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Fiddling While Earth Burns: A History of Ethical Response to Ecological Warning

Recent news events were dominated by two natural disasters: the Sumatra-Andaman earthquake of December 26th, 2004, and Hurricane Katrina, flooding New Orleans in late August 2005. Tragic impacts of these two events could have been reduced by implementation of measures known to exist beforehand: application of tsunami education and warning systems in the Indian Ocean region; and implementation of a plan for management of levees and wetland buffers surrounding New Orleans. Yet these are only two examples of numerous cases throughout history of unheeded ecological warnings. This paper provides an overview of some of these cases and addresses how categorizing responses through environmental philosophy might help future policy discussions.

> "One state of earth succeeds another/passing from barrenness to plenty…" Lucretius (Rome, ca. 100-50 BC).

Thus Lucretius rather complacently assumes that Earth is resilient and will fully replenish itself after our perturbations. Is our current attitude toward ecological problems and sustainability of our civilization more enlightened than the Romans?

News events of recent years were dominated by two major natural disasters: the Sumatra-Andaman earthquake of December 26th, 2004, and the hurricane-caused flooding of New Orleans in late August 2005. Tragic impacts of these two events could have been reduced by implementation of measures known to exist beforehand: application of tsunami education and warning systems in the Indian Ocean region;[1] and implementation of a plan for management of levees and wetland buffers surrounding New Orleans.[2]

Yet these are only two examples of numerous cases of unheeded ecological warnings throughout history. Responses to the current major ecological warning, climate change, could be the most critical case thus far.

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[1] Gonzalez, F. I. 1999. Tsunami! *Scientific American*, (5): 56-65.
[2] Fischetti, M. 2001. Drowning New Orleans. *Scientific American*, (10):

Numerous cases exist in pre-history where cultures realized problems and adapted practices.[3] As an example, Egyptians developed a system of agriculture that lasted for several thousand years.[4] In comparison, modern technological society has only been sustained for approximately two hundred to five hundred years. Lack of adaptation by cultures is also evident.[5]

Deficiencies highlighted by environmental philosophy since the 1970s, consolidated into major categories, include lack of concern for: 1) beauty, integrity, and stability of biotic communities; 2) intrinsic value of other species; 3) adaptation to situated knowledge and site-specifics; 4) sustainability and future generations; and 5) potential for false negative results and false claims of objectivity in risk assessment.

This paper summarizes responses to ecological warnings through history and addresses how environmental philosophy might benefit future environmental assessment. Categorizing alternative scenarios within a spectrum of environmental ethics, ranging from strong anthropocentrism to biocentrism, and addressing concern for the five categories above, can enhance future environmental assessment and planning processes.

Ancient Greek and Roman Response to Ecological Warning

Human activities that lead to unexpected catastrophes marked early Greek mythology and art. Then, in the 6th century BC, rational thought took over and changed the perception of nature and the way it functions. In a deep-seated need for predictability, classic Greeks preferred intelligibility, perfection, and order. Nature as humans wanted to see it was governed by gods or reason according to some sort of a general plan.

The perception of benevolent, harmonious nature, a product of heavenly design, led to the belief of its capacity to return to its former state when disturbed. The concept of 'balance of

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[3] Minnis, P.E. 1996. Notes on Economic Uncertainty and Human Behavior in the Prehistoric Southwest. In *Evolving Complexity and Environmental Risk in the Prehistoric Southwest*, J. Tainter and B.B. Tainter, eds., pp. 57-78. Santa Fe Institute Studies in the Science of Complexity proceedings 24. Addison-Wesley.

[4] J. Donald Hughes, The Environmental History of the World: Humankind's Changing Role in the Community of Life, New York: Rutledge, 2001

[5] Diamond, J. 2005. *Collapse: How Societies Choose to Fail or Succeed*. Viking Books.

nature' can be found in a classical vision of a Mother Earth. It was introduced by Hesiod in his *Theogony* written about 700 B.C. Equilibrium theory discounted physical and geological and climatic forces such as fire, strong winds, rainstorms, and the impact of human activities. Any disturbance was a damage, which, it was believed, set in motion forces leading to recovery.

There were exceptions to this view, of course. "*You never step twice into the same river"* wrote Heraclitus around 500 B.C. He believed that most natural processes are constantly in flux, that "chance and change are the rule, the future is as unpredictable to other organisms as it is to us…'[6] If you do not expect the unexpected you will not find it, for it is hard to be searched out and difficult to compass," he warned. It could be argued that seeds of the precautionary principle, a strong feature in current analysis of environmental problems, were sown a long time ago.

In *De Causis Plantarum* Theophrastus assumed that "Anything which is contrary to nature is dangerous." Even though Theophrastus, who is considered a major forerunner of ecological studies, reminded that order should not be presumed in nature, Greeks rarely ventured into the fascinating world of change and chance.

