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PROLEGOMENA TO CONSERVATION: A FISHEYE REVIEW*

CHANNING KURY

INTRODUCTION

Conservation philosophy is the examination of the assumptions and methodologies of decision-making in regard to resources. Conservation is not research, legislation, public relations or harvesting, although these are important facets of conservation. These facets are functions of decisions to act in a particular manner in a given factual context. Rationality is the key concept, but both normative and positive elements are present in any conservation philosophy. The definition of conservation as "wise use of natural resources" is, while tautologically correct, almost useless as a guide to analysis and action. In 1938, Harold A. Innis noted the lack of philosophy in American conservation literature because "the whole question of conservation is begged by its definition as 'wise use.'"¹

Conservation deals with practical problems. A simple example was presented during the environmental movement of the last few years by the suggestion that a blow for conservation could be struck by not buying a cut Christmas tree. Some people took this suggestion seriously, apparently because it was intuitively obvious that one way to conserve our forests and our environment would be to discourage the cutting of trees. Christmas trees are, however, typically young conifers which have been specifically planted, often on marginal farmlands, and periodically pruned for the purpose of supplying the Christmas market. A boycotter would certainly not have been protecting virgin forest or wilderness; he would not even have been attacking bad land use. Since mature trees require much more space than young trees, the boycotter would not even have been necessarily taking action beneficial to the establishment of more woodland. A possible rationale for the boycott could have been the building of a reverence for nature by imbuing a sacredness to living objects. This building of reverence might be a tenable posture; the advocacy of a significant and direct beneficial effect is not.²

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1. Innis, *The Economics of Conservation*, 28 *Geographical Rev.* 137 (1938).

2. See, regarding wartime voluntary sugar rationing, H. LASSWELL, *POLITICS: WHO GETS WHAT, WHEN, HOW* 63-64 (1958).

AN OBJECTIVE YET INCOMPLETE DEFINITION OF CONSERVATION

Conservation is the art of rational behavior in the context of social and natural limitations. That which constitutes rational, choosing means appropriate to the ends, behavior is not intuitively obvious and is not necessarily easily determined. Smokey the Bear, frontman for the United States Forest Service, has done an eloquent public relations job in convincing people that forest fires are bad, a message which is backed up by television coverage of burning homes and conflagrations that occur in California as well as other states. Foresters, wildlife managers and range scientists have, however, said for years that there are definite benefits to be gained from forest fires, particularly those fires which are deliberately set and controlled by persons with specific, rational goals in mind. Some of the benefits which might accrue from a forest fire include increased blueberry production, establishment of forage areas for deer and destruction of brush which adversely affects forest regeneration. Quite obviously, forest fires can destroy thousands of board feet of timber, but charred logs are not necessarily a sight to be regretted prior to a totally encompassing evaluation to determine whether the fire was an optimal event.

Similarly, an encompassing evaluation is a necessary prerequisite to an assuredly rational decision on a course of action to be taken. For many years, Alaska prohibited the establishment of a highly efficient salmon fishery.³ The same or larger amount of fish could have been caught more cheaply if the most efficient placement of fish-traps and severe limitation of entry into the business had been permitted. The industry could have saved a large amount of money, although it is unlikely that this saving would have reached the consumer. The resulting increase in profit could have been appropriated for salmon research and production, or simply used for dividends. But, as those who are acquainted with benefit-cost ratios, regional analysis and depression economics know, a private cost can be a social benefit. In this example, unemployment was high throughout the west coast of North America during 1970 and the social cost of increased efficiency in the salmon industry could have been increased unemployment. A question which needs to be answered in such a case is what is the trade-off from a social viewpoint for the gain proposed by a technical viewpoint? In this particular case the trade-

3. Article VIII, § 15, of the Alaska Constitution was amended in 1972 to permit Alaska "to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State."

off would change with the state of the economy, so a pat answer would be unacceptable.⁴

Rational behavior, on either an individual or collective basis, demands the foregoing of a gain or benefit for the greatest gain or benefit. This imperative is the link between rationality and optimality since optimality can be defined as the greatest gain or benefit measured in comprehensive terms. Gains or benefits are not necessarily reflected in the gross national product, as currently formulated, and gains or benefits are not identical for all people. A person who suddenly finds himself five dollars richer may purchase a book or place the money in a savings account or take any of a number of other actions. What would be rational would certainly not be obvious to another party and the first party would not necessarily be aware of what action would be best. While individuals frequently do know what is best for them in day-to-day matters, major decisions and unusual occurrences are often inappropriately handled. Collective decision-making suffers a similar malfunction because collective decisions are nevertheless made by individuals. A collective decision often differs from a simple amassing of individual opinions or votes due to a rebounding reinforcement of the rectitude, distinct from the legitimization by consensus, of the decisions in the minds of the people who make and who carry out the decision.

