THE FUTURE OF LIFE

EDWARD O. WILSON

Pulitzer Prize winner and author of *Consilience*

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From one of the world's most influential scientists (and two-time Pulitzer Prize–winning author) comes his most timely and important book yet: an impassioned call for quick and decisive action to save Earth's biological heritage, and a plan to achieve that rescue.

Today we understand that our world is infinitely richer than was ever previously guessed. Yet it is so ravaged by human activity that half its species could be gone by the end of the present century. These two contrasting truths—unexpected magnificence and underestimated peril—have become compellingly clear during the past two decades of research on biological diversity.

In this dazzlingly intelligent and ultimately hopeful book, Wilson describes what treasures of the natural world we are about to lose forever—in many cases animals, insects, and plants we have only just discovered, and whose potential to nourish us, protect us, and cure our illnesses is immeasurable—and what we can do to save them. In the process, he explores the ethical and religious bases of the conservation movement and deflates the myth that environmental policy is antithetical to economic growth by illustrating how new methods of conservation can ensure long-term economic well-being.

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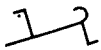
Edward O. Wilson



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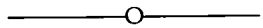

In the end, our society will be defined not only by what we create, but by what we refuse to destroy.

—John C. Sawhill (1936–2000), president,
The Nature Conservancy, 1990–2000

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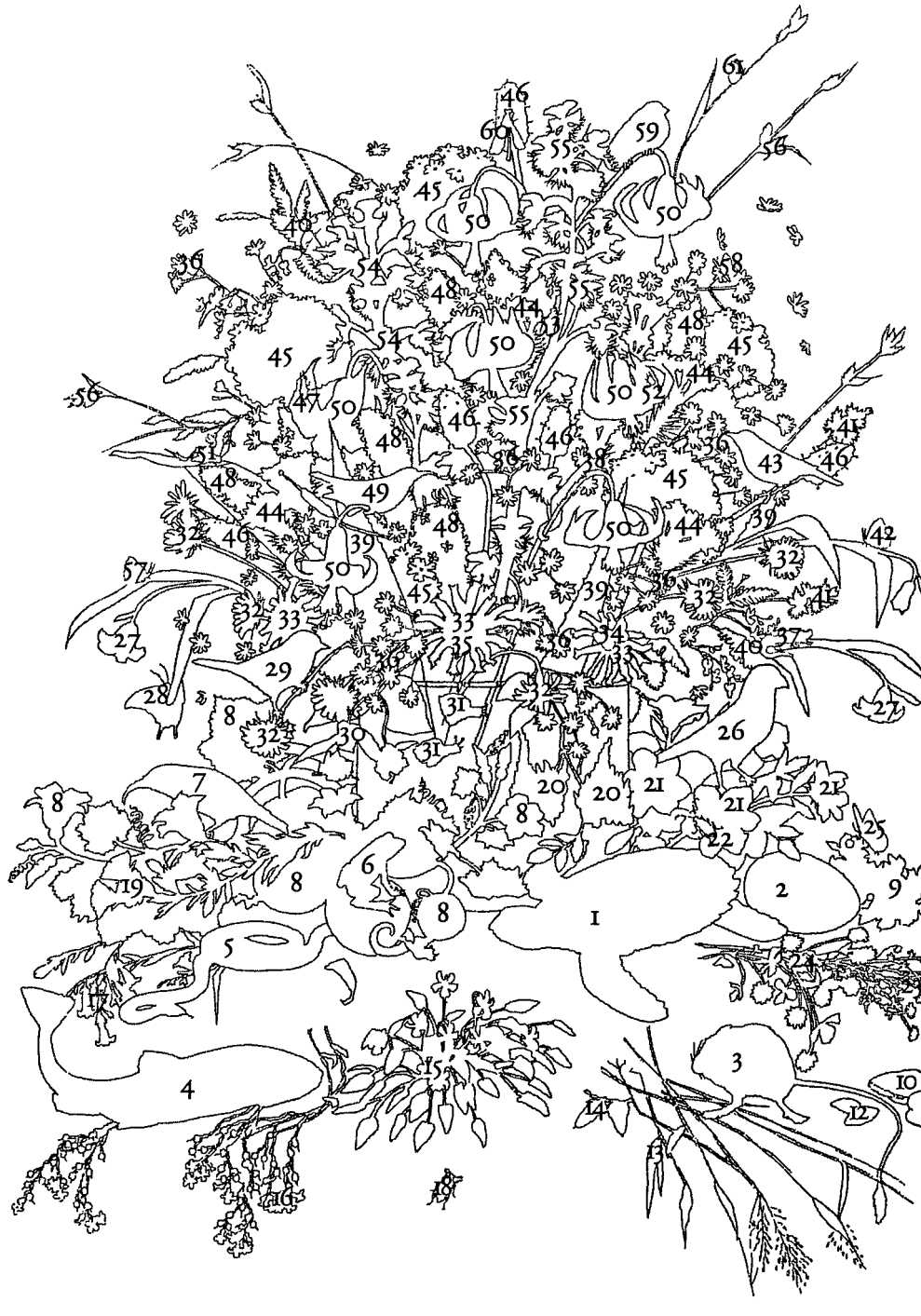
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ENDANGERED AND EXTINCT SPECIES AND RACES

