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Book review

Recent Books on Species Extinction

A Feathered River Across the Sky: The Passenger Pigeon's Flight to Extinction, Joel Greenberg. Bloomsbury Press (2014). xiii+298 pp., \$26.00, ISBN: 9781620405345 (Hardback)

Flight Ways: Life and Loss at the Edge of Extinction, Thom Van Dooren. Columbia University Press (2014). x+193 pp., \$30.00, ISBN: 9780231166188 (Hardback)

Witness to Extinction: How We Failed to Save the Yangtze River Dolphin, Samuel Turvey. Oxford University Press (2008). xii+234 pp., £8.99, ISBN: 9780199549481 (Paperback)

Wild Again: The Struggle to Save the Black-Footed Ferret, David Jachowski. University of California Press (2014). ix+241 pp., \$34.95, ISBN: 9780520281653 (Hardback)

Hemlock: A Forest Giant on the Edge, David Foster, Benjamin Baiser, Audrey Plotkin, Anthony D'Amato, Aaron Ellison, David Orwig, Wyatt Oswald, Jonathan Thompson. Yale University Press (2014). xxviii+306 pp., \$40.00, ISBN: 9780300179385 (Hardback)

Planet Without Apes, Craig Stanford. Harvard University Press (2012). 262 pp., \$25.95, ISBN: 9780674067042 (Hardback)

The Sixth Extinction: An Unnatural History, Elizabeth Kolbert. Henry Holt (2014). 319 pp., \$28.00, ISBN: 9780805092998 (Hardback)

We live in a time of mass extinction. Vigorous debates exist regarding the extent of current extinctions, regionally and globally, for a variety of taxa and for biodiversity as a whole. Conservation biologists dispute how many species might be extinguished over the next several hundred years under various possible scenarios. But few doubt that current extinction rates are orders of magnitude greater than natural background rates, or that the consequences of this include extensive ongoing losses of natural species. Furthermore, current trends suggest that these losses likely will accelerate in the short to medium term (McLellan et al., 2014).

How should conservationists think about this? What can and should we do about it? What is the meaning of the sixth mass extinction in the history of life on Earth, the first to be caused by a single species: us? Seven recent books—five by conservation scientists, one by a leading science journalist, and one by a philosopher—explore these questions. Their authors deserve our thanks, for their practical conservation activities and for trying to think through a complex and inherently dispiriting topic.

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While most of the books reviewed here focus on recent extinctions or current extinction threats, Joel Greenberg's [A Feathered River Across the Sky: The Passenger Pigeon's Flight to Extinction](#) reaches further back to document one of history's most infamous extinctions, that of the North American passenger pigeon

(*Ectopistes migratorius*). This is a story that has been told many times, and some previous tellings probably have been more stylish or eloquent (see for example the pigeon chapter in [Christopher Cockinos' Hope Is the Thing With Feathers \[2009\]](#)). Yet Greenberg's book has value in presenting to general readers what we know and don't know about the life history of this once hugely prevalent bird, informed speculation about the ecological effects of its immense flocks on the forests of eastern North America, and clear analysis of the causes of its extinction. The brutal and disturbing story of its decline at the hands of European settlers and their descendants, across four centuries, is one every conservation biologist and every American should know.

Ornithologists have estimated that at one time passenger pigeons may have represented one out of every four or five birds in North America. Greenberg quotes amazing eyewitness accounts of pigeon flocks darkening the skies for many hours at a time, of the din of their wings, of huge tree branches crashing to the ground overloaded with birds. From early on, these immense flocks were a source of bounty for both Native Americans and Euro Americans. But while Native Americans sometimes had prohibitions against taking adult birds, feeding instead on young squabs, which were tastier, white Americans typically clubbed, netted, and blasted away at the adults, both on and off their nests, whenever possible. Among many dozens of pigeon anecdotes, Greenberg describes the arrival of pigeons in York (today's Toronto) Canada, one day in the mid-18th century. "For several days," he writes:

the city took on the character of a war zone, with the nonstop cacophony of discharging firearms resounding everywhere. Police attempted to enforce the ordinance banning the use of guns within the city, but it proved impossible given the sheer numbers of transgressors, including those of such high status as city council members, crown lawyers, and even the county sheriff. The forces of law and order capitulated: 'It was found that pigeons, flying within easy shot, were a temptation too strong for human virtue to withstand.' (94)

As North Americans' numbers grew, forests were cleared and habitat lost for the pigeons. Farmers resented and fought off the flocks' depredations on their crops (Greenberg considers whether the pigeons were an important threat to settled agriculture, one of many questions that resist clear answers today, so long after their extinction). Thousands and occasionally tens of thousands at a time were captured for use in pigeon shoots, "sporting events" that were often criticized at the time. But what seems to have sealed the pigeons' fate was the advent of new communication and transportation technologies. Greenberg well shows how during the second third of the 19th century, rapidly growing railroad networks allowed quick shipping of pigeons from the country to growing cities, while telegraphic communication quickly alerted market gunners

and game buyers to nesting and roosting sites, no matter how remote. These changes helped create regional and then national markets for pigeons and other “game birds,” which were slaughtered relentlessly. A few state legislative efforts to set take limits or protect pigeons on their nesting sites in the 1880s and 1890s were ineffective, too little too late. Passenger pigeons went from being a powerful ecological force on the landscape as late as the 1870s to being gone from the wild by about 1900, and soon, gone completely.

One of the strengths of Greenberg’s account is the attention he gives to the “market gunners” who made careers out of tracking, shooting, and selling pigeons for two or three decades after the Civil War. This is a part of the story that often gets overlooked in more elegiac accounts of the pigeons’ demise. Did these men realize they were contributing to extinction? For the most part, probably, they did not. Like climate change deniers today, they had a vested interest in not thinking clearly about their own responsibilities in the matter. Because the pigeons came and went unpredictably, it apparently was easy to imagine they had gone elsewhere: “further west,” perhaps, or maybe to South America. In any case, there had always been so many of them. Surely, the big flocks would show up again sometime soon. . . .

Greenberg thinks that if Americans could have reined in the shooting a bit sooner, enough pigeons could have been spared that, aided by new laws and attitudes toward conservation in the 20th century, the species might have been saved. He may not be right. It’s possible that passenger pigeons had come to depend on living in large flocks; that their foraging and nesting behavior had evolved in ways that made the persistence of small numbers of pigeons untenable. In response, Greenberg points to evidence of successful nestings by individual pairs and among small groups. Still, in the case of the passenger pigeon, it was the immense flocks themselves that were the great thing, ecologically speaking. Keeping a few pigeons around, even ranging freely in the wild, would still have represented an immense loss in wild biodiversity from the eastern deciduous forests of North America. (A similar point might be made about the functional extinction of bison from America’s Great Plains. Yet as long as a few wild and many semi-domesticated bison continue to exist, the possibility remains that their functional extinction may be reversed and the plains restored to ecological integrity, at least in places. No such possibility remains to bring back the passenger pigeon to its old haunts).

In a final chapter, Greenberg puts his story in a larger context, noting that humanity is in the early to mid stages of Earth’s sixth great mass extinction episode. He runs quickly through the direct causes, highlighting the importance of habitat loss. He stresses the need for human restraint if we are to have any hope of heading off the current rash of extinctions, and notes continued population growth as evidence for a lack of such restraint.

Why, finally, should readers care? Here Greenberg quotes Paul and Anne Ehrlich’s *Extinction: The Causes and Consequences of the Disappearance of Species* (1981), a key source for many scientists’ thinking about the meaning of extinction. The Ehrlichs provide four main kinds of reasons for why species should be preserved: “(1) other life-forms have a right to exist, and ethical decisions should not be based solely on human benefits; (2) other species are aesthetically pleasing and add to human felicity by their beauty and character; (3) other species provide economic, medical, and other ‘direct benefits’ by their continued existence; and (4) extinctions have indirect and long-term effects on ecosystems of which humans are also a part [so that their loss can undermine the long-term provision of ecosystem services on which people depend]” (206). Greenberg finds all four kinds of arguments for preserving other species convincing. “How much poorer and less enjoyable” will human lives be if we continue down our current path of extinction? he asks (*ibid.*).

In the end, the oft-told story of the demise of the passenger pigeon is one conservationists would do well to remember. We need to set limits to the marketization of nature, if we hope to preserve much of what remains most beautiful and impressive in the natural world. It is easy to criticize 19th century Americans for their profligacy and lack of foresight. And it is indeed right to do so, as long as we go on to ask: what common miracles are we displacing, knowingly or unknowingly, through our own economic activities? What species are we ushering on to extinction through our excessive demands on the natural world?

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“What does it mean that, in this time of incredible loss, there is so little public mourning for extinctions?” asks Thom Van Dooren in his masterful new book *Flight Ways: Life and Loss at the Edge of Extinction*. “Why do the last expressions of so many species leave the world unnoticed—except perhaps by the few conservationists on whose watch, and sometimes in whose hands, they pass away?” (140). Van Dooren explains this silence as a function of people’s “inability to really get—to comprehend at any meaningful level—the multiple connections and dependencies between ourselves and these disappearing others: a failure to appreciate all the ways in which we share a world” (*ibid.*). We do not know their stories, nor do we see their stories as integral to our own. As humanity encases itself ever more fully within “built environments” and “virtual realities” of its own making, opportunities to appreciate these other stories recede.

Flight Ways attempts to show readers how they can begin to rectify these failures. Succeeding chapters discuss the evolutionary histories, ecological interactions, lives and behaviors of five endangered bird species: the Laysan Albatross, India’s Long-billed Vulture, the Little Penguin from the author’s native Australia, North America’s Whooping Crane, and finally the Hawaiian Crow. In each case, Van Dooren clearly explains the multiple causes of the species’ decline, and conservationists’ efforts to prevent its extinction. His accounts are well grounded in the scientific literature, supplemented by interviews with scientists working to conserve them, and by his own experiences with the birds.

