

Environmental Damages after the Federal Environmental Enforcement Act: Bringing Ecosystem Services to Canadian Environmental Law?

Martin Z. P. Olsynski

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Citation Information

Olsynski, Martin Z. P. "Environmental Damages after the Federal Environmental Enforcement Act: Bringing Ecosystem Services to Canadian Environmental Law?." *Osgoode Hall Law Journal* 50.1 (2012) : 129-176.

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Environmental Damages after the Federal Environmental Enforcement Act: Bringing Ecosystem Services to Canadian Environmental Law?

Abstract

The Canadian Environmental Enforcement Act [EEA] directs judges to consider actual environmental damage, or risk thereof, when setting fines for environmental offences. The EEA defines damage as including the loss of use and non-use values. While these terms are not unprecedented in Canadian environmental law, their use in environmental damage assessment is. Bearing in mind recent developments in environmental valuation in the United States and internationally, and considering the emergence of the “ecosystem services” paradigm in particular, this article explores the opportunities and challenges for ecosystem services based environmental damages assessment in the Canadian environmental sentencing context. The ecosystem services concept, much written about in American legal literature, provides a framework for identifying and organizing the numerous direct and indirect contributions that ecosystems make to human well-being, the value of which can then be expressed in economic terms. Although novel and ambitious in some respects, this approach would be consistent with both Parliament’s intention in passing the EEA and with the pre-existing common law framework for environmental sentencing in Canada.

Keywords

Liability for environmental damages; Environmental Enforcement Act (EEA); Ecosystem services--Law and legislation; Canada

Environmental Damages after the Federal *Environmental Enforcement Act*: Bringing Ecosystem Services to Canadian Environmental Law?

MARTIN Z.P. OLSZYNSKI *

The Canadian *Environmental Enforcement Act* [EEA] directs judges to consider actual environmental damage, or risk thereof, when setting fines for environmental offences. The EEA defines damage as including the loss of use and non-use values. While these terms are not unprecedented in Canadian environmental law, their use in environmental damage assessment is. Bearing in mind recent developments in environmental valuation in the United States and internationally, and considering the emergence of the "ecosystem services" paradigm in particular, this article explores the opportunities and challenges for ecosystem services-based environmental damages assessment in the Canadian environmental sentencing context. The ecosystem services concept, much written about in American legal literature, provides a framework for identifying and organizing the numerous direct and indirect contributions that ecosystems make to human well-being, the value of which can then be expressed in economic terms. Although novel and ambitious in some respects, this approach would be consistent with both Parliament's intention in passing the EEA and with the pre-existing common law framework for environmental sentencing in Canada.

Le Parlement canadien a récemment adopté la Loi sur le contrôle d'application de lois environnementales [LCALE], qui ordonne aux juges de considérer les dommages environnementaux réels, ou le risque de ces derniers, lors de la détermination des amendes relatives à des infractions environnementales. La LCALE définit expressément les dommages comme incluant la valeur de la perte de jouissance et de non usage et, bien que ces termes ne soient pas sans précédent dans le droit de l'environnement canadien, leur évaluation actuelle l'est. En

* LL.M. (UC Berkeley), LL.B., B.Sc. (University of Saskatchewan). Part-time professor, University of Ottawa Faculty of Law. This article is based on work completed as a graduate student at Boalt Hall School of Law, University of California at Berkeley. I would like to thank my thesis supervisor, Professor Daniel Farber, as well as Professor J.B. Ruhl and two anonymous referees, for comments and suggestions on earlier drafts.

gardant à l'esprit les récents développements de l'évaluation environnementale aux États-Unis et sur la scène internationale, et en considérant en particulier l'émergence du modèle des « services écosystémiques », cet article se penche sur les occasions et les défis de l'évaluation des dommages environnementaux axée sur les services écosystémiques dans le contexte de la détermination des peines environnementales au Canada. Le concept des services écosystémiques, très présent dans la documentation juridique américaine, fournit un cadre pour l'identification et l'organisation des nombreux apports directs et indirects que les écosystèmes procurent pour le bien-être des humains; la valeur de ces apports peut alors s'exprimer en termes économiques. Bien que cette approche soit novatrice et ambitieuse à certains égards, elle serait conforme à l'intention du Parlement lors de son adoption de la LCALE et au cadre préexistant de la common law relativement aux peines environnementales au Canada.

I.	A PRIMER ON ECOSYSTEM SERVICES AND VALUATION	137
	A. Ecosystems Processes, Structure, Function, and Services.....	137
	B. Ecosystem Services Give Rise to Use and Non-Use Values	142
	C. Tools for Assessment and Valuation: the NRDA Experience	145
II.	ECOSYSTEM SERVICES-BASED EDA UNDER THE <i>EEA</i>	149
	A. Current Approach to Environmental Sentencing in Canada.....	149
	B. The <i>Environmental Enforcement Act</i>	156
	1. Opportunities for Ecosystem Services-Based EDA	160
	i. Judicial Capacity and the Role of Expert Evidence.....	161
	ii. Furthering the Polluter Pays Principle.....	163
	iii. Assessing the Risk of Harm.....	167
	iv. The Potential for Higher Fines.....	169
	v. The Environmental Damages Fund	171
	2. Challenges Facing Ecosystem Services-Based EDA.....	172
	i. Constitutionality	172
	ii. Enforcement and Implementation	174
III.	CONCLUSION	174

ON 18 JUNE 2009, Canada's Parliament passed the government-sponsored *Environmental Enforcement Act* [*EEA*].¹ This "sweeping"² and lengthy omnibus legislation contained numerous amendments to the enforcement, offence, penalty, and sentencing provisions of nine different federal environmental statutes, including Canada's flagship environmental protection legislation, the *Canadian Environmental Protection Act, 1999*.³ It establishes new minimum and higher maximum fines, requires fines to be doubled for second and subsequent offences, and directs all fines to be paid to a specified government account, the Environmental Damages Fund (EDF). It also requires courts to add any profits gained

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1. SC 2009, c 14 [*EEA*]. The *EEA* received royal assent on 18 June 2009.
 2. *House of Commons Debates*, 40th Parl, 2d Sess, No 31 (23 March 2009) at 1823 (Mark Warawa) [*House of Commons Debates*]; and *House of Commons Debates*, 40th Parl, 2d Sess, No 31 (23 March 2009) at 1826 (David McGuinty).
 3. SC 1999, c 33 [*CEPA, 1999*]. The full list of amended statutes can be found in Part II B, below.

in the commission of an offence to the amount of fines ordered, and requires corporations to disclose details of any convictions to their shareholders.⁴

Of all these amendments, the changes to the sentencing provisions have the most potential to transform not only environmental sentencing, but also Canadian environmental law generally. When all of the *EEA*'s provisions are implemented, judges setting fines for an offence under any of the nine statutes will be required to consider whether, in the commission of that offence, the accused "caused damage or risk of damage" to some aspect of the environment.⁵ Damage is defined as including "the loss of use value and non-use value."⁶

Admittedly, there is nothing ground-breaking about judges taking into account the actual and potential environmental harm caused by an offender in determining the appropriate fine; these have long been relevant, if inexact, considerations in Canadian environmental sentencing law.⁷ Nor are the terms "use-value" and "non-use value" unprecedented in Canada. The Ontario Law Reform Commission first advocated their potential role in civil liability for environmental damages in 1990.⁸ More recently, the Supreme Court of Canada opened the door for governments to sue for loss of such values in *Canadian Forest Products v British Columbia (Canfor)*.⁹ In that case, the defendant company was found liable for negligently failing to extinguish a control burn. The provincial Crown sought both commercial damages (for lost stumpage revenue) and compensation for environmental damages, identifying three components of such loss:

"Use value" includes the services provided by the ecosystem to human beings, including food sources, water quality and recreational opportunities.

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4. Parliamentary Information and Research Service, Legislative Summary: Bill C-16: Environmental Enforcement Act by Penny Becklumb (Ottawa: Library of Parliament, 2009) [Parliamentary Information and Research Service]. See also Environment Canada, *Backgrounder: Overview of the Environmental Enforcement Bill* (3 March 2009), online: Environment Canada <<http://www.ec.gc.ca>> [Backgrounder].
 5. See e.g. *Migratory Birds Convention Act*, SC 1994, c 22, s 13.1 (2)(b) & s 13.1(4) [*MBCA*] (as amended by the *Environmental Enforcement Act*, not yet proclaimed into force). See *supra* note 1.
 6. *Ibid.*
 7. *R v United Keno Hill Mines Ltd*, [1980] 1 YJ 299 at para 13, 5 WCB 467 [*United Keno Hill*]. This case and others are further discussed in Part II, below.
 8. Ontario Law Reform Commission, *Report on Damages for Environmental Harm* (Toronto: Ontario Law Reform Commission, 1990) [OLRC Report].
 9. 2004 SCC 38, 2 SCR 74 [*Canfor*]. See Jerry V DeMarco, Marcia Valiante & Marie-Anne Bowden, "Opening the Door for Common Law Environmental Protection in Canada: The Decision in *British Columbia v. Canadian Forest Products Ltd.*" (2005) 15:2 J Envtl L & Prac 233.

“Passive use” or “existence” [non-use] value recognizes that a member of the public may be prepared to pay something for the protection of a natural resource, even if he or she never directly uses it

Finally, an ecosystem may be said to have an “inherent value” beyond its usefulness to humans. . . . [T]o the extent humans recognize this inherent value, and are willing to forego income or wealth for it, it becomes a part of passive [non] use value and becomes compensable.¹⁰

In *Canfor*, however, British Columbia failed to adduce any evidence of loss of these values. Thus, while recognizing that “our environment is an asset of superordinate importance”¹¹ and leaving it open to both the federal and provincial Crown to prove environmental harm in a future case, the Court dismissed this part of the claim, considering it “neither appropriate nor necessary to pronounce on the specific methodology that could be employed in valuation of environmental losses.”¹²

At the time, *Canfor* was described as the latest in a series of cases “to chart a positive future for environmental law in Canada.”¹³ In the years since its release, however, little progress appears to have been made. The case has been cited numerous times by various courts, but no government litigant has taken up the task of environmental valuation for the purposes of environmental damages assessment.¹⁴ What commentators described as “a significant step”¹⁵ and a “potential . . . watershed”¹⁶ has thus far been a mere trickle, barely meeting the Court’s own assessment of an “incremental” development in the common law.¹⁷ As a result, many environmental harms continue to be externalized.¹⁸

10. *Canfor*, *supra* note 9 at para 138.

11. *Ibid* at para 135.

12. *Ibid* at para 153.

13. DeMarco, Valiante & Bowden, *supra* note 9 at 233.

14. Of the 26 times *Canfor* has been reported as being cited, only two cases have been concerned with environmental damages, and only in a limited way. See *Bérubé c Savard*, 2006 QCCQ 2077 at paras 20-27, [2006] RDI 356; and *Westside Transport Inc v Continental Insurance Co*, 2004 BCSC 1195 at para 56, 36 BCLR (4th) 387.

15. Stewart AG Elgie & Antasia M Lintner, “The Supreme Court’s *Canfor* Decision: Losing The Battle But Winning The War For Environmental Damages” (2005) 37:1 UBC L Rev 223 at 260.

16. DeMarco, Valiante & Bowden, *supra* note 9 at 255.

17. *Canfor*, *supra* note 9 at para 155.

18. See DeMarco, Valiante & Bowden, *supra* note 9 at 238. They observe that, “[f]or instance, a corporation that avails itself of tax incentives and inexpensive access to public resources . . . may be able to justify a particular development project from the perspective of its bottom-line even if the net effect of the development on society may actually be negative. Economists often speak of interests that have been externalized from the decision in question.” See also Elgie & Lintner, *supra* note 15 at 229.

The inclusion of use and non-use values in the *EEA* presents an opportunity to pick up where *Canfor* left off, especially when one considers that there were over five hundred convictions under the laws amended by the *EEA* in the five years preceding its passage.¹⁹ While not all of these would have involved environmental harm or even the risk thereof, several recent and high profile incidents, such as the prosecution of Canadian oil sands company Syncrude after approximately 1,500 ducks died in one of its tailings ponds, suggest that the *EEA* could spur some activity on this front.²⁰

Environmental valuation was traditionally an economist's game.²¹ American lawyers and judges began to enter the fray following the 1980 passage of the *Comprehensive Environmental Recovery, Compensation and Liability Act (CERCLA)*, also known as Superfund).²² Ecologists started to get involved in valuation activity in the last two decades, and their work only began gaining wider acceptance at the time that *Canfor* was decided.²³ They began by analogizing ecosystem structure and function to capital, as understood in economics to be the stock that "gives rise to the flow of ecosystem goods and services."²⁴ Recognizing that society's

19. *House of Commons Debates, supra* note 2 at 1824 (Mark Warawa).

20. *R v Syncrude Canada Ltd*, 2010 ABPC 229, 53 CELR (3d) 196 [*Syncrude*]. The company was found guilty of depositing a substance harmful to migratory birds, contrary to subsection 5.1(1) of the *MBCA*, 1995.

21. Wiktor L Adamowicz, "What's it worth? An examination of historical trends and future directions in environmental valuation" (2004) 48:3 *Austl J of Agric Resource Econ* 419. See also WM Hanemann, "The economic conception of water" in Peter P Rogers, M Ramón Llamas & Luis Martínez-Cortina, eds, *Water Crisis: myth or reality?* (London: Taylor & Francis, 2006) 61 at 67.

22. 42 USC § 9601 (1980) [*CERCLA*]. Under *CERCLA*, natural resource damages are recoverable by federal and state governments, as well as Indian tribes, for damages caused by the release of hazardous substances. *CERCLA* is also known as Superfund because of the creation of a special fund for the immediate clean up of the most contaminated sites with provisions for cost-recovery later. Most of the American legal scholarship in this area has focused on the evidentiary suitability of various non-market valuation techniques, and especially contingent valuation (CV). See Damage Assessment Remediation and Restoration Program, Report of the NOAA Panel on Contingent Valuation by Kenneth Arrow et al (Silver Spring: NOAA Office of Response & Restoration, 1993); Frank B Cross, "Restoring Restoration For Natural Resource Damages" (1993) 24:2 *U Tol L Rev* 319 at 321; Brian R Binger, Robert F Copple & Elizabeth Hoffman, "The Use Of Contingent Valuation Methodology In Natural Resource Damage Assessments: Legal Fact and Economic Fiction" (1995) 89:3 *Nw UL Rev* at 1030-31.

