QUANTITATIVE VALUATION IN ENVIRONMENTAL LAW

*Arden Rowell**

Quantitative valuations of environmental impacts affect and sometimes determine the substance and stringency of many environmental laws. At the same time, a constellation of psychological factors makes environmental impacts unusually difficult for individuals to see, understand, and care about. As a result, the environmental valuations that inform environmental law are particularly vulnerable to contextual cues, small shifts in framing, and methodological choice, and can lead to sincere but wildly varying valuations of the same underlying environmental impacts. These distortions become increasingly apparent when valuations are quantified, and in fact can be used predictably to push quantified valuations "up" and "down" using a toolkit of identifiable contextual and methodological levers. From a practice perspective, it can be helpful for attorneys to be able to recognize and use levers to drive quantitative valuations of environmental impacts up or down, and for judges to understand the mechanisms that will have predictable impacts on quantified valuations of environmental impacts. From a public policy perspective, while it is helpful to recognize that environmental valuations may be particularly sensitive to methodological and contextual choice, it is also important to understand that different uses of quantitative valuations within environmental law are differently sensitive to these kinds of shifts in valuation. Because quantitative environmental valuations will rise and fall based upon engagement with context and valuation methodology, refusal to engage with quantified valuation of environmental impacts—historically engaged in by many with progressive and pro-environmental perspectives, but which has also grown more common in recent years amongst conservative and pro-industry perspectives—is likely to have an outsized impact on the quantified value of environmental impacts, and thus on the substance and stringency of environmental regulation.

Within environmental legal scholarship, there is a longstanding debate about the extent to which environmental goods and harms should be valued in quantitative (including monetary) terms, and the extent to which they should instead be valued qualitatively, through democratic means or on moral grounds.[1] While proponents of qualitative and quantitative

* Professor, University of Illinois College of Law.

1 *See, e.g.*, FRANK ACKERMAN & LISA HEINZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING (2004); RICHARD L. REVESZ & MICHAEL A. LIVERMORE, RETAKING RATIONALITY: HOW COST BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH (2008); MARK SAGOFF, THE ECONOMY OF THE EARTH: PHI-

approaches to valuation recognize that some valuations present special challenges, they disagree about whether the appropriate response to those challenges is to quantify more or less.[2]

Some arguments for qualitative valuation are based on critiques about the reasonableness or defensibility of quantitative methods currently in use;[3] others, often tied to ethical movements in environmental ethics that emphasize the intrinsic value of environmental goods and ecosystems[4] or the separable value of political judgment,[5] are based on political or ethical judgments about how society should constitute itself, and how humans should relate to their environment.[6] These latter arguments, including those in Frank Ackerman and Lisa Heinzerling's book *Priceless: On Knowing the Price of Everything and the Value of Nothing*,[7] have been particularly influential within environmental legal scholarship.

One aspect of the appeal of these ethical accounts is that they speak directly to the normative priors of most within the field. Indeed, as readers within the field will already know—and outside the field may suspect—environmental law scholars often hold deeply felt pro-environmental ethical and political commitments. What readers outside the field may not suspect, however, is that these commitments are held so deeply, and are often tied so tightly to positions rejecting quantitative valuation, that environmental scholars sometimes hesitate even to engage with economic analysis or with the quantifications that support it, out of concern that doing so might legitimize

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LOSOPHY, LAW, AND THE ENVIRONMENT (2d ed. 2008); CASS R. SUNSTEIN, RISK AND REASON: SAFETY, LAW AND THE ENVIRONMENT (2002).

2 *Compare* Cass R. Sunstein, *The Limits of Quantification*, 102 CALIF. L. REV. 1369, 1375–79 (2014) (suggesting that constraints on quantification can be at least partially addressed with redoubled efforts to quantify), *with* Lisa Heinzerling, *Quality Control: A Reply to Professor Sunstein*, 102 CALIF. L. REV. 1457, 1457 (2014) (suggesting that the qualitative benefits of regulation cannot be meaningfully addressed via quantitative methods).

3 *See generally, e.g.*, Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553 (2002) (focusing, more than the authors' subsequent book, on criticisms of existing methods).

4 Highly influential accounts include PAUL W. TAYLOR, RESPECT FOR NATURE: A THEORY OF ENVIRONMENTAL ETHICS 12–13 (1986); Aldo Leopold, *The Land Ethic*, *in* A SAND COUNTY ALMANAC AND SKETCHES HERE AND THERE 201, 203–07 (1949).

5 SAGOFF, *supra* note 1, at 26–29.

6 For multiple perspectives on the relationship between environmental ethics and environmental law, see Holly Doremus, *Environmental Ethics and Environmental Law: Harmony, Dissonance, Cacophony, or Irrelevance?*, 37 U.C. DAVIS L. REV. 1 (2003) (summarizing key movements in the relationship between environmental ethics and environmental law, and introducing a variety of perspectives in a symposium on that topic); Jedediah Purdy, *Our Place in the World: A New Relationship for Environmental Ethics and Law*, 62 DUKE L.J. 857 (2013) (tracing the historical relationship between environmental ethics and environmental law, and arguing that the two should converge further). For two influential early articles applying an ethically grounded, noneconomic approach to environmental law, see Christopher D. Stone, *Should Trees Have Standing?—Toward Legal Rights for Natural Objects*, 45 S. CAL. L. REV. 450 (1972); Laurence H. Tribe, *Ways Not to Think About Plastic Trees: New Foundations for Environmental Law*, 83 YALE L.J. 1315 (1974).

7 *See* ACKERMAN & HEINZERLING, *supra* note 1.

what is seen as a dangerous and degrading approach to the environment.[8] In some cases, the intuition that quantification is degrading is so strongly felt that quantitative analyses are viewed as presumptively pretextual: as insincere justifications for reducing the stringency of environmental protection, and for degrading overall environmental quality.[9] In other cases, ethical beliefs in the intrinsic value of nonhuman plants, animals, or ecosystems make quantitative and particularly monetary valuations—expressed in terms of human money—look either ethically orthogonal or arrogant in their human-centrism, and create still greater resistance to quantification.[10] And all of these concerns coexist with a common uneasiness with numbers and numeracy that pervades much of law,[11] including environmental law. At times, these factors combine to generate a strong intuitive rejection of economic approaches within environmental law that might shock law and economics scholars in other subdisciplines.

As a result, and despite some important counterexamples,[12] economic approaches to environmental law remain the minority within the field, and discussions of quantitative or monetary valuations of environmental impacts are still often met with skepticism, suspicion, and even recoil from many environmental legal academics, both in the United States and abroad. In the United States, this sense of hesitancy and even disgust percolates through many pro-environmental organizations as well—a phenomenon with special legal importance given the enforcement role private parties play within U.S. environmental law through "citizen suits," a procedural mechanism common within U.S. environmental statutes that allows for private enforcement regarding many environmental harms.[13]

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8 *See id.* at 7–12. Environmental degradation and loss are a common and powerful focus within environmental law. *See* Arden Rowell, *Regulating Best-Case Scenarios*, 50 ENV'T L. 1105, 1158–59 (2020) (suggesting that psychological factors, including loss aversion, may contribute to the widespread disciplinary focus on environmental degradation and loss).

