The logic of ecosystems: capitalism, rights and the law of ‘ecosystem services’

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‘Ecosystem services’ consist of natural processes on which humans depend, such as photosynthesis, waste decomposition, pollination, and water and air purification. Current proposals for the targeted protection of ecosystem services ignore the logic of ecosystems: interactions between organisms are driven by competition for resources in a contest for survival, in which successful adaptations are responses to system conditions. Preserving or protecting ecosystem services is not possible without protecting the operation of the system within which they exist. Ecosystems have no purposes, interests or objectives, but only dynamics and consequences. While changes to ecosystems can harm human interests, ecosystems themselves cannot be harmed, but only changed. Therefore, the question for environmental law is not whether ecosystem services deserve protection, but whether people have a right to ecosystem services. Contrary to prevailing academic opinion, the answer to this question lies within the principles of capitalism. In its pure form, capitalism is a system of governance based upon the logic of ecosystems, modified in only one main respect: in interactions between people, physical interference is prohibited. Competition is thus transformed from physical struggle into a contest for commercial survival. The principle of non-interference is the conceptual foundation of negative human rights, including self-ownership, property rights, and the freedom to contract in markets. The question is: does the principle of non-interference mean that people have a right to restrict other people from changing ecosystems?

Keywords: law, ecosystem service, capitalism, environmental right, market, ecosystem, negative right, property right, natural selection, evolution

1 INTRODUCTION

Harold lives on 200 hectares of land in the countryside. On Harold’s land lives a population of wild bees. Harold plans to graze cattle on the land, which will require clearing woodlots on which the bees rely for food and nesting. Gretchen grows a fruit orchard nearby. She objects to Harold’s plan to clear the land and thereby threaten the viability of the bee population, which helps to pollinate Gretchen’s fruit trees. If Harold clears the land and harms the bees, does he interfere with Gretchen? Or, if Gretchen prevents the land from being cleared, does she interfere with Harold? Do people have a right to restrict other people from changing ecosystems? The purpose of this article is not to answer these questions, but to argue that these are the questions that matter. A principled approach to the issue of ecosystem services depends upon the definition of rights.

* I would like to thank Daniel Rosenbluth for his excellent research assistance. Comments are welcome at bruce.pardy@queensu.ca.

2 ECOSYSTEM SERVICES AND PROPOSALS TO PROTECT THEM

2.1 Ecosystem services

Ecosystem services ('ES') are commonly defined as those natural processes that are essential to human welfare.¹ Lists of ES commonly include air and water purification,² waste decomposition and soil generation, pollination and photosynthesis.³ The concept of ES is both anthropocentric and utilitarian.⁴ It encompasses only those natural phenomena that are important to the life and prosperity of human beings.⁵

1. 'In addition to producing economically valuable goods (e.g., lumber, bananas, fish, etc.), ecosystems are essential for providing services that are vital to individual and community well-being. The term that captures this principle, "ecosystem services," refers to "a wide range of conditions and processes through which natural ecosystems, and the species that are part of them, help sustain and fulfill human life"', K Hirokawa, 'Sustaining Ecosystem Services Through Local Environmental Law' (2011) 28 Pace Env'tl L Rev 760 at 760, quoting G Daily et al., 'Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems' (1997) 2 Issues in Ecology 1 at 2; Hirokawa also quotes Costanza et al. on the same point: 'Ecosystem functions refer variously to the habitat, biological or system properties or processes of ecosystems. Ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions', Hirokawa, *ibid* at note 2, quoting R Costanza et al., 'The Value of the World's Ecosystem Services and Natural Capital' (1997) 387 Nature 253 at 253. The Millennium Ecosystem Assessment, produced by the United Nations in 2005, adopted an equally broad definition: 'Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits', Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Current State and Trends Assessment*, Vol 1 (Island Press, Washington, DC 2005) 26.

2. The list of what qualifies as an ecosystem service varies. For example, JB Ruhl lists the services provided by aquatic resources as 'groundwater recharge, storm and flood mitigation, sediment control, water purification, climate regulation, water supply, and recreation', JB Ruhl, 'Ecosystem Services and the Clean Water Act: Strategies for Fitting New Science into Old Law' (2010) 40 Environmental Law 1381 at 1382–3. Also see A Rosenthal, K Lyon and E McKenzie, 'Ecosystem Services' in R Craig et al. (eds), *Ecosystem Management and Sustainability* (Berkshire Publishing, Great Barrington, MA 2012) 112.

3. 'A way to think about this more practically is as three suites of services. One might think of translocation processes – the natural service of moving things from one place to another. This would include pollination (moving pollen from one flower to another) and seed dispersal. Another set includes stabilizing processes such as natural pest control (how most agricultural pests are controlled); climate regulation through carbon sequestration (vegetation sucking up CO₂); mitigating droughts (such as retaining water and metering the flow over time); and flood control (coastal wetlands are great at buffering floods). The third category is what you might call cycling or filtration processes. That would include things such as water purification (what was going on in the Catskills), waste degradation (breaking down waste products), and renewal of soil fertility', J Salzman, 'What is the Emperor Wearing? The Secret Lives of Ecosystem Services' (2011) 28 Pace Env'tl L Rev 591 at 593.

4. '... ecosystem services have relevance only to the extent *human* populations benefit from them. They are purely anthropocentric', JB Ruhl, S Kraft and C Lant, *The Law and Policy of Ecosystem Services* (Island Press, Washington 2007) 15 (emphasis in original). For a review of Ruhl, Kraft and Lant's book, see B Pardy, 'Goods, Services and Systems' (2008) 46 Osgoode Hall Law Journal 445.

5. 'Gretchen Daily, one of the leading thinkers in this area, has defined ecosystem services as the conditions and processes through which natural systems make up, sustain and fulfill human life', Salzman (n 3) 593.

2.2 Proposals to protect ecosystem services

Academics and advocates have proposed at least three approaches to protecting ES. One is a regulatory approach that would use a variety of public law machinery to restrict actions that could detrimentally affect ES.⁶ The second would pay people for not harming ES.⁷ Under a third approach, governments would create markets for ES by setting environmental caps such as emission limits on particular industries or facilities and then allowing companies to buy and sell excess room under the caps.⁸

These approaches share three premises. The first is that ES are distinct ecological features or processes capable of specific legal protection. The second is that although some ES have no market value because they are not the subject of property rights and/or are not easily exchanged, all ES have an economic value that can be calculated by measuring their actual or potential importance to human well-being. The third is that since ES are essential to humans, adverse effects imposed upon ES are negative externalities⁹ that should be restrained in the public interest.

