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Conservation in the Old World, especially forest and game conservation, seems to have evolved gradually (Peterken 1981). No doubt a parallel, but very different, practice and conception of conservation also independently evolved in the New World as well. With the wholesale devaluation and destruction of American Indian cultures that occurred during four of the five hundred years of European discovery, conquest, colonization, and finally complete domination of the Western Hemisphere, however, indigenous New World conservation thought and practice was all but lost (Viola and Margolis 1991).

The depopulation of North America was so thoroughgoing, owing more to what might be called inadvertent biological warfare than to conventional warfare (Deneven 1992a), that the English colonists could imagine that they had settled in a wilderness (Nash 1967), not in a country once fully inhabited and significantly transformed by its indigenous peoples (Deneven 1992b). Thus, two allied myths established themselves in the Euro-American consciousness: one, that the whole of North America was a “virgin” wilderness of continental proportions; the other, that North America’s natural resources, and especially its forests, were inexhaustible. The second of these is conventionally called “the myth of superabundance.”

While the wilderness myth has only been recently debunked (Callicott 1991; Gomez-Pompa and Kaus 1991), the myth of superabundance was abandoned around the turn of the

century. With the completion of the transcontinental railroad, the slaughter of the bison herds, and the subjugation of the Plains Indians, the North American frontier palpably closed and the limits of North America’s natural resources dawned on thoughtful Euro-Americans (Hays 1959). Against the background of laissez faire exploitation—unregulated hunting and fishing, logging, mining, plowing, and so on—the necessity of conservation received a good deal of conscious reflection.

George Perkins Marsh is generally credited with first articulating an American conservation philosophy in his prophetic book, *Man and Nature; or The Earth as Modified by Human Action* (1864, 1874). Marsh was mainly concerned about the adverse effects of deforestation on stream flow, soil stability and fertility, and climate. His conservation ethic was an early American version of contemporary Judeo-

Christian stewardship. "Man," he wrote, "has too long forgotten that the earth was given to him for usufruct alone, not for consumption, still less for profligate waste" (Marsh 1874, p. 33).

Ralph Waldo Emerson and Henry David Thoreau had not attained the essentially ecological understanding of the relationship between vegetation, soil, water, and climate that Marsh had. They were principally concerned rather with the aesthetic, psychological, and spiritual paucity of the prevailing American materialism and vulgar utilitarianism. As an antidote, they turned to wild nature—contact with which, they argued, invigorates and strengthens the body, inspires the imagination, energizes the mind, elevates the soul, and provides an occasion for transcending finite human consciousness. Because wild nature is a psycho-spiritual—as well as a material-resource, Emerson (1836) and Thoreau (1863) argued that Americans should preserve a significant portion of it undefined.

Emerson and Thoreau thus stand at the fountainhead of the wilderness preservation philosophy of conservation. Thoreau was probably the first American to advocate what eventually became a national wilderness preservation policy: "I think that each town," he wrote, "should have a park, or rather a primitive forest, of five hundred or a thousand acres . . . where a stick should never be cut—nor for the navy, nor to make wagons, but to stand and decay for higher uses—a common possession forever, for instruction and recreation" (Thoreau 1970, pp. 34-35).

This philosophy of conservation

was energetically promoted by John Muir (1901). Through his lively writing, thousands of American readers experienced vicariously the beauty, the physical and mental salubriousness, and the spiritual redemption that he experienced directly and personally during his many and lengthy wilderness sojourns.

Gifford Pinchot, a younger contemporary of John Muir, articulated a very different philosophy of conservation firmly grounded in utilitarian values and closely associated with the world view of modern classical science. Pinchot (1947, pp. 235-236) crystallized the resource conservation philosophy in a motto—"the greatest good of the greatest number for the longest time"—that echoed John Stuart Mill's (1863) utilitarian creed, "the greatest happiness of the greatest number."

