

# The Perils of De-extinction

By BEN A. MINTEER

## TASMANIA'S LOST TIGER

It wasn't a tiger, at least not in the biological sense. But in the cultural imagination of British and Irish sheepherders transplanted to “Van Diemen's Land” off the southeastern coast of Australia in the early nineteenth century, the carnivorous, striped creature with the stealthy nature certainly fit the bill.<sup>1</sup> Dubbed the Tasmanian tiger—or, alternatively, Tasmanian wolf (which it also was not)—the elusive animal was viewed as a threat to the island's rapidly growing though ultimately ill-suited sheep industry, an unwanted varmint that was also seen as an impediment to the development of the Tasmanian wilderness.



“Benjamin,” the last Thylacine, at the Hobart Zoo in 1933 (Image: Wikimedia)

Neither tiger nor wolf, the “Thylacine” (as it became known after several taxonomic fits and starts), was, in fact, a marsupial mammal roughly the size of a hyena. It went extinct on the Australian mainland around 35,000 years ago, a period that corresponded with the arrival of the dingo (the natural history of the species, however, is a bit foggy). Tasmania, an island state around the size of Ireland or West Virginia, only ever held a small remnant population of Thylacines, probably not more than five thousand at the time of British settlement in 1803.<sup>2</sup>

The species would be decimated in the nineteenth century by bounty hunters working at the behest of the Van Diemen's Land Company, a United Kingdom-based wool-growing venture with a myopic desire for a predator-free landscape. The private bounties would eventually be joined by an official governmental bounty in 1888, which would record more than two thousand kills over the next two decades. Despite its reputation as a bloodthirsty sheep killer, though, the empirical evidence doesn't seem to support the view that the Thylacine was a significant predator of sheep on the island. Some historians have even suggested that the bounty systems and the exaggerated claims about Thylacine predation were attempts to veil an untenable and inexpert sheep industry, a situation that had far more to do with human incompetence and avidity than it did with the actions of marauding marsupials.<sup>3</sup> Regardless, bounties and development drove the species into increasingly remote and hard to access territories by the late nineteenth centu-

ry. By then, Thylacine sightings, which were never that common to begin with, were quite rare.

For decades, naturalists had been suggesting that the animal could be at risk of extinction if these trends continued. There were a few scattered calls for the conservation of Tasmanian wildlife and habitat at the turn of the century, but little measurable progress. In 1914, amid growing concerns within scientific circles that the species was on its last legs, the Tasmanian biologist Thomas T. Flynn (father of the swashbuckling actor Errol Flynn) proposed the establishment of a Thylacine sanctuary, a last-ditch effort to stave off extinction. The idea went nowhere. When a farmer named Wilf Batty shot a Thylacine he caught eating his poultry in May of 1930, it proved to be the last documented kill of the animal on the island.



Tasmanian farmer Wilfred (“Wilf”) Batty with the last confirmed kill of a Thylacine. (Image: Wikimedia [public domain])

Six years later, in July of 1936, the Thylacine would finally receive full protection in the form of a governor’s proclamation. But by then it was only a symbolic gesture. The last known Thylacine died in the Hobart Zoo in September that same year, enjoying, as the historian Robert Paddle has observed, complete and unequivocal protection for its last fifty-nine days of existence.<sup>4</sup>

#### BRING ‘EM BACK ALIVE

How far should we go to bring back lost species? It isn’t a straightforward question, in part because of a key semantic ambiguity: what do we mean by “lost”? Until very recently, recovering lost species meant either the re-introduction of a population that had disappeared from a local range but that was still extant elsewhere (e.g., the return of the Gray Wolf to Yellowstone National Park using animals translocated from Canada), or the re-introduction of a species that had become extinct in

the wild but that still persisted in ex-situ conservation facilities (e.g., the reintroduction of the California condor).

