



The land ethic at the turn of the millennium

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Abstract. Aldo Leopold's land ethic has proved more complex and subtle than he envisioned. Nevertheless, Leopold launched what, facing a new millennium, has proved urgent on the global agenda: an environmental ethics concerned in theory and practice about appropriate respect for values carried by the natural world and human responsibilities for the sustaining of these values. A blending of anthropocentric and biocentric values continues to be vital. These duties toward nature involve analysis of ecosystem integrity and evolutionary dynamism at both scientific and philosophical levels; any responsible environmental policy must be based on plausible accounts of ecosystems and a sustainable biosphere. Humans and this planet have entwined destinies. We now envision an Earth ethic beyond the land ethic.

Key words: Aldo Leopold, Earth ethics, environmental ethics, land ethic, naturalized ethics

The environmental turn in ethics

Fifty years ago, near mid-century, Aldo Leopold lamented, "There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it ... The proof that conservation has not yet touched these foundations of conduct lies in the fact that philosophy and religion have not yet heard of it" (Leopold 1949(1968): 203,210).

Well, they have today. At the turn of the century, philosophers have published over two dozen anthologies and over two dozen systematic works in environmental ethics. Representative are: Botzler and Armstrong 1998; Des Jardins 1997; Johnson 1991; Pojman 1998. (Complete lists may be found on the ISEE website bibliography <<http://www.cep.unt.edu/ISEE.html>>, under 'Anthologies' and 'Systematic Works'.) Courses are taught in several hundred universities and colleges on several continents (also listed on the website). There are four professional journals in the field: *Environmental Ethics*, *Environmental Values*, *Ethics and the Environment*, *Journal of Agricultural and Environmental Ethics*. The International Society for Environmental Ethics (ISEE) has 400 members in 20 countries. The World Congress of Philosophy, August 1998, devoted four sections to environmental philosophy, with four dozen related papers in other sections.

Environmental philosophers have served on policy boards, as with IUCN and the Society for Conservation Biology. They have contributed chapters on ethics and

values to textbooks in conservation biology (Primack 1998; Meffe and Carroll 1997), and articles to *BioScience*, *The Journal of Forestry*, *The Environmental Professional*, *Conservation Biology*, and *Biodiversity and Conservation*. The website bibliography of the ISEE contains nearly eight thousand articles and books, not only by philosophers, ethicists, and theologians, but also by policymakers, lawyers, environmental professionals, foresters, conservation and wildlife biologists, ecologists, economists, sociologists, historians, developers, business persons, citizens – all with an ethical concern about human uses of the natural environment

In religion, dozens of systematic works and anthologies have also appeared, as well as have journals (see Nash 1991; Northcott 1996; Rasmussen 1996; Cooper 1998). Two major bibliographies list well over a thousand titles (see Sheldon, 1992; Baken et al. 1995). Almost every major religious group has had study commissions on faith and the environment.

If someone had been attempting to foresee the future of philosophy at mid-century, when Leopold wrote, perhaps the two most surprising developments would have been the rise of environmental philosophy and the novel perspectives introduced by the feminists, including the ecofeminists. The next two surprising developments might well be the interest in animal welfare and in international development ethics and sustainability, both with ties to environmental philosophy. Someone attempting to foresee future concerns in religion would have been just as surprised; the prevalent neo-orthodoxy denied natural theology, had little use for a theology of nature, and was dominantly anthropocentric.

Environmental ethics remained unknown in philosophy until the mid-1970s, a generation after Leopold died. But that was to change rapidly. Philosophers and religious scholars have thought about nature for millennia, for instance in ancient Greece or China. Although there is an ethic implicit in many of these worldviews, this was never developed as an environmental ethic. Following the Enlightenment and the scientific revolution, nature came to be regarded as a value-less realm, governed by mechanistic causal forces. Values arose only with the interests and preferences of humans, for whom nature was natural resources. For four centuries, Western philosophy and theology were both dominantly anthropocentric. People were all that counted in ethics. Leopold insisted that ethics goes further, although prudential natural resource use is important. This new ethic enlarges traditional ideas about what is of moral concern to include animals, plants, endangered species, ecosystems, and (today) even Earth as a whole. Such ethics is unique in moving outside the sector of human interests, including our interests in this larger community of life. Leopold gave us, famously, a new commandment: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1949(1968): 224-225). Entering the new millennium, I doubt that any philosopher or theologian in the Western world has not heard of environmental ethics. The land ethic has even gone global, as we shall see. All this would have both surprised and pleased Leopold.