Two aspects of this approach resonated particularly strongly with me. The first is the idea that other species are important intergenerational achievements, an idea that I think has rarely been so well captured in prose. As Van Dooren writes in his first chapter, on the albatross:

As early as 9 million years ago, fossils from the Southern Ocean indicate that these birds were already very similar to their current forms. Millions of years before anything like the human species appeared on the scene, albatrosses were already soaring, dancing, and fishing across this great blue planet. Approached with an attentiveness to evolutionary history and a focus on the complex and difficult emergence of each new generation, it is clear that this thing we call a ‘species’ is an incredible achievement. Each of the literally millions of generations of albatrosses that have followed one after the other has itself been ushered into the world through this narrow passage: laid, incubated, hatched, guarded and fed by parents, before taking those first steps toward flight and the world beyond. We often do not appreciate—and perhaps we cannot truly grasp—the immensity of this intergenerational work: the skill, commitment, cooperation, and hard work, alongside serendipity, that are required in each generation to carry the species through. (27)

Albatrosses are the product of natural selection, yes, working blindly. But also of commitment, cooperation, and other virtues that we rightly value when we find them in the human realm. When we marvel at a soaring bird, we should remember the many previous birds that have instantiated these qualities and helped create the spectacle. To see the Laysan albatross

(*Phoebastria immutabilis*) as an achievement, an ongoing story and a very good one, provides the context necessary to better understand our own impacts on it. When albatrosses starve due to swallowing plastics from the great Pacific Garbage Gyre, or crush their eggs on the nest, because DDT has thinned their eggshells, human beings have entered the story in ways that cannot help but make us feel ashamed. When we instead act with restraint, limiting our wastes or setting aside crucial nesting sites, we are also acknowledging the value of this story, and helping write a new chapter in it of which we can be proud.

Second, Van Dooren returns repeatedly to the importance of the particular. Extinction, while a global phenomenon, is not really one thing. Each extinction or potential extinction is unique and means something special, depending on the organism threatened and on its particular ecological connections to other organisms, both human and nonhuman. Furthermore, extinction is not something that happens all of a sudden, when the last member of a species dies. Instead, on Van Dooren's view, extinction can be in process for a long time, as connections are broken to other species and to particular places. As ecologists have previously noted, the "functional extinction" of a species, the cessation of important roles it may play in particular ecosystems, may long predate the final extinction of a species.

Van Dooren believes that the key to better human relationships with other species—and ultimately to creating societies that don't rampantly extinguish them—is to appreciate their stories. To do that, we need to try to tell them as fully and as honestly as we can. "As I researched each chapter," he writes: "I got to know these species in new ways. In each case I was surprised by the way in which knowing more draws us into new kinds of relationships and, as a result, new accountabilities to others" (9).

To take one example, the more he learns about Little Penguins (*Eudyptula minor*), the more absurd the author finds common ways of talking about these animals: as visitors who we are at liberty to graciously allow to stay on "our" property, or not. No. Their local presence predates by many millennia the European settlement of Sydney harbor; they are intensely loyal to particular nesting sites; and this loyalty itself shows that they deserve to remain there without being driven out by human beings. Little Penguins' continued presence, against long odds, preserves an alternative narrative about that place: not the one that starts with convicts and captors arriving in boats, but an older, deeper story. Their presence keeps that story alive for new generations to contemplate and appreciate. It preserves the possibility that the descendants of those early settlers can create a society that intertwines their lives with the lives of other species in more intelligent and generous ways, in the sort of "land ethic" advocated by Aldo Leopold and the generations of conservationists who have followed him.

Embracing such an ethics would demand sacrifices from people, of course. Van Dooren several times speaks of the need to recognize limits, and to leave other species sufficient ecological space to continue to thrive. But like previous efforts to widen the circle of moral considerability, this one holds out the promise of rich benefits, not least in a more accurate and mature understanding of the world we live in. Consider another example.

Long-billed vultures (*Gyps indicus*) have long thrived in India by scavenging large animal carcasses, including those of cattle and people, in the process providing important sanitation "ecosystem services" to human communities. Soaring overhead, they are a living embodiment of the important truths that death is a part of life, and that people can coexist in mutually beneficial ways with the nonhuman world. Now the vultures are in drastic decline, probably due to an overuse of diclofenac and other antibiotics in cattle, which poisons them when they feed on carcasses. Yet the vultures hang on, in places, and as long as they do they preserve an alternative to the life-denying practices that threaten them.

"The extinction of vultures points to the necessity of a concept and a practice of community that draws in the dead, in which what happens to the dead is deeply consequential for the health and continuity" of the living (59). A flourishing community will take wider and truer views of life. It will not be so greedy to increase agricultural production that it poisons itself, or so heedless of natural beauty and diversity that it destroys such an elegant recycling system. Preserving this story on the landscape would not just be a nod to India's past traditions, or to a potentially more ecologically just future. It would continue the realization, the incarnation, of a wise approach to death: an approach that long-billed vultures brought to the subcontinent long before the first hominid made his or her appearance there.

As with India's vultures, each story told in this book highlights important aspects of extinction, from its empirical causes to its larger meanings. Van Dooren follows post-modern theorist Donna Haraway in arguing that we will tell better stories and find better ethical guidance if we jettison attempts to keep the human and the natural conceptually separate, writing: "Inside rich histories of entangled becoming—without the aid of simplistic ideals like 'wilderness,' 'the natural,' or 'ecosystem balance'—it is ultimately impossible to reach simple, black-and-white prescriptions about how ecologies 'should be.' And so we are required to make a stand for some possible worlds and not others; we are required to begin to take responsibility for the ways in which we help to tie and retie our knotted multispecies worlds" (60–61). This framework does appear to open up room to develop the outlines of a Leopold communitarian land ethic, since human and nonhuman beings are already intertwined from the get go. Yet it seems to me that those "simplistic ideals" Van Dooren wants to jettison as excess baggage are in fact essential to the full development of such an ethics.

The more we learn about the causes of extinction, after all, the more we learn that the best way to forestall it usually involves limiting human impacts on wild ecosystems: reducing our "entanglement" with other species and leaving them alone to continue their own "becoming" relatively free from our overbearing presence. Wilderness areas, national parks, wildlife preserves, and similar areas can be simplistically understood, or improperly implemented. But increasing the land and sea area around the globe under such designations is a necessary part of effective biodiversity conservation going forward (Rodrigues et al., 2004).

In the same way, "ecosystem balance" might be out of favor as a descriptive concept within scientific ecology. Yet the idea that we need to find a fairer balance in resource use between people and nonhuman beings arguably will be part of any plausible moral argument for the preservation of other species (Staples and Cafaro, 2012; Wills, 2013). When E.O. Wilson (2014) argues that we need to "leave half for nature," both the concept of "a fair balance" and the concept of "nature" are clearly in play. While Van Dooren may be right that we don't want "simplistic divisions between the human and the nonhuman, the cultural and the natural" (147), we probably do want sophisticated understandings of those divisions: both to be able to tell other species' stories correctly, and to allow those stories to continue without being buried under human stories. However, the issues are complicated, and Van Dooren's success in telling these stories in so compelling a manner perhaps argues in favor of his general approach to telling them.

Another possible weakness of the book is that it avoids pointed discussions of specific measures that people should take to keep from extinguishing other species. Human population control is never mentioned, even though growing human numbers may be the greatest threat facing global biodiversity (McKee, 2003), and even more politically correct suggestions, such as consuming less, are only touched on in very general terms. Perhaps Van Dooren thinks that his stories will speak for themselves, regarding, for example, the need to quit emitting poisonous chemicals or

creating immortal plastics that harm wildlife. He does repeatedly speak about the need to appreciate limits, and to create societies that leave other species sufficient “space” to flourish. Yet one worries that his narrative approach to ethics cannot clearly lay out “thou shalt not” to guide human behavior as we seek to create such societies. Van Dooren several times criticizes efforts to specify definite “principles” or “rules” for such behavior, believing that they provide only a spurious clarity. But it isn’t clear what his resources are in the face of Anthropocene epoch proponents who are comfortable telling a story about life on Earth in which people play an ever more domineering role within global ecosystems and other species are seen as expendable (e.g. Kareiva et al., 2011).

Consider in this regard Van Dooren’s elliptical treatment of population matters. On the one hand, he clearly sees their relevance to his topic. For example, in discussing Little Penguins in Sydney harbor, he writes: “On the whole ... deliberate efforts to discourage the penguins’ presence are probably few in number and are far less significant than the widespread loss of breeding sites that has resulted from the relentless densification of the area” (75). Increasing human populations are extirpating Little Penguins in southeastern Australia; ending such growth is prima facie part of keeping them from being extinguished altogether. Yet the passage continues: “The number of human visitors to and residents of Manly, one of Australia’s most iconic beachside suburbs, has steadily increased over the past several decades and can only be expected to continue to do so” (ibid., emphasis added).

Here Van Dooren expresses the contemporary environmentalist’s all-to-common passivity regarding population matters. Reading this passage, you would never guess that in 2013 Australians held a general election largely focused on national population policies: specifically, on whether the country would continue to pursue rapid population growth through mass immigration (“a Big Australia”), or instead take the hint from fires, droughts, and other ecological stressors, and work toward population stabilization. You would never guess that the Australian Conservation Foundation, one of the country’s largest environmental organizations, has been arguing for national population stabilization for years, largely on the basis that it is needed to preserve Australian biodiversity (in 2010, the ACF petitioned the federal government to recognize population growth as a “key threatening process” under the Environment Protection and Biodiversity Conservation Act). It seems fair to say that the future of Little Penguins in Australia depends in part on how “Big” Australians choose to get. No serious attempt to tell this story can leave population matters aside, and arguably, “Thou shalt not average more than two children per family” and “Thou shalt not allow mass immigration” are two rules that any nation that is serious about living in community with other species must agree to live by. Otherwise, people will inevitably displace other species, and living in community with them will be impossible.