In the fourth century B.C. Plato observed deforestation of Attica by the great man of Athens in its Golden Age. In an oft-quoted passage of *Critias,* he wrote: "what now remains compared to what then existed is like a skeleton of a sick man, all the fat and the soft soil having wasted away, and only the bare framework of the land being left."[7]

Williams laments: "That natural processes were accelerated with tree cutting and cultivation is obvious but, all in all, it is strange that, in such a literate and observant world, no evidence has arisen of consciences disturbed by the exploitation of forests, no general alarm

[6] W.H. Drury Jr. *Chance and Change, Ecology for Conservationists*, 1998, University of California Press, Berkley, Los Angeles: p. 7
[7] Plato. 360 B.C. *Critias*, 111-B.

about depletion, no treatise on forest management, nor examples of efforts to plant trees other than olive trees."[8]

However, Plato, in *Laws*, 761, notes protection of water resources. The administrators:

> shall provide against the rains doing harm instead of good to the land, when they come down from the mountains into the hollow dells; and shall keep in the overflow by the help of works and ditches, in order that the valleys, receiving and drinking up the rain from heaven, and providing fountains and streams in the fields and regions which lie underneath, may furnish even to the dry places plenty of good water.[9]

Clarence Glacken, a scholar of environmental history, noted that Plato's assessments:

> can be accepted neither as factual nor as evidence of deterioration of the Mediterranean landscape owing to natural and man-made catastrophes from the remote past to Plato's time. There is, however, clear evidence here of the recognition by Plato that natural erosion and human activities- such as deforestation- may in their cumulative effects change a landscape throughout time.[10]

Despite some responses, early civilizations nestled in a stable social structure gave relatively little heed to deforestation, soil erosion, and other ecological warnings. Weather, with its impact on agriculture and human health, was the most apparent and therefore most debated variable.[11] In retrospect, the essential reasons that human-induced environmental degradations were not recognized in time lies not just in the fact that early warning signs were noted by only a few individuals, but mainly because they were presented in a way that did not correspond to the mainstream, socially accepted conceptions of nature. The prevailing view in classical times that anticipated Christian perception of creation was that of a design. The earth has been seen as a

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[8] Williams, M. 2003. *Deforesting the Earth: From Prehistory to Global Crisis*, p. 9. Chicago: University of Chicago Press.

[9] The Dialogues of Plato, translated by Benjamin Jowett, in *Great Books of the Western World*, Mortimer J. Adler, Editor in Chief, vol. 6, Encyclopedia Britannica, Inc. 1993

[10] Clarence J. Glacken, *Traces on the Rhodian Shore. Nature and Culture in Western Thought From Ancient times to the end of the Eighteen Century*, 1967, University Of California Press, Berkley, Los Angeles, London, p. 121)

[11] See, *Airs, Water, Places in Hippocratic Writings,* G.E. R. Lloyd, edition and introduction, 1983, Penguin Books: Harmondsworth

physical system devised by a supreme intelligence for the sustenance of humankind and environmental changes as a natural part of cultural history.

The Roman Lucretius (ca. 100- 50 B.C.) can be interpreted to exemplify this complacency, declaring that nature is continuously renewed but nothing is ever wholly destroyed:

> For the time transmutes the nature of the world;/ one state of things must pass into another;/ nothing remains the same, but always changes/ transformed by nature and compelled to alter. / One thing decays and languishes with age/another rises out of what we scorn/ Time therefore transubstantiates the nature/ of all; one state of earth succeeds another/passing from barrenness to plenty…[12]

Response to Ecological Warning in Early Modernity

Examples of a post-Roman conservation conscience are noted as far back as the seventh century.[13] The Magna Carta (1215) contains two sections to environment-related problems.[14] The Renaissance was marked by a growing conviction of human possibility to control and transform the landscape through reason and technology. Amidst this consciousness were beliefs that our activities negatively affect the natural world. In the seventeenth century, John Evelyn, in his '*Silva: or, A Discourse of Forest- Trees,*'[15] advocates forest conservation and restoration to members of British Royal Society. As we quote 50-100 year old texts today, he sustained his arguments with the authority of classics like Virgil, Theophrastus, Pliny and Columella:

> 'to extirpate, demolish, and raze, as it were, all those many goodly woods and forests, which our more prudent ancestors left standing for the ornament and service of their country.'[16] He continues: 'Truly, the waste and destruction of our woods has been so

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[12] Lucretius, *The Rerum Nature (On the nature of things)* , Leob Classical Library, translated by W.H. D. Rouse, 1924, V. 828-836

[13] see H.C. Darby, The Clearing of the English Woodlands, *Geography* XXXVI, 1951, also: The Clearing of the Woodlands in Europe, in *Man's Role in Changing the Face of the Earth*, William L. Thomas (ed), Chicago: University of Chicago Press)1956 Robert M. Alison, The Earliest Traces of a Conservation Conscience, *Natural History*, vol.90:5, 1981:72-78

[14] Robert M. Alison, The Earliest Traces of a Conservation Conscience, *Natural History*, vol.90:5, 1981:72-78

[15] John Evelyn. *Silva: or, A discourse of forest-Trees and the Propagation of timber in His Majesty's Dominions*, York: Printed by A. Ward, 1776 (first printed in 1664)

[16] ibidem, pp.1-3

universal, that I conceive nothing less than an universal plantation of all sorts of trees will supply and well encounter the defect…'[17]

Facing the urgent necessity to confront abuse of water and forests, Luis XIV proclaimed in 1669 the French Forest Ordinance. It was intended to repair damage brought about by destructive use of natural resources and the waste of royal forests. It was also meant to provide for future generations, since 'it is not enough to have re-established order and discipline, if we do not by good and wise regulations see to it that the fruit of this shall be secured to posterity.'[18]

Count Buffon documented effects of human action on the land in more detail than any other scientist before George Perkins Marsh. However, the French Count considered these changes as beneficial for the progress of civilization. 'Wild nature is hideous and dying; it is I, I alone, who can make it agreeable and living'.[19] Yet, he warned about the threats of deforestation. Following Evelyn's proposal, Buffon emphasized need for the science of forestry for 'Nothing is less known; nothing more neglected.[20]