Since rational behavior is neither obvious nor simple, there is a body of knowledge, based more on awareness than precision, which needs to be learned, developed, used and extended. Awareness allows an encompassing evaluation of accuracy, but precision, prerequisite by specialization, encourages an overemphasis on part of the problem but an appalling simultaneous ignorance of the other parts and context. The result may be carefully planned mistakes. The body of knowledge needed for a totally encompassing evaluation is not amenable as a whole to scientific analysis. Although part of the necessary knowledge is amenable to such analysis, an ever changing state of nature, society, and mind limits the value of this portion.

Behavior occurs in a context of social and natural limitations (constraints). A social limitation is the delineation of what may and of what may not be done; a natural limitation is the delineation of what can and of what can not be done. These limitations have changed and will continue to do so. Social limitations have their roots in morality and legality; natural limitations have their causes in economic conditions, technology, resources, nature and the relationship between thought and nature. Social and natural limitations bound an abstract

4. Optimality is not a constant state.

set of feasible behavior patterns, both rational and irrational.⁵ The goal of conservation is to insure that when individuals and societies face a decision they choose a course of action that is rational and feasible. Some rational behavior patterns are mutually exclusive⁶ and so no one integrated set of rational behavior patterns can be the goal of conservation. Considerable latitude exists in the set of the rational within the set of the feasible. Conservation aids not so much in choosing the course of action to be taken as much as aiding in the choosing not to take a particular course because the action is either irrational or infeasible.⁷ Conservation eliminates infeasible and irrational behavior patterns to establish a set of one or more rational patterns, any one of which may be chosen, even at whim, by an individual or society. The expansion and contraction of this set of the rational feasible is a function of the state of knowledge.

Conservation can be considered an activity in which various trade-offs are examined in order to maximize the well-being of individuals and society. Conservation attempts to reconcile desires, present needs and predominant beliefs with available resources, future needs and rational thought. Conservation will continue to be misconstrued and misused because people will confuse its medium with their messages. Conservation is a medium and, as such, is permanent and useful. To construe conservation as a message is to make it ephemeral and of little utility.

MAN, MIND AND LAND

Walter Firey's *Man, Mind and Land: a theory of resource use*⁸ is an exposition of a conservation theory premised on concepts of possibility, adoptability and gainfulness. Possibility is an ecological criterion, adoptability is an ethnological criterion and gainfulness is an economic criterion.

As a general and realistic proposition, the sets of optimal resource processes defined by each of these criteria do not perfectly and completely coincide. Firey submits that not one of the three criteria of possibility, adoptability or gainfulness can, by itself, "provide an adequate rationale for what resource planners are doing or are able to do."⁹ He goes on to say that:

5. Feasibility is quite different for an amoral, immoral or extralegal person.

6. The optimal intersection of the production possibility curve and the indifference curve consists of a set of points, not one point, in a realistically complex situation.

7. Within this article, the irrational is defined as a subset of the feasible because accomplishment is presupposed. It is evident, though, that to attempt the infeasible would be irrational. A legal and moral decision is assumed.

8. W. FIREY, *MAN, MIND AND LAND: A THEORY OF RESOURCE USE* (1960).

9. *Id.* at 251.

No theory, of course, can be expected to explain all aspects of the realm of events with which it is concerned. Neither can any one theory serve as an all-purpose guide to policy formation. The resource planner needs more than a theory of how resource users *actually* behave; he needs some "as if" theories, some fictional theories, as it were, of how people ought to behave if certain abstract limiting conditions are to be *approached* (even though they can never be reached). Such theories provide the planner with some generalized reference points against which he can plot the relative position which a given resource system occupies. . . .¹⁰

Firey hypothesizes an analytical system based on a set of inter-related concepts. His resource systems are sets of resource processes¹¹ which are events which recur in time and which involve somewhat the same combination of human and biophysical factors.¹² A resource system is a man-mind-land structure which imposes a special kind of constraint or necessity upon its human agents such that there is a sufficient reason for them to willingly confine their behavior to the practices which comprise the resource system.¹³

Firey distinguishes two types of resource systems: resource complexes and resource congeries. A resource complex shows some constancy and stability in the face of changes that are external to itself and is composed of specially designated resource practices. Resource congeries show no such stability but vary widely in response to external changes.¹⁴

Resource systems are analyzed by Firey with his three criteria: possibility, adoptability, and gainfulness. Each of these terms is a word of art in Firey's system. In order for a set of resource processes to be "possible" in a given habitat, these processes must be in some equilibrium over the long run with that habitat.¹⁵ If a resource process is to be "adoptable" by resource users, it must first be accorded some worth by these resource users in terms of their system of activities.¹⁶ Resource processes, in order to be classified as "gainful," must have an efficiency greater than a formally stated degree.¹⁷

Firey demonstrates through case studies that the proposition that the set of ecologically optimal resource processes, the set of eth-

10. *Id.*

11. *Id.* at 14.

