

# Goodbye Eternal Frontier

By Connie Barlow

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Native or alien? The distinction is crucial for conservation. An understanding of deep time, however, can scramble the categories. For example, most of us are aware that the “Old West” image of a Lakota warrior riding bareback on a horse is a blend of native and alien. The Lakota were foot-bound until horses sailed across the Atlantic with the Spanish and went feral in the New World. The twist here is that, according to Tim Flannery in his book, *The Eternal Frontier*, it is the *horse* that is native.

Flannery explains that horse ancestors originated in North America 45 or 50 million years ago; humans have been here a mere thirteen thousand years. Horses spent their first 30 million years evolving on this continent and nowhere else. Only during the Miocene, when North America sprouted a dozen kinds of three-toed horses (some grazers, some browsers), did equids begin to colonize the eastern hemisphere. Those early emigrants did not persist in the east, however. The Asian and African horses alive today (including the zebras) all came from ancestors who were confined to North America until just 3 million years ago. Were it not for those persistent descendants of vagrant North American stock, horses would have gone globally extinct when they vanished from North America 13,000 years ago.

This is deep time history, deep ecology history. This kind of education not only alters one’s outlook. It invites a new relationship to the land Americans call home.

Then again, is this home? Tim Flannery, an Australian paleontologist, carries the objectivity of an outsider when he observes that the EuroAmerican culture that dominates North America today is still treating the continent as a frontier — as a place that holds resources to be exploited, and exploited yet again, and by a still-expanding population. We Americans, of course, already know that this is what is expected of the continent, whether we agree or no.

The revelation is that a people cannot relate to a landscape both as limitless frontier and as home.

## **A Deep Time and Deep Ecological History Of North America**

Tim Flannery, director of the South Australia Museum, is officially a vertebrate paleontologist. Yet *Eternal Frontier* is a cross-disciplinary opus that draws from botany, geology, ecology, geography, archeology, anthropology, and American history as well as paleontology and zoology in constructing the first deeply ecological story of this continent that is also grounded in deep time. (The book’s subtitle is “An Ecological History of North America and Its Peoples.”) It is a stunning integration — a *relevant* college education in a mere 380 pages. Any of us who think we know our bioregional stories will think again upon entering this book, for this is the full Cenozoic story of North America. Henceforth, any telling less than this is shallow ecological history.

Flannery begins his tale with the asteroid impact off the coast of Mexico that ended the Mesozoic Era 65 million years ago by extinguishing the ammonites, the great marine reptiles, and the dinosaurs, while severely diminishing the diversity of animal taxa from foraminifera to mammals. Plants took a hit, too, but mostly here in North America and eastern Asia, where the shock and firestorms of the impact were most intense. (Plants can, after all wait out horrific conditions as root, seed, or spore.) The end-Cretaceous impact event is described by Flannery in gruesome detail, leaving the reader aghast at how truly empty of life this charred continent had become in the aftermath, and how open it was, therefore, to the extravagances of “ecological release” and “evolutionary radiation” for those lucky lineages who first wafted in by spore or seed, or poked their heads out of the mud after a long, impact-winter sleep.

The only seed stock for replenishing North American forests seems to have come from what is now the eastern Canadian arctic. Fortunately, Earth was in a greenhouse at the end of the Mesozoic, so the arctic was cloaked with temperate-adapted plants, including the oldest flowering plant lineages that had begun (independently) to evolve tree forms about 70 million years ago: notably, the magnolia (Magnoliaceae) and basswood (Tiliaceae) families. The catch here is that, after climate sorted itself out following the asteroid impact, most of what is now the continental United States remained tropical. Yet the northern trees available to recolonize sterilized or ash-buried lands were all deciduous. Even the conifer that dominates the early Cenozoic fossil record throughout North America is deciduous: *Glyptostrobus*, which persists today only in China and botanical gardens. Deciduous trees could thrive in a place where evergreen makes sense only because North America was an ecological vacuum, a frontier available for easy colonization.