Still, despite all such caveats, Flight Ways is a thought-provoking book and essential reading for those who seek to understand or avert the sixth mass extinction. It makes the case, eloquently and convincingly, for greater attention to scientifically-informed narrative as a way to understand the many meanings of the sixth extinction, and hopefully, to begin to conceive of different and less harmful ways for humans to live on Earth. In an epilogue titled “A Call for Stories,” Van Dooren writes: “Again and again, we need to ask: What does it mean to bring an abrupt ending to this particular way of life? What does this loss mean inside its specific multispecies communities? How are we called to take responsibility, here and now, and how will we take up that call?” (147).

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Conservation biology, as a discipline, is in large part defined by its practitioners’ determination to take on such responsibilities for safeguarding biodiversity. But of course, stepping up in this way is no guarantee of success, a bitter truth that is well-illustrated by

Witness to Extinction: How We Failed to Save the Yangtze River Dolphin. Samuel Turvey, a Research Fellow at the Zoological Society of London, places the recent extinction of the baiji dolphin (Lipotes vexillifer) in the context of the larger, centuries-long loss of the immense biodiversity of the Yangtze River and its adjoining wetlands and forests (“China’s Amazon,” according to the author). The rich, wild nature in and along the Yangtze has been displaced by the ever more intrusive inroads of civilization. Now, as China massively industrializes, the last bits are being destroyed. As Turvey notes: “The fertile plains and valleys of southeastern China support one of the highest human population densities on the planet, and there isn’t much room left for nature any more. People’s daily needs conflict sharply with the needs of the pitiful remnants of the region’s wildlife, and direct overexploitation of the environment by local people up and down the river has hit the Yangtze ecosystem hard” (36–37). Minor ameliorative measures late in the game are proving no match for the immense forces that have been unleashed along the river: the pollution, the dams, the land conversion, the illegal fishing, and the immense pent-up human demand that is behind it all.

Witness to Extinction focuses on one small part of this larger loss, and Turvey’s account will be of particular interest to readers of this journal for its anatomy of failure and frustration: something any conservation biologist will wrestle with sooner or later in his or her career. The book is good on the basics, making extensive use of both western and Chinese sources on the biology and ecology of the baiji, and showing how little is truly known about them (the species was only discovered by science in the 20th century, and few dolphins remained by the time China opened up in the 1980s and Western scientists could get back into the country to join in the search for the animal). It provides a sophisticated analysis of the multiple possible causes of the dolphin’s demise, and a solid account of the efforts to avert it, including the author’s own first-hand conservation efforts somewhat late in the game. Turvey makes strong criticisms both of the international cetacean conservation community and of the Chinese scientists working to save the baiji. He takes us into the realm of rich but eccentric donors, and the frustrations connected with working with them. The writing is strong and vivid throughout; for example, in describing the auditory chaos destroying the soundscapes that these nearly blind dolphins depended upon for making their way in the world, as freight traffic along the Yangtze surged in recent decades.

This raises a key point: whether there ever was any realistic future for the baiji dolphin on the modern Yangtze River, which one presumes the Chinese are not going to turn into a nature sanctuary, given its status as a major artery for ever-growing commerce and industry. A major premise of the book is that with stronger efforts by Chinese officials and international conservation organizations, the baiji could have been saved. This hopeful managerialism is perhaps a core belief of conservation biologists; perhaps it is essential for them to do any work at all. Yet it is not clear that in this case, or in many other cases, it is true. Turvey argues that the baiji’s best chance may have been in one of the large lakes that it had historically occupied, or in small, specially constructed river sanctuaries, rather than on the Yangtze’s main channel. But this scenario brings up the uncomfortable question of whether such intensive species conservation efforts simply prolong the death of many species, rather than putting them on any plausible trajectory for continued flourishing. To its credit, at several points the book does consider whether modern China provides any realistic chance to rein in toxic “growth” in order to preserve nature (e.g. 44–45). Its conclusions on the subject are not encouraging.

The general picture Turvey paints of Chinese conservation officials is one of well-meaning incompetence. This was shown, for example, in lax procedures during the transfer of dolphins to a new baiji sanctuary, and by the failure to protect the animals in

the sanctuary itself. The author also argues that an inability to appreciate wildness undermines conservation in China, writing: “The term ‘conservation,’ it seems, simply meant something quite different in the West than it did in China—a country that had been overpopulated for so long that concepts of wilderness or of nature existing in its own right had little meaning or relevance any more, and where cultural appreciation of animals was largely restricted to their symbolic importance for human affairs. Maybe in this context, it becomes easier to understand . . . why breeding endangered species in zoos [or sustaining them in artificial sanctuaries] was apparently seen as a greater conservation success in China than sustaining populations in the wild” (61–62). Preserving species in zoos, botanical gardens, or other artificial environments is for most conservationists at best a secondary achievement: useful in teaching the general public about other species, or in temporarily housing them on the road to reestablishment in the wild, but not sufficient in itself. It is not just that we believe people should respect the ecological connections and natural communities other species have created over time, as Thom Van Dooren argues in Flight Ways; it is that ex situ preservation cannot save the world’s species over the long-term. Such efforts often fail, even on their own limited terms, as captive species go extinct. Even when they do manage to preserve a few “specimens” for extended periods of time, natural species are what they are in situ: roaming the lands and the seas of planet Earth, interacting with other species, exhibiting their full range of behaviors, adaptations, and natural variations. A chimpanzee in a cage, a baiji in a tank, is not really a chimpanzee or a baiji. A species permanently cut off from life in the wild is for all intents and purposes already extinct.

If Chinese conservationists really cannot see all this, then that is a major weakness of Chinese conservation. It would also be a sad confirmation of how a failure to preserve biodiversity can cut a nation off from its own cultural history, for China’s ancient Taoist sages gave the world some of humanity’s deepest explorations of the notion of wildness and of the value of “letting things be,” while its classical landscape painters portrayed Taoist ideals with unsurpassed beauty and clarity. All that was long ago, however, and perhaps that cultural patrimony has disappeared along with the baiji and the forests and wetlands along the Yangtze.

Turvey also faults the international conservation community, including the IUCN’s Cetacean Specialist Group and big international players like WWF, for not taking on responsibility for baiji conservation sooner and with greater urgency. There was too much “scientific and administrative conservatism” (123), Turvey writes, which he sees as a recurring problem in international conservation efforts. The conservation community turned out to be too fragmented and risk averse to act expeditiously. Western scientists kept asking for more studies of translocation methods and further census data before putting a rescue plan into operation, when rapid capture of the remaining baiji and their release into relatively safe havens may have been the only hope for the species. Evaluating these claims is beyond my area of competence; perhaps better management might have saved the baiji, at least for a time. The main message I take away from this case is different: that once a species depends on rapid, heroic efforts with little margin for error, it is probably doomed.

Turvey’s book is particularly good at explaining the importance of the Yangtze dolphin’s extinction, in terms of its ecological uniqueness and ancient genealogy. As he notes, “the baiji was one of the world’s few species of river dolphin, the survivor of an ancient group of mammals that had once lived in the world’s oceans before the evolution of modern-day marine dolphins. . . . Its ancestors had lived and evolved for 20 million years in the Yangtze Basin, independent from all other cetaceans. In contrast, the Yangtze population of finless porpoise probably had less than

one million years of unique evolutionary heritage, and was closely related to finless porpoises in the seas all around Asia and also to a far greater number of other species of porpoises and dolphins. The disappearance of either animal would be a tragedy, but the disappearance of the baiji would represent a far greater loss to global biodiversity” (102–104). In fact, the baiji had evolved independently for long enough that arguably it deserved classification in its own monotypic family. Over the past 500 years, only four mammal families had been completely wiped out by people. With the Yangtze dolphin’s extinction, we can now add a fifth name to the list: the Lipotidae.

Perhaps the most powerful pages in Witness to Extinction are found in its eighth chapter, describing the author’s participation in a futile attempt to census for baiji along the full length of its former range in the Yangtze. It is a sad story of fading hope; a few short passages will capture its flavor:

It was immediately clear that there was no enforcement whatsoever of any of the illegal fishing practices that had doomed the baiji. Before we even left the dock in Wuhan, two fishing boats circled the Kekao and set their rolling hook long-lines out into the water around the research vessel, as symbolic a gesture as any with which to start the survey. We saw people fishing illegally every day in the river and these fishermen would frequently stop to sell us the prizes from their day’s catch. The Chinese researchers on board our boats didn’t see the irony in this, and so we often ended up stopping to buy our dinner from the very people who had probably driven the animal we were desperately searching for to extinction. (158)

I had been shocked by the state of the Yangtze between Wuhan and Yichang, but the lower stretches of the river were like nothing I had ever seen before. It was a motorway for thousands of freight vessels, lined with oil refineries, factories, and chemical plants pouring pollutants into its waters, and full of sand dredgers ripping up the river bed to make concrete for China’s booming economy. The observers up on the flying bridge were regularly distracted by yells from the acoustic team desperately trying to alert passing ship traffic not to run over the hydrophone being towed behind the boat. The river was choked with trash floating downstream—broken furniture, dead dogs and pigs . . . The riverside towns could be smelt on the wind before they came into view, and before the black-eared kites that swarmed on the rubbish dumps could be seen dusting their talons over the surface of the water to scoop up fish which they ate on the wing. (161)

It’s hard to say quite when hope had started to fade on the downstream journey. For each of us the dawning realization had arrived at a different moment, but I knew that now we were just going through the motions. ‘Baiji’ had become an empty word to me, a term that manipulative individuals used for raising money to advance their own careers; it wasn’t a real animal any more. Alternating waves of acceptance and disbelief were accompanied by a creeping sense of something approaching dread. (162)

Turvey concludes that the Yangtze river, already sadly diminished, is dying, and it is hard to see what can be done to reverse the damage. Certainly there appears to be little that conservation biologists, domestic or foreign, can do to prevent further degradation and extinctions. Significant improvements would depend on a massive change in the industrial policies of the Chinese government, and even were this to occur, much has been lost that can never be recovered. The book’s final chapter, “What Have We Learnt?” focuses on the failures of conservation biologists and, to a lesser extent, Chinese society.

