

# CONVERGENCE AND DIVERGENCE BETWEEN ECOCENTRISM AND SENTIENTISM CONCERNING NET VALUE

GREGORY Matthew MIKKELSON

Volume 13, Number 1, Winter 2018

URI: <https://id.erudit.org/iderudit/1055120ar>

DOI: <https://doi.org/10.7202/1055120ar>

[See table of contents](#)

Publisher(s)

Centre de recherche en éthique (CRÉ)

ISSN

1718-9977 (digital)

[Explore this journal](#)

Cite this article

MIKKELSON, G. M. (2018). CONVERGENCE AND DIVERGENCE BETWEEN ECOCENTRISM AND SENTIENTISM CONCERNING NET VALUE. *Les ateliers de l'éthique / The Ethics Forum*, 13(1), 101–114. <https://doi.org/10.7202/1055120ar>

Article abstract

Animal and environmental ethics should converge on the following three value judgments: natural ecosystems generally involve more good than harm; predation in nature tends to yield positive net benefits; and, at least on a global scale, livestock farming is destroying more value than it is creating. But the ecocentric criteria of environmental ethics and the sentientist criteria of animal ethics may have divergent implications for capitalism's main effect on the world: the collapse of wild nature due to explosive growth in the human economy. Sentientism risks counting this effect as a net gain, whereas ecocentrism surely rates it a massive net loss. While supporting the above claims, I show how they fit into a larger argument in favour of the broader, ecocentric value theory of environmental ethics and against the narrower, sentientist axiology of animal ethics.

© Centre de recherche en éthique (CRÉ), 2019



This document is protected by copyright law. Use of the services of Érudit (including reproduction) is subject to its terms and conditions, which can be viewed online.

<https://apropos.erudit.org/en/users/policy-on-use/>

This article is disseminated and preserved by Érudit.

Érudit is a non-profit inter-university consortium of the Université de Montréal, Université Laval, and the Université du Québec à Montréal. Its mission is to promote and disseminate research.

<https://www.erudit.org/en/>

# CONVERGENCE AND DIVERGENCE BETWEEN ECOCENTRISM AND SENTIENTISM CONCERNING NET VALUE

GREGORY M. MIKKELSON

MCGILL UNIVERSITY

## ABSTRACT:

Animal and environmental ethics should converge on the following three value judgments: natural ecosystems generally involve more good than harm; predation in nature tends to yield positive net benefits; and, at least on a global scale, livestock farming is destroying more value than it is creating. But the ecocentric criteria of environmental ethics and the sentientist criteria of animal ethics may have divergent implications for capitalism's main effect on the world: the collapse of wild nature due to explosive growth in the human economy. Sentientism risks counting this effect as a net gain, whereas ecocentrism surely rates it a massive net loss. While supporting the above claims, I show how they fit into a larger argument in favour of the broader, ecocentric value theory of environmental ethics and against the narrower, sentientist axiology of animal ethics.

## RÉSUMÉ :

Les éthiques animale et environnementale devraient converger vers les trois jugements de valeur suivants: les écosystèmes naturels impliquent généralement plus de bien que de mal, la prédation dans la nature a tendance à produire des avantages nets positifs et, au moins à l'échelle mondiale, l'élevage animal détruit plus de valeur qu'il n'en crée. Mais les critères écocentriques de l'éthique environnementale et les critères de l'éthique animale fondés sur la sentience pourraient avoir des implications divergentes sur l'effet principal du capitalisme sur le monde: l'effondrement de la nature sauvage dû à la croissance explosive de l'économie humaine. Le sentientisme risque de considérer cet effet comme un gain net, alors que l'écocentrisme le considère sûrement comme une perte nette massive. Tout en soutenant les affirmations ci-dessus, je montre comment elles s'intègrent dans un argument plus large en faveur d'une théorie de la valeur écocentrique plus englobante propre à l'éthique environnementale et contre l'axiologie sentientiste plus étroite de l'éthique animale.