9 *See* ACKERMAN & HEINZERLING, *supra* note 1, at 7–12.

10 *See* RICHARD BURNOR & YVONNE RALEY, ETHICAL CHOICES: AN INTRODUCTION TO MORAL PHILOSOPHY WITH CASES 283–91 (2d ed. 2017) (summarizing anthropocentric and ecocentric approaches to environmental ethics, summarizing ecocentric approaches, and criticizing influential economic approaches for their assumptions of anthropocentrism).

11 *See* Lisa Milot, *Illuminating Innumeracy*, 63 CASE W. RSRV. L. REV. 769, 769–70, 806 (2013) (noting the high level of math anxiety amongst many lawyers); *cf.* Arden Rowell & Jessica Bregant, *Numeracy and Legal Decision Making*, 46 ARIZ. ST. L.J. 191, 193–96 (2014) (noting the common belief amongst lawyers that they lack numerical skill or "numeracy," while providing some empirical evidence that people with legal training actually may have comparable numeracy to others with graduate degrees; also reporting the results of an empirical study showing that participants with low numeracy tended to reach different legal conclusions than those with higher numeracy).

12 For an overview of environmental law and economics approaches, including recognition of many of the most influential voices, see generally MICHAEL G. FAURE & ROY A. PARTAIN, ENVIRONMENTAL LAW AND ECONOMICS: THEORY AND PRACTICE (2019).

13 *See* ARDEN ROWELL & JOSEPHINE VAN ZEBEN, A GUIDE TO U.S. ENVIRONMENTAL LAW 26–27 (2021) (discussing the role of citizen suits within U.S. environmental law). This

In the United States, the skepticism many mainstream environmental scholars feel toward quantification of environmental injury was further reinforced in the early years of regulatory cost-benefit analysis, where—as initially implemented by President Ronald Reagan—quantification methods tended to value environmental impacts low, and thus to justify deregulatory policies that many pro-environmental voices rejected.[14] During this period, pro-environmental and proregulatory commentators tended to view cost-benefit analysis and the quantification of environmental harm as biased, even as pro-industry and deregulatory commentators tended to defend both quantification and cost-benefit analysis as reasoned and considerate.[15] While this alignment was sometimes seen as pretextual (on both sides), it is worth noting that common psychological phenomena of motivated cognition make it easier even for sincere decisionmakers to perceive and use information that is consistent with their underlying desires and normative values.[16] Processing information that creates cognitive dissonance with one's prior beliefs is costly and uncomfortable, and people may in fact perceive things differently depending upon their starting positions.[17] As a result, perceiving the upsides of a decision procedure that generates desirable outcomes is easier—and perceiving the bias, errors, and downsides of procedures that generate *un*desirable outcomes is psychologically easier as well.

Given this psychological background, perhaps it should not be either too surprising—or too much call for cynicism—that just as new quantification

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choice to rely on private enforcement mechanisms for federal environmental law is relatively unusual; many other jurisdictions around the world have chosen not to rely so much on private enforcement. *See, e.g.*, JOSEPHINE VAN ZEBEN & ARDEN ROWELL, A GUIDE TO EU ENVIRONMENTAL LAW 21–25 (2021) (providing an overview of enforcement in European environmental law and noting the limited role of private enforcement).

14 *See* ROWELL & VAN ZEBEN, *supra* note 13; *see also* REVESZ & LIVERMORE, *supra* note 1, at 26, 189 (discussing the development and use of regulatory cost-benefit analysis to further Reagan and H.W. Bush-era deregulatory policies); *cf.* MICHAEL A. LIVERMORE & RICHARD L. REVESZ, REVIVING RATIONALITY: SAVING COST-BENEFIT ANALYSIS FOR THE SAKE OF THE ENVIRONMENT AND OUR HEALTH 35–50 (2020) (describing shifts in both progressive and conservative evaluations of progressive cost-benefit policies put in place under President Obama).

15 *See supra* note 14. Although generally descriptive, at no point was this alignment universal. There were scholars who also advocated, for example, for the use of cost-benefit analysis as a neutral decision procedure, without explicit appeal to either proregulatory or deregulatory priors, *see, e.g.*, MATTHEW D. ADLER & ERIC POSNER, NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS (2006); SUNSTEIN, *supra* note 1, and who advocated for cost-benefit analysis on proregulatory grounds, *see, e.g.*, REVESZ & LIVERMORE, *supra* note 1.

16 For a summary of key findings in psychological research on motivated cognition, see ARDEN ROWELL & KENWORTHEY BILZ, THE PSYCHOLOGY OF ENVIRONMENTAL LAW 122–128 (2021).

17 *See* ROWELL & BILZ, *supra* note 16, at 122–28; *see, e.g.*, Charles S. Taber & Milton Lodge, *Motivated Skepticism in the Evaluation of Political Beliefs*, 50 AM. J. POL. SCIENCE 755, 755 (2006) (finding that people tend to seek out consistent but not inconsistent information, and to internally counterargue against positions they don't like while letting preferred positions alone—biasing them towards their preferred conclusions).

methods developed for valuing environmental harms, and as those methods were deployed in the Obama administration to support increasing stringency of many environmental regulations, progressive support for quantitative valuation began (at least temporarily) to increase.[18] (Or, indeed, that pro-industry and deregulatory support for quantitative valuation began simultaneously to weaken.[19]) The policy shift toward progressive quantification methods—a shift supported by arguments made in Richard Revesz and Michael Livermore's *Retaking Rationality*, which came out the year Obama was elected—helped to illustrate the progressive potential of quantification.[20] *Retaking Rationality* suggested—and many of Obama's policies displayed[21]—that pro-environmental values could be paired both with economic analysis and with quantitative valuations, at least in the context of regulatory cost-benefit analysis, and that as a result, using quantitative analyses might not amount to a betrayal of pro-environmental ethical values. For many mainstream scholars and progressive voices, this opened up the possibility of embracing cost-benefit analysis in a way that could fit with their preexisting commitments, perceptions, and values, and which did not generate cognitive dissonance. At the same time, continued embrace of quantification may have begun to trigger cognitive dissonance for those whose deregulatory priors made them uneasy with methods that valued the benefits of regulation more highly.

The growing trust that some pro-environmental voices felt in quantified valuation and cost-benefit analysis, however, was subsequently undermined by the administration of President Donald Trump—an overtly deregulatory administration whose environmental policies tended to imbed quantification techniques that minimized the apparent value of environmental benefits, and to involve other approaches with a deregulatory impact,[22] and whose approach to cost-benefit analysis has been described as a "charade."[23] Pan-

18 *See* LIVERMORE & REVESZ, *supra* note 14, at 35–50 (reviewing the Obama-era shift in approach, and providing a characterization of conservative and progressive response).

19 *See id.* at 79–106 (chronicling the decline in conservative and deregulatory support for cost-benefit analysis, in light of Obama-era shifts in methodology and impact).