23. The term "ecologists" is intended to include ecological economists and the field of ecological economics.

24. JB Ruhl, Steven E Kraft & Christopher L Lant, *The Law and Policy of Ecosystem Services* (Washington: Island Press, 2007) at 17.

near total ignorance of its dependence on these services represented a “major hindrance” to the formulation and implementation of effective environmental policy,²⁵ this group then took it upon itself to not only assess the numerous services provided by nature but also to provide an estimate of their economic value. The first study to do this on a global scale estimated the value of seventeen ecosystem services, such as gas and water regulation, at thirty-three trillion dollars (US) per year.²⁶ And while the initial approaches were marked by a high degree of uncertainty,²⁷ the ensuing “explosion of interest”²⁸ has resulted in “tremendous advancements.”²⁹

This is not to suggest that ecosystem services theory has completely displaced conventional environmental economics, or that it is an environmental policy panacea.³⁰ It is, however, the conceptual framework under which valuation (and environmental decision making generally) is increasingly being carried out: “From their origins as an obscure phrase just nine years ago, ‘ecosystem services’ have gone mainstream, with new initiatives ... blossoming around the world.”³¹

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25. Gretchen Daily, ed, *Nature's Services: Societal Dependence on Natural Ecosystems* (Washington: Island Press, 1997) at xv.
 26. Robert Costanza et al, “The value of the world’s ecosystem services and natural capital” (1997) 387 *Nature* 253 at 253. For comparison, the global GNP at this time was approximately eighteen trillion (US dollars) per year.
 27. Costanza et al listed 12 sources of error and uncertainty in their study. See *ibid* at 258. While lauding the effort, their approach was also criticized by several economists. See e.g. David Pearce, “Auditing the Earth: The Value of the World’s Ecosystem Services and Natural Capital” (1998) 40:2 *Environment* 23 at 23-28.
 28. JB Ruhl & James Salzman, “The Law and Policy Beginnings of Ecosystem Services” (2007) 22:2 *J Land Use & Envtl L* 157 at 157.
 29. Ruhl, Kraft & Lant, *supra* note 24 at 9. The authors observe that “[t]remendous advancement has been made in the past decade towards improving our understanding of the ecological dynamics of ecosystem services, their geographic distribution across landscapes, and their economic value to human communities.” See also Kate A Brauman et al, “The Nature and Value of Ecosystem Services: An Overview Highlighting Hydrologic Services” (2007) 32 *Ann Rev Envtl Res* 67 at 68.
 30. Environmental valuation generally and ecosystem services specifically both have their fair share of detractors. See e.g. Morgan M Robertson, “The neoliberalization of ecosystem services: wetland mitigation banking and the problem of measurement” in Nick Heynen et al, eds, *Neoliberal Environments: False promises and unnatural consequences* (Routledge: New York, 2007) at 114. Richard B Norgaard, “Ecosystem services: From eye-opening metaphor to complexity Blinder” (2010) 69:6 *Ecological Econ* 1219; Frank Ackerman & Lisa Heinzerling, “Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection” (2002) 150:5 *U Pa L Rev* 1553; Mark Sagoff, *The Economy of the Earth: Philosophy, Law, and the Environment*, 2d (New York: Cambridge University Press, 2008).
 31. James Salzman, “Creating Markets for Ecosystem Services: Notes from the Field” (2005) 80:3 *NYUL Rev* 870 at 873.

including in Australia, Costa Rica, and most recently in Norway and the United Kingdom.³² Of particular relevance to this article, the Science Advisory Board on Valuing the Protection of Ecological Systems and Services (EPA Science Advisory Board [EPA-SAB] created by the US Environmental Protection Agency in 2003) recently released a report suggesting inter alia that an ecosystem services approach “would enhance the ability ... to assess injury, define restoration goals, and calculate damages” under *CERCLA*.³³ In fact, regulations under both that statute and the *Oil Pollution Act (OPA)*³⁴ have long relied on the ‘services’ provided by natural resources as their metric for damages,³⁵ reference to which can be found in the United States’ recent complaint against BP Global and others following the August 2010 *Deepwater Horizon* oil spill in the Gulf of Mexico.³⁶

The purpose of this article is to assess the potential for an ecosystem services approach to environmental damages assessment (EDA) in the post-*EEA* world. Part I begins with a primer on ecosystem services theory. While research into ecosystem services in Canada dates back to at least 2004,³⁷ and the term has even

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32. See Alister Doyle, “Norway index gauges nature; may bring GDP rethink”, *Reuters* (21 October 2010) online: Reuters <<http://in.reuters.com/article/2010/10/21/idINIndia-52362320101021>>. Doyle notes, “An index to judge the state of Norway’s nature is a world first that may be a step towards valuing ‘free’ services such as insect pollination or forest growth in a radical shift in economics, officials say.” The UK released the findings of the UK National Ecosystem Assessment (UK NEA), which “represents a first attempt to assess our stocks of natural ecosystem resources, their state and the trends in their development.” See UK National Ecosystem Assessment, *The UK National Ecosystem Assessment: Synthesis of the Key Findings*, UNEP-WCMC (Cambridge: 2011) at 4, online: <<http://uknea.unep-wcmc.org/Resources/tabid/82/Default.asp>>.
33. United States, United States Environmental Protection Agency, *Valuing the Protection of Ecological Systems and Services: A Report of the EPA Science Advisory Board* (Washington, DC: Science Advisory Board, 2009) at 95 [EPA]. See also Wayne R Munns Jr et al, “Translating Ecological Risk to Ecosystem Service Loss” (2009) 5:4 500 at 501. Other American initiatives include the creation of the Office of Environmental Markets (OEM), formerly the Office of Ecosystem Services and Markets, established under the US Department of Agriculture in December 2008. The change in name does not appear to have changed the Office’s mandate. See United States Department of Agriculture, *News Release*, No 0115.10 (Washington, DC: Office of Communications, 10 March 2010).
34. 33 USC § 2701 (1990) [OPA].
35. For the *CERCLA*, see 43 CFR § 11. For the *OPA*, see 15 CFR § 990 (2011).
36. See *United States of America v BP Exploration & Production Inc* (Complaint) at para 66, online: <<http://cdn.law.ucla.edu/SiteCollectionDocuments/Environmental%20Law/USDOJ%20BP%20Complaint.pdf>>. (Stating that “[d]ischarged oil and some of the response activities to address the discharges of oil have resulted in injury to, loss of, loss of use of or destruction of natural resources in and around the Gulf of Mexico ... and also have impaired or caused the loss of services that those resources provide”).
37. See e.g. Nature Conservancy of Canada, *The Value of Natural Capital in Settled Areas of*

made its way into government documents and policies,³⁸ the concept has received limited treatment in Canadian legal literature—especially when compared to the American scholarship.³⁹ This Part also surveys some of the approaches for ecosystem services assessment and valuation that have been developed and applied under the American natural resources damages assessment (NRDA) legislation. Part II examines the relevant *EEA* provisions against the background of the existing common law framework for environmental sentencing in order to identify and assess the opportunities and challenges for integrating ecosystem services in that context. The article concludes by suggesting that while novel and ambitious, an ecosystem services approach to EDA is particularly well-suited for meeting Parliament’s objectives in passing the *EEA*. An ecosystem services approach would also point Canadian environmental law more firmly in what is widely regarded as its necessary direction: towards “recogniz[ing] ... the true value of nature.”⁴⁰

Canada by Nancy Olewiler, (Toronto: The Nature Conservancy of Canada, 2004) [Nature Conservancy of Canada].

38. For a discussion about the role of ecosystem services in the Canadian economy, see Canada, Federal, Provincial and Territorial Governments of Canada, *Canadian biodiversity: ecosystem status and trends 2010*, (Ottawa: Library and Archives Canada, 2010) at 74 [*Canadian biodiversity*]. See also Canada, Fisheries and Oceans Canada, *Spotlight on Marine Protected Areas in Canada*, (Ottawa: Fisheries and Oceans Canada, 2010) (demonstrating the adoption of the International Union for Conservation of Nature (IUCN) definition of Marine Protection Areas (MPAs), incorporating ecosystem services). In fact, a background paper prepared for Environment Canada (EC) by Sustainable Prosperity identified nearly forty federal and provincial programs already in place and working across Canada targeting a particular type of ecosystem or service. See Sustainable Prosperity, *Advancing the Economics of Ecosystems and Biodiversity in Canada: A Survey of Economic Instruments for the Conservation & Protection of Biodiversity* by Alex Kenny et al (Ottawa: Environment Canada, 2011) [Sustainable Prosperity].
39. For one of the earliest American examples, see James Salzman, “Review Essay: Valuing Ecosystem Service” (1997) 24:4 *Ecology LQ* 887 at 902-03. Salzman notes that “it [is] important for environmental lawyers to engage themselves in this research effort, both to explore the role ecosystem services should play in the law’s development and to influence the direction of research so that the services provided by nature may be accorded their proper value.” For Canadian examples, see Heather McLeod-Kilmurray & Gavin Smith, “Unsustainable Development in Canada: Environmental Assessment, Cost-Benefit Analysis, and Environmental Justice in the Tar Sands” (2010) 21 *J Envtl L & Prac* 65 (arguing that ecosystem services should be considered in environmental assessments, among other things); Natalie Chalifour, “Encouraging the Transition to Sustainable Forestry in Canada with Ecological Fiscal Reform - Potential and Pitfalls” (2004) 14 *J Envtl L & Prac* 253 (describing maintenance of ecosystem services as an element of ecosystem-based forest management); and Bruce Pardy, “Goods, Services, and Systems” (2008) 46:2 *Osgoode Hall LJ* 445.
40. Millennium Ecosystem Assessment, *Living Beyond Our Means: Natural Assets and Human Well-Being, Statement from the Board*, (Washington, DC: Millennium Ecosystem Assessment

I. A PRIMER ON ECOSYSTEM SERVICES AND VALUATION

While the concept of ecosystem services can be very complex,⁴¹ the main idea is straightforward: “[E]cosystems are socially valuable and in ways that may not be immediately intuited.”⁴² Societies have long recognized that ecosystems are socially valuable in *some* ways; most environmental laws, including those amended by the *EEA*, are replete with references to the more obvious ways in which humans benefit from ecosystems.⁴³ For a variety of reasons, however, societies have been largely ignorant of the fundamental role played by ecosystems in sustaining not just human life but also human prosperity.⁴⁴

A. ECOSYSTEMS PROCESSES, STRUCTURE, FUNCTION, AND SERVICES

As noted by the authors of *The Law and Policy of Ecosystem Services*, “it is tempting to overstate the case for ecosystem services, to try to find them everywhere simply because anywhere is in one or another ecosystem.”⁴⁵ The problem is exacerbated because the same flurry of activity that has “provided much insight in how to ensure that ecosystem service research is scientifically robust and credible”⁴⁶ has also generated several competing definitions and classification systems.⁴⁷ All of these, however, share the following two fundamental and interrelated perspectives on ecosystem services. First, ecosystem services are distinct from ecosystem attributes or properties, variously referred to as conditions, processes, functions, and structure—these are the constituents of natural capital that make the flow of

Board, 2005) at 5 online: Millennium Ecosystem Assessment <<http://maweb.org/en/BoardStatement.asp>>.

41. Ruhl, Kraft & Lant, *supra* note 24 at 9. See also Norgaard, *supra* note 30.

42. James Boyd & Spencer Banzhaf, “What are ecosystem services? The need for standardized environmental accounting units” (2007) 63:2-3 *Ecological Econ* 616 at 616.

43. Ruhl, Kraft & Lant, *supra* note 24 at 23. As one *EEA*-relevant example, Parliament passed the *Canada National Marine Conservation Areas Act* [CNMCAA] because it wanted to “provide opportunities for the people of Canada and of the world to appreciate and enjoy Canada’s natural and cultural marine heritage. . . .” See SC 2002, c 18, preamble.

44. Most explanations centre on modern society’s detachment from the natural world. See *e.g.* Daily, *supra* note 25; James Salzman, Barton H Thompson, Jr & Gretchen C Daily, “Protecting Ecosystem Services: Science, Economics, and Law” (2001) 20:2 *Stan Envtl LJ* 309 at 311.

45. Ruhl, Kraft & Lant, *supra* note 24 at 15.

46. Rudolf de Groot et al, “Integrating the Ecological and Economic Dimensions in Biodiversity and Ecosystem Service Valuation” in Pushpam Kumar, ed, *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations* (London: Earthscan, 2010) [TEEB] 9 at 16.

47. Boyd & Banzhaf, *supra* note 42 at 616.

ecosystem goods and services possible. Second, like conventional perspectives on environmentally derived benefits, ecosystem services “have relevance only to the extent *human* populations benefit from them. They are purely anthropocentric.”⁴⁸

In *Nature's Services*, Professor Gretchen Daily described ecosystem services as “the conditions and processes through which natural ecosystems ... sustain and fulfill human life.”⁴⁹ In his original study, Professor Robert Costanza referred to ecosystem goods and services as “the benefits human populations derive ... from ecosystem functions,” listing seventeen major ecosystem services.⁵⁰ In its 2005 report, *Valuing Ecosystem Services: Toward Better Environmental Decision Making*, the United States National Research Council (NRC) also referred to ecosystem functions but added ecosystem structure to the mix.⁵¹ That same year, the United Nations released what many consider to be the leading effort in terms of ecosystem services assessment and research, the *Millennium Ecosystem Assessment* [MEA].⁵² The MEA adopted a broad definition of ecosystem services (the benefits that humans derive from ecosystems),⁵³ which it then divided into four more detailed categories:

Provisioning services are the products people obtain from ecosystems, such as food, fuel, fiber, fresh water, and genetic resources. Regulating services are the benefits people obtain from the regulation of ecosystem processes, including air quality maintenance ... and water purification. Cultural services are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences. Supporting services are those that are necessary for the production of all other ecosystem services, such as primary production, production of oxygen, and soil formation.⁵⁴

Most of the literature subsequent to the MEA, including the Canadian literature, appears to have adopted its classification system.⁵⁵ While some have

48. Ruhl, Kraft & Lant, *supra* note 24 at 15 [emphasis added].

49. Daily, *supra* note 25 at 3.

50. Costanza et al, *supra* note 26 at 253-54. For simplicity, Professor Robert Costanza refers to ecosystem goods and services together as ecosystem services.

51. National Research Council, *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*, (Washington, DC: National Academic of Sciences, 2005) at viii online: <http://www.nap.edu/catalog.php?record_id=11139> [NRC Report]. The NRC was unequivocal in its support for this field, which it considered “a prerequisite for sensible conservation decisions.”

52. See online: <<http://www.maweb.org/en/index.aspx>>.

53. Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Current State and Trends Assessment*, vol 1 (Washington, DC: Island Press, 2005) at v [MEA].

54. *Ibid* at 29.

55. See e.g. Shuang Liu et al, “Valuing ecosystem services: Theory, practice, and the need for

expressed concerns that the MEA's "overly generic definition of services ... can confound practical measurement"⁵⁶ and have urged narrower definitions,⁵⁷ there is also recognition that "the conditions and processes underlying ecosystem service production are so tightly interlinked that any classification is inherently arbitrary,"⁵⁸ and that "perhaps ... no final classification can capture the myriad of ways in which ecosystems support human life and contribute to human well-being."⁵⁹

Bearing in mind these latter two points, this article adopts the definition and classification framework recently proposed by the United Nations Environmental Program in *The Economics of Ecosystems and Biodiversity* (TEEB) project.⁶⁰ Largely consistent with the analysis undertaken by the NRC, the MEA, and the EPA-SAB,⁶¹ the TEEB framework makes important distinctions between ecosystem structure, processes, functions, services, and benefits.