## INTRODUCTION

“Two streams of thought meet and are woven together... [in]to the beginnings of what, I believe, will be a lasting marriage. (Though I have no illusions about the tranquility of that particular relationship.)” (Singer, 1992)

Environmental ethics and animal ethics have much in common. For one thing, each field has firmly established itself over just the past few decades. On the theoretical side, this has meant the founding of journals like *The Journal of Animal Ethics* and *Environmental Ethics*; on the practical side, this has meant the organization of activist groups running the gamut from polite to militant. For the most part, both fields have also shared a commitment to non-anthropocentrism. As the editor of a recent anthology put it, “Environmental ethics [which for him includes animal ethics] begins the moment we reject the view that only humans can be moral patients,” (Williston, 2016). In other words, humans are not the only entities in the universe worthy of direct moral concern.

Animal and environmental ethics have tended to differ, however, on the question of just which other entities do count for their own sakes (rather than merely for the sake of humans). Environmental ethicists have often included all individual animals, plants, and other organisms, along with “soils, waters” and the ecosystemic “community as such” (Leopold, 1949). In contrast, animal ethicists have tended to limit their direct moral concern to beings able to experience joy and suffering (Singer, 1973). Animal and environmental ethicists have also largely applied their respective theories to different domains—i.e., domesticated animals including livestock, laboratory subjects, and pets versus wild organisms, species, and ecosystems.

However, again, humans are causing increasingly strong interactions between the wild and domestic realms. For example, the overfishing of wild populations has induced a massive rise in fish farms. Conversely, scientists now identify animal agriculture in general as the world’s leading cause of biodiversity loss (Machovina et al., 2015). Furthermore, it has been more than twenty-five years since two important book-length anthologies focused on the relationships between environmental and animal ethics (Hargrove, 1992; Ryder, 1992). This paper and the others in this special issue therefore address these relationships anew.

In this paper, I argue that a shared commitment to non-anthropocentrism should lead animal and environmental ethics to agree on the following more specific points: that natural ecosystems involve more good than ill and that, while predation in nature yields positive net benefits, livestock farming is a huge net negative. I also show, however, that ecocentric environmental ethics may diverge from sentientist animal ethics in evaluating capitalism’s main effect on the

planet: the relentless supplanting of wild nature by domesticated artifice. Ecocentrists should condemn this trend along with its root cause and seek to restore a state of balance—and cultivate harmony—between humanity and nature. Sentientists, on the other hand, may be stuck with the conclusion that ongoing humanization of the planet is doing more good than harm, even if it is decimating the world population of sentient beings. Below, I relate arguments for the above points to other crucial respects in which ecocentrism gets closer to the truth than does sentientism.

## CONCEPTUAL PRELIMINARIES

Before proceeding, I wish to clarify two things. The first is that the basic concerns of ecocentrism include, rather than substitute for, those of sentientism. Much mischief has resulted from the tendency of both animal and environmental ethicists to speak as if ecocentrism concerns itself with ecological collectives *instead of* with individual animals. A leading ecocentrist recently put it this way:

Ethical concern for endangered species populations... whole endangered species... biotic communities and their associated ecosystems... landscapes... and biomes... greatly exceeds the ethical concern that many environmentalists and environmental professionals feel for individual living/conative/teleological centers of life... if for such beings they feel any ethical concern at all. (Callicott, 2017, p. 116-117)

While ecocentrism should indeed ascribe intrinsic value to endangered species that exceeds the sum of their members' well-being (for example), this in no way implies or excuses lack of ethical concern for individuals. Any defensible ecocentric ethic must do justice to both individual well-being and higher-level properties like the rarity or commonness of different species.

The two best-known exponents of ecocentrism to date—Aldo Leopold and Arne Naess—confirm this construal of ecocentrism as encompassing, rather than replacing, concern for animals. As Leopold put it, “A land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such” (1949, p. 240). As noted above in the introduction, for Leopold these fellow members include animals (along with plants, etc.). Naess made concern for the “the well-being and flourishing of human and nonhuman life on Earth”—which of course includes animal life—the very first plank in his eight-point platform for deep ecology (Naess and Sessions, 1984). Only in the second plank did he widen the focus to also bring the more holistic “richness and diversity of life forms” into view.