(represented in jacket art, and as numbered in adjacent diagram)

1. Hawksbill sea turtle—*Eretmochelys imbricata*
2. Condor egg—*Gymnogyps californianus*
3. Giant kangaroo rat—*Dipodomys ingens*
4. Little Kern golden trout—*Oncorhynchus aquabonita whitei*
5. San Francisco garter snake—*Thamnophis sirtalis tetrataenia*
6. Golden toad—*Bufo periglenes*
7. I'iwi—*Vestiaria coccinea*
8. Okeechobee gourd—*Cucurbita okeechobeensis*
9. Presidio manzanita—*Arctostaphylos pungens* var. *ravenii*
10. James spineymussel—*Pleurobema collina*
11. Fat pocketbook pearly mussel—*Potamilus capax*
12. Dwarf wedge mussel—*Alasmidonta heterodon*
13. Geyser's panicum—*Dichanthelium lanuginosum* var. *thermale*
14. Valley oak—*Quercus lobata*
15. Guadalupe violet—*Viola guadalupensis*
16. Missouri bladderpod—*Lesquerella filiformis*
17. Indian Knob mountainbalm—*Eriodictyon altissimum*
18. American burying beetle—*Nicrophorus americanus*
19. Vine Hill clarkia—*Clarkia imbricata*
20. Price's potato bean—*Apios priceana*
21. Na'u—*Gardenia brighamii*
22. Valley elderberry longhorn beetle—*Desmocerus californicus dimorphus*
23. Baker's blennosperm—*Blennosperma bakeri*