But there is now a third understanding of bringing back lost species, one that takes us into somewhat different scientific and philosophical territory than restoring wolves and condors to their historic ranges. It’s one that until recently seemed unthinkable because it was undoable: the idea of stirring extinct species—including some that vanished thousands of years ago—from their evolutionary graves.

Called “de-extinction”—or, if you prefer a more transcendental register, “resurrection biology”—the controversial idea is premised on a set of established and newer techniques in molecular biology and genetic engineering.<sup>5</sup> One of the more familiar methods is “back-breeding,” or the selective breeding of an extinct animal’s living relatives to carry forward traits resembling the phenotype of the lost species. It’s a technique currently being employed to breed a strain of domestic cattle into something resembling the Aurochs, a species of wild European cattle (and ancestor of modern domestic cow) that went extinct in the first half of the seventeenth century. A more complicated de-extinction technology is the cloning of extinct species via somatic cell nuclear transfer; this method is currently being used in an effort to bring back the Pyrenean Ibex, a Spanish wild goat that went extinct in 2000.

Much of the de-extinction discussion, though—especially as it has played out in the media—has been dominated by discussion of newer, advanced techniques in genetic engineering and synthetic biology, particularly the technological breakthroughs allowed by the ability to rapidly sequence long extinct genomes. These techniques, which are fast developing, could allow scientists to create something resembling long-lost species, perhaps even those that have been extinct for thousands of years. By using ancient DNA taken from museum specimens, scientists could sequence the extinct genomes and “edit” the DNA of closely related species to come up with a genetic blueprint very similar to the extinct forms. So a Band-tailed Pigeon genome could be manipulated into something approximating a Passenger Pigeon genome, an Asian Elephant could have genes for a Woolly Mammoth spliced into its DNA, and so on.

Defenders of de-extinction tend to make a common set of arguments for bringing back vanished biota. One group of claims highlights the ecological and evolutionary benefits: the revived species, we are told, will perform vital (and often lost) ecological functions when

returned to the landscape. For example, the resurrected mammoth could become a keystone species in the restoration of the “mammoth steppe” in northern Siberia, a “Pleistocene Park” containing a spate of reintroduced and revived wildlife in an attempt to reset the ecological and evolutionary clock in this part of the Arctic.

But broader cultural, aesthetic, and moral reasons are also given for bringing back lost species. Supporters argue that de-extinction will evoke a powerful sense of wonder and awe as we witness species raised from the dead and returned to the landscape. On moral grounds, restoring extinct animals has been promoted as our opportunity to finally “put things right,” to balance the moral accounts and make amends for our past ecological transgressions.

Perhaps because of its sad history, which probably had something to do with the animal’s reemergence

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as a conservation icon in Australia in the late twentieth century, the Thylacine is one of the more popular candidates for de-extinction.

The idea of trying to revive the species, though, is not entirely new. In 1999, scientists at the Australian Museum in Sydney began a project that attempted to clone the species using fragments of ancient DNA from preserved specimens. Cost and technological limitations of the time apparently led to the cessation of the project in 2005. A decade later, many scientists and supporters are now taking a more sanguine view of the feasibility of bringing it back.

So let’s imagine, then, that we could use these cutting-edge techniques in conservation genomics to create something close enough to a Thylacine (stripes and all) to call it a Thylacine. And let’s also imagine that a suitably large number of the animals could be created to the point that a viable population could be introduced into the Tasmanian eucalypt forests and grasslands. If we could somehow manage to do all of that, well, why shouldn’t we, especially given the clear and direct human role in the destruction of the species?

It turns out that not everyone thinks de-extinction is such a great idea. Some conservationists, for example, have raised the concern that the introduction of the revived wildlife into contemporary habitats would be more likely to bring ecological destruction than salvation. Native fauna and flora would, they argue, pay the price as the engineered creatures invade and alter ecosystems, environments that have inevitably changed (in

some cases, rather dramatically) in their absence.