The second clarification involves a related confusion between the good of “the whole” conceived individualistically versus holistically. Many sentientists and ecocentrists write as if they disagreed with each other about *whether* species and ecosystems have intrinsic value. But their actual disagreement concerns *how to compute* that value. For example, a utilitarian (the best-known type of sentientist) would compute the total intrinsic value of an ecosystem as the sum of the well-beings of all sentient animals within it. This is an individualistic approach, because it defines the good of the whole as a strict function of the goods of the individual parts. In contrast, a deep ecologist would directly factor in the biodiversity of the ecosystem, along with the well-beings of its component individuals. Because species diversity is not a strict function of organismal well-being, this is a holistic approach.

## CONVERGENCE

In the first two subsections below, I argue that sentientists and ecocentrists should converge in judging wild ecosystems and, more specifically, predation in the wild to involve more good than harm. I proceed by refuting arguments to the contrary that have achieved a dismaying level of credence, given their obvious failures to meet their burden of proof. In the third subsection below, I sketch the argument and some evidence for what I take to be uncontroversial common ground for sentientists and ecocentrists: that meat consumption by humans must (at least) diminish tremendously. I then conclude this section with several “convergence arguments for ecocentrism,” before moving on to the next section about a point on which the two value theories may diverge.

### Wild value

Sentientist Horta (2010a) claimed to “debunk” the “idyllic view of nature” that “happiness... prevails over suffering in the wild” (p. 76). To his credit, he did not limit himself to abstract arguments, but instead discussed a concrete example that supposedly illustrates his point: the Atlantic cod population (*Gadus morhua*) in the Gulf of Maine. However, his discussion of this example demonstrates only what everyone already knows: that there is plenty of suffering in the wild. It does *nothing* to support his claim that “suffering prevails [over happiness] in nature” (p. 75), because he did not bother to examine the positive side of the balance at all. Horta (2017) made essentially the same one-sided argument, but without any such quantitative detail. By even more forcefully insisting that “most sentient beings undergo lives that are not worth living, and suffering vastly outweighs well-being in nature” (p. 265), Horta went far beyond his sources, including Darwin, who famously wrote that

when we reflect on this struggle [by organisms for existence], we may console ourselves with the full belief, that the war of nature is not incessant, that no fear is felt, that death is generally prompt, and that the vigorous, the healthy, and the happy survive. (1859, p. 79)

Horta offered the following estimates to portray the suffering experienced by young cod fish. First, there are around one million adult cod in the Gulf. Second, on average each of these adults lay one million eggs per year.<sup>1</sup> Third, he guessed that ten percent of these eggs hatch, and assigned a ten-percent epistemic probability to the possibility that hatchlings are sentient. Finally, he assumed that, on average, the near entirety of these codlings who get eaten by predators experience ten seconds of suffering in the process. Multiplying these numbers together, we get 100 billion seconds of suffering per year.

If we do what Horta did not, and sketch the positive side of the balance for this example, it ironically supports what he called the “idyllic” view that good experiences greatly exceed bad ones in nature. The psychological goods that count toward intrinsic value for both sentientists and ecocentrists include at least the following: (1) codlings’ own enjoyment of life prior to being eaten, (2) the net pleasure/happiness/satisfaction experienced by the adult cod, and (3) the predators’ well-being enabled by nutrition from codlings. Any one of the above goods, by itself, easily outweighs the suffering estimated by Horta—even more so for the three combined. For example, each codling plausibly experiences more than ten seconds of net joy prior to being eaten. Likewise, most adult cod plausibly live lives that are at least barely worth living. Doing the math, if on average each adult experiences just a bit more than a single day’s (100 000 seconds’) worth of net positive well-being per entire year, we see that it is enough to outweigh the suffering of all their offspring that year. Finally, we can safely assume that the nutrition gained from each codling eaten enables more than ten seconds’ worth of net enjoyment for the predator.

Thus, a sentientist calculus—considering both positive and negative experiences in nature, rather than just negative ones *à la* Horta—implies that the Gulf cod population involves more good than harm. An ecocentric calculus strongly agrees with this conclusion, since it ascribes intrinsic value not only to the individual well-being of sentient fish and their predators, but also to the species diversity and ecosystem function they involve. In particular, the cod’s “r-selected” reproductive strategy sustains its own species, while consumption of codlings helps sustain predator diversity. In addition, perhaps adult cod serve as “keystone predators” themselves, supporting the diversity of their own prey (cf. Paine, 1966; Terborgh, 2015). Finally, cod, their predators, and their prey all contribute to energy flow through the Gulf of Maine, nutrient cycling within it, and other aspects of ecosystem function.