Like the MEA, TEEB defines an ecosystem as a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit.⁶² Ecosystem structure is the biophysical architecture of an ecosystem,⁶³ while ecosystem processes are the changes and reactions that occur within ecosystems, whether physical, chemical, or biological, and include decomposition, production, nutrient cycling, and fluxes of nutrients and energy.⁶⁴ Ecosystem function, then, is defined as a *subset* of the interactions between ecosystem structure and processes that underpin the capacity of an ecosystem to provide goods and services.⁶⁵ For example:

a transdisciplinary synthesis" (2010) 1185 Ann NY Academy of Sci 54; Brauman et al, *supra* note 29; EPA, *supra* note 33; Munns Jr et al, *supra* note 33. In Canada, see *Canadian biodiversity*, *supra* note 38; Sustainable Prosperity, *supra* note 38.

56. Boyd & Banzhaf, *supra* note 42 at 623.

57. *Ibid* at 619. Boyd and Banzhaf also suggest that "ecosystem services are the components of nature, directly enjoyed, consumed, or used to yield human well-being."

58. Brauman et al, *supra* note 29 at 69.

59. de Groot et al, *supra* note 46 at 17.

60. TEEB, *supra* note 46.

61. de Groot et al, *supra* note 46 at 16.

62. TEEB, *supra* note 46 at xxxiii (glossary definition for "Ecosystem"). See also Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: A Framework for Assessment* (Washington, DC: Island Press, 2005) at 27; EPA, *supra* note 33 at 12; and NRC Report, *supra* note 51 at 59.

63. TEEB, *supra* note 46 at xxxiv (glossary definition for "Ecosystem structure"). See also NRC Report, *ibid* at 60.

64. TEEB, *supra* note 46 at xxxiv (glossary definition for "Ecosystem process").

65. *Ibid* at xxxiii (glossary definition for "Ecosystem function"). See also EPA, *supra* note 33 at 13; NRC Report, *supra* note 51 at 60.

[P]rimary production (= process) is needed to maintain a viable fish population (= function) which can be used (harvested) to provide food (= service); nutrient cycling (= process) is needed for water purification (= function) to provide clean water (= provisioning service).⁶⁶

This distinction between functions (or processes) and services is critical.⁶⁷ It highlights both the potential and the limitations of ecosystem services as a framework for environmental valuation:

For example, the ability to absorb floodwater is a biophysical function. A service is created if the absorbed floodwater yields less damage to buildings, roads, and agriculture. Even if an ecosystem rates highly in terms of a functional characteristic, that function may not provide a socially valuable service. While anthropocentric, the notion of service value is the best practical means of differentiating between ecosystems when making difficult tradeoffs. Biophysical characterizations are fundamental to any ecosystem evaluation, but they are a poor guide to an ecosystem's social value.⁶⁸

With respect to ecosystem services, TEEB essentially follows the MEA's typology (including the four categories), except that it makes a finer distinction between services and benefits, clarifies that the term "ecosystem services" is synonymous with ecosystem goods and services, and substitutes habitat services for supporting services. Ecosystem services are thus conceived as "the direct and indirect *contributions* of ecosystems to human well-being,"⁶⁹ and include the following twenty-two main service types:⁷⁰

PROVISIONING SERVICES

1. Food (*e.g.*, fish, game, fruit)
2. Water (*e.g.*, for drinking, irrigation, cooling)
3. Raw Materials (*e.g.*, fiber, timber, fuel wood, fodder, fertilizer)
4. Genetic resources (*e.g.*, for crop-improvement and medicinal purposes)
5. Medicinal resources (*e.g.*, biochemical products, models & test-organisms)
6. Ornamental resources (*e.g.*, artisan work, decorative plants, pet animals, fashion)

66. de Groot et al, *supra* note 46 at 18.

67. See Heather Tallis & Stephen Polasky, "Mapping and Valuing Ecosystem Services as an Approach for Conservation and Natural-Resource Management" (2009) 1162 Ann NY Academy of Sci 265 at 271. Tallis & Polasky suggest: "Until there is some person somewhere who is benefiting from a given process [function] it is only a process and not a service."

68. James Boyd, Dennis King & Lisa A Wainger, "Compensation for Lost Ecosystem Services: The Need for Benefit-Based Transfer Ratios and Restoration Criteria" (2001) 20:2 Stan Env't LJ 393 at 396.

69. TEEB, *supra* note 46 at xxxiv [emphasis added]. See also EPA, *supra* note 33 at 12, defining ecosystem services as "the direct or indirect contributions that ecosystems make to the well-being of human populations."

70. de Groot et al, *supra* note 46 at 25.

REGULATING SERVICES

7. Air quality regulation (*e.g.*, capturing (fine) dust, chemicals, etc.)
8. Climate regulation (incl. carbon-sequestration, influence of vegetation on rainfall, etc.)
9. Moderation of extreme events (*e.g.*, storm protection and flood prevention)
10. Regulation of water flows (*e.g.*, natural drainage, irrigation and drought prevention)
11. Waste treatment (especially water purification)
12. Erosion prevention
13. Maintenance of soil fertility (incl. soil formation)
14. Pollination
15. Biological control (*e.g.*, seed dispersal, pest and disease control)

HABITAT SERVICES

16. Maintenance of life cycles of migratory species (incl. nursery service)
17. Maintenance of genetic diversity (especially in gene pool protection)

CULTURAL & AMENITY SERVICES

18. Aesthetic information
19. Opportunities for recreation & tourism
20. Inspiration for culture, art and design
21. Spiritual experience
22. Information for cognitive development

Of course, not all ecosystems provide all of these services, and provision varies with scale and location. For example, wetlands (*e.g.*, marshes, fens, peatlands) provide numerous local, regional, and global services, including flood protection, storm protection, water supply, improved water quality, waste assimilation, commercial and recreational hunting and fishing, harvesting of natural materials, energy resources, and climate stabilization.⁷¹

To put these services in more concrete terms, it is useful to consider the results of Professor Nancy Olewiler's 2004 study, *The Value of Natural Capital in Settled Areas of Canada*:

- Four-tenths of a hectare of wetlands can store over 6,000 cubic meters of floodwater. ... [regulating service, specifically moderation of extreme events];

71. Luke M Brander, Raymond J G M Florax & Jan E Vermaat, "The Empirics of Wetland Valuation: A Comprehensive Summary and a Meta-Analysis of the Literature" (2006) 33:2 *Envtl & Resource Econ* 223 at 226; Richard T Woodward & Yong-Suhk Wui, "The economics value of wetland services: a meta-analysis" (2000) 37:2 *Ecological Econ* 257.

- Approximately 600 species of wildlife, including species at risk, use wetlands in North America during ... their life cycle. ... [habitat services];
- [Wetlands produce] a wealth of products including fish and shellfish, blueberries, cranberries, timber and wild rice, as well as medicines that are derived from wetland soils and plants. ... [provisioning services];
- [W]etland plants ... can remove between 116 and 770 kg/ha/yr of phosphorus and 350 to 32,000 kg/ha/yr of nitrogen. ... While these estimates have a wide range [due to differences in wetland location, plant composition, and soil type], even the most conservative estimate exceeds the amount of excess nitrogen and phosphorus that finds its way into the [Fraser Valley's] water supplies from current agricultural practices.⁷² [regulating services, specifically waste treatment]

Finally, it should be clear from this brief survey that the goal has not been merely to identify a subset of hitherto unrecognized contributions towards human well-being, but rather to construct a framework through which all contributions, including long-recognized and familiar ones, could be conceptualized, organized, and ultimately valued.⁷³ It is for this reason that ecosystem services assessment would be well-suited for environmental sentencing, as further discussed below in Part II.

B. ECOSYSTEM SERVICES GIVE RISE TO USE AND NON-USE VALUES

In its most basic terms, environmental valuation is economic valuation—“the valuation in monetary terms of items that people might care for”⁷⁴—applied to the natural world. The goal is to determine the utility, or satisfaction, that individuals derive from the environment. It is *not* to discern the objective value of ecosystems with a view towards sustainability or intergenerational equity.⁷⁵

72. Nature Conservancy of Canada, *supra* note 37 at 6, 15. See also online: Ducks Unlimited Canada <http://www.ducks.ca/conserves/wetland_values/index.html>.

73. Professors Ruhl, Kraft & Lant seem to take a different approach, defining ecosystem services as a discrete set of benefits alongside more conventional ones. See *supra* note 24 at 23.

74. Hanemann, *supra* note 21 at 66.

75. Robert Costanza & Carl Folke, “Valuing Ecosystem Services with Efficiency, Fairness, and Sustainability as Goals” in Daily, *supra* note 25 at 49. The authors write:

Valuation ultimately refers to the contribution of an item to meeting a specific goal. ... In ecology, a gene is valuable to the extent it contributes to the goal of survival of the individuals possessing it and their progeny. In conventional economics, a commodity is valuable to the extent it contributes to the goal of individual welfare as assessed by willingness to pay. The

although the existence of such concerns by individuals can and does affect this exercise. In other words, environmental valuation is positivistic rather than normative, asking what value people place on the environment in light of competing preferences as opposed to how much value they perhaps should place.

Economists divide environmental values into two basic categories: use value and non-use value (the latter was referred to as “passive” value in *Canfor*).⁷⁶ Use values arise where utility is derived from actual use of the environment. They can be consumptive, as where fish are used for food, or non-consumptive, as in the case of bird watching.⁷⁷ Use values can also be direct or indirect. In the preceding examples, the fish and birds are directly valued. Their survival, however, depends on their habitat, the appreciation of which gives rise to indirect use value.⁷⁸ Economists have also long recognized that “[m]any people donate to conservation charities concerned with protecting wildlife they will never directly experience, such as tigers or whales, or with protecting natural areas they may never travel to.”⁷⁹ These are non-use values⁸⁰ and include the existence, option, and bequest values identified in *Canfor*.⁸¹

What then, is the relationship between use and non-use values and ecosystem services?

The array of services provided by ecosystems spans all of ... [the] categories of values. The pest-control and flood-control services they offer have direct use value to nearby agricultural producers. Their provision of habitats for migratory birds implies an

point is that one cannot state a value without stating the goal being served. Conventional economic value is based on the goal of individual utility maximization. But other goals, and thus other values, are possible. For example, if the goal is sustainability, one should assess value based on the contribution to achieving that goal.

76. Nick Hanley, “The Economic Value of Environmental Damage” in Michael Bowman & Alan Boyle, eds, *Environmental Damage in International and Comparative Law* (New York: Oxford University Press, 2002) 27 at 27; *Canfor*, *supra* note 9 at para 11.

77. See Frank B Cross, “Natural Resource Damage Valuation” (1989) 42:2 Vand L Rev 269.

Cross notes:

A 1975 United States Department of Agriculture (USDA) study found that some twenty million Americans participated in “sport hunting,” spending nearly six billion dollars in the process. When the same family goes bird watching, they still use and value the resources, but in a non-consumptive way. The magnitude of non-consumptive use of natural resources considerably exceeds even consumptive uses (at 281).

78. Lawrence H Goulder & Donald Kennedy, “Valuing Ecosystem Services: Philosophical Bases and Empirical Methods” in Daily, *supra* note 25 at 23.

79. Hanley, *supra* note 76 at 27.

80. See Jason J Czarnecki & Adrienne K Zahner, “The Utility of Non-Use Values In Natural Resource Damage Assessments” (2005) 32 BC Envtl Aff L Rev 509 at 511-512.

81. *Supra* note 9 at paras 138-40.

indirect use value to people who enjoy watching or hunting these animals Ecosystems also yield an existence value: wetlands, for example, provide such value to people who simply appreciate the fact that wetlands exist.⁸²

In the specific language of the TEEB/MEA framework, direct use values are generally derived from provisioning and cultural services and are typically enjoyed by people located in the ecosystem itself.⁸³ Fishing and bird watching are two examples. Indirect use values are “derived from ecosystem services that provide benefits outside the ecosystem itself. Examples include the natural water filtration function of wetlands, which often benefits people far downstream ... This category of benefits corresponds to the MA notion of regulating services.”⁸⁴ Option values are derived from preserving for future use services that may not be used presently. The value derived from preservation for one’s own future use is called option value; that derived from preservation for one’s heirs is called bequest value.⁸⁵ Finally, non-use values largely fall within the cultural services category. The sum of all of these values represents the Total Economic Value (TEV) of a given ecosystem asset.⁸⁶

Because it is not possible to measure utility itself, economists rely on individuals’ willingness to pay (WTP) or, in certain limited circumstances, willingness to accept compensation (WTA) as a measure of utility.⁸⁷ Where utility is derived from private goods available in a market, such as a car, economists are often satisfied to rely on the market price of such goods as a measure of WTP (and thus utility). In the case of most ecosystem goods and services, however, their status as public goods for which no private markets exist requires the application of non-market valuation techniques.

Returning again to the wetlands of the Fraser Valley, Professor Olewiler found a number of studies applying such techniques (some of which are discussed further below) that estimated the value of all the goods and services provided

82. Goulder & Kennedy in Daily, *supra* note 25 at 25. The relationships are also well captured in figures found in the NRC Report, *supra* note 51 at 241; and de Groot et al, *supra* note 46 at 17.

83. *Supra* note 53 at 54.

84. *Ibid* at 54.

85. *Ibid*.

86. Originally coined by David Pearce. See *Economic values and the natural world* (London: Earthscan, 1993). See also Unai Pascual et al, “The Economics of Valuing Ecosystem Services and Biodiversity” in TEEB, *supra* note 46, 183 at 188.

87. “[I]f individuals are deemed to have the right to enjoy the pre-loss level of environmental quality, then ... [WTA] should be measured; alternatively, if they have no such right, then WTP measures should be sought.” Hanley, *supra* note 76 at 28.

by one hectare of wetlands between \$5,792 and \$24,330 per year. Using the lower estimate, the approximately forty thousand hectares of Lower Fraser Valley wetlands have an annual value of \$231.7 million.⁸⁸ More recently, a report commissioned by the Boreal Forest Initiative estimates the value of seventeen ecosystem services from Canada's northern Mackenzie Region alone at \$570.6 billion per year.⁸⁹

C. TOOLS FOR ASSESSMENT AND VALUATION: THE NRDA EXPERIENCE

Ecosystem services assessment and valuation can be carried out for various purposes, including land-use decision making⁹⁰ and natural-resource management.⁹¹ The context most relevant to EDA, natural resources damages assessment (NRDA) under *CERCLA* and *OPA*, also happens to be the most established and sophisticated.⁹²

CERCLA was US Congress's response to the improper disposal of hazardous substances for over half a century and to the enormous environmental degradation associated therewith.⁹³ Primarily a civil liability scheme designed to apportion the

88. Nature Conservancy of Canada, *supra* note 37 at 15.

89. Canadian Boreal Initiative, *The Real Wealth of the Mackenzie Region* by Mark Alnielski & Sara Wilson (Ottawa: Canadian Boreal Initiative, 2009) at 1, online: <<http://www.borealcanada.ca>>.

90. In a 2006 article, author and journalist Chris Wood described efforts by Ontario's Grand River Conservation Authority to keep that basin's "water factories" clean that are akin, in purpose if not in scale, to what has been described as the "poster child" for recognizing ecosystem services—the City of New York's decision to restore the degraded Catskill watershed to ensure the provision of clean drinking water at a fraction of the cost of building a new and otherwise necessary water filtration plan. See Chris Wood, "The Business of Saving the Earth", *The Walrus* (October 2008), online: *The Walrus* <<http://walrusmagazine.com/articles/2008.10-environment-chris-wood-water-economy/>>.