The financial cost of de-extinction has also been a point of contention, with some conservationists expressing the worry that the limited funds available for traditional species protection (e.g., buying lands to shield them from development) would be diverted to the more glamorous and trendy revivalist projects. Some have also raised the concern that, if de-extinctionists were to be successful, they would erode popular support for other and more traditional conservation initiatives. After all, why worry about endangered species if extinction is no longer an evolutionary death sentence?

These are important reservations, even if they aren’t all equally compelling (e.g., the benefactors of de-extinction will not likely be the same crowd writing \$25 checks to the Defenders of Wildlife). But there are other consequences of the de-extinction agenda, concerns that I think cut more deeply into our environmental values and our moral character.

#### THE TECHNOLOGICAL SUBLIME

The capacity of wild nature to produce a sense of awe and wonder—even something approaching fear—defined the aesthetic response of many eighteenth and nineteenth century artists and philosophers to the natural world. It was the language of the sublime, a reaction to the power, mystery, and beauty of a world beyond human making, understanding, and control. Take, for example, the ornithologist and painter John James Audubon’s description of the vast flocks of Passenger Pigeons blotting out the sun in the Kentucky sky in 1831:

The noise which they made, though yet distant, reminded me of a hard gale at sea...The pigeons, arriving by thousands, alighted everywhere, one above another, until solid masses as large as hogsheads were formed on the branches all round. Here and there the perches gave way under the weight with a crash...I found it quite useless to speak, or even to shout to those persons who were nearest to me.<sup>6</sup>

The birds elicited a similar response from Audubon’s fellow naturalist and illustrator Alexander Wilson: “I was suddenly struck with astonishment at a loud rushing roar, succeeded by instant darkness, which, on the first moment, I took for a tornado, about to overwhelm the house, and everything around in destruction.”<sup>7</sup>

Although de-extinctionists claim that revived species will be proper objects of aesthetic appreciation, awe, and wonder, they are in fact trading this aesthetic regard for the sublime qualities of wild nature for a cel-

ebriation of our own technological ingenuity, power, and control. It's a move anticipated by the philosopher Immanuel Kant, who thought the unique human faculty of reason ultimately allowed us to separate ourselves and transcend the forces of nature. "Sublimity," he wrote in his *Critique of Judgment*, "...does not reside in any of the things of nature, but only in our own mind, insofar as we may become conscious of our superiority over nature within, and thus also over nature without us."<sup>8</sup> Leo Marx, in his 1964 masterpiece *The Machine in the Garden*, revealed how this tension between the lure of nature as an alternative set of values and the siren call of technology animated the work of some of the leading lights of the American literary tradition, from Jefferson and Thoreau to Melville, Twain, and Fitzgerald. The embrace of the technological over the natural, in other words, has deep cultural roots.

A familiar story or not, it's an aesthetic and philosophical move that has reached something of a zenith in the hands of the de-extinctionists, where the sense of wonder and respect once directed at nature has become instead a regard for our own technological prowess. Here's how Harvard geneticist George Church, a leading de-extinction proponent, describes the proposal to bring back the Heath Hen, a relative of the Greater Prairie Chicken that went extinct in the 1930s:

I'm particularly attracted to the heath hen because it's basically a slam dunk...We can just make a few adjustments to the DNA of the greater prairie chicken by synthesizing heath hen DNA. That would take days, thousands [of dollars], nothing. As an engineering project, birds are easy.<sup>9</sup>

Reading these words, I'm reminded of the conservationist-philosopher Aldo Leopold's (typically prescient) assessment of how the modern preoccupation with technology frustrates the development of a more meaningful environmental ethic. "Our tools are better than we are, and grow faster than we do," he wrote in "Engineering and Conservation" (1938). "They suffice to crack the atom, to command the tides. But, they do not suffice for the oldest task in human history: to live on a piece of land without spoiling it." Church may be right that engineering extinct birds is easy (though I have my doubts). But living sustainably and responsibly with other species on the planet, well, that has proved to be anything but.