But as boat traffic and industrial development continue to increase, it is hard to imagine mere managerial improvements as a real solution to the problem of extinction along the Yangtze. Turvey concludes, plaintively: “The last remnants of what was once the most magnificent river system in Asia are being washed away for ever. And how many people are really doing anything to fight it? Somebody out there, please, prove me wrong” (205). This powerful book should be required reading for budding conservation biologists, both as a call to action and as a warning regarding the limits of what action can achieve, in the world that humanity is busily creating.

*

Like Turvey’s book, David Jachowski’s *Wild Again: The Struggle to Save the Black-Footed Ferret* combines the story of an attempt to save a rare and endangered species with that of a young conservation biologist’s early career. Like Turvey’s, Jachowski’s story is one of persistent effort and profound disillusionment in the face of great obstacles. But as the black-footed ferret (*Mustela nigripes*) hangs on and even makes modest progress, Jachowski holds out some hope for the future. Still, this is a relatively grim tale.

Jachowski begins with the basics of ferret biology and ecology, which he explains well, and the history of the species’ decline on America’s Great Plains during the 20th century, due to widespread eradication of its main prey item: prairie dogs. Black-footed ferrets are obligates on prairie dog towns, preying almost exclusively upon them. As prairie dogs dwindled, due to indiscriminate shooting and government poisoning campaigns, so did the ferrets, which came within a whisker of total extinction twice in the past half-century. An expensive and tenacious effort to captive breed the ferrets, underway since the 1980s, has had some success, but reintroductions have been much less successful, with most sites having to be repeatedly restocked with new ferrets to avoid the extinction of local populations. Only a few of the largest reintroduction sites, with tens of thousands of acres of prairie dog colonies, may have achieved self-sustaining ferret populations. This leads Jachowski to conclude that models that suggested a few thousand acres of prairie dog towns would be sufficient to sustain ferret populations greatly underestimate the actual acreage and numbers necessary to do so.

The problem is that there is little support for increasing prairie dog numbers the requisite amount on public lands in the western U.S. In fact, most national grasslands (administered by the U.S. Forest Service) and Bureau of Land Management grazing lands continue to poison prairie dog colonies—even as the biologists tell land managers that prairie dogs are a keystone species, necessary to the flourishing of ferrets and many other species on the Great Plains (Kotliar et al., 2006). Worse, over the past century bubonic plague, an exotic disease first introduced into the U.S. via the port of San Francisco, has swept eastward, devastating prairie dog colonies, particularly the largest ones that are key to long-term ferret success. In the face of plague, it isn’t clear that such extensive prairie dog colonies can survive anymore, since plague tends to explode once colonies increase in size from a few hundred to a few thousand acres. Efforts are underway to find a prairie dog plague vaccine, but whether such a vaccine could ever be deployed on a large enough scale to significantly aid ferrets is unclear. For now, between direct human persecution and indirect human harms (including habitat degradation by the oil and gas industry) the black-footed ferret’s future appears dire.

Prairie dogs have inhabited America’s short-grass steppe for millions of years; the ancestors of black-footed ferrets for at least eight hundred thousand. The presence of prairie dogs and ferrets, where they still occur, indicates land health and ecological integrity. As Jachowski puts it: “On the Great Plains, grasses dominate the landscape. And on those grasslands, patches of prairie dogs bring the prairie alive in increased plant and animal diversity. And on some of those prairie dog colonies, the presence of

black-footed ferrets best symbolizes a healthy, biodiverse piece of ground—a locality likely complete with badgers, swift foxes, burrowing owls, mountain plovers, and ferruginous hawks, some of the prototypical representatives of the prairie” (xiii). “Black-footed ferrets represent the wild heart of the Great Plains,” he writes. “The question that remains unanswered is whether people will tolerate ferrets and their prey and allow them to recover—whether society increasingly finds value in reviving and rewilding the great plains” (ix).

If Americans were able to rewild the plains, this would be a tremendous achievement, all the more meaningful because we have nearly killed off many of these native species. The hope would be to create a society and find ways of raising our food that do not trample upon the beauty and diversity of our native landscapes. Jachowski finds reasons for such hope: in U.S. Forest Service district supervisors like Bill Perry in South Dakota, who stand up for prairie dogs and work to piece together enough contiguous habitat to make ferret reintroduction a solid success; and in ranchers like Larry Haverfield in Kansas, who love the wild animals inhabiting their ranches and who support ferret reintroduction. These are people who respect the stories that wild nature has achieved on the plains. Here, though, it must be said that for every district supervisor who stands up for prairie dogs and the rest of the native biodiversity on the national grasslands, there are a dozen who could not care less about them, and see their jobs as making the grasslands safe for cows (Wuerthner and Matteson, 2002). For every rancher who loves wildlife and is willing to forego a little grass and a few calves to keep it flourishing on his property, there are a dozen who hate prairie dogs and blast away at coyotes, golden eagles, and other “varmints.” On the American Great Plains, federal land managers and ranchers continue to be a worse plague on native biodiversity than the plague itself (Freilich et al., 2003).

Nevertheless, Jachowski has a vision of a healthier and more vibrant Great Plains, where both people and wildlife can thrive. He views his own conservation work as in service to this vision, writing: “I am a generation too late to work among Schaller, Murie, and Douglas-Hamilton. The iconic age of naturalists working, thinking, and documenting wild things in wild places is gone. There are few places far from a road, no place beyond human touch. What is to define my age in wildlife biology? I hope this is the age of restoration. Restoring the character of the land, what distinguishes it apart from the rest of the increasingly globalized and homogenized world” (187). This is a noble vision that deserves to prevail, even if today it is far from prevailing on the prairies or elsewhere in the United States.

Jachowski tells this story comprehensively and well. He is good on the details of efforts to captive breed ferrets and on efforts to reintroduce them to prairie dog colonies in the western U.S. He also tells his own story, which first becomes bound up with black-footed ferrets when he hears about these elusive, semi-legendary animals as a boy. Jachowski works with ferrets in different ways over the years: censusing and searching for them in various locations; captive breeding ferrets in Montana; striving to photograph them in the wild; helping to reintroduce them in a number of locations; searching for possible reintroduction sites from Mexico to the U.S./Canadian border; dusting prairie dog colonies to try to ward off plague in one of the ferrets’ last, best redoubts in South Dakota’s Conata Basin; and working with willing private landowners to help them plan for ferret reintroductions. He even chases off illegal prairie dog shooters from public grasslands (an effort rarely made by the federal officials charged with protecting these areas). Some of the best parts of the book are the author’s descriptions of ferrets, allowing glimpses of a rare creature that few readers will ever see for themselves. Jachowski is also good at describing the experience of the field biologist, particularly its more grueling aspects; good, too, at articulating the uncertainty, loneliness, and

despair that conservation biologists may feel, as they grapple with failure and the realization that their goals are not fully shared by their own societies.

This points to what, in the end, might be the most important message of *Wild Again*: the futility of trying to conserve wildlife while simultaneously poisoning it and using it for target practice, and while allowing an economically marginal activity (raising cattle on the short grass steppe) to trump the preservation of native biodiversity. It is essential that dedicated conservation biologists keep fighting for endangered species, but even the smartest, most persistent advocates will fail in the face of societal indifference or outright hostility. To succeed long-term, conservationists must work within current economic systems while also working to change them—at least when those systems are obviously toxic to wildlife.

Jachowski seems to agree. After so many years spent trying to conserve wildlife on the Great Plains, he well understands that the system is stacked against those efforts and that the trends are not in conservationists' favor. Toward the end of *Wild Again*, he suggests that a change in our attitudes toward wildlife is what is most needed to overcome the ecological effects of a continually growing human presence on Earth (212). But this way of putting things seems somehow off. A new ethical vision of humanity flourishing with wildlife, rather than instead of it, presupposes a willingness to embrace limits to human numbers and economic demands; it is a misunderstanding to propose it as an *alternative* to such acceptance. Perhaps just as it is hard for people in China, even if they love wildlife, to fully embrace wildness, so it is hard for Americans, even if they love wildlife and learned about the theory of competitive exclusion in Ecology 101, to really imagine limits to growth.

In the case at hand, the official management goal is establishment of self-sustaining black-footed ferret populations, in sufficient numbers to allow them to be “delisted” under the Endangered Species Act. Eventually, ideally, the conservation goal should be a Great Plains with prairie dogs scattered widely across the landscape and ferrets able to disperse and find new colonies to inhabit. However, continued human persecution of prairie dogs, combined with plague and ongoing development, undermine these goals. Jachowski wonders, toward the end of his book, if the only realistic future for the ferret is in a continually managed state: people dusting prairie dog colonies to kill fleas and keep down plague; land managers continually restocking ferret numbers at colonies that are too small and isolated to perpetuate themselves naturally. He puts this scenario forward not because he is enthralled with such human manipulation, à la [Marris \(2013\)](#); Jachowski cares deeply about these animals and sees their wildness as essential to their overall conservation value. He “cringes,” he says, to be thinking such “domesticated thoughts” regarding this symbol of the wild prairies (207). Yet he is willing to consider the need to manage ferrets in perpetuity, because he believes this may be the only way to keep them on the short grass steppe landscape.

Jachowski has certainly earned the right to his opinions on proper ferret management. Still, he might be mistaken here: misled by a failure to consider the economic and institutional changes necessary for real conservation. Whatever the cases to be made, in the short-term, for dusting prairie dog colonies or moving black-footed ferrets between colonies, arguably the long-term goal should remain sufficiently large and interconnected populations of wildlife on the Great Plains so that they can persist, without constant human intervention, within the context of the ecological interactions that have evolved over many millennia on the short-grass steppe. Despite all the damage that humans have caused, much of the plains remains sparsely populated and of marginal economic value, and much of the western half of the plains remains in public ownership. I would have liked to see Jachowski

discuss some more daring conservation proposals here, if only to give his readers a fuller understanding of the options. The example of Ted Turner's immense western ranches, totaling millions of acres and managed primarily for wildlife, should have significantly moved the bar regarding what conservationists consider possible on the plains ([Wilkinson, 2013](#)). Another real possibility might involve turning over management of some of the national grasslands from the U.S. Forest Service, where biodiversity protection is an afterthought at best, to the National Park Service, where preservation of wild nature is the primary mission. The Little Missouri National Grassland in western North Dakota contains over a million acres; combined with adjacent Teddy Roosevelt National Park and managed not for cows but for bison, wolves, prairie dogs, ferrets, and other native wildlife, it could re-establish a representative sample of the rich native biodiversity seen by the Lewis and Clark expedition over two hundred years ago.

