retention plan for southern

FIGURE 2: CONCEPTUALIZATION OF ENVIRONMENTAL MARKETS



Source: Sustainable Prosperity

10 Statistics Canada, CANSIM Table 153-0053, *Capital and Operating Expenditures on Environmental Protection, by Type of Activity, Canada (2008)*, http://www5.statcan.gc.ca/cansim/a05?lang=eng&id=1530053&pattern=1530053&searchTypeByValue=1&p2=35.

11 United Kingdom Department for Business Innovation & Skills, *Low Carbon Environmental Goods and Services (LCEGS) Report for 2010/11* (May 2012), http://www.bis.gov.uk/assets/biscore/business-sectors/docs/l/12-p143-low-carbon-environmental-goods-and-services-2010-11.pdf.

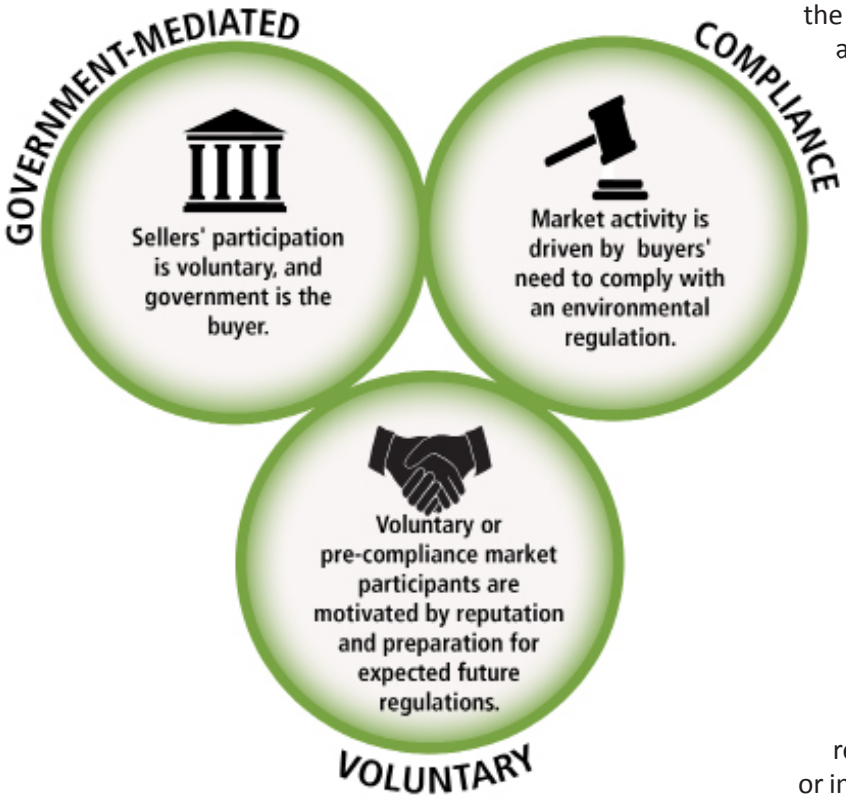
12 For discussion, see Peterson, Annah L., Louise A. Gallagher, David Huberman, and Ivo Mulder, "Seeing REDD: Reducing Emissions and Conserving Biodiversity by Avoiding Deforestation" (January 2012) 31:1 *Journal of Sustainable Forestry* 29.

Ontario at C$12.1 billion, accounting for the wetlands' nitrogen filtration, carbon sequestration, biodiversity, and tourism values.[13] Bundling payments can increase the incentive to preserve EGS. However, there can be issues with "double-dipping" or providing more compensation than is economically efficient, reducing the amount of EGS protection that can be provided with limited resources.

MARKET DRIVERS

The research also classifies each market by its primary driver. There are three main environmental market drivers, as shown in Figure 3:[14]

FIGURE 3: DRIVERS OF ENVIRONMENTAL MARKETS



Source: Sustainable Prosperity

AIR AND CARBON MARKETS

These markets trade in rights to emit and incentives to reduce greenhouse gases and air pollutants. The air and climate market types in this survey are:

- Emissions credit systems;
- Voluntary climate markets and offsets; and,
- Renewable electricity certificates (RECs): tradable, non-tangible energy commodities that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource.

Air quality markets were some of the first environmental markets developed, beginning with a pioneering cap-and-trade program for acid rain-causing sulphur dioxide in the Northeastern United States. The United States also has long-standing programs to regulate emissions from vehicles, and Canada's new regulations are geared to harmonize with those of the United States. The concept has been expanded from air pollutants with regional impacts, such as sulphur dioxide, to the global-scale problem of climate change.

Greenhouse gas (GHG) markets are some of the most developed environmental markets in terms of market infrastructure. There are registries and secondary markets, and a large primary market, particularly in Europe through the European Union Emissions Trading Scheme (EU ETS). GHG credits are reasonably comparable; one tonne of carbon dioxide is identical to others, and so there is little environmental reason to restrict trading to a certain geographical area or industry. A tremendous variety of market actors produce GHGs, yielding a wide range of reduction strategies and abatement costs. These systems often include offsets: reductions created outside of the sectors that are subject to regulatory caps.

The survey does *not* include payments for energy efficiency, except to the extent that they occur in the agricultural Payments for Ecosystem Services (PES) programs addressed in the Biodiversity and Habitats markets.

13 Ducks Unlimited, *A Business Case for Wetland Conservation: The Black River Subwatershed* (July 27, 2011), http://www.ducks.ca/aboutduc/news/archives/prov2011/110727.html.

14 This classification is inspired by Ecosystem Marketplace's PES Matrix. See: Ecosystem Marketplace, *Innovative Markets and Market-Like Instruments for Ecosystem Services* (2012), http://moderncms.ecosystemmarketplace.com/repository/moderncms_documents/the_matrix_5-9-12.1.pdf.

WATER MARKETS

Markets for water quality are a developing area. These markets trade in rights to emit substances into water, or in rights to water allocations. Similar to climate change offsets, water quality markets often focus on the reduction of smaller and diffuse sources of pollution. Hypoxia and eutrophication, processes which can seriously harm aquatic life and ecosystem productivity, can result from an overabundance of nutrients in water. Other contaminants can also cause ecological and health damage. Programs for water quality trading (WQT) compensate pollution sources for reducing their emissions of substances in fertilizers, pesticides, and wastes and carried by runoff waters, including selenium, nitrogen, and phosphorus. WQT can reduce these emissions without large capital expenditures by major emitters, so it can decrease the costs of improving water quality: one study estimates that in the United States, 470 large point-source emitters could save between USD$611 million and USD$5.6 billion by purchasing nutrient reductions from non-point sources, rather than purchasing expensive treatment systems.[15] WQT can also provide income support to agricultural communities, as the agricultural sector is often well-placed to reduce high-nutrient runoff at low cost. Programs generally provide compensation in one of three ways:[16]

- Water quality trading regimes (WQT) resembling the cap-and-trade model of regulated carbon markets;
- Direct payments from government for watershed services; this category includes a number of watershed payment schemes; and,[17]
- Private sector payments for watershed services.

Finally, the survey includes water quantity trading. Trading in water allocations (water quantity trading) will cause rights to water to flow toward the uses with the highest economic value. Water allocation trading is controversial; the concept has caused concerns about the potential for the prioritization of industrial water requirements over local populations' basic water needs, and about poverty as a barrier to clean water access.

BIODIVERSITY AND HABITAT MARKETS

These are markets to secure habitat against development, such as through conservation easements, or to offset losses in habitat and biodiversity resulting from specific projects. Habitat conservation and restoration can have overall positive impacts on species at risk and the maintenance of sound ecosystems. There are several models for habitat and biodiversity preservation through market mechanisms:

- Compensatory mitigation and any related habitat banking, which regulations often require before development permits can be issued;
- Voluntary conservation actions by landowners; and,
- Resource access allocations, such as tradable rights for hunting or fishing (though information on these markets is scarce).

Compensatory mitigation creates offsets against particular projects, and is often required before development permits are issued. Compensatory mitigation is often associated with a "no net loss" policy, which seeks to ensure that for every unit of an ecosystem affected by development, there is a corresponding offset gain in habitat restored or protected against future development. Habitat offsets are "measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken".[18] Offsets can take the form of improvement (e.g. reintroduction of native species and control of invasive species), maintenance gain (e.g. foregoing planned activities such as tree harvesting), or securement of habitat against development or modification.[19]

Some regulatory regimes allow for "banking" and trading of habitat restoration, while others, like Canada's, allow only one-off offsets, carried out by the proponent to compensate for a specific project. The premise of habitat banking is that it can facilitate planning and approvals, identify and protect high-value habitat, and ensure that larger areas of unfragmented habitat are kept undisturbed,

15 Pharino, Chanathip, *Sustainable Water Quality Management Policy: the Role of Trading: The US Experience* vol. 10 (2007). Dordrecht, the Netherlands: Springer.

16 Stanton, Tracy; Echavarria, Marta; Hamilton, Katherine; and Ott, Caroline. State of Watershed Payments: An Emerging Marketplace. Ecosystem Marketplace (2010), http://www.foresttrends.org/documents/files/doc_2438.pdf. (Retrieved June 18, 2012).

17 Some similar schemes have been classified as habitat and biodiversity markets where the market's goals did not include a strong or exclusive watershed component.

18 Business and Biodiversity Offsets Programme, "Resource Paper: Limits to What Can Be Offset" (2012). (BBOP: Washington, DC), p.2.

19 Crowe, Michael and Kerry ten Kate, *Biodiversity Offsets: Policy Options for Government* (Draft) Business and Biodiversity Offsets Programme. p. 16.

to more effectively conserve species and ecosystems.

Voluntary conservation provides compensation for landowners to carry out conservation activities or make legal commitments to protect wildlife habitat and ecosystem services. Biodiversity and habitat markets are also likely to have co-benefits; many habitat protection measures can have positive impacts on other ecosystem functions such as climate regulation and water quality.

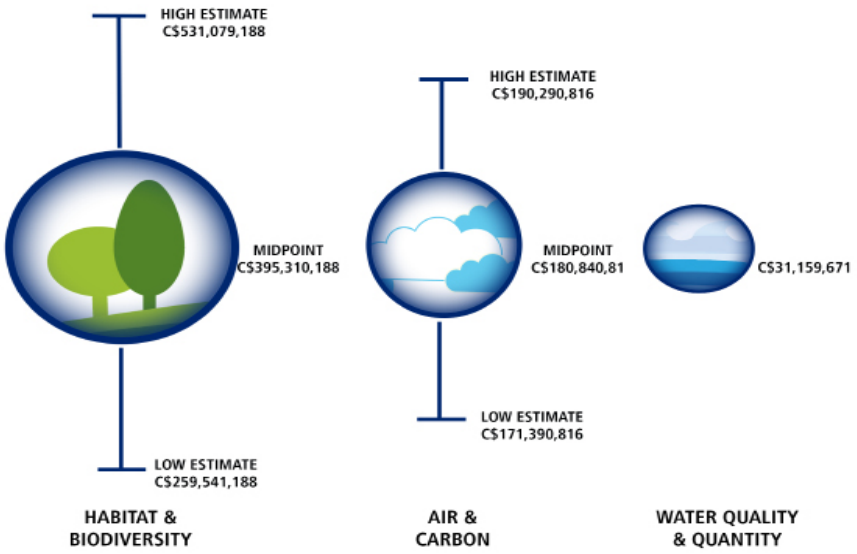
Resource access allocation markets create and trade rights to exploit a certain quantity or share of a harvest of natural resources. This survey does not cover these comprehensively, as data is extremely limited. However, readers should be aware that there are quota systems in operation for renewable natural resources such as fisheries and hunting rights; information on trading volumes and prices is not always collected through a registry or by regulators.

VALUING ENVIRONMENTAL MARKETS

Establishing an economic value for EGS is an incredibly complicated and controversial task, involving substantial data and methodological challenges and subjective choices and preferences. That being said, having some sense of this value is the necessary starting point for considering environmental markets inasmuch as it represents an economic value that is not always captured in traditional markets.

A number of different estimates have been produced to show the size of global environmental markets (see Annex for highlights). Canadian environmental markets are a fraction of the size of global markets, and further research is required to determine the value of EGS in Canada. SP's survey estimates that Canadian environmental markets in 2011 were worth between **C$462 million and C$752 million**, not including the estimated value of fisheries licenses and quotas sold, which were not possible to estimate. Figure 4 shows the minimum and maximum values of Canadian environmental markets by market type.