### Predation by nonhumans

In another paper, Horta made a related argument, that reintroducing predators into ecosystems is “not compatible with a nonspeciesist approach” (2010b, p. 163). Again, he offered a concrete example to supposedly support his point:

the famous reintroduction of *Canis lupus* to Yellowstone National Park in 1995. But again, he considered only the negative experiences that resulted from this reintroduction. In particular, he cited studies showing that the wolves' elk prey have suffered not only higher death rates, but also greater stress levels and poorer nutrition, since fear of wolves now keeps them out of food-rich open meadows where they would be hunted more easily.

Recent studies have confirmed the negative impact of wolves on at least elk numbers and also on one other species, the wolves' competitor, the coyote. But *scores* of other vertebrate species have *surged* due to wolf reintroduction. This is because plant species like willows and aspens have flourished as herbivory by elk has declined. In turn, these plants have directly or indirectly improved the supply of food and/or habitat for amphibians, badgers, bears, beavers, ducks, eagles, fish, flycatchers, foxes, hawks, mice, muskrats, otters, rabbits, ravens, reptiles, sparrows, vireos, warblers, weasels, yellowthroats, and other sentient animals (Baril et al., 2011; Ripple and Beschta, 2012; Monbiot, 2013). The enhanced living conditions behind these surging numbers have arguably also raised the average levels of well-being experienced by individual members of these species. Even bison, though preyed upon by wolves, have nevertheless benefitted from the latter's reintroduction. Though some have been eaten, far more have prospered due to reduced competition from elk.

Once again, by sentientist criteria alone, the very example cited by Horta to condemn predation in the wild turns out to support the conclusion that such predation yields net benefits rather than net harm. All that it takes to reach this conclusion is to do the obvious and consider both positive and negative effects rather than just the latter. Once again, ecocentrism strongly concurs. In addition to the above-mentioned net-positive psychological goods, ecocentrists would also count the net-positive ecological goods provided by the wolf, such as improved species diversity and ecosystem function. As an example of the latter, the recovering willows and other streamside vegetation "provide increased hydraulic roughness and root strength thereby increasing the stability of formerly eroding streambanks" (Ripple and Beschta, 2012, p. 211).

### Animal agriculture

In contrast to predation by some nonhuman animals on others, predation by humans may have perverse consequences at any level (Darimont et al., 2015) and certainly has devastating effects at current levels (Brashares et al., 2004). Live-stock farming wreaks even more colossal disaster on both animals and ecosystems. On the positive side, humans obviously get protein and other nutrients from meat. However, since plant sources can provide the same nutrients, and since many humans overconsume meat to the point of inducing heart disease, it is doubtful whether current levels of meat consumption yield net benefits even from the narrow perspective of human health.<sup>2</sup>

Any broader perspective clearly indicates massive net harm. First, factory farms immiserate billions of sentient creatures. Second, nearly eighty percent of all agricultural land (cropland plus pasture) now goes to feed livestock rather than humans directly. In turn, agriculture is the leading cause of habitat loss for wild species and thus of biodiversity loss worldwide. The fact that it takes far more plant biomass to produce any given amount of animal biomass means that eating lower on the food chain would meet human nutritional needs on a small fraction of the land now used for agriculture. This by itself would reduce and possibly even reverse the current mass extinction, as well as mitigating both depletion of groundwater for irrigation and pollution by pesticides, fertilizer, and greenhouse gas (WWF, 2016; Machovina et al., 2015).<sup>3</sup>

### Convergence arguments for ecocentrism

Sentientism and ecocentrism thus converge on three important *qualitative* value judgments: that value outweighs disvalue in nature and that predation by nonhumans contributes to this positive balance, but that predation by humans on livestock entails a net negative. Nevertheless, they differ *quantitatively* on these matters. Ecocentrism counts not only the net pleasure/happiness/satisfaction experienced by animals, but also the flourishing and health of nonanimal organisms and also the variety and harmony among organisms within and across more-than-animal ecosystems. Thus, relative to sentientism, ecocentrism ascribes much greater positive intrinsic value to natural ecosystems, net benefit to predation by nonhumans, and net harm to livestock farming. This quantitative difference despite qualitative convergence grounds the first among three of what I shall call “convergence argument for ecocentrism”: if one is more confident in the three value judgments discussed above than in either of the two value theories converging on them, then it is best to go with ecocentrism, which supports the judgments more strongly.