I'm not sure what Jachowski would say about these more visionary options. My sense is he would approve of them, but perhaps view them as impractical, given the time frame that ferret conservationists must focus on to avoid this species' imminent extinction. But in the long-term, setting aside a lot more land for native wildlife, or limiting economic activities like ranching and fossil fuel extraction that currently have the run of the short grass steppe, might be *more* achievable than intensively managing wildlife in perpetuity without losing much of what we want to conserve—including ferrets. Just what is “realistic” here? What are the stories we might actually imagine ourselves telling and living on the Great Plains that would preserve their unique biodiversity and keep them great? In *Wild Again*, David Jachowski searches for answers to these questions, never losing sight of the little masked weasels that he insists we must bring with us into the 22nd century and beyond. He deserves thanks for all his efforts, on the land and now in the pages of his book.

*

Like the black-footed ferret, the eastern hemlock (*Tsuga canadensis*) is a victim of long-term human mismanagement that now may finally be finished off by an invasive pest species. As David Foster notes in the preface to *Hemlock: A Forest Giant on the Edge*, “Of all the tree species in our eastern forest, hemlock suffered the heaviest decline from the landscape destruction that followed the arrival of Europeans in North America” (xxi). Hemlocks tend to form deep, dense stands (less than 1% of the sunlight falling on their crowns penetrates to the forest floor below) with a fauna and understory flora that are ecologically distinct from adjacent hardwood stands. Thus, they contribute importantly to landscape level biodiversity. They also create grand, towering forests that have captivated generations of New England nature lovers.

In earlier centuries, hemlocks and other trees were displaced by widespread agricultural deforestation throughout the eastern U.S.; hemlock groves also were destroyed in great numbers because the tree's bark was used for tanning animal hides. More recently, as Foster writes, hemlock “has had a reprieve because the intensity of logging and farming has abated for the past two centuries; in parallel with the reforestation of much of New England and the eastern United States, hemlock has been steadily recovering its revered place in our woods. This recovery should be cause for celebration, but instead it is a time of sorrow, for today the magnificent trees are once again imperiled. This time an insect—the hemlock woolly adelgid—may succeed in accomplishing what axes, saws, sheep, cattle, and fire never could: eliminating the eastern hemlock as a fully functional species across much of its range in eastern North America” (ibid.). As this exotic pest slowly makes it way north through New England's forests, hemlock groves are succumbing, with little, seemingly, that can be done to halt the spreading destruction.

But is the incipient loss of the eastern hemlock “destruction,” or merely change: a change in the relative abundance of different tree species, similar in some ways to other changes in forest composition in recent millennia? How should we tell the story of the decline of the eastern hemlock? And what, if anything, should citizens and land managers do in response to this decline?

These are some of the questions that David Foster, its chief author and editor, and eight coauthors struggle to answer in *Hemlock*. Foster wrote knowledgeably and with feeling about the history of New England’s forests in his earlier *Thoreau’s Country: Journey through a Transformed Landscape* (2001); he is also the director of the Harvard Forest, a diverse 3750-acre research natural area in central Massachusetts affiliated with Harvard University. The Harvard Forest has served as the location for over a hundred years of research into forestry and forest ecology, including previous studies of the impacts of catastrophic change due to hurricane damage, in the 1930s. More recently, it was named a Long Term Ecological Research site. With extensive hemlock groves (now showing signs of woolly adelgid infestation), rich data sets, and robust, ongoing funding, Foster and colleagues are well positioned to attempt to make scientific sense of what is happening to hemlocks in the New England woods. At the same time, they seek to pay tribute to the hemlock and “tell the full story of the species” (xxv).

Readers of this book will learn a great deal of ecological information about the hemlock. There are chapters or sections of chapters on the chemical, ecological, and functional impacts of hemlock stand losses. There is an interesting chapter on hemlock’s role in the local and regional tanning industries. Palynology studies document the species’ shifting density over thousands of years in post-ice age New England forests, an interesting exploration of deep time that reveals that hemlocks haven’t been here forever, and haven’t always been as prevalent as they are currently. This knowledge may threaten to make us too accepting of current anthropogenic changes (e.g. 152). Yet there is no going back to a static view of nature.

The authors do a good job of describing the ecological distinctiveness of hemlock groves. They discuss their role in preserving ecosystem services for people, which may not be very great. They also note that losing hemlock groves may increase biodiversity at local scales, but that this loss leads to greater landscape homogeneity and thus a loss of overall biodiversity. The book devotes an entire chapter to hemlock’s role as a “foundation” species within the ecosystems it dominates, including an interesting attempt to distinguish foundation species from keystone species. “Foundation species create, define, and maintain entire ecological systems,” Foster et al. write (94). “The combination of the deep shade that hemlock casts, its year-round growth, its effective interception of snow and rain and the thick layer of needles fallen from its branches and underlain by poor, acidic soils, creates a unique environment for many other species of plants, animals, fungi, and bacteria” (97). Hemlock stands are particularly diverse in web-building spider species, and support relatively dense numbers of poets.

Hemlock forests do not appear to be particularly valuable in terms of game production, timber, conservation of water flows, or other material “ecosystem services.” Their primary values appear to be ecological and inspirational. The authors of this volume are well-attuned to such values. They also note the scientific and aesthetic benefits of leaving some forests relatively unmanaged. Not only can this provide valuable control sites for future research, but intensive forestry, “cleaning up” either before or after hemlock losses, typically harms forests more than the actual loss of the trees to the woolly adelgid. Dead trees can be incredibly prolific, while the road building, soil compaction, and resource losses following timber harvesting can be very damaging. It is often best,

for the land itself, to leave things alone, or to manage with a light hand.

The book’s penultimate chapter, “When Doing Nothing is a Viable Alternative: Insights into Conservation and Management,” explores these ideas, setting up a framework for advising New England forest owners in the face of ongoing hemlock losses. This is one of the best chapters in the book. It recognizes the diversity of legitimate goals forest owners may have for their lands, and the need to manage them accordingly. Yet it also recognizes that the human need to “do something” in the face of change often leads us astray (there is a particularly interesting discussion, earlier in the book, of a previous generation of Harvard Forest managers grappling with this issue following the forest disturbances generated by the great hurricane of 1938). “Ecological theory and practice show that the human responses to natural disturbance almost always exert a more severe impact on forest ecosystems than the event that they were seeking to mitigate and rectify,” they write (195). An appreciation of this fact would have saved many national forests in the western U.S. from an immense amount of damage in recent decades, caused by so-called “salvage logging” in the aftermath of fires. Hopefully, landowners in the eastern U.S. can avoid piling insult upon injury in response to hemlock losses.

When we turn from the authors’ prescriptions for individual forest tracts to their Rx for the larger landscape, they emphasize the benefits of protecting as much of the forest as possible in a natural state. The most important step in dealing with future ecological stresses and disturbances is to preserve large natural areas with a diversity of species and ecosystems. This will be crucial for the continuance of individual threatened species like the eastern hemlock, the authors argue, and it is also the best hope for the future health of New England’s forest ecosystems as a whole. Foster et al. argue for preserving at least 70% of New England’s forests in a natural and undeveloped state. In this, they echo many recent studies that have affirmed the importance of protected natural areas for preserving biodiversity (e.g. [Le Saout et al., 2013](#)).

For me, a rare jarring note in this book was its seeming complacency about the spread of exotic pests like the woolly adelgid. “In today’s world of global commerce,” the authors write, “organisms move freely to new continents and novel ecological settings” (120). “The loss of dominant species from invasive organisms ... will unfortunately become more important as global commerce and environmental changes increase” (128). But it is not written in stone that global commerce must increase, and even if it does, there are steps that nations can take to limit the spread of exotics. One would have hoped that a book documenting the unnecessary loss of this “forest giant” would have devoted more time and intellectual imagination to discussing ways to limit the spread of exotics. Still, I suppose this lacuna is understandable. Like Jachowski writing about ferrets and plague, the authors of *Hemlock* are dealing with a *fait accompli*. Their focus is on the landscape in front of them. From their perspective, the ever-greater spread of exotics is simply part of the ecological reality of the 21st century. But even if this is so, we still need more discussion about this new reality: focused, now, on whether there is any hope for biodiversity in a world wholly given over to commerce.

No book can cover everything, however, and overall this volume is very well done. It gives us a vivid window onto an ongoing extirpation/extinction event and explores the losses, to people and to nature, caused by such extinctions. Because it has multiple authors, we perhaps get a better sense of the diversity of responses that people can have to such a loss. One benefit of science is that it helps us take longer views, and this provides some hope that hemlocks will eventually rebound, as they have in the past. “We can look to the mid-Holocene hemlock decline 5500 years ago for perspective on how this adelgid episode may play out,” the authors

write. “The optimistic message emerging from the ancient script is that hemlock has always recovered from past devastating blows, so there is strong likelihood that the species will recover from this new one. The sobering news is that, following that great prehistoric decline, it took hemlock nearly 2000 years to regain its former abundance” (213).

Taking the long view can also lead to complacency and passivity in the face of ecological degradation. After all, nothing lasts forever. The face of nature changes, and human-caused changes are in one sense just as natural as any others. In any event, scientists can find intellectual challenge (and further their careers) by studying the myriad changes to the Harvard Forest, whether good, bad, or neutral. *Hemlock* hits all these sour notes, at times. Yet overall it keeps its moral bearings, and ends, appropriately, with a “lament” for ongoing losses. “This is most definitely a tragedy,” writes Foster. “We will lose hemlock. We will lose our flagship for old-growth and primeval forest in the Northeast. We’ll lose distinctive variation in our landscape. And we will lose the history and experiences embodied in these woods” (228–229).