24. Running buffalo clover—*Trifolium stoloniferum*
25. Myrtle silver spot—*Speyeria zerene myrtleae*
26. Laysan finch—*Telespiza cantans*
27. Striped adobe lily—*Fritillaria striata*
28. Schaus' swallowtail—*Heraclides aristodemus ponceanus*
29. Golden-cheeked warbler—*Dendroica chrysoparia*
30. McFarlane's four o'clock—*Mirabilis macfarlanei*
31. Oahu tree snails—*Achatinella* spp.
32. Ash meadows sunray—*Enciliopsis nudicaulis* var. *corrugata*
33. Tennessee purple coneflower—*Echinacea tennesseensis*
34. Lotis blue—*Lycaeides argyrognomon lotis*
35. Hungerford's crawling water beetle—*Brychius hungerfordi*
36. Schweinitz's sunflower—*Helianthus schweinitzeii*
37. Shasta salamander—*Hydromantes shastae*
38. Desert slender salamander—*Batrachoseps aridus*
39. Arizona agave—*Agave arizonica*
40. Sensitive joint vetch—*Aeschynomene virginica*
41. San Clemente Island woodland-star—*Lithophragma maxima*
42. Strohbeen's parnassian—*Parnassius clodius strohbeeni*
43. Black-capped vireo—*Viero atricapillus*
44. Santa Ana woollystar—*Eriastrum densifolium* ssp. *sanctorum*
45. Large-fruited sand verbena—*Abronia macrocarpa*
46. Swamp pink—*Helonias bullata*
47. Oblivious tiger beetle—*Cicindela latesignata obliviosa*
48. Contra Costa wallflower—*Erysimum capitatum* var. *angustatum*
49. Nuku pu'u—*Hemignathus lucidus*
50. Western lily—*Lilium occidentale*
51. Antioch Dunes shieldbacked katydid—*Nebuda extincta*
52. Delta green ground beetle—*Elaphrus viridus*
53. Dehli sands flower-loving fly—*Rhaphiomidas terminatus abdominalis*
54. Western fringed prairie orchid—*Platanthera praeclara*
55. Eastern fringed prairie orchid—*Platanthera leucophaea*
56. White sedge—*Carex albida*
57. El Segundo blue—*Euphilotes battoides allyni*
58. Mission blue—*Icaricia icarioides missionensis*
59. 'Akepa—*Loxops coccineus*
60. San Francisco fork-tailed damsel fly—*Ischnura gemina*
61. San Bruno elfin—*Incisalia mossii bayensis*

PROLOGUE

A LETTER TO THOREAU

Henry!

May I call you by your Christian name? Your words invite familiarity and make little sense otherwise. How else to interpret your insistent use of the first personal pronoun? *I* wrote this account, you say, here are *my* deepest thoughts, and no third person placed between us could ever be so well represented. Although *Walden* is sometimes oracular in tone, I don't read it, the way some do, as an oration to the multitude. Rather, it is a work of art, the testament of a citizen of Concord, in New England, from one place, one time, and one writer's personal circumstance that manages nevertheless to reach across five generations to address accurately the general human condition. Can there be a better definition of art?

You brought me here. Our meeting could have just as well been a woodlot in Delaware, but here I am at the site of your cabin on the edge of Walden Pond. I came because of your stature in literature and the conservation movement, but also—less nobly, I confess—because my home is in Lexington, two towns over. My pilgrimage is a pleasant afternoon's excursion to a nature reserve. But mostly I came because of all your contemporaries you are the

one I most need to understand. As a biologist with a modern scientific library, I know more than Darwin knew. I can imagine the measured responses of that country gentleman to a voice a century and a half beyond his own. It is not a satisfying fantasy: the Victorians have for the most part settled into a comfortable corner of our remembrance. But I cannot imagine your responses, at least not all of them. Too many shadowed residues there in your text, too many emotional trip wires. You left too soon, and your restless spirit haunts us still.

Is it so odd to speak apostrophically across 150 years? I think not. Certainly not if the subject is natural history. The wheels of organic evolution turn at a millennial pace, too slowly for evolution to have transformed species from your time to mine. The natural habitats they compose also remain mostly unchanged. Walden Woods around the pond, having been only partly cut and never plowed, looks much the same in my time as in yours, although now more fully wooded. Its ambience can be expressed in similar language.

Anyway, the older I become, the more it makes sense to measure history in units of life span. That pulls us closer together in real time. Had you lived to eighty instead of just forty-four, we might today have a film clip of you walking on Walden Pond beach through a straw-hatted and parasoled crowd on holiday. We could listen to your recorded voice from one of Mr. Edison's wax cylinders. Did you speak with a slight burr, as generally believed? I am seventy-two now, old enough to have had tea with Darwin's last surviving granddaughter at the University of Cambridge. While a Harvard graduate student I discussed my first articles on evolution with Julian Huxley, who as a little boy sat on the knee of his grandfather Thomas Henry Huxley, Darwin's "bulldog" disciple and personal friend. You will know what I am talking about. You still had three years to live when in 1859 *The Origin of Species* was published. It was the talk of Harvard and salons along the Atlantic seaboard. You purchased one of the first copies available in America and annotated it briskly. And here is one more circum-

stance on which I often reflect: as a child I could in theory have spoken to old men who visited you at Walden Pond when they were children of the same age. Thus only one living memory separates us. At the cabin site even that seems to vanish.