91. In 2008, the US Army Corps of Engineers and the US Environmental Protection Agency (EPA) jointly published final regulations introducing ecosystem services into the decision-making standards for authorizing compensatory mitigation of impacts to aquatic resources under section 404 of the *Clean Water Act*, 33 USC §1251 (1972) [*CWA*]. See JB Ruhl, James Salzman & Iris Goodman, "Implementing the New Ecosystem Services Mandate: A Catalyst for Advancing Science and Policy" (2009) 31:2 Nat'l Wetlands Newsletter 11. The United States Forestry Service has also recognized the need to consider ecosystem services in carrying out its mandate. See online: <<http://www.fs.fed.us/ecosystemservices>>.

92. Shuang Liu et al, *supra* note 55 at 64. See also James Boyd, Dennis King & Lisa A Wainger, "Compensation for Lost Ecosystem Services: The Need for Benefit-Based Transfer Ratios and Restoration Criteria" (2001) 20:2 Stan Envtl LJ 393 at 402.

93. Jeffrey G Miller & Craig N Johnston, *The Law of Hazardous Waste Disposal and Remediation*, 2d ed (New York: West, 2005) at 52. See also Cross, *supra* note 22; and Binger, Copple & Hoffman, *supra* note 22.

costs of cleaning up contaminated sites among “potentially responsible parties” (PRPs), subsection 9607(a)(4)(C) also authorizes “trustees” to recover damages “for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss” resulting from a release of hazardous substances.⁹⁴ The *OPA* was Congress’s response to the 1989 *Exxon Valdez* oil spill and contains essentially the same NRDA provisions.⁹⁵

Recognizing that the measurement of such damages would be difficult, Congress delegated the task of promulgating regulations to the President. In the case of *CERCLA*, they specified that two types of procedures should be developed: relatively simple Type A assessment procedures, which would be applicable to minor releases; and more complex Type B assessment procedures, to be used when the damage to natural resources was more significant and required extensive field work.⁹⁶ No such distinction is made in the *OPA*,⁹⁷ the regulations under which are the responsibility of the National Oceanic and Atmospheric Administration (NOAA). While the procedures in these regulations are not mandatory, their use triggers a rebuttable presumption of accuracy with respect to the assessment of damages in the context of litigation.⁹⁸

CERCLA Type A procedures use computer programs to model the fate of released substances, predict injuries, and calculate damages.⁹⁹ Certain states, including California, Washington, and Florida, have followed suit and designed their own simplified procedures,¹⁰⁰ which employ schedules or formulae to determine damages.¹⁰¹ These usually require a limited set of data, such as the type of habitat in which a spill or release has occurred, the amount of the spill, and the duration of the event.

94. 42 USC §9607. See Cross, *supra* note 22 at 321. Cross notes that “the definition of natural resources includes “land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources” (at 321). Damages recovered by the government are to be “available for use to restore, rehabilitate, or acquire the equivalent of such natural resources” by the appropriate agencies of the federal government or the state government.

95. See 33 USCA § 2702 for the definition of damages and § 2701 for the definition of natural resources.

96. 42 USCA § 9651(c)(2)

97. 33 USCA § 2706(e)(1)

98. For *CERCLA*, see § 107 (f)(2)(C). For *OPA*, see 33 USC § 2707 (1990).

99. *Natural Resource Damages for Hazardous Substances* 73 CFR Part 11 (2008) [*NRDHS*].

100. *Ibid.*

101. Amy W Ando & Madhu Khanna, “Natural Resource Damage Assessment Methods: Lessons in Simplicity from State Trustees” (2004) 22:4 *Contemporary Econ Pol’y* 504.

CERCLA Type B and *OPA* procedures rely on the concept of services as their metric for damages.¹⁰² Somewhat surprisingly—given that neither *CERCLA* nor the *OPA* contain any reference to this term and that the initial publication of both sets of regulations predated the flurry of activity with respect to ecosystem services described in the previous Part¹⁰³—the definition of services in both the *CERCLA* and the *OPA* regulations is entirely consistent with the ecosystem services concept described here.¹⁰⁴ The NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) website specifically references the MEA and explains that “[t]his injury assessment process is based on the understanding that functioning ecosystems provide multiple *ecosystem services* that are critical to day-to-day activities on this planet.”¹⁰⁵

That being said, because the focus under both statutory schemes is increasingly on restoring damaged natural resources, including for interim loss,¹⁰⁶ ecosystem

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102. Thus, the goal of the *OPA* regulations is to “make the environment and public whole for injuries to natural resources and services,” which is achieved by retuning these to baseline conditions and compensating for interim losses from the date of the incident until recovery: see 15 CFR § 990.10 (2012). The *CERCLA* regulations take a more circuitous route. The purpose of the damage determination phase under the *CERCLA* regulations is “to establish the amount of money to be sought in compensation for injuries to natural resources,” where the measure of damages is the cost of either restoration of the injured resources or the replacement of equivalent natural resources, both of which are measured in terms of the level of services provided by the injured resource at baseline, and may include “compensable value”: see 43 CFR § 11.80 (2007). Compensable value includes “the economic value of lost services provided by the injured resources, including both public use and non-use values such as existence and bequest values.” Both use and non-use values are further defined as deriving from services: see 43 CFR § 11.83 (2007).
103. See Katharine K Baker, “Consorting with Forests: Rethinking Our Relationship to Natural Resources and How We Should Value Their Loss” (1995) 22 *Ecology LQ* 677 at 705 (and footnote 143 in particular).
104. Under the *OPA* regulations, “[s]ervices (or *natural resource services*) means the functions performed by a natural resource for the benefit of another natural resource and/or the public”: see 15 CFR § 990.30 (2012). Under the *CERCLA* regulations, “services” means the physical and biological functions performed by the resource including the human uses of those functions. These services are the result of the physical, chemical, or biological quality of the resource”: see 43 CFR § 11.14 (2007).
105. Online: Damage Assessment, Restoration, & Restoration Program <<http://darrp.noaa.gov/economics/index.html>> [DAARP] [emphasis in original]. The DAARP also “provides permanent expertise within NOAA to assess and restore natural resources injured by releases of oil and hazardous substances, as well as by physical impacts, such as vessel groundings in National Marine Sanctuaries.” See online: DAARP <<http://www.darrp.noaa.gov/about/index.html>>.
106. See *NRDHS*, *supra* note 99.

services are decreasingly likely to be valued directly. Instead, they are likely to be valued indirectly in terms of the cost of carrying out restoration projects:

[S]ervice-to-service scaling is the preferred approach for determining the required amount of compensatory restoration following an injury. In this approach, the services lost from natural resource injury are equated to the services gained from restoration. Using the critical assumption that the services lost from the injury are of the same type and value as those restored through a compensatory project, no direct valuation of the injured resources or restored resources occurs.¹⁰⁷

According to the regulatory impact analysis that accompanied the 2008 revisions to the *CERCLA* regulations, scaling techniques such as Habitat Equivalency Analysis (HEA) “are frequently simpler and more transparent than methodologies used to measure the economic value of losses.”¹⁰⁸ In Canada, restoration costs have also been advanced as the presumptive measure of environmental damages.¹⁰⁹

Direct environmental valuation becomes necessary where restoration is impractical, inadequate, or otherwise deemed inappropriate. Much has been written about the various tools that can be employed for this purpose, which economists group into two categories: revealed and stated preference techniques.¹¹⁰ The former includes market price (primarily as a measure of consumptive use value, *e.g.*, for provisioning services such as fish), travel cost (primarily as a measure

The NRDAR advisory committee recommended that DOI should amend its current regulation to explicitly authorize trustees to use the cost of restoration actions that address service losses to calculate all damages, including interim losses. Providing the option for a ‘restoration-based’ approach to all damages better comports with CERCLA’s overall restoration objectives.

See “Natural Resource Damages for Hazardous Substances,” 73 Federal Register 192 (2 October 2008) at 57260.

107. DAARP, *supra* note 105.

108. *NRDHS*, *supra* note 99 at 11083. In Canada, Habitat Equivalency Analysis (HEA) has been considered for the purpose of the Department of Fisheries and Oceans’ (DFO) fish habitat compensation program pursuant to its *Fisheries Act* authorization policy (commonly referred to as its “No Net Loss policy”). See RSC 1985, c F-14, s 35(2) [*Fisheries Act*]. See also Fisheries and Oceans Canada, Review of Approaches for Estimating Changes in Productive Capacity from Whole-lake / Stream Destruction and Related Compensation Projects by G A Packman et al (Ottawa: Fisheries and Oceans Canada, 2006) at 43.

109. OLRG Report, *supra* note 8 at 56.

110. Most of these methodologies, and their strengths and weaknesses, are discussed by Professors Elgie and Lintner in their case comment on *Canfor*. See *supra* note 15. See also OLRG Report, *supra* note 8; and Edgar Gold, David L VanderZwaag & Meinhard Doelle, “Economic Loss and Environmental Damages: Developments in Claims for Offshore Oil Pollution” (1991) 1 J Envtl L & Prac 129; and *supra* notes 22 and *supra* note 94 (American literature within).

of use value, but including both consumptive and non-consumptive uses, e.g., recreational services such as fishing and bird watching, respectively) and hedonic pricing (using property value to estimate environmental values, especially non-use values). Probably the most controversial example of a stated preference technique is contingent valuation (CV), which essentially involves conducting surveys designed to elicit individuals' preferences for the environment or specific goods and services. All these techniques were discussed to some extent in *Canfor*.¹¹¹

Another method for valuation is benefit transfer. Benefit transfer uses information derived from existing valuation studies to assign values in another context. Since 1992, Environment Canada (EC) has been working with various international experts and organizations, including the US Environmental Protection Agency, to develop and implement a benefit transfer “infobase” called the Environmental Valuation Reference Inventory (EVRI).¹¹²

This is not to suggest that ecosystem services assessment and valuation is an exact science. “Even when valuation is informed by the best available science, the valuation process will almost always involve uncertainty. Uncertainty arises in the prediction of changes in ecosystems, in the resulting change in the flow of services, and in estimating the values associated with those changes.”¹¹³ That being said, most environmental regulation operates on the frontier of science, where “scientific uncertainty is endemic.”¹¹⁴ Moreover, in the specific context of ecosystem services valuation, many observers agree that uncertainties result in underestimation rather than overestimation of value.¹¹⁵

II. ECOSYSTEM SERVICES-BASED EDA UNDER THE *EEA*

A. CURRENT APPROACH TO ENVIRONMENTAL SENTENCING IN CANADA

In *Canfor*, the Court drew a distinction between physical damages and compensable loss, highlighting an important distinction between civil and criminal liability:

111. *Supra* note 9 at paras 141-43.

112. Online: Environmental Valuation Reference Inventory <<https://www.evri.ca/Other/AboutEVRI.aspx>>. For example, a keynote search for “wetlands” by the author generated 199 results, including Professor Olewiler’s study, *supra* note 37.

113. *EPA, supra* note 33 at 16.

114. See generally Daniel A Farber, “Building Bridges over Troubled Waters: Eco-pragmatism and the Environmental Prospect” (2003) 87:4 Minn L Rev 852 at 855.

115. See *e.g.* Costanza et al, *supra* note 26 at 258. See also *EPA, supra* note 33 at 16 (discussing the problems that the public’s general lack of understanding about ecosystem services can pose for valuation).

This appeal is thus not about proof of physical damages, but about the proof and assessment of *compensable* loss [I]n assessing compensatory damages for environmental loss, the Court ought not to be engaged merely in punishment of the wrongdoer (which is the domain of regulatory offences) or imputing losses based on little more than a generalized desire to mete out rough justice to a tortfeasor.¹¹⁶

In other words, civil liability and liability for regulatory (variously referred to as “statutory” or “public welfare”)¹¹⁷ offences serve different purposes. In the former context, the driving principle is *restitutio in integrum*: “restoration to the previous condition or the *status quo*,”¹¹⁸ fairness being “best achieved by avoiding both undercompensation and overcompensation.”¹¹⁹ In the regulatory context, on the other hand, the general purpose is to impose sanctions that foster “respect for the law and the maintenance of a just, peaceful and safe society.”¹²⁰ In the specific context of environmental offences, moreover, most observers agree that deterrence and respect for the regulatory process are the primary objectives:

Suffice it to say that Canadian courts have settled upon the need for pollution prevention via deterrence, and the need to generate societal respect for the regulatory process, as the most relevant objectives of environmental sentencing.

The rationale is that since prosecutions occur after an offence, and the environmental damage is already done, any hope for the future protection of the public welfare needs to come from any deterrent effect of the sentence.¹²¹

Although a detailed review of the case law on this point is beyond the scope of this article, one of the benchmark decisions on the importance of deterrence is the Ontario Court of Appeal’s decision in *R v Cotton Felts Ltd.*¹²²

In our complex interdependent modern society . . . regulatory statutes are accepted as essential in the public interest. . . . To a very large extent the enforcement of such statutes is achieved by fines imposed on offending corporations. The amount of

116. *Supra* note 9 at para 59 [emphasis in original].

117. See *R v Sault Ste Marie (City)*, [1978] SCR 1299, 85 DLR (3d) 161. See also Mark Davidson, “Innocent Drops and the Symbolic Generalization of Moral Harms: A New Basis for the Criminalization of Environmental Offences” (2005) 16:1 J Envtl L & Prac 19 at 22-23.

118. *Black’s Law Dictionary*, 7th ed, *sub verbo* “restitutio in integrum.”

119. *Raytch v Bloomer*, [1990] 1 SCR 940 at para 47, 69 DLR (4th) 25.

120. *Criminal Code*, RSC 1985, c C-46, s 718.

121. Elaine L Hughes & Dr Larry A Reynolds, “Creative Sentencing and Environmental Protection” (2009) 19:2 J Envtl L & Prac 105 at 108. See also Davidson, *supra* note 117 at 37 (discussing deterrence); and Sherie Verhulst, “Legislating a Principled Approach to Sentencing in Relation to Regulatory Offences” (2009) 12:3 Can Crim L Rev 281 at 291.

122. (1982), 8 WCB 447, 2 CCC (3d) 287 [*Cotton Felts*]. This case was recently cited with approval in *R v Alpha Manufacturing Inc et al*, [2005] BCSC 1644 at para 48, 68 WCB (2d) 77, and *R v Terroco Industries Ltd*, 2005 ABCA 141 at para 60, 41 Alta LR (4th) 1 [*Terroco*].

the fine will be determined by a complex set of considerations Above all, the amount of the fine will be determined by the need to enforce regulatory standards by deterrence.¹²³

In order to meet these objectives, Canadian courts have long recognized the need for a “special approach” to environmental sentencing.¹²⁴ Probably the most often cited cases with respect to what this entails are *R v United Keno Hill Mines* (1980)¹²⁵ and *R v Bata Industries Ltd* (1993).¹²⁶ In the latter case, and relying very much on the former, the court set out the following list of factors to be considered in sentencing, which continue to guide courts to this day:

- a. *The Nature of the Environment Affected;*
- b. *Extent of the Injury;*
- c. Deliberateness of the Offence
- d. The Attitude of the Accused.¹²⁷

In sentencing corporations, the Court should also consider the following:

- e. The size, wealth, nature of operations and power of the corporation;
- f. The extent or attempts to comply;
- g. Remorse;
- h. Profits realized by the offence; and
- i. Criminal record or other evidence of good character.¹²⁸

Of relevance here is that Canadian courts have long considered it necessary to take into account the nature of the environment affected and the extent of actual or potential damage caused by an offence. Perhaps the most explicit plea for such evidence was made in *United Keno Hill* itself:

In environmental cases, the courts do and should vary the severity of punishment in accord with the nature of the environment affected and the extent of damage inflicted.