*

The title of Craig Stanford’s new book, *Planet Without Apes*, says it all. Humanity is rapidly exterminating the great apes, and we face the real possibility that within the lifetimes of today’s children the only remaining apes will be found in zoos or biomedical research facilities. Still, Stanford asks, “given that all animals are at risk from our rape of the Earth, why should we be so concerned about just four [or six] species—the chimpanzee, gorilla, bonobo, and orangutan—among the many millions alive today?” (2). His answer is that “we should care because these four creatures are our lifeline. They are our last remaining links to our evolutionary past, and they tell us a great deal about who we are today. Allowing them to die would be like allowing our extended family to die”—and not just allowing, but *causing*. “We are not allowing them to perish through benign neglect,” he continues. “Humans have carried out a campaign of extermination against the great apes that has reached epic proportions” (ibid.). Stanford, a professor of biology and anthropology at the University of Southern California, does not shrink from calling this interspecies genocide, a theme he develops throughout the book.

Both in its organization and in its concise yet vivid writing, *Planet Without Apes* is a model of clarity. An initial chapter, “Heart of Darkness,” provides an up-to-date summary of what we know about the great apes (family *Hominidae*), including their physiology, behavior, habitat preferences, and evolutionary history. It also documents rapidly declining population numbers for all species of great apes, and begins to explain the causes and possible means for arresting these decreases. The next three chapters are devoted to a more detailed exploration of the main causes of these declines: habitat loss and degradation (the most important), the bushmeat trade (particularly important in Africa), and anthropogenic diseases. There follows a chapter on the status and ethics of holding great apes in captivity; one on “The Double-edged Sword of Ecotourism,” which both provides strong economic incentives for preserving the African apes and exposes them to deadly diseases; and one on “Ethnocide,” which affirms the existence of ape cultures and argues that exterminating the populations exhibiting these cultures is similar to exterminating culturally unique human populations. An epilogue, “May There Always Be Apes,” reprises Stanford’s main conservation suggestions and tries to inject some hope into a generally dismal prognosis. All this is very well done. Having just taught the book to a class in environmental ethics, I can vouch that it works well in an undergraduate teaching setting, particularly in explaining the multi-causality and synergism of extinction threats. But more experienced conservationists will also probably learn a lot from it.

The moral heart of the book is its claim that the human extinction of the great apes rises to the level of genocide. “Up a long, winding muddy river from the sea, a massive slaughter is taking place,” Stanford writes, evoking Conrad and Kurtz:

It’s happening largely out of sight from anyone who might be motivated to do something to stop it. If it were a slaughter of human beings it would be called by its rightful name: genocide. It spans the wide equatorial belt of the African continent, with a parallel slaughter being carried out half a world away in Indonesia. It has been going on for many decades but its pace has quickened recently, and the slaughterers seem almost hell-bent to rid the world of their victims. It is carried out by the means that conquering peoples have used for centuries. The victims are shot, pierced by arrows. They are ravaged by biological weapons let loose in their midst. Mothers are shot dead, their screaming children pried from their lifeless arms to be sold to people who desire them. Sometimes they are taken captive instead of being killed outright. They live out their lives, often under abhorrent conditions, in the service of their captors. Their natural homes are burned down, chopped down, and bulldozed in the name of progress. Some activists talk about granting the victims the same basic human rights we all possess, to live free from the threat of wanton cruelty. But these are voices in the wilderness, powerless compared to the political and industrial forces at work around them, so the slaughter continues. The victims are outnumbered and outgunned by their torturers, and in the end their fate may lie in being nostalgically remembered by the children and grandchildren of those who did the killing.

The ‘genocide’ I am talking about is that of the last living great apes. Like the European colonists of the tropics who encountered indigenous civilizations but declared the land to be ‘empty,’ those who carry out the ape genocide today do it blithely, without considering their actions a violation of any natural law. Like all colonists, we kill in the name of progress and denigrate the victims to rationalize the genocide. After all, they are animals, we are humans. In fact, we are but human animals and they are close enough to the human family to make the line we like to think of as bold rather fuzzy. (8–9)

This last sentence points toward Stanford’s main strategy to justify his key moral claim. Without exaggerating them, his descriptions emphasize similarities between apes and us: in physiology; in life histories; in our emotional needs and our ability to suffer; in our tool use; in our sociality; above all, in our complex cognitive engagement with the world around us. In these ways and others, the great apes are like us. If it is wrong for individual people to harm one another, or for more powerful human groups to displace weaker ones, it is likewise wrong when people do these things to the great apes.

A key similarity between intra- and interspecies genocide, according to Stanford, is the use of bogus value judgments to justify territorial displacements and resource grabs. A chimpanzee group will file silently through the forest on its way to mount a surprise attack on another group; that is the extent of their trickery. Human beings, less honestly if more creatively, invent value hierarchies to justify our violence and greed. “‘Savages’ were a romantic invention of the western world,” Stanford writes. “When explorers and colonists encountered people with strange customs and languages, it was far easier to exploit them or to ignore their fundamental human rights if one first dehumanized them” (10). Today, when most of us accept the notion that all human beings are entitled to the same basic rights, “great apes are the new ‘others’. . . They are the last true savages, and we are treating them about the same way we treated our human brethren for so long” (11). We do so not based on what we know apes to be, Stanford

implies, since science over the past half century has shown us that the great apes are fascinating and complex creatures, but based on what is convenient to our own cupidity.

Critics may object that apes are not human beings. Some take the use of this concept to describe our treatment of apes as insulting to the human victims of genocide, as trivializing their mistreatment. But Stanford pushes back. He sees similarities in the territorial imperatives that often drive the displacement of one group by another, in the ease with which those who are safe and comfortable ignore the suffering of others, and in the terrible costs of inaction in the face of intra- and interspecies genocides.

Another potential criticism of the use of 'genocide' in this context focuses on whether the extermination of the apes is being done on purpose. As Stanford notes, genocide is typically defined as "the willful and systematic destruction of an ethnic, cultural, political, or racial group" (191). There must be intent to exterminate on the part of particular individuals or groups. But arguably, "extinction of the great apes could not be considered a willful act. It would be an act of great willful ignorance" (*ibid.*), in which no one wants to see the apes extinguished or takes their extinction as a primary goal, and where this extinction is furthered by people deliberately choosing to remain ignorant of how their individual actions (or inaction) are contributing to this extinction.

Anticipating this criticism, Stanford shifts his ground, falling back on an alternative concept: "ethnocide," defined as the extinction of cultures. He makes a good case for this, in one of the most interesting chapters in the book, focused on the diversity of ape cultures in Africa. Once again, some critics seek to reserve the term 'culture' for human cultures. But Stanford argues that "a culture is a group of individuals sharing a basic bundle of traditions" that are passed on through flexible teaching and not just pre-programmed genetically (220). As he demonstrates, on this definition different populations of chimps, bonobos, and gorillas possess different cultures; they exhibit importantly varying traditions regarding tool use, sexual behaviors, food gathering techniques, and more. The moral lesson Stanford draws from this is that "the destruction of each forest means the loss of one chimpanzee culture. The loss of each chimpanzee culture means we lose a piece of the meaning of the species. There is no fundamental difference between the loss of a human culture or language in the face of contact with the outside world and the loss of similar memes among great apes" (221). Both are great losses.

Stanford makes a good case that when we lose populations of the great apes we are not just diminishing these species' gene pools, but losing cultural variation. Still, there remains the caveat that humans are not doing this "on purpose." In responding to this more directly, Stanford might have benefitted from exploring the recent literature on human genocides, which has called into question intent and planning as defining aspects of the phenomenon. Early theories of genocide (as well as its definition under the UN Convention on the Prevention and Punishment of the Crime of Genocide in 1948) were strongly influenced by the example of the Nazi holocaust, which was highly organized and centrally planned. More recent genocides, such as the slaughter in Rwanda in the 1990s, seem to have developed more spontaneously. The ground may have been prepared for them through the hateful rhetoric of some community and government leaders, but apparently there were no elaborate extermination plans. Instead, great poverty and resource scarcity, combined with a rapidly growing population, seem to have predisposed the members of rival ethnic groups to kill one another off in order to steal agricultural land. In the end, the territorial imperative may be the most important determinant of genocide. As one scholar writes, "it is actually very difficult to conceive of genocide without a territorial dimension. . . . Destroying a social group always means destroying its presence and its economic, social and cultural power within a

given territory" (Shaw, 2007). Planning and coordination, racial or ideological justifications, are all arguably less important than the brute fact of displacement of one group by another.

From a territorial perspective, the human domination and displacement of the great apes seems to fit the pattern of genocide. One benefit of such an account is that it can make room for the phenomenon of willed ignorance, explaining the important role this can play in genocide and other injustices (consider in this regard climate change denial: a convenient means for the present generation to avoid inconvenient duties to future ones). This approach, if it is justified, might make it easier to assign humanity greater responsibility for our displacement of the great apes and other species—an effort that most of the writers reviewed here appear keen to make.

While Planet Without Apes states its ethical conclusions forcefully, it is also clearly the work of a conservation scientist in command of the scientific and policy aspects of his topic. It includes clear and nuanced discussions of the causes of extinction facing different ape species. These include the ecological impacts of different types of logging; the means by which traditional African hunting practices have quickly morphed into the commercial "bushmeat" trade, with its attendant "empty forest syndrome"; the spread of palm oil plantations in Indonesia and political anarchy across large swathes of central Africa; and more.

