ECOSYSTEM SERVICES: UNIFYING ECONOMIC EFFICIENCY AND ECOLOGICAL STEWARDSHIP VIA NATURAL RESOURCE DAMAGE ASSESSMENTS UNDER CERCLA

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"Give Me Liberty. I've Already Got Death."[1]
- sign posted by a Love Canal resident

INTRODUCTION

Love Canal, New York, earned its name from William T. Love, who purchased the land on the banks of the Niagara River in hopes of building a model community.[2] But by 1910 Mr. Love's plans had faltered, and the land was subsequently sold to the Hooker Chemical Company as a waste site.[3] By 1953, and after decades of accumulating industrial, military, and municipal waste, the land harbored 21,000 tons of toxic materials stored in barrels beneath the soil.[4] A hard clay basin that had been the aborted beginnings of Mr. Love's canal surrounded the barrels.[5] That same year, the property was sold for one dollar to the Niagara Falls City School District, which needed land to build new schools for the expanding Albany population.[6] School construction ultimately damaged the clay basin, exposing the buried waste to the open air while subsequent roadway development undermined the land's ability to direct rainwater away from the toxin-laced barrels.[7]

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1 Eckardt C. Beck, *The Love Canal Tragedy*, EPA J., Jan. 1979, at 17, 17.

2 *Id.*

3 *Id.*; Beverly Paigen, *Controversy at Love Canal*, HASTINGS CENTER REP., June 1982, at 29, 29.

4 Paigen, *supra* note 3, at 29.

5 *Id.*

6 *Id.*

7 *See* ELIZABETH D. BLUM, LOVE CANAL REVISITED: RACE, CLASS, AND GENDER IN ENVIRONMENTAL ACTIVISM 24-25 (2008) (discussing how high levels of precipitation saturated the ground in the Niagara Falls area); *see generally* Eric Zuesse, *Love Canal: The Truth Seeps Out*,

In the 1970s, chemicals began seeping into adjacent properties, polluting the land and basements of homeowners who knew nothing about the history of the Love Canal site.[8] A mix of caustic chemicals, chlorinated hydrocarbons, and benzene was finding its way into homes, killing plant life, infiltrating drinking water, and giving the entire neighborhood an acrid, burning smell.[9] Children returned home with burns to their hands and faces after playing outside.[10] Birth defects became unusually common, and cancer rates began to increase among Love Canal residents.[11]

By 1978, the deteriorating conditions at the Love Canal site were spurring public concern and dire warnings from inspectors when record springtime rainfalls triggered an explosion.[12] Subsequent waste leakage created a public health emergency, and the citizens of Love Canal were relocated at government expense.[13]

The cleanup took twenty-one years, although the efficacy of that effort remains far from certain.[14] While questions have been raised about the earliest human impact statistics, recent studies confirm elevated levels of cancer among former Love Canal residents.[15] The infant mortalities and birth defects from the time stand as evidence of the direct human costs of imprudent environmental stewardship, and nearby residents continue to report illnesses with possible connections to the toxins underground.[16] Ten years after the explosion and subsequent evacuation, the New York Health Department Commissioner stated that Love Canal stood as a "national symbol of a failure to exercise a sense of concern for future generations."[17]

Motivated in no small part by the events at Love Canal, Congress passed the Comprehensive Environmental Response, Compensation, and

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REASON, Feb. 1981, at 16 (detailing how the damage done by the school construction first allowed chemicals to seep out of their barrels).

8 Beck, *supra* note 1, at 17.

9 *Id.*; Paigen, *supra* note 3, at 29.

10 Beck, *supra* note 1, at 17.

11 *Id.*; Paigen, *supra* note 3, at 30-31.

12 Beck, *supra* note 1, at 17-18.

13 *Id.*

14 Anthony DePalma, *Love Canal Declared Clean, Ending Toxic Horror*, N.Y. TIMES, Mar. 18, 2004, at A1 (noting the removal of Love Canal from the Superfund site listings); Charlie Specht, *Love Canal Crisis Grips Residents Once Again*, BUFF. NEWS (Nov. 16, 2012, 12:54 AM), http://www.buffalonews.com/apps/pbcs.dll/article?AID=/20121116/CITYANDREGION/121119449/1003 (noting ongoing complaints of waste leakage into homes within and beyond the originally affected neighborhoods).

15 Lenore J. Gensburg et al., *Cancer Incidence Among Former Love Canal Residents*, 117 ENVTL. HEALTH PERSP. 1265, 1269 (2009).

16 Specht, *supra* note 14 (discussing ongoing health issues of former Love Canal residents and citizens presently living in the surrounding neighborhoods).

17 Sam Howe Verhovek, *After 10 Years, the Trauma of Love Canal Continues*, N.Y. TIMES, Aug. 5, 1988, at B1 (quoting Dr. David Axelrod, then commissioner of the New York State Health Department) (internal quotation marks omitted).

Liability Act of 1980 ("CERCLA").[18] CERCLA empowered the federal government to take immediate remedial steps in cases of industrial pollution and its consequent impact on the environment, while encouraging systematic, efficient, and cost-effective approaches to redressing human-caused environmental deprivation.[19] The resulting program, most commonly known as "Superfund," currently addresses environmental restoration at more than 1,500 sites and continues to create both solutions and controversies at the intersection of economic efficiency, development, and environmental protection.[20]

From the law's inception, land trustees (typically states acting as plaintiffs in CERCLA actions), environmental scientists, and industry experts have criticized CERCLA and its associated Department of the Interior ("DOI") regulations.[21] CERCLA faces such broad criticism because it seeks to balance a complex interplay between science, economics, and prudence at the heart of its attempt to redress industrially derived environmental pollution. In trying to balance and prioritize these competing forces, CERCLA is restoration-focused and efficiency-minded.[22] CERCLA also requires that any regulations be reviewed every two years to update procedures for identifying and funding needed recovery efforts.[23] Despite these clear goals and commands, the regulations have been slow to change, and while calls for reform mount from the scientific and legal community, courts continue to struggle with regulations initially constructed in the ecological and economic science of the 1980s.[24]

One area where CERCLA regulations remain vulnerable to criticism is in the methodologies for performing natural resource damage assessments. As part of the damages awards permissible under CERCLA, damage assessments use either a simplified "Type A" methodology, where trustees provide a minimal amount of data to a computer model, or "Type B" methods, intended to address more complex settings where a simplified methodology will not suffice.[25] These methodologies were the subjects of early, defining litigation as well as many subsequent battles in the halls of aca-

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18 Patrick E. Tolan, Jr., *Natural Resource Damages Under CERCLA: Failures, Lessons Learned, and Alternatives*, 38 N.M. L. REV. 409, 409 (2008).

19 Sanne H. Knudsen, *Remedying the Misuse of Nature*, 2012 UTAH L. REV. 141, 184-85.

20 U.S. ENVTL. PROT. AGENCY, EPA'S 2008 REPORT ON THE ENVIRONMENT 4-45 (2008), *available at* http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=485027.

21 *See generally* Ohio v. U.S. Dep't of the Interior, 880 F.2d 432 (D.C. Cir. 1989).

22 *See infra* Part II.A.

23 42 U.S.C. § 9651(c)(3) (2006).

24 *See, e.g.*, SCI. ADVISORY BD., U.S. ENVTL. PROT. AGENCY, VALUING THE PROTECTION OF ECOLOGICAL SYSTEMS AND SERVICES 88-90 (2009) [hereinafter EPA SAB REPORT] (recommending changes to EPA's handling of CERCLA cases and the application of ecosystem services); *see also* Tolan, *supra* note 18, at 411-12 (noting ongoing calls for regulatory reform).

25 42 U.S.C. § 9651(c)(2).

demia, in the courts, and within settlement hearings.[26] The Type B methods in particular give rise to classic "battles of the experts" in part because CERCLA and DOI regulations permit the use of any methodology trustees deem fit so long as it is reliable and cost effective and meets certain basic requirements and reporting standards.[27]

Despite a history of difficult litigation and lack of regulatory progress, CERCLA's goals of environmental restoration and economic efficiency remain legislatively intact and represent an opportunity to embrace recent advances in environmental science and economics embodied under the umbrella concept of ecosystem services ("ESS"). ESS does not represent a single methodology but rather a fundamentally different conception of natural resource valuation.[28] Rather than looking piecemeal at each physical resource, ESS looks directly at the beneficial provisioning services provided by the interdependent capabilities of those resources.[29] As such, ESS provides key and previously missing insights into the environment's total value to human society and allows scientists and economists to draw increasingly agreed-upon quantitative conclusions useful to environmental, legal, policy, and industrial decision makers.[30]

Although it enjoys broad acceptance and proven efficacy, ESS has not been integrated into CERCLA's regulatory regime despite numerous calls for its adoption, including from the Environmental Protection Agency ("EPA") Science Advisory Board.[31] This Comment examines a way of overcoming this perceived impediment to applying ESS to CERCLA natural resource damage assessments. Specifically, this Comment explores how courts and litigants can promote legal and scientific progress in defense of CERCLA's principle goals through the application of ESS without awaiting regulatory reform. Such an approach is explicitly permitted by CERCLA, has been recognized by the courts, and can be seen in the DOI's adoption of an earlier methodology under CERCLA known as Habitat Equivalency

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26 Sanne Knudsen, *A Precautionary Tale: Assessing Ecological Damages After the* Exxon Valdez *Oil Spill*, 7 U. ST. THOMAS L.J. 95, 114-17 (2009) (discussing the complexities and controversies surrounding CERCLA damage claims both generally and in settlement actions).

27 42 U.S.C. § 9651(c)(2); 43 C.F.R. § 11.83(a)(3) (2011) (requiring that any methods employed be "feasible and reliable," "be performed at a reasonable cost," "avoid double counting," and be "cost-effective"); *id.* § 11.83(b)(3) (allowing alternative methods as long as they are "standard and accepted"); *id.* § 11.83(c)(3) (permitting the use of alternative methods from those prescribed in the regulations).

28 *See* James Salzman, *A Field of Green? The Past and Future of Ecosystem Services*, 21 J. LAND USE & ENVTL. L. 133, 151 (2006).

29 J.B. Ruhl & James Salzman, *The Law and Policy Beginnings of Ecosystem Services*, 22 J. LAND USE & ENVTL. L. 157, 157-59 (2007).

30 *Id.* at 163-65 (reviewing a number of disciplines and governmental entities embracing ecosystem services for policy and project decision making).

31 *Compare* 43 C.F.R. § 11.83(c)(2) (providing a nonexclusive list of approved methodologies permitted under CERCLA), *with* EPA SAB REPORT, *supra* note 24, at 88 (encouraging the use of ecosystem services under CERCLA).

Analysis ("HEA"). By embracing ESS now, courts and litigants will advance CERCLA's primary objective of restoration; encourage cooperative settlement; and improve economic efficiency. By introducing ESS into CERCLA natural resource damage assessments, all participants will begin moving the work of the courts away from outdated methodologies and their inefficient, unwieldy impact on CERCLA's adjudicative process.