12. *Id.* at 13.

13. *Id.* at 15.

14. *Id.* at 14.

15. *Id.* at 21.

16. *Id.* at 28.

17. *Id.* at 32.

nologically optimal resource processes, and the set of economically optimal resource processes universally coincide is false.¹⁸ He then demonstrates that there can be no generalized rationale for policy efforts designed to improve or reduce the efficiency of a people's resource practices so that those practices would lie completely within either the set of gainful processes or the set of nongainful processes because neither of these relationships universally holds for all social orders.¹⁹ Having confirmed that a given resource complex may contain both gainful and nongainful resource processes, Firey suggests that the nongainful elements can be explained as artifacts of resource users' conformity to practices generally observed in the resource users' communities and for which practices these users expect to be held accountable. In such a case, ambivalence is hypothesized for resource users with respect to the range of adoptable processes. A resource user's willing conformity implies some latent inclination on his part to do otherwise. Firey indicates that a resource complex predicates of its human agents an accurate perception of community practices and an inaccurate judgment of gainfulness.²⁰

[The attitude of willing conformity] manifests a deeply rooted ambivalence in the human being as a resource user, whereby he finds himself impelled toward two distinct (though not exclusive) kinds of practices: the gainful and the likely. Productive efficiency impels him toward the former; prudence in his relationships with fellow resource users impels him toward the latter. The one leads him to experiment and to invent; the other leads him to acquiesce and to preserve.²¹

Firey finally hypothesizes that a necessary condition for the existence of a set of newly developed natural resources is concurrent or antecedent instability in the set of physically possible processes and the set of socially defined processes.²²

Firey juxtaposes resource development and resource conservation, which need not be mutually exclusive but generally are.²³ Resource development is any conversion of natural processes into natural resources qua potential capital whether the resources are actually used or not. Development occurs when the values and techniques of a people render elements of their habitat accessible to them at what-

18. *Id.* at 39-54.

19. *Id.* at 55-80.

20. *Id.* at 81-109.

21. *Id.* at 111-112.

22. *Id.* at 151-155.

23. *Id.* at 137.

ever time they may choose to exploit those elements.²⁴ Conservation is the reduction of a people's standards of consumption so that a natural resource continues to be available and adoptable for that population for a longer time than the resource would otherwise be.²⁵ Development and conservation could occur simultaneously.

Firey's theory of conservation relates to the conceptualization of resource use and, in having been applied in testing several hypotheses through case studies, elucidates the difficulty of formulating goals in a realistically complex policy process. Firey has presented a convincing argument that the system can never be a closed system.

Firey's argument, while simple, is nevertheless grounded in basic concepts which are easy to assume and assert but very difficult to definitively evaluate. Concepts are merely tools with which we conduct our affairs and the fictions of the concepts should not be used to make decisions.²⁶ To do so would be to determine a result based on intuitive abstraction rather than the essence of reality. Problems with definitions, terms and concepts have a history of plaguing conservation. For example, Robert H. Bailey has suggested that the concept of multiple-use has been of limited value to forest land-use planning because the concept has been frequently equated with the simple existence of two or more uses on a given area, many foresters have perceived it to be a principle to be applied to all areas, and the concept's esoteric nature has tended to isolate the forester from external sources of expertise needed to effect the optimum use of forest land.²⁷ Conservation is better perceived as an open system rather than a closed system and distinguishing between the fiction and the reality of concepts is fundamentally important to practical decision-making.

THE CONSERVATION ETHIC

Aldo Leopold gave a talk on May 1, 1933, in Las Cruces, New Mexico, published later that year in the *Journal of Forestry* under the title of "The Conservation Ethic."²⁸ The ideas contained in that

24. *Id.* at 136-137.

25. *Id.* at 137.

26. See Ross, *Tu-Tu*, 70 HARV. L. REV. 812 (1957). K. Boulding has perceived the image as a fundamental pan-disciplinary concept suitable as a premise for a new science dubbed eiconics, *THE IMAGE* (1956). Compare "thinking it makes it so," the Catch-22 of psychology, and "thinking it does not make it so," a thesis dubbed the Titanic effect by K. Watt, *THE TITANIC EFFECT* (1974).