As I will discuss below, these are questionable premises. But first I will take a short detour into the logic of ecosystems.

3 THE LOGIC OF ECOSYSTEMS

3.1 Ecosystems

You may think of your body as a thing. After all, it has a physical existence and identifiable boundaries. It is a solid object, with mass and substance, and you know where your body ends and the rest of the world begins. Atoms and molecules make up cells, which make up organs and tissue, which make your body the thing that it is. Except that it is not a thing in the same way as a chair, a basketball, or a rock. Like chairs, basketballs and rocks, at this moment your body is made up of a particular collection of atoms and molecules. But unlike these inanimate objects, every day some of your atoms and molecules are lost, and others replace them. You consist of different

6. This approach emphasizes new rules and regulations, planning, adaptive management and an expanded role for public authorities. For example, see JB Ruhl, 'Ecosystem Services and the Clean Water Act: Strategies for Fitting New Science into Old Law' (2010) 40 J Env Law 1381; Hirokawa (n 1); Ruhl, Kraft and Lant (n 4).

7. 'Payments for Ecosystem Services' or PES consist of public funds paid to parties with property rights over ES, to compensate them for the opportunities foregone by sparing them instead of using the land for a more profitable purpose. For example, see Salzman (n 3) 600–604; K Bennett, 'Additionality: The Next Step for Ecosystem Service Markets' (2010) 20 Duke Environmental Law & Policy Forum 417; T Greiber (ed), *Payments for Ecosystem Services: Legal and Institutional Frameworks* (IUCN, Gland, Switzerland 2009).

8. See L Wayburn and A Chiono, 'The Role of Federal Policy in Establishing Ecosystem Service Markets' (2010) 20 Duke Environmental Law & Policy Forum 385; G Achterman and R Mauger, 'The State and Regional Role in Developing Ecosystem Service Markets' (2010) 20 Duke Environmental Law & Policy Forum 291; C Reid, 'Between Priceless and Worthless: Challenges in Using Market Mechanisms for Conserving Biodiversity' (March 2013) Transnational Environmental Law 1. The most frequently cited example of an ES market is the cap and trade model for limiting greenhouse gas emissions: government allocates caps, and then companies buy and sell emission allowances depending on whether their emissions are above or below their cap.

9. See Salzman (n 3) 595.

material today than yesterday, last year, and ten years ago. New atoms and molecules are laid down in a particular place and manner, so that they interact with the others just so. Those particular combinations and interactions are what make you unique. You are not a thing but a pattern – the product of a system of processes expressing a package of information.

Ecosystems are not things either. In fact, they do not even have physical shapes or boundaries. Instead, they are intangible systems producing patterns and outcomes. An ecosystem is a model that explains the dynamics of interactions amongst living and non-living elements that function as a system.¹⁰ These systems are not just collections of organisms – crickets and water lilies – but consist of relationships and interactions that together amount to something different from the sum of their parts. They operate according to their own immutable characteristics and rules. The way ecosystems work is what they are.

3.2 The logic of ecosystems: competition, natural selection and evolution

Ecosystems, natural selection and evolution are intimately connected.¹¹ In ecosystems, population growth makes resources scarce.¹² Because resources are scarce, competition for resources is inevitable.¹³ Some organisms obtain the resources necessary to survive and reproduce, and others do not.¹⁴ In this way, competition for scarce

10. An ecosystem is 'a community of organisms and their physical environment interacting as an ecological unit', R Lincoln, G Boxshall and P Clark, *A Dictionary of Ecology, Evolution, and Systematics* (Cambridge University Press, Cambridge 1982) at 75; 'A community of plants and animals within a particular physical environment that is linked by a flow of materials through the non-living (abiotic) as well as the living (biotic) sections of the system', S Mayhew, *A Dictionary of Geography* (4th edn, Oxford University Press, Oxford 2009) available at <<http://www.oxfordreference.com/view/10.1093/acref/9780199231805.001.0001/acref-9780199231805-e-1029>>.

11. 'Ecology is a branch of evolutionary biology', J Kricher, *The Balance of Nature: Ecology's Enduring Myth* (Princeton University Press, Princeton 2009) x; '[E]volution provides the basis for ecology, or at least is a strong pattern driving it', WK Dodds, *Laws, Theories and Patterns in Ecology* (University of California Press, Berkeley 2009) 26. Dodds calls natural selection and evolution the second law of ecology and natural selection the first law of evolution; *ibid.*, 23–4.

12. 'The key to natural selection is Malthusian economics. ... Malthus described how basic environmental resources would ultimately limit populations, thus creating a struggle for existence. Competition is inevitable (because of population growth) and thus only some within a population ultimately survive, while others must perish', Kricher, *ibid.*, 57–8; W Ashworth, *The Economy of Nature: Rethinking the Connections between Ecology and Economics* (Houghton Mifflin Co. 1995) at 98–99.

13. '[W]hen any essential resource becomes limited, there will inevitably be some form of competition, direct or indirect, within the population for access to that particular resource. Not all will obtain it, and, if it is vital to survival or reproduction, not all will survive or reproduce', Kricher, *ibid.*, 58–9.

14. 'Losers die and winners eat. The honey bird, skunklike mammal and hunter ... are predators and the hive is prey. But that's not the whole cast of characters. The bees and their honey wouldn't exist without flowers, but the flowers wouldn't exist without bees, and so on. Put it this way: Competitions for feeding and breeding take place in an arena. The arena is a habitat. The fittest panther in the jungle is a goner if its habitat goes. And what is a habitat? It's an intricate, complicated web of interdependencies', J Jacobs, *The Nature of Economies* (Vintage Books, New York 2000) 21–2.

resources in ecosystems is the dynamic that drives natural selection.¹⁵ When organisms succeed, their genes are passed to the next generation. When they fail, they become a genetic dead end. Natural selection, in turn, is the engine of evolution.¹⁶ As the genetic makeup of populations changes through time by natural selection, new genetic variations emerge, and species evolve. Genetic variation that impedes survival is weeded out. However, variations can also be advantageous if they provide a survival advantage.¹⁷ When the organisms that hold advantageous genes reproduce, they pass the adaptation on to their offspring.¹⁸ Natural selection produces a genetic makeup that determines anatomy, physiology and behaviour.¹⁹

To say that organisms compete for scarce resources is not to suggest that they are always engaged in direct physical struggle.²⁰ Conflict between organisms can indeed be direct, violent and deadly, such as when predators consume prey. However, there

15. Natural selection: 'A complex process in which the total environment determines which members of a species survive to reproduce and so pass on their genes to the next generation', M Allaby, *A Dictionary of Ecology* (4th edn, Oxford University Press, Oxford 2010) online.