Somewhat ironically, just when humans, with their increasing industry and technology, seemed further and further from nature, having more knowledge about natural processes and more power to manage them, just when humans were more and more rebuilding their environments, the natural world emerged as a focus of ethical concern. Ironically as well, philosophers have to thank Leopold, a forester and wildlife biologist, for launching this ethics (with other prophets like Rachel Carson, John Muir, and David Brower).

Ethics toward nature

Environmental ethics is theory and practice about appropriate concern for, values in, and duties to the natural world. Since humans are helped or hurt by the condition of their environment, this is a concern for what humans have at stake – benefits, costs, and their just distribution, risks, pollution levels, rights and torts, needs of future generations. But environmental ethics goes further. A naturalistic ethics is reached when humans ask about appropriate respect toward those who are other than human, such as the wildlife or the trees. This might be termed biocentric ethics, centering on a respect for life, rather than exclusively centering on humans. Environmental ethics applies ethics to the environment, analogously to ethics applied to business, medicine, engineering, law, and technology. But the latter are still human-focused applications. Environmental ethics is more radical, more inclusive – so many claim. Whales slaughtered, wolves extirpated, whooping cranes and their habitats disrupted, ancient forests cut, Earth threatened by global warming – these are ethical questions intrinsically, owing to values destroyed in nature, as well as also instrumentally, owing to human resources jeopardized. Humans need to include nature in their ethics; humans need to include themselves in nature.

That there ought be this deeper ethic is still doubted by many who are entrenched in the prevailing anthropocentric ethics. Humans can have no duties to rocks, rivers, nor to wildflowers or ecosystems, and almost none to birds or bears. Humans have serious duties only to each other; anthropocentrists may wish to save these things for the benefits they bring. But the environment is the wrong kind of primary target for an ethic. Nature is a means, not an end in itself. Nothing there counts morally. For the last fifty years, however, Leopold's land ethic has been steadily challenging just those claims.

We ought to love 'the land', as Leopold terms it, "the natural processes by which the land and the living things upon it have achieved their characteristic form (evolution) and by which they maintain their existence (ecology)". "That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics" (Leopold (1949)1968: 173, 224-225). People still count, but this ecosystemic level in which people and all other organisms are embedded also counts morally. The appropriate units for moral concern are the fundamental

units of development and survival. Those have been, over the millennia, evolutionary ecosystems – at least until humans began so drastically to introduce their cultural and agricultural changes. Even yet, natural systems remain fundamental to our support. We co-inhabit Earth with five or ten million other species, and we and they depend on these biotic communities of life.

The challenge to ethical respect toward nature is partly scientific and partly philosophical. Perhaps ecosystems do not exist – or exist in too loose a way to count morally. They are nothing but aggregations of their more real members, like a forest is (some say) nothing more than a collection of trees. An ethicist will have trouble valuing what does not really exist. One needs ecology to discover what biotic community means as an organizational mode. Then we can reflect philosophically to discover values there that might command our moral respect.

Ecosystems can seem little more than stochastic processes. A seashore, a tundra is a loose collection of externally related parts. Much of the environment is not organic at all (rain, groundwater, rocks, nonbiotic soil particles, air). Some is dead and decaying debris (fallen trees, scat, humus). An ecosystem has no brain, no genome, no skin, no self-identification, no telos, no unified program. It does not defend itself against injury or death. It is not irritable. The parts (foxes, sedges) are more centrally integrated than the wholes (forests, grasslands). So it can seem as if an ecosystem is too low a level of organization to be the direct focus of moral concern. Ecosystems do not and cannot care; they have no interests about which they or we can care. There is really not enough centered process to call community.

But this is to misunderstand ecosystems, to make a category mistake. To doubt communities because they are not organismic individuals is to look at one level for what is appropriate at another. One should look for a matrix of interconnections between centers, for creative stimulus and open-ended potential. Everything will be connected to many other things, sometimes by obligate associations, more often by partial and pliable dependencies; and, among other components, there will be no significant interactions. There will be shunts and criss-crossing pathways, cybernetic subsystems and feedback loops. One looks for selection pressures and adaptive fit, not for irritability or repair of injury, for speciation and life support, not for resisting death. We must think more systemically, and less organismically.