27. Paper prepared by Robert H. Bailey for the conservation philosophy course at Cornell University (1969).

28. Leopold, *The Conservation Ethic*, 31 J. FORESTRY 634 (1933).

article were later given a wider audience through his *A Sand County Almanac*,²⁹ and are often referred to as his land ethic.

As perceived by Leopold, there are basically two schools of thought regarding resource management. One school maintains that a resource is strictly and solely an object from which to produce goods. The market determines the goals and traditional economics provides the logic of how to manage the resource. The other school of thought maintains that resources have non-economic values which should be maintained. Philosophy asserts the goals and then economics, as applied logic, is used to aid in managing the resources. Leopold adamantly sided with the latter school and suggested that people "quit thinking about decent land-use as solely an economic problem."³⁰ The conservation ethic is a means of introducing the non-market, non-economic values into the decision-making process.

If a manager were to make decisions *as if* he were accountable to the land for his conduct, his decisions would be different than if he only had to prepare a financial statement of his conduct towards the land. In other words, the conservation ethic is considering land as if it had enforceable standing in the decision-making process.³¹ This extension of ethics to include the land is based on the premise that the well-being of both man and land is only insured by ecological complexity. The conservation ethic is not one of general preservation but encompasses the alteration of resources with the limitation that soils, waters, plants and animals may continue their existence in natural states at least in limited areas.

One function of this restraint is the prevention of man's self-defeat by preventing man from irreparably changing his environment to his own detriment.³² Leopold observes, in his writings, that economic

29. A. LEOPOLD, *A SAND COUNTY ALMANAC* (1949). *ROUND RIVER: FROM THE JOURNALS OF ALDO LEOPOLD* (1953), edited by Leopold's son Luna, is composed of diary excerpts, but it contains a few essays which follow the thrust of the conservation ethic.

For an analysis of the development of Leopold's philosophy, see S. FLADER, *THINKING LIKE A MOUNTAIN: ALDO LEOPOLD AND THE EVOLUTION OF AN ECOLOGICAL ATTITUDE TOWARD DEER, WOLVES, AND FORESTS* (1974).

30. A. LEOPOLD, *supra* note 27, at 224.

31. Somewhat along this line, Stone has proposed that natural objects have standing to sue through a guardian, have damages measured as damages to the natural object itself (rather than to the human users), and have the damage awards applied to correcting the harm done to the natural object, *Should Trees Have Standing?—Toward Legal Rights for Natural Objects*, 45 S. Cal. L. Rev. 450 (1972). Cf. J. PASSMORE, *MAN'S RESPONSIBILITY FOR NATURE: ECOLOGICAL PROBLEMS AND WESTERN TRADITIONS* (1974).

32. V. Ziswiler agrees: "All examples included in this book are presented with the same basic reasoning: when man continues to destroy nature, he saws off the very branch on which he sits since the rational protection of nature is at the same time the protection of

self-interest is blind to critical elements in the functioning of the man-land relationship and that to insure a continuing harmony between man and land an ethic needs to be present in resource decision-making.³³ Leopold's key question is whether the land-use tends to preserve the integrity, stability and beauty of the biotic community as well as whether the land-use is profitable. Leopold's conservation ethic, or any other conservation philosophy, does not present final decisions for actions that are universally valid; these philosophies are only partial modes of reaching decisions.

Ian McHarg reflects the spirit of the conservation ethic in his *Design with Nature*³⁴ but his formulation of decision-making, which is primarily applicable to land-use planning, is significantly different. McHarg suggests that the appropriate criterion for the placement of a highway or the location of any other activity that has an environmental impact is the "minimum social cost," which is determined by evaluating areas of land as of no or little value, medium value or high value for alternative uses. These values are converted to a visual exhibit by using three tones for each alternative use on an acetate overlay for a map of the area; the lowest values are represented by the lightest tone. By stacking all the overlays on the map, the location of the area of the minimum social cost is revealed by the lightest zones.

Unfortunately, questions inherent in this method are not adequately answered by McHarg. First, how are the uses defined and which uses are included in and which others are excluded from the analysis? Second, can one significantly rank areas and, if one does, how arbitrary are the divisions between the levels of values? Third, are the various values for different aspects of land and land-use comparable or are the trade-offs made in an arbitrary manner? For example, is the high value zone for wildlife comparable to the high value zone for housing vis-a-vis the placement of a highway?

