In Search of the Holy Grail of Environmental Law: 
A Rule to Solve the Problem

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There is widespread resistance to the use of generally applicable rules in environmental law. Such rules are thought impossible; and if not impossible, then certainly undesirable. This consensus is one of the main obstacles to progress in ecosystem protection, as it prevents environmental law from becoming a rigorous, coherent, predictable discipline, and from being able to stem the tide of ecological deterioration. Modern environmental law consists of nebulous, discretionary concepts and lists of narrow prohibitions for specific situations. Neither is based upon an abstract definition of sustainability in ecological terms. Consequently, the size of the human footprint upon ecosystems continues to grow. If environmental matters were to be governed by a single, generally applicable rule, what would it say? In this article, the author develops a rule that defines an environmental bottom line and respects established legal norms. The first step identifies an ecological limit for society as a whole. The second articulates a rule that proscribes individual behaviour, such that the combined impact of all individual actions would be within the limit identified in the first step.
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I. INTRODUCTION

A. Environmental Law: An Empty Vessel

Consider an imaginary place where physical violence is the norm. People go around hitting each other over the head with sticks. They do it often. They do it to intimidate, to settle scores, and to punish those they do not like. The use of force is widespread. The strong and powerful use it to their advantage over the small and weak, who are terrorized and unable to defend themselves.

Imagine that in this place there is no law that prohibits the use of force. Hitting others over the head with sticks is not prohibited. Finally, there is a proposal to change the law. This suggestion is met with agreement from some, but with much resistance from others, for predictable reasons: (1) strong people are empowered by the use of force; (2) changing the law would mark a departure from the way people are used to having things; and (3) saying that change is necessary amounts to criticism of a way of life and those who have a place in it.

Imagine the efforts that might be made against the creation of an effective law prohibiting the use of force. Violent means might be used to resist, of course, but consider this question in the legislative sense. There are at least two strategies that those opposed to change could adopt to frustrate the effectiveness of a new rule against violence. The first would be to try to make the new rule vague and contextual. They might say that any rule against the use of force should not be absolute, but flexible. Prohibit force yes, they would say, but do it in a way that does not offend community values and takes context into account. They might propose the following rule:

No one may use force against another unless the situation makes it acceptable.

Or alternatively:

No one may use force against another if the nature or extent of the beating offends the sensibilities of the community.

These rules allow the use of force to continue. That is because their prohibition is based upon community standards, or in other words, upon what people generally do. At the time the new law is developed, what people generally do is beat each other with sticks. In order for the law to be effective, it must describe a rule that departs from existing community standards. Indeed, that is the purpose of creating the new law. (If it did not depart from what people generally do, there would be no need for a new law.)

The second approach that those resistant to change might take is to attempt to make the new law specific and complicated. Instead of a generally applicable rule that prohibits the use of force, they might propose an extensive list of particular rules for particular situations, such as:

1. No one is to beat another with a stick in the parking lot of an arena after a hockey game.
2. **No one is to use a stick with force in order to get a better place in a cashier’s line.**

3. **No one is to beat a sibling with a stick on the sibling’s birthday.**

And so on. The result of a long list of particular instances where the use of force is prohibited is to permit the use of force in all other circumstances. It is okay to beat others after a baseball game. One may use force to get a better seat on the bus. You can take a club to your brother if it is not his birthday.

Either of these alternatives - the vague rule based on social acceptability or the list of specific rules - would successfully prevent a general prohibition against the use of force. A rule far more effective at preventing violence, of course, is:

**No one may apply force against another without the other’s consent.**

To this rule might be added carefully defined exceptions such as provocation, self-defence, and medical necessity. The rule would be effective because it is simple and generally applicable. Occasionally, scenarios would arise that do not fall cleanly inside or outside the rule, but for the vast majority of situations, the rule would provide a clear signal about what is legal and what is not.

In environmental law, there is no such rule. There is as yet no articulation of an environmental bottom line, or definition of the meaning of environmental protection or sustainability in abstract legal terms. No generally applicable “environmental rule” exists. Instead, both versions of rule avoidance described above can be found: vague notions based upon what is socially acceptable, and extensive lists of specific prohibitions for specific situations. The best example of the former is sustainable development, defined originally as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs,” an expression of an admirable aspiration that means little and achieves even less. The latter make up the bulk of modern command-and-control environmental regulations. Neither kind of rule is any more effective in defining an environmental bottom line than in defining battery; neither establishes principles upon which environmental law can be based.

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1. Such is the stuff of litigation and law school exams.
3. For example, under Schedule 2 of the *Effluent Monitoring and Effluent Limits – Inorganic Chemical Sector Regulation*, O. Reg. 64/95, made pursuant to the *Environmental Protection Act*, R.S.O. 1990, c. E-19, the Daily Plan Loading Limit for Aluminum at the Cabot Canada Ltd. Plant in Sarnia, Ontario, is 3.5 kg/day. John-Mark Stensvaag notes, “[e]nvironmental law has been transformed from a discipline of broad phrases into a realm dominated by fine print … ‘fine print’ has three attributes: (1) it is hidden and difficult to detect; (2) it has been crafted by someone who seeks to use it to his or her advantage; and (3) it leads to unexpected outcomes” (John-Mark Stensvaag, “The Not So Fine Print of Environmental Law” (1994) 27 Loy. L.A. L. Rev. 1093 at 1093-94).
Other legal subjects are governed by basic principles. For example, contract cases proceed from the propositions, first, that voluntary agreements reached between contracting parties should be enforced; and second, that in the event of breach, innocent parties are to be placed in the position they would have been in had the contract been performed. Of course, there are enough secondary rules, exceptions, and details to fill treatises on the law of contract, but these two ideas are where contract disputes begin. To take another example, in family law there are rules about division of assets and support and custody of minor children. For instance, in Ontario, family property is to be divided equally upon breakdown of the marriage; each parent has a responsibility to provide support for minor children; and custody of a child is to be determined according to the best interests of the child. Each of these rules is clear and generally applicable. They distinguish between interests. They determine outcomes in particular cases. Adjudication is still often necessary and evidence frequently contentious, but rules exist that apply to the dispute.

Such rules do not exist in environmental law, which instead consists of a mess of incoherent ideas that lack traction:

As many have observed, environmental law has substantially influenced other, established areas of law such as administrative law, international law, property, torts, and water law as well as more remote subjects such as corporations, securities regulation, and intellectual property. However, when one sums up the cases, statutes, and administrative regulations that make up the core of what most people consider environmental law, one is hard pressed to reduce them to a set of distinctive, fundamental principles, let alone rules that can be applied to a wide range of current and future issues, as one can do in other areas of “real law”.

Environmental law’s “principles”, such as sustainable development, the precautionary principle, and the “polluter pays principle”, among others, cannot be used to determine the outcome of particular cases, nor have they been given this role in environmental legislation. Instead of articulating a priority or defining a hierarchy, they merely describe an ideal. Sustainable development, for example, is accomplished when everything is taken care of – the environment is protected, the economy is developed, and social equity is achieved. However, it does not prescribe a way to resolve conflicting priorities so as to reach that end.8 Sustainable development resists

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4 Section 5(1) of Ontario’s Family Law Act (R.S.O. 1990, c. F-3) states: “When a divorce is granted or a marriage is declared a nullity, or when the spouses are separated and there is no reasonable prospect that they will resume cohabitation, the spouse whose net family property is the lesser of the two net family properties is entitled to one-half the difference between them.”