Flannery thus introduces the North American Story with the violent birth of the Cenozoic and, coincidentally, the very birth of the North American continent. During the Mesozoic, the eastern and western halves of what would become North America had been separated by shallow water, the Bearpaw Sea, which flooded the continental mid-section all the way from the Arctic Ocean to the Gulf of Mexico. Within five million years following the asteroid impact, tectonic uplift associated with the rise of the Laramide Mountains in the west had disappeared the sea. One grand continent was born.

## **Toward a Mythic Story of the North American Continent**

Zoologist David Burney, ecologist Stuart Pimm, conservation biologist John Terborgh, and Pleistocene ecologist Paul Martin have all written laudatory reviews of *The Eternal Frontier*, published in major journals<sup>1</sup>. The science is top-notch, they agree, and the style of delivery is engaging.

Here I'd like to suggest that this book gives us far more than excellent, expansive, integrated, and readable science. It gave me the idea that, by golly, there *is* a story of the North American continent. There are mythic themes that connect the abundant bare facts, and there are lessons to be learned from 65 million years of continental experience.

Oh, what a mythic story it is! Before reading Flannery's book, I assumed that a common Native American name for this continent that has been

adopted by many conservation-minded folks had no basis in fact. Now I know that soon after Turtle Island was born (upon the retreat of the Bearpaw Sea), this continent hosted the Golden Age of Turtles. Never before and never since — and never anywhere else — has the turtle been such a prominent and speciose member of animal guilds. Pond turtles, soft-shelled turtles, river turtles, and snapping turtles (the latter restricted to North America until just 3 million years ago, when it sent emissaries to South America) all survived the meteor impact. Sixty-five million years ago, when these turtles could safely poke their heads out of the mud, the landscape and pondscape they looked out on was nearly barren of vertebrate life. Crocodylians and (now extinct) champsosaurs also survived in the sediments, and offered the turtles just enough predatory challenge to keep them from reproducing their way to oblivion.

Thematically, we learn that this continent has for sixty-five million years been a land of immigrants. “No other continent,” writes Flannery, “exhibits such different origins for the constituent parts of its fauna.” North America has been a magnet for newcomers, who may overeat or outcompete the natives when they first arrive, but eventually settle into adaptive harmony as natives themselves — and with whatever life community remains.

It seems that whenever climate and sea level conspired to give four-leggeds the opportunity to move around, the vast continent of Eurasia sent us proficient beasts, via Greenland and the Canadian Archipelago or by way of Beringia (the now-submerged continental shelf that, when sea level is lower, connects Alaska with Siberia). Elephants (mastodons) found their way into the New World perhaps 17 million years ago, beavers less than ten million. Much earlier, rhinolike brontotheres arrived, radiated, and vanished. True rhinos, too, ventured into North America early in the Eocene, and they thrived here until just three million years ago.

Global trade has been much less successful in the opposite direction. There are, however, four big success stories among the mammals. North America gave birth to the dog family (Canidae), the camel family (Camelidae), the horse family (Equidae), and the squirrel family (Sciuridae), all of whom now have a presence in much of the world. The squirrel story begins in the Oligocene some 30 million years ago, when angiosperm plants in North America had to cope with extreme seasonality for the first time: hot summers, frigid winters. North American nut trees appeared at this time too, suggesting a coevolutionary dance of seed and seed disperser.

The only truly and completely American large mammal alive today is the pronghorn. Not a deer, not an antelope, not a goat, the pronghorn family Antilocapridae originated right here and stayed put for 19 million years. All sorts of pronghorns, some sprouting four, even six, antler-like horns, thrived during the Miocene, Pliocene, and Pleistocene. The only one that survived the “extinction of the massive” 13,000 years ago still retains a vestige of a by-gone era. *Antilocapra americana* apparently still believes that a long-legged hyena, a swift *Arctodus* bear, or a cheetah might be lurking over the grassy horizon. Pronghorns can sprint five miles per hour faster than cars are supposed to travel on the Pennsylvania turnpike. The animal is thus way overbuilt for its current predators: coyote and the all-too-rare gray wolf. Pronghorns are running from the ghosts of predators past.