Second, it is arguably worse to mistakenly exclude from direct moral consideration a being or entity who deserves it than to mistakenly include one who does not. While sentientism opens the door to nonhuman animals, it slams the door shut after them. Ecocentrism, in contrast, continues to hold the door open for plants, fungi, protists, and bacteria. And it acknowledges the moral considerability of ecological collectives like species and ecosystems based on more than just the well-being of the organisms within them. Thus, again, uncertainty about which value theory is correct should lead us to favour the more inclusive one, ecocentrism.

I offer the last of three convergence arguments by way of analogy with Norton’s (1984) argument for anthropocentrism, which he wrongly assumed the public favours. Social science actually shows widespread adherence to ethical views exceeding not only anthropocentrism, but also sentientism. For example, strong



majorities of Americans agree that “humans have moral duties and obligations [not only] to other animal species,” but also “to plants and trees,” and even “to non-living nature” (Leiserowitz et al., 2005, p. 28). Thus, given the above-discussed practical convergences of sentientism and ecocentrism, it is best to stick with ecocentrism, since it fits better with public opinion.

The evidential basis of this last argument suggests a rather pointed challenge for sentientists. The best-known sentientist arguments about basic axiology—such as Singer’s classic 1973 essay—oppose their view to the narrower one of anthropocentrism. Though there is still a long way to go (Donaldson and Kymlicka, 2011), such arguments have done great good. They have compelled many academic philosophers to broaden their perspectives and have inspired many individuals and institutions to change their practices. However, many sentientists now also defend their view against the broader ones of biocentrism and ecocentrism (see, e.g., Singer, 2011). These latter attempts resemble the anthropocentric defences once raised against sentientism. This resemblance and the social-scientific evidence cited above prompt the following question for sentientists: Do you really want to spend your career trying to get people to *narrow* their ethical horizons?

### POSSIBLE DIVERGENCE: ECOCIDE

Convergence arguments are of course not the only kind bearing on the choice between sentientism and ecocentrism. In Mikkelson (in press), I follow up on Kelly’s (2003) inference to the best explanation. We contend that the best account of what makes various aspects of sentient life intrinsically valuable entails that “nonsentient” life and higher-level properties of entire species and ecosystems have intrinsic value as well. In this section, I sketch a possible divergence between sentientism and ecocentrism. If the reader agrees with the value judgment in question—that the disvalue of plummeting wild animal populations outweighs the value of skyrocketing human numbers—then the fact that only ecocentrism clearly supports this judgment provides another argument in its favour.

The most recent version of the WWF’s living planet index (LPI) tracks the average percent change in population size, from 1970 to 2012, among thousands of wild vertebrate species around the world. The upshot is that nature is collapsing. Every year sees two percent more lost, with a total of fifty-eight percent gone over the forty-two-year period, and populations set to be hacked down to a mere one-third of their initial levels by 2020 (WWF, 2016). If anything, the invertebrates making up most of the 10 million species on Earth have fared even worse (Dirzo et al., 2014; Hallmann et al., 2017).

The root cause of this downward spiral is relentless, exponential—i.e., explosive—growth of the human economy. While efficiency gains have reduced ecological damage per unit of economic activity by more than one percent per year, total economic activity has risen by more than three percent a year. Between 1970 and 2012, the world economy nearly quadrupled (data from the Global Footprint Network and World Bank). This means more, every year, of nature extracted, transformed into commodities, consumed, then discarded as waste, often toxic (Leonard, 2010).<sup>4</sup>

The almost-quadrupled economy sustained more than twice as many humans in 2012 than it did in 1970 (data from United Nations). Does this human gain outweigh the nonhuman devastation indicated by the LPI? Here is where sentientism and ecocentrism may very well part ways. The reason is that sentientism counts only gains and losses of individual sentients' well-being, whereas ecocentrism also counts both the well-being of so-called "nonsentient" organisms and higher-level properties of entire species and ecosystems. Because humans are more psychologically (and physiologically) complex than most of the nonhuman sentient animals we've been replacing, it may be that total sentient well-being has increased. If humans indeed experience greater well-being than most other sentient animals, then average sentient well-being has surely increased as well. Thus, the sentientist may be committed to valuing the billions of additional humans more highly than the trillions of wild animals they have supplanted.