Response to Late-modern Ecological Visionaries

The late-modern environmental movement began roughly fifty years later, in the mid-1800s. George Perkins Marsh, in his book *Man and Nature* (1864), called for human cooperation with nature: 'I know no more important practical lessons in this earthly life of ours… that those relating to the employment of the sense of vision in the study of nature.'[21]

Henry David Thoreau, of course, anticipated environmentalism and forest ecology through studies such as *Walden* (1854) and *Excursions* (1864). Thoreau was also one of the first American supporters of Charles Darwin's theory of evolution. Alfred Russell Wallace communicated with Darwin and came close to publishing his own, similar theory of evolution

[17] ibidem, p.3
[18] ibidem, p.492
[19] Georges- Louis Leclerc, Comte de Buffon, *Natural History, General and Particular*, Translated from French by William Smellie, ed., London: T. Cadell and W. Davies, 1812: vol 12: xiii
[20] ibidem, pp. 271-290
[21] G.P. Marsh, *The Earth as Modified by Human Action* (A new edition of Man and Nature), 1987

beforehand. Writing about the spectacular South Pacific birds of Aru in 1869, Wallace hinted at intrinsic value in nature:[22]

> It seems sad that on the one hand such exquisite creatures should live out their lives and exhibit their charms only in these wild, inhospitable regions…should civilized man ever reach these distant lands…we may be sure that he will so disturb the nicely-balanced relations of organic and inorganic nature as to cause the disappearance, and finally the extinction, of these very beings whose wonderful structure and beauty he alone is fitted to appreciate and enjoy. This consideration must surely tell us that all living things were *not* made for man.

John Muir is largely known for his preservationist philosophy, which was presented in dichotomy to the utilitarianism of his contemporary, Gifford Pinchot. Yet Muir anticipated several key concepts in ecology besides preservation. His idea that Yosemite was formed by glaciers, not a catastrophic earthquake, defied the conventional theory led by Josiah Whitney, and caused the leading geologist of the time, Louis Agassiz, to call Muir: "the first man who has any adequate conception of glacial action." Muir also anticipated the animal rights movement by questioning hunting ethics and conservation biology by promoting preservation of entire river drainages, not just for aesthetics, but to preserve intact ecosystems.[23]

Pinchot, although much maligned by preservationists, protected millions of acres from timber barons through the federal forest reserves. Although utilitarian, his initial, primary rationale for the reserves was an early version of watershed protection – secondary was future timber supply.[24]

Aldo Leopold also served as an ecological visionary. Despite his notoriety during his career, many of Leopold's suggestions have surprisingly taken seventy years to surface into

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[22] Wallace, A. R. 1869. The Malay Archipelago. Cited in, Quammen, D. 1996. *Song of the Dodo: Island Biogeography in an Age of Extinctions*, p. 611. New York: Scribner.
[23] Ehrlich, G. 2000. *John Muir: Nature's Visionary, pgs. 96-97, 200.* Washington D.C.: National Geographic Society.
[24] Hays, S. P. 1959. *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920*. Pittsburgh: University of Pittsburgh Press.
Worster, D. 1992. *Rivers of Empire: Water, Aridity, and the Growth of the American West.*

policy and implementation within the concept of ecosystem management, a kind of middle ground between Pinchot's utilitarianism and Muir's preservation.

Many realize Leopold's early contributions to conservation, which combined unusual field perception and writing skills with collaborative efforts. Leopold was one of the first wildlife ecology professors, co-organizer (with Arthur Carhart) of the first designated wilderness area, co-organizer (with John Curtis) of some of the first native plant community restorations, and (most notably to philosophers) one of the first to articulate a land ethic in writing.[25]

Leopold's writing on a conservation ethic first surfaced in a 1924 essay "Some Fundamentals of Conservation in the Southwest," which was highlighted in an early (1979) issue of Environmental Ethics.[26] Leopold also saw ecological relationships in the field not apparent to others. Another 1924 essay highlighted the problematic relationship of Southwest cattle grazing to reduced fire, increased brush, and increased soil erosion.[27]

Largely ignored until the 1990s, the Western states brush and fire issue has now cost the US government $1.6 billion in just one recent initiative. Yet there are still more examples surfacing of Leopold's early awareness of today's conservation issues. As early as 1918, in a lesser-known article, Leopold warned about genetic mixing of native fisheries adapted to specific habitats.[28] Not long afterward Gila trout populations declined from new non-native trout stocking programs, with inherent costs of endangered fish protection and recovery incurred today.[29]

New York: Oxford University Press.

[25] Meine, C. 1988. *Aldo Leopold: His Life and Work.* Madison: University of Wisconsin Press.

[26] Leopold, Aldo. 1979. Some Fundamentals of Conservation in the Southwest. *Environmental Ethics* 1: 131-41. Flader, S. L. 1979. Leopold's Some Fundamentals of Conservation: A Commentary." *Environmental Ethics* 1: 143-48.

[27] Leopold, A. 1924. Grass, Brush, Timber, and Fire in Southern Arizona. *Journal of Forestry*, 22 (6): 1-10. Reprinted in *The River of the Mother God and Other Essays*. 1991. S. L. Flader and J. B. Callicott, eds. Madison: University of Wisconsin Press.

[28] Leopold, A. 1918. Mixing trout in western waters. *Transactions of the American Fisheries Society*, 47: 101-102.

[29] Callicott, J.B. 2000. Harmony Between Men and Land: Aldo Leopold and the Foundations of Ecosystem Management. *Journal of Forestry*, 98 (5): 5-13.