20 REVESZ & LIVERMORE, *supra* note 1.

21 *See* LIVERMORE & REVESZ *supra* note 14 at 35–50. For example, President Obama directed the generation of a "Social Cost of Carbon" to quantify the global environmental impacts of climate change, a valuation policy with important pro-regulatory implications. *See* William Pizer, Matthew Adler, Joseph Aldy, David Anthoff, Maureen Cropper, Kenneth Gillingham, Michael Greenstone, Brian Murray, Richard Newell, Richard Richels, Arden Rowell, Stephanie Waldhoff & Jonathan Wiener, *Using and Improving the Social Cost of Carbon*, 346 SCIENCE 1189, 1189 (2014) (describing the Social Cost of Carbon and its impact); *see also* Arden Rowell, *Foreign Impacts and Climate Change*, 39 HARV. ENV'T L. REV. 371, 375–388 (describing the history of the development of the Social Cost of Carbon).

22 For a review of Trump-era deregulation, see generally LIVERMORE & REVESZ, *supra* note 14, at 104 (characterizing the Trump administration's approach to cost-benefit analysis as a "charade . . . that attempts to ignore the benefits of regulations; that questions those benefits at every opportunity; and that, when convenient, invents sham benefits out of thin air to support a favored deregulatory action").

23 *See id.*

demic-era discussions pitting economic flourishing against public-health concerns have also fed into a narrative that implies to many that economic analysis is antagonistic to health and related concerns.[24]

Environmental law and policy is thus at an uneasy moment in regards to both economic analysis and quantitative valuation. [25] At the least, it is a challenging time for many in the mainstream of environmental scholarship, who historically held deep emotional and ethical reservations about the role of economic analysis in environmental law, and who are personally and emotionally grieved by the prospect of continued environmental degradation.

Yet while the continued controversy surrounding the quantification of environmental goods may be understandable in light of recent political developments, it is also unfortunate, at least insofar as that controversy has reinforced the widespread reluctance amongst both scholars and environmental organizations to meaningfully engage in many of the valuation questions that inform key legal outcomes. In part as a result of the domestic success of law and economics in shaping policy, and unlike some other environmental regimes around the world, a significant portion of U.S. environmental law is informed by—and in some cases, even determined by—quantitative and economic analysis.[26] These analyses are necessarily informed by quantitative valuations of environmental goods and harms—the same type of valuations with which many environmental scholars and activists hesitate to engage. Indeed, in many environmental contexts, the rules of engagement are at least partially set by economic analysis, and thus by the quantitative valuations of environmental goods and harms that inform those analyses.

The particular uses to which quantified valuations are put has, as I shall discuss further below, potentially important implications for the stakes of valuation, and thus for the importance of full engagement in the process of valuation. Before getting to those points of fine-tuning, however, it is important to emphasize the larger and more general starting point, which is that quantified valuations do inform multiple key functions within environmental law—especially, though not exclusively, U.S. environmental law.[27] The historical reluctance of many environmental scholars to engage with economic

24 *See* Exec. Order No. 13,927, 85 Fed. Reg. at 35,165 (June 4, 2020). For one of many perspectives suggesting that it is incomplete—and even dangerous—to presume that pandemic policies require a choice between economics and health, see generally Carla Guerriero, Andy Haines & Marco Pagano, *Health and Sustainability in Post-Pandemic Economic Policies*, 3 NATURE SUSTAINABILITY 494 (2020); *see also* Arden Rowell, *COVID–19 and Environmental Law*, 50 ENV'T L. REP. 10881 (2020) (discussing additional impacts of the pandemic on environmental law and policy).

25 For further characterization of this moment in historical and political perspective, see LIVERMORE & REVESZ, *supra* note 14, at 179–90.

26 *See* ROWELL & VAN ZEBEN, *supra* note 13, at 81–89 (describing the foundational impacts of quantitative risk analysis and cost-benefit analysis within U.S. environmental law); *cf.* VAN ZEBEN & ROWELL, *supra* note 13 at 80–87 (noting the importance of science-informed risk assessment within EU environmental law).

27 *See* ROWELL & VAN ZEBEN, *supra* note 13, at 81–89.

analysis and quantified valuation thus freezes them out of discussion and engagement in powerful parts of environmental decisionmaking. When environmental scholars who refuse to engage are on one "side" of the issue—for example, those scholars who hold deep pro-environmental perspectives—this creates a distortion in the field that impoverishes legal decisionmaking, the public, and the environment itself.

Perhaps the point can be made clearer by analogy. By holding back from engagement in quantification, it has been as if, disgusted by the sport of pugilism, pro-environmental perspectives have refused to put a fighter into a (legal) boxing ring at all. Instead, they have their best athletes stand conscientiously by, articulating objections to how the violence is demeaning or damaging, crossing their muscled arms on the sidelines—even as the fight continues on without them. Meanwhile, stakeholders without the disgust for the sport—historically, business interests, polluters, or regulated industry—have invested in training, put their best fighter in the ring, spectate enthusiastically, and stand ready to read the rulebook and to argue. The fight is then determined either by forfeit, or by substitution of a straw man for what could have been a powerful representative of a pro-environmental perspective. Who is the victor in such a fight? Perhaps those who step into the ring, perhaps no one; but certainly not the public, who deserve laws and regulations that flow from the product of engagement between the best that all perspectives can field.

The point here is not to argue that pugilism is appealing rather than disgusting, or even to relitigate the question of whether it is degrading to quantify or to monetize environmental harms and impacts. It is rather to say that even if violence (or quantifying environmental impacts) seems repugnant, recoiling from a fight may have important consequences—in this case, on environmental quality and environmental protection—and that it is at least worth recognizing what those consequences are. Some fights may have graver consequences than others; being able to recognize which those are may matter to when it seems appropriate and worthwhile to step into the ring, even given misgivings about the potential damage (whether personal or ethical) that engagement may cause. Of course, stepping into a ring after a life of conscientious objection carries disadvantages along with it; even a powerful athlete who has never boxed may struggle at first to land punches against (even weaker) opponents who have honed their footwork and their uppercuts and who have developed expertise in the rules of the game. In such cases, it is better for everyone (except perhaps the more-experienced opponent) if everyone understands what the stakes of the fight will be, how scorekeeping is kept, what makes for a fair hit, and when the match will be over.

These are also the necessities for meaningful engagement with quantitative valuation. Frequently, determinations of how environmental goods and harms are valued—in quantitative terms—form the "punches" that are thrown within the ring of environmental policymaking. It is important to have a full mental account of the role that quantified valuations play within

U.S. environmental law; to be able to recognize where engagement with quantified valuations is likely to be questionable, as well as when it has high and highest stakes; and for stakeholders to have a handful of techniques ready, both to be able to recognize others' moves and to plot their own. Such an account is especially critical for environmental scholars and stakeholders who are disgusted by quantification and economic analysis of the environment, and who otherwise might remove themselves from these fights, as such an understanding may help them both in deciding when it could be important to overcome their repugnance and step into the ring of economic analysis; and in knowing what to do once they get there. But the account is also important for less-skeptical scholars and for courts; for them, an account of how—and how much—quantified valuations affect environmental law may help both in identifying the pressure points where seemingly technical choices about quantification methodology may trigger particularly significant shifts in the substance of environmental law, and where additional attention to valuation methodology may pay highly leveraged dividends. Finally, such an account is important in helping to ensure that environmental law is informed by a full range of perspectives and arguments.