5 Ibid., s. 31(1).

6 Children’s Law Reform Act, R.S.O. 1990, c. C.12, s. 24(1).


8 Sustainable development “incorporates environmental, social, and economic concerns, but it does not prioritize them, or define their relationship. Where environmental, social, and economic interests are in conflict, sustainable development does not say which interest
definition. It is the best example of the ambiguous concepts that have become embedded in the environmental law firmament, not in spite of their vagueness, but because of it. These concepts allow hard questions to be avoided instead of confronted.

Some environmental statutes include provisions that appear to be substantive rules of wide application, not unlike the family law rules referred to above. For example, section 14 of the Ontario Environmental Protection Act states:

Despite any other provision of this Act or the regulations, no person shall discharge a contaminant or cause or permit the discharge of a contaminant into the natural environment that causes or is likely to cause an adverse effect.

At first reading, this provision appears to say that no one may pollute so as to cause environmental deterioration. Unfortunately, it does not have this meaning. It does not prohibit coal-fired generating plants, the use of cancer-causing pesticides, the spreading of pig dung, the contamination of drinking water with antibiotics, and so on. This provision, and the accompanying definition of “adverse effect”, does not

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9 “Sustainable development is a flag under which many armies are marching” (P.S. Elder, “Sustainability” (1991) 36 McGill L.J. 831 at 834); “[T]he concept of sustainable development, rather than offering firm groundings or a clear blueprint for the future, is cloaked with various interpretive, definitional and terminological mists” (David VanderZwag, “The Concept and Principles of Sustainable Development: ‘Rio-Formulating’ Common Law Doctrines and Environmental Laws” (1993) 13 Windsor Y.B. Access Just. 39 at 41); “[I]t is by no means easy to identify the meaning of ‘sustainable development’. The concept is often exemplified and instantiated but rarely, if ever, defined… At best, ‘sustainable development’ looks like a convenient umbrella term to label a group of congruent norms” (Vaughan Lowe, “Sustainable Development and Unsustainable Arguments” in Alan Boyle and David Freestone, eds., International Law and Sustainable Development: Past Achievements and Future Challenges (Oxford: Oxford University Press, 1999) 19 at 25-26).

10 Courts are used to fleshing out vague terms in statutes and constitutions, and the principle of **stare decisis** gives staying power to their interpretations. Unfortunately, courts have a relatively minor role in the development of environmental law. Other, less adjudicatory and more technocratic processes such as adaptive ecosystem management are coming to dominate the practice of environmental protection, and within such disciplines the idea of precedent – the proposition that like cases should be decided alike – is anathema.

11 “For over a generation, accounts of environmental damage and steps to address it have filled our country’s mass media and scholarly journals. But an extraordinary reluctance to set environmental goals for society, or even to seriously debate setting them, has attended that flood of ink and intellect” (William F. Pederson, “‘Protecting the Environment’ – What Does That Mean?” (1994) 27 Loy. L.A. L. Rev. 969 at 969).


12 Ibid. “Adverse effect” is defined in section 1(1) as one or more of,

(a) impairment of the quality of the natural environment for any use that can be made of it,
amount to an environmental line in the sand. Instead, it allows government administrators to make inexact policy decisions that no one can predict ahead of time. The section is typical of environmental statutes in its ambiguity, its lack of reference to cumulative effects, the discretion exercised in its application, and most importantly, in its failure to define “damage” in ecological terms. In the face of such provisions, the size of the human footprint upon ecosystems continues to grow.15

There is strong resistance to the proposition that a simple, generally applicable environmental rule ought to be established. Many environmentalists do not favour one. The weight of academic opinion is against the use of one.16 Scientists say eco-

14 The vague, contextual approach can also be accomplished through the use of a list of “factors” for decision-makers to weigh. Such tests are common in environmental law, as well as many other areas of administrative decision-making. Richard Epstein contrasts the use of factor-laden inquiries with simple rules:

The simplest rules … are those in which the answer to a single question of fact determines the legal outcome. Age requirements for voting or holding public office are usually offered as the simplest of simple rules because a single answer to an obvious question establishes legal rights and duties. On the opposite side of the ledger are those rules that are ever so much more common today: in order to decide whether a given product has a defective design, it is necessary to review a list of six, ten, or fifteen factors, all of which are relevant to the decision but none of which is decisive. In each case, both sides to the litigation are forced to play a game of “edges” in an inquiry that is structured to make it impossible to have dispositive answers to any question. Litigants therefore must seek to milk each factor for all that it is worth, and must recognize that an impressive victory scored on factor 4 could be wiped out by a calamitous defeat on factor 7. In essence, a question that necessarily has a yes/no answer – is the defendant liable to the plaintiff – is not governed by some simple on/off switch, but by a massive, costly, and uncertain inquiry (Richard Epstein, Simple Rules for a Complex World (Cambridge: Harvard University Press, 1995) at 25).


16 For example, Dan Tarlock states, “… an effective and long-lasting environmental law cannot be constructed around a series of abstract substantive principles. There is a reason that no Restatement (First) of Environmental Law exists or is in process. The candidate suite of principles such as advance environmental impact assessment, polluter pays, precaution, and sustainable development are useful starting points but they can only serve as guideposts to structure a dynamic, but inevitably ad hoc, decision making process” (Tarlock, supra note 7 at 219) [footnote omitted].
systems cannot be properly governed with such an approach. The present trend in environmental law is away from the use of generally applicable rules. Instead, there is widespread belief that environmental decisions must be fact-specific; that different subjects (air, water, pesticides, waste management, endangered species, and many others) must have different regulatory regimes; that environmental decision-makers must have broad discretion (land-use planning, environmental assessment, ecosystem management, environmental prosecutions) to weigh conflicting priorities (environmental, economic, social) to craft appropriate results one situation at a time; and that environmental outcomes are a proper subject for consultation with the public and negotiation with industry. It is thought to be impossible to create an environmental rule that is both generally applicable in all environmental circumstances and specific enough to define an environmental bottom line; and that, even if it were possible to create one, such a rule would be undesirable.

This consensus is one of the main obstacles standing in the way of progress in environmental protection. It prevents environmental law from becoming a rigorous, coherent, predictable discipline, and from being able to stem the tide of environmental deterioration. I have argued elsewhere that in the present era, environmental decisions are made in a manner that does not respect legal norms; its processes are not subject to the principle that like cases should be decided alike; that predominant features of environmental law fail to conform to the rule of law; that an adaptive management approach to the environment, in which “intuitionistic” decisions are made one situation at a time (“I can’t define it, but I know it when I see it”), is neither desirable nor inevitable; that environmental and planning practices do not need to run roughshod over common law principles of tort and property law; and that, as a discipline, environmental law has yet to acknowledge, much less resolve, its central

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17 For example, Daniel Botkin, a biologist at the University of California, writes that the proper approach to environmental stewardship is a system of ecosystem management that “requires specific knowledge because policies must be specific…. Nature in the twenty-first century will be a nature that we make; the question is the degree to which this moulding will be intentional or unintentional, desirable or undesirable. … The task before us is to understand the biological world to the point that we can learn how to live within the discordant harmonies of our biological surroundings, so that they function not only to promote the continuation of life but also to benefit ourselves: our aesthetics, morality, philosophies and material needs” (Daniel Botkin, Discordant Harmonies: A New Ecology for the Twenty-First Century (Oxford: Oxford University Press, 1990) at 191, 193 and 197).
19 Ibid.
21 Pardy, supra note 18.
In this article, I attempt to develop a rule that expresses an environmental bottom line and respects established legal norms, based upon an abstract but specific legal definition of ecological damage. If environmental matters were to be governed by a single, generally applicable rule, what would it say?