The book also carefully and realistically considers possible conservation measures. Stanford appears convinced that at least in Africa, further ecotourism development is likely the only way to preserve these magnificent animals in situ. He recognizes the grave dangers along this path, including excessive habituation and the certainty of sometimes transmitting human diseases to apes. Yet in the face of great human need and corrupt governments, finding ways that ape conservation can benefit people economically is probably the only way to achieve significant conservation. Stanford also sticks up for the importance of national parks and other formally protected areas, arguing that in a hundred years the only great apes existing in the wild will likely be found within designated wild lands. Of course such areas must be protected in reality and not just "on paper," yet another conservation issue he deals with in his book (like Turvey's book on the baiji dolphin, Planet Without Apes does a good job of leaving PC pieties aside and recognizing the failure of Indonesian and African governments to protect the great apes living within their borders).

"I have no patience for conservation accounts that portray the future of endangered wildlife in absolutely bleak terms," Stanford writes (6). In line with this, his book ends with a cautiously optimistic concluding chapter: if we chose the right policies, human beings can preserve viable wild populations of all the remaining great apes, if perhaps in reduced numbers. Yet one senses that Stanford wills himself to this conclusion, and that in his heart, he believes the genocide will continue.

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In his plea for more and better stories about threatened species, Thom Van Dooren emphasizes the importance of attending to the particular and warns against overgeneralization. As the works reviewed here demonstrate, even telling the story of the extinction of a single bird, mammal, or tree species is a challenging task. Yet the sixth mass extinction is bigger than any one species and it is this larger story that Elizabeth Kolbert seeks to tell in her new book The Sixth Extinction: An Unnatural History. Kolbert is an accomplished environmental reporter and the author of a previous book on climate change, the highly regarded Field Notes from a Catastrophe (2006). While the other books reviewed here are well written and important, the reality is that Kolbert's book will probably garner more readers than all half dozen of them put together. Published by a trade rather than an academic press, hers is the one you can find on the "new arrivals" table at Barnes & Noble. Fortunately,

she is a master storyteller in full command of her material, whose book will indeed help general readers better understand the essential facts and awesome scope of the sixth mass extinction.

Each of the book's thirteen chapters focuses on an individual species or group of species that is extinct or threatened with extinction. The first, beginning with the Panamanian golden frog (*Atelopus zeteki*) and other frogs of Central America, broadens out into an account of the threats to amphibians worldwide. In a few sentences, Kolbert deftly illustrates the amazing diversity of global amphibians, a diversity long in the evolving. She succinctly explains how an exotic chytrid fungus is devastating frog populations around the world, with no sense yet that its spread can be stopped or its effects mitigated. Here as elsewhere, Kolbert strives to portray conservationists' efforts honestly and without false hope. "Everyone I spoke to at EVACC [the El Valle Amphibian Conservation Center in Panama] told me that the center's goal was to maintain the animals until they could be released to repopulate the forests, and everyone also acknowledged that they couldn't imagine how this would actually be done. 'We've got to hope that somehow it's all going to come together,'" one herpetologist tells the author. "'We've got to hope that something will happen, and we'll be able to piece it all together, and it will all be as it once was, which now that I say it out loud sounds kind of stupid'" (14–15). Says another researcher, "The point is to be able to take them back, which every day I see more like a fantasy" (15), given the continued presence of the exotic fungus and other stressors.

Kolbert's goal isn't to induce feelings of hopelessness in her readers, I take it, but to give those readers a sense of just how powerful the forces are that are driving the sixth mass extinction, and how difficult it will be to avoid it—if this is even possible. In a similar vein, she points out that even under very optimistic climate change scenarios, where the global community makes strenuous efforts to keep temperature increases toward the lower end of what is possible, biologists still predict massive climate-related biodiversity losses. The point is not that we should not strive to limit climate change—more climate change will likely lead to even greater losses. The point is to take an honest look at where we are headed and where we are taking the rest of creation.

The next five chapters describe species that went extinct either in deep time, like graptolites and ammonites, or relatively recently, like mammoths and the great auk. Here Kolbert tells the story of how scientists gradually came to understand that life evolves and that species extinction is possible, in the process discovering the deep time that paleontologists think within today. She explores the previous five mass extinctions, discussing possible causes and the millions of years life needed to rebound to former levels of diversity. This approach cleverly ties the reader's attempt to understand the sixth mass extinction to some of the great intellectual achievements of modern science. It also helps Kolbert demonstrate and explain issues of scale. This is particularly important, since appreciating the scale of mass extinction, its temporal rarity and the sheer numbers of species that are being lost, is among the great hindrances to non-scientists really understanding it.

Subsequent chapters focus on species that are currently being extinguished. Kolbert visits various diverse and threatened ecosystems, and interviews the scientists and conservationists trying to understand and protect them. Like the rest of the book, these chapters are beautifully written. They provide a near perfect example of popular science writing, as a judicious mix of storytelling, vivid description, and clear analysis explains the proximate causes of the sixth mass extinction. For example, the role of exotics in driving species endangerment is explored through a discussion of white nose syndrome in bats, featuring some of the scientists who first discovered the phenomenon in the northeastern U.S., as well as Kolbert's own spelunking. The potential dangers to biodiversity from ocean acidification are well illustrated by the paucity

of species in the vicinity of undersea volcanic vents; Kolbert joins marine biologists diving alongside vents off the small island of Castelloragone, near Naples. Whether she is hiking deep within a South American jungle, watching a scientist discover a new tree species, or scuba diving along Australia's Great Barrier Reef when the corals are spawning, Kolbert's descriptions well capture the beauty of Earth's biological diversity and the excitement of exploring it.

Kolbert is a trustworthy guide to some important aspects of anthropogenic mass extinction that are easy to overlook; for example, the fact that mass extinctions "lay low the strong as well as the weak." Traits that were a good evolutionary bet in many ecosystems for immense periods of time—such as large size with the trade-off of slow reproduction times—are suddenly, when humans come on the scene, disastrously maladaptive. She is very good at explaining scientific points to laymen. At just the right time, readers are told that the pH scale is logarithmic, in order to better appreciate how much humans are changing the ocean's chemistry. She deploys vivid phrases, such as "putting Pangaea back together" to convey the scope of human-caused biological invasions taking place around the world today. Above all, she works to convey to her readers the huge scale of the changes people are causing: "every year more non-indigenous species of mammals, birds, amphibians, turtles, lizards, and snakes are brought into the U.S. than the country has native species of these groups" (211); Earth now has the highest carbon concentrations it has seen for a million years or more; etc.

Kolbert picks up on the theme that human-caused change has led to a new epoch for life on Earth. But unlike such fatuous treatments as Ackerman (2014) she does not suggest that there is any cause to celebrate this new Anthropocene epoch, because clearly it is a disaster for other species. "The way corals change the world—with huge construction projects spanning multiple generations—might be likened to the way that humans do," she writes: "with this crucial difference. Instead of displacing other creatures, corals support them. Thousands—perhaps millions—of species have evolved to rely on coral reefs, either directly for protection or food, or indirectly, to prey on those species that come seeking protection or food. This coevolutionary venture has been under way for many geologic epochs. Researchers now believe it won't last out the Anthropocene" (130).

The evidence suggests that human beings have been disastrous for other species ever since we first evolved into something recognizably ourselves. The Anthropocene has been an Age of Death for many other species, and it has been going on for tens of thousands of years. Reviewing the historical record, Kolbert generally supports the "overkill" hypothesis, which finds modern humans causing extinction waves through overhunting as they colonized new areas around the world. Like Greenberg in *A Feathered River Across the Sky*, she brushes aside attempts to whitewash humanity by finding other causes for these extinctions in Australia, North America, Madagascar, and elsewhere. Like Stanford in *Planet Without Apes*, she sees us as "pruning our own family tree": first by extinguishing the Neanderthals and Denisovans, and now in our displacement of the great apes—although she avoids the term "genocide" to describe this displacement.

In fact, Kolbert generally avoids moral terms in describing the sixth mass extinction, and avoids blaming people for causing the particular extinctions that go to make it up. Is this a strength or a weakness of her account? Perhaps both.

Moral responsibility implies conscious agency. For many and perhaps most past anthropogenic extinctions, it is hard to assign such agency. Moral responsibility also implies that today humanity could choose to avoid the sixth mass extinction, through sufficient concern, enlightened government policies, and so forth. But can we? It is not clear. It could be that like the asteroid that killed

the dinosaurs, humanity is out of control: an inevitable disaster for the biosphere. “To argue that the current extinction event could be averted if people just cared more and were willing to make more sacrifices is not wrong, exactly; still, it misses the point,” Kolbert believes. “It doesn’t much matter whether people care or don’t care. What matters is that people change the world” (266), rapidly and massively, disrupting the world at scales beyond those to which other species can adapt. In a recent review, Verlyn Klinkenborg (2014) writes that “when I first read *The Sixth Extinction*, I thought there was a chapter missing. It might have been called ‘Why We Should Care’” (29). But Kolbert’s point is that caring is not enough, and that when it comes to human impacts on the biosphere, intentions are trivial compared to actions.

Still, Klinkenborg grapples with supplying a moral argument for why humans should care about our extinction of other species, and why it is “biotically indecent” not to act to stop it. “Every species that has ever existed on this planet is or has been a successful experiment in living,” he writes. “Existence is the only measure of success, not pervasiveness or ubiquity or intelligence . . . No species is more valuable or meaningful than another, except in the minds of humans . . . The general tendency of our species—a tendency that seems to be intensifying all the time—is to decrease biological diversity on this planet. We do so by destroying habitats, overconsuming natural resources, and spreading invasive species, willingly or not. It’s tempting to say that this is the cost of consciousness. We like to imagine that cultural diversity is an adequate substitute for biological diversity—for ourselves, if not for other species. It isn’t” (30). For those looking for more fully developed arguments for other species’ intrinsic value or right to continued existence, philosophical resources are available (Agar, 2001; Gorke, 2003). In any event, many readers will share Klinkenborg’s intuition that the moral cannot be left out of this story.

Kolbert, too, most likely shares that intuition, even if she finds intellectual or narrative reasons to avoid directly discussing the morality of extinction in her book. Intellectual reasons: the issues are complicated; the general nature of ethical justification is still a matter of disagreement among moral philosophers; specific arguments regarding the moral worth of other species remain inconclusive (Sandler, 2012). Narrative reasons: the story she tells is already immensely complicated and she must limit the demands she makes on her readers; moral concern may perhaps be conveyed or evoked more effectively indirectly, through description and storytelling (a claim explicitly made by Van Dooren in *Flight Ways*).