Importantly, the stakes of quantitative valuations of environmental impacts will vary across valuation contexts. At a basic level, higher-stakes valuations justify greater engagement and care—even in the face of continued objections to the underlying methods themselves. But which valuations should be expected to have high stakes?

One obvious mediator of stakes is the apparent magnitude of the underlying impact, which of course will vary across environmental contexts. The extent of the damage addressed after the Deepwater Horizon oil spill, for example,[28] makes the valuations underlying those calculations higher stakes than those involving a much smaller or contained spill. For extraordinarily large cases such as the Deepwater Horizon, it clearly made sense both for the attorneys and for the court to spend significant attention on the process of valuation.

That said, the apparent magnitude of the underlying impact is not the only important consideration. Analysts—including environmental scholars and attorneys—would also do well to consider the sensitivity of the underlying good to changes in underlying valuation methodology, as well as the sensitivity of the underlying use to shifting legal outcomes. Both of these factors

28 For a summary of the damages calculated in the Deepwater Horizon oil spill, as well as resources on ongoing restoration, see *Deepwater Horizon*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://darrp.noaa.gov/oil-spills/deepwater-horizon (last visited Jan. 26, 2021) and *Deepwater Horizon—BP Gulf of Mexico Oil Spill*, ENV'T PROTECTION AGENCY, https://www.epa.gov/enforcement/deepwater-horizon-bp-gulf-mexico-oil-spill#:~:text=ON%20April%2020%2C%202010%2C%20the,of%20marine%20oil%20drilling%20operations (last visited Jan. 26, 2021) (listing related case and settlement information). The spill—thus far the largest in the history of marine oil drilling operations—led to emissions of at least four million barrels of oil into the Gulf of Mexico, and to $8.8 billion being levied against British Petroleum in natural resource damages (along with $5.5 billion as a penalty under the Clean Water Act). *Id.*

may increase or decrease the level to which careful engagement with valuation will be justified.

Consider the role of valuation methodology. Different valuation methodologies can generate different apparent values for the same targeted good, even for straightforward market goods that are routinely traded in well-functioning markets.[29] Anyone who has ever had a dispute with an insurance company over the loss or damage of some item is familiar with the types of decisions that affect such valuations. Should a stolen bicycle be valued at the average cost of a bicycle in the area, or the cost of the particular type of bicycle that it was? Should it be valued at original cost, replacement cost, second-hand cost, or actual cash value, as if it had been sold? Is the value subject to depreciation for the time you owned it, and if so, at what rate? The answer to each of these methodological questions affects the valuation of the bicycle. And the questions only become more complicated as goods become more complex.[30]

The complications are exponentially greater for nonmarket goods—for things that are not traded in markets at all, such as the welfare of a fish species, clear air, or the long-term preservation of a wilderness.[31] Environmental economists have still—sometimes heroically—developed methods for expressing some portion of these goods in quantitative and even monetized terms, often by relying by contingent valuation studies, which ask people about their valuations.[32] Environmental agencies continue to develop additional valuation methods for other environmental benefits, particularly of

29 Everyone is familiar with the experience of finding market goods on sale for different prices; the existence of consumer aids like the Google shopping bar is evidence of the pervasiveness of this phenomenon. Alternatively, consider the three leading sources of valuation for donated household goods, typically used by taxpayers itemizing charitable donations, each tend to give varying (sometimes wildly varying) values for the same items: a used couch, for example, is valued alternatively by the Salvation Army at $35–$200, by Goodwill at $75, and by Intuit at $16–$30. *See Valuation Guide for Goodwill Donors*, GOODWILL, https://www.goodwill.org/wp-content/uploads/2020/03/donation_valuation_guide.pdf (last visited Feb. 18, 2020); *Donation Value Guide*, The SALVATION ARMY, https://satruck.org/Home/DonationValueGuide (last visited Feb. 18, 2020).

30 Business valuation, for example, is a whole subindustry of its own. *See generally* DAVID T. LARRABEE & JASON A. VOSS, VALUATION TECHNIQUES: DISCOUNTED CASH FLOW, EARNINGS QUALITY, MEASURES OF VALUE ADDED, AND REAL OPTIONS (2013).

31 For an overview of these challenges, see EPA, NAT'L CTR. FOR ENV'T ECON., GUIDELINES FOR PREPARING ECONOMIC ANALYSES, 7-1 (2010).

32 For highly practical summary directed towards legal practitioners, see generally *id.*; Catherine M.H. Keske, *How to Value Environmental and Non-Market Goods: A Guide for Legal Professionals*, 39 DENV. J. INT'L L. & POL'Y 423 (2011). For the most recent proposed guidelines on environmental valuation at EPA, see U.S. ENV'T PROT. AGENCY, GUIDELINES FOR PREPARING ECONOMIC ANALYSES (2010). The EPA maintains an office of more than thirty PhD economists at the National Center for Environmental Economics, who spend much of their time working on and developing new methods for environmental valuations; for a collection of their ongoing research, see *Environmental Economics Research Inventory—NCEE EERI Series*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/environmental-economics/environmental-economics-research-inventory-ncee-eeri-series (last updated Dec. 17, 2019).

"ecosystem services," which are benefits (such as providing food and water, regulating flood risk, and providing cultural and recreational opportunities) that ecosystems provide to humans.[33] Such benefits are also valued through some combination of revealed preference studies—looking at how much money people pay in markets for similar goods—and stated preference or contingent valuation studies, such as surveys that ask people how much they would be willing to pay to have higher water quality, to waterski on a lake, to have improved visibility in a national park, or to preserve a region's biodiversity.

Much has been written elsewhere on agency valuation practices, particularly regarding environmental and nonmarket goods, and there is not space in this brief Essay to do justice to environmental economists' increasingly sophisticated—and increasingly complex—valuation techniques.[34] At a minimum, however, it is important to recognize that environmental valuations are subject to most of the same kinds of methodological questions that apply to market goods. Should the impacts be defined broadly (on "any aquatic species"), for example, or narrowly (on "Eastern Oyster, Crassostrea Virginica, in the Piankatank River, Virginia")?[35] Over what time period should impacts be valued? Does their value change over time, and at what rate? Is the relevant value what someone would pay to acquire the good, or what they would have to be paid to give it up? But while these general challenges apply, environmental impacts are also distinctively vulnerable to a constellation of psychological heuristics and phenomena that affect people's judgments about the environment and their relationships with it.[36]

As highlighted below, and as Kenworthey Bilz and I have explained in detail in our recent book, *The Psychology of Environmental Law*, environmental impacts are psychologically distinctive because they tend to be diffuse through time and space, complex, and to have a nonhuman character.[37] Each of these characteristics triggers a set of cognitive, emotional, and motivational phenomena that make environmental impacts unusually challenging for people to perceive, understand, and care about.[38] As a result, quantita-

33 *See* CARLOS CORVALAN, SIMON HALES & ANTHONY MCMICHAEL, WORLD HEALTH ORG., ECOSYSTEMS AND HUMAN WELL-BEING: HEALTH SYNTHESIS: A REPORT OF THE MILLENNIUM ECOSYSTEM ASSESSMENT 41 (José Sarkhán & Anne Whyte eds., 2005); James Salzman, Essay, *Valuing Ecosystem Services*, 24 ECOLOGY L.Q. 887, 892–98 (1997).