Forgive me, I digress. I am here for a purpose: to become more a Thoreauvian, and with that perspective better to explain to you, and in reality to others and not least to myself, what has happened to the world we both have loved.

The landscape away from Walden Pond, to start, has changed drastically. In your time the forest was almost gone. The tallest white pines had been cut long before and hauled away to Boston to be trimmed into ship masts. Other timber was harvested for houses, railroad ties, and fuel. Most of the swamp cedars had become roof shingles. America, still a wood-powered nation, was approaching its first energy crisis as charcoal and cordwood ran short. Soon everything would change. Then coal would fill the breach and catapult the industrial revolution forward at an even more furious pace.

When you built your little house from the dismantled planks of James Collins's shanty in 1845, Walden Woods was a threatened oasis in a mostly treeless terrain. Today it is pretty much the same, although forest has grown up to fill the farmland around it. The trees are still scraggly second-growth descendants of the primeval giants that clothed the lake banks until the mid-1700s. Around the cabin site, beech, hickory, red maple, and scarlet and white oak push up among half-grown white pines in a bid to reestablish the rightful hardwood domination of southern New England forests. Along the path from your cabin on down to the nearest inlet—now called Thoreau's Cove—these trees give way to an open stand of larger white pines, whose trunks are straight and whose branches are evenly spread and high off the ground. The undergrowth consists of a sparse scattering of saplings and huckleberry. The American chestnut, I regret to report, is gone, done in by an overzealous European fungus. Only a few sprouts still struggle up from old stumps here and there, soon to be discovered by

the fungus and killed back. Sprouting their serrate leaves, the doomed saplings are faint reminders of the mighty species that once composed a full quarter of the eastern virgin forest. But all the other trees and shrubs you knew so well still flourish. The red maple is more abundant than in your day. It is more than ever both the jack-of-all-trades in forest regeneration and the crimson glory of the New England autumn.

I can picture you clearly as your sister Sophia sketched you, sitting here on the slightly raised doorstep. It is a cool morning in June, by my tastes the best month of the year in New England. In my imagination I have settled beside you. We gaze idly across this spring-fed lake of considerable size that New Englanders perversely call a pond. Today in this place we speak a common idiom, breathe the same clean air, listen to the whisper of the pines. We scuff the familiar leaf litter with our shoes, pause, look up to watch a circling red-tailed hawk pass overhead. Our talk drifts from here to there but never so far from natural history as to break the ghostly spell and never so intimate as to betray the childish sources of our common pleasure. A thousand years will pass and Walden Woods will stay the same, I think, a flickering equilibrium that works its magic on human emotion in variations with each experience.

We stand up to go a-sauntering. We descend the cordwood path to the lake shore, little changed in contour from the sketch you made in 1846, follow it around, and coming to a rise climb to the Lincoln Road, then circle back to the Wyman Meadow and on down to Thoreau's Cove, completing a round-trip of two miles. We search along the way for the woods least savaged by axe and crosscut saw. It is our intention to work not around but *through* these remnants. We stay within a quarter-mile or so of the lake, remembering that in your time almost all the land outside the perimeter woods was cultivated.

Mostly we talk in alternating monologues, because the organisms we respectively favor are different enough to require cross-explanation. There are two kinds of naturalists, you will agree,

defined by the search images that guide them. The first—your tribe—are intent on finding big organisms: plants, birds, mammals, reptiles, amphibians, perhaps butterflies. Big-organism people listen for animal calls, peer into the canopy, poke into tree hollows, search mud banks for scat and spoor. Their line of sight vacillates around the horizontal, first upward to scan the canopy, then down to peer at the ground. Big-organism people search for a single find good enough for the day. You, I recall, thought little of walking four miles or more to see if a certain plant had begun to flower.