Pinchot bluntly reduced the "Nature"—with which Marsh, Emerson, Thoreau, and Muir were variously concerned—to "natural resources." "There are two things on this material earth," he averred, "people and natural resources" (Pinchot 1949, p. 325). And he even equated conservation with the systematic exploitation of natural resources. "The first great fact about conservation," Pinchot (1947, p. xix) noted, "is that it stands for development." For those who might take the term "conservation" at face value and suppose that it meant, if not nature preservation, then at least saving some natural resources for future use, Pinchot was quick to point out their error: "There has been a fundamental misconception," he wrote, "that conservation means nothing but the husbanding of resources for future generations. There could be no more se-

rious mistake" (Pinchot 1947, p. xix). And it was none other than Pinchot (1947, p. 263) who characterized the Muirian contingent of preservationists as aiming to "lock up" resources in national parks and other wilderness reserves.

In short, for Pinchot conservation meant the efficient exploitation of "natural resources" and the fair distribution of the benefits of doing so. Science was the handmaid of efficiency, and macro-economics of fairness. Thus Pinchot's philosophy of conservation was wedded to the eighteenth- and nineteenth-century scientific world view, according to which nature is a collection of bits of matter, assembled into a hierarchy of independently existing chemical and organismic aggregates, that can be understood and manipulated by reductive methods. It was also wedded to the correlative social science of economics—the science of self-interested rational individuals pursuing preference-satisfaction in a regulated market.

John Muir and Gifford Pinchot were, for a time, friends and allies. Their very different philosophies of conservation, however, led to a falling out (Nash 1967). The personal rift between Muir and Pinchot symbolizes the schism that split the North American conservation movement into two mutually hostile camps at the beginning of the twentieth century (Fox 1981). Pinchot commandeered the term "conservation" for his philosophy, while Muir and his followers came to be known as "preservationists."

Pinchot's philosophy dominated conservation in the public sector of

the United States—the Forest Service (of which Pinchot himself was the first chief), the Fish and Wildlife Service, the Bureau of Land Management, and state departments of natural resources (Fox 1981). Muir's philosophy prevailed in non-governmental conservation organizations, such as the Sierra Club (which Muir founded), the Wilderness Society, and the Nature Conservancy (Fox 1981).

Aldo Leopold was employed by the United States Forest Service for fifteen years (Meine 1988). Thus he began his career as a conservationist solidly in the Pinchot camp. Nevertheless, he gradually came to the conclusion that Pinchot's conservation philosophy was inadequate because it was based upon an obsolete pre-ecological scientific paradigm (Flader 1974). As Leopold (1939a, p. 727) put it:

Ecology is a new fusion point for all the sciences . . . The emergence of ecology has put the economic biologist in a peculiar dilemma: with one hand he points out the accumulated findings of his search for utility in this or that species; with the other he lifts the veil from a biota so complex, so conditioned by interwoven cooperation and competitions that no man can say where utility begins or ends.

From an ecological point of view, nature is more than a collection of discontinuous useful, useless, or noxious species furnishing an elemental landscape of soils and waters. It is, rather, a vast, intricately organized and tightly integrated *system* of complex *processes*. And human beings are not specially created and uniquely valuable demigods, any more than nature is a vast

emporium of goods, services, and amenities. We are, rather, very much a part of nature. Further, the portrait of human beings in economic theory as single-minded consumers is a gross caricature. Individual welfare, from an ecological point of view, is inextricable from the health and integrity of both the social and natural communities to which we belong.

We tend to think of Leopold as having begun his distinguished career in the Pinchot school of conservation thought and gradually to have come over, armed with new ecological arguments, to the wilderness preservation school of thought. And indeed Leopold was committed to wilderness preservation throughout his life, though his reasons evolved from an emphasis on recreation (Leopold 1921) to an emphasis on the role of wilderness in scientific research and wildlife conservation (Leopold 1936, 1941).