Kolbert may avoid directly discussing the morality of the sixth mass extinction because she finds such reflections hard to bear herself, or because she believes such discussions will deter potential readers. Or again, she may just doubt that humanity can avoid extinguishing wild nature. “What matters is that people change the world,” she writes. “This capacity predates modernity . . . Indeed, [it] is probably indistinguishable from the qualities that made us human to begin with: our restlessness, our creativity, our ability to cooperate to solve problems and complete complicated tasks. As soon as humans started using signs and symbols to represent the natural world, they pushed beyond the limits of that world . . . If you want to think about why humans are so dangerous to other species you can picture a poacher in Africa carrying an AK-47 or a logger in the Amazon gripping an ax, or better still, you can picture yourself, holding a book in your lap” (266). It is not some unruly “other” that is extinguishing species, Kolbert reminds her readers, through irrational actions that might be reined in with increased efficiency or improved management. It is all of us, with our many and growing demands on nature. Humanity’s cognitive abilities allow us to manage and mangle the world, extinguishing

other species as we breach natural limits: first in thought and then in deed. That might just be what we do.

Here though, the question of morality reasserts itself. For it is precisely our cognitive abilities, our reason, that allows us (we hope) to imagine better choices and sometimes to act on them. It is our ability to understand and appreciate stories, such as the life histories and evolutionary histories of natural species, that allows us sometimes to act with restraint, so as to preserve those good things that are worth preserving. Are our relationships with other species outside the realm of such morality? Aldo Leopold, Rachel Carson, Wangari Maathai and many other giants of conservation have argued “No.” They worked to put morality at the center of conservation and to make it a part of our relationships to other species. I believe they were right to do so.

Kolbert is a terrific writer and her book should do a lot to educate general readers about the sixth mass extinction. Still, no book can do everything, and there is more to the story. We need to place the sixth mass extinction in its proper moral perspective. Human beings do naturally “push beyond the limits” of the world as it is given. We innovate, but we also restrain ourselves. Morality involves setting and enforcing limits, and human society is only possible because of this restraint.

It is only when people recognize and accept limits that the possibility emerges of treating one another morally. The same holds true for our treatment of other species. To have any realistic hope of acting justly toward other species, we must accept and indeed embrace limits to our own numbers and to our economic demands on the world. *The Sixth Mass Extinction* contains no real discussion of such matters. But without serious consideration of limits to growth, there really is no hope for preserving the world’s wild biodiversity. Some may claim that is just the way things are. As Craig Dilworth demonstrates in *Too Smart For Our Own Good: The Ecological Predicament of Humankind* (2009), the growth imperative lies very deep in human psychology and social organization, and may be inescapable. Even if that is not the case, there is little evidence that contemporary human beings have much interest in limiting growth to ensure the well-being of our own children and grandchildren, much less frogs or corals, dolphins or ferrets. Still, arguably, we should. The claims of morality transcend our current realities and call humanity to something better.

In the end, Elizabeth Kolbert is only willing to allow the morality of her story to come out indirectly. First, in her vivid yet often elegiac descriptions of species and ecosystems that have been or soon will be extinguished. Second, in juxtaposing the story of humanity’s hard-won understanding of biodiversity’s history with the story of its rapidly increasing displacement at our hands. As E.O. Wilson writes, in a quote which introduces her volume: “If there is danger in the human trajectory, it is not so much in the survival of our own species as in the fulfillment of the ultimate irony of organic evolution: that in the instant of achieving self-understanding through the mind of man, life has doomed its most beautiful creations.” The ultimate irony? We might better call it the ultimate crime.

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What can we learn from reading these seven books on extinction and pondering the stories they tell? First, that we must protect nature from commerce. From passenger pigeons to *Pongo pygmaeus*, the pursuit of profit has spelled ruin for countless wild species. Setting aside lands that are free from commercial hunting, logging, and other extractive uses remains the most effective way to protect wild nature, while “working landscapes” never work for an ecosystem’s full complement of native flora and fauna.

Second, these books remind us that while saving other species is hard, people continue to be inspired to take up this necessary

work. The heartbreaking nature of biodiversity conservation in the twenty-first century comes through particularly clearly in Turvey and Jachowski, while all seven books suggest that the outlook for preventing future extinctions is bleak. Yet men and women around the world continue to accept the challenge of protecting other species and telling their stories to a wider world. They deserve our thanks and our active support.

Third, conservationists are much more comfortable talking about the proximate causes of extinction than about its underlying, fundamental causes: human economic and demographic growth. While this failure to grapple with the systemic causes of species loss may stem from a desire to be “practical,” it often leads to incomplete analyses and a failure to articulate what would be needed to achieve real conservation. Arguably, a book about great ape conservation that ignores the need to stabilize human populations in Indonesia and Africa ignores one of the most important factors that will determine whether or not ape conservation succeeds. Arguably, books that decry the decline of black-footed ferrets or the eastern hemlock while accepting that commerce will continue indiscriminately spreading exotic diseases and pest species around the world are books that are sure to have many sequels.

Fourth, conservationists are a long way from imagining, much less demanding, the kinds of societies that would actually have a chance to conserve Earth’s biodiversity for the long term. Partly this is due to the underdeveloped state of conservation ethics. The books under review here actually give some grounds for hope on this score: excepting the Kolbert volume, they all grapple seriously with questions of right and wrong in our treatment of other species. That’s good to see. We will know we are in the vicinity of a mature conservation ethics when talk of efficiency and ecosystem services is balanced by talk of love and limits, beauty and integrity, appreciation and gratitude. Conservation biologists should take a page from these books and talk more frequently about their values, and about the kinds of nature-loving societies that they would like to live within.

What would it take to really “save” Earth’s endangered species? Simply ramping up current efforts will not be enough: capturing the last few cranes or condors, ferrets or baiji, managing them carefully, restoring them to well tended protected areas. We do need such efforts, of course, along with ecological restoration projects to undo past damage, better pollution controls and more efficient resource use. But beyond all this, we need to create societies that don’t damage nature and extinguish other species in the first place. That means limiting our numbers and economic demands. It means forcefully curbing our natural desire to be in control. As E.O. Wilson says, it means “leaving half for nature,” at least, in parks and other protected areas. It means rewriting a story that right now does not appear to be heading toward a happy ending, for them or for us.

References

- Ackerman, D., 2014. *The Human Age: The World Shaped by Us*. W.W Norton.
- Agar, N., 2001. *Life’s Intrinsic Value*. Columbia University Press.
- Cockino, C., 2009. *Hope Is the Thing With Feathers: A Personal Chronicle of Vanished Birds*. Tarcher.
- Dilworth, C., 2009. *Too Smart for Our Own Good: The Ecological Predicament of Humankind*. Cambridge University Press.
- Ehrlich, P., Ehrlich, A., 1981. *Extinction: The Causes and Consequences of the Disappearance of Species*. Random House.
- Foster, D., 2001. *Thoreau’s Country: Journey through a Transformed Landscape*. Harvard University Press.
- Freilich, J., Emlen, J., Duda, J., Freeman, D., Cafaro, P., 2003. Ecological effects of ranching: a six-point critique. *BioScience* 53, 759–765.
- Gorke, M., 2003. *The Death of Our Planet’s Species: A Challenge to Ecology and Ethics*. Island Press.
- Kareiva, P., Lalasz, R., Marvier, M., 2011. Conservation in the anthropocene: beyond solitude and fragility. *Breakthrough* J., 29–37 (Fall).
- Klinkenborg, V., 2014. How to destroy species, including us. *The New York Review of Books* (March 20), 29–30.
- Kolbert, E., 2006. *Field Notes from a Catastrophe: Man, Nature, and Climate Change*. Bloomsbury.
- Kotliar, N., Miller, B., Reading, R., Clark, T., 2006. The prairie dog as a keystone species. In: Hoogland, J.L. (Ed.), *Conservation of the Black-Tailed Prairie Dog: Saving North America’s Western Grasslands*. Island Press, pp. 53–64.
- Le Saout, S., Hoffmann, M., Shi, Y., Hughes, A., Bernard, C., Brooks, T., Bertzky, B., Butchart, S., Stuart, S., Badman, T., Rodrigues, A., 2013. Protected areas and effective biodiversity conservation. *Science* 342, 803–805.
- Marris, E., 2013. *The Rambunctious Garden: Saving Nature in a Post-Wild World*. Bloomsbury.
- McLellan, R., Iyengar, L., Jeffries, B., Oerlemans, N. (Eds.), 2014. *Living Planet Report 2014: Species and Spaces, People and Places*. World Wildlife Fund.
- McKee, J., 2003. *Sparing Nature: The Conflict between Human Population Growth and Earth’s Biodiversity*. Rutgers University Press.
- Rodrigues, A., Akçakaya, H., Andelman, S., et al, 2004. Global gap analysis: priority regions for expanding the global protected-area network. *BioScience* 54, 1092–1100.
- Sandler, R., 2012. *The Ethics of Species: An Introduction*. Cambridge University Press.
- Shaw, M., 2007. *What is Genocide?* Polity Press.
- Staples, W., Cafaro, P., 2012. For a species right to exist. In: Cafaro, P., Crist, E. (Eds.), *Life on the Brink: Environmentalists Confront Overpopulation*. University of Georgia Press, pp. 283–300.
- Wilkinson, T., 2013. *Last Stand: Ted Turner’s Quest to Save a Troubled Planet*. Lyons Press.
- Wills, C., 2013. *Green Equilibrium: The Vital Balance of Humans and Nature*. Oxford University Press.
- Wilson, E.O., 2014. *A Window on Eternity: A Biologist’s Walk Through Gorongosa National Park*. Simon & Schuster.
- Wuerthner, G., Matteson, M., 2002. *Welfare Ranching: The Subsidized Destruction of the American West*. Foundation for Deep Ecology.

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