I am a member of the other tribe—a lover of little things, a hunter also, but more the snuffling opossum than the questing panther. I think in millimeters and minutes, and am nowhere near patient as I prowl, having been spoiled forever by the richness of invertebrates and quick reward for little effort. Let me enter a tract of rich forest and I seldom walk more than a few hundred feet. I halt before the first promising rotten log I encounter. Kneeling, I roll it over, and always there is instant gratification from the little world hidden beneath. Rootlets and fungal strands pull apart, adhering flakes of bark fall back to earth. The sweet damp musty scent of healthy soil rises like a perfume to the nostrils that love it. The inhabitants exposed are like deer jacklighted on a country road, frozen in a moment of their secret lives. They quickly scatter to evade the light and desiccating air, each maneuvering in the manner particular to its species. A female wolf spider sprints headlong for several body lengths and, finding no shelter, stops and stands rigid. Her brindled integument provides camouflage, but the white silken egg case she carries between her pedipalps and fangs gives her away. Close by, julid millipedes, which were browsing on mold when the cataclysm struck, coil their bodies in defensive spirals. At the far end of the exposed surface a large scolopendrid centipede lies partly concealed beneath decayed bark fragments. Its sclerites are a glistening brown armor, its jaws poison-filled hypodermic needles, its legs downward-curving scythes. The scolopendrid offers no threat unless you pick it up.

But who would dare touch this miniature dragon? Instead I poke it with the tip of a twig. *Get out of there!* It writhes, spins around, and is gone in a flash. Now I can safely rake my fingers through the humus in search of less threatening species.

These arthropods are the giants of the microcosm (if you will allow me to continue what has turned into a short lecture). Creatures their size are present in dozens—hundreds, if an ant or termite colony is present. But these are comparatively trivial numbers. If you focus down by a power of ten in size, enough to pick out animals barely visible to the naked eye, the numbers jump to thousands. Nematode and enchytraeid pot worms, mites, springtails, pauropods, diplurans, symphylans, and tardigrades seethe in the underground. Scattered out on a white ground cloth, each crawling speck becomes a full-blown animal. Together they are far more striking and diverse in appearance than snakes, mice, sparrows, and all the other vertebrates hereabouts combined. Their home is a labyrinth of miniature caves and walls of rotting vegetable debris cross-strung with ten yards of fungal threads. And they are just the surface of the fauna and flora at our feet. Keep going, keep magnifying until the eye penetrates microscopic water films on grains of sand, and there you will find ten billion bacteria in a thimbleful of soil and frass. You will have reached the energy base of the decomposer world as we understand it 150 years after your sojourn in Walden Woods.

Untrammeled nature exists in the dirt and rotting vegetation beneath our shoes. The wilderness of ordinary vision may have vanished—wolf, puma, and wolverine no longer exist in the tamed forests of Massachusetts. But another, even more ancient wilderness lives on. The microscope can take you there. We need only narrow the scale of vision to see a part of these woods as they were a thousand years ago. This is what, as a small-organism naturalist, I can tell you.

"Thó-reau." Your family put the emphasis on the first syllable, as in "thorough," did it not? At least that is what your close friend Ralph Waldo Emerson scribbled on a note found among his

papers. Thoreau, thorough naturalist, you would have liked the Biodiversity Day we held in your honor here recently. It was conceived by Peter Alden, a Concord resident and international wildlife tour guide. (Easy name to remember; he is a descendant of John Alden of Pilgrim fame.) On July 4, 1998, the anniversary of the day in 1845 you moved furniture into the Walden cabin, Peter and I were joined by more than a hundred other naturalists from around New England. We set out to list all the wild species of organisms—plants, animals, and fungi—we could find in one day with unaided vision or hand lens within a broad section of Concord and Lincoln around Walden Pond. We aimed for a thousand. The final tally, announced to the thorn-scratched, mosquito-bitten group assembled at an outdoor meal that evening, was 1,904. Well, actually 1,905, to stretch the standards a bit, because the next day a moose *(Alces alces)* came from somewhere and strolled into Concord Center. It soon strolled out again, and evidently departed the Concord area, thus lowering the biodiversity back to the July 4 level.