16. 'Natural selection will act on species leading to changes in genotype and, thus, phenotype. The mechanism is natural selection on heritable characteristics coupled with slight variability in the heritable characteristics. This theory is based on the Malthusian law of exponential growth in the absence of controls on growth, heritable characteristics that influence survival, and the selective process related to differential survival', Dodds (n 11) 23–4.

17. 'Stated formally, natural selection occurs whenever individuals with heritable variations differ in the number of surviving offspring they have compared to other individuals in the population (in other words, they differ in their *relative fitness*). Natural selection occurs most commonly and strongly when organisms inherit rare, harmful variations, like haemophilia (the inability to form blood clots), that impair an individual's ability to survive and reproduce. Such traits are less likely to be passed on to the next generation, thus reducing or eliminating them from the population. This sort of filter is called negative selection and often leads to a lack of change over time within a population, maintaining the status quo. Occasionally, however, positive selection occurs when an organism inherits by chance an *adaptation*, a new, heritable feature that helps it survive and reproduce better than its competitors. Adaptive features, by their very nature, tend to increase in frequency from generation to generation, causing change over time', D Lieberman, *The Story of the Human Body: Evolution, Health and Disease* (Pantheon Books, New York 2013) 9 (emphasis in original, footnotes omitted).

18. '... individuals vary genetically within populations. This variation will ultimately influence who survives when it is crunch time. Those variants most suited to whatever the environment imposes will tend to survive and reproduce better than those with different traits', Kricher (n 11) 57–8.

19. 'Natural selection is the process responsible for adaptation. ... Selection acts on anatomy, physiology, and, in animals, behavior. It is the force in nature that quite literally shapes all living things. It explains why African lions (*Panthera leo*) have such long canine teeth and powerful jaws; why certain wasps paralyze spiders and then lay their eggs on them; why red mangrove trees (*Rhizophora mangle*) have stilted roots; why some flowers are tubular in shape and red in colour; why some molds produce chemicals that inhibit bacterial growth', Kricher (n 11) 57. 'Nothing in biology makes sense except in light of evolution', Lieberman (n 17) 365.

20. 'Many are born, but not all survive to reproduce. Those that do are a select, non-random subset of the original cohort. Because individuals differ genetically, the population evolves as environments change in various ways. ... Darwin recognized that fitness is largely a metaphorical term and need not literally mean "nature red in tooth and claw." Organisms may struggle against each other, against other species, or against the elements. But ultimately it will be the genetic endowment of the various individuals that will weigh most heavily in the struggle for existence and the ultimate survival of the fittest', Kricher (n 11) 59–60.

are many ways to compete,²¹ and competition in ecosystems encompasses a diverse array of adaptations and strategies. Survival does not necessarily depend on being the largest, fastest or most ferocious, but on being effectively adapted to the requirements of the environment in which the organism lives.²² Relationships between organisms cover the spectrum between conflict and coexistence: predation, parasitism, symbiosis, mutual dependence and cooperation.²³

Ecosystems have no purposes, interests or goals, but only dynamics and consequences.²⁴ Organisms succeed in ecosystems by surviving to reproduce, but an ecosystem cannot succeed or fail. The system of interactions may evolve into a system of greater or lesser complexity, greater or lesser diversity, or even fade away altogether – but the nature of its evolution is always 'correct' because it is dictated by and is a reflection of the interactions and adaptations amongst its elements. The logic of ecosystems is thus: competition for scarce resources leads to natural selection in which those organisms better adapted to ecosystem conditions survive and reproduce, producing evolutionary change. 'Ecosystem services' such as pollination, water purification and soil generation are merely products of this ongoing process.

4 FLAWS IN THE PREMISES OF PROPOSED APPROACHES TO ES

4.1 Premise 1: ecosystem services are distinct features or processes that can be specifically protected

ES are only distinctive because they seem important to human survival and prosperity.²⁵ Since in an ecosystem everything is connected to everything else, to assign importance

21. For example, competition may occur 'between individuals of the same species (intraspecific competition), or between different species (interspecific competition) at the same trophic level, in which the growth and survival of one or all species or individuals is affected adversely. The competitive mechanisms may be direct (active) ... or indirect, when a common resource is scarce', M Allaby, 'Competition' in the *Oxford Dictionary of Ecology* (3rd edn, Oxford University Press, Oxford 2005), 100.

22. 'Some people erroneously think that natural selection means "survival of the fittest." Darwin never used that phrase ... nor would he have, because natural selection is better described as "survival of the fitter." Natural selection doesn't produce perfection; it only weeds out those unlucky enough to be less fit than others', Lieberman (n 17) 365.

23. For example, some species of predators hunt in packs while others are solitary. Each is an adaptive behaviour. Zebras are one of many prey species that travel in herds, providing collective protection from predators. Cooperation occurs because of competition, not in spite of it. Cooperation in ecosystems is never universal; cooperation allows organisms to join forces against challenges to their survival. In no ecosystems do organisms cooperate for the mutual good of all.

24. 'According to Darwin's view (since reaffirmed by a century and a half of further biological evidence), natural selection is a purposeless process but an efficacious one. Impersonal, blind to the future, it has no goals, only results. From scattershot variations, culled and accreted, it produces pragmatic forms of order. Its driving factors are hyperfecundity and mortal competition; its products and by-products are adaptation, complexity, and diversity', D Quammen, 'Evolution and Intelligent Design: Mr. Darwin's Abominable Volume' (Spring 2006) *Virginia Quarterly Review* 4 at 6.