FIGURE 4: THE VALUE OF CANADIAN ENVIRONMENTAL MARKETS



Source: Sustainable Prosperity

Much of the difference between the high and low estimates is due to two main factors (see Annex for details):

1. Uncertainty about the estimates for spending on compensatory mitigation for damage to fish habitat; and,

2. A range of estimated prices in the markets for tradable hunting rights and carbon credits.

Further uncertainty results from the overlapping programs that purchase conservation easements and secure habitat, but this is not reflected in the estimate.

The research surveyed 57 distinct environmental markets and programs in Canada, with the breakdown by environmental medium and by market driver shown in Table 1. There were 15 compliance markets, where trading and credit purchases are driven by legal obligations to meet environmental targets. Not all of these markets had transactions in 2011. There were 28 government-mediated markets, where participation by credit producers is voluntary and the purchaser is government. Most PES and WQT markets fell into this category. There were also 14 voluntary or pre-compliance markets – however, some of these markets may be tied to compliance with compensatory mitigation regulations. The survey counts individual programs run by Non-Governmental Organizations (NGOs) and government organisations as

discrete "markets". Table 1 lists the markets and programs covered by this survey, and shows the market's main driver and the basis for payments in the market (i.e. whether the market provides payments for a specific outcome-based credit, or whether participants simply receive payment for an action).

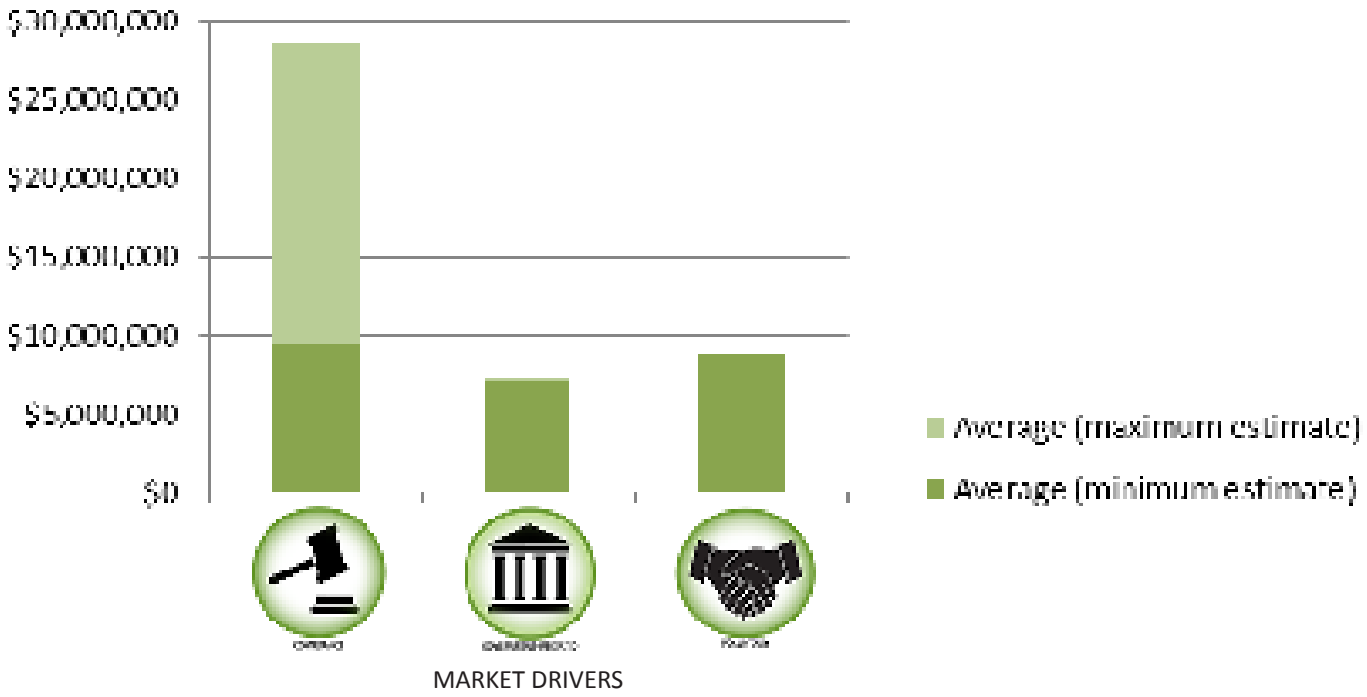
TABLE 1: NUMBER OF ENVIRONMENTAL MARKETS BY TYPE AND DRIVER

				TOTAL
	4	3	2	9
	3	6	0	9
	8	19	12	39
TOTAL	15	28	14	57

Source: Sustainable Prosperity

The average size of a compliance-driven market is notably higher than the value of other styles of programs, though due to the uncertainty about spending on compensatory mitigation, the range of possible values is also larger.

FIGURE 5: AVERAGE SIZE OF ENVIRONMENTAL MARKETS, BY MARKET DRIVER (ALL CURRENCY IS C$)



Source: Sustainable Prosperity

TABLE 2: SUMMARY OF CANADIAN ENVIRONMENTAL MARKETS

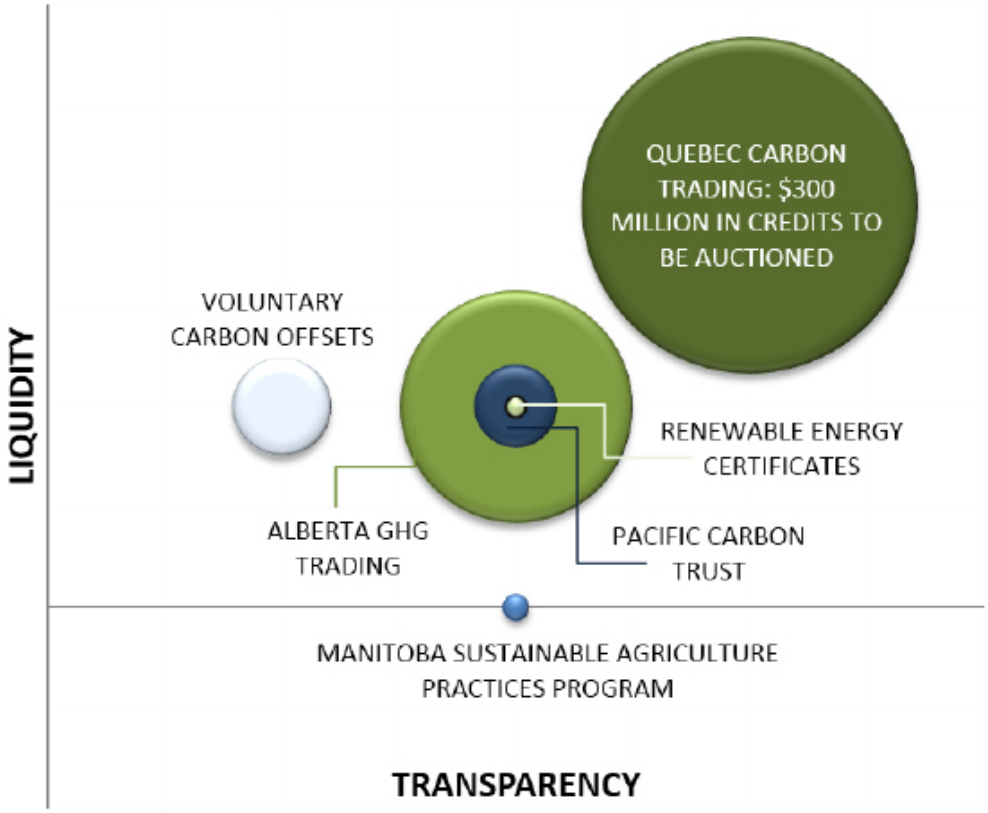
 AIR & CARBON	 WATER QUALITY & QUANTITY	 HABITAT & BIODIVERSITY
VOLUNTARY AND PRE-COMPLIANCE MARKETS		
• Renewable Energy Certificates • Voluntary carbon offsets		• Conservation easements and preserves purchased by Nature Conservancy of Canada, Ducks Unlimited Canada, and contributions from Wildlife Habitat Canada (some capital comes from compliance with wetland compensation policy) • 9 Alternative Land Use Services (ALUS) programs, including Norfolk County and Vermilion County • Wildlife Habitat Canada
GOVERNMENT-MEDIATED MARKETS		
PAYMENT-BASED		
• Manitoba Wetland Restoration Incentive Program • Manitoba Sustainable Agricultural Practices Program • Energy efficiency components of farm stewardship programs (see Habitat and Biodiversity) •	• Ontario Landowner Environmental Assistance Program • Lake Simcoe Farm Stewardship Program • Ontario Drinking Water Stewardship Program • Conservation Ontario watershed stewardship initiatives (this includes up to 36 separate conservation authorities' initiatives but is counted as one market) • Alberta/Canada Growing Forward water management program • Prince Edward Island ALUS	• Federal Habitat Stewardship Program for Species at Risk • Environmental Damages Fund (federal) • Aboriginal Fund for Species at Risk • Conservation Ontario watershed stewardship initiatives (this includes up to 36 separate conservation authorities' initiatives but is counted as one market) • Manitoba Habitat Heritage Corporation wetlands easement program • Quebec's Partenaires pour la nature program • North American Waterfowl Management Plan conservation
CREDIT-BASED		
• Pacific Carbon Trust (for government's own compliance)		
COMPLIANCE MARKETS		
PAYMENT-BASED, UNKNOWN, OR CREDIT SCHEME AND RATIOS NOT CLEAR		
	• SaskPower watershed management payments	• Department of Fisheries and Oceans "HADD" compensation (requires a minimum ratio of compensation, but credits are not tradable) • Federal wetlands compensation policy • Provincial wetland compensation policies in Nova Scotia, New Brunswick, PEI. Pending policies in Alberta, British Columbia
CREDIT-BASED		
• Alberta Specified Gas Emitters Regulation GHG cap-and-trade • Ontario trading of sulphur dioxide and nitrogen oxides • Federal vehicle emissions regulations • Federal regulations on degreasing solvents TCE and PERC	• South Saskatchewan River Basin water allocation transfers • South Nation River watershed payments	• Department of Fisheries & Oceans transferable quota systems (Atlantic and Pacific) – contain many sub-markets for individual species • Alberta tradable hunting licenses

Source: Sustainable Prosperity

AIR QUALITY AND CARBON MARKETS

Several carbon markets are currently in operation in Canada (Table 3), motivated by compliance and by voluntary action. The total value of payments in these markets is estimated at between C$171 million and $190 million. Figure 6, below, summarizes the carbon markets in Canada, and rates them along a liquidity and transparency continuum. This illustrates how tradable and clearly-priced these markets are: the more liquid and transparent the market, the greater the potential that trading will reduce the cost of environmental protection.[20] Canadian air and carbon markets are dwarfed by international markets: global carbon trading was worth some USD$176 billion in 2011, according to the World Bank.[21]

FIGURE 6: AIR AND CARBON MARKETS IN CANADA



Source: Sustainable Prosperity

20 Further discussion of these ratings can be found on p. 29.
21 Kossoy, A., and Guignon, P. *State and Trends of the Carbon Market, 2012*, (2012), World Bank, http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_2012_Web_Optimized_19035_Cvr&Txt_LR.pdf.

TABLE 3: AIR AND CARBON MARKETS (ALL CURRENCY IS C$)

MARKET	MARKET DRIVER	ESTIMATED VALUE OF PAYMENTS
CAP-AND-TRADE SYSTEMS		
Alberta Greenhouse Gas Emissions Trading System	Compliance	$124.7 to $143.6 million (including $55.4 million in technology fund payments)
Ontario Emissions Trading Registry (sulphur dioxide, nitrogen oxide)	Compliance	$29 000 to $8,900,000
Federal fuel efficiency regulations (on-road vehicles)	Compliance	$0
Federal - Transferable consumption allowance for degreasing solvents	Compliance	$16,318 (no pricing data available; estimated at $1/kg)
VOLUNTARY AND GOVERNMENT-FUNDED CARBON MARKETS AND OFFSETS		
Pacific Carbon Trust	Government-mediated	$18,000,000
Manitoba Wetland Restoration Incentive Program	Government-mediated	$28,420
Manitoba Sustainable Agriculture Practices Program	Government-mediated	$1,800,000
Voluntary carbon offset sales by Canadian offset providers	Voluntary	$25,419,000[1]
Renewable Energy Certificates	Voluntary	$1,427,000[2]

Source: Sustainable Prosperity

1 Molly Peters-Stanley, Ecosystem Marketplace. Personal communication (August 20, 2012).

2 2007 estimate. Sustainable Prosperity , "The Potential of Tradable Renewable Energy Certificates in Canada" (Ottawa, December 2011), http://www.sustainableprosperity.ca/dl658&display.

CAP-AND-TRADE SYSTEMS

See the feature on the Alberta GHG regulatory scheme on page 16.