#### FLIPPING THE SCRIPT

But there are further issues with de-extinction con-

sidered as a conservation ethic. Species revivalists like Brand try to frame the effort to bring back extinct species as a gesture of ecological recompense and an opportunity to revise a shopworn and tragic conservation narrative. That traditional account, we're told, is an unpleasant and discouraging tale of environmental destruction and loss. De-extinction promises a much cheerier story, a more uplifting narrative driven by sunny acts of biological creation and ecological recovery.

“Promoters of de-extinction are inadvertently undermining the responsibility to learn the lessons of our environmental history

It's an argument that seems to appeal to more than a few conservationists. One

of them is Stephen Kellert, Tweedy/Ordway Professor Emeritus of Social Ecology at Yale and a distinguished scholar of societal attitudes toward wildlife. In a recent letter supporting the proposed revival of the Heath Hen, Kellert applauds what he takes to be the power of de-extinction as a moral corrective:

[Reviving the Heath Hen] is about restoring the human spirit as much as restoring a singular biological entity. It is about redressing the harm we have so extensively inflicted on what Henry Beston once described as "other nations, caught with ourselves in the net of life and time...of the splendor and travail of the earth." It is about atoning for previous grievous wrongs. Restoring the heath hen offers us the chance for a moral reawakening. It provides us with an affirmative opportunity to restore our connection to the earth and contribute to the healing and beauty of the land.<sup>10</sup>

The problem with this position, at least by my lights, is twofold. First, I think Kellert, Brand, and other de-extinction proponents too casually and uncritically equate the engineered doppelgängers with the vanished species. Their remarks certainly seem to suggest they think that the introduction of the former somehow recovers all of the values lost with the disappearance of the latter.

You don't have to be an essentialist about the "natural," however, or cling to outmoded notions of species purity to recognize that there are, as we might say, morally significant differences between the extinct species and the synthesized versions. One key distinction hinges on the co-evolutionary natural history of the lost forms. Although the engineered reproductions may hold other values for conservationists, unlike their progeni-

tors they will not have evolved in relationship to other species within a natural habitat over millennia. And that unique co-evolutionary and ecological narrative is, I believe, an important part of how and why we value wild species. It's a character that simply can't be recreated in a modern genomics lab.<sup>11</sup>

The second problem is the idea that designing and releasing facsimile species somehow makes up for, maybe even reverses, the ecological mistakes of the past. The story seems to be that developments in twenty-first century species engineering will absolve us of the ecological sins of destroying the Thylacine, the Passenger Pigeon, the Heath Hen, and the rest. But in fomenting the fantasy that we can erase the environmental abuses of the past by pursuing high-tech species revival technologies, promoters of de-extinction are inadvertently undermining the responsibility to learn the lessons of our environmental history. Brand, for example, believes that bringing back the Passenger Pigeon will allow us to “reverse the founding human mistake that inspired modern conservation,” and that in doing so the narrative of conservation can break free of the “constant whining and guilt-tripping” that has defined its moral temperament.<sup>12</sup>

But it's not “guilt-tripping” to responsibly reflect on our environmental losses and to absorb the moral lessons of extinction. Admittedly, it's not always pleasant to dwell on the mistakes of the past, but being honest about the history of ecological destruction and maintaining a clear-eyed fidelity to this chronicle (especially in the face of efforts—both well intended and otherwise—to unravel it) is vital to cultivating and safeguarding a meaningful ecological ethic.

