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Author(s): David Berry

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Preservation of Open Space and the Concept of Value*

By DAVID BERRY

ABSTRACT. This paper identifies and classifies six major kinds of values which people ascribe to areas of open space (utility, functional, contemplative, aesthetic, recreational, and ecological values), whether the open space is public or private, urban or rural, or large or small. These values are predominantly culturally-shaped attitudes. They are not mutually exclusive but nonetheless cannot be subsumed under just one notion of value such as trade-offs and, consequently, models for evaluating open space based on the familiar utility function are inadequate representations of human reasoning. Public policy concerned with preserving open space must incorporate a multidimensional set of noncommensurate values and one paradigm for doing so is discussed.

THE RAPID LOSS of open space to expanding urban activity and to resource exploitation has caused many citizens to offer economic and noneconomic arguments to preserve land for outdoor recreation, environmental protection, and scenic amenities. As has long been recognized the values of open space are poorly registered in the land market because open space is a public good and because not all values can be expressed in terms of dollars. Therefore, it is necessary to look elsewhere for these values. This paper presents a classification of the major kinds of values that people put on open space, outlines the relationships among these values, and

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broadly reviews the implications of incorporating a multidimensional concept of value into public land use policy. In addition, the inadequacy of the typical utility model of consumer evaluation as applied to open space is noted.

Before discussing the values attributed to open space, however, we should specify the relationships between values of open space preservation and principles of collective action to preserve land as open space. Values form the general basis for specific claims to protect open space: typical claims might be, "open space in such and such a location would provide an accessible place for outdoor recreation, it would protect the local ecology, and is pleasant to look at."

In contrast, principles of collective action are aimed at resolving conflicts among open space claims on the one hand and land development claims on the other. Equitable and impartial resolution of such conflict situations requires that consideration be given to the distribution of gains and losses that are implicit in alternative planning decisions, taking account of all interested parties and the claims of these parties as they are based upon the values they hold or that can be attributed to them. The values described in this paper generate the kinds of specific claims in terms of which open space decision principles can be formulated.

I

A CLASSIFICATION OF OPEN SPACE VALUES

THE WIDE VARIETY of perspectives from which the preservation of open space is justified reflects the multidimensionality of the values associated with open space, whether it be located in urban, suburban, rural or wilderness areas. Although it is not possible to prepare an exhaustive list of these values, six seem particularly important: utility, functional, contemplative, aesthetic, recreational, and ecological values (1).

Evidence for existence of these six values recurs in survey data concerning people living near different areas of open space and in arguments to protect threatened areas of open space. With regard to the first set of evidence, such values have been identified in several hundred surveys of residents of the Philadelphia metropolitan area and these results have been described and analyzed elsewhere (2). The surveys dealt with rating the importance of a number of characteristics of specific parks and other areas of open space and with willingness to pay to preserve certain land as open space. From the data it emerged that, among other things, relatively great importance is attached to passive outdoor recreation in and aesthetic values of metropolitan open space, ranging in size from small neighborhood parks

to large, wooded, stream valleys and to ecological values of large wooded areas. Moreover, variation in open space values was often correlated with stage of life cycle, income, or distance of the household from the park.

In addition to these survey results, we observe from the spectrum of arguments to preserve specific areas of open space put forth by concerned citizens, planners, social scientists, land use lawyers, and others (as will be noted in the paragraphs to follow), that the same general pattern of values underlies diverse circumstances. We now turn to a discussion of these categories of value.

Utility values are those in which the value of open space is expressed as a trade-off between acres of open space or visits to the open space on the one hand and other goods or services on the other hand. If money is the other good, the trade-off yields a demand or willingness to pay subject, of course, to the bidder's income or prespecified level of "utility." Trade-offs involving outdoor recreation in terms of visits to open space and distance travelled, travel costs incurred, or location rent paid have been measured with dollar values attributed to a certain number of visits or a certain residential location. One can also consider trade-offs involving the open space itself, which is a public good, rather than the private good, visits, and other commodities such as money (3). In short, the utility value of the open space is measured by what is traded off to obtain it or to make visits to it (4).

However, some very restrictive assumptions must be made to interpret trade-offs as values and not as merely after-the-fact observations of behavior that was predicated on the basis of other values or other lines of reasoning. First of all, it is necessary to assume that the things being traded off (acres of open space in a particular location or visits to the open space and money) are each desirable in and of themselves. This is an easy assumption to live with, but a second is absolutely crucial and possibly not true in many cases. Acres of open space or visits and money must be comparable: giving up some of one thing for more of the other must be the explicit intention of the individual or group making the choice. If it is not an explicit intention an observed exchange of one for the other is made after the fact and no value can be imputed to it that has any explanatory or ethical content (5). The comparability assumption can be restated as requiring the decision maker to be able to state preferences among any (reasonable) pair of bundles of acres of open space and money or visits and money (or other good).