Alberta's *Specified Gas Emitters Regulation*[22] established a cap-and-trade scheme in 2007. Industrial facilities producing over 100 Megatonnes (Mt) of GHGs annually must reduce their GHG emission intensity by 12% annually under a baseline of the three previous years. Offset protocols have been developed and reviewed for activities in sectors including agriculture, energy efficiency, forestry, methane and waste management, geological sequestration, renewable energy, and transportation mode shifting.[23] No offsets generated outside of Alberta or prior to 2002 may be used for compliance. As of the 2012 compliance year, the regulator will accept only the use of "go-forward" offset credits.[24] This change may explain the increase in the use of tillage offsets in the 2011 compliance year, the last year in which retrospective credits can be submitted for compliance. The likely value of the market is between C$124.7 million and $143.6 million annually, including payments into a technology fund which is redistributed for projects that are to reduce emissions. Offsets in the Alberta market were valued at approximately C$58.3 million.

Some trading of sulphur dioxide and nitrogen oxide credits continues via the Ontario Emissions Trading Registry.[25] Confidentiality agreements related to sales often prevent the disclosure of price information. Based on information from market participants and the number of credit exchanges recorded on the registry, the maximum value of the credits traded in 2011 was approximately C$8.9 million.[26]

Federal vehicle efficiency regulations also contain tradable permit mechanisms: Environment Canada enforces a cap on automakers' fleet-wide nitrogen oxide emissions. No transfers were reported for the 2009 model year,[27] the most recent for which information is available, although 3,472 credits were generated. (See Pending Markets, for changes to the regulations on vehicle emissions).

Federal regulations under the *Canadian Environmental Protection Act* on trichloroethylene (TCE) and tetrachloroethylene (PERC) used in metal degreasing have seen only limited trading; no pricing information is available through the regulator, Environment Canada, but 16,318 kg of the regulated substances was traded in 2011.[28] TCE and PERC are used in dry cleaning, as a chemical intermediate, and for degreasing in metal cleaning. TCE volatilizes easily in air, but also affects groundwater.[29]

22 Alberta, *Specified Gas Emitters Regulation*, Alta Reg 139/2007.
23 Climate Change Central, Past Alberta Protocol Reviews, http://carbonoffsetsolutions.climatechangecentral.com/offset-protocols/past-alberta-protocol-reviews.
24 Alberta Environment, "Notice of Final Deadlines for Claiming Historic Offset Credits" (January 4, 2012), http://www.environment.gov.ab.ca/info/library/8427.pdf
25 Registry available at www.oetr.on.ca.
26 Per tonne prices estimated by contacts ranged from "several hundred" to "practically zero".
27 Environment Canada, "Fleet Average NOx Emission Performance of 2009 Model Year Light-Duty Vehicles, Light-Duty Trucks and Medium-Duty Passenger Vehicles" (January 2012), http://www.ec.gc.ca/Publications/94AEA92E-B89B-4C15-B85A-5AF5B6F2338E/FleetAverageNOxEmissionPerformanceReportOf2009.pdf
28 Suufi Rirash, Environment Canada. Personal communication (June 2012).
29 Peter Watts, "Concise International Chemical Assessment Document 68" (World Health Organization: Geneva, 2006), http://www.who.int/ipcs/publications/cicad/cicad68.pdf.

FEATURED MARKET: ALBERTA *SPECIFIED GAS EMITTERS REGULATION*

In Alberta's cap-and-trade system, large final emitter facilities (emitting over 100Mt of GHGs annually) must reduce the intensity of their emissions by 12% annually, though absolute emissions have continued to rise. Aside from reducing their own emissions intensity ("improvements to operations"), companies have several options for compliance:

1. Emissions performance credits purchased from other facilities;
2. Purchases of offsets produced in Alberta according to one of the approved offset protocols; and,
3. Payments into a technology fund, priced at C$15 per tonne of CO_2e over the facility's emissions cap. The technology fund is used to fund emission reduction and climate adaptation projects in Alberta through the Climate Change and Emissions Management Corporation.

Credits on the Alberta offset market are worth approximately C$13, though trading is bilateral so value is not clear. The value of credits in the market in 2010 was between C$125 million and $151 million, including C$70 million in technology fund contributions; in 2011, with the same price assumptions, it was between C$115.3 million and $143.6 million.

As shown in Figure 7, since the program began in 2007, technology fund contributions have slightly decreased in popularity and offset purchases have increased. 2011 saw the highest volume yet of offset credits submitted for compliance with the program. However, both the technology fund and offsets outpace improvements in regulated facilities' operations. Use of the technology fund for compliance is unlimited, and effectively places a ceiling of C$15 on offset prices. The slowdown in offset production in 2009 and 2010 suggests that an increase in technology fund prices could spur the offset market; Alberta Environment is conducting economic modelling to determine the effects of an increase in technology fund credit prices.

FIGURE 7: ALBERTA EMITTERS' COMPLIANCE CHOICES (MT OF CREDITS)

Note: Data for 2007 is doubled to estimate a full year, as the program was only in force for the second half of 2007. For market valuation method, see Annex.

VOLUNTARY CARBON MARKETS AND OFFSETS

The 17 offset suppliers headquartered in Canada sold 3.2MtCO_2e of credits from domestic projects, not including sales to the British Columbia government through the Pacific Carbon Trust.[30] These sales were worth USD$25.7 million in 2011 (C$25.4 million). Only 1 MtCO_2e of voluntary carbon offsets, valued at USD$8 million, was purchased by Canadian buyers in 2011; 75% of these purchases were of domestic offsets.[31] The market uses a number of different registries and standards. The Canadian Standards Association's GHG CleanProjects Registry lists 188 Canadian projects, totalling 106.6 Mt of potential emissions reductions over their lifetimes.[32] One venue for sales of carbon offsets, the Chicago Climate Exchange (CCX), closed its operations in 2011, with 70% of credits on the exchange liquidated in 2011 and no Canadian-originating credits traded in 2011.[33] However, some CCX credits were transferred to the InterContinental Exchange (ICE). In 2012 to date, ICE has hosted sales of 293 kt of credits originating in Canada, worth C$31 200.[34]

In British Columbia (BC), which since 2008 has also had a carbon tax, the Pacific Carbon Trust (PCT) sells carbon offsets to government entities at a standard price of C$25 per tonne, to meet the government goal of carbon neutrality for its own operations. Public institutions in British Columbia spent approximately C$18 million on offsets in 2011 through the PCT.[35] The forestry protocol governing the creation of forestry-sector offsets eligible for BC compliance purposes has recently been used by First Nations to create the Great Bear Rainforest carbon offset project.[36]

Some climate offset markets operate as a subsidy-style system rather than creating credits for specific emissions reductions. For instance, Manitoba's Wetland Restoration Incentive Program supplements and emphasizes the climate protection component of other payments for ecosystem services programming. It provides farmers with a one-time payment of C$200/hectare (ha) over top of payments received for conservation easements over wetlands on their properties, in recognition of the climate benefits of preserving wetlands.[37] Government provided some C$24,000 in EGS payments through this program in 2011.[38] Manitoba's Sustainable Agriculture Practices Program also provides payments to agricultural producers in exchange for actions to reduce GHG emissions, along with other benefits.[39] Like many of the agricultural programs in this survey, applicants are required to complete an environmental planning process before applying for grants to implement environmental practices.

RENEWABLE ELECTRICITY CERTIFICATES

Renewable Electricity Certificates (RECs) were estimated at C$1.4 million for Canada in 2007. REC sales were likely higher in more recent years, as renewable electricity generating capacity has more than doubled since 2007.[40] However, prices may have fluctuated as expectations for climate policy have changed (this has also been the case in the United States), so the value of the market is uncertain. RECs in Canada are largely a voluntary market, although Prince Edward Island (PEI) has a renewable portfolio standard (RPS) targeting 30% renewable electricity by 2013.[41]

PENDING MARKETS

One important development targeted in late 2012 is the advent of the Quebec cap-and-trade system. The Government of Quebec expects credit auctions to raise some C$300 million annually until 2020[42,43]. Auction

30 Peters-Stanley, M., and Hamilton, K., *Developing Dimension: State of the Voluntary Carbon Markets 2012*. (May 31, 2012) Bloomberg New Energy Finance and Ecosystem Marketplace, https://www.bnef.com/WhitePapers/download/112.

31 Molly Peters-Stanley, Ecosystem Marketplace, Personal communication (August 20, 2012).

32 CSA Group, "GHG CleanProjects: Project Listing", http://www.ghgregistries.ca/cleanprojects/masterprojects_e.cfm (retrieved August 21, 2012).

33 Peters-Stanley, M., and Hamilton, K., *Developing Dimension: State of the Voluntary Carbon Markets 2012*. (May 31, 2012) Bloomberg New Energy Finance and Ecosystem Marketplace, https://www.bnef.com/WhitePapers/download/112.

34 Based on the traded value of credits in the ICE registry as of August 2012.

35 Kossoy, A., and Guignon, P., *State and Trends of the Carbon Market, 2012*, (2012) World Bank, http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_2012_Web_Optimized_19035_Cvr&Txt_LR.pdf.

36 Pollon, Christopher, "Great Bear Forest To Be Massive Carbon Offset Project: How Eight Coastal First Nations Will Harvest Money From Trees Without Saws" (June 11, 2012), http://thetyee.ca/News/2012/06/11/Great-Bear-Carbon-Offset/index.html.

37 Manitoba, "Wetland Restoration Incentive Program", online: http://www.gov.mb.ca/waterstewardship/water_info/riparian/wetland_restoration.html

38 Manitoba, *Public Accounts 2010/11*, online: http://www.gov.mb.ca/finance/pdf/annualreports/pubacct_4S1_11.pdf, p.444.

39 Manitoba, "Manitoba Sustainable Agriculture Practices Progra", online: http://www.gov.mb.ca/agriculture/soilwater/climate/fcc04s00.html

40 Combined wind, tidal, and solar generating capacity increased from 1,824 MWh in 2007 to 4.101 MWh in 2010. Statistics Canada, Table 127-0009: Installed generating capacity, by class of electricity producer.

41 Prince Edward Island Department of Environment, Energy, and Forestry, *Prince Edward Island Energy Strategy* (2008), http://www.gov.pe.ca/photos/original/env_snergystr.pdf. The corresponding regulation has not been updated to reflect the 2013 target: *Renewable Energy Act*, RSPEI 1988, c R-12.1.

42 Département de développement durable, environnement, et parcs du Québec, *Plan d'action 2006-2012 sur les changements climatiques (2006)*.

43 International Emissions Trading Association, *Summary of Québec's*

revenues will be applied to funding public investments under the *2013-2020 Climate Change Action Plan.* Approximately 80 major industrial and electricity sector emitters will be regulated starting in 2013, with fuels from the transportation and building sectors added in 2015.[44] The California carbon market is to be linked to the Quebec market, as they are both WCI members;[45] California's carbon market is projected to be worth USD$40 billion in auction revenues to the state, starting with USD$3 billion in 2012 alone.[46] The recent election of a new government in Quebec could also have impacts on this climate change plan: the Parti Québecois platform commits to a steeper economy-wide target of 25% reductions from 1990 levels by 2020 and promises to link the Quebec market with European and American carbon markets.[47]

British Columbia, Manitoba, and Ontario are also WCI members, but not all WCI members are moving forward with cap-and-trade options for controlling GHG emissions. Enabling legislation for GHG cap-and-trade is in place in Manitoba[48] and Ontario,[49] but has not been implemented.

Also in 2012, federal regulations for GHG emissions from passenger vehicles will come into force, allowing vehicle manufacturers to trade efficiency credits between their fleets for model years 2011 to 2016. Firms can claim credits for sales of alternative vehicles and vehicles featuring innovative emission reduction.[50] These regulations are harmonized with the United States' regulations. The regulated sector has approximately 15 auto company players and trading would likely occur bilaterally, with permit applications approved by Environment Canada.

Regulation Respecting a Cap-and-Trade System for Greenhouse Gas Emission Allowance (February 2012).

44 Government of Québec, *Budget 2012-13: Québec and Climate Change: A Greener Environment*, p. 7 (2012), http://www.budget.finances.gouv.qc.ca/Budget/2012-2013/en/documents/climate.pdf.

45 Moore, Lynn, "Québec, California Expected to Link their Cap-and-trade Programs" (June 29, 2012) *Montreal Gazette*, http://www.montrealgazette.com/business/Quebec+California+link+their+trade+carbon+programs/6863356/story.html#ixzz1zZD5ZSOx.

46 Point Carbon North America "Battle Lines Drawn Over California CO2 Market Revenue" (March 9, 2012), http://www.pointcarbon.com/news/1.1787824

47 Parti Québecois, <Agir en toute liberté: le programme du Parti Québecois >(August 4, 2012) online : http://pq.org/parti/programme#c-5-2.