34 For the Environmental Protection Agency's current approach, see U.S. ENV'T PROT. AGENCY, *supra* note 32; *see also* CORVALAN ET AL., *supra* note 33, at 41; Salzman, *supra* note 33, at 892–98; Trudy Ann Cameron & Jeffrey Englin, *Respondent Experience and Contingent Valuation of Environmental Goods*, 33 J. ENV'T ECON. AND MGMT. 296 (1997); Matthew A. Wilson & John P. Hoehn, *Valuing Environmental Goods and Services Using Benefit Transfer: the State-of-the Art and Science*, 60 ECOLOGICAL ECON. 335 (2006).

35 Roger Mann, Melissa Southworth, Ryan B. Carnegie & Rita K. Crockett, *Temporal Variation in Fecundity and Spawning in the Eastern Oyster,* Crassostrea Virginica*, in the Piankatank River, Virginia*, 33 J. SHELLFISH RSCH. 167, 167 (2014).

36 *See* ROWELL & BILZ, *supra* note 16.

37 *Id. passim.*

38 *Id.*

tive valuation of environmental goods are distinctively challenging for individuals to identify, process, and generate—and particularly subject to contextual cues, to framing, and to motivational processes and cognition that can distort people's perceptions and processing.

Knowledge of these psychological phenomena can be used to generate concrete strategies for making quantitative valuations of environmental goods look either larger or smaller. It is important for environmental scholars to be aware of these phenomena, and even more, for there to be general awareness that quantitative environmental valuations will change in predictable directions, depending upon the methodological choices that go into their calculation. Knowledge of the impact of these strategies goes directly to the question of what is gained via engagement with quantitative valuation methods—and what may be lost if, as is currently the case, one set of strategies is more frequently invoked within environmental decisionmaking, even as the other is neglected.

As a brief and incomplete guide, consider the following strategies:

CHOICES THAT PREDICTABLY AFFECT VALUATIONS OF ENVIRONMENTAL IMPACTS

Methods to Drive Valuations UP	Methods to Drive Valuations DOWN
• Increase scope: spatial scope, time period of interest, number of targeted goods	• Decrease scope: spatial scope, time period of interest, number of targeted goods
• Adopt low discount rates	• Adopt high discount rates
• Elicit willingness to accept (WTA) a loss	• Elicit willingness to pay (WTP) for a gain
• Emphasize scarcity and uniqueness, as well as perceived ties to identity and in-group well-being	• Dampen perceived scarcity and uniqueness and ties to identity; emphasize ties to out-group well-being

Obviously, as with other types of goods, increasing the scope of the goods being valued will tend to increase the valuation: attaching a dollar value to the harm of foreign impacts, for example, will generate a larger number than valuing similar harm only within the United States.[39] Considering longer time scales opens up the possibility of more impacts to be counted.[40] And logically, more impacts will generally lead to larger values.

39 For further discussion of valuation of foreign harms, and the way that different valuation methods can affect calculations, see Arden Rowell & Lesley Wexler, *Valuing Foreign Lives*, 48 GA. L. REV. 499, 501–02 (2014); *see also* Rowell, *supra* note 21 at 400–20 (describing the implications of adopting a global versus domestic scope for purposes of valuing the "Social Cost of Carbon," the United States' primary regulatory mechanism for quantifying climate change harms).

40 *See* Arden Rowell, *Time in Cost-Benefit Analysis*, 4 U.C. IRVINE L. REV. 1215, 1232–38 (2014) (discussing the impact of the selection of relevant time scale).

Discount rates—the rate used to adjust for the time-value of money and to make monetized impacts comparable through time—can have an extraordinary effect on the present value of environmental impacts.[41] But while discount rates can affect the present value of any type of good, their impact is exaggerated for environmental impacts, both because environmental impacts tend to be dispersed over time, so that there is often a long latency period for rates to compound,[42] and because processing latent impacts tends to trigger psychological heuristics—including present bias, hyperbolic discounting, myopia, and difficulties with hedonic forecasting—that can make individuals perceive greater value in immediate over future gains (and future over immediate losses).[43] As a general matter, however, selecting a low discount rate instead of a high discount rate will tend to drive the present value of environmental impacts substantially up, making environmental protection look more valuable.

Another well-documented effect is that goods are valued more highly when valuations are elicited on the basis of willingness to accept (WTA) a loss, than where they are valued based on willingness to pay (WTP) to secure a gain.[44] While there are documented WTA/WTP gaps across multiple contexts, the gap is particularly large for goods—like environmental goods—which are not routinely traded in markets.[45] In fact some research suggests that, for environmental goods, willingness to pay (WTP)

41 *See* GEOFFREY HEAL, ECONOMIC THEORY AND SUSTAINABILITY 27–31 (1998); Shane Frederick, George Loewenstein & Ted O'Donoghue, *Time Discounting and Time Preference: A Critical Review*, 40 J. ECON. LITERATURE 351, 355 (2002); Arden Rowell, *The Cost of Time: Haphazard Discounting and the Undervaluation of Regulatory Benefits*, 85 NOTRE DAME L. REV. 1505, 1512–14 (2010). For a classic article on the practice of regulatory discounting in regulatory cost-benefit analysis, see Richard L. Revesz, *Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L. REV. 941, 943–44 (1999). For a discussion of methodological choices regarding discounting that affect regulatory valuations, see generally Rowell, *supra*; Cass R. Sunstein & Arden Rowell, *On Discounting Regulatory Benefits: Risk, Money, and Intergenerational Equity*, 74 U. CHI. L. REV. 171 (2007) (reviewing agency practice).

42 *See* Revesz, *supra* note 41, at 947–48.

43 *See* ROWELL & BILZ, *supra* note 16, at 48–50 (reviewing research on the impact of latency or temporal diffusion on perception and processing of environmental impacts).

44 *See id.* at 129–31 (reviewing research on WTP/WTA gap and the endowment effect as it applied to environmental contexts); Jack L. Knetsch, *Biased Valuations, Damage Assessments, and Policy Choices: The Choice of Measure Matters*, 63 ECOLOGICAL ECON. 684, 685 (2007) [hereinafter Knetsch, *Biased Valuations*]; Jack L. Knetsch, *Environmental Policy Implications of Disparities Between Willingness to Pay and Compensation Demanded Measures of Values*, 18 J. ENV'T ECON. & MGMT. 227, 228 (1990). Observed gaps between willingness to pay (WTP) and willingness to accept (WTA) actually provided the inspiration for the original experimental research on the endowment effect, which has been particularly influential within law. *See, e.g.*, Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471, 1484 (1998); Gregory Klass & Kathryn Zeiler, *Against Endowment Theory: Experimental Economics and Legal Scholarship*, 61 UCLA L. REV. 2, 4–6 (2013).