Part I of this Comment reviews the emergence and development of CERCLA and the critical cases that have come to frame our interpretation of CERCLA's natural resource damage provisions. Part II discusses three primary goals of CERCLA as defined by the legislation itself and the courts, and then examines how current methodologies fail to meet those goals. Part III examines legal opportunities through which courts and litigants can move beyond current methodologies and toward the application of ESS. Part IV then presents possible normative outcomes of adopting ESS and is followed by a brief conclusion.

I. THE BEGINNINGS OF CERCLA AND ITS CURRENT REGULATORY FRAMEWORK

CERCLA was intended to allow the federal government to respond quickly to public health emergencies created by chemical spills and hazardous waste sites.[32] The goal was the restoration of damaged lands while ensuring that the costs of restoration were neither unbearable nor ultimately borne by taxpayers.[33]

A. *The Basic Structure of CERCLA's Approach to Redressing Environmental Harm*

CERCLA is better known as "Superfund," and the law is intended to allow immediate cleanup using a federally maintained budgetary fund.[34] Based on a "polluter pays" principle, responsible parties are held liable for cleanup costs.[35] CERCLA empowers the government to recoup all costs

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32 New York v. West Side Corp., 790 F. Supp. 2d 13, 20 (E.D.N.Y. 2011) (outlining the basic intent of CERCLA); Tolan, *supra* note 18, at 409.

33 *West Side*, 790 F. Supp. 2d at 20; *see also* H.R. REP. NO. 99-253, pt. 4, at 49-50 (1985), *reprinted in* 1986 U.S.C.C.A.N. 3068, 3079-80 [hereinafter HOUSE REPORT].

34 42 U.S.C. § 9611(a) (2006) (detailing the permissible uses of the Superfund); *West Side*, 790 F. Supp. 2d at 20 (describing the purposes of CERCLA); David B. Spence, *Imposing Individual Liability as a Legislative Policy Choice: Holmesian "Intuitions" and Superfund Reform*, 93 NW. U. L. REV. 389, 390 (1999) (noting the common use of "Superfund").

35 United States v. Capital Tax Corp., 545 F.3d 525, 530 (7th Cir. 2008) (describing "polluter pays" liability under 42 U.S.C. § 9607 (internal quotation marks omitted)); *see also* 42 U.S.C. § 9607(a).

associated with the removal of toxic materials and restoration of the site from responsible parties.[36]

CERCLA encourages both rapid response to emergencies such as Love Canal and long-term solutions that fully restore the environment, seeking to do so in the most economically efficient way.[37] CERCLA also grants the executive branch the authority to establish all regulations required to enact those goals.[38] The law requires biannual regulatory review and the use of the best available methods and states that all damages assessments must take into account but "not [be] limited to . . . replacement value, use value, and [the] ability of the ecosystem or resource to recover."[39] The executive branch also has the authority to enter into settlement agreements, offer liability limits, and provide covenants not to sue in order to encourage all settlements that are in the public interest.[40] CERCLA is notable for imposing joint, strict, and several liability on responsible parties.[41] Because of the potential scale of liability, significant litigation resources are spent on determining whether or not a particular CERCLA defendant qualifies as a "potentially responsible party" under the law.[42]

B. *CERCLA's Natural Resource Damage Assessment Provisions*

Another contentious aspect of CERCLA is natural resource damage assessments, through which trustees determine the extent of environmental damage and the costs of restoration.[43] CERCLA states that trustees may recover damages to natural resources and that all sums recovered may be used only to "restore, replace, or acquire" lost natural resources and services.[44] While all sums recovered must be applied to restoration efforts, monetary damages are not limited to the cost of restoring or replacing the

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36 42 U.S.C. § 9607(a); *see also West Side*, 790 F. Supp. 2d at 20.

37 42 U.S.C. § 9604 (outlining executive response authority); *id.* § 9607(a)(4)(C) (establishing the protocols and scope of liability); Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 456 (D.C. Cir. 1989); *see also* HOUSE REPORT, *supra* note 33, at 50.

38 42 U.S.C. § 9615.

39 *Id.* § 9651(c)(2)-(3).

40 *Id*. § 9622 (a), (c), (d)(2), (f).

41 Tolan, *supra* note 18, at 409.

42 *See* 42 U.S.C. § 9607(a)(1)-(4) (outlining the scope and extent of CERCLA liability); *id.* § 9613(f) (describing contributory liability under CERCLA); *see generally* William D. Evans, Jr., *The "Cape Fear" Features of Superfund Contribution Litigation: The Available Remedies and Extent of Liability*, 75 MICH. B.J. 1170 (1996) (providing an explanation of CERCLA liability and the history giving rise to the same).

43 *See generally* James L. Nicoll, Jr., *Marine Pollution and Natural Resource Damages: The Multi-Million Dollar Damage Award and Beyond*, 5 U.S.F. MAR. L.J. 323 (1993) (providing "a brief survey of the principles of natural resource damage claims under federal law").

44 42 U.S.C. § 9607(f)(1).

physical resources themselves.[45] This liability extension is meant to allow recovery of damages suffered by the public in the form of lost use of the injured resources.[46] In all cases, the calculation of those sums is to be derived by one of two general approaches: a simplified method for smaller spills, and a more open-ended set of protocols and methods for complex situations that require on-site study and testing.[47] Named after their relevant paragraph in the code, "Type A" tests are for the more simplified contexts, while "Type B" are reserved for more complicated settings.[48] Much of the controversy in natural resource damage assessments stems from the selection and execution of different Type B methodologies that can yield widely varied results, creating uncertainty and confusion for litigants and the courts.[49]

In 1986, while regulations were still being drafted, Congress reauthorized CERCLA via the Superfund Amendments and Reauthorization Act ("SARA").[50] SARA made the law permanent and clarified the language of some central provisions.[51] The SARA revisions also amended several aspects of the legislation, including the addition of a rebuttable presumption of accuracy for any claim by state or federal trustees based upon methods specified under duly promulgated regulations.[52]

C. *Department of the Interior's First CERCLA Regulations Prior to* Ohio v. DOI

Congress expected CERCLA's regulations to be generated by the EPA, but President Ronald Reagan chose to assign regulatory authority to the DOI instead.[53] The regulatory process took nearly three years, by which time the DOI had exceeded CERCLA's deadline for issuing final regulations.[54] The DOI's regulations established a number of parameters for Type B assessments, listing a prescribed but nonexclusive set of allowable as-

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45 *Id*.

46 HOUSE REPORT, *supra* note 33, at 50.

47 42 U.S.C. § 9651(c)(2).

48 *Id*.

49 *See infra* Part II.B-.C.

50 Tolan, *supra* note 18, at 413.

51 H.R. REP. NO. 99-253, pt. 1, at 54-56 (1985), *reprinted in* 1986 U.S.C.C.A.N. 2835, 2836-38.

52 *Id.*; Tolan, *supra* note 18, at 413.

53 Duane Woodard & Michael R. Hope, *Natural Resource Damage Litigation Under the Comprehensive Environmental Response, Compensation, and Liability Act*, 14 HARV. ENVTL. L. REV. 189, 206 (1990).

54 Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 440 (D.C. Cir. 1989).

sessment methodologies.[55] Trustees were permitted to use valuations based upon market-derived as well as non-market-derived damages estimates, although the regulations favored the use of market-derived assessments.[56] The "rebuttable presumption" from SARA was also integrated by granting the presumption to any method performed by a state or federal trustee which fulfilled basic methodological requirements and adhered to certain reporting protocols.[57] Plaintiffs were free to choose alternative methods as long as they were standard and accepted methods of cost and value estimation, but in so doing risked losing any potential benefit from the rebuttable presumption.[58]

The DOI's regulations also sought economic efficiency through requiring the use of cost-effective assessment methodologies and by limiting the impact of those assessments on damage awards.[59] The limitation of damages was principally implemented through a "lesser of" rule.[60] The rule required basing damages on the lesser of restoration costs or diminution of value.[61] The regulations also provided for a hierarchy of valuation methods when calculating natural resource damages.[62] The hierarchy preferred market-derived valuations first and allowed the use of non-market-derived methods, including contingent valuation ("CV"), only when market-derived measures were determined to be inappropriate by officials conducting the damage assessments.[63]

In another attempt to avoid inefficient outcomes, the DOI narrowly interpreted CERCLA's provisions for capturing non-use losses, which are losses suffered by the public that stem from potential and future, rather than actual and present, uses.[64] Under the DOI's regulations, damages for non-use losses could only include "[c]ommitted use[s]," which were defined as "a current public use; or a planned public use of a natural resource for which there is a documented legal, administrative, budgetary, or financial commitment established before the discharge [of hazardous waste]."[65]

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55 *See* 43 C.F.R. § 11.60 (1987) (describing the regulation's purpose of identifying damage assessment methodologies for Type B assessments); *id.* §§ 11.81-.84 (detailing allowable damage assessment methodologies).

56 *Compare id.* § 11.83(c)(1), *with id*. § 11.83(d)(1).

57 *Id*. § 11.91(c).

58 *See id.*; Patrick H. Zaepfel, *The Reauthorization of CERCLA NRDs: A Proposal for a Reformulated and Rational Federal Program*, 8 VILL. ENVTL. L.J. 359, 372 (1997) (noting the regulatory compliance requirement for being able to invoke the rebuttable presumption and explaining that noncompliant methods can be used but will not be afforded any presumption of accuracy).

59 43 C.F.R. § 11.35(b)(2).

60 Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 441-42 (D.C. Cir. 1989) (describing both parties' arguments on how to interpret the relevant statutory language).

61 43 C.F.R. § 11.83(d).

62 *Id*. § 11.83(c)(2), (d)(1); *see also Ohio*, 880 F.2d at 462.

63 *Supra* note 62.

64 *See* 43 C.F.R. § 11.84(b)(2).

65 *Id*. § 11.14(h).

D. *The Case of First and Lasting Impression:* Ohio v. DOI

Even before the DOI's regulations were issued, and well before the 1986 SARA amendments, a long list of litigants sought to challenge various aspects of the emerging regulations.[66] The cases were ultimately combined in *Ohio v. U.S. Dep't of the Interior*[67] and presented before the D.C. Court of Appeals in 1989.[68] Petitioners included ten states, three environmental groups, one chemical industry trade association, a manufacturing company, and a utility company.[69] They sought various changes to both the Type A and Type B damage assessment regulations.[70] The Type A issues were resolved under a different case,[71] decided the same day as *Ohio*, while *Ohio* focused exclusively on the Type B concerns.[72]

The *Ohio* decision upheld some aspects of the regulations but also required substantial revisions to specific sections.[73] By emphasizing the CERCLA text itself, the amendments under SARA, and a House report from the SARA debates which explained how its revisions were meant to clarify the original legislation, the *Ohio* court drew several important conclusions.