48 The Climate Change and Emissions Reductions Act, CCSM c C135.

49 Ontario, *An Act to amend the Environmental Protection Act with respect to greenhouse gas emissions trading and other economic and financial instruments and market-based approaches*, SO 2009 c 27.

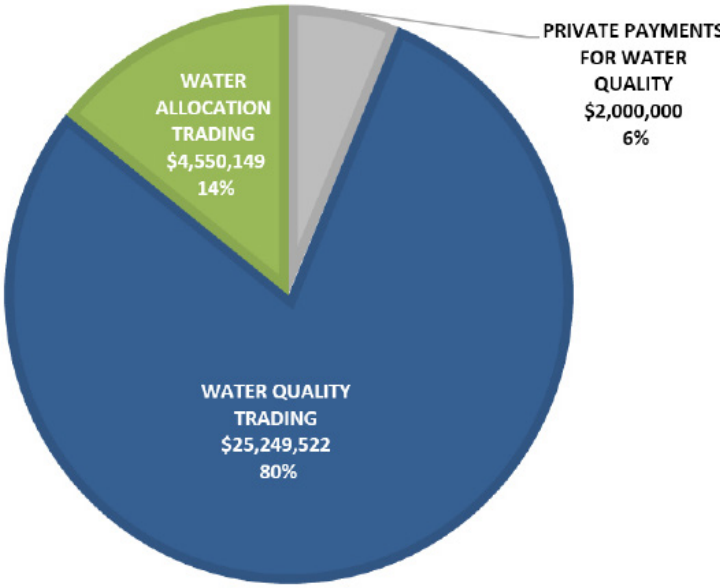
50 Canada Gazette, http://www.gazette.gc.ca/rp-pr/p2/2010/2010-10-13/html/sor-dors201-eng.html.

WATER MARKETS

WATER QUALITY TRADING

A number of water quality trading programs exist in Canada. The majority of the programs identified were government-mediated payments. The payments are often in exchange for the performance of a practice rather than the demonstrated achievement of a particular environmental outcome. Total water quality trading is estimated at approximately C$25.3 million per year, as shown in Figure 8.[51] The agricultural sector produces most of the credits in these markets, and funding generally comes from government. However, a variety of market models for water quantity and quality are operating in Canada. Readers should be aware that the agricultural PES programs featured in other sections of this report also fund improvements to water quality through practices such as improved manure management and buffer strip protection along watercourses.

FIGURE 8: WATER MARKETS IN CANADA (HIGH ESTIMATE - DATA FROM 2009 TO 2011) (ALL CURRENCY IS C$)



Source: Sustainable Prosperity

51 The total spending associated with the market could be higher than this estimate, because spending by farmers and provinces is not available for all programs.

TABLE 4: WATER MARKETS COVERED IN THE SURVEY (ALL CURRENCY IS C$)

MARKET	MARKET DRIVER	ESTIMATED VALUE OF PAYMENTS
CREDIT-BASED WATER QUALITY MARKETS		
South Nation River phosphorus trading	Compliance	$17,910 in 2010; $0 project grants in 2011
PAYMENT-BASED WATER QUALITY MARKETS		
Ontario Landowner Environmental Assistance Program	Government-mediated	$1,387,522[1]
Lake Simcoe Farm Stewardship Program	Government-mediated	$1,881,250[2]
Ontario Drinking Water Stewardship Program	Government-mediated	$5,167,000
Conservation Ontario watershed stewardship initiatives (Note: this consists of watershed stewardship activities funded by Ontario's 36 separate conservation authorities)	Government-mediated	$14,400,000 (estimated at $12,485,000 once overlap with other programs is removed)
Prince Edward Island - Alternative Land Use Services	Government-mediated	$660,000[3]
Alberta - Growing Forward water management program	Government-mediated	$3,200,000
Agriculture and Agri-Food Canada (AAFC) Advancing Canadian Agriculture and Agri-Food Program pilot EGS programs (4 pilots)	Government-mediated	$987,894 (programs ended 2009, so this figure is not included in total)
PRIVATE WATERSHED SERVICES PAYMENTS		
SaskPower watershed management payments	Compliance	$2,000,000[4]
WATER ALLOCATION MARKETS		
Alberta - tradable water allocations in South Saskatchewan River Basin (SSRB)	Compliance	$4,550,149

Source: Sustainable Prosperity

1 Lake Simcoe Region Conservation Authority, " Landowner Environmental Assistance Program – 2011 Progress Report" Staff Report No 34-12 BOD.

2 Andrew Graham, Ontario Soil and Crop Improvement Association. Personal communication (June 8, 2012).

3 Shawn Hill, Prince Edward Island Department of Environment, Energy, and Forestry. Personal communication (May 2012).

4 Province of Saskatchewan, "Annual Report 2007-2008: Saskatchewan Watershed Authority", http://www.swa.ca/Publications/Documents/SWAAnnualReport20072008.pdf.

CREDIT-BASED WATER QUALITY MARKETS

One credit-based WQT scheme was identified. The South Nation River Conservation Authority's WQT scheme is the one with the most direct link between large phosphorus emitters (e.g. wastewater management lagoons) and offsetters: it is these large emitters who provide funding for the implementation of beneficial management practices (BMPs) to reduce the aggregate level of phosphorus going into the watershed. Large emitters receive 1 kg of compliance credit for every 4 kg worth of phosphorus reductions, to ensure positive environmental impacts despite some uncertainty in implementation. Located in Southeastern Ontario, South Nation's phosphorus crediting has been widely recognized as an example of the potential for watershed EGS payments.[52] In 2010, South Nation funded C$17,000 worth of credits, for a total of C$726,313.62 since 2001.[53]

PAYMENT-BASED WATER QUALITY MARKETS (PILOT PROJECTS)

Across Canada, there are a number of small government-mediated water quality markets, often at the pilot phase. In 2008 and 2009, Agriculture and Agri-Food Canada (AAFC) provided C$988,000 per year for ecological goods and services (EGS) pilot programs, plus funds for EGS research.[54] It is not clear how many of these may be renewed in future, so they are not included in the total estimate. The pilots included a phosphates offset project in Quebec's Pike River watershed, which provided a one-time payment of C$675/ha, equivalent to two years' foregone crops on the land devoted to the offsets.[55] The project protected approximately 100ha of grass buffer strips and floodplain zones, in order to reduce phosphate-rich runoff. The other EGS payments funded through AAFC pilot projects are shown in Table 5.

TABLE 5: AAFC PILOT EGS PROGRAMS (2008-2009) (ALL CURRENCY IS C$)

PROVINCE	WATERSHED	VALUE PER YEAR
SASKATCHEWAN	Lower Souris watershed	$265,000
QUEBEC	Pike River/*Rivière-aux-Brochets* watershed	$675,000 (including $458,000 from AAFC)
NOVA SCOTIA	St. Andrews River watershed	$256,000
PRINCE EDWARD ISLAND	Souris and Founds River watersheds	$177,000

Source: Sustainable Prosperity

PAYMENT-BASED WATER QUALITY MARKETS (CURRENTLY OPERATING)

A number of payment-based programs target water management, but fund practices rather than assigning credits for specific reductions in emissions or runoff: called "payment-based water quality markets" in this report. They include the Lake Simcoe Farm Stewardship Program, which paid C$1,505,000 to agricultural producers in the Lake Simcoe region to prevent water nutrient enrichment. This leveraged at least C$376,000 from agricultural producers. The Ontario Landowner Environmental Assistance Program provided C$1,387,522 of government payments in 2010/11, and is delivered through the Lake Simcoe Region Conservation Authority.

The Ontario Drinking Water Stewardship Program (ODSWP) provided C$5 million in 2010/11 to conservation authorities across the province to provide local financial assistance to property owners who undertook voluntary projects to address significant drinking water threats identified in local assessment reports. [56] The funding recipients included the Lake Simcoe Region Conservation Authority, but otherwise did not overlap with other programs found by the survey. The Ontario Soil and Crop Improvement Association had C$167,000 in funding available through the ODWSP in 2010/11 to fund management practices and capital improvements benefiting water quality.

Prince Edward Island renewed and expanded its EGS pilot program through 2013, following up on the federally-

52 See, for example, O'Grady, Dennis and Mary Ann Wilson, *Phosphorus Trading in the South Nation River Watershed, Ontario, Canada* (not dated); Environment Canada, *Agents of Change – Pollution and Waste - South Nation Conservation* (July 2009); Selman, Mindy, Suzie Greenhalgh, Evan Branosky, Cy Jones, and Jenny Guiling, "Water Quality Trading Programs: An International Overview", (March 2009) WRI Issue Brief: Water Quality Trading No.1.

53 Ronda Boutz, South Nation Conservation Authority. Personal communication (May 2012).

54 Agriculture and Agri-Food Canada, "Approved National Projects – June 2007 – Ecological Goods and Services", http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1204924034909&lang=eng#egs.

55 The survey assumes that this payment has not been cancelled, as it was legally required when the last reference to it was found. Dimple Roy et al, "Ecological Goods and Services: A Review of Best Practice in Policy and Programing" (*sic*). (IISD, Winnipeg: August 2011), http://www.iisd.org/pdf/2011/egs_policy_programing.pdf.

56 Ministry of Environment, "Ontario Drinking Water Stewardship Program Four Year Report 2007-2011", http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_080910.pdf.

funded pilot program; [57] its ALUS program disbursed C$660,000 in payments in 2011. The program provides incentives to plant native trees in buffer zones; to retire sensitive lands by expanding buffer zones and high-sloped land; to take land out of production to conserve soils; and to maintain livestock fences around water bodies. The ALUS program has been popular, with 3,050 hectares of land enrolled in the program in 2010/11.[58] This ALUS program is classified as a Water Quality program because reducing fish kills in Prince Edward Island is a pressing ecological objective.[59]

AAFC and all Canadian provinces have signed onto the Growing Forward policy framework. This umbrella agreement for agricultural policy includes an environmental tranche which funds voluntary PES programs aimed at protecting a bundle of ecosystem attributes in agricultural zones. Alberta's water management program under Growing Forward provided C$3.2 million in funding in 2010/11,[60] leveraging at least C$1.6 million to $3.2 million (30% - 60% of the funded costs) from agricultural producers. Other Growing Forward programs have a more general PES focus, creating incentives for agricultural producers to enhance biodiversity, water quality and management, carbon sequestration, or energy efficiency. Details on these programs are in the Habitat and Biodiversity section.

PRIVATE PAYMENTS FOR WATERSHED MANAGEMENT

There is at least one example of private payments for the provision of water quality management. SaskPower, the Saskatchewan provincial electric utility, provides approximately two-thirds of the budget for provincial watershed management and stewardship initiatives through payments to the Saskatchewan Watershed Authority. This amounts to approximately C$2 million annually.

WATER ALLOCATION TRADING

Water quantity allocation trading is less well-established than water quality trading, with only one active scheme in Canada: In 2006, Alberta closed the South Saskatchewan River Basin to new water allocations, such that any existing licence holder could sell or lease their license to any other licence holder or a new entrant, as approved by the regulator. Trades are bilateral, so there is little transparency about pricing. Based on program records of trading volumes and discussions with Alberta Environment about probable prices, approximately C$4.5 million in trades took place in 2011.[61] Municipalities are often able to offer a higher price, and the producers of higher-value specialty crops can offer more than other farmers.[62]

PENDING MARKETS

The survey did not identify any pending markets for water quality or quantity. A number of pilot programs, including the Agriculture Canada EGS pilots and a "reverse auction" for wetland restoration in the Assiniboine River watershed in Saskatchewan, were not being considered for renewal or repetition.

Some legislation exists to allow water allocation trading. British Columbia's water laws also allow allocation transfers from one owner to another,[63] and extension of water use rights for purposes other than those on the license.[64] However, these provisions are little used and are not subject to environmental considerations.[65] Ontario legislation has recently been amended (amendments are not yet in force) to permit allowance transfers, but only with the consent of the Ministry of the Environment.[66] The legislation restricts inter-basin transfers.