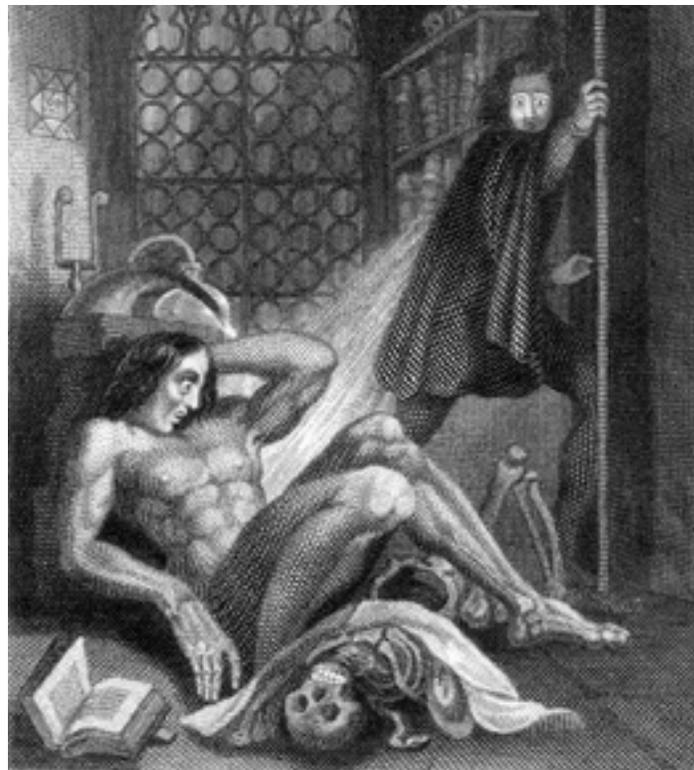
#### PROMETHEAN DREAMS

Lurking within some of the more fervent pro-de-extinction arguments is an even more troubling moral and cultural vision, however: a view of humans as all-powerful creators and the presumptive governors of planetary life. It's telling, I think, that Brand has resurrected and slightly revised his familiar motto from the *Whole Earth Catalog* in his pitch for de-extinction: “We are as gods and HAVE to get good at it.”<sup>13</sup>

Interestingly, Brand considers himself a “Pragmatist” in environmental and conservation matters; the subtitle of his most recent book is “An Eco-Pragmatist Manifesto.” But a truly authentic Pragmatism (i.e., that late nineteenth and early twentieth century school of American philosophy led by William James and John Dewey, among others) is distinguished not by Brand's

aggressively anthropocentric view of the universe, but by the recognition of our own fallibility and the contingency of experience and by a sense of human limits in nature. It's an outlook that, in Dewey's work, required the careful adaptation to and cooperation with natural forces as much as it necessitated adjustment and transformation of them. Brand's intellectual mooring is therefore not Pragmatism. Instead, it's a twenty-first century spin on Prometheism: a celebration and justification of human creation, power, and the control of nature in the engineering age.

Apparently, this Promethean ability to create also licenses the creator to destroy. Consider how de-extinction advocate Subrat Kumar (a biologist writing in the journal *Nature*) responds to worries that revived species could become destructive forces if and when they are eventually released into ecosystems: “Any species that we bring back,” he writes, “could be engineered to be eliminated easily should it pose a problem.”<sup>14</sup> It's a remark notable, perhaps, for its frankness (and for its tin ear toward animal and environmental ethics), but I think this cavalier view toward life flows quite naturally from the philosophical commitments of the de-extinction movement that at times bleeds through all the high-minded conservation rhetoric.



“A new species would bless me as its creator and source; many happy and excellent natures would owe their being to me.” [Frontispiece to the revised 1831 edition of Mary Wollstonecraft Shelly, *Frankenstein*; or the Modern Prometheus] (Image: Wikimedia)

## HARD CHOICES IN THE ANTHROPOCENE

De-extinction, then, fails as a conservation ethic. But I think it also collapses as a conservation strategy. Even if we could get past its myriad ethical, cultural, and philosophical challenges (spoiler alert: I don't think we can), it is difficult to see how it could ever play a significant role in the conservation of (extant) vulnerable species or the protection of ecological systems. It will do very little, for example, to address the current crisis of global bio-

“Conservation in the Anthropocene must be a balancing act between the pragmatic need for action and the moral wisdom of ecological restraint.

diversity decline and habitat fragmentation and destruction. That's not to say that some of the technologies at the core of the idea don't have scientific value for conservation; the study of ancient DNA to understand ecological and evolutionary processes, for example, is certainly relevant to contemporary conservation science.<sup>15</sup> But de-extinction can't be considered a plausible conservation approach, despite the desire of Brand and others to make it one. It's only a curio.