Early warnings were also provided by lesser known ecologists regarding the impact of dams on Northwest salmon populations. Costs of ignoring this warning today are reflected in serious, expensive proposals (some implemented) to entirely remove dams.[30]

Noted ecologist Eugene Odum warned of another potentially costly aquatic problem in the 1960s, diversion of water from the Everglades. The response was twenty years continuation of the Corps of Engineers program, which was started in the late 1940s. The late 1990s required a bi-partisan, $8.6 billion federal program to restore flows to this endangered ecosystem.

C.S. Holling's 1970s-80s research highlighted thresholds of ecological resiliency as appropriate warning measures. Holling sees an important distinction between resilience and stability, criticizing researchers who define resilience as how quickly an organism or ecosystem returns to its previous, stable equilibrium. Holling states that resilience "emphasizes the boundary of a stability domain and events far from equilibrium, high variability, and adaptation to change." Holling emphasizes dynamic, not steady-state, equilibriums in ecology.[31]

Holling notes problems with control of natural fluctuations that result in surprising, more intense disturbances later on. Examples given include are forest fire control and continuous cattle grazing that depletes potentially resilient forage species:

> In short, the biophysical environment became more fragile and more dependent on vigilance and error-free management at a time when greater dependencies had developed in the socioeconomic and institutional environment. The ecosystems simplified into less resilient ones as a consequence of man's success in reducing variability.

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[30] Goldsmith, E. and N. Hilyard. 1984. *The Social and Environmental Effects of Large Dams.* Vols 1 and 2. Cornwall, UK: Wadebridge Ecological Center.; also see Phadke, R. 1999. Berkeley Workshop On Environmental Politics; Bibliographies; B 00-1; Dams, Displacement, and Community Reconstruction: An Annotated Bibliography and Reference Guide; Berkeley, CA: Institute Of International Studies, University Of California, Berkeley**;** http://globetrotter.berkeley.edu/EnvirPol/Bib/B01-Phadke.pdf

[31] Holling, C. S. 1978. *Adaptive Environmental Assessment and Management*. John Wiley and Sons, London.

Holling, C. S. 1986. The Resilience of Ecosystems; Local Surprise and Global Change. In, *Sustainable Development of the Biosphere*, W. C. Clark and R. E. Munn, ed. Cambridge University Press,Cambridge.

Holling, C. S. 2004. From complex regions to complex worlds. *Ecology and Society,* 9 (1): 11. Website: http://www.ecologyandsociety.org/vol9/iss1/art11 (last accessed 7-18-04).

Holling emphasizes soil processes as key to facilitating renewal in temperate systems, but recommends local research into other holding processes at the boundary of ecosystem variability. These are components of the ecosystem that keep it from jumping past a threshold into another state of degradation or change that makes it difficult to return to the previous state.

Holling urges linking socioeconomic time frames with ecological time frames. He suggests institutional change occurs at 20-30 year intervals, the length of a career. If an ecological problem develops in less than that time, it can be more difficult to fix with a paradigm shift. He recommends comparative research into anticipation, monitoring and adaptation in different biomes. Holling thus suggests a paradigm of *adaptive management*, in which research and planning continually changes in response to ecosystem dynamics, research results, and site-specific conditions. This approach is being adopted, much sooner than Leopold's ideas, within the larger framework of ecosystem management.

The precautionary principle is another, more recent example of progress. If consequences of an action are unknown, but have potential to be significantly or irreversibily negative, it is better to avoid that action. It can also support taking action prior to scientific evidence if delay might prove costly to society and nature.[32] It has been used in European rejection of genetically modified foods, among other issues. The term was first used in 1988. Although the term is considered new,[33] the concept is old. An example is the German Duke of Wuerttemberg and Teck, who as early as 1778 banned the use of lead pipes for drinking water, 200 years before scientifically grounded World Health Organization guidelines on the toxicity of lead.[34]

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[32] European Environment Agency (EEA), Environmental Issue Report No. 22, *Late Lessons From Early Warnings: The Precautionary Principle 1896–2000* (EEA Copenhagen 2001) (http://reports.eea.eu.int/environmental_issue_report_2001_22/en)
[33] Appell, D. 2001. The New Uncertainty Principle. *Scientific American*, January.
[34] Klein, G. 2004. Editorial. Fourth Conference on Environment and Health, Budapest, Hungary. *Umwelt·Medizin·Gesellschaft*, 17: 3.

The European Environment Agency, in a 2001 report coinciding more to this paper's theme than any other citation, also notes:[35]

> The first reports of injuries from radiation were made as early as 1896 (hence the title of the report). The first clear and credible early warning about asbestos came two years later in 1898. The current asbestos-induced death rate in the United Kingdom is about 3,000 deaths per year, and some 250,000–400,000 asbestos cancers are expected in western Europe over the next 35 years, due to past exposures.

The report is most focused on environmental (human) health cases, but also includes a case study on fisheries decline. Calls for regulation of over-fishing go back as far as 1376. Thomas Huxley, who otherwise was a prominent biologist, noted in 1883 that marine fisheries were "inexhaustible." He failed to take into account the increasing use of more boats and improved technology to bring in the same catch. Fisheries biologists in the 1990s had become "so accustomed to inaccuracy in its basic models that striking differences between model and observation were scarcely noted..."[36] More recently the ecosystem approach, highlighted by Leopold for terrestrial ecosystems in the 1940s, has been slow to be implemented in fisheries as well as in terrestrial land management.