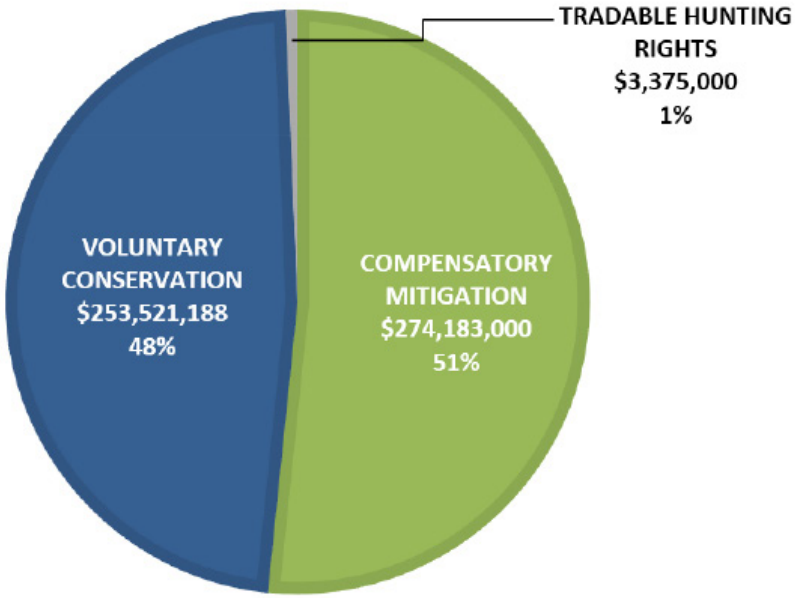
BIODIVERSITY AND HABITAT MARKETS

Before discussing these markets, it is important to make several notes on methodology, as this is the category with the largest range of uncertainty. First, because of the "bundled" attributes of biodiversity markets, some payments for ecosystem services schemes are included in the biodiversity and habitat markets category rather than

57 Prince Edward Island Wildlife Federation, "Souris & Area Branch Activities:ALUS Program" (2012) , http://www.souriswl.ca/ALUS.html.
58 Libby Johnston, "An Assessment of Prince Edward Island's Alternative Land Use Services (ALUS) program, 2008-2011" (University of New Brunswick Faculty of Forestry and Environmental Management/Department of Economics, April 2012).
59 See, e.g. Government of Prince Edward Island, "Action Committee to Examine Measures for Fish-Kill Prevention" (July 23, 2012), http://www.gov.pe.ca/newsroom/index.php3?number=news&newsnumber=8494&dept=&lang=E.
60 Government of Alberta, *Growing Forward: Alberta's Mid-Point Progress Report*, http://www.growingforward.alberta.ca/cs/groups/growing_forward/@gf_water_doc/documents/document/mdaw/mda3/~edisp/agucmint-007808.pdf.
61 David McGee, Alberta Environment. Personal communication (May 2012).
62 *Ibid*.
63 *Water Act* RSBC 1996, c 483, s 19.
64 *Ibid*, s 34.
65 Brandes, Oliver M., Linda Nowlan, and Katie Paris, *Going With The Flow? Evolving Water Allocations and the Potential and Limits of Water Markets in Canada*. (December 2008, Conference Board of Canada: Ottawa), http://poliswaterproject.org/sites/default/files/09_going_w_flow_1.pdf
66 SO 2007 c 12 s 1(8), amending the *Ontario Water Resources Act*, RSO 1990, c O.40 s 34(11).

in the previous section on water markets. If the market related mostly to water quality and did not focus on funding beneficial management practices (BMPs) that also protect biodiversity, it was included in Water Markets. Second, information on voluntary conservation agreements and easements has been gathered both "bottom-up" from program reports, and "top-down" from the accounts of land trusts and governments, meaning that double-counting is possible. Omissions are also possible: some programs did not provide data, and the contributions of smaller land trusts and conservation groups outside the North American Waterfowl Management Plan are not included. Third, in jurisdictions like Nova Scotia, where applicants for development permits can pay other parties to carry out offset projects, "voluntary" conservation spending can in fact be driven by the need for regulatory compliance. Finally, the estimate of spending on federally required fisheries habitat compensation is based on the estimates from another study: more detail is available in the annex to this document. The high estimate for the market size of biodiversity and habitat markets in Canada is shown in Figure 9, whereas Table 6 summarizes the various programs.

FIGURE 9: HABITAT AND BIODIVERSITY MARKETS (HIGH ESTIMATE) (ALL CURRENCY IN C$)



Source: Sustainable Prosperity

TABLE 6: ESTIMATED PAYMENTS IN BIODIVERSITY AND HABITAT MARKETS (MOST RECENT AVAILABLE FISCAL YEAR) (ALL CURRENCY IS C$)

MARKET	MARKET DRIVER	ESTIMATED VALUE OF PAYMENTS
COMPENSATORY MITIGATION MARKETS		
Department of Fisheries and Oceans (DFO) Habitat Alteration, Disturbance, or Destruction (HADD)	Compliance	$9,605,000 to $274,183,000 (see Annex)
Federal wetlands compensation	Compliance	No estimate available
New Brunswick wetland habitat compensation	Compliance	No estimate available
Nova Scotia wetland habitat compensation	Compliance	No estimate available
PEI wetland habitat compensation	Compliance	No estimate available
Ontario *Species at Risk Act* overall benefit registry	Compliance	No estimate available
VOLUNTARY COMPENSATION MARKET SPENDING		
Federal - Habitat Stewardship program for species at risk	Government-mediated	$9,000,000 to $13,000,000 annually
Aboriginal Fund for Species At Risk	Government-mediated	$3,300,000
Environmental Damages Fund	Government-mediated	$150,677
Manitoba Habitat Heritage Corporation conservation agreements	Government-mediated	$7,538,833
Nature Conservancy of Canada purchases of conservation lands and agreements	Voluntary	$31,881,659
Ducks Unlimited Canada	Voluntary	$62,995,000
North American Waterfowl Management Plan	Voluntary (with government, corporate, and NGO contributions)	$89,716,305
Ontario Species at Risk Stewardship Fund	Government-mediated	$4,000,000
Quebec *Partenaires pour la nature* program	Government-mediated	$2,640,000
ALUS programs in Norfolk County, ON, Vermilion County, AB. 7 more ALUS programs are now operating, but no data for these was available.	Voluntary (with corporate and NGO contributions)	$155,000 to $160,000
Growing Forward Farm Stewardship programs (11 programs – one in each province and the Yukon)	Government-mediated	$48,835,879
RESOURCE ALLOCATION MARKETS		
DFO Transferable Quotas - Pacific region	Compliance	$1, 469,000,000 of asset value (licences and quota); no trading estimate available
DFO Transferable Quotas - Atlantic fisheries	Compliance	No trading estimate available
Alberta tradable hunting rights	Compliance	$510,000 to $3,375,000

Source: Sustainable Prosperity

COMPENSATORY MITIGATION

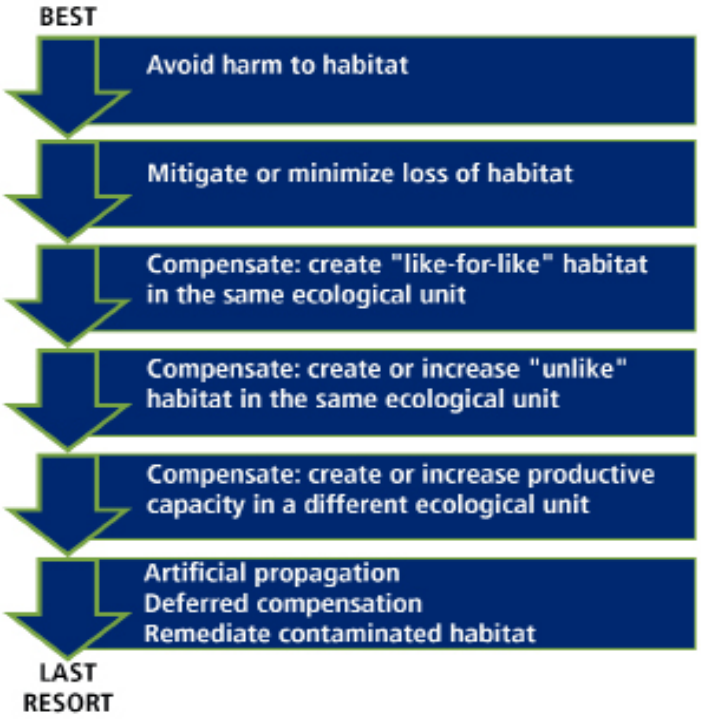
FEDERAL COMPENSATORY MITIGATION POLICIES

In Canada, compensatory mitigation is part of the project permitting and environmental assessment regimes, and is governed by policy statements tied to those regulatory regimes. The offsets generated in Canada are generally not fungible. The federal regime on fish habitat prohibits payments in lieu of direct habitat compensation by the proponent, and does not broker offsets by third parties. Habitat banking is defined as being compensation carried out before an authorization is issued.[67] The Department of Fisheries and Oceans' policy guidance on fish habitat calls for "no net loss" of fish habitat, and says that "the creation of a habitat bank does not involve monies".[68] Any fish habitat lost through an authorized activity that causes "harmful alteration, disruption, or destruction" (HADD) requires compensation, if there is no alternative means of avoiding the habitat loss caused by a project seeking an approval. The habitat compensation techniques recommended in the guidance follow a hierarchy (see Figure 10).

The federal practitioners' guide instructs practitioners to "aim for" a more than 1:1 ratio, due to the uncertainty associated with habitat productivity. Passive or incidental habitat creation is not to be counted or banked. One study has observed compensation ratios of 3:1 and higher, with lower ratios where the habitat restored or created is very similar to that destroyed.[69] Quigley and Harper's analysis of DFO authorizations shows that the majority of the area affected by authorizations is due to roads, highways, and urban development.[70] DFO does not break down habitat compensation activities by industry; of the activities referred to DFO for HADD assessment in 2010/11, watercourse crossings, shoreworks, and structures in water accounted for some 60% of the 7,772 authorization requests.

The market for compensatory mitigation is likely to change due to the 2012 federal budget bill, which repeals the definition of "fish habitat" and focuses instead on "serious harm" to fish in or supporting commercial, recreational, or Aboriginal fisheries, and permanent harm to fish habitat.[71] This could mean that the HADD compensation requirements will apply to fewer projects in future. This would decrease the amount of compensatory mitigation required.

FIGURE 10: MITIGATION HIERARCHY IN DFO POLICY GUIDANCE ON AQUATIC HABITAT



Source: DFO Practitioners Guide to Habitat Compensation; graphic by Sustainable Prosperity

Further habitat compensation activities take place through the Canadian Wildlife Service wetlands compensation (part of Environment Canada). The *Implementation Guide for Federal Managers* also aims for the achievement of "no net loss" of wetland functions, to be applied wherever the *Canadian Environmental Assessment Act* requires a federal environmental assessment.[72] Habitat compensation under this program is not tradable. Investment in and impacts of the federal compensatory mitigation programs are unclear, as is the extent to which expenditures and authorizations overlap with other regimes.

67 Department of Fisheries and Oceans, *Practitioners Guide to Habitat Compensation*, s.5.6.
68 Department of Fisheries and Oceans, *Practitioners Guide to Habitat Compensation*.
69 Rubec, Clayton and Hanson, Alan, "Wetland Compensation and Mitigation: Canadian Experience" (2009) *Wetlands and Ecological Management* 17(3-14).
70 DJ Harper and JT Quigley, "No Net Loss of Habitat: A Review and Analysis of Habitat Compensation in Canada" (2006) 36:3 *Environmental Management* 343.
71 Bill C-38, *An Act to implement certain provisions of the Budget tabled in Parliament on March 29, 2012 and other measures*, 1st sess 41st Parl, 2012 (assented to June 29, 2012), RSC 2012, c 19.
72 Pauline Lynch-Stewart, Paula Neice, Clayton Rubec, and Ingrid Kessel-Taylor, *The Federal Policy on Wetland Conservation: Implementation Guide for Federal Land Managers,* Canadian Wildlife Service, Environment Canada (1996). http://www.ec.gc.ca/Publications/6AD07CA9-1DDD-4201-ACCF-B18E-41FCB350/FederalPolicyonWetlandConservationImplementationGuide1996.pdf

Ontario's *Species at Risk Act* allows permits to be issued for projects if the Minister is satisfied the project will have an "overall benefit to the species within a reasonable time".[73] With regulatory development to flesh out the meaning of "overall benefit", this provision could create a habitat banking market for some species at risk, particularly declining species that are often encountered on developable lands (e.g. grassland birds such as Bobolink and Eastern Meadowlark).One permit under the an overall benefit provisions has been approved as of August 2012.[74]

PROVINCIAL COMPENSATORY MITIGATION POLICIES

Provincial policies for compensatory mitigation of biodiversity and habitat loss are also developing (see Pending Markets). New Brunswick's wetland conservation policy contains a mitigation hierarchy similar to the federal guidance; compensation at a 2:1 ratio is the "last resort" option, and there is to be no loss of provincially significant wetlands (i.e. compensation is not allowed for these).[75] New Brunswick recently released a long-term wetland conservation strategy, which maintains the mitigation hierarchy and promises to regulate provincially significant wetlands regardless of their size.[76] Prince Edward Island's wetland conservation policy does not differentiate between provincially significant wetlands and other wetlands, applying a "no net loss" standard to all wetlands. Further, PEI's policy recommends that mitigation banking not become part of PEI's wetlands conservation.[77]

In September 2011, Nova Scotia released its Wetland Conservation Policy, which sets a goal of "no net loss " for designated wetlands, and no loss for wetlands of special significance except if the alteration would provide a "necessary public function" (examples given include linear pipeline and electrical supply infrastructure) authorized by Cabinet.[78] Currently, Nova Scotia's policy is driving financing of Ducks Unlimited Canada's habitat activities in Nova Scotia.[79]

Habitat banks have been created in Nova Scotia, Quebec, Manitoba, Alberta, and British Columbia, generally by provincial government.[80] The majority of these are in Quebec (25 banks) and Nova Scotia (10 banks).[81] There are an estimated 43 habitat banks in Canada.