But Leopold realized that the Muir-Pinchot schism had left North American conservation in an unfortunate "zero-sum" dilemma: either lock up and preserve pristine nature, or efficiently and fairly develop it . . . and, in doing so, necessarily degrade or destroy it. Half a century after institutionalizing Pinchot's conservation philosophy through the establishment of the Forest Service and similar natural-resource-management bureaucracies, the United States Congress institutionalized Muir's conservation philosophy in the Wilderness Act of 1964. It reads in part: "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of

life are untrammelled by man, where man is a visitor who does not remain" (Nash 1967, p. 5). Reflecting the unequal political strength of the conservationists and the preservationists, the contiguous forty-eight United States eventually became segregated into large development zones dotted here and there (mostly west of the Mississippi) with wilderness preserves adding up to only two or three percent of the total. Hoping to break out of this dilemma, Leopold advocated a "win-win" philosophy of conservation, stressing ways of inhabiting and using nature that are at the same time ecologically benign. As he put it, the "impulse to save wild remnants is always, I think, the forerunner of the more important and complex task of mixing a degree of wildness with utility" (Leopold 1991a, p. 227).

Accordingly, Leopold set out to define conservation in the following terms: as "a universal symbiosis with land, economic and aesthetic, public and private" (Leopold 1933, p. 639); as "a protest against destructive land use" (Leopold 1991b, p. 212); as an effort "to preserve both utility and beauty" (Leopold 1991b, p. 212); as "a positive exercise of skill and insight, not merely a negative exercise of abstinence and caution" (Leopold 1939b, p. 296); and, finally, as "a state of harmony between men and land" (Leopold 1949, p. 207).

Currently, Leopold's harmony-with-nature philosophy of conservation is called "sustainable development"—*if* by "sustainable development" is meant the initiation of human economic activity that does not significantly compromise ecological health and integrity; and, ideally, eco-

conomic activity that might positively enhance it. "Sustainable development" is, however, an unfortunate phrase. "Ecological livelihood" would be less liable to misinterpretation and misappropriation. "Sustainable" is vague and often used by economists to mean passing on enough capital and technological know-how to replace exhausted natural resources and compromised biological systems with artificial alternatives. And "development" is often a euphemism for the building of high-rise condominiums, shopping malls, parking lots, and subdivisions. In calling for a "universal symbiosis with land," Leopold had in mind changes far more radical than, say, building more energy-efficient tract houses and automobiles. He was proposing, rather, a veritable revolution in the way we human beings inhabit and use the natural environment.

How should we assess twentieth-century North American conservation philosophy as we approach the twenty-first century?

Pinchot's philosophy of conservation is no longer viable, since it is founded on a reductive, pre-ecological scientific paradigm. Even the United States Forest Service is admitting that old-growth forests are not just senescent stands of timber, overdue for clear-cutting and replanting to even-aged monotypical blocks of fast-growing trees. The Forest Service is finally coming around to the idea of ecological forest management.

Muir's philosophy of wilderness preservation is equally obsolete. First, no less than Pinchot's, it perpetuates the pre-evolutionary strict separation of "man" from "nature." It simply puts

an opposite spin on the value question, defending bits of innocent, pristine, virgin "nature" against the depredations of greedy and destructive "man." Second, it ignores the presence and the considerable impact of indigenous peoples in their native ecosystems. North and South America, for example, had been fully inhabited and radically affected by *Homo sapiens* for 10,000 or more years before European discovery (Deneven 1992b). And third, it assumes that, if preserved, an ecosystem will remain in a stable steady-state, while current thinking in ecology stresses the importance of constant, but patchy, perturbation and the inevitability of change (Botkin 1990).

Leopold's harmony-with-nature philosophy of conservation is the only twentieth-century North American philosophy of conservation that seems likely to be viable in the twenty-first century. It recognizes that human beings are as much a part of nature as any other species. But it would urge that, like most other species, we human beings learn to live symbiotically with our fellow-denizens in the various ecosystems that we inhabit. And it absorbs the enduring conservation value and the core of truth in the obsolete wilderness idea. Wilderness areas, originally set aside for outdoor recreation, scenic beauty, and solitude can best serve contemporary conservation as habitat for populations of species that, to remain viable, require deep undisturbed forest, extensive unplowed savannah and heath, uncompromised wetlands, and so on. But such areas may require invasive management—not "resource" management, but ecosystem management.