B. Legal Instrumentality Versus Political Feasibility

I do not maintain that the hypothetical rule developed in this article would be either politically feasible or socially acceptable. One would expect the same kind of resistance to a new, substantive environmental rule as to the hypothetical rule prohibiting the use of force described above. The exercise in this article is an experiment in environmental law, not a political manifesto. To some readers, this approach may avoid a vital question. One of the most frequent laments of the environmental law critic is that the political will required to achieve change is lacking. Indeed, some maintain that the central problem with environmental law is that once the veneer of process is scraped away, there is little left except politics, or that there is so much discretion given to decision-makers that the outcome inevitably reflects political considerations. Others prescribe pragmatic approaches to environmental progress, and may believe that there is little purpose to be served in separating political issues from legal ones in the environmental arena. I am not of this opinion, and will attempt to address the legal question set apart from the issue of political feasibility. The purpose of this article is not to advocate a pragmatic or political solution to environmental impasse, but to provide a legal model for a rule that would prevent environmental harm and achieve “sustainability”. The objective is not to propose a statute that would be politically viable, but to describe a rule that would protect ecosystems were it to be enacted. Thus, this article examines a question that lies entirely outside the world of pragmatic environmental politics: what legal instrument could be applied to create wholesale change in environmental ends? There is little point in lamenting

24 Supra note 8.
28 As Farber observes, “it is disturbingly easy to make the case that human institutions are incapable of successfully solving environmental problems. Besides the inherent difficulties posed by the problems themselves, implementing solutions requires that we overcome deep-seated human weaknesses: grave collective action problems, the limitations of human rationality, and a necessarily imperfect political system” (Farber, “Building Bridges Over Troubled Waters”, ibid. at 848).
political obstacles if, should those obstacles disappear, there is no ready-made legal approach that is capable of achieving the environmental goals that so many espouse.

In theory, what would a generally applicable environmental rule look like? There are many possibilities. Below is one attempt to fashion a rule with teeth, one that establishes a bright-line limitation. This hypothetical rule is not located in any specific regulatory context or place, except that it is designed for a common law jurisdiction. It does not attempt to resolve constitutional division of powers problems, but assumes that a single sovereign authority holds legislative power over environmental matters. It leaves for another time international governance and competition issues that enacting such a rule would raise.

In the next Part, I develop this generally applicable environmental rule in two steps. The first step defines an environmental limit for society as a whole. The second defines a limit for each person. Following the articulation of the rule, I offer, in Part 3, a draft statute that expresses the rule in legislative terms.

II. DEVELOPING AN ENVIRONMENTAL RULE

One of the main defects in modern environmental law is its disregard for total load, or the cumulative environmental impact created by all human activity – past, present, and future. Instead, to the extent that human actions are regulated, they are regulated as isolated events. Environmental law consists of different regulatory regimes at different levels of government that apply to different kinds of environmental hazards or natural resources containing fact-specific standards that are applied (or not) one situation at a time. This approach does not calculate or control the cumulative ecological footprint caused by human activity. In order to determine an acceptable environmental impact for individual actions, it is necessary to know the tolerable total impact. In Step 1, I attempt to define tolerable total impact – an environmental limit for society as a whole. In Step 2, I attempt to articulate a rule that proscribes individual behaviour, such that the combined impact of all individual actions does not exceed the limit identified in Step 1.

A. Step 1: Defining an Environmental Limit for Society as a Whole

In Step 1, the following propositions will be argued:

(a) Ecosystems are the units that environmental law should protect.

(b) Ecosystems change through time.

(c) Ecosystems experience two kinds of change: (i) temporary; and (ii) permanent.

(d) Temporary change to ecosystems is irrelevant. Permanent change to ecosystems may be caused by (i) natural forces or (ii) human impact. Permanent change produced by natural forces is not cause for concern in environmental law.

(e) Ecosystems are like Russian dolls – small ones are contained within larger ones. If permanent change is experienced within a small system but not within a larger one that contains it, then nothing of significance has occurred.
Step 1 concludes by defining ecological “damage” as permanent change caused by human impact to an ecosystem, unless a larger ecosystem can be identified in which no such permanent change is found. No ecological damage can be said to have occurred if change is temporary, or if permanent change occurs for reasons other than human impact.

1. Ecosystems: The Units that Environmental Law Should Protect

The basic ecological unit is the ecosystem. An ecosystem is “a community of organisms and their physical environment interacting as an ecological unit.”

All ecosystems have common characteristics. These commonalities are what allow them to be called “ecosystems”. In other words, use of the word “ecosystem” denotes an entity with identifiable features. All entities in that category must have something in common that allow them to belong to the category.

This reasoning may seem obvious, but it is necessary to make this point because a frequent and recurring argument in current environmental jurisprudence is that every ecosystem is unique – that in fact ecosystems do not share common characteristics. This argument is one of the justifications for an approach called “adaptive ecosystem management”, whose central tenet is that governance of ecosystems must occur one ecosystem at a time, in isolation and according to that system’s peculiarities. This view is incompatible with the notion of general rules, and its advocates reject the possibility of a rules-based approach to environmental protection. Therefore, to make an argument for the use of general rules, it is necessary to identify the characteristics that ecosystems share.

Advocates of adaptive ecosystem management are quite right when they say that ecosystems exist in infinite variation. Like snowflakes, no two systems are identical.

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30 See e.g. Tarlock, supra note 7 and Bradley Karkkainen: “In crucial respects no two ecosystems are quite alike; they operate by different sets of rules. As a result, the environmental consequences of our actions may also vary widely, depending upon the particular ecosystem context in which the action occurs … Only recently have we begun to pay more serious heed to the ecosystem-level consequences of environmental decision-making, recognizing that how we act may well need to be tailored to the needs, demands, and constraints of the particular ecological contexts within which we find ourselves” (Bradley Karkkainen, “Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism” (2002-2003) 21 Va. Envtl. L.J. 189 at 194).

31 Or its variations, including “collaborative ecosystem governance” as discussed by Karkkainen, ibid.

32 For example, J.B. Ruhl characterizes positivist, rule-driven decisions as anathema to environmental pragmatism (Ruhl, “Working Both (Positivist) Ends Toward a New (Pragmatist) Middle in Environmental Law”, supra note 27 at 531), a school of thought that embraces ecosystem management. Ruhl states that ecosystem management is “as slippery as it needs to be to win the day” (J.B. Ruhl, “A Manifesto for the Radical Middle”, supra note 27 at 394).
Nevertheless, use of the word “ecosystem” to describe a phenomenon carries a meaning, in the same way that calling something a “machine” means something. To a young child, a sewing machine and a forklift are completely different things. They are vastly different in size, shape, sound, and function. In spite of their differences, these two things do in fact have much in common: they both have motors; run on an external source of energy; are directed by human beings; occasionally require repairs; and so on. Similarly, ecosystems share the following characteristics:

1. They contain living and non-living elements.

2. They have some measurable degree of diversity – of species, genes, chemicals, patterns, communities, and so on.

3. They have some degree of resilience – the system’s tendency to maintain relationships between system elements in the presence of disturbances.\(^{33}\) (Resilience may be very low, very high, or somewhere in between – ecosystems do differ in this respect – but in all cases, there will be a measure of resilience.)