VOLUNTARY HABITAT CONSERVATION

The programs in this section are classified as markets for the purposes of this survey, because they represent payments in exchange for agreements to undertake certain activities beneficial to the preservation and enhancement of habitat. However, they are frequently not fungible and not transparent.

Three federal programs provide funding for voluntary habitat conservation and research, with participation at the landowner's discretion: the Habitat Stewardship Program for Species at Risk provides C$9 to $13 million annually for habitat protection and species protection actions; since 2000, the program has leveraged C$254 million and provided C$106 million in government funds to 1850 projects.[82] The Aboriginal Fund for Species at Risk funds similar projects with Aboriginal organizations and tribal councils.[83] The Environmental Damages Fund focuses on funding restoration of habitat using court settlements, fines, and voluntary payments from environmental enforcement.

In Manitoba, the Manitoba Habitat Heritage Corporation (MHHC) invests in conservation agreements through programs such as its Riparian Stewardship Initiative and Agro-Woodlot Program. MHHC is a Crown corporation funded by the provincial and federal governments, the United States through the North American Waterfowl Management Plan, and Wildlife Habitat Canada.[84]

In Ontario, the Ministry of Natural Resources funded 92 projects through the Ontario Species at Risk Stewardship Fund. These projects focused on stewardship activities

73 *Endangered Species Act* SO 2007 c 6 s 17(2).
74 Ontario Ministry of the Environment, "Endangered Species Act Authorization Tracker", http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STDPROD_087316.html (retrieved August 8, 2012).
75 New Brunswick Department of Environment, *New Brunswick Wetlands Conservation Policy*. (June 2002), http://www.gnb.ca/0009/Wetlands/WetlandStrategyStrategieTerresHumides.pdf
76 New Brunswick Department of Environment, *Long-Term Wetland Management Strategy*. (February 13, 2012), http://www.gnb.ca/0009/Wetlands/WetlandStrategyStrategieTerresHumides.pdf
77 Prince Edward Island Department of Fisheries, Aquaculture, and Environment, *A Wetland Conservation Policy for Prince Edward Island.* (Not dated), http://www.gov.pe.ca/photos/original/fae_wetland_con.pdf.
78 Nova Scotia, (September 2011), http://www.gov.ns.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf.
79 Nic McLellan, Ducks Unlimited Canada. Personal communication (July 11, 2012).
80 Senes Consultants and High Park Group, Fish Habitat Banking in Canada: Opportunities and Challenges (March 2011). Prepared for Cameco Corporation, Nova Scotia Power, Port Metro Vancouver, Bruce power, Manitoba Hydro, AREVA Resources Inc and U.S. Steel Canada. (at p.5)
81 *Ibid*.
82 Environment Canada, "Habitat Stewardship Program for Species at Risk" http://www.ec.gc.ca/hsp-pih/default.asp?lang=En (April 23, 2012) Retrieved June 18, 2012.
83 Species at Risk Public Registry, "Aboriginal Fund for Species at Risk" http://www.registrelep-sararegistry.gc.ca/involved/funding/faep-asrp_e.cfm. Retrieved June 18, 2012.
84 Manitoba Habitat Heritage Corporation, *Annual Report 2010/11.*

and incentives, and on education.[85] The program provided C$4 million in 2011/12.

Activities in Canada through the North American Waterfowl Management Plan (NAWMP) received C$89.7 million in contributions in 2011. This plan focuses on waterfowl habitat across North America. It is funded by contributions from the public sector, the private sector, and charities (including Ducks Unlimited Canada and the Nature Conservancy). Since 1986, the NAWMP has influenced 107.7 million acres of habitat through voluntary actions by landowners and secured 20.8 million acres through land title transfers or binding legal agreements.[86]

The land trust system also contributes to the preservation of habitat. In fiscal year 2010/11, the Nature Conservancy of Canada spent C$31.9 million on purchases of conservation lands and agreements.[87] Ducks Unlimited Canada's 2011 expenditures for enhancement, securement, and management of waterfowl habitat were C$63 million.[88] Other land trusts exist across the country, but these two are the largest. In 2010/11, Wildlife Habitat Canada also provided C$3,500 to the Thunder Bay District Stewardship Council for wetland enhancement; C$20,000 to the University of Western Ontario and Long Point Waterfowl for sandhill crane releases; and C$2,000 to the Land Conservancy of British Columbia.

Tracking conservation financing in Canada is complex, with organizations often providing grant money to each other, creating the potential for double-counting. For instance, Wildlife Habitat Canada provided C$1.45 million in conservation funding to a variety of bodies in 2010/11, but some of this is not included in the survey's total as much of this funding would already be counted through Nature Conservancy of Canada and Ducks Unlimited Canada. Assuming that 100% of Ducks Unlimited activities support the NAWMP, the total for voluntary conservation finance would be reduced by C$63 million. Further study and tracing of these flows would be beneficial to determine the total impact of habitat protection financing in Canada.

85 Ontario Ministry of Natural Resources, "Stewardship Fund", http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STEL01_131229.html

86 North American Waterfowl Management Plan, *Canadian Habitat Matters: 2011 Annual Report*. (2012), http://www.nawmp.ca/pdf/HabMat2011English.pdf.

87 Nature Conservancy of Canada, *2010-11 Audited Financial Statements*. (2011), http://www.natureconservancy.ca/assets/documents/nat/annual-reports/2010-11-Audited-Financial-Statements.pdf

88 Ducks Unlimited Canada, *Financial Statements, Year Ended March 31, 2011*. (May 27, 2011), http://www.ducks.ca/aboutduc/pdfs/2011-03-31%20Ducks%20Unlimited%20FS%20FINAL.PDF.

AGRICULTURAL PAYMENTS FOR ECOSYSTEM SERVICES (PES)

Research found a number of voluntary biodiversity and habitat markets associated with the Growing Forward agricultural policy framework and similar to the government-mediated watershed PES previously discussed. While outcomes are not always strictly measured, the programs are intended to have a broad spectrum of environmental benefits. These markets compensate the implementation of Beneficial Management Practices (BMPs), including upland and riparian habitat management; erosion control; manure management; shelterbelt and native vegetation establishment; invasive species control; and wetland restoration.

AAFC provided C$56.8 million in transfer payments for on-farm environmental action in fiscal year 2010/11.[89] Growing Forward requires 60% federal, 40% provincial funding, for a total of C$94.6 million in government funding annually for on-farm environmental action through Growing Forward.[90] This C$94.6 million figure is *not* included in the total, because reporting is unclear how much of these transfer payments become PES payments, compared to other categories like outreach and administration. Provincial agencies reported C$48.8 million in the most recent fiscal years for which information is available in Growing Forward PES payments (see Table 7). Leveraged funds from agricultural producers are presented in the right-hand column, based on program data or estimated from the program's cost-share ratio: a 30% cost-share ratio means that the program covers 30% of project costs.

89 Receiver General for Canada (2011), " Public Accounts of Canada 2011" http://www.tpsgc-pwgsc.gc.ca/recgen/pdf/50-eng.pdf. Ottawa: Minister of Public Works and Government Services Canada.

90 Agriculture and Agri-Food Canada, *Growing Forward* s 10.1.2, http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1239741723112&lang=eng#eleven

TABLE 7: CONTRIBUTIONS TO AGRICULTURAL PES PROGRAMS LINKED WITH GROWING FORWARD (ALL CURRENCY IS C$)

PROVINCE OR TERRITORY	PROGRAM	PAYMENTS TO AGRICULTURAL PRODUCERS, MOST RECENT AVAILABLE FISCAL YEAR	CONTRIBUTIONS BY AGRICULTURAL PRODUCERS, MINIMUM
YUKON	Canada-Yukon Farm Stewardship Program	$44,000[1]	$220,000 on $73,000 of approved projects (not all completed)
BRITISH COLUMBIA	Beneficial Management Practice Program	$3,500,000[2]	$1,400,000 to $2,450,000 (estimated based on 30-60% cost share) Province estimates $1,500,000.[3]
ALBERTA	Growing Forward stewardship agreements	$2,350,000	$2,350,000 (estimated based on 50% cost share)
SASKATCHEWAN	Canada-Saskatchewan Farm Stewardship Program	$8,041,969[4]	$5,259,000 (estimated based on individual BMPs' cost shares)
MANITOBA	Environmental Farm Action Program	$2,200,000	$3,000,000[5]
ONTARIO	Canada-Ontario Farm Stewardship Program	$7,680,000[6]	$5,376,000 (30-50% cost share)[7]
	Species at Risk Farm Incentive Program	$777,000	$777,000 (estimated based on 50% cost share)
QUEBEC	Mesures cofinancées du programme Prime-Vert	$8,936,043	$1,132,312 (program figures)[8]
NEW BRUNSWICK	Environmental Farm Plan BMPs	$1,405,000	$3,375,000 (program figures)[9]
NOVA SCOTIA	Not available[10]		
PRINCE EDWARD ISLAND	Canada-PEI Agriculture Stewardship Program	$968,062	$1,672,000[11]
NEWFOUNDLAND & LABRADOR	Agricultural Sustainability	$845,000	$258,904 (program figures, 2010-11; 75% cost share)[12]

Note: Agricultural sector contribution figures may not be exact, as some projects that have been funded would only have received financing for the portion under the program's project cap.

Source: Sustainable Prosperity

1 Matt Ball, Yukon Ministry of Energy, Mines, and Resources. Personal Communication (July 10, 2012).

2 British Columbia Agricultural Research & Development Corporation, "Environmental Farm Plan: 2008/09 Program Statistics", http://www.bcefp.ca/userfiles/file/efp/2008%20EFP%20Stats.pdf

3 British Columbia Agricultural Research & Development Corporation, "Fantastic Year for BMPs" (Not dated), http://www.ardcorp.ca/index.php?page_id=14.

4 Jessica Wruck, Provincial Council of Agricultural Development and Diversification Boards. Personal communication (July 12, 2012).

5 Brittany Dyck, Manitoba Agriculture, Food, and Rural Initiatives. Personal communication (July 12 2012).

6 Andy Graham, Ontario Soil and Crop Improvement Association. Personal communication (June 8 2012).

7 *Ibid.*

8 Marie-France Gagnon, ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec. Personal communication (August 6, 2012).

9 Bruce Kinnie, New Brunswick Agriculture, Aquaculture, and Fisheries. Personal communication (July 11, 2012).

10 Nova Scotia Federation of Agriculture. Personal communication (July 10, 2012).

11 Barry Thompson, Prince Edward Island Department of Agriculture and Forestry. Personal communication (August 27, 2012).

12 Newfoundland and Labrador, Growing Forward Evaluation Report, 2009-2012, http://www.nr.gov.nl.ca/nr/funding/growingforward/growing_forward_evaluation_2009_2012.pdf.

A number of non-government PES programs have also been established. The ALUS program in Norfolk County, Ontario has 1000 acres (a) enrolled, paying C$150/a each year. Vermilion County, Alberta's program is newer, has 2500 acres enrolled, and pays less (C$2-40/a) to reflect the lower biomass production and endangered species density of the land.[91] The most recently created ALUS programs began in December 2011 in four Saskatchewan rural municipalities.

RESOURCE ALLOCATION MARKETS

The only tradable quota system for which this survey was able to produce an estimate of trading value was a hunting rights system in Alberta. This regime allows trading in hunting rights for antelope, black bear, cougar, elk, mule deer, moose, trophy sheep, white-tailed deer, and waterfowl. Allocations can be leased or sold outright; the latter is higher-priced. The size of the market was between C$510,000 and $3.4 million in 2011, as 560 allocations were sold and 1150 were leased.[92]

Tradable hunting rights are not the only system of tradable natural resource allocations in Canada. Many Canadian fisheries are managed by a transferable quota system, which allocates rights to a certain amount of the annual catch, in hopes of removing the incentive to fish rapidly. The Atlantic and Pacific fisheries both fish many species under transferable quotas. One estimate puts the total value of licenses and quota in the Pacific fleet at C$1.469 billion in 2010-11.[93] Information on trading is limited, and so no estimate on trading volumes and values is available. Further, the system remains controversial: while it may have helped to alleviate the deleterious social and ecological impacts of "derby-style" fishing, there are concerns that expenditures on quota affect the livelihood of fishing communities.[94]

PENDING MARKETS

British Columbia's new draft policy on habitat compensation will allow payments in lieu of direct compensation. Implementation will begin in 2012, and the policy will apply in situations where provincial staff are asked for advice on development, the province is the project proponent, or a permit from the province is required.