Prescribed burns, for example, may be necessary to manage savannahs and certain forests so as to maintain the mix of species that compose them.

From the perspective of Leopold's harmony-with-nature philosophy of conservation, what is ecosystem management? And how does it differ from resource management? First and foremost, resource management is commodity-oriented. Forests are managed for maximum sustainable yield, ideally, of commercial timber and pulp to supply the building materials and paper industries. Wildlife, similarly, is managed for maximum sustainable yield of game species, not of all wildlife, to provide sport and meat for human hunters. (Yet another reason why "sustainable development" is an unfortunate label for the symbiotic relationship between people and land, envisioned by Leopold, is the inevitable confusion—especially in the minds of traditionally trained foresters and other resource managers—of "sustainable development" with "maximum sustainable yield.") Ecosystem management, on the other hand, aims, first and foremost, to maintain the health and integrity of ecosystems. Commodity production is a secondary and subordinate aim, to be pursued to the extent that it is compatible with maintaining the health and integrity of ecosystems.

This understanding of ecosystem management raises two more questions: What is ecosystem health? and What is ecosystem integrity? Ecosystem (or "land") health was defined by Leopold (1949, p. 221) as "the capacity of the land for self-renewal." Currently the concept is understood to refer to the capacity of ecosystems to maintain

their functions—such as sustaining biomass production, cycling nutrients, holding soil, and modulating stream flow (Costanza *et al* 1992). This functional understanding better incorporates orderly ecological change than Leopold's more recursive definition. Let integrity, on the other hand, refer to an ecosystem's historic structure—its complement of component species in their characteristic numbers. Maintaining ecosystem integrity, so understood, is a more exacting norm of ecosystem management, since ecosystem functions may be little impaired by the incidental loss of non-keystone species, by the competitive exclusion of native species by exotics, or by the gradual and orderly change from one type of community to another.

In addition to directly managing ecosystems to maintain their health and integrity—by prescribed burns, afforestation, culling weedy species, excluding or eradicating exotics, protecting or reintroducing natives, and so on—ecosystem management entails managing human economic activities. It entails finding new ways of living on the land. Leopold himself was especially distressed by the increasing industrialization of agriculture during the mid-twentieth century (Leopold 1945) and looked for ways of making agriculture more compatible with ecosystem health and integrity (Leopold (1939b). Finding methods of harvesting timber that do not compromise the health and integrity of old-growth ecosystems is part of the current Clinton plan to resolve the jobs-versus-old-growth conundrum in the Pacific Northwest (Egan 1993). Ecological range management might be achieved by removing all domestic

stock and reestablishing native ungulates—bison, deer, antelope, and elk—in their historic numbers. Range “ranching,” in such a scenario, might consist of erstwhile cowboys and -girls culling the herds, strictly regulated by the Fish and Wildlife Service or the BLM, and selling the meat on the expanding organic and gourmet foods market (Callicott 1991).

In sum, then, a human-harmony-with-nature conservation philosophy is more consistent with evolutionary and ecological biology than are both preservationism and resourcism. The ideal of this philosophy of conservation is to share the Earth with all our “fellow-voyagers . . . in the odyssey of evolution” (Leopold 1949, p. 109) and to provide all the Earth’s species with

adequate living space. As things presently stand, however, to do that, to nurture biological diversity at every scale, takes more than setting aside habitat. It requires ecosystem management, that is, managing ecosystems primarily for *their* health and integrity, not for *our* commodity production. Since we human beings are part of nature, according to this way of thinking, human economic activities are not necessarily and by definition incompatible with ecosystem health and integrity. Complementing wildlands management, we must aggressively pursue “sustainable development,” that is, the initiation of human productive activities which are limited by ecological feasibility no less than by economic feasibility.

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