4. They have a one-way net flow of energy (from outside to inside), which facilitates the circulation of materials within the system from one form to another.\(^{34}\)

5. They have a carrying capacity for particular kinds of organisms.

6. They exist in a state of nonequilibrium.

7. Their changes are unidirectional – ecosystems do not return to a previous state, but evolve to a new form.


Modern environmental law is not ecosystem-based. Instead, environmental protection laws focus on narrower things, such as human health, air, water, forests, wetlands, wildlife habitat, and so on. Separate regimes regulate these various subjects, sometimes at multiple levels of government, as though ecosystems did not exist. If ecosystems were protected, much of the attention now paid to other environmental and health concerns would be unnecessary because they would not be in peril. Protected ecosystems would not contain contaminants that cause environmental diseases. Separate legal regimes for the protection of endangered species would be redundant because wildlife habitat would not shrink. No separate forest management regime would be needed because forest ecosystems would be governed by the general rule. The subjects of modern environmental law are elements of ecosystems. If ecosystems were preserved, then ecosystem elements would be protected as well. Thus, ecosystems themselves are the units that environmental law should protect.

35 While ecosystem-based environmental law does not yet exist in Canada, endorsement of the concept of ecosystem governance can be found in statutory provisions, government policy statements, and House of Commons Committee reports. For example, the Preamble to the Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33), states, “the Government of Canada recognizes the importance of an ecosystem approach.” Section 2 (1)(c) commits the Government of Canada to “implement an ecosystem approach that considers the unique and fundamental characteristics of ecosystems”. “Environment” is defined in section 3(1) as: “the components of the Earth and includes (a) air, land and water; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).” Alberta’s Environmental Protection and Enhancement Act (S.A. 1992, c. E-13.3), defines “environment” in section (1)(t) as “the components of the earth and includes (i) air, land and water, (ii) all layers of the atmosphere, (iii) all organic and inorganic matter and living organisms, and (iv) the interacting natural systems that include components referred to in subclauses (i) to (iii).” In Part III of its “Statement of Environmental Values” prepared under the Ontario Environmental Bill of Rights (S.O. 1993, c. 28), the Ontario Ministry of Environment and Energy pledges to “adopt an ecosystem approach to environmental protection and resource management. This approach views the ecosystem as composed of air, land, water, and living organisms, including humans, and the interactions among them. When making decisions, the Ministry will consider: the cumulative effects on the environment; the interdependence of air, land, water and living organisms; and the interrelations among the environment, the economy and society” online: Government of Ontario <http://www.ene.gov.on.ca/envision/env_reg/ehr/english/SEVs/moe.htm>. See the Report of the House of Commons Standing Committee on Environment and Sustainable Development: It's About Our Health! Towards Pollution Prevention (Ottawa: Canadian Communication Group, 1995) at 50, cited by Jamie Benidickson, Environmental Law, 2nd Ed. (Concord: Irwin Law, 2002) at 17-18, who continues: “Arguably, then, adoption of the ecosystem focus represents a broadening of the objectives of environmental protection regimes.”

36 Other, non-environmental laws related to human health, such as workplace safety and food and drug regulation, would not be redundant because the risks they govern do not arise from ecological conditions.
2. Nonequilibrium: Ecosystems Change Through Time

The current prevailing view about how ecosystems work is the “nonequilibrium” paradigm.\(^\text{37}\) It has slowly replaced the equilibrium paradigm, under which ecosystems were thought to have the following characteristics:

1. to be essentially closed,
2. to be self-regulating,
3. to possess stable point or stable cycle equilibria,
4. to have deterministic dynamics,
5. to be essentially free of disturbance, and
6. to be independent of human influences.\(^\text{38}\)

In other words, under the equilibrium paradigm, fully developed ecosystems were thought to be essentially stable systems existing in a steady state unless disturbed by outside forces. Ecosystem elements were thought to exist in equilibrium, regulated by homeostatic mechanisms that ensured repetition of predictable cycles of lows and highs through seasons or other periods of time. The equilibrium paradigm reflected the notion of the “balance of nature”, in which the natural world was a fully-formed, stable entity except when upset by human action.

In the nonequilibrium paradigm, ecosystems do not exist in an unchanging state. Instead, they are thought to be dynamic systems in a process of continual change and evolution. For some systems, the degree of change is rapid. For others, it may be exceedingly slow. An ecosystem may appear to be in a state of equilibrium when measured over a particular period of time. The nonequilibrium paradigm suggests that even these apparently stable systems are dynamic, and eventually will exhibit evidence of change. Furthermore, ecosystems do not have firm boundaries, and merge with one another.\(^\text{39}\) Smaller systems are part of larger systems, and it is difficult to speak of one system as a separate entity from the next. A system in apparent equilibrium may be an integral part of another that is exhibiting change.

Calculation of an environmental limit is more difficult for systems in nonequilibrium than it would be under an equilibrium paradigm. If undisturbed ecosystems existed in a state of equilibrium, evidence of change to an ecosystem would be evidence of human disturbance to that system. Nonequilibrium in ecosystems means that ecosystems may change even when there has not been human disturbance, and thus the occurrence of change cannot act as the flag for the presence of human interference.\(^\text{40}\)

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\(^{40}\) Tarlock, *supra* note 37.
3. Kinds of Change in Ecosystems: Temporary and Permanent

Two kinds of change can occur within ecosystems: temporary and permanent. Temporary change occurs when equilibrium is not affected; permanent change occurs when it is.

If ecosystems exist in a state of nonequilibrium, how can one speak of equilibrium levels? In spite of the primacy of the nonequilibrium paradigm, equilibrium still plays a significant role in the way ecosystems function. Nonequilibrium is not necessarily the opposite of equilibrium. It does not suggest that equilibrium never appears in nature, but simply “that it need not appear at all scales or for all phenomena.” In other words, the nonequilibrium paradigm acknowledges that many ecosystems exist in a stable state and contain elements that are in equilibrium, at least in the short or medium term. Equilibrium is not a static condition, but a reflection of the operation of homeostatic mechanisms that maintain the element within a certain range:

The equilibrium level is like the central or rest position on a pendulum. Its location does not indicate or determine the height of the oscillations or their frequency. A population of grasshoppers, for instance, may swing from season to season from low to high, passing through its equilibrium point.

For an element in equilibrium, such as a population of insects, temporary change is normal. The population may be high one year and low the next, as it proceeds through a cycle. Thus, the discovery that there are fewer grasshoppers this year than in the previous year does not necessarily indicate that there is anything awry in the ecosystem. The change in population is temporary – it will return to its high level in its next cycle.

On the other hand, some incidents of change may not be in accordance with the system’s usual state. If some external disturbance causes the population of grasshoppers to dip below its lowest normal level, if homeostatic forces do not return it to its usual cycle, and if therefore the equilibrium level of grasshoppers is altered, then the change is permanent.

4. Causes of Permanent Change in Ecosystems: Natural and Human

Change is temporary when an element is still in equilibrium. Temporary change is not important because there has been no change to the way the system operates, or to the relationships between system elements. Environmental laws should not attempt to prevent temporary change within ecosystems. Permanent change, on the other hand, presents a different challenge.

There are two causes of permanent change in ecosystems: natural and human. The first is of no concern to environmental law. Prevention of the second should be

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41 Pickett, Kolasa & Jones, supra note 38 at 161.
environmental law’s objective. In order to carry out such a mandate, the law must distinguish between natural and human causes of change.