> Eight of twelve "late lessons" derived from all cases relate to epistemology and values:[37]
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> 1) Acknowledge and respond to ignorance, as well as uncertainty and risk, in technology appraisal and public policymaking; 3) Identify and work to reduce 'blind spots' and gaps in scientific knowledge; 4) Identify and reduce interdisciplinary obstacles to learning; 5) Ensure that real world conditions are adequately accounted for in regulatory appraisal; 6) Systematically scrutinize the claimed justifications and benefits alongside the potential risks; 8) Ensure use of 'lay' and local knowledge, as well as relevant specialist expertise in the appraisal; 9) Take full account of the assumptions and values of different social groups; 10) Maintain the regulatory independence of interested parties while retaining an inclusive approach to information and opinion gathering;

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[35] European Environment Agency (EEA), Environmental Issue Report No. 22, *Late Lessons From Early Warnings: The Precautionary Principle 1896–2000* (EEA Copenhagen 2001) (http://reports.eea.eu.int/environmental_issue_report_2001_22/en)

The EEA report concludes:[38]

> …'levels of proof' can vary from the 'reasonable grounds for concern' of the European Commission's Communication on the Precautionary Principle, to the 'beyond reasonable doubt' of criminal law. Choosing which level to use in particular situations involves a decision that can radically shift the size, nature and distribution of the costs of being wrong. This is a key political decision with *profound ethical implications* (emphasis ours)…This type of public decision-making is not unknown: military intelligence has long adopted similarly precautionary approaches to uncertainty and high stakes, where the costs of being wrong can be catastrophic…The costs of preventive actions are usually tangible, clearly allocated and often short term, whereas the costs of failing to act are less tangible, less clearly distributed and usually longer term, posing particular problems of governance.

The report deals with risk of false negatives, or Type II errors, which do not adequately confirm an ultimately high risk. Interestingly, the reports' authors attempted to include examples of false positives, cases that highlight risk but ultimately do not warrant concern. A recent publication highlighted twenty-five such cases in human health, but the top six of these (including sewage dumping in the North Sea and the Y2K millennium bug) "were not deemed robust enough for those who recommended them" to include in the European Environment Agency report. [39]

The field of risk assessment has added strength to calls for early responses to warnings. Risk assessment has often been informally and even intuitively performed by public policymakers and environmental health personnel, but a movement to increase quantitative accuracy of risk assessments using the best available science and probability is occurring.[40] This can set up a

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[36] ibidem
[37] ibidem
[38] ibidem
[39] Lieberman, A. J., S.C. Kwon. 1998. *Facts versus fears: A review of the greatest unfounded health scares of recent times*, 3rd ed., revised June 1998, American Council on Science and Health, New York, at http://www.acsh.org.
[40] Gordon, L. J. 1995. Environmental Health and Protection: Century 21 Challenges. *Journal of Environmental Health*, Vol 57, No. 6.

potential conflict between mathematical, "rational" professional judgment and "irrational" public perception, also described as probabilistic versus contextual risk.[41]

Beebe and Omi, concerned about public perception of wildland burning after the 1988 Yellowstone fires and 1991 Oakland Hills fire, conducted a review of risk assessment and perception literature and applied it to wildland fire.[42] Their findings indicate: 1) a public tendency to overestimate risk from hazards that: (a) are feared; (b) kill instead of merely injure; (c) are perceived as uncontrollable, irreversible, or catastrophic; 2) most people faced with low frequency hazards prefer to wait for it to occur, then respond, rather than take precautions; 3) lack of active risk prevention is partly due to discomfort with probabilistic risk assessments, preferring certainty and factual information instead; 4) many also deny a hazard or discount its potential impact – rarely relocating, and insurance costs can be spread among many, lowering incentives; 5) difficulty in classifying natural versus human-caused hazards – human control of fire can make events less frequent but more intense, similar to flood control; 6) the public prefers unrealistic, zero-risk situation managed by the government – an example is earthquake risk, which is 10% homeowner and 88% government responsibility; 7) there is a need for greater public participation in developing prescribed fire plans.

Initially following a "knowledgable expert" versus "less informed public" approach, Beebe and Omi conclude by recommending involvement of the public in developing fire plans. This can not only help inform the public about the risk of infrequent fire regimes and prescribed fire, but also increase professionals' knowledge about local, contextual perceptions of risk, and considerations they may not have included in preparatory risk assessment. This will help avoid two common pitfalls of risk assessment, omitted voice and heuristics.[43]

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[41] Thompson, P. B., W. Dean. 1996. Competing Conceptions of Risk. *Risk – Issues in Health and Safety 7*. http://www.fplc.edu/RISK/vol7/fall/thompson.htm

[42] Beebe, G.S., P.N. Omi.. 1993. Wildland Burning: The Perception of Risk. *Journal of Forestry*, Vol. 91, No. 9, pp. 19-24.

[43] Graham, J. D., J. B. Wiener, eds. 1997. *Risk vs. Risk: Tradeoffs in Protecting Health and the Environment*. Cambridge, MA: Harvard University Press.

Another common pitfall of risk assessment is bounded oversight roles. A land manager seeking to increase fire regimes, reduce fire intensities, and manage for site-specific forest health may overlook countervailing risks involved with wildland fire that other specialists would be concerned with. Examples are risks from smoke pollution, reduction of already-reduced wildlife habitat, and increase of atmospheric carbon levels.[44] This approach addresses an early concern of Leopold's, warning about the tendency of reductionism to miss the larger picture of ecological relationships.[45]

Kristin Shrader-Frechette is a leading philosopher in risk assessment who emphasizes public involvement. A key ethical concept is that, although some risks such as automobile driving or smoking may be higher, some of the public has often been exposed to risk of pollution without consent. Issues can also be set up by errors in expert analysis, even in supposedly high-level, state-of-the-art risk assessments.[46] Hartley notes that participatory environmental justice can be seen as favorable to most worldviews.[47] Such site-specific work falls into the concerns of postmodernism.[48]