Several additional assumptions about preferences among bundles of open space in a particular location or visits to the open space and money allow

the economist to draw the familiar indifference curves of a utility function. The decision maker must be able to 1) state indifference (equal preference) among several bundles of acres of open space in a particular location and money or visits and money; 2) state preferences in a transitive manner so that if bundle A is preferred to bundle B and bundle B is preferred to bundle C, then bundle A is preferred to bundle C; and 3) form a continuous line or band of equally preferred bundles between bundles which are preferred equally.

Although these assumptions are not wildly unrealistic and although experiments have shown that people can make such choices for either public or private goods, it is nonetheless possible to cite reasoning for land uses which does not make reference to trade-offs. In other words, utility values constitute only part of the realm of value. The failure of utility values to encompass all value is probably attributable more to the failure of the comparability assumption than to anything else. People just do not frame their logic entirely as trade-offs. As a consequence, imputed trade-offs can be *ex post facto* rationalizations.

Utility values, when they do exist, may be based on the services open space can provide—outdoor recreation, scenic amenities, and environmental protection. Persons finding great utility in outdoor recreation would probably not be willing to give up much for open space that provided only environmental protection, for example. Moreover, people having to incur greater travel costs to visit a particular park will achieve a lower level of utility than they would if they lived closer. Thus the accessibility of the open space and its suitability for outdoor recreation, scenic amenities, or environmental protection are critical to the utility values people place on any particular site.

Functional values are those in which preservation of open space is an effective means to some end involving natural processes such as protection of water quality, minimization of soil erosion, protection of the public health, and aversion of natural hazards, certain or uncertain. For example, protecting a floodplain as open space may serve as a means to promoting more efficient production by averting flood damages to activities that would otherwise have been located in the floodplain, or preserving a woodland as open space may help purify the air by absorbing selected pollutants.

Much of the argument for recognizing the functional values of open space concentrates on the *compatibility* of natural processes and man's uses of the land. This has been the underlying idea in Hills' pioneering work in Ontario, for example, in which areas were designated for agriculture, lumbering, recreation, wildlife, etc., largely on the basis of the idea of

compatibility (6). To aid in planning for compatible land uses, advocates of functional values, such as McHarg (7), have identified environmentally sensitive landscapes—landscapes which, if disturbed by some specified kind and degree of development, would be subject to natural processes detrimental to human welfare. Among these are floodplains, steep slopes, aquifer recharge areas, forests, marshes, areas subject to recurrent forest, scrub, or grass fires, areas with high water tables, and so on. On the basis of advancing or maintaining human welfare, production or consumption, these areas should (often) be left as open space (8).

Contemplative and aesthetic values are those in which protecting a certain landscape as open space (including scenic agricultural land) is desirable because people appreciate and respond to beautiful scenery and enjoy recalling past visits to the open space, anticipating future visits (9), or merely knowing that the open space exists without the intention of ever visiting it. These two kinds of values are closely intertwined although they can be separated in some circumstances. For example, contemplative values include the knowledge that a particular area of environmentally interesting open space has been protected from development, such as an area of Alaska, even though the person doing the contemplating never intends to visit the area to enjoy the scenery, but still enjoys thinking and reading about arctic and subarctic ecosystems. In addition, contemplative values include the knowledge that can be obtained from formal or informal study of plant and animal communities and their physical environments in areas preserved as open space. Aesthetic values of the landscape may be associated with on-site experiences or with living in an area with extensive open space and the daily experiences that that entails.

Several studies have been conducted to identify components of aesthetic value in landscapes much as McHarg has done to identify environmentally sensitive components of the land. At a concrete level these studies have concentrated on landscape features themselves such as hills, caves, lakes, streams, and so on (10). But more abstract components have been sought as well. Lynch (11) has found that people tend mentally to organize their environment in geometric terms (districts, nodes, paths, edges, and landmarks), and that open space may be categorized as a district within a city, for example. Nongeometric categorization of the landscape occurs as well and Calvin, Dearing, and Curtin (12) concluded that, among other things, some people classify scenery into a "turbulent-tranquil" continuum. Experiments by Craik have yielded evidence that people do tend to agree with each other on describing the natural environment and Litton has identified variety, unity, and vividness as three general aesthetic criteria in

perceiving a landscape (13).

Recreational values are those in which land preserved as public open space provides places where people can relax, play, engage in physical activities, get away from urban pressures, return to nature, seek solitude, and so on. Dissecting recreational values, we may trace the benefits of certain land uses to psychological and physical experiences inherent in various forms of outdoor recreation (14).

Ecological values are those in which locally representative or locally unique plant and animal communities or associations are felt to be valuable in and of themselves and therefore ought to be protected in open space. Unlike the values discussed above, the ecological values people hold are not particularly man-oriented. Rather, they are concerned with the well-being of other forms of life and not with the notion that open space provides a service, amenity, or experience that is good for man nor that open space permits society to carry on its production and consumption in harmony with various natural processes.

Ecological values are most appropriately brought into play when an area containing relatively undisturbed, locally representative or unique communities or associations is threatened by land development. The argument here is that leaving the land as open space will allow indigenous plants and animals to maintain a more or less natural (and dynamic) existence in the region and that this in and of itself is good. Plants and animals benefit from the protection and suffer from the destruction of their habitats so it therefore is reasonable to consider them in the evaluation of open space (15).