Ecocentrism delivers the opposite verdict. Even a minimal version, which merely adopts Hurka's (1983) proposal of a diminishing-returns relationship between the intrinsic value of a species and its population size, supports the conclusion that "defaunation [as well as defloration] in the Anthropocene" (cf. Dirzo et al., 2014) has subtracted vastly more value than economic growth has added (Mikkelson and Chapman, 2014). More robust versions of ecocentrism, which more explicitly value species diversity and ecosystem function, support this conclusion even more strongly (Mikkelson, 2011).

## **CONCLUSION: SUPPLANTING THE UNJUST WITH THE NATURAL**

There is no jettisoning the concept of the wild or the effort to preserve some nature relatively free from human interference without accepting the human conquest of the biosphere... And we should not accept that conquest because it is selfish and unjust... Better to step back from the moral abyss of mass extinction... and set limits to human domination. (Cafaro, 2017, p. 128-129)

I have thus argued that sentientists and ecocentrists should agree on the positive net value of wild nature and predation within it and on the negative net value of livestock farming. I also showed why they might nevertheless disagree about the net (dis-)value resulting from the massive rise in human domination of the

biosphere that has occurred over the past few decades. To be fair, however, neither sentientists nor ecocentrists would endorse this latter trajectory as having been the best one. I thus conclude by contrasting two actually endorsed visions of the future that came into clearer focus during the conference of May 2017. One proceeds from the nature-is-Hell picture painted by Horta (see this volume, p. 85-100), along with the heroic assumptions about humanity's ability to save it critiqued by Delon and Purves. The other vision springs from something more like the "respect for independent nature" espoused by Hettinger (see this volume, p. 65-84).

I frame both visions as answers to the question, What is to be done about sentience and wildness? One answer is to massively intervene in nature to reduce animal suffering. This answer finds support not only from Horta, but also from several other animal ethicists, including Nussbaum (2006) who (in-)famously called for "supplanting the natural with the just." Such beneficent domestication would likely involve further massive reduction in the total number of sentient animals on Earth. Given that domesticated animals generally have smaller brains than their wild ancestors (Kruska, 2005), it would also probably reduce the average level of sentience among the nonhuman animals remaining. Without a doubt, it would further decimate the diversity of sentient and other life. This vision's single-minded focus on reducing suffering—while foregoing the huge amounts of pleasure, happiness, satisfaction, consciousness, knowledge, love, etc. that more numerous, more sentient animals would otherwise enjoy—leads me to ask whether it deserves the name "sentientist." "Antisentientist" seems closer to the mark.

The other answer to the question posed above is to massively intervene in society, to reduce human impacts on wild nature. This vision would involve short-term, limited interventions in nature to facilitate the rewilding of large areas—half the Earth, according to many proponents—but those areas would then be free to continue evolving on their own (Dinerstein *et al.* 2017). In this vision, the numbers of sentient animals in thousands to millions of species begin to recover from their anthropogenic—or, perhaps more accurately, "plutogenic" (cf. d'Arcy 2014)—collapse. Average levels of sentience resume the upward evolutionary trajectories set back when humans first started massively intervening in nature. And the variety of sentient and other life, along with the integrity and functioning of wild ecosystems, restores itself as well.

To the extent that animal ethicists disavow the points of convergence defended herein and commit themselves instead to the first vision sketched above, we seem to have again what Callicott (1980) called a "triangular affair": stark conflict not only between business as usual and the alternative visions of animal and environmental ethics, but also between those competing alternatives.