1. CERCLA's Primary Goal of Restoration and Rejecting DOI's "Lesser of" Rule

As mentioned above, the DOI's regulations required that damages be determined as "the lesser of: restoration or replacement costs; or diminution of use values."[74] The court was highly critical of this regulation, saying that it "squarely rejects the concept of any clearly expressed congressional preference for recovering the full cost of restoration."[75] The court held that CERCLA contained strong evidence of preferring restoration costs and rejected the DOI's arguments in support of its regulation, stating that "CERCLA evinces a clear congressional intent to make restoration costs the basic measure of damages."[76] Based on what it described as a "unanimous"

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66 *See Ohio*, 880 F.2d at 438.

67 880 F.2d 432 (D.C. Cir. 1989).

68 *Id.*; *see also* 42 U.S.C. § 9613(a) (2006) (empowering the D.C. Court of Appeals to hear cases challenging CERCLA's regulations).

69 *Ohio*, 880 F.2d at 438.

70 *Id.*

71 Colorado v. U.S. Dep't of the Interior, 880 F.2d 481, 482-83 (D.C. Cir. 1989) (addressing the Type A regulations).

72 *Ohio*, 880 F.2d at 440.

73 *Id.* at 438.

74 43 C.F.R. § 11.35(b)(2) (1987).

75 *Ohio*, 880 F.2d at 444.

76 *Id.* at 444-48.

determination by commentators that the "lesser of" rule would nearly always favor diminution of values, the court stated that the rule failed to uphold CERCLA's broader restorative goals.[77]

The House debates on SARA gave particular credibility to the court's examination of legislative intent, as the SARA revisions were, at least in part, debated on the basis of the draft regulations.[78] The court first noted that the House report described the DOI as "confus[ed]" and indicated that the DOI's understanding should be "resolved in light of Congress' strong emphasis on restoration of resources."[79] The House report excerpts in the opinion also described damages as including the "costs of restoration and the value of all the lost uses of the damaged resources . . . from the time of the release up to the time of restoration."[80]

2. Acceptance of the Rebuttable Presumption

In another portion of the opinion, the *Ohio* court set aside industry critiques of SARA's "rebuttable presumption."[81] Seeking to overcome court deference to the Department's regulatory determinations, industry critics asserted that the DOI's decision to apply the rebuttable presumption to certain methodologies was arbitrary and capricious.[82] Despite these criticisms, the court defended the regulations, stating that the methodologies were thoroughly tested and had been subjected to comments during the regulatory drafting period and that regulatory implementation of an explicit legislative requirement was neither arbitrary nor capricious.[83]

3. Rejecting the Preference for Market over Non-Market Assessments

The court was less supportive of the DOI's decision to place different assessment methods in a hierarchical structure that favored market-derived methods over methods that sought to establish the value of non-marketed

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77 *Id.* at 446 & n.13.

78 *Id.* at 452-53 & n.31.

79 *Id.* at 453 (internal quotation marks omitted). In a corresponding footnote, the court detailed Congress's perception of this confusion and its revisions to CERCLA to separate the allowable uses of recovered sums (to "restore, replace, or acquire" equivalent resources) from the recovery limits, which could exceed restoration and replacement, thereby allowing damage sums to incorporate both recovery costs and lost uses. *Id.* at 453 n.33.

80 *Id.* at 454 (alteration in original) (emphasis omitted).

81 *Ohio*, 880 F.2d at 478-79.

82 *Id.*

83 *Id.* at 479.

environmental commodities.[84] Market-derived methods were favored by industry petitioners but also failed to capture any benefit derived from a natural resource unless that benefit had an established market.[85] In a simple example, it was easy to establish the market value of an apple but much more difficult to establish the value of carbon sequestration or runoff management.[86] The court agreed with environmental petitioners that while market price is reasonable as one factor, it is unreasonable to consider market price as the only factor.[87] As such, the court struck down the hierarchical requirements and ordered the DOI to permit the combined use of all reliably calculated values.[88]

4. The Non-Market Method of Contingent Valuation

One of the most controversial aspects of the DOI's regulations was the inclusion of contingent valuation ("CV").[89] CV methodologies attempt to tease out the value of natural resources for which there is no established market.[90] CV draws statistical conclusions by first surveying individuals' preferences based on a stated "willingness to pay" for a given service.[91] As described in the regulations, CV employs "techniques that set up hypothetical markets to elicit an individual's economic valuation of a natural resource."[92] Critics of CV were quick to point out that it resulted in widely varying and oftentimes potentially bloated valuations.[93] However, the court rejected these arguments and upheld the use of CV on the basis of fulfilling the goal of restoration, addressing the problem that market values did not

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84 *Id.* at 462-64.

85 *Id.* at 462-63.

86 Thomas C. Brown et al., *Defining, Valuing, and Providing Ecosystem Goods and Services*, 47 NAT. RESOURCES J. 329, 357-61 (2007).

87 *Ohio*, 880 F.2d at 462-64.

88 *Id.* at 463-64.

89 Dale B. Thompson, *Valuing the Environment: Courts' Struggles with Natural Resource Damages*, 32 ENVTL. L. 57, 62-65 (2002) (describing the debate surrounding CV which attended the *Ohio* decision).

90 BIODIVERSITY, ECOSYSTEM FUNCTIONING, AND HUMAN WELLBEING: AN ECOLOGICAL AND ECONOMIC PERSPECTIVE 253 (Shahid Naeem et al. eds., 2009).

91 *Id.*

92 43 C.F.R. § 11.83(d)(5)(i) (1987).

93 *See, e.g.*, Brian R. Binger et al., *The Use of Contingent Valuation Methodology in Natural Resource Damage Assessments: Legal Fact and Economic Fiction*, 89 NW. U. L. REV. 1029, 1132-34 (1995). Several other articles addressed the criticisms of or pointed out shortcomings in CV. *See* Note, *"Ask a Silly Question . . . ": Contingent Valuation of Natural Resource Damages*, 105 HARV. L. REV. 1981, 1982 (1992) (stating that CV is "so speculative that the costs of using CV . . . outweigh the benefits"); John M. Heyde, Comment, *Is Contingent Valuation Worth the Trouble?*, 62 U. CHI. L. REV. 331, 343-44 (1995); *see also* Thompson, *supra* note 89, at 63-65 (detailing the extent and variety of support and criticism for CV between 1989 and 1995).

account for all losses, and deferring to the DOI's conclusion that CV was the "best available procedure."[94]

5. Economic Efficiency

The *Ohio* court engaged in an extended discussion of CERCLA's focus on economic efficiency.[95] The court first noted the presence of cost-effective considerations in several CERCLA provisions.[96] The court also emphasized congressional intent not to force defendants to pay for restoration when doing so was simply not feasible, or where the cost of restoration was grossly disproportionate to the use value of restoring the environment.[97]

However, while the court recognized CERCLA's cost-effective focus in areas such as response planning and settlement negotiations, it also found clear congressional intent to prioritize full restoration over raw dollar-for-dollar cost assessments during damages calculations.[98] Relying on the congressional record, the court stated that the emphasis on restoration was not born of an "irrational dislike of 'efficiency,'" but because the contemporary state of economic and environmental science could not fully valuate losses.[99] The court stated that favoring restoration did not forswear efficiency as a goal, but it rejected the DOI's "lesser of" rule as inconsistent with CERCLA's "repeated emphasis on the primacy of restoration."[100]

E. *Revision of DOI Regulations After* Ohio *and Their Review in* Kennecott Utah Copper Corp. v. DOI

In response to *Ohio*, the George H. W. Bush administration submitted during its closing days revised regulations that were promptly pulled from submission a few days later by the incoming Clinton administration.[101] This regulatory maneuvering was later questioned in court, but because of the timing of the Bush filings and their subsequent withdrawal, as well as the

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94 Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 478 (D.C. Cir. 1989) (internal quotation marks omitted).

95 *Id.* at 456-57.

96 *Id.* at 456.

97 *Id.*

98 *Id.* at 456-57.

99 *Id.* at 457.

100 *Ohio*, 880 F.2d at 457.

101 Kennecott Utah Copper Corp. v. U.S. Dep't of the Interior, 88 F.3d 1191, 1200-01 (D.C. Cir. 1996).

clerical procedures of the Federal Registry, the court upheld the actions of the Clinton administration.[102]

The Clinton administration ultimately submitted regulations in 1994.[103] These new regulations allowed a more expansive use of CV and triggered renewed questions regarding their legitimacy.[104] Litigants returned to the D.C. Court of Appeals in *Kennecott Utah Copper Corp. v. U.S. Dep't of the Interior*.[105] The plaintiffs raised both procedural challenges to the regulatory process and on the merits reasserted many of the criticisms submitted under *Ohio*.[106] Unsurprisingly, the D.C. Court of Appeals did not reverse its *Ohio* holdings and upheld the 1994 version of the regulations against the plaintiffs' procedural challenges, while noting again the need to balance cost effectiveness with restoration goals.[107] The *Kennecott* court also upheld the allowance of trustee-chosen alternative methodologies to those prescribed by the regulations.[108] In a seemingly prescient recognition of future developments, the court also upheld the DOI's inclusion of "services" provided by a natural resource as compensable under CERCLA and sustained the DOI's definition of those services as "the physical and biological functions performed by the resource including the human uses of those functions."[109]

F. *Contingent Valuation Following* Ohio *and* Kennecott *and the Development of Habitat Equivalency Analysis*

Responses to the D.C. Circuit's support for CV under *Ohio* and *Kennecott* were swift, reflecting and extending many of the critiques heard in court.[110] However, CV has survived, remains in use, remains controversial, and plays a strong role in the uncertainties of settlement agreements.[111] As early as 1995, one article summed up the consensus about the need to move beyond CV, suggesting that "regulators and scholars need to focus

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102 *Id.* at 1201, 1206.

103 *Id.* at 1201.

104 *Id.* at 1201-02, 1204 (describing the procedural history and the claims against the 1994 regulations and noting the more expansive use of CV under the 1994 revisions).

105 88 F.3d 1191 (D.C. Cir. 1996).

106 *Id.* at 1202.

107 *Id.* at 1217-18, 1219, 1225.

108 *Id.* at 1216-17.

109 *Id.* at 1220 (quoting 43 C.F.R. § 11.14(nn) (2011)) (internal quotation marks omitted).

110 *See* sources cited *supra* note 93.

111 Marcia Silva Stanton, *Payments for Freshwater Ecosystem Services: A Framework for Analysis*, 18 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 189, 240-41 (2012); *see also* Barton H. Thompson, Jr., *Ecosystem Services & Natural Capital: Reconceiving Environmental Management*, 17 N.Y.U. ENVTL. L.J. 460, 472 (2008).

their research efforts on developing other valuation techniques to capture and quantify actual damages to the public."[112]

One effort at creating a new methodology came from the National Oceanic and Atmospheric Administration ("NOAA") and its attempts to calculate damages as a federal trustee under CERCLA, the Clean Water Act, and other environmental statutes.[113] As a part of those efforts NOAA advanced a methodology known as habitat equivalency analysis ("HEA").[114]

CV and other extant methods had been focused on a traditional, tort-like derivation of damages through per-unit calculations of past, present, and future damages.[115] By contrast, HEA focuses on what must be done to fully restore or replace a lost resource, and on compensating the public for interim lost services resulting from injury to or destruction of natural resources.[116] HEA does not require the restoration of the original resources, however, because it assumes that the public is willing to accept an even tradeoff between a unit of lost use at one location and a unit of restoration use in the same or a different location.[117] HEA also assumes that trustees can fully calculate the value of any lost resources, as well as the value of any resources secured or established through restoration or replacement.[118] HEA's efficacy ultimately depends on the assumption that replacing one region of land for another, or one set of resources on the same land for another, is equivalent to restoring the original land and its concomitant resources to their pre-accident condition.