High-tech fantasies like de-extinction will certainly not do much to address the ratcheting up of the rate of current global species losses—perhaps more than one thousand times the background or “normal” rate of extinction. It's a distressing statistic that has led many biodiversity scientists to suggest that we may be in the middle of a sixth mass extinction on earth, an event on par with the disappearance of the dinosaurs.<sup>16</sup> But it isn't only the quickening extinction trends that are troubling. It's also the wider pattern of population declines and decreases in abundance of individuals within them. This has prompted some scientists to refer to the current moment as the “Anthropocene defaunation,” a term that captures the full sweep of human-driven species decline as well as the impacts of these losses on the healthy functioning of ecosystems.<sup>17</sup>

The numbers are alarming (there's that doom and gloom again). According to the 2014 Living Planet Index report authored by the World Wildlife Fund and the London Zoological Society, on average vertebrate species populations have declined 52 percent since 1970.<sup>18</sup> A new analysis performed by the journal *Nature* has found that 41 percent of all amphibians, 26 percent of mammal species, and 13 percent of birds currently face extinction, with considerably higher percentages at risk in the future if current threats, from climate change and habitat loss to species exploitation, continue unabated.<sup>19</sup>

Responding systematically and effectively to the global conservation challenge demands an extraordinary effort and by all accounts an unprecedented one. Hard decisions will have to be made. For example, in many cases intensive and aggressive conservation actions will be required to protect biodiversity in the coming decades. These might even include translocating vulnerable populations outside their historical ranges to novel habitats deemed more suitable as the climate changes, a controversial practice called managed relocation (a.k.a., “assisted colonization” or “assisted migration”). It's a radical departure from the traditional preservationist approach, which emphasizes the protection of species in their historical habitat and, in general, the minimization of human manipulation of ecological communities.<sup>20</sup>

As we go down this more interventionist path, however, we need to ensure that our aggressive efforts to conserve do not evolve into a “save species at any cost” philosophy. If we end up sacrificing other important environmental and moral values, such as the respect for nature's wildness and a sense of human proportion on the landscape, we will have lost something vital in our conservation ethic as we tighten our grip on the ecological and evolutionary wheel. Conservation in the Anthropocene must be a balancing act between the pragmatic need for action and the moral wisdom of ecological restraint.

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The Thylacine was officially declared extinct by The International Union for Conservation of Nature (IUCN) in 1986, fifty years after the last known individual died in the Hobart Zoo. Over the years the species has become a powerful environmental symbol on the island, an emblem appearing on everything from postage stamps and license plates to beer bottles. It's a form of mass cultural atonement, perhaps, for a widely acknowledged and lamented environmental mistake.

Even though repeated organized searches for proof of its existence have produced no definitive evidence that the animal still roams the Tasmanian wilds, Thylacine sightings have been reported regularly on the island since the 1930s, against all odds and, one might conclude, all reason. Somehow, then, the animal has also managed to morph into something else in the Tasmanian moral imagination, something other than a tragic icon of human destructiveness and loss. It's become a symbol of a kind of stubborn environmental hope, though not the false hope promised in de-extinction dreams. It's the col-

lective wish that nature retains just enough mystery—and just enough power—to still surprise us, even in the Age of Humans.

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Ben A. Minter holds the Arizona Zoological Society Endowed Chair in the School of Life Sciences at Arizona State University. His work explores the intersection of environmental ethics, ecology, and conservation. He is also a Senior Scholar at the Center for Humans and Nature.

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