25. 'It is tempting to overstate the case for ecosystem services, to try to find them everywhere simply because anywhere is in one or another ecosystem. But it is important not to confuse ecosystem *functions*, which are ubiquitous, with ecosystem *services*, which are the consequence of only some ecosystem functions', Ruhl, Kraft and Lant (n 4) 15 (emphasis in original).

to a specific list of ecosystem features is problematic. All organic processes, whether directly useful to humans or not, are products of the ecosystem within which they occur – the result, but not the end result (because there are no end results), of millions of years of competition, natural selection, adaptation and evolution within systems of interacting organisms and non-organic resources. Without the dynamics of the systems in which they are found, the phenomena would not exist. Therefore, protecting ES requires that the systems in which they exist operate and evolve in the way that they do. Ecosystems are unplanned, dynamic, changing, uncertain, and uncontrolled. Those are the conditions that produced ES. Aiming to specifically protect ES to the exclusion of the rest of the system does not sustain the conditions that produced them. Protecting ES is a specific, instrumentalist objective that flies in the face of the logic of ecosystems. The fate of ES depends on the fate of the systems within which they emerged.

4.2 Premise 2: the economic value of ES depends upon their importance

Many ES are either not the subject of property rights or cannot be easily bought and sold in markets. For example, ES provided by atmosphere and oceans²⁶ fall outside the realm of property rights. Other ES are generated by ecosystem features found on land, and yet may still not be easily exchanged. For example, a wetland is subject to the property rights of the owner of the land on which it is found, but the ES provided by those wetlands, such as flood control and water purification, extend beyond the wetland's geographical location. Owners of surrounding land and users of the water would have an interest in persuading the wetland's owner to preserve the wetland rather than filling it in. However, because the wetland provides benefits that are diverse, unevenly distributed and difficult to trace, an agreement between its owner and all those who benefit from its existence would be unlikely.²⁷ Many of those who benefit from the wetland would not be aware that they do so until it was destroyed; and even then, since one wetland is merely part of a larger watershed, its contribution to water quality may be difficult to ascertain. Even if perfect information was available, where benefits are diverse or resources are 'open-access',²⁸ those who benefit are apt to become free riders²⁹ by having other people pay for the preservation of the resource while reaping the rewards of its existence.

Some scholars maintain that an economic value can be calculated for ES by assessing their importance to human well-being. In 1997, one of the first studies to estimate the economic value of global ES reported that the value of 17 of the Earth's ES, including air and water regulation, was worth 33 trillion dollars (US) per year.³⁰ If one accepts the premise that value is proportionate to importance, then 33 trillion

26. In particular, those parts of oceans located in international waters.

27. Ruhl, Kraft and Lant (n 4) 72–6.

28. Ibid 74.

29. Free rider: 'One who obtains an economic benefit at another's expense without contributing to it', B Garner (ed), *Black's Law Dictionary* (West Group, St Paul MN 1999) 676; 'A person or organization who benefits from a public good but neither provides it nor contributes to the cost of collective provision', J Black, N Hashimzade, and G Myles, *A Dictionary of Economics* (3rd edn, Oxford University Press, Oxford 2009) available at <<http://www.oxfordreference.com/view/10.1093/acref/9780199237043.001.0001/acref-9780199237043-e-1287?rskey=sveBA5&result=1212>>.

30. R Costanza et al., 'The Value of the World's Ecosystem Services and Natural Capital' (1997) 387 *Nature* 253 at 253. The authors noted that global GNP at this time was approximately US\$18 trillion per year. An updated version of this study published in May 2014

dollars seems much too low. Instead, the Earth's ES should be priceless, since without them everyone is dead. But ES are not actually priceless, or worth even 33 trillion dollars. The economic value of ES depends on the same market dynamics as the value of everything else: whether they are subject to rights, and what people will pay for those rights. Whether people will pay for something and how much they will pay depends on the demand and supply of exchangeable interests rather than upon importance or utility.³¹ The classic example of a high value, low utility good is diamonds, which are fairly useless but extremely valuable. At the other end of the spectrum, water is essential to life, but in water-rich regions, it may cost little or nothing because there is plenty available for all.³² As I will discuss below, economic value is determined in markets by the same logic that compels adaptation and evolution in ecosystems.

Consider the economic value of a resource that is essential but not scarce: gravity. On one hand, without gravity we would all drift out into space and die; indeed, life on Earth would never have arisen at all, planets would not exist to orbit a sun, and so on. Gravity is essential to life, and therefore its value is infinite and incalculable. On the other hand, no one is in a position to remove or to eliminate gravity, and nobody is able to exclude others from its effects. It is not scarce. It is not a consumable resource but a constant physical property. No one has rights to gravity and no one has the right or ability to take it away. No one would pay for gravity since there is no way to avoid it, and there is no ability or reason to get more or less of it than one inevitably is exposed to. Therefore, the economic value of gravity, a feature of nature upon which life depends, is zero.

Attempting to measure the economic value of gravity may seem absurd, but its absurdity is itself the point: the economic value of a resource is not determined by its importance. What matters is its scarcity, and whether it is subject to rights that can be exchanged. Other environmental resources and ecosystem functions are also essential to life. Pollination, air and water purification, and soil decomposition are not as plentiful as gravity, and unlike gravity, they can be diminished by human action. As a result, it is tempting to leap to the conclusion that they can be, or should be, assigned an economic value. However, like other resources, their economic value depends upon whether they are subject to rights that can be bought and sold, and the supply and demand for those rights.³³

estimates the value at \$145 trillion: R Costanza et al., 'Changes in the Global Value of Ecosystem Services' (2014) 26 *Global Environmental Change* 152, available at <<http://www.sciencedirect.com/science/article/pii/S0959378014000685>>.

31. It may make sense to fix a value for ecosystem services that are not subject to market forces where a court must calculate damages owed by a defendant who has damaged the plaintiff's property, particularly if the plaintiff is a public entity and the damage is to a public or common resource. Imagine that a wetland on land owned by A has been ravaged by a fire negligently caused by B. If B is held liable for A's losses, it must be determined what damages are payable from B to A. The question arises: what was the wetland worth? Different methods may be used by courts to value loss, including diminution in market value, cost of restoration, loss of income or profit, or loss of use value or non-use value. See M Olszynski, 'Environmental Damages after the Federal Environmental Enforcement Act: Bringing Ecosystem Services to Canadian Environmental Law?' (2012) 50 *Osgoode Hall LJ* 129 at 131 and 143.