123. *Cotton Felts*, *supra* note 122 at para 19.

124. See *R v Kenaston Drill (Arctic) LTD* (1973), 12 CCC (2d) 383, [1973] NWTJ No 1 (SC).

This case was cited with approval in *United Keno Hill*, *supra* note 7.

125. For a more recent example, see *R v Schuizke*, 2008 SKPC 149 at paras 32, 55, 88, 328 Sask R 112. As of 2005, *United Keno Hill* had been followed 19 times and mentioned 31 times. See Davidson, *supra* note 117 at 36, n 68.

126. [1995] OR (3d) 321 127 DLR (4th) 438 (Ont CA),, rev’g in part [1993] 14 OR (3d) 354, 11 CELR (NS) 208 (Ont Gen Div), rev’g on other grounds [1992] OR (3d) 329, 7 CELR (NS) 245 (ONCJ PD) [*Bata*].

127. [1993], *ibid* at para 20 [emphasis added].

128. See Stanley David Berger, *The Prosecution and Defence of Environmental Offences* (Aurora: Canada Law Book, 2008) at 7:13.

(a) Nature of Environment

A unique ecological area supporting rare flora and fauna, a high-use recreational watershed, or an essential wildlife habitat, are environments calling upon users to exercise special care. Any injury to such areas must be more severely condemned than environmental damage to less sensitive areas.

(b) Extent of Injury

Penalties should reflect the degree of damage inflicted ... In some instances not only the actual damage caused but [also] the potential damage that might have emanated from the polluter's activities must be considered. ...

As in assault offences the more severe the beating the greater the condemnation expressed in sentencing. Similarly, evidence of injury should be tendered in environmental cases. ...

Most sentencing dispositions in environmental cases necessitate expert and technical evidence to describe the extent of environmental harm caused by the offence.¹²⁹

Canadian courts have long been willing (if not eager) to consider detailed, technical expert evidence with respect to actual and potential environmental harm. That being said, they have also recognized that ascertaining and quantifying harm is difficult in most environmental cases.¹³⁰ Even where evidence of harm has been introduced, there does not appear to be any consistent approach for translating such harm into a monetary figure other than perhaps the principle of parity, which requires "similar sentences to similar offenders for similar offences committed in similar circumstances."¹³¹

Two exceptions are *R v Carriere*¹³² and *R v George M Caseley & Sons Inc.*¹³³ The former is demonstrative of Canadian judges' willingness to seriously engage the issue of environmental harm generally and an economic approach to sentencing specifically; the latter illustrates some of the challenges that prosecutors will face when introducing such evidence. While Canadian courts have recognized that environmental harm has an economic component in other cases,¹³⁴ these two

129. *Supra* note 7 at paras 11-14, 16.

130. For a recent case, see *R v Northwest Territories Power Corp*, 2011 NWTTC 3 at para 89, 2011 CELR (3d) 257 [*Northwest Territories*].

131. *Ibid* at para 107 (citing section 718.2(b) of the *Criminal Code*). See also *Terroco*, *supra* note 122 at para 65.

132. 2005 SKPC 84, 272 Sask R 13 [*Carriere*].

133. (2004) CELR (3d) 178, 716 APR 194 (PEPC) [*Caseley*].

134. See *e.g.* *R v Corner Brook Pulp and Paper Ltd* (2010), 53 CELR (3d) 108 at paras 23, 25, 317 Nfld & PEIR 309 (NFPC); *Fletcher v Kingston (City)*, [1999] OJ 5705 (QL) at para 3 (ONCJ PD); *R v New Brunswick Electric Power Commission*, 10 CELR (NS) 184 at para 49,

decisions stand out for the extent to which the courts explored economic principles and tools in the context of quantifying environmental harm.

In *R v Carriere*, the accused were convicted of an offence under the *Migratory Birds Convention Act* [MBCA] (one of the statutes amended by the *EEA*), namely, the illegal taking of birds. Justice Robinson observed that:

Paragraph 13(4.1)(a) of the [pre-*EEA*] Migratory Birds Convention Act 1994 says that a court imposing a sentence shall take into account “the harm or risk of harm caused by the commission of the offence.” The question thus arising is, “What is the harm or risk of harm caused by the accused’s actions?” ...

By accepting that harm would result from a reduction in wild duck populations, I am necessarily assuming that wild ducks have a value. But what value? ... [A] proper assessment of the harm or risk of harm ... cannot occur without at least some understanding of what wild ducks are worth.

[T]he Convention recognizes that “many of these species [migratory birds] are of great value as a source of food or in destroying insects which are injurious to forests and forage plants on the public domain, as well as to agricultural crops, in both Canada and the United States”

Some of the values might be impossible to quantify in dollars, but they are important nonetheless. Few would suggest there is no aesthetic value in seeing large flocks of ducks flying overhead during the fall migration.

Ducks also have a real dollar value when used for some purposes, most notably, sport hunting. As set out in figures below, sport hunters kill as many as 14 million ducks each year in North America It would have been very useful to know what an individual duck is worth in dollars to the sport hunting industry. Is it \$10 or \$100 or something quite different? As it is, I am left to assume that ducks have a significant value to the industry without having any precise figure for what that value might be.¹³⁵

Thus, while Justice Robinson was technically (albeit understandably, bearing in mind the lack of submissions on this point) wrong in concluding that aesthetic values are impossible to quantify in monetary terms, he was prescient in recognizing that ducks confer numerous benefits to society, including provisioning services (*e.g.*, food), regulating services (*e.g.*, biological control), and cultural and amenity services (*e.g.*, hunting and bird watching), and in his willingness to consider their economic value for the purposes of sentencing.

In *R v Caseley*, on the other hand, Justice Thomson seemed less willing to consider economic value. That case involved the deposit of pesticides into the Wilmot River from an adjacent field following a large rain event, contrary to

[1991] NBJ 1144 (NBCP); *United Keno Hill*, *supra* note 7 at para 9.
 135. *Carriere*, *supra* note 132 at paras 21, 23-24, 26-27.

subsection 36(3) of the *Fisheries Act*.¹³⁶ The Crown sought to quantify the environmental harm not only as the costs of restocking and monitoring the Wilmot River (for a total of \$12,800),¹³⁷ but also to include what the court deemed “more intangible losses which economists *apparently believe* occur from these kinds of events”:

Ms. DeBaie assigned a dollar value to the time spent by volunteers although they were unpaid. She assigned a dollar value to the work of government employees although no additional staff were hired as a result of this offence. She assigned a dollar value to the recreational enjoyment of individual fishers and multiplied it by the projected numbers of fishers who might be expected to use the Wilmot River, and multiplied that by the number of days that those individuals might have fished. ...

Ms. DeBaie then attempted to quantify the total overall economic impact of resident, visiting non-resident Canadian, and visiting non-Canadian fishers not fishing on Prince Edward Island and in the case of non-residents, apparently not even visiting Prince Edward Island because of the closure of the Wilmot River to recreational fishing. Ms. DeBaie estimates that the total impact could be as high as \$690,000 per year while the river remains closed.

The difficulty which the Court has with Ms. DeBaie’s evidence is that it is for the most part not based on empirically grounded data. There is no evidence of how many people fished the Wilmot River, on average, before its closure. There is no evidence that even one fisher stopped fishing in east Prince County because of the closure. There is no evidence that even one visitor failed to come to Prince Edward Island and fish because of the closure.

[W]ithout evidence based on hard data, in the Court’s view, Ms. DeBaie’s conclusion must be regarded as speculation and insufficient grounds upon which to base any form of restitution order.¹³⁸

Although perhaps not as dismissive as the defendant’s expert in *Canfor*, who characterized environmental loss valuations as “airy-fairy,”¹³⁹ Justice Thomson was clearly skeptical of the Crown’s evidence and its approach to environmental harm generally. While some of his concerns were valid, his disbelief was misplaced. The work of volunteers, for example, reflects the existence of non-use values derived from the Wilmot River’s cultural services. With respect to the work of government employees, American courts have determined that recoverable costs under *CERLCA* include both case-specific government expenses and indirect costs,

136. *Supra* note 108.

137. *Caseley*, *supra* note 133 at para 9.

138. *Ibid* at paras 10-13 [emphasis added].

139. *Supra* note 9 at para 59.

recognizing that in a world of budgets and limited resources, expending and even redirecting funds is also reflective of the value of the ecosystem.¹⁴⁰

Finally, numerous Canadian environmental laws authorize compensation to persons or to relevant government departments for what are essentially ecosystem service losses caused by conduct that contravenes those laws or any regulations made thereunder.¹⁴¹ Section 42 of the *Fisheries Act*, for example, not only makes polluters civilly liable to the Crown for remediation costs, it also allows commercial fishers to recover lost income “to the extent that the loss can be established to have been incurred as a result of the deposit” of deleterious substances.¹⁴² This is, in effect, an action for the loss of provisioning services (*i.e.*, of fish for food)—a loss that figured prominently in the damage assessment following the *Exxon Valdez* spill and that will likely figure prominently in damages claims against BP following the *Deepwater Horizon* spill in the Gulf of Mexico.¹⁴³

Justice Thomson’s decision is nevertheless useful for several reasons. It suggests that restoration costs may not always adequately reflect ecosystem service losses, especially cultural services. It also identifies some of the challenges that prosecutors are bound to face when introducing such evidence. For example, the Crown should have introduced evidence (as would be required in an action under subsection 42(3)) about the actual extent of fishing before and after the offence in order to establish the loss (including potential loss) in this instance.¹⁴⁴ The decision also serves as a reminder that the Crown must prove the existence of an aggravating factor beyond a reasonable doubt.¹⁴⁵

140. *United States Environmental Protection Agency v Bell Petroleum Services Inc*, 734 F Supp 771, rev’d on other grounds, 3 F 3(d) 889 (5th Circuit 1993).

141. See *e.g.* *CEPA, 1999*, *supra* note 3, s 40.

142. *Fisheries Act*, *supra* note 108, s 42(3). See Gold, VanderZwaag & Doelle, *supra* note 111 at 149.

143. Keith H Hirokawa, “Disasters And Ecosystem Services Deprivation: From Cuyahoga to The *Deepwater Horizon*,” (2011) 74:1 Alb L Rev at 555. Hirokawa observes:

The Gulf’s *provisioning services* affect the entire nation’s seafood markets and the region’s economy. In 2008, commercial fishermen in the Gulf of Mexico supported a commercial fishing harvest of 1.27 billion pounds of finfish and shellfish at a value of \$659 million in landings revenue [emphasis in original].

144. As an example, an assessment of the recreational fishery value provided by the Credit River, near Toronto, Ontario, indicated recreational benefits of \$1.2 million dollars per year to anglers who fish the Credit. See Pembina Institute & Credit Valley Conservation, *Natural Credit: Estimating the Value of Natural Capital in the Credit River Watershed* by Mike Kennedy & Jeff Wilson (Drayton Valley: Pembina Institute, 2009) at 31, online: Pembina Institute <www.pembina.org> [Pembina Institute].

145. See *Criminal Code*, *supra* note 120 at s 724(3)(c); *R v Gardiner*, [1982] 2 SCR 368 at 26, 140 DLR (3d) 612.

B. THE ENVIRONMENTAL ENFORCEMENT ACT

The *EEA* amends nine federal environmental statutes: the *Antarctic Environmental Protection Act*,¹⁴⁶ the *Canada National Marine Conservation Areas Act* [*CNMCAA*]¹⁴⁷ the *Canada National Parks Act*,¹⁴⁸ the *Canada Wildlife Act*,¹⁴⁹ the *Canadian Environmental Protection Act (CEPA, 1999)*,¹⁵⁰ the *International River Improvements Act*,¹⁵¹ the *Migratory Birds Convention Act, 1994*,¹⁵² the *Saguenay – St. Lawrence Marine Park Act*,¹⁵³ and the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act*.¹⁵⁴ All of these statutes contain provisions that prohibit harm either to a particular environment—such as a marine conservation area, national park, or international river—or caused by a particular activity, such as the handling and disposal of hazardous substances or the killing of or trading in wildlife. They also contain other kinds of prohibitions, including those related to the filing of documents and records, which may not be directly related to any kind of environmental harm.¹⁵⁵

When all of the *EEA*'s provisions are proclaimed into force, each of the nine statutes will have essentially the same “purpose of sentencing” clause, tailored to the specific circumstances of each act. Thus, under the *CNPA*, the amending provisions of which have already been proclaimed into force,

[t]he fundamental purpose of sentencing for offences under this Act is to contribute to *respect for the law* establishing and protecting parks through the imposition of just sanctions that have as their objectives

- (a) to *deter* the offender and any other person from committing offences under this Act;

146. SC 2003, c 20 [*AEPA*].

147. *CNMCAA*, *supra* note 43.

148. SC 2000, c 32 [*CNPA*].

149. RSC 1985, c W-9 [*CWA*].

150. *Supra* note 3.

151. RSC 1985, c I-20 [*IRIA*].

152. *Supra* note 5.

153. SC 1997, c 37 [*SSLMPA*].

154. SC 1992, c 52 [*WAPPRIITA*]. The *EEA* also creates the *Environmental Violations Administrative Monetary Penalties Act*, SC 2009, c 14, s 126 [*EVAMPA*]. This act establishes an administrative monetary penalty scheme applicable to the acts listed above, as well as to the *Canada Water Act*, RSC 1985, c C-11 [*CWA*].

155. See *e.g.* *MBCA*, *supra* note 5, s 5.2. The Act states: “No person shall (a) wilfully destroy or cause to be destroyed a document, a record or data that is required to be kept under this Act or the *Canada Shipping Act, 2001*, or wilfully alter or cause to be altered such a document, a record or data with intent to mislead.”

- (b) to *denounce* unlawful conduct that damages or creates a risk of damage to parks; and
- (c) to *restore* park resources.¹⁵⁶

In addition to deterrence and respect for the regulatory process, both of which are already established objectives in sentencing, Canadian judges must now have regard to restoration. Although judges have been ordering restoration and remediation under the guise of “creative sentencing” for several years, these have not generally been regarded as objectives in sentencing.¹⁵⁷

Through this addition, Parliament can be considered as having confirmed a “polluter pays” approach to sentencing. Already “firmly entrenched in environmental law in Canada,”¹⁵⁸ the polluter pays principle “assigns polluters the responsibility for remedying contamination for which they are responsible and imposes on them the direct and immediate costs of pollution.”¹⁵⁹ While the actual phrase need not be used in order for the principle to find application,¹⁶⁰ it is not surprising that three of the statutes amended by the *EEA* explicitly refer to the polluter pays principle in the context of this new third objective. Under *CEPA, 1999*, for example, the objective is “to reinforce the ‘polluter pays’ principle by ensuring that offenders are held responsible for effective clean-up and environmental restoration.”¹⁶¹

To meet these purposes, Parliament has introduced new “principles of sentencing” into each of the nine statutes. Pursuant to subsection 13.1(1)(a) of the *MBCA*, for example, a court is directed to consider—in addition to the principles and factors set out in section 718 of the *Criminal Code*—the principle that the amount of the fine should be increased to account for and reflect the gravity of the aggravating factors associated with the offence, including those set out in subsection 13.1(2):

- (a) the offence caused damage or risk of damage to migratory birds or their nests;
- (b) the offence caused damage or risk of damage to any unique, rare, particularly important or vulnerable population of migratory birds;
- (c) the damage caused by the offence is extensive, persistent or irreparable¹⁶²

156. *CNPA*, *supra* note 148, s 27.6 [emphasis added].