An ecosystem generates a spontaneous order that envelopes the richness, beauty, integrity, and dynamic stability of the component parts. One should not in an indiscriminating way extrapolate criteria of significance from organism to biotic community, any more than from person to animal or from animal to plant. Rather, one should discriminate the criteria appropriate to this level. The selective forces in ecosystems at once transcend and produce the lives of individual plants and animals. In evolutionary ecosystems over geological time the numbers of species on Earth have increased from zero to five million or more. Whittaker (1972) found that on continental scales and for most groups "increase of species diversity... is a self-augmenting evolutionary process without any evident limit". There is a tendency toward what he called 'species packing'.

Organisms defend only their own selves or kinds, but the system spins a bigger story. Organisms defend their continuing survival; ecosystems promote new arrivals. Species increase their kinds, but ecosystems increase kinds, and increase the integration of kinds. The system is a kind of field with characteristics as vital for life as any property contained within particular organisms. The organismic kind of creativity (regenerating a species, pushing to increase to a world-encompassing maximum) is used to produce, and is checked by, another kind of creativity (speciating that produces new kinds, interlocking kinds with adaptive fit, plus individuality and openness to future development). The collective order can be more complex than the behaviors of any of the individual parts. Ecosystemic order is a comprehensive, complex, fertile order just because it integrates (with some openness) the know-how of many diverse organisms and species; it is not an order built on the achievements of any one kind of thing. In result there are diversity, unity, dynamic stability, novelty, spontaneity, a life-support system, the wonderland of natural history.

Ethicists, sometimes encouraged by biologists, may think ecosystems are just epiphenomenal aggregations. This is a confusion. Any level is real if there is significant downward causation. Thus the atom is real because that pattern shapes the behavior of electrons; the cell because that pattern shapes the behavior of amino acids; the organism because that pattern coordinates the behavior of hearts and lungs; the community because the niche shapes the morphology and behavior of the foxes within it. Being real requires an organization that shapes the existence and the behavior of member/parts. A complex system, such as an ecosystem, is one whose properties are not fully explained by an understanding of its components.

If we are concerned about what is value-able, able to sustain value on our landscapes, why not say that it is the productivity of such ecosystems? The products are valuable, able to be valued by the humans who come late in the process; but why not say that the process is what is really valuable, that is, able to produce these values in biodiversity? It would be foolish to value golden eggs and disvalue the goose that lays them. It would be a mistake to value the goose only instrumentally, and not for what it is in itself. How much more so an ecosystem that generates myriads of species, or even an Earth that produces billions of species, ourselves included. Evolutionary history is past; we are not responsible for that. But the resulting life communities continue, and they have become our responsibility. Viewed in depth, these ecosystems remain today the source and support of individual and species alike. Such a perspective begins to naturalize ethics, an ethic for what Leopold called 'the land'.

Ecosystem integrity versus evolutionary dynamism?

Although Leopold became prophetic in the 1970s and early 1980s, there have been, in the latter 1980s and the 1990s, still further vigorous challenges to his vision of

ecosystem integrity and stability as the fundamental principles of a land ethic. These challenges are, again, both scientific and philosophical. Ecosystems have proved more complex, subtle, and confusing than Leopold thought. We need to reconsider their integrity and dynamic historical changes.

Ecologists, Leopold included, always knew that there is disturbance in the orderly succession of their ecosystems, producing a patchwork landscape. Ecosystems have various kinds of resilience, but if the disturbances become amplified enough, the order gets swamped in disorder. Botkin (1990) finds, at best, "discordant harmonies". "Wherever we seek to find constancy we discover change. ... Nature undisturbed is not constant in form, structure, or proportion, but changes at every scale of time and space." Pickett et al (1992: 84) claim: "The classical paradigm in ecology, with its emphasis on the stable state, its suggestion of natural systems as closed and self-regulating, and its resonance with the nonscientific idea of the balance of nature, can no longer serve as an adequate foundation for conservation. The new paradigm, with its recognition of episodic events, openness of ecological systems and multiplicity of locus and kind of regulation, is in fact a more realistic basis."