32. Ruhl, Kraft and Lant (n 4) 11.

33. As Olszynski states, 'In its most basic terms, environmental valuation is economic valuation – "the valuation in monetary terms of items that people might care for" – applied to the natural world. The goal is to determine the utility, or satisfaction, that individuals derive from the environment. It is *not* to discern the objective value of ecosystems with a view towards

4.3 Premise 3: harms caused to ES are negative externalities

A negative externality is a cost imposed on someone other than the party creating the cost.³⁴ A factory emitting air pollution on residential neighbours 'externalizes' the burden of that pollution onto the residents because it does not have to incorporate its negative value into the cost of producing its hammers. Therefore, the factory will produce too many hammers because their financial cost is lower than their actual cost.³⁵ Since ES are essential to humans, goes the argument, adverse effects imposed upon them are externalities.³⁶ Those externalities should be restrained in the public interest, ideally by internalizing the cost onto the source of the effect.

Two objections to this reasoning exist, the first where the victims of the externality have a legal right to resist it, and the second where they have no such right. Where residents have a right to be free from air emissions, identifying the emissions as an externality is straightforward but redundant. The emissions violate a legal right, and the violation calls for a remedy. If the right is enforced, the externality will be prohibited (or the right-holder will be compensated by court order or by negotiated settlement). Where the residents have no right to limit air emissions, their characterization of the pollution as an externality is merely a preference. They prefer not to have pollution imposed upon them, while the owners of the factory prefer not to be limited in the pollution that they emit. The economist Ronald Coase, in his renowned article 'The Problem of Social Cost', posited the reciprocal nature of limits and effects, and argued that in the absence of legal rights, it cannot be said which party imposes on the other.³⁷ Alleging externalities begs the rights question: who has the right to do what?³⁸

The relative nature of externalities can be illustrated by comparing the air pollution scenario to a conflict about free speech. In each, parties are in conflict and the difficulty lies in determining who imposes upon whom. If Bob states his opinion on a soapbox in the town square in a manner to which Joyce objects, does Bob impose upon Joyce when he speaks or does Joyce impose upon Bob when she prevents him from speaking? If Bob has a 'right to free speech', then Joyce's censorship is a violation of Bob's right. However, if Joyce has a right not to be defamed and Bob's words have the effect of lowering Joyce's character in the estimation of her peers, then Bob's speech violates Joyce's right. The conclusion depends on the

sustainability or intergenerational equity, although the existence of such concerns by individuals can and does affect this exercise. In other words, environmental valuation is positivistic rather than normative, asking what value people place on the environment in light of competing preferences as opposed to how much value they perhaps should place', Olszynski (n 31) at 142–3 (emphasis in original).

34. 'A cost ... arising from any activity which does not accrue to the person or organization carrying out the activity', Black, Hashimzade, and Myles (n 29) available at <<http://www.oxfordreference.com/view/10.1093/acref/9780199237043.001.0001/acref-9780199237043-e-1134?rskey=U98H5u&result=1072>>.

35. 'The prices paid for commodities in a typical market economy do not include the social costs of many types of environmental damage. These externalities have been discussed in the economic literature for over fifty years. Ignoring these costs leads to market prices that are lower than social prices, and as a result, levels of consumption are too high from a social perspective', T Mount, 'Redirecting Energy Policy in the USA to Address Global Warming' in M Dore and T Mount (eds), *Global Environmental Economics: Equity and the Limits to Markets* (Blackwell Publishers, Malden MA 1999) 301 at 304.

36. See Salzman (n 3) 595.

37. R Coase, 'The Problem of Social Cost' (1960) 3 *Journal of Law and Economics* 1.

38. See Salzman (n 3) 603.

existence and definition of the rights held by each party. It is impossible to know which party imposes upon the other without contemplating the rights in issue. The same is true for air emissions. Where a factory produces air emissions to which residents object, it is tempting to assume that the emissions are an externality because the factory is imposing them upon the residents. However, that conclusion depends upon both the extent of the rights held by the residents and the nature of the emissions created by the factory. If the residents have no right to be free from air emissions, the factory is not causing an externality. If the residents have a right to be free from emissions that present a danger to human health, then the factory is producing an externality if the emissions are toxic, but not if they consist of steam. In the absence of rights, it is premature to identify where the externality lies.

One might argue that the regulatory prohibition of pollution designates pollution as an externality, which therefore justifies its prohibition. However, this reasoning is circular: the existence of externalities is commonly cited as a rationale for regulation that prohibits or limits them.³⁹ If the existence of the externality depends upon its regulatory prohibition, then the externality cannot be the rationale for the regulation, since before the regulation came into force, the externality did not exist. The initial problem still remains: in the absence of defined rights, where does the externality lie?

5 CAPITALISM

Ecosystems have no purposes, interests or objectives, but only dynamics and consequences. While changes to ecosystems can harm human interests, ecosystems themselves cannot be harmed, but only changed. Therefore, the question for environmental law is not whether ecosystem services deserve protection, but whether people have a right to ecosystem services. Contrary to prevailing academic opinion, the answer to this question lies within the principles of capitalism.

5.1 Pure capitalism: the rule of non-interference

Capitalism is a loaded term with intensely political and ideological connotations. It can be used to refer to a wide variety of modern forms of state governance⁴⁰ with market economies.⁴¹ That is not the meaning of the term used here. Instead,

39. For example, see SA Shepard, 'A Negative Externality by Any Other Name: Using Emissions Caps as Models for Constraining Dead-Weight Costs of Regulation' (2014) *Administrative Law Review* (forthcoming), available at <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2253548>; T Schoenbaum and R Rosenberg, *Environmental Policy Law* (3rd edn, Foundation Press, Westbury NY 1996) 50–58.

40. 'Capitalism is the name of the economic system that dominates the world today', R Heilbroner, *Twenty-first Century Capitalism* (House of Anansi Press, Concord 1992) 3.

41. Capitalism: 'The economic system based on private property and private enterprise. Under this system all, or a major proportion, of economic activity is undertaken by private profit-seeking individuals or organizations, and land and other material means of production are largely privately owned. Under capitalism parts of the economy may be in public ownership. The government may impose certain regulations on the activities of the private sector regarding public health and safety, enforcement of competition, and protection of the environment', Black et al. (n 29), available at <<http://www.oxfordreference.com/view/10.1093/acref/9780199237043.001.0001/acref-9780199237043-e-337?rskey=fztPcP&result=341>>.