Leading thinkers in ecology and environmental policy maintain that a line cannot or should not be drawn between the natural world and human society for the purposes of environmental protection.\(^{43}\) I will address two aspects of this issue. The first is the proposition that human beings are so inextricably connected to the operation of ecosystems that the question of where nature ends and humans begin is not a meaningful question to ask. Daniel Botkin states:

The answers to the old questions – What is the character of nature undisturbed? What is the influence of nature on human beings? What is the influence of human beings on nature? – can no longer be viewed as distinct from one another. Life and the environment are one thing, not two, and people, as all life, are immersed in the one system.\(^{44}\)

The second aspect that I will address is, given the complexity and uncertainty of ecosystem function, whether it is too difficult scientifically to determine which effects are due to human action and which are the result of natural phenomena.

(i) Can humans be distinguished from nature?

On this topic I repeat here what I said in a recent article:\(^{45}\) can humans be distinguished from nature? The answer is a paradoxical “yes and no”. In some ways, human beings are simply animals. They breathe, eat, and decompose like any other. They interact with other elements of the system, and such interactions determine how the system operates. Indeed, that is the essence of a system: relationships and interactions between constituent parts. The presence of bees within an ecosystem has certain consequences for the way that system behaves; so too with the presence of humans. In these respects, it would not be accurate to distinguish between human beings and the natural world because the latter would be different without the former.

On the other hand, humans produce things that are archetypically “unnatural”: pollution, urban sprawl, climate change, deforestation, and so on. If these effects are natural, then the word has no meaning because it would not distinguish anything from anything else.\(^{46}\) If all human effects are natural, then pollution, urban sprawl, climate

\(^{43}\) For example, J.B. Ruhl writes, “environmentalism cannot take the form of a ‘Berlin wall’ keeping humans out and the animals in. Instead, we must envision long-term connections between humans and nature, requiring continual change and adaptation on both sides” (Ruhl, “Working Both (Positivist) Ends Toward a New (Pragmatic) Middle in Environmental Law”, supra note 27 at 525). See also Karkkainen, supra note 30 at 197; and J.B. Wiener, “Beyond the Balance of Nature” (1996) 7 Duke Envtl. L. & Pol’y F. 1.

\(^{44}\) Boktin, supra note 17, at 188.

\(^{45}\) Supra note 22 at 683-685.

\(^{46}\) As Oliver Houck explains, to include human beings as part of ecosystems is to strip the concept of nature of any meaning. He suggests that “neither answer, people-are-in ecosystems or people-are-out, seems to work.” (Houck, “Are Humans Part of Ecosystems?” (1998) 28 Envtl. L. 1 at 3.)
change, and clear-cutting are, by definition, natural. Modern environmental law tends to ignore this difficulty. In particular, ecosystem management is based upon the premise that humans cannot be distinguished from nature, and accordingly places human experience firmly into the process of identifying desirable environmental outcomes. The irony of ecosystem management is that its goals reflect an eco-centric orientation, but its form allows for the reverse. Leaving human interests inside the calculation of proper outcomes makes possible an environmental free-for-all and makes enforcement of an environmental bottom line impossible. When the levers of ecosystem management are in the hands of those who are not inclined to maintain existing ecosystem processes, it is possible for them to characterize environmental degradation as a natural phenomenon.

But if humans are elements of ecosystems, how can nature be defined to exclude them? One way to answer this question is to use the following analogy: the economic concept of a perfectly competitive marketplace. In a perfectly competitive market, the price of any particular good is determined by the individual decisions of many buyers and sellers. Each transaction influences the “invisible hand” of the market that decides the going price. None of the many buyers and sellers has sufficient market power to control the price of the commodity. In contrast, in a market subject to monopoly or oligopoly forces, some market participants have more influence than others. The “natural” price of the good cannot be determined because the invisible hand is not in operation. This economic distinction can be applied analogously to the question of whether human impacts on ecosystems can be distinguished from natural events.

Human beings are part of nature when they are the ecological equivalent of one of the many competitive buyers and sellers in a perfectly competitive

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47 If humans are part of ecosystems, then whatever serves human needs is, by definition, a good ecosystem development: “The danger in ecosystem management, as it is currently emerging in government planning, is that it tends to put – indeed, it intends to put – humans back into step one, into the definition of the ecosystem itself. The ecosystem management goal is not predicated on a natural system; it is predicated on human needs and desires. … Ecosystem management is whatever we want to do” (ibid. at 10, 6).

48 J.B. Ruhl, an advocate of ecosystem management, agrees that the idea that all human effects are natural is nonsensical, but suggests that ecosystem management operates on the premise that it is impossible to define “natural” or “naturalness” without reference to humans – including the definition that I offer here. “The truth is that humans have an influence on the environment – we are immersed in it – and thus, because we and we alone have a choice about how to act, we are locked in a search for the way to behave towards it” (J.B. Ruhl, “The Myth of What is Inevitable Under Ecosystem Management: A Response to Pardy” (2004) 21 Pace Envt'l L. Rev. 315 at 319-20).

49 Edward Grumbine identifies the five principal goals of ecosystem management as: maintaining viable populations of all native species in situ; representing, within protected areas, all native ecosystem types; maintaining evolutionary and ecological processes; maintaining the evolutionary potential of species and ecosystems; and accommodating human use and occupancy within these constraints (Edward Grumbine, “What is Ecosystem Management?” (1994) 8 Conservation Biology 27 at 31, cited by Ruhl, ibid. at 316).
marketplace … when they exist within an ecosystem as one of many perfectly competitive species; … However, when humans exert a disproportio-
tionate influence on the state of a system, like a monopoly in a market-
place, they are not part of nature, but stand outside it … Under these con-
tions, the changes experienced by the system are not guided by the “invisi-
ble hand” of system interactions, but are wrought by one of its elements alone.50

The effects caused by some humans in some places during some historical peri-
ods may be properly categorized as natural. However, that does not include most of
the impact of human society at the beginning of the 21st century. When forests are
clear-cut, genetic makeup of plants and animals controlled, or surface waters diverted
or dammed, ecosystem monopoly power is being exercised. Modern humans are eco-
system elements unlike any other. In the 21st century, to err on the side of precaution,
environmental law should define nature as that which does not derive from human ac-
tion.51

(ii) Can law distinguish between human and natural causes of ecosystem change?

Differentiating change caused by monopolistic humans and change that occurs naturally is scientifically difficult. Indeed, scientific uncertainty characterizes envi-
ronmental decision-making. Farber notes:

One reason [that environmental protection is so difficult to accomplish] is
that we always seem to operate in a state of scientific uncertainty. This un-
certainty not only causes problems directly, but also interacts with human
psychology to foster denial and avoidance. Other psychological problems
also abound, relating to an inability to process probabilities, bias in favor
of the status quo, and selective absorption of information. These problems
of individual psychology are compounded by political difficulties: collect-
ive action problems, the influence of special interests, and a level of po-
larization that makes constructive debate difficult.52

Despite the difficulties that scientific uncertainty creates, such uncertainty is not a
good reason why simple, generally applicable environmental rules cannot be used.
Courts regularly do what science cannot: make decisions in the absence of scientific
certainty. This practice is not limited to environmental cases – disputes of all kinds
turn on conflicting or inconclusive evidence from scientific experts.53 The job of a
court is to consider and weigh the evidence offered, and come to a conclusion that ap-