Philosophy can also be valuable analyzing hidden value judgments used in developing supposedly objective, scientific standards of risk.[49] Such public scrutiny of risk assessment can help policymakers reach a better decision based on broader, longer-term values.[50] Ernest

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[44] *ibid*.
[45] Leopold, A. 1940. "Song of the Gavilan." Journal of Wildlife Management, 4, No. 7 (July 1940), p. 329-332. Reprinted in *A Sand County Almanac and Sketches Here and There* (New York:Oxford University Press, 1949), p. 149-54.
[46] Shrader-Frechette, K. S. 1991. Scientific Method, Anti-Foundationalism, and Public Decisionmaking. *Risk – Issues in Health and Safety 1*. http://www.fplc.edu/RISK/vol1/winter/Shrader.htm
Shrader-Frechette, K. S. 1982. Nuclear Power and Public Policy. *Environmental Ethics*, 4: 261-71.
[47] Hartley, T. W. 1995. Environmental Justice: An Environmental Civil Rights Value Acceptable to All World Views. *Environmental Ethics*, 17: 277-89.
[48] Preston, C. 2000. Conversing with Nature in a Postmodern Epistemological Framework. *Environmental Ethics*, 22: 227.
Stone, C. D. 1988. Moral Pluralism and the Course of Environmental Ethics. *Environmental Ethics*, 10: 139-54.
[49] Crawford-Brown, D., N. E. Pearce. 1989. Sufficient Proof in the Scientific Justification of Environmental Actions. *Environmental Ethics*, Vol. 11, No. 2, pp. 153-167.
[50] Devall, B. 1988. *Simple in Means, Rich in Ends: Practicing Deep Ecology*. San Francisco: Sierra Club Books.

Partridge's work on duties to future generations,[51] along with articles in *Environmental Ethics*,[52] provides further support within philosophy. The concept of duties to future generations has, of course, made its way into international policy through sustainable development.[53] Yet its continuing reliance on neoclassical economics, anthropocentrism, and the consuming forces of capitalism has drawn many critics.[54]

Examples of two leading polar opposites on environmental issues are Bjorn Lomborg, author of *The Skeptical Environmentalist*,[55] and Bill McKibben, author of *The End of Nature*.[56] Lomborg's refutation of environmental risk survived formal challenges of dishonesty by fellow Danish scientists.[57] However, many critiques, including one by a climate researcher at the same institution (Cambridge University) that published the book, noted its use of selective reference and addition of a personal theme of non-governmental policy intervention.[58] Lomborg's work was inspired by Julian Simon, an economist who won a bet with ecologist Paul Ehrlich that the price of five metals would go down from 1980-1990 (all five did, despite Ehrlich's belief they would rise due to increasing scarcity).

McKibben's book, which underwent a re-printing on its tenth anniversary, to some reviewers takes on a spiritual or even Luddite perspective. The title of his work falls in the pessimistic genre of other environmental alarmists such as Ehrlich, who is perhaps the best

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[51] Partridge, E., ed. 1982. *Responsibilities to Future Generations.*

[52] Care, Norman S. 1982. Future Generations, Public Policy, and the Motivation Problem. *Environmental Ethics*, 4: 195-213.
Mackenzie, M. 1985. A Note on Motivation and Future Generation s. *Environmental Ethics*, 7: 63-69.
Wenz, P. 1983. Ethics, Energy Policy, and Future Generations. . *Environmental Ethics*, 5: 195-209.
Gillroy, J.M. 1992. Public Policy and Environmental Risk. *Environmental Ethics*, 14: 217-37.
Spash, C. L. 1993. Economics, Ethics, and Long-Term Environmental Damages. *Environmental Ethics*, 15: 117-32

[53] World Commission on Environment and Development. 1987. *Our Common Future.* Oxford: Oxford University Press.

[54] Daly, H. E. 1995. The Perils of Free Trade. In, *Green Planet Blues: Environmental Politics from Stockholm to Rio.* Conca, K., M. Alberty, G.D. Dabelko, eds. Boulder, CO: Westview Press.

[55] Lomborg, B. 2001. *The Skeptical Environmentalist: Measuring the Real State of the World.* Cambridge: Cambridge University Press.

[56] McKibben, B. 1989. *The End of Nature*. New York: Random House.

[57] Lomborg, B. Critiques. http://www.lomborg.com/critique.htm (access 1-9-06).

[58] Grubb, M. 2001. Review of "The Skeptical Environmentalist." *Science*, 294: 1286-87.

known ecologist for errors in predicting pending disasters, mostly in the realm of population and food supply. Bill Vogt gave similar, widely-read warnings twenty years before Ehrlich, about population and soil erosion in Latin America.[59] Alarmist predictions can do later damage to the environmental movement but may be necessary. McKibben's 1990 book had climate change as a central issue and, although he also used selective reference and personal values to create the book, could be seen as visionary given recent further evidence on climate change.[60]

Values become particularly important when science, even though it is influenced by values, becomes especially uncertain. A more recent essay by Shellenberger and Nordhaus, titled "The Death of Environmentalism,"[61] sees the issue of progress on climate change and other environmental problems as one of value analysis. The authors' solution to an inappropriate special interest approach by environmental leaders is interdisciplinary framing of environmental issues within the context of broad-based public values such as economic development and public health.