To keep our pronghorn fit and facile, perhaps we should bring back the cheetah? Flannery’s research has turned up the cheetah (*Acinomyxax*) as possibly the only genus of living cat that originated in North America. The particular species that chased pronghorn until 13,000 years ago was the spitten image of the one that is now having such troubles with humans, lions, and hyenas in Africa. Bring back the cheetah!

Unaware that Paul Martin and David Burney had published a “bring back” manifesto in *Wild Earth* a year before his own book was published.<sup>2</sup> Tim Flannery independently and forcefully argues that Americans should repatriate not only the cheetah but also the lion. America’s Pleistocene lion was nearly identical to the living African lion; only it was probably maneless and certainly far bigger, with footprints the size of dinner plates. Flannery also joins Martin and Burney in proposing repatriation of the biggest land mammal alive today: the elephant. This convergence of ideas suggests that perhaps the time has come to seriously consider repatriation as part of rewilding North America.<sup>3</sup>

Convergence (or, “parallel evolution”) is indeed another theme that stands out in the Cenozoic story of 65 million years. It seems that there are forms and lifeways that time and time again are called forth by ecological opportunities, and in more than one place. Descended from rails, the six-foot tall terror bird (*Diatryma*) stalked North America like a miniature *T. rex* in the early Cenozoic of North America. In South America, independently evolved bird lineages held onto the niche of top carnivore for 50 million years. The last of the breed was the ten-foot-tall *Titanis*, who

survived until late in the Pliocene, after it had ventured into North America.

Similarly, true cats (family Felidae) originated in the eastern hemisphere and then spread to Turtle Island, but not until an older and unrelated form of “cat” — the nimravid — went extinct 23 million years ago. Even canids have periodically generated catlike forms (our living gray fox, a nimble tree climber, is arguably as much catlike as doglike). And, of course, there are the remarkable saber-toothed “cats” of South America. These were pouched marsupials, yet their body and teeth look uncannily like the placental *Smilodon* (a true cat) of the north. The closest common ancestor of *Smilodon* and its South American equivalent was far more like a shrew than a cat, and that ancestor coexisted with the dinosaurs.

An important chapter in the Story of the North American Continent recounts the amazing exchange of life forms between North and South America some three million years ago, when the Isthmus of Panama emerged. For tens of millions of years before then, the only terrestrial vertebrates that came into or left South America were those that could fly (bats and birds), float (turtles and tortoises), or hunker down on storm-launched plant debris for a long sea voyage (frogs, lizards, snakes, and toads).

For example, Turtle Island welcomed tree frogs (*Hyla*) into its life community some 35 million years ago. These frogs all came from South America. Toads journeyed north a few million years later. Since then, both kinds of amphibians have speciated grandly, becoming North American natives. Whiptail and race runner lizards (family Teiidae) lived in both of the Americas during the Cretaceous. The asteroid extirpated all of those native to the north. Teiids of Turtle Island today thus all hail from South American ancestors who rafted north during the Cenozoic. But the cursorial mammals came north only when the continents drifted close enough to one another for an extended swim (about five million years ago for the smaller ground sloths) or a dryland odyssey (two or three million years ago for the rest). South American ground sloths, glyptodonts, and toxodons did well in the north until humans arrived 13,000 years ago. Only the small ambassadors from the south — opossums, porcupines, and armadillos — remain.

Meanwhile, Turtle Island sent southward its vertebrates in droves. There is no canid, cat, deer, mouse, rat, coati, skunk, squirrel, rabbit, tapir, peccary, camel (llama), cat, bear, or weasel native to South America whose ancestors have been there for

more than five million years – and most scampered or slunk across the isthmus only two or three million years ago. Now consider: who else is there?

Following this “Great American Interchange,” the story of the North American continent shifts from deep time to deep history. And this is where the bad news begins.