After HEA's initial use under the Clean Water Act, the National Marine Sanctuaries Act, and the Oil Pollution Act ("OPA"), trustees started using HEA in CERCLA claims.[119] HEA was accepted in court, surviving *Daubert* challenges to its legitimacy and doubts about its applicability to determining natural resource damages.[120] Despite HEA's development in

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112 Binger et al., *supra* note 93, at 1107.

113 NAT'L OCEANIC & ATMOSPHERIC ADMIN., DEP'T OF COMMERCE, HABITAT EQUIVALENCY ANALYSIS: AN OVERVIEW 1 (1995) [hereinafter HEA OVERVIEW], *available at* http://www.darrp.noaa.gov/library/pdf/heaoverv.pdf.

114 *Id.*

115 Heyde, *supra* note 93, at 337-39; *see also id.* at 352-53 (discussing the difficulties of calculating natural resource values using CV or other per-unit methods).

116 HEA OVERVIEW, *supra* note 113, at 2, 4.

117 *Id.* at 3.

118 *See id.* at 3-4; *see also* William H. Desvousges, *Assessing Groundwater Damages: A Case Study*, LAW SEMINARS INT'L 5 (June 24, 2010), http://www.lawseminars.com/materials/10NRDNM/Individual%20Speaker%20Materials/26%20Desvousges.pdf.

119 HEA OVERVIEW, *supra* note 113, at 1 n.1; Sharon Gwinn et al., Research Material, *A Review of Developments in U.S. Ocean and Coastal Law January 1-October 31, 1997*, 4 OCEAN & COASTAL L.J. 173, 188 (1999) (noting court acceptance of HEA as early as 1997 in *United States v. Fisher*, 977 F. Supp. 1193 (S.D. Fla. 1997), *aff'd*, 174 F.3d 201 (11th Cir. 1999)).

120 *See* United States v. Great Lakes Dredge & Dock Co., 259 F.3d 1300, 1305-06 (11th Cir. 2001) (upholding HEA against a *Daubert* challenge); United States v. Union Pac. R.R., 565 F. Supp. 2d 1136,

the 1990s and acceptance in court as early as 1997, it was not added to the DOI's regulations as a Type B methodology until 2008.[121] The fact that HEA was in use in CERCLA damage assessments prior to the DOI's regulatory embrace was not only noted by the DOI during the revision process but was used as part of the justification for including HEA as a prescribed methodology.[122]

As HEA's presence expanded within the natural resource damages landscape, a close cousin, resource equivalency analysis ("REA"), developed for assessments of lost resources like animals and game, as opposed to lost habitats.[123] New Jersey, in particular, has become a hotbed of HEA/REA-based litigation.[124]

However, despite a footing in the courts and eventual regulatory inclusion, HEA and REA have begun facing criticism regarding accuracy and bloated damages estimates similar in tone to the criticisms once leveled at CV.[125] In two recent New Jersey cases based on state laws, REA was set aside as impermissible.[126] In both cases the court dismissed REA's use in part because the defendants argued that the specific methods used by the plaintiff were scientifically unsound.[127] But the court also rejected REA because it agreed with defendants' assertions that the use of REA had resulted in an unjustified "windfall to [the] [p]laintiffs" by grossly overestimating the cost of replacing damaged resources at two former chemical plant sites.[128] The court agreed that while the damages assessment only cited groundwater losses, the proposed new lands to replace those losses would provide surplus benefits such as wildlife and recreational use.[129]

1150-51 (E.D. Cal. 2008) (accepting HEA methodology for the purposes of natural resource damage assessments).

121 Natural Resource Damages for Hazardous Substances, 73 Fed. Reg. 57,259, 57,267 (Oct. 2, 2008) (to be codified at 43 C.F.R. pt. 11).

122 *Id.* at 57,261 (noting in its decision that HEA was one of four methods being added "which have been used successfully to resolve claims under both the CERCLA and the OPA").

123 KRISTIN SKRABIS, DEP'T OF THE INTERIOR, OVERVIEW OF THE DRAFT RESOURCE EQUIVALENCY ANALYSIS (REA) FOR THE LEAF RIVER OIL SPILL 1-2 (2002), *available at* http://www.deq.state.ms.us/MDEQ.nsf/pdf/Main_GenesisApp8/$File/Appendix%208.pdf?OpenElement; *see also* Natural Resource Damages for Hazardous Substances, 73 Fed. Reg. at 57,267 (adopting REA under Type B methodologies at the same time as HEA).

124 *See* Tolan, *supra* note 18, at 438-41 (detailing New Jersey's litigation utilizing HEA).

125 *See, e.g.*, Desvousges, *supra* note 118, at 4-5.

126 N.J. Dep't of Envtl. Prot. v. Essex Chem. Corp., No. A-0367-10T4, 2012 WL 913042, at *9-10 (N.J. Super. Ct. App. Div. Mar. 20, 2012) (per curiam); N.J. Dep't of Envtl. Prot. v. Union Carbide Corp., No. MID-L-5632-07, slip op. at 9 (N.J. Super. Ct. Law Div. Mar. 29, 2011); *see also* Desvousges, *supra* note 118, at 4-5 (criticizing New Jersey's methodologies in the *Union Carbide* case in applying REA).

127 *See Essex*, 2012 WL 913042, at *9-10; *Union Carbide*, slip op. at 10.

128 *Union Carbide*, slip op. at 11.

129 *Id.*

Based on nearly identical findings, both cases were dismissed in their entirety.[130]

G. *Ecosystem Services: A New Paradigm for Evaluating Natural Resource Damages*

The history of ESS begins with the difficulty scientists faced in establishing an accurate picture of damages from the 1989 Exxon Valdez oil spill in Alaska.[131] Offering a completely new paradigm for valuating natural resources, ESS received its first formal presentation in the 1997 book *Nature's Services*.[132] From that early publication and after nearly two decades of subsequent development, what began as a single text has acquired the support of scientists, economists, governmental entities, and business interests.[133]

1. What Are Ecosystem Services?

Traditional methods such as CV and HEA base their valuations on the worth of individual physical resources.[134] In contrast, ESS relies on identifying naturally derived services stemming from the interactions among individual physical resources, interactions from which humans derive various forms of economic benefit.[135] In connecting the dots between physical resources and economically beneficial services, ESS captures a greater spectrum of ecological value by evaluating an environment through three tiers: processes, functions, and services.[136]

Processes include the direct consequences of biophysical structures like slow water passages, the existence of plant and animal life, or the accumulation of soil nutrients.[137] Functions are the first level of environmental

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130 *Essex*, 2012 WL 913042, at *9-10; *Union Carbide*, slip op. at 13.

131 Lisa A. Wainger et al., *Wetland Value Indicators for Scoring Mitigation Trades*, 20 STAN. ENVTL. L.J. 413, 472 (2001) (acknowledging the early incorporation of ecosystem services considerations in the Valdez oil spill restoration plan); *see also* Malcolm W. Browne, *Studying Oil Spill's Damage to Wildlife, Scientists Hope to Salvage Lessons*, N.Y. TIMES, Apr. 2, 1989, at 1 (discussing the Exxon Valdez spill generally).

132 Ruhl & Salzman, *supra* note 29, at 158.

133 *Id.* at 157, 160-62.

134 *See supra* notes 89-93, 116-118 and accompanying text.

135 THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY: ECOLOGICAL AND ECONOMIC FOUNDATIONS 18-19 (Pushpam Kumar ed., 2010) [hereinafter ECOSYSTEMS AND BIODIVERSITY]; Brendan Fisher et al., *Ecosystem Services and Economic Theory: Integration for Policy-Relevant Research*, 18 ECOLOGICAL APPLICATIONS 2050, 2051-52 (2008).

136 ECOSYSTEMS AND BIODIVERSITY, *supra* note 135, at 17-19.

137 *See id.*

activity, such as sustaining a viable fish population or water purification.[138] Services are the final tier and represent direct benefits to humans' well-being, such as providing food and clean drinking water.[139] In all cases, ESS emphasizes that it is the interaction and interdependence among the physical resources of an environment which create ecologically derived economic wealth, not the physical resources themselves.[140] Rather than viewing land or plant and animal life as ends unto themselves, ESS focuses on the valuable functions an ecosystem performs and how those functions economically benefit human beings—for example, the benefits lost when water filtration and waste treatment functions performed by the soil were overwhelmed by waste accumulation and construction at Love Canal.[141]

Some of the services identified by ESS include scrubbing groundwater and air of contaminants, creating raw materials for industry, providing food and water, managing flood and drought runoff, ensuring genetic crop variety so crops survive harsh weather, and providing recreational and social services to surrounding communities.[142] Without many of the services provided by the ecosystems around us, life on this planet would quite literally be unsustainable.[143] One of the goals of ESS is to accurately and completely capture the value of an environment through understanding the economic wealth generated by its service output.[144] This in turn allows us to more readily compare the cost of losing, restoring, sustaining, or replacing a given environment.[145]

2. The Real Life Efficacy of Ecosystem Services

Despite its relative youth, ESS has begun proving itself in public policy decision making, governmental planning, private-public partnerships, and business. ESS's benefits have improved the drinking water supply to

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138 *Id.* at 18.

139 *Id.*

140 *See* Jim Chen, *Webs of Life: Biodiversity Conservation as a Species of Information Policy*, 89 IOWA L. REV. 495, 547-48 (2004) (examining the interrelatedness of species, environments, and service provisions and noting "[t]he value of the world's ecosystems as intact, living organisms in their own right greatly exceeds that of individual species").

141 *See* BLUM, *supra* note 7, at 24-25 (discussing how high levels of precipitation saturated the ground in the Niagara Falls area); ECOSYSTEMS AND BIODIVERSITY, *supra* note 135, at 26 (listing waste treatment as a regulating service); Zuesse, *supra* note 7, at 24-25 (detailing how construction damage allowed chemicals to seep out of their storage barrels and into the surrounding land).

142 James Salzman et al., *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309, 310 (2001).

143 *See id.* at 310-11.

144 *See* Ruhl & Salzman, *supra* note 29, at 158-59.

145 *See, e.g.*, *id.* at 159 (looking at the costs of replacing natural sources of soil nitrogen with commercial fertilizer).