If you could have come back that Biodiversity Day you might have joined us unnoticed (that is, if you refrained from bringing up President Polk and the Mexican question). Even the 1840s clothing would not have betrayed you, given our own scruffy and eclectic field wear. You would have understood our purpose too. From your last two books, *Faith in a Seed* and *Wild Fruits* (finally rescued from your almost indecipherable notes and published in the 1990s), it is apparent that you were moving toward scientific natural history when your life prematurely ended. It was logical for you to take that turn: the beginning of every science is the description and naming of phenomena. Human beings seem to have an instinct to master their surroundings that way. We cannot think clearly about a plant or animal until we have a name for it; hence the pleasure of bird watching with a field guide in hand. Alden's idea quickly caught on. As I write, in 2001, Biodiversity Days, or "bioblitzes" as they are also called, are being held or planned elsewhere in the United States as well as in Austria, Ger-

many, Luxembourg, and Switzerland. In June 2001 we were joined for a third event in Massachusetts by students from 260 towns over the entire state.

At Walden Pond that first day I met Brad Parker, one of the character actors who play you while giving tours around the reconstructed cabin. He is steeped in Thoreauviana, and eerily convincing. He refused to deviate even one second from your persona as we talked, bless him, and for a pleasant hour I lived in the virtual 1840s he created. Of course, to reciprocate I invited him to peer with me at insects and other invertebrates beneath nearby stones and fallen dead branches. We moved on to a clump of bright yellow mushrooms. Then Neo-Thoreau mentioned a singing wood thrush in the canopy above us, which my deafness in the upper registers prevented me from hearing. We went on like this for a while, with his making nineteenth-century sallies and responses and my struggling to play the part of a time-warped visitor. No mention was made of the thunder of aircraft above us on their approach to Hanscom Field. Nor did I think it anomalous that at sixty-nine I was speaking to a reanimation of you, Henry Real-Thoreau, at thirty. In one sense it was quite appropriate. The naturalists of my generation are you grown older and more knowledgeable, if not wiser.

A case in point on the growth of knowledge. Neo-Thoreau and I talked about the ant war you described in *Walden.* One summer day you found red ants locked in mandible-to-mandible combat with black ants all around your cabin. The ground was littered with the dead and dying, and the ambulatory maimed fought bravely on. It was an ant-world Austerlitz, as you said, a conflict dwarfing the skirmish on the Concord Bridge that started the American Revolution a rifle shot from Walden Pond. May I presume to tell you what you saw? It was a slave raid. The slavers were the red ants, most likely *Formica subintegra,* and the victims were the black ants, probably *Formica subsericea.* The red ants capture the infants of their victims, or more precisely, their cocoon-clad pupae. Back in the red-ant nest the kidnapped pupae

complete their development and emerge from their cocoons as adult workers. Then, because they instinctively accept the first workers they meet as nestmates, they enter into voluntary servitude to their captors. Imagine that! A slave raid at the doorstep of one of America's most ardent abolitionists. For millions of years this harsh Darwinian strategy has prevailed, and so will it ever be, with no hope that a Lincoln, a Thoreau, or an Underground Railroad might arise in the formicid world to save the victim colonies.

Now, prophet of the conservation movement, mentor of Gandhi and Martin Luther King Jr., accept this tribute tardily given. Keen observer of the human condition, scourge of the philistine culture, Greek stoic adrift in the New World, you are reborn in each generation and vested with new meaning and nuance. Sage of Concord—Saint Henry, they sometimes call you—you've fairly earned your place in history.

On the other hand, you were not a great naturalist. (Forgive me!) Even had you kept entirely to natural history during your short life, you would have ranked well below William Bartram, Louis Agassiz, and that prodigious collector of North American plants John Torrey, and be scarcely remembered today. With longer life it would likely have been different, because you were building momentum in natural history rapidly when you left us. And to give you full credit, your ideas on succession and other properties of living communities pointed straight toward the modern science of ecology.