Alberta is developing a new wetlands policy. This policy has been in development since 2008 to replace the 1993 interim policy, which applied only on privately held "settled" land. However, the policy may not provide a strong incentive for increased development of habitat banking and offsets, because it does not contain a "no net loss" goal and only applies in the densely populated "white zone" in the southern half of Alberta.[95] The Alberta Water Council's recommendations to the government would allow the government to consider restoration of previously-existing wetlands, construction of wetlands where they have been removed or never existed, enhancement of existing wetlands, and (as partial compensation) securement of existing wetlands and research for wetland re-establishment.[96] It is unclear how many of these recommendations will appear in the final policy. Alberta may also allow trading of disturbance permits in its boreal forest region, as an advisory group on boreal conservation has recommended,[97] and the new Land Use Framework and *Alberta Land Stewardship Act* allow.[98]

Quebec may produce further programming, following a commitment in its climate change plan to support the conception of new tools for estimating the monetary value of services generated by biodiversity and ecosystems. Land-use planning is a priority application for this work,[99] so it is possible that more PES-type schemes could be implemented in Quebec soon.

The ALUS program in Norfolk County, Ontario is engaged in ongoing work to create an Ontario Ecological Credit for the agricultural sector, which will stack payments from carbon sequestration and biodiversity.[100] This approach, if successful, may help to grow this market by making credits more interchangeable and "commodity-like".

91 Bryan Gilvesy, ALUS Norfolk . Personal communication (July 12, 2012).

92 Price estimates from Ryk Visscher, Ryk Visscher Hunting Adventures and past President of Alberta Professional Outfitters Society. Personal communication (July 2012). Figures on license transfers from Mabel Brick, Alberta Professional Outfitters Society. Personal communication (June 2012).

93 Nelson, Stuart, *West Coast Fishing Fleet: Analysis of Commercial Fishing License, Quota, and Vessel Values as at March 31, 2011*. Prepared for Fisheries & Oceans Canada, Pacific Region (November 2011), http://www.pac.dfo-mpo.gc.ca/fm-gp/picfi-ipcip/docs/2011-value-valeur.pdf.

94 Ecotrust, *Briefing: A Cautionary Tale About ITQs in BC Fisheries* (2009), http://ecotrust.ca/sites/all/files/ITQ_Cautionary_Tale_FINAL.pdf.

95 Madsen, Becca, Nathaniel Carroll, Daniel Kandy, and Genevieve Bennett, 2011 Update: State of Biodiversity Markets. Washington, DC: Forest Trends, 2011, at p. 10. Available at: http://www. ecosystemmarketplace.com/reports/2011_update_sbdm.

96 Alberta Water Council, *Recommendations for a New Alberta Wetland Policy* (September 16, 2008), http://www.awchome.ca/Portals/0/pdfs/WPPT%20Policy%20web.pdf.

97 Mike Kennedy, "New Policy Tools for Conservation in Alberta's Boreal Natural Region" (August 2010) *Wild Lands Advocate* 18:4. http://albertawilderness.ca/issues/wildlands/forests/boreal-forest/archive/2010-08-new-policy-tools-for-conservation-in-albertas-boreal-natural-region

98 Alberta, Alberta Land Stewardship Act, SA 2009 c A-26.8

99 Quebec, Ministre du développement durable, environnement, et parcs, Climate Change Action Plan 2013-2020, http://www.mddep.gouv.qc.ca/changements/plan_action/pacc2020-en.pdf.

100 Norfolk ALUS, "The Ontario Ecological Credit", http://www.norfolkalus.com/index.php?option=com_content&view=article&id=100&Itemid=32.

ASSESSING THE STATE OF ENVIRONMENTAL MARKET DEVELOPMENT

To create a simple visual explanation of the attributes of Canadian environmental markets, each market segment is classified below according to two attributes, liquidity and transparency, and assigned numerical values along a continuum, with the scoring system summarized in Table 8. The three types of environmental markets covered in this survey were evaluated according to the scoring criteria, with the results shown in Figure 11.

- **Liquidity:** The ease with which a good, service, or attribute can be transferred between market participants. This ranged from 0 for credits that are not tradable, such as sole-source conservation offsets, to 3 for credits that are tradable, whose trading is tracked in a registry, and a developed secondary market exists.

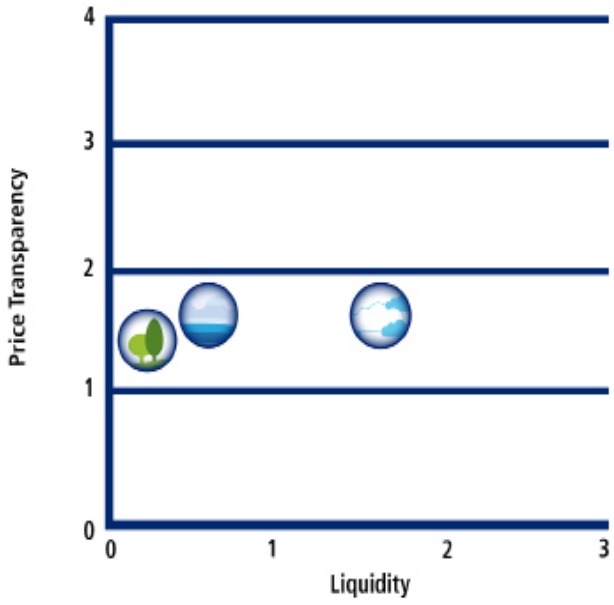
- **Transparency:** The ease and accuracy of price discovery: this was zero where no credit sales were allowed in the market; 1 where prices were negotiated bilaterally between buyers and sellers but were not disclosed to third parties in a predictable way; 2 where the credit issuer or clearinghouse sets a standard price; 3 where there is public and competitive credit pricing; and 4 where the market has public and competitive pricing and a secondary market.

TABLE 8: MARKET ATTRIBUTE SCORING SYSTEM

LIQUIDITY	TRANSPARENCY
0 – Not tradable	0 – Internal price (no trading)
1 – Tradable, no clearing-house or registry	1 – Bilateral negotiation of prices
2 – Tradable, with clearing-house or registry	2 – Standard price set by credit issuing agency or clearing-house
3 – Tradable, with clearing-house/registry and secondary market	3 – Public and competitive credit pricing
	4 – Public pricing with secondary market

Source: Sustainable Prosperity

FIGURE 11: AVERAGE ENVIRONMENTAL MARKET STRUCTURE IN CANADA



Source: Sustainable Prosperity

This liquidity and transparency framework, which shows what is currently happening in the structure of Canada's environmental markets, can be complemented by some more contextual and qualitative thinking about what makes a productive, stable, and beneficial environmental market. This can be thought of in terms of five key criteria:

1. **Scarcity:** prices in a market are governed by the scarcity of the commodity being traded. For environmental markets, this scarcity can come from social pressure to be more environmentally conscious, from regulatory limits, or from actual physical scarcity. Environmental markets can set regulatory limits on use of EGS, to avoid the uncertainty and risks associated with physical scarcity of EGS.

2. **Scale:** The potential market must not be too "thin" to support innovation, price discovery, and the differences in mitigation costs that enable markets to reduce the costs of achieving a given environmental outcome. Where scale is insufficient to achieve these cost reductions, policy-makers should consider what kinds of mechanisms might be able to increase the market's scale, while respecting the limits on markets described by the remaining S's:

3. **Standards:** Strong protocols, monitoring, auditing, and verification contribute to the financial and

environmental value of markets. For instance, catch monitoring and robust science-based targets for Total Allowable Catch contribute to the effectiveness of transferable quotas in fisheries. An improved understanding by the market regulator of the typical proportion of a water license that is actually used can allow for the development of policies around "sleeper" allocations. The Manitoba Ombudsman has noted that enforcement of prohibitions on drainage of permanent and semi-permanent wetlands is weak.[101] Good standards for data and verification as programs develop may also increase the markets' resilience to trade law challenges: an environmental market supported with strong monitoring of environmental outcomes will find it easier to demonstrate that it these programs are environmental in nature, rather than being illegal subsidies or disguised restrictions on international trade.

4. **Social context:** The design of markets must be context-driven. For agricultural PES, several interviewees emphasized the importance of building markets whose purpose and functioning people understand intuitively and want to participate in, not only for economic benefit, but also because participation contributes to their quality of life and conforms to their values. A market's design must also be sensitive to competing public policy priorities such as social equity – for instance, if participation in a resource allocation system is so expensive that many people cannot access the resource, there will be an incentive to poach, or to covertly violate the regulations establishing the market – for instance, to capture many animals but only retain the more valuable specimens toward one's quota. Durable and dynamic environmental markets can fit into the governance that is already necessary for other styles of EGS regulation: a Conference Board of Canada report pointed out while that water markets can sometimes help to reallocate water toward ecosystem protection and priority uses, they do not solve problems such as "poor management, existing over-allocation, or failing water governance".[102]

5. **Stability:** Markets created by regulation need assurance that the market will be stable and long-term, so that investment is worthwhile. Pilot programs are a valuable way to test an idea, but may not inspire the larger investments and systemic changes that secure longer-term markets can drive. Further, programs clearly linking credits with regulatory compliance by the user of the ecosystem service, such as South Nation's phosphorus trading, have a revenue stream that may prove more self-sustaining than those that rely on long-term allocations of government spending.

The liquidity and transparency matrix and the "5 S" criteria yield observations about market structure and potential. They can also be thought of as design criteria: in a situation where too many of these S's do not stand a good chance of being satisfactorily achieved, an environmental market may not be the optimal policy response to environmental degradation. Keeping these two sets of tools in mind, the following sections discuss the gaps and opportunities in the markets as they exist today, and suggest a number of actions for investors, policy-makers, and others.

AIR AND CARBON MARKETS

In Canada, air and carbon markets had the highest liquidity ratings (1.78) of all the market categories. Canadian air and carbon markets are often set up to have credits that can be traded at least once (though, in practice, it seems they are often not transferred in secondary markets after the initial sale). The main challenges for air and carbon markets seem to be on the policy side: creating a price for carbon and setting appropriate targets to motivate investment. Low trading volumes and prices suggest that all regulated entities are easily able to secure other compliance options, and thus the targets are not stringent enough to take advantage of the efficiencies that a market system can offer. This seems to affect several programs: low prices and low levels of trading were documented in Ontario's sulphur dioxide and nitrogen oxide trading, and in federal fuel efficiency regulations. This could indicate that Ontario's goals for air quality are being met; if not, then tightening targets could increase innovation and investment. Similarly, Alberta is considering increasing the price of its GHG technology fund credits, to drive further emission abatement within facilities and bring higher-cost offsets online.[103]

The idea of carbon trading and offsetting has gained a constituency, but the challenge of getting the market to scale continues. While several provinces have legislation that would enable cap-and-trade, and some are pursuing

101 Manitoba Ombudsman, Report on the Licensing and Enforcement Practices of Manitoba Water Stewardship (2008), http://www.ombudsman.mb.ca/pdf/MB%20Water%20Stewardship%20Report%20on%20Licensing%20and%20Enforcement%20Practices%20April%2030%202008.pdf.

102 Brandes, Oliver M., Linda Nowlan, and Katie Paris, Going With The Flow? Evolving Water Allocations and the Potential and Limits of Water Markets in Canada. (December 2008, Conference Board of Canada: Ottawa), http://poliswaterproject.org/sites/default/files/09_going_w_flow_1.pdf.

103 Bob Savage, Alberta Environment. Personal communication (June 2012).

multiple approaches to price and reduce GHG emissions, and linking these markets in order to increase market efficiency will be an important step.

With respect to price transparency (air and carbon markets averaged 1.67, compared to the survey average of 1.48), the most common pricing model for the carbon markets in Canada remains standard prices set by the credit issuer or regulator. Liquidity is higher than in other markets (an average liquidity score of 1.56, compared to the survey's average of 0.38). This may be due to the characteristics of the media typically covered by these markets: industrial emissions to air are relatively easy to measure (compared to measuring the attributes of complex ecological systems) and to treat as interchangeable credits. Some changes to market structure are possible: for instance, several air pollution markets covered in this report did not collect pricing information about credit trades. Since the concept of emission credit as commodity is quite comfortable for many people and market actors, increasing the price transparency of these markets could have efficiency benefits without being alienating.