I refer to the pure or theoretical form of capitalism rather than its historical or traditional meaning. 'Capital' generally denotes property, or a particular kind of property that generates wealth,⁴² including such notions as 'the means of production' or 'capital goods'.⁴³ 'Capitalism' in its simple form is a system in which property is privately held and employed in markets. This pure form of capitalism bears little resemblance to the modern manifestation of welfare states that carry a 'capitalist' moniker.⁴⁴ Nor can one point to any particular country or period in which pure capitalism has reigned. Pure capitalism, like the rule of law, perfectly competitive markets and pristine ecosystems, is a conceptual framework or model. It may never have existed in practice and may never be realized.

The capitalist proposition that owners of property may employ it in the way they see fit is dependent upon a legal right to exclude others from interfering with the stuff to which the property rights apply: a right of non-interference. This right has broad and deep implications. Its application extends beyond property, and is consistent with self-ownership, liberty of movement and freedom to contract. It is reflected in the traditional roster of negative rights in common law jurisdictions, including tort causes of action in battery, false imprisonment, trespass, nuisance and negligence; the rules of contract; rights of due process in criminal law; and so on.

5.2 Markets: systems of rights exchange

It is not possible to understand capitalism without considering the nature of markets. Non-interference means that people may do as they see fit with their goods and their labour. One of the things that they see fit to do is exchange them with others. Markets consist of the purchase and sale of rights, and in particular, property rights.

Like ecosystems, markets are systems. Sometimes the two systems are represented as existing in opposition, but the operating principles of markets and ecosystems are not opposite. Instead, they are remarkably similar and have much in common.⁴⁵ In particular, markets share the logic of ecosystems, modified by the capitalist principle of non-interference: in interactions between people, physical interference is prohibited. Competition is thus transformed from a physical struggle for existence into a

42. 'Capital is wealth whose value does not inhere in its physical characteristics, but in its use to create a larger amount of capital. Typically, this use takes place as money is converted into commodities such as raw materials, the raw materials converted into finished goods and services, and the finished goods sold on the market – not to make a profit and retire to a life of ease, but to buy more raw materials to start the process over again. ... Capital thus differs from wealth in its intrinsically dynamic character, continually changing its form from commodity into money and then back again in an endless metamorphosis that already makes clear its integral connection with the changeful nature of capitalism itself', JB Braithwaite, 'Neoliberalism or Regulatory Capitalism', RegNet Occasional Paper No 5, October 2005, 30 available at <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=875789>.

43. Capital goods: 'Goods intended for use in production of other goods or services, rather than for final consumption', Black et al. (n 29), available at <<http://www.oxfordreference.com/view/10.1093/acref/9780199237043.001.0001/acref-9780199237043-e-334?rsk=y=fztPcP&result=321>>.

44. See Braithwaite (n 42).

45. W Ashworth, *The Economy of Nature: Rethinking the Connections between Ecology and Economics* (Houghton Mifflin, New York 1995) 205; M Rothschild, 'Economy as Ecosystem', in D Boaz (ed), *The Libertarian Reader: Classic and Contemporary Readings from Lao-tzu to Milton Friedman* (Free Press, Chicago 1997) 243; Jacobs (n 14).

capitalist contest for commercial survival. Like ecosystems, markets have dynamics but no goals. They do not exist to accomplish an objective. Where ecosystems consist of interactions between living and non-living elements, markets consist of transactions and the dynamics that they create.⁴⁶ Markets are neither the stuff being exchanged nor the place where they are exchanged, but the interactions of buyers and sellers and the aggregate results of their transactions.⁴⁷

Sometimes it is said that markets are distinct from capitalism, and that markets can arise in non-capitalist situations where property does not exist.⁴⁸ Of course, it is true that markets exist in jurisdictions that do not attract the political label of 'capitalist', but since a market transaction is an exchange of interests,⁴⁹ markets cannot exist where individual interests do not. Where private property is not officially sanctioned by a state, exchange may still occur, but the interests being exchanged exist in spite of state action. Markets can arise spontaneously when people agree to interact without force or the threat of force, and agree to honour bargains in trade. But this cooperation can be precarious. It depends on continuing restraint from both parties, and their ongoing judgement that they are better off with voluntary trades in the absence of coercion. Stable markets can be guaranteed when an authority with a monopoly over the use of violence, such as but not limited to a sovereign state, enforces the ground rules that makes the market a market rather than a contest of force.

5.3 Ecosystems and markets

In an ecosystem, there are no restrictions on survival strategies. Ecosystems have rules, but they are not rules in the same sense as human laws or codes of political governance. Ecosystems exist in a state that political scientists would call 'anarchy'. No statutes restrict the actions of organisms. No legal or moral codes govern behaviour. No police walk the trails and no courts enforce judgments. If human actions diminish the habitat of bees, then according to the logic of ecosystems, the bees adapt or perish. In ecosystem terms, either result will do. The ecosystem does not benefit or suffer either way. Neither result is morally preferable, since morality has no role in

46. Ashworth, *ibid* 116.

47. 'The market system is not a place or a thing or even a collection of things. It is a set of activities of distinctive pattern', C Lindblom, *The Market System* (Yale University Press, New Haven CT, 2001) 52.

48. 'For various reasons, people or their rules forbid some kinds of market transactions ... Participants may then move to illegal transactions, intermixing black markets with legal ones. ... In communist systems, illegal transactions are common. Consumers create networks of favors and reciprocal obligations in order to obtain objects and performances not available through legally established channels. ... Black and grey markets account for a significant share of market activity all over the world, though their magnitude is difficult to estimate', Lindblom, *ibid* 51.

49. 'The basic mechanism of contract is very simple, powerful, and universal. It essentially involves your surrendering something that you value in exchange for something else that you value even more. ... this one simple idea of gains through trade is capable of infinite repetition. What is purchased in one transaction can be reworked, repackaged, and resold in another transaction. As long as the mutual gain condition is satisfied at every stage, there is no reason to place any artificial limitations on the number of times people can rely on this one rule. One good idea beats a thousand bad ones', R Epstein, *Simple Rules for a Complex World* (Harvard University Press, Cambridge 1995) 72.

ecosystems. No right or wrong exists.⁵⁰ Any action that leads to survival is a successful action.

Markets, in contrast, are based upon a human judgement that the use of force in human dealings is undesirable and inappropriate. Force is employed only by those enforcing the rules of the market and not by its participants. It is used by public authorities who punish those who apply it privately. Thus, markets are ecosystems with the violence removed.⁵¹ Only persons are subject to the rule of non-interference, and only in relation to each other. Hawks are not prohibited from eating mice, nor people from eating chickens. But people may not kill each other, nor take each other's chickens. Two systems of competition carry on in parallel, one in which any form of action or adaptation may be seen and the other in which physical coercion may not be employed.