McHarg presents his arguments and documents them with examples of his work in an effort to sell the concept, but a more balanced theoretical analysis, complemented by highway placement study, is Douglas Lacate's *The Role of Resource Inventories and*

mankind," EXTINCT AND VANISHING ANIMALS: A BIOLOGY OF EXTINCTION AND SURVIVAL viii (1965).

33. Although of limited application to conservation, the common law concept of waste is a measure designed to maintain the productive capacity of real estate. Orthodox legal analysis suggests that this principle of law is not grounded on any esoteric concept of maintaining an ecosystem but is simply based on the protection of owners of subsequent interests and landlords; in doing so, socially valuable resources tend to be preserved.

34. I. MCHARG, *DESIGN WITH NATURE* (1969).

*Landscape Ecology in the Highway Route Selection Process.*³⁵ Lacate suggests that the use of high and low ratings is not as important as identification (and implicitly definition) of landscape features along with knowing the location, size and shape of occupied areas in the context of how adjacent areas might also be influenced. Some value priorities are found to be obvious, but others are not incorporable into the stack of map overlays because there is a lack of usable information. Lacate emphasizes that it is important for the interpreter of land forms to know at what level of decision-making the various bits of information are to be incorporated. He also describes the value of aerial photographs as sources of information; implied in the use of these photographs is the point made by him in earlier articles that land should not be considered as a bundle of discrete characteristics but rather as an integrated form upon which a person imposes, by interpretation, characteristics and values.³⁶

Questions of rationality, choosing means appropriate to the goals, and optimality, picking the means and goals for the greatest benefit, are raised by any decision-making methodology. McHarg's minimum social cost method is not assuredly optimal, but the methodology is rational because it recognizes that there are many values affected by major land use changes. His methodology forces the conscientious planner to deal with these values; this confrontation between planner and values should result in better land-use planning.³⁷

In contrast to McHarg's attempt to incorporate many values into the planning process while recognizing the constraints of nature, Leopold's conservation ethic presents an emphasis on the biotic community as an entity of independent value. The land is not simply a constraint on, as well as a source of, marketable production; the biotic community has inherent value. George F. Kennan has taken essentially the same position by advocating that the interests of "mankind generally, together—and this is important—with man's animal and vegetable companions" must be the basis of environmental conservation.³⁸ Such a noble position, while tenable, is the extreme version of the argument for conserving the biotic community.³⁹ The usual thrust of the argument is that the well-being of

35. D. LACATE, *THE ROLE OF RESOURCE INVENTORIES AND LANDSCAPE ECOLOGY IN THE HIGHWAY ROUTE SELECTION PROCESS* (1970).

36. Lacate, *A Review of Landtype Classification and Mapping*, 37 *LAND ECON.* 271 (1961); Lacate, *Wildland Inventory and Mapping*, 42 *FORESTRY CHRONICLE* 184 (1966).

37. See also CONSERVATION FOUNDATION, *THREE APPROACHES TO ENVIRONMENTAL RESOURCE ANALYSIS* (1967).

38. Kennan, *To Prevent a World Wasteland: a proposal*, 48 *FOREIGN AFF.* 408 (1970).

39. The National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-47 (effective

man is dependent on the well-being of the biotic community.⁴⁰ In any case, the concept that biota have value of their own, independent of man's valuation of them as resources, can be adopted as an "as if" theory made operational by incorporating into the decision-making process a presumption that the natural environment should be preserved even absent a showing of tangible benefits to man. Such a working presumption would be an adoption of the conservation ethic.

USE OVER TIME

S. Ciriacy-Wantrup presents a simple, elegant theory of conservation in his *Resource Conservation: economics and policies*.⁴¹ Ciriacy-Wantrup defines conservation as a change in the time distribution of use rates of individual resources in which the aggregate weighted change in use rates is greater than zero. Depletion is defined as such a change that is less than zero.⁴² The theory can be expressed mathematically.⁴³ He applies his theory, denoted in this article as Use Over Time, to a wide range of examples and perhaps makes his theory the most thoroughly explained of any of conservation.

Ciriacy-Wantrup's definition of conservation is only descriptive. Conservation is not necessarily good; depletion is not necessarily bad. The evaluation of the utility of conservation is dependent on what the goals of the decision-maker are and whether depletion or conservation rationally relate to these goals. The definitions of conservation and depletion are predictive and positive⁴⁴ in that they are

Jan. 1, 1970), appears to be premised on both views. Section 4322 states that the purposes of the act are "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man. . . ."

40. Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968). Hardin concludes, much like Leopold, that a fundamental extension in morality is essential since no technical solution exists to the general problem.