157. Hughes & Reynolds, *supra* note 121 at 111-12.

158. *Imperial Oil Ltd v Quebec (Minister of the Environment)*, 2003 SCC 58 at para 23, 2 SCR 624.

159. *Ibid* at para 24.

160. Jerry V DeMarco, “Building a Strong Foundation for Action: A Review of Twelve Fundamental Principles of Environmental and Resource Management Legislation” (2008) 19:1 J Envtl L & Prac 59 at 64.

161. *CEPA, 1991*, *supra* note 3, s 287(c). Similar wording is found in the *AEPA*: see *supra* note 146, s 50.9. Under the *MBCA*, the objective is “to reinforce the ‘polluter pays’ principle and to restore migratory birds and their habitats.” See *supra* note 5, s 13.09(c).

162. *Ibid* (subsection 13.2(d)-13.2(i) deal with intent, economic benefit, prior warning, history of

As noted earlier, “damage” in this context includes loss of use and non-use value.¹⁶³

Like the purpose of sentencing clause, this list of aggravating factors serves primarily to codify the existing common law factors applied in sentencing,¹⁶⁴ with the new and important inclusion of use and non-use values in the definition of environmental damage.

Part and parcel with these provisions are new minimum and higher maximum fines, different levels of penalties for different types of offenders, and Governor in Council authority to distinguish, using regulations, between less and more serious offences that would carry lower and higher fine ranges, respectively.¹⁶⁵ For designated serious offences by an individual, a summary conviction carries a minimum \$5,000 and a maximum \$300,000 fine, whereas on indictment the minimum is \$15,000 and the maximum is \$1 million. For small corporations, a summary conviction carries a minimum \$25,000 and a maximum \$2 million fine, whereas on indictment the minimum is \$75,000 and the maximum is \$4 million. For large corporations, a summary conviction carries a minimum \$100,000 and a maximum \$4 million fine, whereas on indictment the minimum is \$500,000 and the maximum is \$6 million.¹⁶⁶

Parliament has also uniformly armed judges with the powers necessary to order what are often referred to as “creative sentences,”¹⁶⁷ the most relevant of which would appear to be the power to order remediation. Thus, under the *CNMCAA*, courts may:

in addition to any punishment [fine] imposed ... make an order ... (b) directing the person to take any action that the court considers appropriate to remedy or avoid any damage to any marine conservation area resources that resulted or may result from the commission of the offence.¹⁶⁸

Viewed this way, it might be presumed that Parliament intended for deterrence and denunciation to be accomplished through fines, with restoration and the polluter pays principle being achieved through additional orders such as re-

non-compliance and post-offence conduct). Additionally, subsection 13.1(3) states that the absence of an aggravating factor is not to be construed as a mitigating factor.

163. *Ibid*, s 13.1(4).

164. See also Hughes & Reynolds, *supra* note 121 at 110-11.

165. See *e.g.* *CNMCAA*, *supra* note 43, s 16(1)(n). Although the regulation-making authority here is not as clear as it could be, this power could be considered analogous to the distinction between Type A and Type B procedures under *CERCLA*.

166. Parliamentary Information and Research Service, *supra* note 4 at 6.

167. Hughes & Reynolds, *supra* note 121.

168. *CNMCAA*, *supra* note 43, ss 27(1), 27(1)(b).

mediation. This distinction seems to evaporate, however, in light of the *EEA*'s requirement that all fines be directed to Environment Canada's Environmental Damages Fund (EDF).¹⁶⁹ A sort of 'Superfund-lite' the EDF receives money from civil judgments and regulatory sentences, which it spends on environmental restoration in the location where the damage occurred or on other projects based on established criteria.¹⁷⁰ In other words, the EDF "follows the Polluter Pays Principle to help ensure that those who cause environmental damage or harm to wildlife take responsibility for their actions."¹⁷¹

On their face, these *EEA* provisions may seem duplicative. As will be seen below, however, the power to order remediation and the allocation of all fines to the EDF (essentially an indirect remediation order) actually ensures a comprehensive scheme for capturing the full range of relevant ecosystem services losses, both permanent and temporary, actual and potential, and for ensuring that environmental fines are put to the best use. The only concern will be to avoid double counting, which could occur where the Crown introduces evidence of ecosystem service losses and also seeks an order for restoration. In such instances, the amount of the fine reflecting actual ecosystem service losses (setting aside for the moment the risk of loss) would be restricted to interim losses, recognizing that restoration should eventually replace any permanent losses.¹⁷² On the other hand, in the majority of cases where the actual environmental damage and therefore restoration required is minimal¹⁷³ but the risk of damage—the potential loss of ecosystem services—is great, both a restoration order and a significant fine may be appropriate and would not constitute double counting.

The availability of both restoration orders and the EDF also gives judges the option of retaining jurisdiction over restoration activities (*e.g.*, where the conduct

169. See *CNPA*, *supra* note 148, s 29.1(1); *CNMCAA*, *supra* note 43, s 26.1; *IRLA*, *supra* note 151, s 44; *CWA*, *supra* note 149, s 13.13; and *MBCA*, *supra* note 5, s 13.2.

170. Harry J Wruck, QC, "The Federal Environmental Damages Fund" (2004) 5 *CELR* (3d) 120 at 120. See also Hughes & Reynolds, *supra* note 121; and Environment Canada, online: <<http://www.ec.gc.ca/edf-fde/default.asp?lang=En&n=A82326FE-1>> [EDF Website] (listing recent cases and corresponding fines).

171. *Ibid.*

172. The same approach was advanced in Canada, in *Canfor*, *supra* note 9 at para 11. The Court observed:

The Attorney General of Canada intervened in support of the Province to argue that full compensation for damage to protected natural resources must include reimbursement for financial expenditure on restoring the natural resource ("restoration cost"), compensation for the loss of use and passive use until such time as restoration is complete ("loss of use"), and, where the facts warrant, additional compensation for permanent loss of a unique resource where there is no prospect of restoration.

173. Wruck, *supra* note 170 at 137.

of the accused was particularly offensive) or allowing these to be managed by the EDF. In the latter case, the Crown would simply need to ensure that the fine requested is sufficient to secure adequate restoration. Such costs could be introduced as evidence of lost use and non-use values, bearing in mind that under the American NRDA legislation restoration costs are generally preferred as an indirect but more transparent method for valuing actual ecosystem services losses, while in Canada they have been recommended as the presumptive method for estimating environmental damages.¹⁷⁴

1. OPPORTUNITIES FOR ECOSYSTEM SERVICES-BASED EDA

Before considering the opportunities and challenges for ecosystem services-based EDA, it is reasonable to ask whether adoption of the ecosystem services paradigm—or any kind of valuation framework—is desirable for the purposes of environmental sentencing. After all, valuation does presume a utilitarian or instrumental view of the natural world seemingly to the exclusion of other values, including intrinsic value.¹⁷⁵

Whatever one's position on the utilitarian versus intrinsic value debate with respect to environmental law and policy generally,¹⁷⁶ in the specific context of the *EEA* the question appears moot. Parliament clearly signaled its approval for a utilitarian approach when it included use and non-use values in the definition of environmental damage. Furthermore, those who might insist on recognizing the environment's intrinsic value can find solace in the fact that the use of the non-exhaustive term "includes" in the definition of environmental damage leaves room for judges to take intrinsic value into account, should the Crown introduce evidence of it.

174. See *supra* note 106-109.

175. For the possible emergence of a non-utilitarian ethic in environmental law, see Demarco, *supra* note 160 at 67. According to Professors Karin Mickelson and William Rees, however, "there is no doubt that environmental protection is understood in instrumental terms ... indeed, it can be said to characterize most current environmental law and policy." See "The Environment: Ecological and Ethical Dimensions" in Elaine Hughes, Alastair R Lucas & William A Tilleman, *Environmental Law and Policy*, 3d ed (Toronto: Emond Montgomery, 2003) 1 at 19.

176. On the utilitarian side, there would also seem considerable merit in the position, first articulated in *Nature's Services*, that "economic markets play a dominant role in patterns of human behavior, and the expression of value—even if imperfect—in a common currency helps to inform the decision-making process." See Daily, *supra* note 25 at 10. For intrinsic arguments, see *e.g.* Sagoff, *supra* note 30.

i. Judicial Capacity and the Role of Expert Evidence

Perhaps the most important determinant with respect to the potential for an ecosystem services approach to EDA is not the inclusion of use and non-use values in the definition of environmental damages but the Canadian judiciary's established appreciation for, and understanding of, technical expert evidence with respect to environmental harm.

There is little merit in the argument that an ecosystem services approach is too complex for the purposes of sentencing, as was argued by industry when a similar approach was proposed for sentencing in the United States in 1993.¹⁷⁷ Canadian judges have demonstrated a considerable capacity for understanding complex ecological principles and processes, often in the context of competing expert evidence.¹⁷⁸ They have understood and written with sophistication about the perils of acid rain,¹⁷⁹ the impacts of chlorofluorocarbons (CFCs) on the ozone layer (including the importance of cumulative effects)¹⁸⁰ the biological persistence of polychlorinated biphenyls (PCBs),¹⁸¹ the impacts of sediment on fish habitat,¹⁸² and the fragility of the arctic environment,¹⁸³ to name only a few examples.

Where lawyers and courts have struggled, understandably, is with the quantification of environmental harm in monetary terms, relying instead where possible on the principle of parity. In the absence of a standardized metric, however, there is no guarantee that the first (or "benchmark") sentence for a given offence reflects the actual or potential environmental harm that arose in the circumstances, rendering subsequent sentences essentially arbitrary (at least with respect to this aggravating factor). Because of its precedential nature, such an approach can also lead to relatively low fines that do not account for society's rapidly evolving

177. US, Environmental Protection Agency, *An Advisory of the Illegal Competitive Advantage (ICA) Economic Benefit (EB) Advisory Panel of the EPA Science Advisory Board* (EPA-SAB-ADV-05-003) (Washington, DC: US Environmental Protection Agency, 2005) [EPA, *An Advisory*] (for a recent reversal in this position). Under current US Sentencing Guidelines (USSG), for offences involving fish, wildlife, and plants, judges may take into account the "market value" of lost fish and wildlife or, where no market exists, the costs of restitution, but are advised to not consider aesthetic values measured through such methods as CV (see USSG § 2Q2.1).

178. See *e.g.* *R v Procter*, 2008 BCSC 19, [2008] BCWLD 1575.

179. See *e.g.* *United Keno Hills*, *supra* note 7 at para 9.

180. *R v Canadian Tire Corp.*, (2004) OTC 668 at paras 57-66, 96, 110, 9 CELR (3d) 248 (OSCJ)

181. *R v Chem-Security (Alberta) Ltd.*, 1998 ABPC 96 at paras 13, 22, 233 AR 289. See also *R v Sinclair* (2009), 45 CELR (3d) 222 at para 107-08, CarswellOnt 4894 (WL Can) (OCJ).

182. *Northwest Territories*, *supra* note 130 at paras 81-94. See also *R v Sutherland*, 2010 ONSC 2240, 51 CELR (3d) 163; and *R v Brown and Brown*, 2005 BCPC 517, [2006] BCWLD 656.

183. *R v Iqaluit (City)*, 2002 CanLII 53331 at para 8 (NU CJ).

knowledge of and appreciation for the problem of environmental degradation. Indeed, part of the rationale for the *EEA* was “a growing understanding of the extent and severity of the damages that environmental offences can cause, and a corresponding increase in the demand for more severe penalties and fines ...”¹⁸⁴

Both the *Carriere* and *Caseley* decisions, on the other hand, indicate a willingness to consider a different approach. Although the adoption of an ecosystem services framework would clearly require some capacity building on behalf of both lawyers and the judiciary, a strengthened capacity to implement environmental law was another factor driving passage of the *EEA*:

The need for the amendments proposed in the ... [*EEA*] are [*sic*] clear. At the Global Judges Symposium held in Johannesburg, South Africa in 2002, where Canada's Supreme Court was represented, the Johannesburg Principles on the Role of Law and Sustainable Development were adopted. The principles include the following statement:

We are strongly of the view that there is an urgent need to strengthen the capacity of judges, prosecutors, legislators and all persons who play a critical role ... in the process of implementation, development and enforcement of environmental law ... especially through the judicial process ...¹⁸⁵

Stanley Berger suggests:

The endorsement of these principles ... [is] worth repeating in hearings involving the admissibility of evidence and sentencing before trial and appellate courts because the commitment made is not simply that of a group of academics; it was made by the judiciary on behalf of the judiciary.¹⁸⁶

It should also be noted that in New South Wales, where the framework for environmental sentencing is essentially identical to Canada's, the judiciary has

184. Canada, Environment Canada, *Background: Environmental Enforcement Bill, New Penalties and Sentencing Provisions*, (Ottawa: Environment Canada, 2009), online: Environment Canada <<http://www.ec.gc.ca/default.asp?lang=en&n=714D9AAE-1&news=20D9CEF0-0991-4A6F-A12E-FC132BDF06CA>> [Environment Canada].

185. *House of Commons Debates*, *supra* note 2 at 1823 (Mark Warawa). In the preamble to the Principles, the Members of the Judiciary emphasized “that the fragile state of the global environment requires the Judiciary as the guardian of the Rule of Law, to boldly and fearlessly implement and enforce applicable international and national laws...” See *The Johannesburg Principles on the Role of Law and Sustainable Development adopted at the Global Judges Symposium held in Johannesburg, South Africa on 18-20 August 2002*, UNEP, (2002), online: UNEP <<http://www.unep.org/law/symposium/Principles.htm>> [Johannesburg Principles].

186. Stanley Berger, *The Prosecution and Defence of Environmental Offences*, vol II (Aurora: Canada Law Book, 2009) at 7.9.

already come to recognize that what the *Caseley* court described as “intangible losses” are actually externalities—the public costs of environmental or ecosystem service degradation—which can and should be redressed in sentencing:

Where the commission of an offence results in external costs (environmental, social or economic) being suffered, these costs contribute to the objective harmfulness of the offence The court may not be able, by its sentence, to capture all of the external costs Nevertheless, the court may properly be able to reflect the external costs in its sentence and by that means, in part, bring back the external costs to the offender.¹⁸⁷

In the United States there was originally considerable opposition to any assessment of harm in the enforcement context, and current policies now focus almost exclusively on recapturing the economic benefits of non-compliance.¹⁸⁸ There have nonetheless been calls recently to take environmental harm, and the loss of ecosystem services specifically, into account in at least some situations.¹⁸⁹ Thus, in addition to an established role for expert evidence with respect to environmental harm in the regulatory context in Canada, there is also precedent in other common law jurisdictions for recognizing and accounting for the public costs of environmental degradation for the purposes of environmental sentencing.

ii. Furthering the Polluter Pays Principle

As mentioned above, the polluter pays principle suggests that polluters should bear the costs of the pollution generated by their activities. Among the most “operationalized” environmental principles in Canada,¹⁹⁰ it is also recognized at the international level, for example in Principle 16 of the 1992 *Rio Declaration on Environment and Development* (of which Canada is a signatory): “National au-

187. BJ Preston, “Principled sentencing for environmental offences – Part 2: Sentencing considerations and options” (2007) 31:3 Criminal Law Journal 142.