To value the way ecosystems work is to value the way markets work – because, with the exception of the principle of non-interference, markets work the way ecosystems work. Like ecosystems, markets do not really exist except in the sense that they consist of the interactions and dynamics that govern commercial transactions. They are not collections of goods, or buyers or sellers, or places where things are bought and sold, although one may find all of these things interacting in markets. The way markets work is what they are. Like ecosystems, markets are engines of adaptation; and like ecosystems, markets are organic and immutable.⁵² They share the non-instrumentalism of ecosystems.

Environmentalism criticisms of capitalism are puzzling. They tend to extol ecosystems but fault features of capitalism and markets that most closely reproduce the dynamics of ecosystems. Capitalism is closer to a state of nature than is any other kind of governance. In ecosystems and markets, there is no notion of common

50. 'The forest, as usual, is quiet apart from the muted sounds of rustling leaves, buzzing insects, and a few chirping birds. Suddenly, pandemonium breaks out as three chimpanzees tear through the trees high above the forest floor, leaping spectacularly from branch to branch, hair bristling, screaming wildly as they chase a group of colobus monkeys at breakneck speed. In less than a minute, an experienced older chimp makes a magnificent jump, catches a terrified monkey that was heading his way, and dashes its brains out against a tree. The hunt is over as suddenly as it started. As the victor rips his prey into pieces and starts to consume the flesh, other chimps hoot with excitement. Any humans watching, however, are likely to be shocked. Observing chimps can be disturbing, not just because of the violence, but also because we prefer to think of them as gentle, intelligent cousins. Sometimes they seem mirrors of our better selves, but when hunting, chimps reflect humanity's darker tendencies in their craving for flesh, their capacity for violence, and even their lethal use of teamwork and strategy', Lieberman (n 17) 25–6.

51. 'Serious sport ... is war minus the shooting', G Orwell, 'The Sporting Spirit' in *Shooting an Elephant and Other Essays* (Harcourt, Brace & World, New York 1945) 153. Markets are ecosystems minus the violence.

52. For further exposition of this point, see B Pardy, 'The Hand is Invisible, Nature Knows Best, and Justice is Blind: Markets, Ecosystems, Legal Instrumentalism and the Natural Law of Systems' (2009) 44 *Tulsa Law Review* 67: 'Calling these systems "immutable" does not mean that they are impervious to external forces, but only that their internal principles are independent of state regulation, moral argument, or personal preference. They cannot be manipulated to behave as something other than systems. ... Their fundamental rules have not been created or invented by human beings, and cannot be changed by government design. ... Governments may impose taxes, restrict supplies, or subsidize production but cannot eliminate the relationship between supply, demand, and the price for a particular good. ... Human action can affect the outcome of system processes, but it cannot change the nature of those processes'.

good, equality of outcome or distributive justice. There is no requirement to share, except when sharing is a self-interested adaptation borne of competition for scarce resources. No one expropriates a squirrel's nuts for redistribution. The squirrel loses his nuts only to larger squirrels that take them by force. The use of state coercion to redistribute resources opposes system dynamics, since redistribution depends on the taking of property, and any transfer that is not voluntary is coercive. Therefore, any system based upon redistribution is based upon the coercive use of force by the state. State force exercises control over system outcomes, something that no single organism can do in ecosystems, and no single buyer or seller can do in markets.

Most manifestations of the modern administrative state, whether employing the tenets of economic development, central planning or collective ownership, share two features that differ from the operation of markets in a system of pure capitalism: (1) they are instrumentalist, in the sense that the state formulates particular goals it wishes to achieve (create jobs, control inflation, decrease poverty, promote nationalism, protect language or culture, encourage regional development, and so on), and formulates policies and laws accordingly; and (2) they employ force to achieve those goals. Thus, their common premise is that the proper role of public authorities is to identify and achieve social objectives that they deem desirable. These systems of governance are not systems in the same sense that ecosystems and markets are systems. In ecosystems and markets, no one controls consequences for the system as a whole. Results aggregate from a multitude of individual actions, decisions and adaptations. The logic of ecosystems provides order without direction.⁵³

The way to make markets more like ecosystems would be to remove restrictions on the use of force. The principle of non-interference restrains violence rather than enabling it. Capitalism transforms life and death into buy and sell. Critics who laud ecosystems but bash capitalism are in error. Markets are the kinder, gentler version of ecosystems. That is not to maintain that markets are kind or gentle. Commercial failure may result in devastating financial consequences for investors and employees, and the bankruptcy of some commercial enterprises in a market is as inevitable as the failure of some organisms to survive in an ecosystem. Even so, bankruptcy is less severe than death.

6 RIGHTS AND ES

The law of the jungle contains no rights or prohibitions. In an ecosystem, resources are free for the taking – if you can prevail against others who want them too. The tragedy of the commons⁵⁴ is not a tragedy, but merely one of the dynamics to which organisms must adapt or perish. Nothing prevents taking a dead gazelle from a lion except the lion's response. Organisms do not respect the interests, habitats or lives of other organisms.

53. In his introduction to Michael Rothchild's *Economy as Ecosystem* in *The Libertarian Reader: Classic and Contemporary Readings from Lao-tzu to Milton Friedman* (D Boaz ed, Free Press, New York 1997) at 243, David Boaz describes three portraits on the wall of economist William A Niskanen, former member of the US President's Council of Economic Advisors and Chairman of the Cato Institute: one of Isaac Newton, one of Adam Smith and one of Charles Darwin, each with the inscription 'Order without Direction'.