50 Pardy, supra note 22 at 684-85.
51 The response of the managers, I believe, would be that we have already passed the point of
no return – that there is not enough “natural” left in the world that operates independently
from the influences humans have already wrought, including spreading of invasive species
and toxic pollutants, climate change, agriculture, and so on. Ruhl concludes, “[t]he dream
of letting nature alone is quite appealing. But it is too late” (Ruhl, supra note 48 at 322).
52 Farber, “Building Bridges Over Troubled Waters,” supra note 27 at 884.
53 The list is long and includes actions dealing with medical misadventure, criminal insanity,
patent infringement, contract breach, toxic torts, and so on.
plies to the action before it. Dealing with scientific and factual uncertainty is the business that courts are in:

Courts frequently decide cases fraught with scientific and evidential uncertainty. Expert evidence on contentious questions frequently conflicts. Such conflicts may produce difficult questions of fact, but they do not necessarily produce difficult questions of law. Evidential uncertainty may make abstract rules difficult to apply, but it does not suggest that they should not exist. It is quite true that there are an infinite number of interactions occurring in an infinite number of different ecosystems. The numbers are so vast that they cannot all be documented, much less understood. That is a reason to favour abstraction, not a reason to avoid it.\(^5^4\)

Scientific complexity does not preclude legal determinations of environmental harm.\(^5^5\) Legal cases produce legal answers, not scientific ones. Courts do not purport to make declarations of universal fact in the way that scientists attempt to do. Environmental rights and prohibitions are legal questions. Ecological evidence is unquestionably relevant to their determination, but is not the determinant itself. Thus, that ecology views ecosystems as complex and dynamic, and lacks the tools to make precise determinations of cause and effect, does not mean that such questions cannot be asked and answered in environmental law.

5. Ecosystems Are Like Russian Dolls: Small Ones Are Found Within Larger Ones

Ecosystems are the units to be protected, but which ecosystems? They may be as large as continents, and as small as tidal pools or rotting logs. When a person steps in a puddle or burns a log, those ecosystems are radically changed, and sometimes eliminated altogether. If such actions were prohibited, it would become impossible to function. Fortunately, it is not necessary to preserve very small ecosystems for the very reason that they form part of larger ones.

[C]omplex ecosystems are understood to consist of many intimately interlinked and “nested” ecosystems. In other words, a large ecosystem, such as a region of Amazonian rainforest, has embedded within it smaller systems, such as the cycles of energy and life operating on a specific hillside or along a specific portion of riverbank. In turn, these subsystems incorporate ever smaller sub-subsystems, all the way down to soil bacteria. Nested systems thus contain everything from sweeping macrosystems to minutest microsystems…\(^5^6\)

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\(^{54}\) Pardy, supra note 18 at 432.

\(^{55}\) If adequate information was a prerequisite for such decisions, they would never be made: “[T]here is never enough information to feel confident about a particular decision. No key ecosystem management decision ever gets made in a setting of adequate information” (George Frampton, “Ecosystem Management in the Clinton Administration” (1996) 7 Duke Envtl. L. & Pol. F. 39 at 44, cited by Karkkainen, supra note 30 at 203, n. 37).

\(^{56}\) Thomas Homer-Dixon, The Ingenuity Gap (New York: Alfred P. Knopf, 2000) at 132. See also Hal Salwasser, “[e]very ecosystem is a subset of a larger system. Forests are ecosys-
Assume that someone walks along the seashore, stepping into tidal pools, spilling out their contents, and occasionally obliterating them altogether. Does this action produce permanent change caused by human beings? If the ecosystem in question is the tidal pool, the answer may be “yes” (although such systems may be rapidly formed and destroyed independently as well, facing transformation every time a large wave pounds the shoreline). But say the ecosystem in question is a larger one – the marine system along the shoreline, for example. It may include thousands or millions of mini-system pools and puddles that are being regularly created and destroyed. This process is part of the way this system works. In the context of the marine system, does the action of human beings stepping into puddles cause a permanent change? The answer is “no”.

Thus, the test is not whether permanent change has been caused to any ecosystem, but whether it has been caused to every ecosystem within which the entire effect takes place. In other words, if there is change within a small system but there is a larger encompassing ecosystem that has not experienced permanent change, then no ecological damage has occurred. It may be that the small system has experienced pronounced change, but that the encompassing system has experienced no permanent change at all. For example, consider the effects of removing a tree from a forest and burning it. The system of organisms that existed within the tree is permanently destroyed. However, from the perspective of the forest, nothing of any consequence has happened. Strictly speaking, there is one less tree. But in the long term, that tree will be replaced, and the overall number of trees in the forest ten years later will not be affected by the removal of the single tree. When the forest is the ecosystem under consideration, no permanent change can be detected.

The test may be expressed in this way because the evaluation is of cumulative effects, or total load. Moving to a larger system means that the effects of all the human activity within that system must be combined to determine if there is any permanent effect. A human splashing the water out of a tidal pool changes the tidal pool. However, if the question is posed with respect to the larger marine system, the question becomes, “Have all the human activities along the shore and in the water caused a permanent change to the marine coastal ecosystem?” (The question is not “Did the splashing of the tidal pool alone cause a permanent change to the marine coastal ecosystem?”) The larger the system, the more human effects must be included in the calculation of the total impact.

The diagram below represents four ecosystems. Ecosystem 1 is a small system contained within system 2, which in turn exists within system 3, which itself is found inside system 4. (Note that the dimensions of an ecosystem are not determined by abrupt boundaries as the diagram suggests.) If the cumulative effects of human activity upon ecosystem 1 (a tree or a tidal pool) is to cause permanent change within system 1, but permanent change is not caused by the total load of human activity in system 2 (including but not limited to the human impact in system 1), then ecological

tems, as are ponds, lakes, rotting logs, rangelands, and estuaries. The Northern Rockies is an ecosystem. So is North America. So is the planet” (Salwasser, supra note 39 at 86).
damage has not occurred. Similarly, if permanent change caused by human action is found in system 2, but not by the total load of human action in system 3 (including but not limited to the action in system 2), then ecological damage has not occurred. And so on.

Thus, the target for a general prohibition against permanent ecosystem change is not every ecosystem. Instead, if it is possible to identify any ecosystem (even a large one – indeed, even the largest one, the biosphere on the surface of the planet) that will experience no permanent change as a result of the cumulative effects of human activity that takes place within it, then no “environmental harm” has occurred.

Approaching the issue in this manner does not mean that there would be open season on very small ecosystems. On the contrary, such a prohibition would mean that any effect on small ecosystems that contributed to permanent change to a larger

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57 For example, would this approach allow the elimination of a species from a small ecosystem on the basis that a larger ecosystem is not affected? The answer is, it depends. In the case of the tidal pool, destruction of a single pool would eliminate the organisms that lived in the pool. But the populations of such organisms along the marine coastal system would not be affected in any way – their equilibrium levels would remain constant over time, and the particular organisms eliminated from the tidal pool would be replaced. However, in a different scenario, the elimination of a species from one system would amount to a permanent change to the larger system as well. For example, consider the destruction of the habitat of a community of spotted owls in a coastal rainforest. Assume that developers sought to justify that action on the basis that it would not affect the continental ecosystem. That justification would be inadequate unless, like the tidal pool scenario, the equilibrium population of spotted owls was restored by ecosystem resources outside the coastal rainforest but within the continental system, and if the temporary loss of the owls had only temporary effects upon other species and ecosystem elements. Sometimes, a permanent change within a small system is also a small permanent change within a larger system, which is not permitted under the test.
ecosystem would be prohibited. Recall that the test is whether the cumulative effects of all human action within the system cause permanent change. The larger the system in question, the wider the net for the human impacts that must be incorporated into the calculation.