188. Under the *EEA*, such benefits are intended to be captured through the imposition of an additional fine pursuant to section 24.3 of the *CNMCAA*. For example:

If a person is convicted of an offence under this Act and the court is satisfied that, as a result of the commission of the offence, the person acquired any property, benefit or advantage, the court shall order the person to pay an additional fine in an amount equal to the court’s estimation of the value of that property, benefit or advantage. The additional fine may exceed the maximum amount of any fine that may otherwise be imposed under this Act.

See *CNMCAA*, *supra* note 43.

189. EPA, *An Advisory*, *supra* note 177 at 2. See also David Markell, “Is There A Possible Role For Regulatory Enforcement In The Effort To Value, Protect, And Restore Ecosystem Services?” (2007) 22:2 J Land Use & Env’tl L 549 at 549.

190. *Demarco*, *supra* note 160 at 64.

thorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the costs of pollution”¹⁹¹

In the context of the *EEA* (and of environmental offences generally), the polluter pays principle is only partially applicable in the sense that most environmental laws authorize the externalization of some environmental harm as the cost of economic development.¹⁹² In this context, application of the polluter pays principle does not seem intended to capture the full range of externalities (*i.e.*, ecosystem services losses) associated with an activity but more specifically those attributable to the commission of a particular offence because they fall outside of the bargain struck between governments, the public, and industry in setting regulatory standards.¹⁹³

Even in this partial application, however, there is “little practical significance in the notion that the polluter must pay unless it can be established precisely for what he must pay and exactly how much it will cost him.”¹⁹⁴ It is in this sense, as a conceptual framework for capturing and organizing environmental values that may not be immediately obvious, that an ecosystem services approach to EDA seems particularly appropriate:

Simply listing the services derived from an ecosystem, using the best available ecological, social, and behavioral sciences, can help ensure appropriate recognition of the full range of potential ecological responses to a given policy and their effects on human well-being. It can also help make the analysis of the role of ecosystems more transparent and accessible.¹⁹⁵

A recent controversial proposal by Canadian pipeline company Enbridge Inc. provides a useful example. Enbridge proposes to construct two pipelines

191. *Rio Declaration on Environment and Development*, UNER, 1992, UN Doc E.73.II.A.14, (1992) at principle 16.

192. See Hughes & Reynolds, *supra* note 121 at 105-06. The authors write: “To the disappointment of many, environmental law does not have as its focus the end of all environmental harm. Rather, it is about achieving a balance between the socio-economic benefits of modern industrial and technological development, and the health and ecological costs that inevitably accompany such activities.” One of the most prominent federal exceptions to this rule would be section 5.1 of the *MBCA*, *supra* note 5. See *Synchrude*, *supra* note 19.

193. For a concrete illustration of this bargain and its occasionally arbitrary results, see *Carriere*, *supra* note 132 at paras 42-43 (Justice Robinson acknowledges, and expresses some sympathy for, the accused’s comments that while he may be guilty of illegally taking 158 birds, a dam lawfully operated by the provincial government does far more damage to migratory birds).

194. Michael Bowman, “The Definition and Valuation of Environmental Harm: An Overview” in Bowman & Boyle, *supra* note 76, 1 at 1.

195. *EPA*, *supra* note 33 at 12.

running from Alberta to Kitimat, British Columbia, where it would also build a new marine terminal.¹⁹⁶ Of the three proposed marine transportation routes, one would see oil tankers enter the Hecate Strait via Queen Charlotte Sound.¹⁹⁷ Queen Charlotte Sound, in turn, is adjacent to the Gwaii Haanas National Marine Conservation Area, Canada's first marine conservation area (MCA) under the *CNMCAA*.¹⁹⁸ In light of the recent *Deepwater Horizon* spill in the Gulf of Mexico, which has also stirred memories of the 1989 *Exxon Valdez* oil spill, it is not surprising that many local First Nations have called for an outright ban on oil tanker traffic in this area, arguing that a spill would be just a matter of time.¹⁹⁹

Should a spill occur within Gwaii Haanas, it could easily constitute an offence under the *CNMCAA*.²⁰⁰ Pursuant to subsection 24.7(2), a sentencing judge would need to consider whether "(a) the offence caused damage or risk of damage to any marine conservation area resources," whether this damage was to "(b) ... any unique, rare, particularly important or vulnerable marine conservation area resources," and whether it was "(c) ... extensive, persistent or irreparable," where "damage" includes the loss of use and non-use values.²⁰¹

A sentencing judge might be inclined, as Justice Robinson did in *R v Carriere*, to turn to the relevant legislative framework for "some understanding of what [MCAs] are worth."²⁰² As noted in Part I, most environmental laws—including those amended by the *EEA*—are replete with references to the more obvious

196. Enbridge, Northern Gateway Pipelines, *Project Brochure*, vol 4 (Vancouver: Blanchette Press, 2010) at 4.

197. *Ibid* at 11.

198. See online: Parks Canada <http://www.pc.gc.ca/progs/amnc-nmca/cnamnc-cnnmca/gwaiihaanas/itm3-/estab3a_e.asp?all=true> [Parks Canada].

199. "Oil tanker traffic ban sought by B.C. groups," *CBC News* (30 November 2010), online: CBC News <<http://www.cbc.ca/canada/story/2010/11/30/bc-groups-want-ban-on-oil-tanker-traffic.html>>. While catastrophic spills of that magnitude (nearly 11 million gallons in the case of the *Exxon Valdez*) are uncommon, oil spills do happen all over the world. Between 1960 – 1995, there were nearly 1000 spills of at least 10,000 gallons (approximately 37,850 liters) with the greatest number occurring in the Gulf of Mexico (267) and the northeastern United States. See online: NOAA <http://archive.orr.noaa.gov/faq_topic.php?faq_topic_id=1#2>. In Canada, oil tankers have been fined between \$80,000 and \$125,000 for spills off the coast of Nova Scotia. In fact, it was an oil spill that led to the creation of the EDF. See Wruck, *supra* note 170 at 131 and 120, respectively.

200. *Supra* note 43, s 29(1).

201. *Supra* note 43.

202. In that case, Justice Robinson referred to provisions of the 1916 Convention and those contained in an amending Protocol signed by the United States and Canada on 14 December 1995 that signaled the Parties' reasons for protecting migratory birds, found in a schedule to the *MBCA*. See *Carriere*, *supra* note 132 at paras 24-25.

ways in which humans benefit from ecosystems. In the case of the *CNMCAA*, Parliament recognized that “the protection of natural, self-regulating marine ecosystems is important for the maintenance of biological diversity” and that “the marine environment is fundamental to the social, cultural and economic well-being of people living in coastal communities”²⁰³

On their own, such statements say very little about the specific contributions made by marine environments, making a comprehensive assessment of lost use and non-use values difficult. Applying the ecosystem services approach, however, these contributions can be, and have been, catalogued and listed as follows:

- *Provisioning services*: food (primarily fish), bulk raw materials, medicines, and ornamental resources;
- *Regulating services*: nutrient cycling and fertility, air quality and climate regulation, waste treatment, moderation of extreme events (e.g. storm protection);
- *Habitat Services*: maintenance of life cycles (nursery); maintenance of genetic diversity;
- *Amenity and Cultural Services*: recreational services (e.g. eco-tourism); inspiration for culture, art and design; and spiritual experience.²⁰⁴

A similar preliminary listing of services can be made with respect to national parks and rivers, as well as migratory birds and other wildlife.²⁰⁵ Such lists would then need to be revised and quantified, applying the various tools discussed in Part I (e.g., travel cost method, CV, benefit transfer) against the “hard data” found lacking in *Caseley*. In the case of the Gwaii Haanas, such data would include the following:

- More than 370 thousand pairs of seabirds including tufted puffins, rhinoceros auklets, ancient and marbled murrelets nest in Gwaii Haanas [habitat services];

203. *Supra* note 43 (preamble).

204. See e.g. *supra* note 53 at ch 18. See also Charles H Peterson & Jane Lubchenco, “Marine Ecosystem Services” in Daily, *supra* note 25, 177; and Les Kaufman & Paul Dayton, “Impacts of Marine Resource Extraction on Ecosystem Services and Sustainability” in Daily, *supra* note 25, 275.

205. See Brauman et al, *supra* note 29 at 72 (with respect to rivers and their related services). With respect to migratory birds, see the discussion applying the TEEB typology to migratory birds in the *Carriere* case in Part II A, above.

- Seventeen species of whales and dolphins including orcas, humpbacks and grey whales can be seen in the waters of Gwaii Haanas [habitat and cultural services];
- The waters of this MCA support the Haida's traditional harvest of marine resources, as well as commercial fisheries including herring roe-on-kelp (K'aaw), salmon, halibut, rockfish, geoduck clams, and red sea urchin [provisioning and cultural services];
- A large sea lion rookery is located at the southern tip of Gwaii Haanas at Cape St. James [habitat and cultural services];²⁰⁶

Bearing in mind that valuation is a matter best left to the experts, a recent study estimated the benefits of marine protected areas in the United Kingdom at £5.5 to £12.7 billion.²⁰⁷ Similarly (in terms of magnitude and bioregional attributes), lost non-use values resulting from the *Exxon Valdez* spill in Prince William Sound were estimated at a minimum of \$2.8 billion (US).²⁰⁸ While these figures would obviously need to be adjusted downward for all but the worst scenarios (*e.g.*, using the benefit transfer method), it is clear from the above figures that a spill even a fraction of that size could result in millions of dollars in lost provisioning, habitat, and cultural services.

Thus, in addition to furthering the polluter pays principle by ensuring the comprehensiveness of any EDA, an ecosystem services approach would also render sentencing more transparent and accessible, both of which should advance the additional and important goals of uniformity and parity.

iii. Assessing the Risk of Harm

The polluter pays principle is also only partially applicable in the sentencing context in that it is only relevant to the question of actual as opposed to potential environmental harm. The courts in *Cotton Felts*, *United Keno Hill*, and *Kenaston Drilling* all recognized, however, that in many instances the potential environmental harm, both in the specific circumstances of the offence but also more generally with regard to the prohibited conduct, is just as relevant to the objective of deterrence (both specific and general²⁰⁹), if not more so. Such recognition is also reflected in

206. Parks Canada, *supra* note 198.

207. See S Salman Hussain et al, "An ex ante ecological economic assessment of the benefits arising from marine protected areas designation in the UK" (2010) 69:4 Ecological Econ 828 at 836-37.

208. Richard T Carson et al, "Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill" (2003) 25:3 Envtl & Resource Econ 257 at 278.

209. See *Terroco*, *supra* note 122 at para 53 ("A key component of sentences imposed for breaches

the *EEA*. This suggests an even broader role for ecosystem services assessment and valuation than in the civil liability context, where only actual losses are relevant.

As with actual harm, an ecosystem services approach to the risk of harm would render it more transparent, comprehensive, and objective. Its probabilistic nature also highlights the distinction, noted at the outset of this Part, between civil and regulatory liability. In the civil liability context, the goal of EDA (or NRDA in the United States) is compensation, and ecosystem services valuation is carried out to quantify the extent of loss as precisely as possible. In the sentencing context, where EDA is being carried out to quantify the gravity of the aggravating factor (in this case, the risk of damage) with a primary view towards deterrence, whether general or specific or both, judges would seem to have more flexibility. Evidence with respect to the value of ecosystem goods and services associated with the area or conduct in question could then serve as a guidepost for the risk of harm, rather than as a strict determinant.

Suppose, for example, that a corporation released a toxic substance contrary to section 95 of *CEPA, 1999* in the vicinity of the Credit River, near Toronto, and the evidence showed that while the actual release was relatively limited, the accused's conduct created a considerable risk of a much greater release. Suppose further that the Crown introduced expert evidence that the Credit River watershed provides more than \$371 million in ecosystem services to area residents every year.²¹⁰ A sentencing judge would then have an objective guidepost in assessing the risk of harm caused by the accused, bearing in mind several other factors, including the nature, location, and duration of the prohibited conduct and its potential to cause ecosystem service losses.

As another example, this time with a view towards general deterrence, the Court in *R v Carriere* observed that while the illegal taking of 159 ducks had no significant impact on the duck populations of either the Cumberland Marshes or North America as a whole,

[t]he sustained health of North America's wild duck population depends on the co-operation of the governments and peoples of three different countries-Canada, the U.S. and Mexico. That co-operation is not just restricted to the regulation of sport hunting, but regulation of sport hunting is key to maintaining duck populations. ... If every hunter took the view that he could double his legal limit, the annual

of environmental protection statutes should be specific and general deterrence"). See also *R v Sapp*, 2005 BCPC 166 at para 9, [2005] BCWLD 3945. "It must be recognized that even if there had been little or no actual harm ... there would still have been harm done to the processes designed to regulate and generally manage the environment and natural resources" (*ibid* at para 16).

210. Pembina Institute, *supra* note 144 at 1.

duck hunt would potentially result in 30 million ducks killed. Perhaps the ducks could take this pressure for a short while. However, as the examples of the passenger pigeon and the whooping crane illustrate, sustained overhunting would likely lead to devastation.

Of course, one person breaking the law will not necessarily cause everyone to follow suit ... [b]ut the potential exists for one person's breaches to encourage an ever widening disregard for the rule of law.²¹¹

As noted above, Justice Robinson was "left to assume that ducks have a significant value ... without having any precise figure for what that value might be."²¹² It is possible, however, to assess the economic value of particular species, as has been done recently for polar bears²¹³ and Atlantic salmon.²¹⁴ The value of the former was estimated at over \$6 billion per year, primarily as a reflection of non-use values. In the sentencing context, such figures can provide an objective benchmark against which the risk of harm can be measured.

iv. The Potential for Higher Fines

As the above examples suggest, an ecosystem services approach to environmental sentencing has the potential to increase—perhaps even significantly—the size of the fines imposed by judges. It is relevant, then, that in passing the *EEA*, Parliament clearly intended environmental offences to attract higher fines:

Current fines are too low to be effective deterrents. Furthermore, they do not adequately express society's strong disapproval of environmental offences. ...

To put this in perspective, we need to consider that penalties for environmental offences in the United States often reach millions of dollars. Bill C-16 would address this issue by providing guidance to the courts in appropriate fines for introducing minimum fines, requiring courts to consider aggravating factors and increasing most of the minimum and maximum fines [*sic*].²¹⁵

211. *Carriere*, *supra* note 132 at paras 46-47.

212. *Ibid* at para 27.

213. "What is the price of a polar bear?" *CBC News* (17 December 2010), online: CBC News <<http://www.cbc.ca/news/canada/story/2010/12/17/pricing-polar-bears.html>>. See Environment Canada, Evidence of the Socio-Economic Importance of Polar Bears for Canada by ÉcoRessources Consultants (Ottawa: Environment Canada, 2011) (final report).