41. S. CIRIACY-WANTRUP, *RESOURCE CONSERVATION: ECONOMICS AND POLICIES* (3d ed. 1968) [hereinafter cited as *RESOURCE CONSERVATION*]. *RESOURCE CONSERVATION* is not a survey of economic theory *re* natural resources; for such a survey, see O. HERFINDAHL & A. KNEESE, *ECONOMIC THEORY OF NATURAL RESOURCES* (1974). A worthwhile exercise would be a thoughtful reading of A. SCOTT, *NATURAL RESOURCES: THE ECONOMICS OF CONSERVATION* (1973).

42. *Resource Conservation*, *id.* at 53.

43. *Id.* at 379-381.

44. See M. FRIEDMAN, *ESSAYS IN POSITIVE ECONOMICS* 3-43 (1953); but see Galbraith, *Economics and the Quality of Life*, 145 SCI. 117 (1964). Herfindahl & Kneese, *supra* note 41 at 41, observe that the theory of welfare economics is both positive and normative. The theory is normative because it deals with policy issues in which value judgments are inherent.

key to the analysis of how resource users respond to changing conditions of taxation, tenancy, rates of interest, etc. Ciriacy-Wantrup goes further than these definitions and suggests that decisions should not be made which would make the halting and reversal of depletion uneconomical.⁴⁵ This criterion of the critical zone of irreversible depletion is a normative judgment but nevertheless crucial to his theory.

The effects of conservation or depletion must be evaluated in terms of human goals defined for each resource user rather than for universally standard goals for small unit decision-making.⁴⁶ If the goal is farming, fertility depleting crops may be rational in the short-run but management practices that induce gully erosion would probably be irrational. Fertility can normally be economically replenished but gullies may effectively eliminate farming as a use of that land. When a decision is to be reached, the analysis of its effects should be carried not only to the immediate goal but also to the ultimate effect on the resource.⁴⁷

The general practice in financial accounting is to consider land used for site purposes as nondepreciable and land used for the exploitation of nonrenewable resources as depletable. Timber lands have been traditionally considered as depletable. With the establishment of tree farms, the financial accounting would presumably be adopted to the recurring resource. Miguel A. de Capriles observes that:

In principle, accounting authorities agree that agricultural land should be depreciated, although sometimes they speak of "expiration" of the "value" of land as a result of "erosion and cropping." However, modern methods of cultivation tend to prolong the fertility of farm land. This factor, together with the secular trend toward higher land prices, may lead to a situation (similar to that of land used for site purposes) where no predictable net cost can be allocated over the economic life of farm land.⁴⁸

Financial accounting is obviously important for the management of resources. Serious systematic errors apparently do not arise due to the inherent methodology, but rather due to the conception of the resource held by the manager⁴⁹ or the taxing authorities. Currently, the accounting of business operations does not include negative or

45. RESOURCE CONSERVATION, *supra* note 41 at 253.

46. Societal goals are distinguished. See also Price, *Values and Concepts in Conservation*, 45 ANNALS ASS'N. AM. GEOGRS 64 (1955).

47. See Gaffney, *Soil Depletion and Land Rent*, 4 NAT. RES. J. 537 (1965).

48. de Capriles, *Modern Financial Accounting (Part I)*, 37 N.Y.U. L. REV. 1080 (1962).

49. See, *United States v. Reserve Mining Co.* 380 F. Supp. 11 (D.C. Minn. 1974).

positive externalities although legislation might expand financial accounting to include these social costs and benefits.

Although Use Over Time differs from the conservation ethic, the results of both philosophies tend to the same conclusions.⁵⁰ The conservation ethic uses the criterion of the tendency to preserve the integrity, stability and beauty of the biotic community. Use Over Time has the criterion of avoiding the critical zone of irreversible depletion. These criteria are complementary in that the conservation ethic and Use Over Time select the same set of decisions, with selection within the set being made by other criteria such as efficiency. Efficiency is a pervasive concept and can not be ignored by any rational decision-maker. In brief, the efficiency criterion tests whether or not the benefits exceed the costs (including opportunity costs) and provides a means of selecting the best decisions out of a pool of acceptable decisions.⁵¹

UTILITARIAN CONSERVATION

In 1789, Jeremy Bentham published the first edition of his *An Introduction to the Principles of Morals and Legislation*, which is an outline of utilitarian philosophy. The underlying principle of utilitarian philosophy, as formulated by Bentham, is that actions should be directed towards creating the greatest happiness for the greatest number.⁵² Greatest happiness for the greatest number is measured by summing the interests of persons vis-a-vis actions and comparing the net sums. Utilitarianism assumes quantification and interchangeability (or comparability) of individual welfare functions.