54. G Hardin, 'The Tragedy of the Commons' (1968) 162 Science 1243.

Capitalism and markets impose restrictions on behaviour not present in ecosystems. The source of those restrictions is the principle of non-interference, which is the conceptual foundation of negative human rights, including most common law rights such as self-ownership, property rights, and the freedom to contract in markets. Sometimes, those restrictions have the effect of protecting ecosystem functions and resources, including ES, especially when the resources in question are subject to property rights. Capitalism is faulted for facilitating the consumption and destruction of resources, but it does no such thing. The argument is thus: since the owner of the land on which bees live can destroy their habitat, his property rights must be the source of the ability to do so.⁵⁵ This reasoning is incorrect. The effect of property rights is to enable the holder of the rights to prevent other people from using or damaging the resource. Property rights held by the owner of the land mean that *only* the owner can destroy the habitat. That is the nature of negative legal rights, including property rights: they do not entitle the holder to act, but to restrict others from acting in a manner that breaches the right. A negative right gives the holder of the right the ability to limit the civil liberties of others.⁵⁶ In the case of property rights, others are restricted in what they may do with respect to the thing to which the property rights apply.⁵⁷ In the absence of a regime of rights or other legal restrictions, anybody can do anything they like.⁵⁸ Possession of land does not give the right to occupy, but the right to exclude others from that space, making occupancy exclusive. The possessor may have the ability to use up or damage the resource to which the right relates but that ability is not created by the right.⁵⁹ It exists because no one else has a right to stop

55. For example, Freyfogle states, 'The private ownership of land has become problematic for many people who care about nature and who worry that we are not living responsibly in it and on it. Too often landowners act in ways that are not ecologically sound. Too often they think only of themselves and the short run and fail to consider the larger community of life and future generations. And private property – that is, the legal power that owners possess – seems to shield landowners from meaningful challenge to what they do', E Freyfogle, 'Taking Property Seriously' in D Grinlinton and P Taylor (eds), *Property Rights and Sustainability: The Evolution of Property Rights to Meet Ecological Challenges* (Martinus Nijhoff Publishers, Leiden 2011) 43 at 43.

56. B Welling, *Property in Things in the Common Law System* (Scribblers Publishing, Mudgeeraba 1996) 6–7.

57. Ibid.

58. 'Utopians talk about a time when 'all property was common'. They are not using the word 'property' in today's sense. They refer to a time when no one held property in things and everyone was free to make use of them. ... Property limits the exercise of liberty by non-holders', *ibid* 18–19.

59. The source of confusion may lie in the failure to distinguish between property and things. In common parlance, things are often referred to as 'property', as in 'The car is my property' or 'The property was transferred on July 5', but this usage is not precise and is technically incorrect. Things are not property, and property is not a thing. Property is a legal right. It restricts the behaviour of other people towards the thing to which the right relates. Consider a situation where a house has been leased. The owner/lessor holds ownership (fee simple) in the house, and the lessee holds possession (occupation) of the house. The lessee, as possessor and occupier, holds the right to exclude others from the house. That right can be enforced against the whole world, including the owner. The owner, during the period of the lease, does not have the right to exclude the lessee from the property. Because the property rights are divided between the parties, it makes little sense to say that the house is 'the property' of either the owner or the lessee. In fact, the owner holds some of the property rights and the lessee holds others. See Welling (n 56) 8–14.

him. In the absence of property rights, *everybody and anybody* can destroy the bees' habitat. Capitalism and markets do not facilitate or enable the use, consumption or destruction of ecosystem processes. Sometimes the rule of non-interference prevents it. The environmentalist criticism of capitalism, therefore, should not be that it facilitates the destruction of ecological resources, but that it does not always prevent it.

Ecosystems cannot be harmed but only changed. If ecosystems are changed by human action⁶⁰ to the detriment of human well-being, then change to ecosystems represents a conflict between people. The way to resolve conflicts between people is to determine who has rights to what – which will indicate who has the ability to restrict the actions of whom. Without answering the rights question, identifying externalities is problematic. The question is, does the principle of non-interference mean that people have a right to limit other people from changing ecosystems?

Negative rights – rights that restrict the actions of other people – express the principle of non-interference. If Gretchen has a right to restrict Harold's actions, it must be because Harold is interfering with her by making changes to his own property. Of course, she has no property rights in Harold's land. The only respect in which Harold's actions allegedly interfere with Gretchen is their effect in changing the ecosystem of which elements found on his land are a part. In order to maintain such a complaint, she would have to show that she has a right to non-interference in ecosystems.

Does she? When does human interference with an ecosystem breach the rights of other humans? When is it merely one of the actions and interactions that make the system what it is, and change the system the way it does? Humans participate in ecosystems when they breathe, eat and die. It is impossible not to do so. But if all human actions in ecosystems are natural actions that are simply part of the activity in ecosystems, then none of those actions can be said to constitute interference with others.⁶¹ On what basis could it be said that wiping out a colony of bees or paving over a wetland is not merely an interaction, but constitutes interference with the system itself, and therefore with individuals who have a right to non-interference? I have proposed possible approaches to this question elsewhere.⁶² The resolution is complex and contentious.

7 CONCLUSION

ES are the product of a long and ongoing process of natural selection in ecosystems. Protecting ES because of their usefulness to human society is an instrumentalist mandate in conflict with the nature of ES and ecosystems. In effect, proposals to protect ES threaten to do to ecosystems what advocates pretend to reject: to place more importance on their use to human society than on their natural, unplanned, ungoverned operation.

60. Of course, ecosystems also change without human action, leading to difficult conceptual and threshold questions about when a change is 'natural'. See B Pardy, 'In Search of the Holy Grail of Environmental Law: A Rule to Solve the Problem' (2005) 1 International Journal of Sustainable Development Law and Policy 29 ['Holy Grail'].

61. See Holy Grail, *ibid*; and B Pardy, 'Environmental Law and the Paradox of Ecological Citizenship: The Case for Environmental Libertarianism' (2006) 33 Environments 25.

62. 'Ecological Share: A Basis for Environmental Liability in Tort' (1993) 3 Journal of Environmental Law and Practice 87; Holy Grail, *ibid*; 'The Hand is Invisible, Nature Knows Best, and Justice is Blind: Markets, Ecosystems, Legal Instrumentalism and the Natural Law of Systems' (2009) 44 Tulsa Law Review 67.

Laws designed to protect specific ecosystem services are misguided because they do not preserve the ecosystem dynamics that produced the ‘service’ in the first place. If humans depend on ES, then they also depend on the way ecosystems work, because the two are really the same.

In markets, people may not physically interfere with other people. Does the right to non-interference mean that people have a right to restrict other people from changing ecosystems on which they depend? If so, then ecosystem services would be protected to the extent that the right encompasses them. If not, then ecosystem services are not protected, and should not be – since people have no such right. If Harold’s destruction of bee habitat interferes with Gretchen’s autonomy, then Gretchen should have legal rights that prevent Harold from doing so. If it does not, then Harold should not be stopped – since his actions interfere with the autonomy of no one.