45 *See* John K. Horowitz & Kenneth E. McConnell, *A Review of WTA/WTP Studies*, 44 J. ENV'T ECON. & MGMT. 426, 427 (2002).

to secure an environmental amenity may be as little as one-tenth (ten percent) of what participants would identify as their willingness to accept (WTA) the loss of the same amenity.[46] By these lights, the common regulatory practice of using WTP over WTA has particularly large potential consequences for the stringency of federal environmental regulations.[47]

Other psychological factors can also play a distinctive and predictable role within environmental valuation. This includes the perception of scarcity and uniqueness.[48] Generally speaking, people exhibit preferences for things they perceive as one of a kind.[49] Perceived scarcity also increases the perceived value of goods,[50] and triggers a constellation of psychological phenomena sometimes called a "scarcity mindset,"[51] inflating valuations and making it difficult for people to focus on other things. Conversely, perceived abundance decreases people's valuation of goods, and may even lead to waste.[52] Finally, the preference for uniqueness and scarcity is further heightened where people associate particular objects or places in the world around them with their personal or social identity.[53] Furthermore, benefits to others who are perceived as falling within an "in-group" are routinely valued more highly than those that are perceived as accruing to "others" or those in an "out-group."[54]

For some readers, the observation that valuation of environmental goods is distinctively vulnerable to psychological heuristics and biases may

46 *See id.* at 428; Knetsch, *Biased Valuations*, *supra* note 44, at 685 (estimating a similar fraction of one-fourth); *see also* ROWELL & BILZ, *supra* note 16, at 130.

47 *See* Knetsch, *Biased Valuations*, *supra* note 44, at 684–85.

48 The book expands substantially on these points. *See* ROWELL & BILZ, *supra* note 16, at 104–06, 192–95.

49 *See id.*

50 *See* Luigi Mittone & Lucia Savadori, *The Scarcity Bias*, 58 APPLIED PSYCH. 453, 455 (2009).

51 *See* SENDHIL MULLAINATHAN & ELDAR SHAFIR, SCARCITY: WHY HAVING TOO LITTLE MEANS SO MUCH 12–14 (2013).

52 *See* ROWELL & BILZ, *supra* note 16, at 194 ("Just as scarcity increases subjective value, perceived abundance may decrease it. Consider how the passenger pigeon was hunted to extinction, although—perhaps in part because—flocks once covered the sky."). For empirical research on abundance and waste, see Brian Wansink, *Can Package Size Accelerate Usage Volume?*, 60 J. MKTG. 1, 29 (1996) (household consumer products); Natalina Zlavetska, Chris Dubelaar & Stephen S. Holden, *Sizing Up the Effect of Portion Size on Consumption: A Meta-Analytic Review*, 78 J. MKTG. 140, 140 (2014) (food-portion size).

53 *See* Mihaly Csikszentmihalyi, *Why We Need Things*, *in* HISTORY FROM THINGS: ESSAYS ON MATERIAL CULTURE 20, 25–26 (Steven Lubar & W. David Kingery eds., 1993); Geoffrey J. Leonardelli, Cynthia L. Pickett & Marilynn B. Brewer, *Optimal Distinctiveness Theory: A Framework for Social Identity, Social Cognition, and Intergroup Relations*, 43 ADVANCES EXPERIMENTAL SOC. PSYCH. 63, 85 (2010).

54 *See* ROWELL & BILZ, *supra* note 16, at 53–58; Henri Tajfel, *Experiments in Intergroup Discrimination*, 223 SCI. AM. 96, 102 (1970). Disturbingly, some research suggests that people can actually take pleasure in harms experienced by members of an out-group, particularly when the out-group is perceived as a competitor. Mina Cikara, Emile G. Bruneau & Rebecca R. Saxe, *Us and Them: Intergroup Failures of Empathy*, 20 CURRENT DIRECTIONS PSYCH. SCI. 149, 149–50 (2011).

seem to vindicate scholarly objections to environmental quantification. Such a conclusion is dangerous, however, for at least two reasons. The first is that it is unclear that the swings in value that attend to many of these heuristics and biases only attach when values are quantified or monetized. Although there are a few studies showing that quantification (and even more specifically, monetization) itself may affect some aspects of valuation,[55] qualitative values—including ethical and political views about the world—are vulnerable to contextual and psychological influence as well. Generally speaking, rejecting quantitative valuation in favor of qualitative valuation, or economic analysis in favor of other methods, simply does not remedy the underlying psychological conditions that make it difficult for people to perceive, understand, and care about environmental impacts.[56] More qualitative methods may even risk making psychological effects even harder to recognize and tease out.

Second, the malleability of environmental valuations to contextual cues and to framing concerns makes refusing to engage with economic analysis an even riskier mechanism of response to those objections, in light of the role of economic analysis in environmental law. To see why this is so, imagine that valuations of any kind operate like a seesaw, teetering up or down depending upon the mass placed on either side. Any valuation can move some—whether up or down—in response to contextual differences and methodological choices. But for many types of goods—for example, of many goods traded in robust markets—the seesaw operates on the basis of a relatively short fulcrum. The seesaw may still teeter in response to mass placed at either side, but the total variability in height is limited by the ground. Now, imagine that a particular form of valuation—such as environmental valuation—is vulnerable to additional sources of psychological (or other) variability. For valuations of these types, it is as if the fulcrum is elevated several feet above the ground. Such a setup is subject to much greater variations up and down, again depending upon who (if anyone) sits on either side. If pro-environmental voices refuse even to sit on their side of the seesaw, the valuations will be lowered—and extremely so. The resulting valuations, used to inform environmental law (via damage assessments, stringency determinations, and even status assignments, as noted below) will be systematically lowered as well, even as conversations about those valuations will be

55 In particular, some studies show that encouraging people to think about things in terms of money may measurably change people's thoughts, feelings, motivations, and behaviors. *See* Eugene M. Caruso, Kathleen D. Vohs, Brittani Baxter & Adam Waytz, *Mere Exposure to Money Increases Endorsement of Free-Market Systems and Social Inequality*, 142 J. EXPERIMENTAL PSYCH. 301, 301–02, 305 (2013) (finding that even incidental exposures to money led subjects to indicate greater support for inequality, socioeconomic differences, free-market economies, and group-based discrimination); Kathleen D. Vohs, *Money Priming Can Change People's Thoughts, Feelings, Motivations, and Behaviors: An Update on 10 Years of Experiments*, 144 J. EXPERIMENTAL PSYCH. e86, e86 (2015).

56 *See generally* ROWELL & BILZ, *supra* note 16.

systematically impoverished. This will happen not because lowered valuations are the best representations of either public welfare or of the importance of environmental flourishing, or even because of inherent faults with the seesaw, but because no one was sitting on the other side of the seesaw to balance it out. And this difference is greater precisely because environmental valuations are susceptible to larger swings in valuation, as a result of increased "height," or susceptibility to psychological and contextual factors.