214. Charlene MacKenzie, "Study tracks true value of salmon; Research Miramichi one of four rivers looked at to determine impact of fishing industry," *Telegraph-Journal* (20 June 2011) A1, online: Telegraph-Journal <<http://telegraphjournal.canadaeast.com/front/article/1416596>>.

215. *House of Commons Debates*, *supra* note 2 at 1823 (Mark Warawa). These increases would seem to bring Canadian penalties within the same range as many American ones: see Markell,

All other things being equal, this means that an offence that would have previously merited a \$50,000 fine should be met with a higher fine, post-*EEA*. Of course, setting a fine is a multifaceted exercise and environmental damage (and the risk thereof) is only one, albeit important, aggravating factor. But if one of the drivers motivating the higher fine regime was a growing understanding of the extent and severity of the damages that environmental offences can cause,²¹⁶ then an ecosystem services approach—whose very reason for being is to reveal the numerous, often hidden ways in which ecosystems contribute to societal well-being—is especially well-suited for achieving such higher fines in a manner that is fair and, as noted by the EPA-SAB, transparent and accessible.

The availability of higher fines should also change the cost-benefit analysis with respect to the appropriateness of carrying out ecosystem services assessment and valuation. That the cost of valuation can deter parties from carrying it out is widely recognized, including in Canada.²¹⁷ As discussed in Part I, this reality has led to the creation of several low-cost methods for assessing harm pursuant to *CERCLA* Type A procedures and as developed by several states. Such tools would be welcome for minor offences in the Canadian regulatory context as well, but where the actual damage is significant or where the evidence establishes a risk of significant environmental damage, the costs of ecosystem services assessment and valuation might be offset by the potential for a higher fine. And while the *EEA*—in contrast to *CERCLA*—is silent with respect to the costs of assessment as a component of environmental damage, it seems to leave room for the Crown to seek a recommendation from the court that portions of any EDF-destined fine be used to reimburse the government for assessment costs already incurred.²¹⁸ Alternatively, bearing in mind the funding structure of the EDF,²¹⁹ the Crown might be able to introduce a preliminary assessment of damages and a relatively comprehensive estimate of the costs of a more detailed assessment and restoration, which would then be available for those purposes through the EDF.²²⁰

supra note 189 at 561. Markell writes:

Under many of the significant regulatory statutes, EPA can impose substantial penalties — up to \$32,500 per day, per violation. ... If the regulated party has committed three different violations of the Clean Water Act for a month, the total maximum potential penalty increases to \$2,925,000 (\$975,000 x three).

216. See Environment Canada, *supra* note 184.

217. See Elgie & Lintner, *supra* note 15 at 256-57.

218. See *e.g.* *CNPA*, *supra* note 148, s 29.1(2).

219. The EDF does not appear to distinguish between assessment costs and the costs of restoration: see EDF website, *supra* note 170 (under “Potential Applicants”).

220. But see Wruck, *supra* note 170 at 134. He observes, “An area where polluters have in the past been highly suspicious of government is in the field of environmental research. One common

v. *The Environmental Damages Fund*

The EDF directs funds, received as a result of fines, to projects that benefit the environment in the geographic region where the original incident occurred. Although priority is given to restoration projects, other projects that “develop environmental damage assessment and restoration methods including techniques for the valuation of damage” are given equal consideration in cases where little or no actual damage has occurred.²²¹

The literature is replete with references to data limitations, especially with respect to baseline conditions.²²² Professor David Markell argues that the use of Supplemental Environmental Projects (SEPs) and other enforcement tools to fill these gaps would enable the EPA “to shift the burden of doing much of this ecosystem-beneficial work to the regulated community. . . . Enforcement offers an opportunity for environmental progress and new learning that, quite simply, is not likely to occur if it were dependent entirely on government resources and initiatives.”²²³

The direction of fines to the EDF—especially in those instances where there is little actual damage but the risk of ecosystem services losses warrants a significant fine—presents a similar opportunity. This opportunity takes on additional significance in light of the Canadian government’s commitment, included in its first legislatively-mandated sustainable development strategy, to develop and apply models for ecosystem services valuation by 2015.²²⁴ In addition to facilitating the gathering of baseline data, such work could examine recent recommendations made in the United States regarding the development of “ecosystem service assessment endpoints” for the purposes of ecological risk assessment.²²⁵ ERA is a fundamental part of the remediation process under *CERCLA* for sites that are so contaminated that they qualify for Superfund moneys and can be remediated without awaiting a trial award. As noted in Part I, ecosystem services have been advanced as a “common currency” that could facilitate the integration of

complaint is that the monies are often needlessly spent by government scientists attempting to engage in research for the purpose of pursuing their own pet projects.”

221. EDF Website, *supra* note 170 (under “Potential Applicants”).

222. Markell, *supra* note 189 at 571-72. For a Canadian example, see Nature Conservancy of Canada, *supra* note 36 at 26.

223. Markell, *supra* note 189 at 554.

224. Canada, Sustainable Development Office, *Planning For A Sustainable Future: A Federal Sustainable Development Strategy For Canada* (Ottawa: Environment Canada, 2010) at 55 [Sustainable Development Office].

225. Munns Jr et al, *supra* note 33 at 502.

ERA and damages assessment.²²⁶ Such research would be particularly relevant for certain departments, such as the Department of Fisheries and Oceans and Environment Canada, which often order remedial work through administrative powers prior to taking enforcement action.²²⁷ Qualifying research would also include further research into the various tools discussed in Part I (including HEA and benefit transfer), as well as the emerging concept of ecological production function (EPF), which describes “the relationships between the structure and function of ecosystems, on the one hand, and the provision of various ecosystems services, on the other.”²²⁸

2. CHALLENGES FACING ECOSYSTEM SERVICES-BASED EDA

Perhaps the most obvious objection to ecosystem services-based EDA is that neither the *EEA* nor any of the statutes that it amends make any reference to that term. Although such a reference would be welcome, its omission should not be viewed as excluding it. As a conceptual framework accompanied with a set of methodologies, ecosystem services-based EDA is merely the means by which lawyers and judges can accomplish the more important and legislatively determined end (*i.e.*, the consideration of lost use and non-use values), considering that Parliament understandably expressed no view as to the manner by which this should be accomplished. It is also worth recalling that the regulations under *CERCLA* and *OPA* rely on the concept of ecosystem services notwithstanding the absence of this term from either statute, and further that these schemes represent the gold standard for natural resource damages assessment and valuation.

Constitutional questions and the uncertain prospect of enforcement are more serious obstacles to ecosystem services-based EDA in Canada.

i. Constitutionality

The *EEA*'s damage provisions are likely to be challenged on constitutional grounds as an encroachment on the provinces' civil jurisdiction over property and civil rights.²²⁹ Such a challenge is unlikely to succeed. The analysis is complicated

226. *Ibid* at 501.

227. Hughes & Reynolds, *supra* note 121 at 116.

228. *EPA*, *supra* note 33 at 30. The report also suggests that “[t]hese functions capture the biophysical relationships between ecological systems and the services they provide, as well as the inter-related processes and functions, such as sequestration, predation, and nutrient cycling” (*ibid* at 30). See also NRC Report, *supra* note 51 at 3.

229. See *R v Zelensky*, [1978] 2 SCR 940, 86 DLR (3d) 179. See also *House of Commons Debates*, 40th Parl, 2d Sess, No 31 (23 March 2009) at 1827 (David McGuinty). McGuinty stated: “The court may indeed order compensation and restoration payments. I believe there will

somewhat by the fact that the *EEA*'s environmental damage provisions are not part of a statutorily authorized compensation or civil liability scheme but rather are subsumed in a list of aggravating factors within a fine regime. Nevertheless, a future accused facing a large fine is likely to emphasize the civil liability character of these provisions and argue substance over form. Both *CERCLA* and the *OPA* are civil liability schemes, after all.

Even if the EDA provisions are considered tantamount to an authorized compensation or civil liability scheme, they are unlikely to be found *ultra vires*. Subsection 42(3) of the federal *Fisheries Act*, discussed in Part II (which attaches liability for losses resulting from a deposit of deleterious substances), was challenged unsuccessfully on such grounds in *Gagnier and Hope Point Fishing Company Ltd v Canadian Forest Products Ltd*.²³⁰ Relying on the Supreme Court of Canada's decision in *General Motors of Canada Ltd v City National Leasing*,²³¹ the court applied the following three-part test:

[F]irst, a determination of whether the impugned provision does encroach on provincial powers; second, in a case like the present one, a determination of whether it is a valid part of a regulatory scheme; and third, if the scheme is valid, a determination of whether the impugned provision is "sufficiently integrated" with or "functionally related" to the scheme.²³²

Although a detailed exploration of this question is beyond the scope of this article, it seems clear that no serious challenge could be made to the damage provisions of those *EEA*-amended statutes that deal with federal lands, whether national parks or marine conservation areas. As for the others, the damage provisions of each statute are tailored to the attribute of the environment that is the subject of federal jurisdiction. For example, the relevant provisions of the *MBCA* are not concerned with the environment generally, but with the loss of use and non-use values associated with migratory birds and their nests.²³³ Such provisions seem

be questions about constitutionality." Readers should note that such a challenge would be to the EDA provisions of the *EEA* generally, and would not be specific to an ecosystem services approach.

230. (1990), 51 BCLR (2d) 218, 23 ACWS (3d) 1040 (BCSC) [*Gagnier*].

231. [1989] 1 SCR 641, 58 DLR (4th) 255 [*General Motors*].

232. *Gagnier*, *supra* note 230 at 225. Readers may be interested to know that Mr. Gagnier was ultimately unsuccessful in his action. Agreeing with defence counsel that "Mr. Gagnier ... will lie when it is to his economic advantage to do so," the Court felt "bound to disregard Mr. Gagnier's evidence altogether insofar as it touches on his claim for damages. Without his evidence, the ... claims for damages must fail." See *Gagnier v Canadian Forest Products Ltd*, 1991 CanLII 143 at 17-18 (BCSC).

233. *Supra* note 5, s 13.1.

sufficiently integrated and functionally related to the protection of migratory birds to withstand constitutional scrutiny.

ii. Enforcement and Implementation

A greater uncertainty with respect to ecosystem services-based EDA, or any EDA for that matter, is the likelihood of implementation and enforcement. As noted by Professor David Boyd, “[o]n paper, Canada has many seemingly impressive environmental laws. In practice, key elements of these laws are rarely, if ever, implemented.”²³⁴ While this issue was raised by several MPs during the debate on the *EEA*, perhaps the clearest statement of the problem was made by Bloc Quebecois MP Bernard Bigras:

It is all well and good to want to change the fine structure, but the current laws must be enforced. I have been a member of this House since 1997, and I have seen a number of environmental laws enacted in Canada... But the fact is that we lack the resources to enforce these acts. We can give officers more power, but there are very few officers on the ground to enforce the law.²³⁵

Although EC, and its Atlantic region in particular, already have a recognized capacity to conduct EDA,²³⁶ they do not appear to have the same kind of institutional support as their American counterparts (*e.g.*, the NOAA’s DARRP). The Conservative government’s 2008 budget allocated an additional \$21 million to EC over two years for the implementation of the stricter enforcement regime that the *EEA* was expected to bring,²³⁷ but it will take several years before an increase in enforcement, if any, will be measurable. In the meantime, recent reports by the federal Commissioner for the Environment and Sustainable Development and Ecojustice suggest an opposite trend.²³⁸

III. CONCLUSION

Justice Binnie, writing for the majority in *Canfor*, observed that “[if] justice is to be done to the environment, it will often fall to the Attorney General, invoking both

234. David R Boyd, *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (Vancouver: UBC Press, 2003) at 237.

235. *House of Commons Debates*, 40th Parl, 2d Sess, No 33 (25 March 2009) at 1943 (Bernard Bigras).

236. Wruck, *supra* note 170 at 138.

237. Parliamentary Information and Research Service, *supra* note 4 at 35.

238. See Canada, Office of the Auditor General of Canada, *2011 December Report of the Commissioner of the Environment and Sustainable Development* (Ottawa: Office of the Auditor General, 2011), online: Office of the Auditor General <http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201112_e_36027.html>.

statutory and common law remedies, to protect the public interest.”²³⁹ *Canfor* was an example of the latter kind of remedy. While the Attorney General for British Columbia was ultimately unsuccessful, the Court’s decision was widely received as having increased the potential for the common law “to assist in the realization of the fundamental value of environmental protection.”²⁴⁰

Environmental sentencing in the post-*EEA* world is an example of the former kind of remedy mentioned by Justice Binnie. The inclusion of lost use and non-use values within the definition of environmental damage should similarly be viewed as having increased the potential of federal environmental legislation to assist in achieving that same important goal. In order to realize this potential, however, any assessment of environmental damages, including potential damages, must be as comprehensive as possible and must not overlook the numerous, often hidden ways through which the environment, or natural capital, sustains human well-being and prosperity. This was and continues to be the impetus for ecosystem services research, which is why this article explored the potential for ecosystem services-based EDA.

There are several factors favoring the incorporation of an ecosystem services approach to EDA. These include the Canadian judiciary’s existing approach to environmental sentencing (particularly the established role of expert evidence in determining harm), the incorporation of restoration and the polluter pays principle as objectives in sentencing, the recognized importance of the *risk* of harm in achieving deterrence, the higher fine regime, and finally, the flexibility and efficiencies gained by directing fines to the EDF.

A useful first step in this direction would be to begin gathering necessary baseline information. It should be relatively easy, for example, to assess and then update periodically the ecosystem services provided by Canada’s national parks and marine conservation areas. This information would undoubtedly be useful for some federal government departments independent of its potential future use in prosecuting offences.²⁴¹ As noted, it is also possible to assess the economic value of particular species. Once conducted, such assessments could be applied in multiple cases, instead of undertaking separate valuations in each case. Such efforts could thus result in considerable cost savings, with implications for the cost-benefit analysis of ecosystem services assessment and valuation discussed above.

239. *Canfor*, *supra* note 9 at para 8.

240. *Ibid* at para 155.

241. One might reasonably assume that Parks Canada or DFO would be the principal parties interested in such valuation, which could then be provided to the Public Prosecution Service of Canada (PPSC).

Ecosystem services may not be an environmental law and policy panacea, but a “[f]ailure to refine our understanding of their value, and the consequent inability to account for those values ... is unlikely to promote their conservation.”²⁴² This sentiment, directed towards regulatory and market settings, seems equally applicable to environmental sentencing. Accounting for ecosystem services losses in this latter context would be an ambitious project, and would require a clear commitment on the part of both the federal government and the judiciary. As noted, however, Canada has already committed to developing and applying models for ecosystem services valuation²⁴³ and members of its judiciary have committed “to boldly and fearlessly implement and enforce” its environmental laws.²⁴⁴ Considering also that such an approach would facilitate the understanding, protection, and restoration of ecosystem services in other contexts,²⁴⁵ the case for ecosystem services in environmental sentencing is overwhelming.

242. Ruhl, Kraft & Lant, *supra* note 24 at 31.

243. Sustainable Development Office, *supra* note 224.

244. Johannesburg Principles, *supra* note 185.

245. Markell, *supra* note 189 at 572.