## NOTES

- <sup>1</sup> Horta supposed that each female lays two million (p. 81), but seems to have forgotten that half the population are male, which requires cutting the estimated number of eggs per adult in half.
- <sup>2</sup> Also, as any connoisseur of vegan food knows, at least comparable and perhaps even greater levels of pleasure, happiness, satisfaction, and other psychological goods are attainable through consuming mostly plants as are now attained by overconsuming animals.
- <sup>3</sup> In addition, while humans would consume more plants if they ate less meat, a larger number of domestic plants would be spared consumption by livestock, and a still greater number of wild plants would be spared the habitat loss involved in growing feed. Thus, not only would fewer animals be harmed by agriculture, but fewer plants as well.
- <sup>4</sup> See Mikkelsen (2013) and (in review) for why environmental conditions are unlikely to improve unless economic growth slows to substantially below the rate at which economists and governments typically aim (around three percent per year).

## REFERENCES

Baril, Lisa M., A. J. Hansen, Roy Renkin, and Rick Lawrence, "Songbird Response to Increased Willow (*Salix* Spp.) Growth in Yellowstone's Northern Range," *Ecological Applications*, vol. 21, no. 6, 2011, p. 2283-2296.

Brashares, Justin S., Peter Arcese, Moses K. Sam, Peter B. Coppolillo, A. R. E. Sinclair and Andrew Balmford, "Bushmeat Hunting, Wildlife Declines, and Fish Supply in West Africa," *Science*, vol. 306, no. 5699, 2004, p. 1180-1183.

Cafaro, Phil, "Valuing Wild Nature" in Stephen M. Gardiner and Allen Thompson (eds.), *Oxford Handbook of Environmental Ethics*, Oxford, Oxford University, 2017, p. 125-138.

Callicott, John Baird, "Animal Liberation: A Triangular Affair," *Environmental Ethics*, vol. 2, no. 4, 1980, p. 311-338.

———, "How Ecological Collectives Are Morally Considerable," in Stephen M. Gardiner and Allen Thompson (eds.), *Oxford Handbook of Environmental Ethics*, Oxford, Oxford University, 2017, p. 113-124.

D'Arcy, Stephen, "Environmentalism as if Winning Mattered: A Self-Organization Strategy," <https://publicautonomy.org/2014/09/17/environmentalism>, 2014.

Darimont, Chris T., Caroline H. Fox, Heather M. Bryan, and Thomas E. Reimchen, "The Unique Ecology of Human Predators," *Science*, vol. 349, no. 6250, 2015, p. 858-860.

Dinerstein, Eric, David Olson, Anup Joshi, Carly Vynne, Neil D. Burgess, Eric Wikramanayake, Nathan Hahn, Suzanne Palminteri, Prashant Hedao, Reed Noss, Matt Hansen, Harvey Locke, Erle C. Ellis, Benjamin Jones, Charles Victor Barber, Randy Hayes, Cyril Kormos, Vance Martin, Eileen Crist, Wes Sechrest, Lori Price, Jonathan E. M. Baillie, Don Weeden, Kieran Suckling, Crystal Davis, Nigel Sizer, Rebecca Moore, David Thau, Tanya Birch, Peter Potapov, Svetlana Turubanova, Alexandra Tyukavina, Nadia De Souza, Lilian Pintea, José C. Brito, Othman A. Llewellyn, Anthony G. Miller, Annette Patzelt, Shahina A. Ghazanfar, Jonathan Timberlake, Heinz Klöser, Yara Shennan-Farpón, Roeland Kindt, Jens-Peter Barnekow Lillesø, Paulo Van Breugel, Lars Graudal, Maianna Voge, Khalaf F. Al-Shammari, And Muhammad Saleem, "An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm", *BioScience*, vol. 67, no. 6, 2017, p. 534-545.

Dirzo, Rodolfo, Hillary S. Young, Mauro Galetti, Gerardo Ceballos, Nick J. B. Isaac and Ben Collen, "Defaunation in the Anthropocene," *Science*, vol. 345, no. 6195, 2014, p. 401-406.

Donaldson, Sue and Will Kymlicka, *Zoopolis: A Political Theory of Animal Rights*, New York, Oxford University, 2011.

Hallmann, Caspar A., Martin Sorg, Eelke Jongejans, Henk Siepel, Nick Hofland, Heinz Schwan, Werner Stenmans, Andreas Müller, Hubert Sumser, Thomas Hörren, Dave Goulson and Hans de Kroon, "More than 75 Percent Decline over 27 Years in Total Flying Insect Biomass in Protected Areas," *Public Library of Science ONE*, vol. 12, 2017, e0185809.