Sagoff (1997) thinks even worse: "Ecosystems are unstructured, transitory, and accidental in nature." "Ecological systems and communities are just random, accidental, contingent, and purposeless collections of biological flotsam and jetsam." "Nature is going nowhere, has no Integrity' or 'well-being' of its own" (1997:923,931-932). Some biologists seem quite to reverse Leopold, Soulé (1995), although ardent in his conservation biology, says, "Certainly the idea that species live in integrated communities is a myth.... Living nature is not equilibrial.... Nature at the level of local biotic assemblages has never been homeostatic." "So-called biotic communities" is "a misleading term". If so, perhaps the land ethic preserving biotic communities is also a myth. Natural history is fractured into undefinable and indefinite assemblages that defy generalization, the loose associations feared above, only now in chaotic flux. Much less are such random, chaotic collections worth preserving for any beauty, integrity or stability they might have.

Leopold does need to be revisited, even revised. But, with a second look, he proves to be surprisingly sophisticated (Callicott 1996). Listen to him, half a century back: "The image commonly employed in conservation education is 'the balance of nature'. ... This figure of speech fails to describe adequately what little we know about the land mechanism. A much truer image is the one employed in ecology: the land pyramid, ... a tangle of [food] chains so complex as to seem disorderly, yet the stability of the system proves it to be a highly organized structure. Its functioning depends on the co-operation and competition of its diverse parts" (Leopold (1949)1968: 214-215), "To the ecological mind, balance of nature has merits and also demerits. Its merits are that it conceives of a collective total, that it imputes some utility to all species ... Its defects are that there is only one point at which balance occurs and the balance is normally static." It "imputes to the biota properties which exist only on the grocer's counter" (Leopold 1991: 267).

Over the decades, ecosystems are not static but have dynamic stability, recurrent processes and patterns; over the millennia, this passes into evolutionary development. Leopold was well aware that North America has undergone ice ages, climatic changes, speciation and extinctions of fauna and flora, and respeciation, "Evolution has added layer after layer, link after link." "The trend of evolution is to elaborate and diversify the biota" (Leopold (1949)1968:216). This is more true than static balance.

Meanwhile, we do have three and a half billion years of life on Earth, generated and regenerated; and the matrix of such speciation is always ecosystems. An ecosystem is a spontaneously-organizing system of interrelated parts, simultaneously persisting and evolving through changes over decades and centuries. An ecosystem is a vital and dynamic collection of organisms, each with its capabilities and limits, each species selected over evolutionary history to do rather well in the niche it inhabits, an adapted fit, and with some capacities for adapting to changes in its altering environment. In these ecosystems qualities emerge that are corporate or holistic (such as trophic pyramids or tendencies to succession), not the qualities of any individual parts (such as metabolism or death). The result is the richness of biodiversity over the geological millennia.

There are ordered regularities (seasons returning, the hydrologic cycle, acorns making oak trees, squirrels feeding on the acorns) mixed with episodic irregularities (droughts, fires, lightning killing an oak, mutations in the acorns). The rains come; leaves photosynthesize; insects and birds go their way; earthworms work the soil; bacteria break down wastes that are recycled; coyotes find dens, have their pups, and hunt rabbits; and on and on. Ecosystems contain as cybernetic subsystems the species lineages reproduced generation after generation. The half-life, on average, of many species is something like 5 million years. Lions have lived on the Serengeti plains for a long time, as have the zebras they eat. Over longer scales there are climate changes, respeciation, new niches generated and occupied. This dynamic stability does not preclude but rather includes variation and change.

Philosophers of biology doubt whether there are laws anywhere in biology, as law is generally understood in physics and chemistry, owing to the historical, earthbound nature of biology. Life depends on unique information discovered and transmitted in genes and DNA. But it does not follow that biology is without dependable, repeatable regularities. Weber (1999: 72, 91) finds that "there are ecological laws, if it is allowed that laws generalize over a restricted domain of application". "Ecology knows evolutionary invariant generalizations which are law-like and at the same time distinctively biological." Such regularities typically continue when evolutionary novelties are introduced. There are degrees of regularity and of contingency within both evolutionary history and landscape ecology, as there are also within genetics and molecular biology (Cooper 1998).