Bentham's book is directed towards jurisprudence, but utilitarianism is a consummate philosophy.⁵³ The basic utilitarian principle was the predecessor of one formulation of conservation as propounded by Gifford Pinchot, Theodore Roosevelt and W. J. McGee. They chose utilitarianism as one means to explain and, I suspect, to analyze their actions.

The Pinchot-Roosevelt-McGee formulation includes an additional term, "for the longest time," and provides a special construction to the original terms of the utilitarian principle. The basic tenet of

50. But see Hutchison, *Bringing Resource Conservation into the Main Stream of American Thought*, 9 NAT. RES. J. 532 (1969).

51. Project size and budget constraint present practical and theoretical difficulties in ranking projects.

52. An antecedent is Cesare Bonesane, marchese di Beccaria, *Tratto dei delitti e delle pene* (1764) [*An Essay on Crimes and Punishment* (translation 1778)].

53. "The dominant, often inchoate and unconscious, social philosophy of western intellectuals and professionals is utilitarianism." Fried, Book Review, 85 HARV. L. REV. 1691 (1972).

utilitarian conservation is that decisions should be made with the goal of producing the "greatest good to the greatest number for the longest time."

In 1910, Pinchot published a collection of essays under the title of *The Fight for Conservation*.⁵⁴ Many of the essays were previously published and were aimed at the general public. As a result, the book is not a learned treatise on conservation philosophy, but it nevertheless reveals the fundamental premises Pinchot used to justify his conception of utilitarian conservation. The "greatest good" was conceived as the balancing of individual interests, but the "greatest number" was a code word signifying an anti-trust political criterion. "Longest time" was a test of whether an action would tend to preserve or waste resources.

Orris C. Herfindahl has argued that Pinchot's formulation of conservation is internally inconsistent.⁵⁵ According to Herfindahl, Pinchot's goal is the simultaneous maximization of three variables, the greatest good, the greatest number, and the longest time. Such a maximization would be admittedly nonsensical if the variables were independent of each other, but Pinchot had a clear system of priorities within and among the three variables. Pinchot's definition of conservation is a short-hand reference to a set of benchmarks for decision-making, rather than an economics or a mathematical expression of quantity.

The anti-trust political criterion rejects the proposition that some resources may be better managed for everyone by large private units because of economies of scale.⁵⁶ Micro-economic theory even

54. G. PINCHOT, *THE FIGHT FOR CONSERVATION* (1967). See also G. PINCHOT, *BREAKING NEW GROUND* 504-10 (1972); Pinchot, *How Conservation Began*, 11 *AGRICULTURAL HISTORY* 255 (1937).

55. Herfindahl, *What is Conservation?*, in *THREE STUDIES IN MINERAL ECONOMICS* 1 (1961). Hardin made a similar error regarding Bentham's formulation, *supra* note 40. Ciriacy-Wantrup seems to have misinterpreted Pinchot's formulation, *RESOURCE CONSERVATION*, *supra* note 41 at 49. See also Gordon, *Economics and the Conservation Question*, 1 *J. LAW & ECON.* 113 (1958). *Contra*, Kury, *Gifford Pinchot's Philosophy*, 73 *J. FORESTRY* 154 (1975).

56. Meyers' criticism of Sax's assumption that the 160-acre limitation for a single farmer for federal irrigation benefits as a good thing implicitly rejects the criterion. Meyers, *Book Review*, 77 *YALE L. J.* 1036 (1969). The Supreme Court, in *Ivanhoe Irr. Dist. v. McCracken*, 357 U.S. 275, 297 (1958), observes that the 160-acre limitation "is a reasonable classification to limit the amount of project water available to each individual in order that benefits may be distributed in accordance with the greatest good to the greatest number of individuals. The limitation insures that this enormous expenditure will not go in disproportionate shares to a few individuals with large land holdings. Moreover, it prevents the use of the federal reclamation service for speculative purposes." The acreage limitation has frequently been avoided. See R. BERKMAN & W. VISCUSI, *DAMMING THE WEST* 139-150 (1973). The National Water Commission, *WATER POLICIES FOR THE FUTURE* 142-149 (1973), has recommended that the 160-acre limitation be abolished but that the

suggests that "a monopolist would tend to use resources at a lower rate now and thus produce for a longer time in the future than the competitor in a similar market."⁵⁷ J. K. Galbraith points out, however, that:

Were there competition, there would be many firms, each much smaller and with a different technology and different cost functions. One does not know, accordingly, whether the competitive equilibrium would be at a greater or smaller level of output, investment or employment.⁵⁸

Pinchot would not have been concerned with the apparent contradiction of being against monopolies and trusts (with their alleged better management and deferred time preference), yet being for good management and the preservation of resources for the future. If there is any contradiction at all, Pinchot had a ready solution: government regulation or public ownership and management, either of which could "rationalize" resource practices and could also incorporate a future-oriented time preference.