New York City, have shed light on the full costs of recent industrial disasters, and are being used by government and industry to set policy.

a. *ESS Finds a Cost-Effective Solution to New York City's Thirst*

One of ESS's early success stories comes from New York City's need to supply over one billion gallons of drinking water every day.[146] By applying ESS methods, New York City was able to compare the costs of building a filtration plant ($6 billion to $8 billion to build, $300 million per year to operate) to the cost of acquiring and preserving 350,000 acres of land in the Catskills watershed ($1.5 billion).[147] The decision to protect the watershed represented enormous savings to New York City and revealed ESS's power to accurately quantify and compare the cost effectiveness of nature's service output with man-made alternatives.[148]

b. *ESS and Recognizing the Full Economic Impact of the Deepwater Horizon Spill*

ESS has been used more recently to calculate damages related to local ecosystem injuries caused by the 2010 Deepwater Horizon oil spill in the Gulf of Mexico.[149] Although a $20 billion fund was established to begin recovery, there is concern that it will be depleted before the impacted ecosystems—an area of roughly 90,000 square miles—can be fully restored.[150] ESS methodologies are being used to valuate the many services once provided by those ecosystems and the impact of their loss to the economies, industries, and people of the Gulf region.[151] The strength of ESS is highlighted in these assessment efforts, particularly its ability to "accept that our largely nonmarketed ecological wealth underpins our marketed economic wealth."[152] In other words, ESS provides a way of recognizing that when it comes to economic wealth, the value of a given environment is greater than the sum of its ecological components.

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146 *See* Salzman, *supra* note 28, at 139.

147 Salzman et al., *supra* note 142, at 315.

148 *See id.* at 319.

149 Keith H. Hirokawa, *Disasters and Ecosystem Services Deprivation: From Cuyahoga to the* Deepwater Horizon, 74 ALB. L. REV. 543, 544-45 (2011); *see also* Campbell Robertson & Clifford Krauss, *Gulf Spill Is the Largest of Its Kind, Scientists Say*, N.Y. TIMES, Aug. 3, 2010, at A14 (discussing the Deepwater Horizon spill generally).

150 Hirokawa, *supra* note 149, at 544.

151 *See id.* at 554-59 (discussing a variety of ecosystem services of concern to the Deepwater Horizon spill and the surrounding ecosystems).

152 *Id.* at 552 (quoting John Porter et al., *The Value of Producing Food, Energy, and Ecosystem Services Within an Agro-Ecosystem*, 38 AMBIO 186, 186 (2009)) (internal quotation marks omitted).

c. *ESS in Government Environmental Policy*

Governmental entities seeking to quantify the assets and liabilities of their environmental holdings have also adopted ESS. The U.S. Forest Service employs ESS to improve conservation efforts, and the U.S. Department of Agriculture has adopted ESS as a means of establishing and broadening markets for naturally derived services created by public and private farmlands.[153]

Internationally, the United Nations has conducted two assessments of the world's ecosystems and funds ongoing research to develop ESS methodologies.[154] In an outgrowth of the United Nations' Millennium Ecosystem Assessment of world ecosystem health and sustainability, the United Nations is using ESS to focus global environmental efforts on projects that will bear a direct impact on human economic and physical well-being.[155]

d. *ESS in Private-Public Partnerships and Business Planning*

In addition to ESS's use in public arenas, environmental foundations such as the Nature Conservancy increasingly use ESS in developing partnerships between public and private entities.[156] Additionally, industries including mining, manufacturing, and insurance are funding research projects and working with nonprofits to develop new, ESS-based tools to incorporate into their own business plans.[157]

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153 *See* Ruhl & Salzman, *supra* note 29, at 163-64.

154 ECOSYSTEMS AND BIODIVERSITY, *supra* note 135, at xvii-xx.

155 *Id.* at 17. The United Nations' Millennium Ecosystem Assessment was the first global attempt to understand human impact and dependency upon ecosystem services, took over four years, and involved the work of roughly 1,360 experts from ninety-five countries. 1 ECOSYSTEMS AND HUMAN WELL-BEING: CURRENT STATE AND TRENDS vii, x (Rashid Hassan et al. eds., 2005) [hereinafter ECOSYSTEMS AND HUMAN WELL-BEING]; *see also* Thompson, *supra* note 111, at 467-68 (discussing the breadth of the Millennium Ecosystem Assessment project, the project's scientific impact, and some of the key findings with regard to human impact on the global ecosystem's ability to support agriculture; carbon sequestration; clean water provisioning; weather regulation; pollination and insect population; and spiritual, religious, and aesthetic values).

156 *See* Ezequiel Lugo, *Ecosystem Services, the Millennium Ecosystem Assessment, and the Conceptual Difference Between Benefits Provided by Ecosystems and Benefits Provided by People*, 23 J. LAND USE & ENVTL. L. 243, 248-49 (2008).

157 Paul R. Armsworth et al., *The Ecological Research Needs of Business*, 47 J. APPLIED ECOLOGY 235, 240-41 (2010) (regarding developing relationships between business and ESS scientists); Katherine R. Smith, *Public Payments for Environmental Services from Agriculture: Precedents and Possibilities*, 88 AM. J. AGRIC. ECON. 1167, 1170-71 (2006) (discussing potential use of ESS to structure payments to agriculture for ecosystem services provided by agricultural lands to adjacent property owners); *see also* MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: OPPORTUNITIES AND CHALLENGES FOR BUSINESS AND INDUSTRY 10 (2005), *available at* http://www.millenniumassessment.org/documents/document.353.aspx.pdf.

II. THE GOALS OF CERCLA AND THE LIMITS OF CURRENT NATURAL RESOURCE DAMAGE ASSESSMENT METHODOLOGIES

Before investigating ESS's potential when applied to CERCLA damage assessments, it is necessary to review CERCLA's goals as defined by legislation and the courts. It is also important to understand the efficacy and limits of the CV and HEA damage assessment methodologies, why they remain controversial, and how they ultimately fail to meet CERCLA's goals.

A. *Three Goals Prioritized by CERCLA in Remediating Natural Resource Damages*

Three overarching goals from CERCLA are repeatedly asserted in its statutory provisions, the DOI regulations, and the determinations of the *Ohio* and *Kennecott* courts: (1) the primacy of full restoration to damaged environments; (2) the encouragement of cooperative and effective settlement agreements; and (3) economic efficiency.

1. The Primacy of CERCLA's Restoration Focus

The holdings in the *Ohio* and *Kennecott* courts, as well as the legislative history of both CERCLA and SARA, confirm that CERCLA's primary focus is the restoration of natural resources injured by human activity.[158] This is particularly true with regard to CERCLA's natural resource damage assessment provisions, which are focused on the repair, restoration, and replacement of injured resources.[159]

This central purpose is first found in the law itself, which requires that all recovered sums must be used to "restore, replace, or acquire the equivalent [resources]."[160] Assessment procedures for calculating natural resource damages under CERCLA must take into account not only injury and destruction but also the "replacement value, use value, and [the] ability of the ecosystem or resource to recover."[161]

The *Ohio* decision provides extensive findings regarding the primacy of restoration costs as the basic measure of recovery.[162] The court places great emphasis on text within the damages and settlement provisions of

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158 *See supra* Part I; *see also* Judith Robinson, Note, *The Role of Nonuse Values in Natural Resource Damages: Past, Present, and Future*, 75 TEX. L. REV. 189, 198-99 (1996).

159 *See* Robinson, *supra* note 158, at 199.

160 42 U.S.C. § 9607(f)(1) (2006).

161 *Id.* § 9651(c)(2).

162 *See* Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 450-52 (D.C. Cir. 1989).

CERCLA, as well as congressional record documents further revealing a focus on restoration.[163] The *Kennecott* decision also advances the importance of restoration in the eyes of the court, rejecting arguments that states must choose a hierarchical, rather than holistic, approach to determining total damages.[164]

The primacy of restorative goals under CERCLA is also supported by legal scholarship.[165] Professor Dale B. Thompson noted, "implementation of the first principle of the *Ohio* decision, which emphasized restoration rather than valuation, has improved the handling of [natural resource damage] cases."[166] Even where there is debate about the efficacy of CERCLA litigation, that efficacy is measured by the degree to which sums collected ultimately aid restoration, presuming as a matter of course that restoration is the primary purpose of collecting those sums.[167]

2. Encouragement of Effective Settlement

CERCLA contains detailed instructions to the President on encouraging and managing the settlement process.[168] CERCLA grants executive authority to enter into settlements and shields from judicial review executive decisions to settle.[169] CERCLA further requires facilitation of all settlements that are in the public interest, that expedite effective remedial actions, and that minimize litigation.[170] The law's provisions also limit subsequent liability to the government and settling parties,[171] establish a public comment period to vet agreements for impropriety or inadequacy,[172] and allow covenants not to sue to encourage defendants to negotiate.[173] Courts have also recognized the emphasis CERCLA places on cost-effective resolution without resort to litigation.[174] The courts continued to uphold this

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163 *Id.*

164 Kennecott Utah Copper Corp. v. U.S. Dep't of the Interior, 88 F.3d 1191, 1229-30 (D.C. Cir. 1996).

165 *See* Julie E. Steiner, *The Illegality of Contingency Fee Arrangements When Prosecuting Public Natural Resource Damage Claims and the Need for Legislative Reform*, 38 ENVTL. L. REP. NEWS & ANALYSIS 10773, 10781 (2008).

166 Thompson, *supra* note 89, at 77-78.

167 *See, e.g.*, Allan Kanner & Mary E. Ziegler, *Understanding and Protecting Natural Resources*, 17 DUKE ENVTL. L. & POL'Y F. 119, 122 (2006).

168 *See generally* 42 U.S.C. § 9622 (2006).

169 *Id.* § 9622(a).

170 *Id.*

171 *Id.* § 9622(c)(1)-(2).

172 *Id.* § 9622(d)(2)(B).

173 *Id.* § 9622(f).

174 *See In re* Acushnet River & New Bedford Harbor: Proceedings re Alleged PCB Pollution, 712 F. Supp. 994, 996 (D. Mass. 1989).

intent after the SARA amendments made the goal of encouraging settlement even more clear.[175]

The improved efficiency of settlement over full litigation also offers a partial answer to critics of CERCLA who cite the cost of litigation as undermining the availability of Superfund monies for restoration.[176] Professor Patrick E. Tolan, Jr., taking note of CERCLA's preference for settlement, concludes that cooperative resolution through settlement offers several efficiency and effectiveness advantages over full litigation.[177]

3. Economic Efficiency

As the previous two priorities reveal, CERCLA's restorative focus and settlement provisions rest upon a fundamental belief in the value of cost-effective, balanced decision making. Cost effectiveness figures prominently in CERCLA itself and the law's subsequent review in court.

Under CERCLA, the regulations must employ "the best available procedures" for identifying and quantifying natural resource damages.[178] The damage provisions further require that the regulations be subject to review every two years so that they remain in step with more advanced procedures.[179] Other portions of CERCLA are even more explicit about the goal of cost effectiveness. In the area of remediation (the removal of spilled toxins), CERCLA specifically calls for cost-efficient cleanup methods.[180] CERCLA also calls for research and development into cleanup methodologies to increase cost effectiveness.[181] Finally, in forming the National Response Plan, which provides an overall guide to actions under CERCLA, the executive branch is required to establish response procedures that assure cost-effective remedial actions.[182]

By comparison, CERCLA's natural resource damage provisions are less overt in their acceptance of cost effectiveness. In some cases the statute seems to forgo efficiency entirely and suggests a conscious decision on the part of the legislators to do so.[183] Closer examination conducted in *Ohio*

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175 *See* City of New York v. Exxon Corp., 697 F. Supp. 677, 692-93 (S.D.N.Y. 1988).