That an ecosystem is 'stable', as Leopold put it, is related to the contemporary idea that an ecosystem is 'sustainable'. Natural systems were often 'sustained' in the past for long periods of time, even while they gradually modified. The Ecological Society

of America has warned that humans ought to preserve their 'sustainable biosphere' (Lubchenco et al. 1991). But that presupposes that these biospheric ecosystems were once, before human disruptions, ongoing systems over time and that they can and will, with intelligent human uses of them, continue far into the future. Worries about global warming, for example, assume that characteristically (though not invariantly) climate does not change so rapidly that the fauna and flora cannot track those changes, sustaining the ecosystem through modifications,

Equilibrium theory and non-equilibrium theory represent two ends of a spectrum with real ecosystems somewhere in between equilibrium and non-equilibrium, and whether one sees one or the other can depend on the level and scale of analysis. If density or community structure as a whole is studied, equilibria may appear never to be reached. However, at population levels, species diversity, or community compositions, ecosystems can show more predictable patterns, and even approach steady states on restricted ranges (Koetsier et al. 1990). O'Neill et al. (1986: 3) summarizes the conclusions of his research team: those who see stability and those who see change are looking at two sides of one coin: "In fact, both impressions are correct, depending on the purpose and time-space scale of our observations". "The dynamic nature of ecosystems", concludes Pahl-Wostl (1995), is "chaos and order entwined".

Perhaps there are no equilibria reached and kept, but ecosystems are equilibrating systems composed of co-evolving organisms, with checks and balances pulsing over time. Population growth is constantly checked by food supply, predation, disease, or habitat availability, for example. There are autotrophs, heterotrophs, predators and prey, herbivores, omnivores, carnivores, trophic pyramids. There are succession (often interrupted), competition, symbiosis, energy flow, carrying capacity, niches, co-evolution, and often density dependent regulation, as well as density independent factors. Many general characteristics are repeated; many local details vary. Patterns of growth and development are orderly and predictable enough to make ecological science possible – and also to make possible an environmental ethics respecting these dynamic, creative, vital processes,

There is a kind of order that arises spontaneously and systematically when many self-actualizing units jostle and seek their own programs, each doing its own thing and forced into informed interaction with other units. In culture, the logic of language or the integrated connections of the market are examples. Science or Christianity are community enterprises too vast to be comprehended by any one mind; many minds contribute to the building of each. No one individual orders language, markets, science, religion. Individuals pursue their interests in all four, but none of these processes is fully to be explained merely as aggregated individual interests.

Government too is at various scales: legislative, executive, and judicial checks and balances, at federal, state, county, and municipal levels. Cultural heritages are generally like this, and we may legitimately respect Judaism or Christianity, or democracy or science, none of which are centrally controlled processes, all of which mix elements of integrity and dependability with dynamic change, even surprise and

unpredictability, We might wish for 'beauty, integrity, and stability' in democracy or science, without denying the elements of pluralism, historical development, and novel discoveries.

Natural selection means changes, but natural selection fails without order, without enough stability in ecosystems to make the mutations selected for dependably good for the time being. There is variation, more or less contingent, but without relative stability in environments, sustained patterns of evolutionary change cannot occur. A rabbit with a lucky genetic mutation that enables it to run a little faster has no survival advantage to be selected for, unless there are foxes and coyotes reliably present to remove the slower rabbits. Ecosystems have to be more or less integrated (in their food pyramids, for example), relatively stable (with more or less dependable food supplies, grass growing again each spring for the rabbits), and with persistent patterns (the hydrologic cycle watering the grass), or nothing can be an adapted fit, nor can adaptations evolve. Various changes in evolutionary history may result from 'drift', and therefore be contingent, but species lineages cannot drift through a world too chaotic to provide reliable life support.

Some events are more infrequent, such as extreme droughts or storms. Coded in the genetics and expressed in the coping behaviors of its member species, ecosystems will have some capacities to adjust to interruptions that come often enough to be remembered in the genetic memory of member species. Lodgepole pines can make serotinous cones, for example, and the forest replaces itself. Some species become adapted for rapid reproduction in disturbed habitats (*r*-selected), some adapted for sustained replacement in settled habitats (*K*-selected), because suitable habitats for such species recur. Provided that climatic changes or novel species invasions are not too overwhelming, ecosystems that have long persisted will probably persist longer.

Leopold knew well enough that there is dynamic change, through time yielding historical development. Integrity in ecosystems includes the capacity to evolve. Stability, and nothing more, would squelch this creativity. On a big enough scale, ecology meets evolution. Or, perhaps one should say, the evolution going on all the time becomes evident. Ecology is always a time slice out of evolution.