**Conclusion to Step 1: The Meaning of “Ecological Damage”**

Ecosystems are the units that environmental law should protect. If ecosystems are protected, secondary environmental interests like human health, wildlife habitat, wetlands, forests, air, and water are protected also. Ecosystems exist in a nonequilibrium state, meaning that they may change through time. Ecosystems experience two kinds of change: temporary and permanent. Temporary change is irrelevant. Permanent change to ecosystems may be caused by natural forces or human impact. Permanent change caused by natural forces is natural and is not cause for concern. Permanent change caused by human impact is what environmental law should prevent. Ecosystems are like Russian dolls – small ones are contained within larger ones. If permanent change is experienced within a small system but not within a larger one that contains it, then nothing of significance has occurred. Therefore, ecological “damage” occurs when an ecosystem experiences permanent change caused by human impact, unless a larger ecosystem can be identified in which no such permanent change is found.

**B. Step 2: Defining a Limit for Each Person**

It is not enough for an environmental rule to identify limits for society as a whole. To be effective as a legal prohibition, a rule must proscribe individual behaviour. Citizens must be able to determine what they are not allowed to do. Concepts such as sustainable development do not provide this detail. Thus, they are unable to govern individual action, and therefore fail to control cumulative human impact. In Step 1 above, ecological “damage” was defined as permanent change caused by human impact to all ecosystems within which the impact occurs. In Step 2, the task is to define how much impact each person can produce so that the total does not cause the kind of change described in Step 1.

We began with a simple rule prohibiting the use of force:

*No one may apply force against another without the other’s consent.*

The equivalent environmental prohibition may be described as follows:

*No one may produce environmental impact that, if multiplied by the number of humans in the ecosystem, would cause a permanent ecosystem change, unless a larger encompassing ecosystem can be identified in which no permanent change would result from the impact multiplied by the number of humans in that larger system.*

This rule has four primary features that are essential to its effectiveness.
1. The Rule Applies Equally to All

In order to be a governing rule or principle of environmental law, an individual limitation must be generally applicable – that is, it must apply equally to all. Therefore, it must express the same limit for all. In other words, a generally applicable principle demands that environmental capacity be apportioned equally amongst all human members of an ecosystem. The alternative is anathema to the rule of law: prohibitions that apply to some but not to others, even when all cause the same kind of hazard. For example, consider a law that prohibited only selected categories of people from drinking and driving. If that law exempted some people, and thus allowed them to drive drunk – those who resided in particular neighbourhoods, perhaps – one would have no difficulty in concluding that the law was awry.58

2. The Rule Distinguishes Between Ecological Impact and Ecological Harm

Humans, like all animals, cannot survive without causing ecosystem impacts. Whenever an organism breathes, eats, or decomposes, it interacts with other elements of the system and thus causes impacts. Such impacts are not detrimental to the system. Indeed, they are what make the system work – they are the interactions that create relationships among system elements. Without impacts, the system would not be a system, but merely a collection of static “things”.

Ecosystem impacts are not prohibited by this rule. To prohibit such impacts would be silly because it would mean that people were not allowed to breathe, eat, defecate, or die. Instead, the rule defines when human impacts exceed their limits. It says that any kind or extent of impact is permissible unless some fundamental characteristic of the system would be permanently changed if all people within that system inflicted a similar impact. Human activity must take place within the ecosystem’s capacity to absorb it without becoming a different system. This concept can also be characterized as preserving natural capital59 and living off the interest. Under the formulation proposed here, the “interest” is the capacity of any given ecosystem to tolerate human impacts without experiencing permanent change.

Defining ecological harm in this manner avoids defining it in a way that incorporates social and economic factors. Environmental damage should be defined in eco-

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58 Many rules of general application have exceptions and/or different standards for different degrees of risk. For example, transport trucks may be subject to a slower speed limit than passenger cars. Such exceptions do not alter the general principle that prohibitions are to be applied equally to those creating the same kind or degree of hazard.

59 “Ecosystems are capital assets: if properly managed, ecosystems supply a stream of critical life-support services. These ‘ecosystem services’ include the production of goods (such as seafood and timber), life support processes (such as pollination, flood control, and water purification), and life-fulfilling conditions (such as beauty and scenery), as well as the conservation of options for the future (such as genetic diversity)” (Geoffrey Heal et al., “Protecting Natural Capital Through Ecosystem Service Districts” (2001) 20 Stan. Envtl. L.J. 333 at 334).
logical terms. The alternative is to give it a social meaning, which results in the approval of environmentally damaging activity because it is considered socially useful.

3. Compared to the Impact Presently Produced by Most People, the Rule Sets a Low Threshold

The rule prohibiting the use of force encounters resistance precisely because the use of force is widespread. A rule prohibiting ecosystem harm will cause great turmoil because it conflicts with the behaviour of nearly everyone. That is what makes the rule necessary. The degree of difficulty that people will experience in complying with the rule is not a relevant measure of the rule’s propriety. A better measure is what happens in the rule’s absence. If no such rule exists, humans will cause permanent change to ecosystems, or more accurately, will continue to cause permanent change to ecosystems. If creating such a limitation is too difficult, then natural capital will continue to be consumed. Ecosystems will be corrupted by human action. “Nature” will cease to exist. To some, this outcome may be philosophically or spiritually troubling, but more serious are its implications for outright survival. The importance of ecosystem health is often dismissed, or at least characterized as simply one of many issues. As Jared Diamond states, that dismissal is based upon the misconception:

… that we must balance the environment against human needs. That reasoning is exactly upside-down. Human needs and a healthy environment are not opposing claims that must be balanced; instead they are inexorably linked by chains of cause and effect … Our strongest arguments for a healthy environment are selfish: we want it for ourselves, not for threatened species like snail darters, spotted owls, and Furbish louseworts.60

4. Compared to the Alternatives, the Rule is Simple

The complexity of ecosystems and an increasingly complex human society do not call for an increasingly complex system of environmental governance. The proper response to factual complexity is legal simplicity. Legal complexity is easy to create. Indeed, it happens by incremental inadvertence, and is difficult to avoid. Creating legal simplicity in an effective form is the more challenging task.61 The purpose of developing a single, simple environmental rule is not to turn each human action into a matter for lawyers and courtrooms, but exactly the reverse: complexity and uncertainty lead to interminable and costly litigation. Simplicity and clarity lead to the prevention and efficient resolution of conflict. Consider two forms of prohibitions against the use of force referred to in the introduction above: one that makes the prohibition dependent upon social context; and the other that states a context-less prohibition. Which is more likely to end up in a courtroom? Undoubtedly the one that is dependent upon context, since there is much more to argue about to the judge. When a rule is simple and clear, so is the resolution of most situations. So too with the envi-

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61 It is easy to produce a Tax Act that is three inches thick. It would be a far more impressive accomplishment to produce a Tax Act that was effective, just, and only half an inch thick.
An environmental rule articulated here. Occasionally, scenarios would arise that do not fall cleanly inside or outside the rule, but for the vast majority of situations, the rule would provide a clear signal about what is legal and what is not. Under this rule, the following activities can be expected to be prohibited: clear cutting, operating coal-fired generating stations and nuclear power plants, driving petroleum powered automobiles, spraying pesticides, growing genetically modified crops, operating fish farms, burying inorganic waste, and numerous other everyday practices.

III. A DRAFT STATUTE

Below is a draft statute that incorporates the rule developed above. There are a few issues that the draft does not resolve: the question of limits for corporations; the enumeration of exceptions (four are provided in the draft, but there are others that would be necessary); and the method for evaluating changes within urban environments made of concrete and steel. These questions pose challenges that are resolvable, but are beyond the scope of this discussion.