That doesn't matter now. I understand why you came to Walden Pond; your words are clear enough on that score. Granted, you chose this spot primarily to study nature. But you could have done that as easily and far more comfortably on daily excursions from your mother's house in Concord Center, half an hour's walk away, where in fact you did frequently repair for a decent meal. Nor was your little cabin meant to be a wilderness hermitage. No wilderness lay within easy reach anyway, and even the woods around Walden Pond had shrunk to their final thin margins by the

1840s. You called solitude your favorite companion. You were not afraid, you said, to be left to the mercy of your own thoughts. Yet you craved humanity passionately, and your voice is anthropocentric in mood and philosophy. Visitors to the Walden cabin were welcomed. Once a group of twenty-five or more crowded into the solitary room of the tiny house, shoulder to shoulder. You were not appalled by so much human flesh pressed together (but I am). You were lonely at times. The whistle of a passing train on the Fitchburg track and the distant rumble of oxcarts crossing a bridge must have given you comfort on cold, rainy days. Sometimes you went out looking for someone, anyone, in spite of your notorious shyness, just to have a conversation. You fastened on them, as you put it, like a bloodsucker.

In short, you were far from the hard-eyed frontiersman bearing pemmican and a long rifle. Frontiersmen did not saunter, botanize, and read Greek. So how did it happen that an amateur naturalist perched in a toy house on the edge of a ravaged woodland became the founding saint of the conservation movement? Here is what I believe happened. Your spirit craved an epiphany. You sought enlightenment and fulfillment the Old Testament way, by reduction of material existence to the fundamentals. The cabin was your cave on the mountainside. You used poverty to purchase a margin of free existence. It was the only method you could devise to seek the meaning in a life otherwise smothered by quotidian necessity and haste. You lived at Walden, as you said (I dare not paraphrase),

> to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived . . . to live deep and suck out all the marrow of life, to live so sturdily and Spartan-like as to put to rout all that was not life, to cut a broad swath and shave close, to drive life into a corner, and reduce it to its lowest terms, and, if it proved to be mean, why then to get the whole and genuine meanness of it, and publish its meanness to the world; or if it

were sublime, to know it by experience, and be able to give a true account of it in my next excursion.

You were mistaken, I think, to suppose that there are as many ways of life possible as radii that can be drawn from the center of a circle, and your choice just one of them. On the contrary, the human mind can develop along only a very few pathways imaginable. They are selected by satisfactions we instinctively seek in common. The sturdiness of human nature is the reason people plant flowers, gods live on high mountains, and a lake is the eye of the world through which—your metaphor—we can measure our own souls.

It is exquisitely human to search for wholeness and richness of experience. When these qualities are lost among the distracting schedules of everyday life, we seek them elsewhere. When you stripped your outside obligations to the survivable minimum, you placed your trained and very active mind in an unendurable vacuum. And this is the essence of the matter: in order to fill the vacuum, you discovered the human proclivity to embrace the natural world.

Your childhood experience told you exactly where to go. It could not be a local cornfield or gravel pit. Nor the streets of Boston, which, however vibrant as the hub of a growing nation, might cost a layabout his dignity and even his life. It had to be a world both tolerant of poverty and rich and beautiful enough to be spiritually rewarding. Where around Concord could that possibly be but a woodlot next to a lake?

You traded most of the richness of social existence for an equivalent richness of the natural world. The choice was entirely logical, for the following reason. Each of us finds a comfortable position somewhere along the continuum that ranges from complete withdrawal and self-absorption at one end to full civic engagement and reciprocity at the other. The position is never fixed. We fret, vacillate, and steer our lives through the riptide of countervailing instincts that press from both ends of the con-

tinuum. The uncertainty we feel is not a curse. It is not a confusion on the road out of Eden. It is just the human condition. We are intelligent mammals, fitted by evolution—by God, if you prefer—to pursue personal ends through cooperation. Our priceless selves and family first, society next. In this respect we are the polar opposite of your cabinside ants, bound together as replaceable parts of a superorganism. Our lives are therefore an insoluble problem, a dynamic process in search of an indefinable goal. They are neither a celebration nor a spectacle but rather, as a later philosopher put it, a predicament. Humanity is the species forced by its basic nature to make moral choices and seek fulfillment in a changing world by any means it can devise.