Botkin (1990: 62) finds little stability in ecosystems, but he amply finds order: "Nature undisturbed by human influence seems more like a symphony whose harmonies arise from variation and change over every interval of time. We see a landscape that is always in flux, changing over many scales of time and space," An ecosystem is "a certain kind of system composed of many individuals of different species ... and their environment, making together a network of living and nonliving parts that can maintain the flow of energy and the cycling of chemical elements that, in turn, support life" (Botkin 1990: 7). Botkin is often able to computer model these systems, else ecosystem management is impossible.

That, if you like, revises Leopold, but it retains relatively ordered ecosystems, making ecosystem science possible. If these ecosystems are rather like 'symphonies', that order has enough beauty to make environmental ethics a responsibility.

Thankfully, ecosystems are proving more complex, and correspondingly more interesting and valuable than even Leopold knew.

Generally ecosystemic nature, out there independently of humans though it may be, is today under threat owing to human disruptions. This threat is variously described as a threat to ecosystem function, health, integrity, or quality. Such ecosystem functions are both objective features of the world (the hydrological cycles, the nutrient flows) at the same time that they are affected for better or worse by human activities (acid rain killing trees and fish). The processes and products originally in place will with high probability have been those for which organisms are naturally selected for their adaptive fits, since misfits go extinct and easily disrupted ecosystems collapse and are replaced by more stable ones. Ecosystems get tested over thousands of years for their resilience.

This is true even though ecosystems are continually changing and though from time to time natural systems are upset (when volcanoes erupt, tsunamis destroy whole regions, or catastrophic epidemics break out). Then organisms have to adapt to altered circumstances and, as new interdependencies and networks appear, the integrity of ecosystems has to become re-established. Natural systems are typically places of adapted fit, as evolutionary and ecology theory both teach.

Even if natural ecosystems have characteristically settled into rather predictable patterns only slowly modified over evolutionary time, it seems likely that such systems, already quite complex, will be destabilized by human modifications, since these are often drastically different (bulldozers scraping off soil, synthetic pesticides, exotic weeds from another continent, acid rain). The fauna and flora have no genetic memory of such disruptions. Reliable predictions of these novel upsets will be beyond the capacities of ecosystem science with its presently available models and theories. An ecosystem might have naturally evolved certain checks and balances, feedback loops, but little follows from this to what will happen with human-introduced innovations (when the Europeans move to Hawaii, for instance, where the flightless birds have no evolutionary experience with ground predators). On the scale of human duties in conservation, preservation, and land-use planning, many find that Leopold's land ethic is still wise advice. We cannot predict how the next millennium will end, but we can work to sustain the biosphere in the first century of that millennium.

Earth ethics beyond the land ethic

Leopold was onto something bigger than he knew, as prophets often are. He never faced many issues now paramount in environmental ethics. Here we reach another scale question. Leopold forged his ethic in the sand counties of Wisconsin, though he was quite aware that persons around the globe need a land ethic. He also wrote of New Mexico, of Iowa, lamented the lack of wilderness in Germany and hoped it could be saved in the Carpathian Mountains of central Europe, or in Siberia. But Leopold

did not face the global issues now novel and developing in environmental ethics; he wrote little about the future of Earth as a planet. In that sense, environmental ethics has become more millenarian, eschatological.

Leopold knew nothing of the hole in the ozone layer, of global warming. He did not face issues of sustainable development in Africa or the Amazon. Nor did he ask questions about environmental justice. These arise where the poor bear disproportionately the burdens of environmental degradation, or where developed nations, with one-fifth of the world's population consume four-fifths of its resources, with four-fifths of the world in developing nations limited to one-fifth of the world's production. Ecofeminism did not exist in his lifetime; so he never faced its strident claims that the domination of women is inextricably linked with the domination of nature, and both problems must be solved together. He does not deal with escalating populations in the Third World, nor with the consumer culture being produced by global capitalism. He does not mention the World Bank, or The North American Free Trade Agreement (NAFTA), or the World Trade Organization (WTO), with their environmental policies, or lack thereof. Nor does he ask who owns genetic resources in tropical rainforests, who can patent their use, nor whether ivory should be sold or banned in order best to protect elephants. He does not worry about the rights of indigenous peoples, or about the release of genetically engineered organisms into natural environments. Leopold's land ethic can seem simplistic, almost parochial before the urgency and complexity of these global issues.