It is quite clear from Pinchot's writings that there is no necessary contradiction between the preservation of resources and the consumption in the present. He stated that present consumption has preference over future consumption. If, however, there were two courses of actions which could be taken, Pinchot would have preferred the one that, with all other things being equal, would tend to preserve the resource for the future. Pinchot suggested that hydro-power be used in preference to coal in generating electricity since hydro-power is naturally renewed but coal is effectively a fixed stock that with use can only be diminished.⁵⁹ He did not say that hydro-power should invariably be preferred to coal, but merely that the development of energy resources should not be indifferent to long term problems.

Pinchot's conservation philosophy does not include an ethical restraint on present consumption⁶⁰ and so, in his view, society should not sacrifice for future generations. Society should shift its resource use patterns from control by trusts; from unnecessary

direct beneficiaries pay the full costs of the irrigation projects. *See also* Taylor, *Water, Land, and Environment, Imperial Valley: Law Caught in the Winds of Politics*, 13 NAT. RES. J. 1 (1973).

57. Scott, *supra* note 41 at 98; *see also* 43-46, 97-106.

58. J. GALBRAITH, *ECONOMICS AND THE PUBLIC PURPOSE* 16 (1973).

59. For an introduction to stock resources and for an explanation why the term may be misleading, *see* McDIVITT, *MINERALS AND MEN* (1965).

60. Which is in accord with the conventional wisdom of economics. *See* H. BARNETT & C. MORSE, *SCARCITY AND GROWTH: THE ECONOMICS OF NATURAL RESOURCES AVAILABILITY* (1963).

consumption, such as uncontrolled forest fires; and from irreversible consumption to reversible use where the needs of the present society are indifferent.^{6 1}

Pinchot's conservation philosophy emphasizes societal criteria in decision-making with a limitation against physical-economic waste. Compared with Leopold's conservation ethic, utilitarian conservation has a closer time horizon. Leopold, who was concerned with living resources, was philosophizing about maintaining the biological machinery of the land indefinitely. Pinchot was in addition concerned with so-called stock resources and his writings reflect his purported belief that industrial society, as he knew it, might have a life limited by mineral resources. Certainly Pinchot was aware of the economic principle of interchangeability of inputs and he did not necessarily write off technological advancement. His concern with stock resources can be interpreted as that a natural resources policy should not be indifferent to final consumption as opposed to recycleable use or, more generally, irreversible processes versus reversible processes.

SUMMARY

As Ronald Beazley notes: "Conservation . . . is the establishment and observation of economically, socially, and politically acceptable norms, standards, patterns, or models of behavior in the use of natural resources by a given society."^{6 2} Conservation is concerned with the level, manner, and location of investment in natural resources^{6 3} and a dynamic element is present.^{6 4} Walter Firey has modeled these elements sufficiently so that an observer has an initial framework within which to analyze complex resource issues. But analysis is not enough for rational decisions; some normative benchmarks are needed as a base for a relative, if Sisyphean,^{6 5} rationality. Aldo Leopold's and S. Ciriacy-Wantrup's views on the need to have a presumption for preservation of natural conditions provide an intellectual underpinning for much of the recent environmental con-

61. Present needs are unlikely to be indifferent and the prevention of physical-economic waste can entail sacrifice by the present society. Bentham, in contrast, was willing to consider future generations in his calculus and apparently even animals. Utilitarianism is, as a practical matter, anthropocentric and present oriented.

62. Beazley, *Conservation Decision-making: a rationalization*, 7 NAT. RES. J. 345 (1967).

63. *Id.* at 347.

64. *Id.* at 347-348. R. BALCH, *THE ECOLOGICAL VIEWPOINT* (1965), recognizes the significance of the ever changing milieu of natural resources decision-making and that an expression of this condition has often been controversy.

65. See Newberry, *The Ecological State of Siege*, 32 ANTIOCH REV. 449 (1973).

cerns. Gifford Pinchot was likewise concerned with the preservation of resources and he perceived resource policies as also political policies. He advocated an anti-trust policy as a key element in his own conservation philosophy. Ideas such as these are not enough in and of themselves to guide us unerringly through decision processes, but they do constitute, if viewed as through a fish's eye, aids in developing rational resource policies.