## The Bad News

Tim Flannery draws from mainstream, majority science in his ecological and evolutionary history of this continent. The overkill (overhunting) theory of end-Pleistocene extinctions is thus the causal explanation he provides for why the horses, camels, elephants, sloths, glyptodonts, tapirs, peccaries, long-horned bison, and giant tortoises disappeared here some 13,000 years ago. The ripple effects of overkill — extinction by starvation, exacerbated by hunting — is the majority explanation for the simultaneous (or somewhat later) extinction of our great native carnivores: dire wolf, sabertooth cats, American lion, cheetah, and the biggest mammalian land carnivore of all time: *Arctodus*, the short-faced bear. Thirteen thousand years ago is the time we may come to look back upon as the beginning of the end of the Cenozoic Era.<sup>4</sup>

Overkill theory is bad news because overkill is us. We did it. Flannery has such a grasp of the literature, and does such an exquisite job of weaving together the evidential threads, that unless one commences the reading dead-set against the idea of overkill — that is, against the idea that spear-wielding humans entering North America some 13,000 years ago over-hunted to extinction slow-reproducing wildlife — one is sure to finish the book a believer.

Pleistocene ecologist Paul Martin has for 35 years been the chief proponent of the overkill theory, and he has offered *Wild Earth* readers samples of the argument on two occasions.<sup>5</sup> This essay is not the place for reiteration of overkill evidence. It is, however, important to know that within the past five years, discoveries in New Zealand, Australia, Madagascar, Hawaii [cite Hawaiian article in W.E.], and Polynesian islands all validate overkill theory. Everywhere, it seems, the last appearances of Pleistocene mammals, reptiles, and flightless birds correlate astonishingly well with first appearances of artifacts and charcoal attributable to *Homo sapiens*.

Correlation is not, of course, proof of cause, but correlation en masse is persuasive. Proponents of climate change have struggled to explain why

continental ice waxed and waned sixteen times in the past two million years, yet only on the seventeenth melt-back did the change force North America into an “extinction of the massive.” Now, with fine-tuned dating of extinction events in hand, a dwindling team of climate proponents is pressed to explain the non-simultaneity of extinctions around the world. How was climate shifting 50,000 years ago in Australia — and only in Australia? Why did that shift take place before the putative change in North America 13,000 years ago? And how did Cuba manage to avoid the zoological effects of North American climate change until 6,000 years ago, when its six species of ground sloth suddenly vanished? Even more astonishing, one island a dozen miles off the coast of Siberia held onto its mammoths for 8,000 years longer than mammoths survived anywhere else in the world.

And then there are the more recent extinctions of the islands substantially distant from any mainland (and more difficult to colonize by raft or canoe). Hawaii began to lose its flightless and other vulnerable birds around 1,500 years ago.<sup>6</sup> Madagascar lost its gorilla-size lemurs, its elephant birds, and its giant tortoises just 1,200 years ago. Even more isolated, New Zealand lost its moa birds just 600 years ago.

It is both humbling and heartening to learn that westernized industrial peoples are not the only ones to wreak havoc on lands newly colonized. It seems that no human culture can be expected to walk lightly upon an unfamiliar landscape. Not because we are inherently evil: technology, even at the level of chipped stone, turns us into formidable predators of any beings who did not co-evolve with projectiles. Animals too big to hide, too naïve to run, and unable to give birth to replacements as quickly as we can slaughter them are the most vulnerable. In the lean times of winter or extended droughts, even bioregionally attuned humans may be driven to kill and kill again, harvesting fatty tongues, while leaving behind the kidney-straining excesses of bare protein, starved flesh. Only after the plundering by the pioneers is complete do the peoples begin a new dance with the landscape. Limits of the land may then shape humans into indigenes who live more or less sustainably with the community of life that remains.

It is unsettling to realize, too, that, within the context of the 65 million year Cenozoic Era, our symbol of the western wilderness, the grizzly, is a recent arrival. The bear who crossed Beringia after the first humans led the way was a human-saavy species that could find a niche in the New World only when a far heftier, faster, and indigenous “short-faced” bear

(*Arctodus*) lost its prey base to overkill, and perhaps made the mistake of assuming that it need not run from anything. *Ursus arctos* is so recent an arrival that our griz has not yet had time to speculate from the ancestral Eurasian populations of brown bear. The same is true of the animal we call elk and that Europeans call red deer (*Cervus elephas*). Ditto the moose: *Alces gigas*. The gray wolf, too, is a recent arrival. Although the dog family, Canidae, originated right here, the gray wolf took form in Eurasia, returning home maybe 100,000 years ago, but only becoming prolific on this continent after our native dire wolf disappeared.