Since Leopold wrote, the United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro in 1992 brought together the largest number of world leaders that have ever assembled to address any one issue, coupling sustainable development with a sustainable biosphere, and finding both urgent. That conference drew 118 heads of state and government, delegations from 178 nations, virtually every nation in the world, 7000 diplomatic bureaucrats, 30000 advocates of environmental causes, and 7000 journalists. The results of the Summit have been less effective than many hoped, but at least ethics was always on the agenda, and environmental values were fundamental to every topic discussed. Even where the Summit failed to act, the failure indicated how much of value was at stake in the issues negotiated. The Summit was symbolically important, and this has become increasingly evident as we turn the millennium. The issues that coalesced there have been gathering over the last five hundred years, and they will be with us for another 500. Agenda 21 is probably the most complex and comprehensive international document ever attempted.

Ethics in the modern West, has been almost entirely interhuman ethics, persons finding a way to relate morally to other persons – loving our neighbors. Ethics seeks to find a satisfactory fit for humans in their communities, and this has meant that ethics has often dwelt on justice, fairness, love, rights, or peace, settling the disputes of right and wrong that arise among us. But ethics now is anxious also about the troubled planet, its fauna, flora, species, and ecosystems. The two great marvels of

our planet are life and mind, both among the rarest things in the universe. In the global picture, the late-coming, moral species, *Homo sapiens*, arising a few hundred thousand years ago, has, still more lately in this century, gained startling powers for the rebuilding and modification, including the degradation, of this home planet.

Environmental ethics, started by a forester spending his weekends in a shack in the rural sand countries, will be taken by some, even yet, to be peripheral concern about chipmunks and daisies, extrapolated to rocks and dirt. But not so. The four most critical issues that humans currently face are peace, population, development, and environment. All are entwined. Human desires for maximum development drive population increases, escalate exploitation of the environment, and fuel the forces of war. Those who are not at peace with one another find it difficult to be at peace with nature, and vice versa. Those who exploit persons will typically exploit nature as or more readily – animals, plants, species, ecosystems, and Earth itself.

One can, if one wishes, say that concern for the environment is only enlightened human self-interest; one can, if one wishes, say that concern for justice and equitable distribution of resources is only enlightened self-interest. We do all benefit from sustainable development in a sustainable biosphere, as we do from justice and fair resource distribution. Still, a perspective with more depth sees entwined destinies, people with other people, people with their planet, responsible caring in human and biotic communities. Environmental ethics is the elevation to ultimacy of an urgent world vision.

We are searching for an ethics adequate to respect life on this Earth, the only planet yet known with an ecology. On Earth, home to several million species, humans are the only species who can reflect about their land ethic, about the future of the planet. Earth is the planet 'right (suitable) for life', and ethics asks about the (moral) 'right to life' on such a planet. Certainly it seems 'right' that life should continue here, a matter of 'biotic right', as Leopold ((1949)1968: 204, 211) put it. Life is, in the deepest sense, the most valuable phenomenon of all. Death has to be figured into the life process, with life regenerated. Life must be sacrificed for the support of life, on which principle ecosystems are founded. Life might be sacrificed to support more abundant life. Still, these long-continuing life processes are the miracle of Earth, and have become, as never before as we humans turn our millennium, our evolutionary and ecological responsibility.

Nature has equipped *Homo sapiens*, the wise species, with a conscience to direct the fearful power of the brain and hand. Perhaps conscience is less wisely used than it ought to be when, as in classical Enlightenment ethics, it exempts the global community of life from consideration, with the resulting paradox that the self-consciously moral species acts only in its collective self-interest toward all the rest. Among the remarkable developments on Earth with which we have to reckon, there is the long-standing ingenuity of the myriads of species that compose natural history; there is the recent, explosive human development; and there ought to be, and is, a developing environmental ethic that optimizes natural values in complement to human concerns.

We are not so enlightened as we supposed, not until we reach this Earth ethics. This is the biology of ultimate concern. This is seeing further than Leopold, but we see so far because we stand on this giant's shoulders. We are travelling deeper into ethics than ever before, unfolding a worldview that Leopold began to envision, an urgent call as we turn the millennium. The land ethic has become Earth ethics.

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