176 *See, e.g.*, Steiner, *supra* note 165, at 10782.

177 Tolan, *supra* note 18, at 447-49 (noting that cooperative settlements can reduce burdens on budget-strapped state agencies, reduce suspicion and "bad guy" images on the part of polluters, and create stronger long-term working relationships between governmental and business entities for the long cleanup effort).

178 42 U.S.C. § 9651(c)(2).

179 *Id.* § 9651(c)(3).

180 *Id.* § 9621(a).

181 *Id.* § 9660(b)(7)(B).

182 *Id*. § 9605(a)(7).

183 *See, e.g.*, *id.* § 9607(f)(1) ("The measure of damages in any action . . . shall not be limited by the sums which can be used to restore or replace such resources.").

reveals the reason for this seeming disparity. The *Ohio* court stated that the absence of efficiency in CERCLA's damage assessment provisions was not a product of "an irrational dislike of 'efficiency'; rather, it suggests that Congress was skeptical of the ability of human beings to measure the true 'value' of a natural resource."[184] The *Ohio* court further supported this assertion by citing the work of numerous commentators, finding broadly shared skepticism regarding the accuracy of 1986-era attempts at fully valuating natural resource damages.[185] The court goes on to note, however, that doubts about contemporary methodologies during CERCLA's passage did not foreclose applying efficiency to damage assessments pending future scientific development.[186] The court expressly recognized the tie between restoration of natural resources, economic efficiency, and limited scientific ability, stating "the use of restoration cost as a presumptive measure of damages does not repudiate the goal of economic efficiency . . . . 'At present, however, the economic tools for valuing natural resources are of questionable accuracy.'"[187]

B. *How Contingent Valuation Fails to Uphold CERCLA's Priorities*

Against the backdrop of these three primary goals, contingent valuation has never held much promise.[188] CV's introduction into a suit invariably raises doubts about the validity of any damages claim, for example in the $900 million settlement after the Exxon Valdez spill.[189] Settlements of that scale, and the fact that the damage valuations driving them are rarely subjected to full review by the courts, caused one commentator to describe natural resource damage assessments as a "black hole" of liability and a "sleeping giant" because of as-yet-"untapped" potential for liability.[190] CV is so vague that at least one case had trouble even determining whether or not CV, or another methodology, was being used in the first place.[191] Even

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184 Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 457 (D.C. Cir. 1989).

185 *See id.* at 457 n.40.

186 *Id.*

187 *Id.* (quoting Frank B. Cross, *Natural Resource Damage Valuation*, 42. VAND. L. REV. 269, 331 (1989)).

188 Note, *supra* note 93, at 1982; *see also* Thompson, *supra* note 89, at 63.

189 Carol A. Jones & Katherine A. Pease, *Restoration-Based Compensation Measures in Natural Resource Liability Statutes*, CONTEMP. ECON. POL'Y, Oct. 1997, at 111, 112 (noting the controversy over the use of CV after the Exxon Valdez settlement).

190 Tolan, *supra* note 18, at 410.

191 Cook v. Rockwell Int'l Corp., 580 F. Supp. 2d 1071, 1128 (D. Colo. 2006) (wherein defendants argued that the plaintiffs' evidence was a CV study and therefore invalid, an argument that the court rejected based on a determination that the plaintiffs' evidence did not meet the definition of a CV study).

advocates of strong damages rules in environmental law recognize CV's potential to yield over-inclusive assessments of natural resource damages.[192]

CV's ineffectiveness at accurately establishing restoration costs, and its success in bloating damages awards, is further aggravated by its focus on assessing past injuries rather than on environmental restoration for the future.[193] One proactive justification for CV's approach, with parallels to common law damages theory, has been deterrence of potential polluters.[194] But CV's uncertain results raise questions about its validity even as a deterrent.[195] Indeed, in cases where CV-derived values yield the highest damages awards, such awards tend to be viewed with greatest skepticism by the courts and are often dismissed, negating any deterrent effect.[196]

Excessive damages not only undermine deterrence but also present a significant risk to settlement.[197] The threat of high damages presents hard choices for defendants, many of whom are more, not less, likely to continue litigating because the cost of accepting CV-based damages liability can readily exceed the cost of litigation.[198]

Even when parties do settle, the likelihood that the agreement will fulfill CERCLA's requirement that settlements be "in the public interest" is low, in part because CV estimates are derived not from expected restoration costs but from estimated losses in the past.[199] Courtroom skepticism and the

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192 *See, e.g.*, Daniel A. Farber, *Basic Compensation for Victims of Climate Change*, 155 U. PA. L. REV. 1605, 1629 (2007) ("By allowing the use of contingent valuation as a method for measuring harm, the approach to compensation for environmental damage from toxic substances and petrochemicals goes well beyond what I propose with respect to harm resulting from climate change.").

193 Robert R.M. Verchick, *Feathers or Gold? A Civic Economics for Environmental Law*, 25 HARV. ENVTL. L. REV. 95, 115-16 (2001).

194 Frank B. Cross, *Restoring Restoration for Natural Resource Damages*, 24 U. TOL. L. REV. 319, 342 (1993); James S. Seevers, Jr., *NOAA's New Natural Resource Damage Assessment Scheme: It's Not About Collecting Money*, 53 WASH. & LEE L. REV. 1513, 1527, 1531 (1996).

195 Heyde, *supra* note 93, at 352-53 (discussing the deterrence purpose of antipollution legislation in general, CERCLA specifically, and whether CV effectuates that goal).

196 Tolan, *supra* note 18, at 436-37 (noting the general skepticism about high and conjectural damage valuations and reviewing a New Mexico case in which lost use natural resource damage calculations were dismissed as "grossly overstated").

197 Binger et al., *supra* note 93, at 1035 ("In light of the enormous monetary claims that can be derived from manipulating [CV], defense litigants are faced with the draconian choice of either agreeing to large natural resource damage settlements or attempting to defend against [CV] evidence with relatively complex, esoteric, and academic arguments regarding the theoretical invalidity or methodological weaknesses of the method." (footnotes omitted)).

198 Note, *supra* note 93, at 1992; *see also* Margaret H. Lemos, *Special Incentives to Sue*, 95 MINN. L. REV. 782, 799 n.68 (2011) (noting that higher damages lead to fewer settlements).

199 Thompson, *supra* note 89, at 78 (reviewing a Michigan state case in which the court's inability to factually resolve the accuracy of CV resulted in settlement outside the court and secondarily inspired revisions to Michigan state law excluding non-use value damage assessments because of questions about their reliability). The Michigan state law, therefore, undermines the goal of full restoration required under CERCLA insomuch as non-use values were recognized as an important aspect of restoration by the *Ohio* decision. *See* Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 464 (D.C. Cir. 1989).

potential for abuse under the guise of CV-determined damages further erode the restoration, settlement, and efficiency goals of CERCLA.

C. *Habitat Equivalency Analysis and Moving Toward a Restorative Focus by Degrees*

The essential difference between CV and HEA methods is in the monetization of past losses, in the case of CV, versus determining the direct cost of sufficient compensatory restoration efforts under HEA.[200] As a result, HEA avoids some of the CV conundrum. First, HEA sidesteps the difficulties in basing value on non-marketed past losses.[201] Second, HEA derives its figures directly from restoration costs, avoiding discrepancies between the cost of losses suffered in the past and the cost of making necessary restoration efforts in the future.[202] HEA also directly aids in the restoration process, as the cost determinations under HEA necessitate choosing, developing, and negotiating around a restoration plan.[203]

Developed by NOAA, HEA has gained the acceptance of the DOI and the courts, and its more frequent employment in natural resource damage assessments shows that its methods are more readily accepted by adjudicated proceedings.[204] After its initial success as an alternative method in suits under CERCLA, HEA was eventually added to CERCLA's prescribed methods, although the process took more than a decade.[205] HEA also finds somewhat broader acceptance from industry, further aiding the settlement process.[206]

But HEA is not without its weak spots, most notably its focus on resource-by-resource restoration that fails to encompass the full extent of lost services compensable under CERCLA.[207] By failing to consider the contributions of each resource to an integrated whole, HEA sometimes has trou-

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200 Thompson, *supra* note 89, at 74.

201 Tolan, *supra* note 18, at 417-18.

202 *Id.*

203 *Id.* at 417.

204 *See, e.g.*, United States v. Great Lakes Dredge & Dock Co., 259 F.3d 1300, 1305-06 (11th Cir. 2001) (accepting HEA); United States v. Fisher, 977 F. Supp. 1193, 1198 (S.D. Fla. 1997) (laying out the judicial standard for allowable application of HEA), *aff'd*, 174 F.3d 201 (11th Cir. 1999).

205 Natural Resource Damages for Hazardous Substances, 73 Fed. Reg. 57,259, 57,267 (Oct. 2, 2008) (to be codified at 43 C.F.R. pt. 11).

206 *See* Tolan, *supra* note 18, at 417-18.

207 LINWOOD PENDLETON, BLUE RIBBON PANEL ON ESTUARY ECONOMICS, MEASURING AND MONITORING THE ECONOMIC EFFECTS OF HABITAT RESTORATION: A SUMMARY OF A NOAA BLUE RIBBON PANEL 1 (2010), *available at* http://nicholasinstitute.duke.edu/sites/default/files/publications/measuring-and-monitoring-the-economic-effects-of-habitat-restoration-a-summary-of-a-noaa-blue-ribbon-panel-paper.pdf; *see also* Knudsen, *supra* note 19, at 168-70 (arguing that in general natural resource laws "divide nature into discrete elements" and fail to account for the ecosystem's preservation and protection).

ble recognizing that the total economic value of an environment can be greater than the sum of its parts.[208]

The consequences of this oversight can be seen in the New Jersey cases discussed above. In those suits, the courts stated that funds for new preserves meant to offset damaged lands would offer environmental benefits not found in the loss estimates from the original property, seemingly because of a narrow assessment of lost services on the original, damaged lands.[209] Thus, HEA and its successors have their own limitations and can result in full dismissals of all natural resource damages claims in court.[210]

The emerging limits to HEA are reflective of the broader difficulty that remains with economic assessments to natural resource damages. On the one hand, there are deep moral and methodological misgivings about reducing environmental resources to dollar figures, raising concerns about, for instance, whether or not one can ever fully quantify the personal and spiritual value of nature to humanity.[211] However, without complete and reliable economic valuation to encourage cooperative settlement actions, the work of the court becomes mired in debates about the nature and merit of any one party's claims. As seen in New Jersey, rather than helping CERCLA's restorative goals, the contentious battles can result in complete dismissals with the practical effect of leaving needed restoration efforts unfunded.[212]

Given all these challenges and limits to the traditional approaches for natural resource damage assessments, it has been suggested that scientists, litigants, and the courts should seek and embrace advances in assessment methodologies.[213] Fortunately, litigants and the courts can readily employ such advances as they develop because bringing new methods to CERCLA ahead of regulatory reform is explicitly permitted under Type B alternative procedures. Trustee introduction of new methodologies is also a proven

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208 VALUATION OF REGULATING SERVICES OF ECOSYSTEMS: METHODOLOGY AND APPLICATIONS 24-25 (Pushpam Kumar & Michael D. Wood eds., 2010); *see also* EPA SAB REPORT, *supra* note 24, at 52.