Ecological Sustainability Act
Statutes of New Durham 2005, Chapter E-15

Part I – Purpose, Definitions, and Prohibition

Purpose
1. The purpose of this Act is to achieve ecological sustainability in New Durham.

Meaning of ecological sustainability
2. “Ecological sustainability” means the absence of permanent change caused by human impact in an ecosystem of any size within which the impact is found.

Definitions
3. In this Act, “diversity” means the variety of elements in an ecosystem, including but not limited to the variety of species, genes, chemicals, patterns, and communities;

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62 In stating the case for simple rules, Epstein argues, “… no set of rules will be perfect in its application; indeed, knowing when to quit is one of the driving forces behind a set of simple rules. Nonetheless even though there are some daunting exceptions, these rules do have the virtue of offering solutions for 90 to 95 percent of all possible situations. Never ask for more from a legal system. The effort to clean up the last 5 percent of the cases leads to an unravelling of the legal system insofar as it governs the previous 95 percent” (Epstein, supra note 14 at 53).
“ecosystem” means a community of plant and animal organisms and their physical environment interacting as an ecological unit, and includes ecosystems of all sizes, from very large macro-ecosystems to very small micro-ecosystems;

“emergency” means a sudden, unexpected, imminent, and substantial danger to human life or physical safety;

“equilibrium” means a steady state maintained through the operation of homeostatic ecosystem forces;

“municipality” has the same definition as provided in the Municipal Act, Revised Statutes of New Durham 1990, c. M.45;

“nonequilibrium” means the absence of a steady state; a condition of ecosystems in flux or evolution;

“permanent change” means:

a) with respect to ecosystems found to be in an equilibrium state, any alteration to the system’s diversity, stability, or resilience;

b) with respect to ecosystems found to be in a nonequilibrium state, any alteration to the change in or evolution of the system’s resilience or diversity that would not have occurred but for human action;

c) with respect to any ecosystem element found to be in an equilibrium state, whether or not the ecosystem as a whole is in equilibrium or nonequilibrium, any increase or decrease in the equilibrium level of any such element.

“stability” means the measure of an ecosystem’s ability to recover from a disturbance and re-establish its equilibrium state;

“resilience” means the measure of an ecosystem’s ability to maintain relationships between system elements in the presence of disturbances.

**Prohibition for individuals**

4. No one may produce ecosystem impact that, if multiplied by the number of humans in the ecosystem, would cause a permanent ecosystem change, unless:

   (1) a larger encompassing ecosystem can be identified in which no permanent change would result from the impact multiplied by the number of humans in that larger system; or

   (2) the impact is permitted by section 5.

**Exceptions**

5. Ecosystem impact in excess of that provided for in section 4 may be produced where the impact:

a) moves the ecosystem to a state in which it existed prior to permanent change caused or contributed to by human beings; or

b) takes place during an emergency and is for the purpose of preventing physical human injury or death; or
c) takes place within a municipality and improves human health or safety; or
d) takes place inside a building and is not detrimental to human health or safety.

Part II – Civil Liability

Civil liability

6. Any person who violates section 4 is civilly liable to the Government of New Durham for damages equal to the cost of returning the ecosystem, as far as possible, to its state before the impact.

Standing

7. Any person has standing to bring a civil action to establish the liability described in section 6.

Strict liability

8. No finding of intent, recklessness, wilful blindness, negligence, breach of standard of reasonable care, foreseeability of damage, or other element of fault is required to establish the liability described in section 6.

Burden of proof

9. The burden of proof for all elements of the cause of action lies upon the plaintiff on a balance of probabilities.

Other remedies

10. In addition to the damages described in section 6, a court may:

(a) award damages to be paid by the defendant to the plaintiff for any damage to the plaintiff’s personal or property interests;

(b) issue an injunction prohibiting the defendant from continuing any action, activity, or state of affairs that produces impact in excess of that provided for in section 4;

(c) require that damages be paid by the defendant to the Government of New Durham in an amount appropriate to compensate the people of New Durham for any permanent ecosystem change caused by the impact; and

(d) require that damages be paid by the defendant to the Government of New Durham in an amount equal to the amount of the benefit, whether financial or otherwise, acquired by or that accrued to the defendant.

Part III – Criminal Liability

Offence

11. Every person who intentionally or with knowledge or wilful blindness violates section 4 is guilty of an offence.
Private prosecutions

12. (1) A prosecution for an offence under this act may be commenced and conducted in the name of the State of New Durham by any person who has retained a lawyer for this purpose.

(2) The Attorney General may not assume carriage of a private prosecution commenced under subsection (1) except with the consent of the person or persons who commenced the prosecution.

Burden of proof

13. The burden of proof for all elements of the offence in section 11 lies upon the prosecution beyond a reasonable doubt.

Penalties

14. Every person convicted of an offence under section 11 is liable:

(a) on a first conviction, for each day or part of a day on which the offence occurs or continues, to a fine of not more than $1,000; and

(b) on each subsequent conviction,

(i) for each day or part of a day on which the offence occurs or continues, to a fine of not more than $50,000;

(ii) to imprisonment for a term of not more than one year; or

(iii) to both such fine and imprisonment.

Other remedies

15. (1) The court that convicts a person of an offence under section 11, in addition to any other penalty imposed by the court, may increase a fine imposed upon the person by an amount equal to the monetary benefit acquired by or that accrued to the person as a result of the commission of the offence, despite any maximum fine elsewhere provided.

(2) On its own initiative or on the request of the prosecutor, the court that convicts a person of an offence under section 11, in addition to any other penalty imposed by the court, may order the person to take such action as the court directs within the time specified to prevent, eliminate or ameliorate damage that results from or is in any way connected to the commission of the offence.

(3) On its own initiative or on the request of the prosecutor, the court that convicts a person of an offence under section 11, in addition to any other penalty imposed by the court, may make an order for restitution against the person convicted of the offence, requiring the person to pay another person for reasonable expenses actually incurred by the other person on account of damage to property in which the other person has an interest that results from or is in any way connected to the commission of the offence, in such amount and on such terms and conditions as the court considers just.
(4) A civil remedy for an act or omission available under this or any other Act or rule of law is not affected by reason only that an order for restitution under this section has been made in respect of that act or omission.

IV. CONCLUSION

The purpose of this article has not been to advocate a pragmatic or political solution to environmental impasse, but to develop a rule that would protect ecosystems were it to be enacted. There is little point in lamenting political obstacles to environmental protection if, should those obstacles be overcome, there is no legal approach capable of actually achieving environmental objectives. In this article, I have described a generally applicable rule that would produce ecological "sustainability", one that defines a legal prohibition in ecological terms, and respects established legal norms. The principle upon which the rule is based is that permanent change to ecosystems caused by modern human society should be prevented.

Compliance with the proposed rule would require significant social change. The rule might be rejected on this basis. Such rejection would mean that a choice has been made: that it is too difficult in social, economic, and political terms to preserve ecosystems in a natural state. That, in turn, would mean that the planet is on a path to a human-made ecological system. Two issues arise. The first is whether that is what we mean to do - whether it is a deliberate plan arising from a well-informed, democratic consensus, or the inadvertent result of a refusal to face hard choices. The second is whether such an environment will work - whether ecosystems of our own making will function so as to provide for our needs as natural systems do, or whether they will prove to be unable to support human life and civilization on its present scale. The preferable, prudent path is one that does not require answers to those questions.