Hargrove, Eugene C. (ed.), *The Animal Rights/Environmental Ethics Debate: The Environmental Perspective*, New York, SUNY, 1992.

Horta, Oscar, "Debunking the Idyllic View of Natural Processes: Population Dynamics and Suffering in the Wild," *Telos*, vol. 17, no. 1, 2010a, p. 73-88.

———, “The Ethics of the Ecology of Fear against the Nonspeciesist Paradigm: A Shift in the Aims of Intervention in Nature,” *Between the Species*, vol. 10, 2010b, p. 163-187.

———, “Animal Suffering in Nature: The Case for Intervention,” *Environmental Ethics*, vol. 39, no. 3, 2017, p. 261-279.

Hurka, Thomas, “Value and Population Size,” *Ethics*, vol. 93, no. 3, 1983, p. 496-507.

Kelly, Christopher, *A Theory of the Good*, Boulder, University of Colorado, 2003.

Kruska, D. C. T., “On the Evolutionary Significance of Encephalization in Some Eutherian Mammals: Effects of Adaptive Radiation, Domestication, and Feralization,” *Brain, Behavior and Evolution*, vol. 65, no. 2, 2005, p. 73-108.

Leiserowitz, Anthony A., Robert W. Kates and Thomas M. Parris, “Do Global Attitudes and Behaviors Support Sustainable Development?,” *Environment*, vol. 47, no. 9, 2005, p. 22-38.

Leonard, Annie, *The Story of Stuff: How Our Obsessions with Stuff is Trashing the Planet, Our Communities, and Our Health—A Vision for Change*, New York, Simon and Schuster, 2010.

Leopold, Aldo, *A Sand County Almanac*, New York, Oxford University, 1949.

Machovina, Brian, Kenneth J. Feeley and William J. Ripple, “Biodiversity Conservation: The Key Is Reducing Meat Consumption,” *Science of the Total Environment*, vol. 536, 2015, p. 419-431.

Mikkelsen, Gregory M., “Weighing Species,” *Environmental Ethics*, vol. 33, no. 2, 2011, p. 185-196.

———, “Growth is the Problem; Equality is the Solution,” *Sustainability*, vol. 5, 2013, p. 432-439.

———, “Sentience, Life, Richness,” in Tyler DesRoches, Frank Jankunis and Byron Williston (eds.), *Canadian Environmental Philosophy*, in press.

———, “Invisible Hand or Ecological Footprint? Comparing Social vs. Environmental Impacts of Recent Economic Growth,” in review.

Mikkelsen, Gregory M. and Colin A. Chapman, “Individualistic Environmental Ethics: A *Reductio ad Exstinctum*?,” *Environmental Ethics*, vol. 36, no. 3, 2014, p. 333-338.

Monbiot, George, *Feral*, Toronto, Penguin, 2013.

Naess, Arne and George Sessions, *The Deep Ecology Platform*, [www.deepecology.org/platform.htm](http://www.deepecology.org/platform.htm), 1984.

Norton, Bryan G., “Environmental Ethics and Weak Anthropocentrism,” *Environmental Ethics*, vol. 6, no. 2, 1984, p. 131-148.

Paine, Robert T., “Food Web Complexity and Species Diversity,” *American Naturalist*, vol. 100, no. 910, 1966, p. 65-75.

Ripple, William J. and Robert L. Beschta, “Trophic Cascades in Yellowstone: The First 15 Years after Wolf Reintroduction,” *Biological Conservation*, vol. 145, no. 1, 2012, p. 205-213.

Ryder, Richard (ed.), *Animal Welfare and the Environment*, London, Gerald Duckworth, 1992.

Singer, Peter, "Animal Liberation," *The New York Review of Books*, April 5, 1973.

———, Foreword, in Ryder, Richard (ed.), *Animal Welfare and the Environment*, London, Gerald Duckworth, 1992.

———, *Practical Ethics*, New York, Cambridge University, 2011.

Terborgh, John W., "Toward a Trophic Theory of Species Diversity," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 112, no. 37, 2015, p. 11415-11422.

Williston, Byron (ed.), *Environmental Ethics for Canadians*, Toronto, Oxford University, 2016.

WWF, *Living Planet Report 2016: Risk and Resilience in a New Era*, Gland, WWF International, 2016.