209 N.J. Dep't of Envtl. Prot. v. Essex Chem. Corp., No. A-0367-10T4, 2012 WL 913042, at *8-9 (N.J. Super. Ct. App. Div. Mar. 20, 2012) (per curiam).

210 *See id.* (rejecting the use of REA as misapplied and stating that it would have provided a "windfall" to the plaintiffs); N.J. Dep't of Envtl. Prot. v. Union Carbide Corp., No. MID-L-5632-07, slip op. at 10 (N.J. Super. Ct. Law Div. Mar. 29, 2011) (same result); *see also* Desvousges, *supra* note 118, at 4-5.

211 *See* K. E. McConnell, *Does Altruism Undermine Existence Value?*, 32 J. ENVTL. ECON. & MGMT. 22, 36 (1997); Sarah F. Trainor, *Finding Common Ground: Moral Values and Cultural Identity in Early Conflict Over the Grand Staircase-Escalante National Monument*, 28 J. LAND RESOURCES & ENVTL. L. 331, 348-49 (2008).

212 *See supra* notes 126-130 and accompanying text.

213 *See, e.g.*, Binger et al., *supra* note 93, at 1107.

approach that has been utilized and accepted in the past, as seen with HEA.[214]

III. ECOSYSTEM SERVICES AND SATISFYING CERCLA'S PRIMARY GOALS

The incorporation of ESS into natural resource damage assessments can and should follow in HEA's footsteps. While commentators and the EPA's Science Advisory Board have encouraged the addition of ESS to CERCLA's regulatory damage provisions, there has not yet been any change in the list of prescribed Type B methodologies since the addition of HEA in 2008.[215] However, CERCLA itself, the priorities identified in the *Ohio* line of cases, and the courts' and DOI's acceptance of the path taken by HEA create ample legal justification for litigants and courts to embrace ESS going forward.

A. *Ecosystem Services Is an Allowable Alternative Methodology Under CERCLA*

ESS represents an opportunity to move beyond extant approaches and has the scientific pedigree to meet the requirements of CERCLA's Type B alternative methodologies allowance.[216] The primary requirements as stated by the DOI regulations are that they be reliable, cost effective, and "standard and accepted."[217] ESS is a relatively new field, but one with at least a fifteen-year history of documented study and development.[218] In that time it has been the focus of an expanding assortment of social and environmental scientists, as well as economists, governmental entities, and private interests.[219]

The success of ESS in resolving New York City's drinking water needs and understanding losses stemming from the Deepwater Horizon spill attest to the reliability and cost effectiveness of its approach.[220] More recently, governmental entities have formally embraced ESS in valuating their own environmental holdings, and regulatory advisory boards are ad-

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214 42 U.S.C. § 9651(c)(2) (2006); 43 C.F.R. § 11.83(b)(3), (c)(3) (2011); *see also supra* note 122 and accompanying text.

215 *Compare* EPA SAB REPORT, *supra* note 24, at 88, *with* 43 C.F.R. § 11.83(c)(2).

216 *See, e.g.*, 43 C.F.R. § 11.83(b)(3), (c)(3).

217 *Id*. § 11.83(a)(3), (b)(3).

218 *See* Ruhl & Salzman, *supra* note 29, at 158 (setting the "birth" of ecosystem services at 1997); *see generally* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS (Gretchen C. Daily ed., 1997) (referenced by Ruhl & Salzman).

219 Ruhl & Salzman, *supra* note 29, at 157-63 (reviewing the growth in interest and work on ESS from the 1990s to 2007).

220 *See supra* notes 146-152 and accompanying text.

vocating further use of ESS.[221] Industry has also embraced ESS by funding research projects and working with nonprofits to develop ESS-based business planning and strategy tools.[222] ESS therefore provides a strong foundation from which the courts could uphold its use on the basis of meeting both CERCLA and regulatory requirements requiring that Type B alternative methodologies represent reliable, cost effective, and "standard and accepted" cost-estimating practices for determining compensable value.[223]

B. *Ecosystem Services and Fulfilling CERCLA's Restorative Goal*

Much like HEA, ESS is forward looking in its assessment of a given environment. Specifically, ESS looks directly at how to secure an environment and its underlying processes to protect the services upon which humans rely, a concept sometimes referred to as the "stream of benefits."[224] The calculation of damages in an ESS regime is not based on what has been lost but upon what must be rebuilt to restore the full benefits stream.[225] This forward-looking focus can, in turn, be applied directly to the restorative intent of CERCLA, just as has been done with HEA.[226] Additionally, the sustainability of an environment going into the future is another measure of restorative efficacy underserved in current environmental litigation.[227] ESS directly aids in sustainability analysis by requiring an accounting of the services lost to environmental deprivation and focusing on their restoration for the future.[228] ESS then provides economically useful comparisons between restoration options based on what must be done to sustainably restore the natural processes that underlie those services.[229]

C. *Ecosystem Services and Fulfilling CERCLA's Goal of Economic Efficiency*

ESS increases the efficiency of CERCLA recovery efforts on a number of fronts. First, ESS recognizes the relative inefficiency of man-made

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221 *See generally* EPA SAB REPORT, *supra* note 24.

222 *See supra* note 157 and accompanying text.

223 43 C.F.R. § 11.83(b)(3), (c)(3) (2011).

224 ECOSYSTEMS AND BIODIVERSITY, *supra* note 135, at 92; *see also* Keith H. Hirokawa & Charles Gottlieb, *Sustainable Habitat Restoration: Fish, Farms, and Ecosystem Services*, FORDHAM ENVTL. L. REV., Spring 2012, at 1, 14-15.

225 Thompson, *supra* note 111, at 466-67.

226 Tolan, *supra* note 18, at 417-18.

227 Alfred R. Light, *Beyond the Myth of Everglades Settlement: The Need for a Sustainability Jurisprudence*, 44 TULSA L. REV. 253, 272-73 (2008).

228 Hirokawa & Gottlieb, *supra* note 224, at 14.

229 *See id.*

alternatives to lost ecosystem services.[230] New York City's Catskills study presents one stark contrast between man-made and naturally-derived services.[231] The use of ESS in determining more efficient ways to restore lost services offers an opportunity to optimize restorative measures that goes beyond HEA's one-for-one approach, thereby allowing litigants and the courts to make cost-effective decisions like those made in the Catskills watershed study.

In addition to outcome efficiency, ESS also provides a more accurate and complete measurement of losses than either CV or HEA. Recognizing, through its tiered analysis framework, the interdependence of the environment, ESS looks past the incomplete and imperfect surrogates of physical loss and resource-to-resource damages estimates used by CV and HEA, and instead captures how non-marketed ecosystem processes generate the final services we depend on for survival, profit, and pleasure.[232] That probative accuracy is only strengthened by the global, shared efforts of economic, social, and environmental science which continue to produce increasingly refined tools for ESS valuations.[233]

The economic foundations for ESS valuations are purposely derived from market experience, an effort that supports efficiency through accuracy. For example, the ESS research taking place in the context of environmental disasters such as Hurricane Katrina and the Deepwater Horizon spill are driven by examining the impact of those disasters on regional populations and economies.[234] As a result, ESS valuations are improving cost estimates for restorations in those regions by recognizing and focusing on what must be physically replenished in order to restore what has been ecologically and economically lost.[235]

The market focus of ESS also supports economically efficient outcomes. ESS valuations are more objective than CV because they are made in reference to market impacts stemming from a change in available services,[236] rather than the far more ambiguous "stated value" preferences used

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230 DAVID BATKER ET AL., EARTH ECON., GAINING GROUND: WETLANDS, HURRICANES AND THE ECONOMY: THE VALUE OF RESTORING THE MISSISSIPPI RIVER DELTA 26 (2010), *available at* http://www.eartheconomics.org/FileLibrary/file/Reports/Louisiana/Earth_Economics_Report_on_the_Mississippi_River_Delta_compressed.pdf.

231 Salzman et al., *supra* note 142, at 315-16.

232 *See supra* notes 134-145 and accompanying text.

233 *See* COMM. ON ASSESSING & VALUING THE SERVS. OF AQUATIC & RELATED TERRESTRIAL ECOSYSTEMS, NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., VALUING ECOSYSTEM SERVICES: TOWARD BETTER ENVIRONMENTAL DECISION-MAKING 153-55 (2005), *available at* http://www.nap.edu/openbook.php?isbn=030909318X.

234 Hirokawa, *supra* note 149, at 554-57.

235 *Id.*

236 *See id.* at 552.

in CV.[237] While some groups have advocated for the incorporation of CV-like calculations into ESS,[238] other researchers have resisted these suggestions.[239] The resistance to CV is an intentional focus on generating objectively quantified valuations as a way of providing more practical tools to policymakers and property stakeholders such as CERCLA trustees and defendants.[240] It is a goal widely shared in the ESS community, as reflected in the United Nations' own ESS efforts and its focus on human well-being in measuring damage to ecosystems worldwide.[241] As a result, ESS presents itself as an almost direct response to longstanding criticisms leveled at CV and HEA, strengthening the case for its introduction into CERCLA damage assessments on the basis of advancing best methods while simultaneously moving toward economic efficiency, as suggested by *Ohio*.

The *Ohio* court gave lengthy discussion to the interplay of cost efficiency and restoration under CERCLA, although the court's opinion is more typically cited for its full-throated defense of restoration costs and its embrace of CV.[242] Lost in that recapitulation, however, is *Ohio*'s explicit recognition of economic efficiency as an important goal under CERCLA.[243] Also lost is the court's recognition that the step back from efficiency within CERCLA's damage provisions was not because of a lack of congressional interest in efficiency, but rather a recognition of the need to err on the side of achieving full restoration given the limited methods available at the time.[244] Litigants and courts can therefore rely upon *Ohio* in promoting ESS in the service of both restoration and efficiency, rather than as a basis for choosing one over the other.

D. *Ecosystem Services and Fulfilling CERCLA's Goal of Encouraging Cooperative Settlement*

Settlement is encouraged and strengthened by decreasing adversarial barriers.[245] While it is unreasonable to expect complete collaboration in resolving CERCLA claims, the role of cooperative resolution in environmental litigation is already the subject of legal scholarship.[246] Such cooperative efforts have already benefited trustees, defendants, and the environ-

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237 James Peck, *Measuring Justice for Nature: Issues in Evaluating and Litigating Natural Resources Damages*, 14 J. LAND USE & ENVTL. L. 275, 282, 284-85 (1999).