You searched for essence at Walden and, whether successful in your own mind or not, you hit upon an ethic with a solid feel to it: nature is ours to explore forever; it is our crucible and refuge; it is our natural home; it is all these things. Save it, you said: in wildness is the preservation of the world.

Now, in closing this letter, I am forced to report bad news. (I put it off till the end.) The natural world in the year 2001 is everywhere disappearing before our eyes—cut to pieces, mowed down, plowed under, gobbled up, replaced by human artifacts.

No one in your time could imagine a disaster of this magnitude. Little more than a billion people were alive in the 1840s. They were overwhelmingly agricultural, and few families needed more than two or three acres to survive. The American frontier was still wide open. And far away on continents to the south, up great rivers, beyond unclimbed mountain ranges, stretched unspoiled equatorial forests brimming with the maximum diversity of life. These wildernesses seemed as unattainable and timeless as the planets and stars. That could not last, because the mood of Western civilization is Abrahamic. The explorers and colonists were guided by a biblical prayer: May we take possession of this land that God has provided and let it drip milk and honey into our mouths, forever.

Now, more than six billion people fill the world. The great

majority are very poor; nearly one billion exist on the edge of starvation. All are struggling to raise the quality of their lives any way they can. That unfortunately includes the conversion of the surviving remnants of the natural environment. Half of the great tropical forests have been cleared. The last frontiers of the world are effectively gone. Species of plants and animals are disappearing a hundred or more times faster than before the coming of humanity, and as many as half may be gone by the end of this century. An Armageddon is approaching at the beginning of the third millennium. But it is not the cosmic war and fiery collapse of mankind foretold in sacred scripture. It is the wreckage of the planet by an exuberantly plentiful and ingenious humanity.

The race is now on between the technoscientific forces that are destroying the living environment and those that can be harnessed to save it. We are inside a bottleneck of overpopulation and wasteful consumption. If the race is won, humanity can emerge in far better condition than when it entered, and with most of the diversity of life still intact.

The situation is desperate—but there are encouraging signs that the race can be won. Population growth has slowed, and, if the present trajectory holds, is likely to peak between eight and ten billion people by century's end. That many people, experts tell us, can be accommodated with a decent standard of living, but just barely: the amount of arable land and water available per person, globally, is already declining. In solving the problem, other experts tell us, it should also be possible to shelter most of the vulnerable plant and animal species.

In order to pass through the bottleneck, a global land ethic is urgently needed. Not just any land ethic that might happen to enjoy agreeable sentiment, but one based on the best understanding of ourselves and the world around us that science and technology can provide. Surely the rest of life matters. Surely our stewardship is its only hope. We will be wise to listen carefully to the heart, then act with rational intention and all the tools we can gather and bring to bear.

Henry, my friend, thank you for putting the first element of that ethic in place. Now it is up to us to summon a more encompassing wisdom. The living world is dying; the natural economy is crumbling beneath our busy feet. We have been too self-absorbed to foresee the long-term consequences of our actions, and we will suffer a terrible loss unless we shake off our delusions and move quickly to a solution. Science and technology led us into this bottleneck. Now science and technology must help us find our way through and out.

You once said that old deeds are for old people, and new deeds are for new. I think that in historical perspective it is the other way around. You were the new and we are the old. Can we now be the wiser? For you, here at Walden Pond, the lamentation of the mourning dove and the green frog's *t-r-r-oonk!* across the predawn water were the true reason for saving this place. For us, it is an exact knowledge of what that truth is, all that it implies, and how to employ it to best effect. So, two truths. We will have them both, you and I and all those now and forever to come who accept the stewardship of nature.

Affectionately yours,
Edward