Deep time awareness compels us to accept, as well, that the symbol of the Great Plains is a newcomer to North America. Bison entered this continent 400,000 years ago. The long-horned behemoths then evolved several distinctive species native to place. But those first American bison all vanished with the mammoths and sloths — presumably because they were not only naïve of projectiles but hadn't evolved a strong herding instinct. Into the empty niche came the smaller, short-horned bison that still survives in Europe. *Bison bison*, commonly known as buffalo here, goes by the name wisent in its land of origin. These bison didn't need horns to convince would-be predators to stay away from their young. They ran. And the females and young kept to open grasslands, where predators were easily detected at a distance, running was unimpeded, and many muzzles could work together to detect the approach of danger. Alas, even these bison nearly succumbed in North America to guns and railroads.

## Frontier Or Home?

Tim Flannery makes clear that humans per se are not lethal to megafauna (witness pre-colonial Africa). Rather, the problem is with humans who find themselves in an edenlike *frontier* of populous and easily killed large animals. It is the purple looestrife manifestation of our species that makes a continent quake. Because island life is the most vulnerable of all — never having been honed by continental competition and predation — very little animal life of any size makes it through the frontier stage. For example, giant tortoises once thrived on virtually all tropical and temperate continents and islands. The Aldabran tortoise survives only because of the harborless coastline of its remote home in the Indian Ocean. Galapagos tortoises owe their persistence entirely to an upstart conservation ethic — and to longevity. By the time humans began to captively breed the tortoises (whose eggs and young were destroyed by feral

rats and cats), the only tortoises remaining for breeding stock were nearly two hundred years old.

Even after humans adapt to place as indigenes, the danger to wildlife is not over. Native cultures may effectively revert to an alien relationship with their habitat if the technology available to them suddenly ramps up — notably, if a new technology enters the landscape from abroad and the local peoples indiscriminately make it their own. The sign of an alien is that it is too successful. The body carrying the gun may be native, but the human-gun amalgam is not.

In the case of North America, the newest waves of human colonists haven't given themselves a fair chance to become indigenous. Technological ingenuity keeps breaching natural limits. For example, Tim Flannery recounts how Euro-Americans passed right by the deserts of the Great Basin on their first westward drive. The limits of the land bested the available technology. But once deep drilling and pumping became possible, the frontier re-opened; lands that had been “wastes” became wheat fields.

Each time that technological innovation gets us out of a resource-limit pickle, there are populations, species, and even whole biomes who take the fall. Cornucopians are dangerous not because they are wrong. The real danger for the community of life is that the cornucopians may be right for some time to come. Perhaps technological advances will continue to save us from materials shortages, energy shortages, maybe even water shortages, and in just the nick of time. At some point, of course, one limit or another will prove unbreachable (perhaps the limit of human sanity in an increasingly crowded and artificial world), but by then we will have wiped out more forms of life than a Manhattan-size meteor was able to accomplish 65 million years ago.

Flannery also shows how EuroAmericans have vastly expanded the boundaries of the available, exploitable “frontier.” It matters little if North America runs out of resources vital to its dominant culture, so long as the rest of world can be pillaged. Our frontier is now the whole planet. The problem with “globalization,” he maintains, is not that it is happening. The problem is that the form globalization has taken has been shaped by the frontier ethic.

## The Good News

The good news is that Tim Flannery has given us a chance to wake up. He offers, in breath-takingly

beautiful prose, the deep time perspective my culture needs to finally “get” what we are about. He opens our eyes to the ruinous treadmill of technological fixes we are on.