238 *See, e.g.*, EPA SAB REPORT, *supra* note 24, at 98.

239 *See, e.g.*, ECOSYSTEMS AND BIODIVERSITY, *supra* note 135, at 117-18.

240 *Id.* at 118.

241 *See supra* note 155 and accompanying text.

242 Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 456-57 (D.C. Cir. 1989).

243 *See id.*

244 *See id.* at 457 & n.40.

245 Jeffrey R. Seul, *Settling Significant Cases*, 79 WASH. L. REV. 881, 907-11 (2004).

246 *See, e.g.*, Tolan, *supra* note 18, at 447-50.

ment through reduced litigation costs and a focus on restoration efforts rather than a squabble over damages claims.[247]

As noted above, ESS has been met with approval in a number of areas of business and policy, including portions of some industries frequently represented among CERCLA's defendants.[248] Ongoing efforts between conservation foundations, government, and industry are furthering this interdependence and shared faith in ESS.[249] As such, ESS has been subjected to a level of interdisciplinary scrutiny and collaboration dissimilar to any of its predecessors in the CERCLA arena.[250]

ESS's interdisciplinary commitment offers a unique opportunity to carry settlement discussions away from "draconian" fear and toward the realm of agreed-upon solutions to specific environmental problems.[251] Some may argue that plaintiff trustees will be less willing to settle under a regime where their damage awards may be lessened without devices like CV to leverage their claims. However, the costs of ongoing, complex litigation for multiple cases as a state or federal trustee can be overwhelming, and practical pressure on money and manpower already provide some leverage in nudging trustees toward cooperative settlement.[252] The readiness to settle would likely be aided by ESS because its more broadly accepted results could reduce transaction costs and other barriers to cooperation while more thoroughly addressing full restoration to trustee lands.

E. *The HEA Model: No Need to Wait for Regulatory Reform*

CERCLA encourages, DOI regulations allow, the courts have recognized, and proponents of HEA have already exploited the opportunity to bring any valid methodology to the damage assessment process regardless of regulatory recognition. First, CERCLA explicitly allows the employment of alternative methods.[253] Second, the DOI has adopted regulations that reflect that statutory command.[254] Finally, the *Kennecott* holding defends trustee discretion with regard to choice of methodologies.[255] In sum, the discretionary grant to trustees is expansive, as long as the chosen method represents a valuation method that is accepted, reliable, and cost effective.

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247 *Id.* at 448-49.

248 *See supra* notes 146-148 and accompanying text.

249 *See* Lugo, *supra* note 156, at 248-49.

250 *See* Keith H. Hirokawa, *Three Stories About Nature: Property, the Environment, and Ecosystem Services*, 62 MERCER L. REV. 541, 580-81 (2011).

251 *See* Binger et al., *supra* note 93, at 1035.

252 Tolan, *supra* note 18, at 448-49.

253 43 C.F.R. § 11.83(b)(3), (c)(3) (2011).

254 *Id.* § 11.91(c).

255 Kennecott Utah Copper Corp. v. U.S. Dep't of the Interior, 88 F.3d 1191, 1216-17 (D.C. Cir. 1996).

Trustee innovation in bringing new methodologies to CERCLA is not revolutionary. HEA is the test case, representing a successful effort by NOAA which was not only accepted by DOI regulators but also served as a justification for HEA's subsequent regulatory inclusion under CERCLA.[256] Given ESS's broad acceptance within the scientific, governmental, and business communities; its focus on reliable economic indicators of ecological value; and its emphasis on directly and fully determining restoration costs, ESS fulfills CERCLA's regulatory prerequisites of acceptance, reliability, and cost effectiveness.

F. *The "Rebuttable Presumption" Conundrum*

SARA's revisions to CERCLA granted a rebuttable presumption of accuracy to any state or federal trustee assessments adhering to the regulations' methodological requirements.[257] At first glance, this would seem to be a strong weapon on the side of plaintiffs. However, while it does ostensibly shift the burden of persuasion, in practice the rebuttable presumption simply requires defendants to do what they would have done already: defend themselves assertively against the conclusions of trustee experts. Thus, the "promise" of the rebuttable presumption offers little in practice where litigation revolves around "battles of the experts," particularly when the methodologies employed are subject to decades of blistering criticism, as is the case with CV and as seems to be the emerging case with HEA and its progeny.[258]

Based on the guidelines CERCLA provides for alternative methodologies, it is likely ESS would be entitled to the rebuttable presumption. To whatever degree ESS is not so entitled, however, resistance to ESS based on fear of losing the rebuttable presumption is likely overcome by the potential benefits flowing from ESS's clear restorative emphasis, interdisciplinary acceptance, and solid economic foundations.

IV. POLICY CONSIDERATIONS AND IMPACTS FROM ADOPTING ECOSYSTEM SERVICES

As suggested by the awkward handling of CERCLA regulations under three successive administrations, regulatory reform is frequently subject to

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256 Natural Resource Damages for Hazardous Substances, 73 Fed. Reg. 57,259, 57,267 (Oct. 2, 2008) (to be codified at 43 C.F.R. pt. 11).

257 42 U.S.C. § 9607(f)(2)(C) (2006).

258 *See* Thompson, *supra* note 89, at 84-85 (comparing two different cases, each using CV studies, one of which was a "state of the art" study and where both studies were ultimately rejected by the courts); *see also supra* notes 189-210 and accompanying text.

the winds of political change.[259] While this can be advantageous in some ways, it does little for executive responsibilities that rely on disciplines changing as rapidly as economics and environmental science. The wealth of data accumulated from even the most recent disasters has advanced ESS significantly.[260] Continuing to await regulatory reform against a backdrop of political shifts in executive power is only deepening the divide between the DOI's regulations and ever-advancing economic and environmental science.

Increased pressure on ecological resources worldwide and the need for humanity to adapt quickly in response to that pressure presents a further, compelling argument to support ESS's emphasis on nature's benefit to man.[261] As seen in both Love Canal and the Catskills, many ecosystem services sustain not only economic life but also more basic needs of human survival.[262] In the name of upholding the public interest, courts should embrace ESS as serving CERCLA's primary goals and to project a better "sense of concern for future generations."[263]

By embracing ESS the courts would also be improving judicial efficiency. The common acceptance of ESS and its reliance on market-derived assessments that seek to serve decision makers and stakeholders will reduce the number of potential issues prior to trial.[264] As has been seen in patent litigation, clarifying standards increases settlement and judicial efficiency.[265] Broad adoption of ESS will similarly clarify the metrics and measures of CERCLA damage assessment litigation.

The current methodologies also put stress on judges by calling on them to render judgment on technical fields over which they possess limited competence.[266] Unlike HEA and CV, which have found supporters and de-

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259 *See supra* notes 53, 101-104 and accompanying text.

260 *See supra* notes 149-152 and accompanying text.

261 *See* ECOSYSTEMS AND HUMAN WELL-BEING, *supra* note 155, at 829-34 (listing losses to ecosystems affecting food and clean water provisioning, climate regulation, nutrient cycling, the spread of disease, and biodiversity).

262 *Id.* at 829.

263 Verhovek, *supra* note 17 (quoting Dr. David Axelrod, then commissioner of the New York State Health Department) (internal quotation marks omitted).

264 *See* Ohio v. U.S. Dep't of the Interior, 880 F.2d 432, 474-79 (D.C. Cir. 1989) (reviewing many industry concerns with regard to CV and noting industry faith in assessments); *see also supra* notes 193-195 and accompanying text. Litigation complexity and expense would be reduced in an ESS context where the methodology itself bears the imprimatur not only of environmental science but also economics, government, and industry, thereby reducing uncertainty over outcome and increasing efficient settlement. *See supra* notes 248-251 and accompanying text.

265 Richard S. Gruner, *How High Is Too High?: Reflections on the Sources and Meaning of Claim Construction Reversal Rates at the Federal Circuit*, 43 LOY. L.A. L. REV. 981, 1064-65 (2010) (suggesting that higher settlement rates imply greater legal standard clarity in patent law, another field dominated by settlements).

266 Matthew W. Swinehart, Note, *Remedying* Daubert*'s Inadequacy in Evaluating the Admissibility of Scientific Models Used in Environmental-Tort Litigation*, 86 TEX. L. REV. 1281, 1302 (2008) (noting

tractors, ESS has received broad support, making it harder to rebut in court.[267] Its rapid development, and its having found a range of uses in government, business, and public policy also evidence shared faith in ESS.[268] Adoption of ESS in the CERCLA natural resource damage assessment process would likely encourage additional development of ESS methodologies.[269] The presence of industry, economic, social, and environmental science in the ESS community implies that much of the methodological debate would be had within the scientific literature and workplaces of ESS, environments vastly more competent than the courts to identify best methods. Thus, there is a policy advantage, with regard to judicial competence, in encouraging ESS by allowing the vigorous and useful debate about "best methods" to evolve in the scientific, rather than judicial, community.

CONCLUSION

CERCLA litigation is, by the very nature of its complex intertwining of law, policy, and science, an evolving landscape. The history of CERCLA litigation is evidence of the difficult issues raised when one attempts to accurately assess damage done to the environment and how that damage affects the well-being of citizens. At its inception, CERCLA faced the challenge of addressing extensive industrial damage to natural resources using a limited and imperfect scientific toolset. CV faced immediate criticism from all sides but was accepted as a "best available procedure" at the time. HEA, while resolving some of the concerns about CV, now faces growing skepticism of its own. What was state of the art in 1986 has long since been superseded, and the need for a practical, policymaker-aware system of assessment has resulted in the development of ESS. Courts and litigants can employ the legislative and judicial opportunities that were already used by HEA to bring ESS into CERCLA natural resource damage assessments. In support of CERCLA's principle goals and improved normative outcomes, courts and litigants can and should introduce ESS without waiting for regu-

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Justice Rehnquist's dissent in *Daubert* and the impropriety of judges being asked to render admissibility decisions regarding the "highly technical nature of models" in environmental cases).

267 Lars Noah, *Scientific "Republicanism": Expert Peer Review and the Quest for Regulatory Deliberation*, 49 EMORY L.J. 1033, 1050 n.65 (2000) (noting the validation provided by peer review and peer criticism in accrediting methodologies used in CERCLA natural resource damage assessments).

268 *See supra* note 157 and accompanying text.

269 *See, e.g.*, Robin Kundis Craig, *Justice Kennedy and Ecosystem Services: A Functional Approach to Clean Water Act Jurisdiction After* Rapanos, 38 ENVTL. L. 635, 658-61 (2008) (reviewing EPA and Army Corps guidance in response to Justice Kennedy's concurrence in *Rapanos v. United States*, 547 U.S. 715 (2006), in which Justice Kennedy created a "significant nexus" test related to the Clean Water Act and from which the agencies determined that Kennedy's test would "impose[] new informational demands" on the agencies, resulting in more frequent and commonplace discussions of ecosystem services in Clean Water Act litigation).

latory reform. In so doing, all parties will more faithfully serve CERCLA's primary restorative thrust to the benefit of the environment and all who depend on nature's provision of critical, life-sustaining services.