A potential casualty of climate change, biodiversity conservation may be the largest challenge. Leakey[62] and Wilson[63] highlight the sixth great extinction period, caused by humans, an issue Callicott prioritizes highly within the field of environmental ethics.[64] If the issue is expanded to include soil organisms, the biodiversity issue expands greatly in numbers and scope, from hotspots to management of entire landscapes.[65] Accuracy in predictability of threats to species populations is continually evolving.[66] Although biodiversity science may still have some

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[59] Vogt, W. 1948. *Road to Survival.* New York: William Sloane Associates.
[60] Intergovernmental Panel on Climate Change. 2001. *Climate change 2001, The Scientific Basis*. Washington: Cambridge University Press.
[61] Shellenberger, M., T. Nordhaus. 2005. The Death of Environmentalism: Global warming politics in a post-environmental world. Breakthrough Institute. http://www.thebreakthrough.org/images/Death_of_Environmentalism.pdf (access 1-9-06).
[62] Leakey, R., R. Lewin. 1995. *The Sixth Extinction.* New York: Doubleday.
[63] Wilson, E. O., ed. 1988. *Biodiversity.* Washington: Nat. Academy Press.
[64] Callicott, J.B. 1996. Do Deconstructive Ecology and Sociobiology Undermine Leopold's Land Ethic? *Environmental Ethics*, 18 (1): 353-72.
[65] Franklin, J. F. 1993. Preserving Biodiversity: Species, Ecosystems, or Landscapes? *Ecological Applications*, 3(2): 202-205.
[66] Mann, C. C., M. L. Plummer. 1999. A Species' Fate, By the Numbers. *Science*, 2 April 1999, Vol. 284.

uncertainty, values (not accuracy) may be the central issue. Will biodiversity policy change if the science becomes more accurate? Even Lomborg notes that the best available data indicates species extinction is currently occurring at 1500 times the natural background rate.[67] As Beebe and Omi note above, the public tends to discount long-term risks without clear, direct effects. As Shellenberger and Nordhaus note above, climate change (and biodiversity) is a long-term (50-year) issue.

Conclusion

In July 17, 1998, a 7.1 magnitude earthquake gave birth to a fearsome tsunami. These natural disasters generated by earthquakes along colliding tectonic plates of the Pacific Rim have long been known to scientists. On this particular occasion, *Scientific American* (May 1999: 56-65) published an article by Frank I. González, who wrote: Its awesome fury cannot be diminished, but lessons learned from a rash of disasters this decade- and a new way to track these killer waves- *will save lives.'*

Yet, regardless of various tsunami centers and networks of deep-ocean reporting stations that could track tsunamis, deadly waves claimed more than 200,000 lives on December 25th, 2004. González concluded: "Even the most reliable warning is ineffective if people do not respond appropriately. Community education is thus perhaps the most important aspect of the national mitigation program…Tsunami researchers and emergency response officials agree that future destructive tsunamis are inevitable and technology alone cannot save lives."

A corresponding December 15, 2005 editorial in *Nature* recommended risk scientists find mechanisms to disseminate their information more effectively to decision-makers within a United Nations team-based risk-management strategy, coupled with broader proposals to reduce poverty,

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Zimmer, C. 1999. Life After Chaos. *Science*, 2 April 1999, Vol. 284.

[67] Lomborg, B. Critiques. http://www.lomborg.com/critique.htm (access 1-9-06).

corruption, and illiteracy.[68] Philosophers and social scientists specializing in value-analysis should be part of these teams.

Yet, if there is so much work to be done for society to respond to warnings about risk to human health, how can environmental ethicists address critical issues of less direct risk to humans, such as climate change and its effects on biodiversity? Previous discourses have taken place in environmental ethics regarding anthropocentrism and environmental pragmatism.[69] Given the trend of more team-oriented work in conservation, philosophers and social scientists may need to keep branching out in these important efforts to understand public values[70]. Although there are valid criticisms to such mechanisms as environmental economics, anthropocentrism, and applying organized religion to nature,[71] site-specifics may dictate whether economic incentives are most feasible[72] or, in some cases such as Canada's Species at Risk Act, [73] should be left out of the assessment entirely. A biocentric or ecocentric approach incorporating intrinsic value can provide the underlying foundation for these conservation tools. In the process, the concept of intrinsic value, inherent in human nature,[74] can be brought to the surface.

Leopold's land ethic was based on the notion that man improves over time and that a land ethic is a natural course of evolution in ethics. This runs counter to ideas of those such as Walter Benjamin, written during the Nazi invasion of France, that the notion of man progressing through

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[68] Editorial. 2005. Preparing for disaster. *Nature*, Vol. 438, Issue 7070: 889.

[69] Hargrove, E. 1984. On Studying Environmental Ethics. *Environmental Ethics*, 6: 99-100.
Light, A. , E. Katz, eds. 1996. *Environmental Pragmatism.* London: Routledge.
Oechsli, Lauren, and Eric Katz. 1993. Moving beyond Anthropocentrism: Environmental Ethics, Development, and the Amazon. *Environmental Ethics*, 15: 49-59.

[70] Myers, N. 2005. Review of The Logic of Sufficiency, by Thomas Princen, MIT Press. *Science*, 310: 1771.

[71] Pister, E. P. 1979. Endangered Species: Costs and Benefits. *Environmental Ethics*, 1: 341-55.
Hargrove, E.C., ed. 1987. *Religion and Environmental Crisis.* Athens, GA: University of Georgia Press.
Tucker, M.E., J. A. Grim, eds. 1993. Worldviews and Ecology. Lewisburg, PA: Bucknell University Press.
Sagoff, M. 1988. Some Problems with Environmental Economics. *Environmental Ethics*, 10: 55-74.