WATER MARKETS

The average transparency rating in water markets was 1.67. The reason that water markets score relatively high on price transparency is that several have a standard pricing scheme set by the government actor delivering the program – this does not mean that the price given is necessarily the most efficient, but at least some kind of price is discoverable. For water, the challenge consists in using and modifying existing legislation to deliver on environmental protection needs, and in determining what type of pricing strategy is the most appropriate for a given watershed and the community around it. However, it should be noted that markets in this sector often seem to operate as pilot programs or time-limited programs, suggesting that more transparent policy information and longer-term price signals would help to alert potential participants and foster a more developed market. Further, there is likely substantial scope to create markets that link potential water quality credit producers with credit purchasers in stressed watersheds: this could ensure a consistent demand for the kinds of environmental practices that right now are mostly funded through government and conservation authorities.

Water markets' liquidity score was 0.33. Some of this score is attributable to the number of programs based on non-tradable payments; there may be room to increase the liquidity of water markets. Cooperation to manage entire watersheds and provide payments within that watershed will require inter-provincial cooperation. Continued study on the impact of particular management practices will also be an important take-away from some of the pilot projects and stewardship programs that have been developed in recent years, in order to ensure that more liquid credit-based programs can be developed with confidence. Bundled and more highly tradable credits involving water quality, carbon sequestration, and habitat conservation are also a significant opportunity to develop.

Water allocation markets are a special case. The low adoption of water allocation markets suggests either that not many areas of Canada are water-constrained or that this type of market has not found popular or political favour. Alberta, which is quite market-oriented, is the only province to have adopted water allocation trading, and only in a region that is water-constrained.

HABITAT AND BIODIVERSITY MARKETS

Habitat and biodiversity markets were rated as the least liquid and least transparent. For many, there is no central registry of information available to market participants regarding the availability and pricing of credits (or other compliance options, if the program does not offer tradable credits). However, a number of the agricultural programs in the habitat section of the study provided a standard contribution ratio. Where this kind of program information was available, it provided some price transparency and increased the average transparency score to 1.42.

Some compensatory mitigation programs are structured not to be tradable at all; the average liquidity rating of the habitat programs in the survey was 0.11. Limiting trading could be logical for some types of habitat, where the availability is so limited that any loss at all is not ecologically tolerable; it could also make sense to limit trading where the prospective market is likely to be very thin, and not create gains "worth" the cost of establishing the market. Nationally, an industry consortium is pressing for greater use of habitat banking and compensation for conservation and regulatory approvals in Canada.[104] Some markets may be too thin for very liquid habitat trading to be viable: Prince Edward Island's refusal to allow wetland compensation banking may stem from an estimation that the province simply does not have enough undeveloped area for blocks of habitat to be secured at reasonable cost;

104 Senes Consultants and High Park Group, Fish Habitat Banking in Canada: Opportunities and Challenges (March 2011). Prepared for Cameco Corporation, Nova Scotia Power, Port Metro Vancouver, Bruce power, Manitoba Hydro, AREVA Resources Inc and U.S. Steel Canada.

larger provinces inland may have more of a given type of habitat, enabling the protection of larger blocks of land or wetland and making a market possible.

Further research and monitoring of habitat losses, gains, and productivity would enable habitat and biodiversity markets to increase in liquidity and transparency, by providing confidence about appropriate compensation ratios for habitat. There is also a lack of summary information on the amount of habitat that is being protected; initiatives like the North American Waterfowl Management Plan pull together substantial amounts of information for some habitat types, but it is difficult to reconcile the extent to which this information overlaps with other initiatives or with mandatory compensatory mitigation, in order to provide a comprehensive picture of habitat protection finance in Canada.

Other habitat and biodiversity markets, as well as the bundled environmental programs classified alongside them, are not tradable and provide standard prices and cost-share ratios for habitat protection and EGS actions, through an application process. Standard pricing is convenient, but can result in the awarding of payments higher than the actual cost of projects, which has been observed in some biodiversity markets in Canada.[105] Reducing this overpayment, to the extent possible, would increase the number and size of projects that can be funded. At the same time, some informants emphasized adequate replacement of lost revenue in order to induce participation in PES programs.

105 For instance, the standard price offered by a PES program in Manitoba was estimated to overpay by 25% compared to the actual decrease in land value from the introduction of a perpetual conservation easement. Lawley, Chad and Charles Towe, "Implicit Prices of Habitat Conservation Easements", Department of Agribusiness and Agriculture Economics, University of Manitoba (May 2012, Project Number: PR-01-2012), http://www.learnnetwork.rees.ualberta.ca/en/PublicationsCommunications/~/media/learnnetwork/Publications%20and%20Communication/Documents/PR012012LawleyTowe.pdf.

NEXT STEPS FOR ENVIRONMENTAL MARKETS

As described in this survey, there is a wide variety of environmental markets currently operating in Canada, with a variety of structures and capabilities. Due to the unique nature of ecosystem goods and services, there may be limits to the expansion or use of these markets. However, there are several areas where investors, policy-makers, and others could support the continued development of environmental markets in Canada, which are outlined in more detail below.

A number of issues need resolution if environmental markets are to reach their full potential in Canada:

1. There is a **lack of data and transparency** in existing markets.
2. Many opportunities remain to mitigate transaction costs through **improved market information**.
3. **Strong research and public policy** are required to underpin market development.

INVESTORS

- Identify opportunities to participate in existing markets as advisors, lenders, financers, and insurers;
- Participate in building market infrastructure, such as registry systems;
- Continue to liaise with environmental groups to understand and develop financing models for environmental markets, including opportunities to multiply the impact of environmental market investments; and,
- Develop a strong understanding of the benefits and risks from investment in conservation, air, carbon, and water markets.

Roles for the financial sector include lending and financing of offsets and projects; providing trading infrastructure; and insuring. The key role for the financial sector is as a "market-maker" – facilitating the purchases and sales of credits– and advisor, for their clients. For financial service providers to get more involved in these markets, their clients need to get more involved. More companies

need to think more deeply about environmental risks, dependencies, and opportunities, and how involvement in environmental markets can help them secure access to ecosystem goods and services. Policy-makers often set the frameworks in which investment decisions are made, but the financial sector is the only part of the economy capable of providing the kind of capital that would be necessary to scale up existing investments beyond their current small scale. Further, investors need to develop models to understand the new revenue streams that environmental market-based instruments can create. Much of the value of Canadian environmental markets comes from compliance-driven markets, which on average are larger than voluntary or government-mediated programs. In this survey, the 15 compliance markets accounted for C$141.6 to $428 million, while the 28 government-mediated markets were at between C$198 and $202 million and the 14 voluntary programs were approximately C$122.4 to 122.5 million. This suggests that regulatory action can be key to driving environmental market creation.

POLICY-MAKERS

Identify opportunities to create new markets and scale-up and modify the structure of existing markets for increased efficiency and better governance;

- Identify necessary data for good market functioning and ensure that it is collected and shared; and,
- Set appropriate targets to drive market growth.

Market scale: Many environmental markets are localized and have credits that are not tradable at an efficient scale, if at all. Sometimes this is by design, in order to minimize compliance risks or avoid trading unlike environmental attributes, but sometimes these restrictions simply make it more difficult for buyers to purchase at competitive prices, which can increase overall costs. The challenge of knowing the difference between a necessary restriction on marketization a missed opportunity has been summed up as follows: "[t]he challenge for decision makers is to assess when market-based solutions to biodiversity loss are likely to be culturally acceptable, as well as effective, efficient and equitable."[106] Markets should be developed with regard for social sensitivities and ecological priorities. Some provincial wetland conservation policies exclude wetlands of special value from the compensatory mitigation regime; this could be a practical approach if there are concerns about the effect of markets on specific natural areas.

Previous research from Sustainable Prosperity suggests species at risk, fish habitat, and water withdrawals are particularly fruitful areas for increasing the tradability of EGS.[107] Federal conservation regulations could be amended to allow bilateral trading, taking advantage of efficiencies from having specialized firms working on conservation offsets, in the way that exists in the United States. Maintenance of a strong "no net loss" standard, clear procedures, and enhanced compliance monitoring would be important to ensure that this market would have the intended ecological impact. British Columbia's proposed policy allows cash in lieu of direct habitat compensation. British Columbia's results can provide lessons for the federal scheme. Another area to explore is "stacking" or "bundling" of payments, so that compensation can be provided for the various different ecosystem attributes that can be protected by one offset.[108]

Data from existing markets can be enhanced. Information is easy to share digitally, so there is little reason not to provide market actors with increased price transparency where an online registry is already established; several programs have online registries to show the volume of credit trading, but do not collect any pricing information due to concerns about confidentiality. Others do not collect trading information.

Where market structure is established, target-setting is also important to make the market more efficient than a traditional command-and-control approach. For instance, the existing carbon and air quality markets tend to have relatively well-developed market infrastructure, but a key challenge is setting targets to support prices and trading.

RESEARCHERS

- In collaboration with other sectors, develop information on efficiencies and potential compliance risks that could result from market development;
- Continue research on the functioning and sensitivities of ecosystems, in order to ensure that environmental markets that are established or modified rely on appropriate data; and,

106 TEEB, The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB. (2010)

107 Sustainable Prosperity, Advancing the Economics of Ecosystems and Biodiversity in Canada: A Survey of Economic Instruments for the Conservation & Protection of Biodiversity. (2011), http://www.sustainableprosperity.ca/dl534&display.

108 Peterson, Annah L., Louise A. Gallagher, David Huberman, and Ivo Mulder, "Seeing REDD: Reducing Emissions and Conserving Biodiversity by Avoiding Deforestation" (January 2012) 31:1 Journal of Sustainable Forestry 29.

- Review lessons learned from the experiences of other jurisdictions.

Better baseline scientific data on environmental conditions and policy performance can contribute to the sound design of environmental markets. For instance, a very limited number of species globally have been assessed for their vulnerability to extinction;[109] information on these sensitivities can provide information to help set boundaries for conservation offset trading.

Based on current information, it is possible to estimate spending on Canadian environmental markets, but difficult to say what the appropriate spending would be: more research into the optimal size of the market opportunity is also required, to complement financial and industry actors' understanding of available financial flows.

CONSERVATION AND ENVIRONMENTAL GROUPS

- Continue to develop awareness and proposals for environmental markets that would support their organizations' goals; and,
- Develop awareness of how environmental markets might fund their current work.

PHILANTHROPIC GROUPS AND FOUNDATIONS

- Seek opportunities to provide funding for the continuation of projects and research; and,
- Support linkages between conservation and environmental organizations and industry.

The voluntary sector can complement industry and finance in providing support for environmental market development. Of note, the W. Garfield Weston Foundation has provided Norfolk County ALUS with C$1.5 million to continue development of its ALUS program.[110]

INDUSTRY

- Understand environmental risks, dependency, and opportunities.

Industry can engage constructively with researchers, civil society, government, and suppliers to identify their reliance on EGS[111], as well as opportunities to finance EGS and reduce exposure to environmental risks.

CONCLUSION

While there may be more going on in Canadian environmental markets than meets the eye, there is still much to be done to create effective, efficient, and fair environmental markets. This survey demonstrates that there is a large untapped potential for environmental markets in Canada, and that scaling up the use of such markets can dramatically reduce the cost of environmental policies. Realizing that potential will depend on a number of structural elements that both governments and the private sector will need to put in place.

Government's role will centre around its traditional functions, including the gathering and provision of key data and information on natural capital stocks and flows, and the establishment of standards and definitions around which to build markets. More than anything, though, governments can provide the regulatory and policy regime to enable markets to develop.

The private sector can best contribute to the development of environmental markets by playing to their own traditional strengths in market development, including the creation of market infrastructure (such as trading platforms) and the provision of financial services, from "market making" to acting as counterparties for market participants.

At this critical time for the global environment, everyone's participation is needed.

109 Scholes, Robert, Rashid Hassan, Neville J. Ash, Ecosystems and Human Well-being: Current State and Trends, Vol. 1. (2005) Millennium Ecosystem Assessment, http://www.maweb.org/documents/document.766.aspx.pdf.

110 ALUS Norfolk Ontario, "$1.5 Million Gift to Norfolk County ALUS from Weston Foundation". (December 7, 2011) , http://alusontario.tumblr.com/post/13875910867/1-5-million-gift-to-norfolk-alus-from-weston.

111 See for example, the World Resources Institute's Corporate Ecosystem Services Review: http://www.wri.org/publication/corporate-ecosystem-services-review.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