Now it is up to us to *choose* a new relationship to North America, to Earth. The landscape cannot be counted on to force the choice upon us — at least not anytime soon. So how will we, of all humans — this prideful, feral, frontier-addicted culture — be motivated to go native, and with all the skill and grace that our sciences and technologies (appropriate technologies) might afford us? What will make us willing to say goodbye to the convenience of a frontier relationship with this land, with any land?

One tool in the transformation of spirit will surely be the teaching and preaching of the mythic story of the North American continent. Tim Flannery has given us the storyline, the themes, and a wealth of stunning examples. It is now up to the educators and dramatists and firebrands among us to shout this message from the hilltops, and to tone the message for distinctive audiences.

For EuroAmericans like myself, this means offering the psychological carrot of an opportunity to become indigenous — no less indigenous than the Native Americans have become, and the deer and the bears before them. The quid pro quo is our coming to accept responsibility for the consequences of our unprecedented technological prowess, and pledging to become even more ethically attuned than other peoples have had to be about which technologies we choose to use, where and when we use them, and how much.

For the Spanish speaking newcomers from the south, it means acknowledging and taking responsibility for the ecological consequences of their reproductive prowess. There is nothing unnatural about having lots and lots of offspring and calling in the relatives when a frontier land offers the opportunity for “ecological release.” Turtles have done it here before, and so have brontotheres and bison. But now the whole community of life on this continent beseeches

the newest human immigrants for conscientious biological restraint in a way that no other immigrant to this land has ever before been asked to do.

And what about the Native Americans? Like *Bison bison*, they barely survived European colonization of this continent. Their numbers are nothing; their hold upon the land inconsequential. What they could contribute is sanctioning the telling of a new mythic and science-based story of the North American continent by conservation-minded storytellers such as myself. The story drawn from science need not diminish their own creation accounts. Moreover, linking the Clovis culture of mammoth hunters to overkill need not tarnish their own record of sustainability.

Reading Flannery’s book, I realized that Native Americans *are* indigenes — with pedigrees not nearly as ancient as the horse, but indigene nonetheless. Lakota or Hopi or Cherokee are no more Eurasian than are rattlesnakes. In both cases, ancestors initially came from Eurasia. But evolution right here (cultural evolution for the one, biological evolution for the other) has been so pronounced that each is, in fact, native born. Tribal peoples of the Americas are indigenous precisely because they are tribal — culturally adapted to particular bioregions, distinct from one another. In contrast, the Clovis peoples implicated in overkill occupied the entire continent while using a uniform style of chipped-stone spearhead and with no evidence of art.

Thus the oldest creation stories inspired by the North American landscape are deeply true. The stories tell of peoples emerging from this continent — not trudging here from somewhere else. The Clovis culture ventured here by way of Beringia, but the Native American cultures of today evolved in place (some more recently than others) from the ashes of the Clovis culture’s frontier excesses, and some from successive waves of frontier peoples. There should be no question that native peoples were born of this continent. They are the only *Homo sapiens* for whom North America has ever been home. It is time for the rest of us to learn from their lead.

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<sup>1</sup> The major reviews of *The Eternal Frontier* are: David A. Burney, 2001, “A Down-Under Look at North America,” *Natural History* vol: 76–77. Paul Martin, 2002, “Title,” *Bioscience* vol: pages. Stuart Pimm, 2001, “Cenozoic Dramas,” *Science* 292: 1842–42. John Terborgh, 2001, “The Age of Giants,” *New York Review of Books*, September 20, pp. ??

<sup>2</sup> Paul S. Martin and David A. Burney, 1999, “Bring Back the Elephants!” *Wild Earth* vol: pp.

<sup>3</sup> Connie Barlow, 1999, “Rewilding for Evolution” vol: 53–56.

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<sup>4</sup> Christopher Manes, 1991, "Whatever Happened to the Cenozoic?" 1(2): pp.

<sup>5</sup> Paul Martin discussed overkill in his 1992, "The Last Entire Earth," *Wild Earth* vol: 29–32, and in his 1999, "Bring Back the Elephants! *Wild Earth* vol: pp.

<sup>6</sup> Lyanda Haupt, 1996, "Feathers and Fossils," *Wild Earth* vol: 44–49.