Still another type of objection to psychological analysis of environmental valuation—or indeed, to behavioral analysis of any type—is that it involves a great deal of work to try to tease out all of the different implications of varying and interacting cognitive, emotional, and motivational effects. One common version of this objection is the complaint that behavioral analyses—whether in environmental law or, more commonly, elsewhere—involve long "lists" of biases and heuristics.[57] Such complaints are often used as justifications for using simpler behavioral models that do not require analysts to grapple with so many considerations at once, a feature of particular appeal to the old guard in law and economics, who tends to prefer simpler theoretical behavioral models to empirical models.[58] Such objections can strike psychologists, accustomed to working through difficult, context-specific problems, as pretextual or even intellectually lazy: Why not do more work if it will result in greater accuracy? But many legal analysts are not accustomed to this type of work, and indeed, the point of their analyses is often to inform policy choices, where resource and institutional constraints may limit the practicability of extended multifactorial analysis. For such applied decisionmaking as the law must often manage, it is reasonable to ask whether the additional complexity of careful empirical behavioral analysis is (always) worth the effort it requires. It is therefore helpful to consider the stakes of the underlying valuation in determining the extent of effort that is worthwhile.

Thus far, this analysis has emphasized two considerations that raise the stakes of (some) environmental valuations: their magnitude and their sensitivity to change in response to valuation methodology. As noted, environmental valuations are subject to heightened methodological variability not only because environmental impacts are not commonly traded on markets, but also because of the psychology of environmental impacts, which tend to be diffuse, complex, and nonhuman in character.

Methodological sensitivity may interact, however, with a third factor, which can also impact the stakes of any particular valuation. That factor is

57 *Cf., e.g.*, MARIO J. RIZZO & GLEN WHITMAN, ESCAPING PATERNALISM: RATIONALITY, BEHAVIORAL ECONOMICS, AND PUBLIC POLICY 46–48 (2020).

58 For a discussion distinguishing empirical and theoretical approaches to modeling behavior, see Thomas S. Ulen, *The Importance of Behavioral Law*, *in* THE OXFORD HANDBOOK OF BEHAVIORAL ECONOMICS AND THE LAW 93, 95 (Eyal Zamir & Doron Teichman eds., 2014).

the use to which the valuation is put. The same valuation can generate different legal stakes, depending upon the way that it informs a legal analysis. In some cases, even small changes in valuation may substantially shift the substance of legal outcomes. The stakes of valuation—and of the methodologies underlying valuation—increase with the likelihood of large shifts in legal consequence. And while the greatest attention to quantitative valuation in environmental contexts has been paid to regulatory cost-benefit analysis, that is by no means the only way in which quantitative valuation informs U.S. environmental law.

To see how this works, and how the use of a valuation can matter, consider that (quantified) valuations are routinely used in at least three different ways within environmental law: to inform damage calculations, to inform stringency, and to determine status. The same valuation can generate different stakes, depending upon which of these uses it is put to.

Imagine, for these purposes, that depending upon the methods used, it is possible to monetize the value of all aquatic life in a particular body of water at somewhere between $0 and $10 million. (I recognize that, for some readers, even reading that sentence is repugnant; please, bear with me.) How worthwhile it is for anyone—pro-environmental or not—to engage with this valuation, and thereby to potentially push the valuation toward one end of the range or the other, will vary based on how the valuation is used, what aspect of the legal decision the valuation informs, and how sensitive that aspect is to small shifts in quantified value.

Where valuations are used to inform damage calculations and other simple quantities, as with natural resource damages or in environmental torts, the payoff of engaging with the valuation is scalar: it scales with the size of the range. Of course, because environmental goods are subject to such variability in valuation, the range will often be relatively large; but within that range, there are no particular discontinuities where stakes suddenly change. A firm defending against a suit claiming damages for the firm's killing of all aquatic life in the designated body of water would have, at most, $10 million in liability. Any arguments it can identify to justify the lower end of the range will save it money, and any arguments that plaintiffs can bring to justify the higher end of the range will generate a larger penalty and thus (potentially) greater future deterrence. But again, within this range, the stakes increase smoothly with increases in the underlying quantified valuation. If different valuation methods would result in the aquatic life being valued either at $9999 or $10,001, for example, the stakes of choosing between methods would just be $2—probably not even enough to justify the time spent understanding both methods. Only a larger difference would justify additional engagement in the valuation methodology—say, the difference between a valuation method that generated a $8.1 million value and a $10 million value (with a difference of $1.9 million). For damage calculations, then, the stakes of valuation methodology are determined by how large the range of plausible valuations is.

Now imagine the same kind of environmental harm—the loss of all aquatic life in a particular body of water—with the same potential valuation range. But now, the range is being put to a different legal purpose: not to determine *damages*, but to determine what stringency of ex ante regulation would be cost-benefit justified. Regulators might, in such a case, be pondering whether the industry should be required to adopt various technological methods for reducing the harm. They might consider whether to require no specific action (which would cost $0), the installation of cheap screens for filtering water intake (which would cost $10,000, and reduce kill by half), or a complicated technological setup that would force the industry to recirculate its water and thus avoid almost all killing of aquatic animals (which would cost $8 million).[59] In this case, various levels of regulatory stringency will be cost-justified only if the environmental valuation of the aquatic life in the stream exceeds the cost of the potential technologies. In that sense, the stakes of the valuation are *discontinuous*: they increase substantially around the inflection points that would make various requirements cost-justified or not (and are otherwise inconsequential). It matters a great deal, for example, whether the valuation of the aquatic life is $9999 or $10,001: the choice between those methods will determine whether the $10,000 screens is required or not. But there are few if any legal consequences attaching to whether the valuation is $10,050 or $3 million. For this type of determination, the stakes of engagement with the valuation process vary wildly, depending upon where there are discontinuities in the impact. Being able to establish that the aquatic organisms should be valued at least $10,000 is the difference between no regulatory limit at all on killing all of the organisms, and saving half. Similarly, being able to establish that the aquatic organisms should be valued at least $8 million is the difference between saving only half their lives, and saving all of them. Once that threshold is reached, however, there is little to no payoff in continued engagement; there is no practical impact in moving the valuation needle upwards from $8.1 million to $10 million. To determine the stakes of any particular valuation within a stringency determination thus requires attention to where the discontinuities are, and to the minimum thresholds that are required to justify each level of additional stringency. At those stringency thresholds, the stakes of engagement can be relatively large, even for relatively small changes in valuation.

Finally, take the same kind of environmental harm—the loss of all aquatic life in a particular body of water—but now imagine that the

59 This fact pattern is drawn from a similar puzzle that the EPA faced under the portions of the Clean Water Act that apply to cooling-water-intake structures, and which was reviewed in *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 215, 224 (2009). In that case, the EPA attached a quantitative valuation of $83 million to the lives of 3.4 billion aquatic organisms a year killed by power plant cooling systems—substantially less than the $389 million/year that would have been required for additional technological protection. For further discussion, see ROWELL & BILZ, *supra* note 16, at 94–96.

underlying valuation of between $0 and $10 million is being used to inform a question of legal status, which will then be used to determine (or even just to inform) some set of legal obligations or entitlements. As one straightforward example, consider whether an industry actor that failed to install $10,000 screens would be liable in negligence. Here, again, the payoff of engaging with the valuation process will vary discontinuously with whether or not a particular threshold has been met. In the context of negligence, a $2 difference between valuing the lost aquatic life at $9999 and $10,001 is the difference between liability and no liability. Engagement around this threshold pays steep potential dividends—even as arguments above that threshold have no additional legal impact.