[72] Fernandez, S. M. 2005. A Market Approach to Sturgeon Conservation Under the US Endangered Species Act. *Fisheries*, 30 (12): 20-27.

[73] Irvine, J. R., M. R. Gross, C. C. Wood, L. B. Holtby, N. D. Schubert, P. G. Amiro. 2005. Canada's Species at Risk Act: An Opportunity to Protect "Endangered" Salmon. *Fisheries*, 30 (12): 11-19.

[74] Kidner, D. 1998. Culture and the Unconscious in Environmental Theory. *Environmental Ethics*, 20 (1): 61-80.

history is severely misguided and biased.[75] Yet, whether you are a "Pollyanna" optimist or "Chicken Little" pessimist, it is clear that significant progress has been made in conservation through policy initiatives.[76]

Ethics and other realms of philosophy are critical. The European Environment Agency notes that: "Weighing up the overall pros and cons of (precautionary) action, or inaction, is therefore very difficult, involving ethical as well as economic considerations..." [77] One of the most recent leaders in ecological warning, Jared Diamond, states in *Collapse*: "Perhaps the crux of success or failure of a society is to know which core values to hold onto, and which ones to discard and replace with new values."[78] Environmental ethicists specialize in value assessment, and have a role to play if progress is to continue.

Heraclitus pointed out that: 'Eyes and ears are poor witnesses for men if their souls do not understand the language.'[79] Yet Kidner claims they do understand the language, it is merely buried in the unconscious.[80] This is not simply a matter of experts educating the public but, like a good writer, enhancing capability to conceptualize beliefs and ideas buried by day-to-day life.

A summary of the history of inadequate response to ecological warning, although brief and itself necessarily inadequate, can increase the urgency of analysis of and response to present and future warnings. One answer may lie in inclusion of environmental values, countering global complacency with globalization by environmental ethics – introducing a rapid environmental ethical assessment process (REEAP) into programmatic and project-level environmental

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[75] Smith, M. 2001. Environmental Anamnesis: Walter Benjamin and the Ethics of Extinction. *Environmental Ethics*, 23 (4):

[76] Salwasser, H., D.W. MacCleery, and T.A. Snellgrove. 1997. The Pollyannas vs. The Chicken Littles - enough already! *Conservation Biology* 11:283-286.
Grubb, M. 2001. Review of "The Skeptical Environmentalist." *Science*, 294: 1286-87.

[77] European Environment Agency (EEA), Environmental Issue Report No. 22, *Late Lessons From Early Warnings: The Precautionary Principle 1896–2000* (EEA Copenhagen 2001) (http://reports.eea.eu.int/environmental_issue_report_2001_22/en)

[78] Diamond, J. 2005. *Collapse: How Societies Choose to Fail or Succeed*. Viking Books.

[79] Heraclitus. Fragment 107.

[80] Kidner, D. 1998. Culture and the Unconscious in Environmental Theory. *Environmental Ethics*, 20 (1): 61-80.

assessment – a McEnvironmentalEthics, if you will, or perhaps Kantian Fulfilled Conservation (KFC), named after a successful franchise in the area of most global warming concern, China.

Environmental assessment is based on alternatives developed through public comment on an initial proposed action. This is a common framework for decision making. The history of articles in the journal *Environmental Ethics* are compiled into five categories to evaluate alternatives (see appendix). Alternatives are also categorized here within a spectrum of environmental ethics, ranging from strong anthropocentrism to biocentrism. These categorizations help illustrate core values for the public, some of which may be their own that they strongly identify with, and make up the REEAP framework..

The five categories of ethical concerns, with corresponding key authors, are: 1) Beauty, integrity, and stability of biotic communities (Leopold's land ethic); 2) intrinsic value of other species (Norton, Callicott); 3) sustainability and future generations (Partridge); 4) adaptation to situated knowledge and site-specifics (Lyotard, Haraway); and 5) potential for false negative results and false claims of objectivity in risk assessment (Shrader-Frechette).

The spectrum of environmental ethics ranges from: 1) strong anthropocentrism or utilitarianism (Bentham); to 2) weak anthropocentrism (Norton); to 3) community ecocentrism (Callicott, Leopold); to 4) Biocentrism (Taylor); to 5) strong individual animal rights (Singer).

A sample assessment is illustrated by an initial proposal for longleaf pine restoration involving logging non-native species and burning the pine stand repeatedly to restore natural fire regimes and plant communities. Such a proposal would be rated with the following matrix. A rating of one through five is given for each category, with one being the highest rating. Such numerical ratings could be augmented by short narrative explanations. Previous involvement of philosophers in environmental planning has included categorization of public comments into categories of values. The purpose of this matrix is to highlight value judgments hidden within alternatives, increasing public accessibility to those values illustrated within the field of environmental philosophy. Constructive criticism of the matrix would be greatly appreciated.

Table 1. Environmental ethics of alternatives, rated 1-5 (1 highest) (Draft matrix – May 18, 2007)

	Proposed action	No action	No logging	No burning
Beauty, integrity, and stability of communities	1	3	2	2
Intrinsic value of other species	2	4	4	3
Sustainability and future generations	2	4	3	2
Situated knowledge and site-specifics	2	5	4	3
Precautionary principle (false negatives, false objectivity)	3	2	2	2
Subtotal	9	18	14	12
Strong anthropocentrism	5	3	5	5
Weak anthropocentrism	4	4	4	4
Community ecocentrism	1	5	3	3
Biocentrism	2	2	2	2
Individual animal rights	3	1	1	1

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Appendix

The history of articles in the journal *Environmental Ethics* are compiled into five categories (20+ pages). This is available upon request.