To be fair, particularly where status determinations are informed by economic valuation but not determined by it, the exact threshold necessary to trigger the relevant status may sometimes be unclear. Consider, for example, whether the loss of aquatic life would constitute a "significant" environmental impact, sufficient to trigger environmental-impact analyses requirements under the National Environmental Policy Act (NEPA).[60] Intuitively, aquatic life valued at $0 might tend to be more easily dismissed as insignificant, while aquatic life valued at $10 million might more easily ground a claim that the impact was significant. But whether the relevant threshold flips at $10,000, $1 million, or $10 million is hard to say, and is not elucidated within the confines either of NEPA itself or of the interpretations of NEPA by the Council of Environmental Quality.[61]

That said, the lack of an explicit quantitative threshold will not always make status determinations less impactful; consider, on this front, the

60 National Environmental Policy Act of 1969 § 102(2)(C), 42 U.S.C. § 4332 (2018). Famously, NEPA requires agencies to perform an environmental impact statement prior to performing any action that would "significantly affect[ ]" the "quality of the human environment." *Id.* Because the determination of significance is so critical to the operation of the statute, the Council of Environmental Quality maintains a set of regulations designed to help in determining what counts as a "significant" impact. *See* 40 C.F.R. § 1508.27 (2015); *see also* Jamison E. Colburn, *The Risk in Discretion: Substantive NEPA's Significance*, 41 COLUM. J. ENV'T. L. 1, 17–23 (2016) (discussing the importance of, and difficulties in, determining significance under NEPA). The determination of whether a particular quantum of environmental impacts is valued sufficiently to meet the threshold of "significance" thus plays a crucial role in determining the obligations that flow under NEPA. *See* Colburn, *supra*, at 19 & n.100 (suggesting that as applied, the significance determination is "chameleon-like" and indeterminate, noting a series of seemingly inconsistent applications of the standard).

61 *See supra* note 60; *see, e.g.*, Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions, 84 Fed. Reg. 30,097, 30,098 (proposed June 26, 2019) (noting that "NEPA and CEQ's implementing regulations do not require agencies to monetize costs and benefits of a proposed action," while stating that agencies need only analyze the impact of their proposed actions on greenhouse gas emissions "when the amount of those emissions is substantial enough to warrant quantification, and when it is practicable to quantify them using available data and [greenhouse gas] quantification tools").

perennial puzzle in environmental law of how to establish standing in environmental cases.[62] One constant challenge has been establishing—to the satisfaction of courts—that environmental injuries can be "injuries in fact" for purposes of standing.[63] Using quantitative valuation to establish that an environmental good can be valued at at least $1 may well be the difference between being able to establish injury in fact—a required element of standing—and having an entire case (or set of cases) denied judicial review.[64] In such contexts, engagement in valuation processes can pay extraordinarily large dividends.

In sum, the variation between valuation methods may develop heightened importance where—as with determinations of stringency and legal status—the effects of a valuation are discontinuous; in such cases, even small changes in valuation methodologies can generate substantial shifts in the substance of the environmental laws that the valuations inform. In the case of stringency determinations, adopting valuation methodologies with higher values for environmental goods will tend to increase the stringency that seems justified, and higher valuations may justify a "jump" to a higher level of stringency. In the case of status determinations, higher-output valuation methods may actually help trigger status-level protections, for example by helping to illustrate that environmental impacts exceed the threshold of "significance" and thus deserve legal or procedural protection, or by establishing that an environmentally harmful behavior was so damaging that it was negligent. In situations where valuation methodologies affect or may even be determinative of how much protection the law offers, it is particularly important for legal scholars and practitioners to engage with the process of quantitative valuation, and to understand the methodological choices and psychological factors that can affect the apparent value of environmental protection.

Conclusion

Understanding the role that quantitative valuations play within environmental law, as well as using basic tools to engage with those valuations, can

62 *See* Holly Doremus, *The Persistent Problem of Standing in Environmental Law*, 40 Env't. L. Rep. 10956, 10956 (2010); Richard J. Lazarus, *Restoring What's Environmental About Environmental Law in the Supreme Court*, 47 UCLA L. Rev. 703, 751 (2000) (discussing the challenges of addressing standing in environmental harm because of the challenges presented by the qualities of environmental impacts).

63 *See* Doremus, *supra* note 62, at 10956–57.

64 *See, e.g.*, Lujan v. Defenders of Wildlife, 504 U.S. 555 (1992). For a practical application of quantitative valuation methods to standing doctrine, and a thorough discussion of the potential for using monetized valuations to trigger recognition of injury in fact in environmental cases, see Allie Jo Mitchell, Note, *Establishing An "Injury-in-Fact" Through Valuations of Ecosystem Services: Putting It in Terms Federal Courts Understand*, 20 Minn. J.L. Sci. & Tech. 439, 441 (2019).

have substantial impacts on the way that the environment is valued within—and protected by—environmental law.

U.S. environmental law is importantly shaped by economic analysis, and by the quantitative valuations on which those analyses rely. Quantitative environmental valuations present special challenges, both because they tend not to be traded on markets, and because the psychology of environmental impacts makes them difficult for people to perceive, understand, and care about. As a result, whether environmental impacts are valued high or low is particularly susceptible to contextual cues and to legitimately difficult methodological choices in the valuation process. Historically, mainstream environmental scholars have hesitated to engage themselves with such choices, out of ethical concerns and general distaste for economic analysis. Historically, this generated a distortion in the collection of voices that legal decisionmakers—both courts and agencies—heard in regards to environmental valuation. Recent years have seen an increase in pro-environmental engagement with quantitative valuation, even as it has seen some decrease in support by those with deregulatory perspectives. A decision by either "side" to further disengage from quantitative valuation, however, could have important impacts on how environmental harms are quantified, and thus—in some cases—on the substance and stringency of environmental laws.

Although disengagement with quantitative valuation may sometimes be motivated by psychological factors and exacerbated by motivated cognition, it is important for scholars and stakeholders to consider both the general impact of that disengagement, and the particular stakes involved in particular valuations decisions. As a general matter, differential engagement is likely to lead to either higher valuations and greater stringency of environmental protections (if deregulatory voices disengage) or lower valuations and lowered stringency of environmental protections (if pro-environmental voices disengage). That said, not all engagement in quantifying environmental benefits will have the same payoff: some questions of environmental valuation have higher stakes, and some legal uses of valuation are more sensitive to small changes in context or methodology. Focusing on these contexts may help in targeting engagement with quantitative valuation of environmental impacts to those circumstances where it is most likely to affect the outcome of how environmental quality is regulated.