"Natural regions" preserved as open space can be protected by requiring that as many ecological linkages as possible (such as food chains) be maintained, by allowing for buffer zones of open space along the edges of the ecological communities, and by ensuring that isolated natural regions are sufficiently large to maintain rare species and larger animals.

II

DISCUSSION

THESE SIX VALUES or general reasons for preserving open space are characterized by their strong interdependencies. They overlap extensively and serve to complement each other but the degree of these relationships must, of course, be a function of the specific area of open space being considered and of the people doing the considering. Broadly speaking, however, one way to categorize the relationships among open space values is through the operators of set theory: union, intersection, and set inclusion (*i.e.* subset

relationships). For a particular landscape, the union of all values represents the entirety of (possibly conflicting) claims or reasons for preserving that landscape as open space, the various intersections of values represent the overlap among reasons, and set inclusion represents the subsuming of one value in another. The complete inclusion of one value within another is likely to be a rare occurrence, so that, for instance, it is improbable that utility values would fully express the ecological values held by people with regard to a specific landscape. Thus, calculating willingness to pay to preserve a certain species of fungus which grows in a woodland habitat is rather pointless.

In an argument to preserve open space it is possible to discern two interpretations of value. The first is concerned with objectively verifiable evidence (what C. L. Stevenson (16) calls beliefs) and the second with culturally shaped emotions and feelings (what Stevenson calls attitudes).

A belief held by person A is something which he or she can convince person B is true by scientific methods. For example, one can demonstrate that floods will, with high probability, reach a certain extent at least once every hundred years in a particular floodplain, or that suburban development of such and such intensity will cause an increase of X percent in the peak flow of a particular stream after a storm, or that a particular species of bird will not survive in an area if development occurs because its habitat will be destroyed.

Thus, in order to argue by way of functional values for preservation of a floodplain as open space it is necessary to estimate potential flood damage, or in order to argue by way of ecological values for preservation of a woodland as open space it is necessary to make a biological inventory and ecological analysis, and so on. But by themselves these analyses, verifiable through scientific methods, do not sufficiently reflect the values of open space. They must be interpreted or given meaning as attitudes.

Demonstration of the truth or falseness of an attitude is not possible and for person A to convince B that open space preservation is good or desirable he or she must appeal to a more subjective criterion of acceptance of an argument. Specifically, A must try to convince B by appealing to what are ultimately mutually held general cultural values, feelings, or emotions. Persuasion may or may not be possible (just as B may not accept A's scientific demonstration if he believes the method is faulty), but the extensive usage, citation, and acceptance of the open space values described above indicate that there are widely held attitudes in the United States consistent with the preservation of open space.

Attitudes toward preserving open space may be illustrated by noting how

A might persuade B that say, the New Jersey Pine Barrens, or at least a large portion of them, should not be allowed to be developed. For example, an argument using ecological values of the Pine Barrens requires at least a preliminary survey of the area to obtain a list of plant and animal species and a rough understanding of ecological communities and associations located there. Given this knowledge, how does B feel about the area? There is no natural law stating that if it is not protected, dire consequences will befall man (nor is there an economic "law" that says it must be developed). Only acceptance of a feeling of respect for non-human forms of life can save the Pine Barrens on the grounds of ecological values. B's acceptance of the worth of respecting these plants and animals in their natural habitat depends on the descriptions of the Pine Barrens A assembles and organizes, but it also depends on the general values he (B) has learned and upon the emotions he feels. If B puts economic worth ahead of all else or regards nature as the enemy of man, he will not be receptive to A's argument about ecological values, no matter how thorough an ecological analysis is carried out.

To summarize thus far, it is apparent that open space is not a homogeneous good. It serves a variety of purposes and can do so in a variety of locations in a variety of sizes. In fact, a person's attitudes toward a particular tract of open space probably reflect a multidimensional concept of value rather than only one of the values listed above. Floodplain protection, for example, may promote 1) ecological values because the open space protects both stream and riparian ecosystems, 2) functional values because flood losses are minimized and water quality protected, and 3) aesthetic values because a strip of open space along a floodplain provides a scenic contrast with intensive uses of urban land.

Finally, it should be borne in mind that land which provides high values of one kind may be of little or no consequence for other values. Small neighborhood parks may be of great utility and recreational value to people in that neighborhood, but the ecological values that people hold will not generally be met by such a park. Similarly, land that protects steep slopes may be a poor choice for outdoor recreation but a good choice for the functional value of guarding against soil erosion, and so on.

III

OPEN SPACE VALUES AND PUBLIC POLICY

IN THE PREVIOUS SECTION we noted the intrinsic multidimensionality in the value of open space. There is, in addition, a second kind of multidimensionality when values are treated as reasons for adopting a partic-

ular land use policy or for espousing a general principle of land use policies. The interested parties who benefit from a particular land use policy may very well be different from those who pay the costs. Thus, there is a multidimensionality in the interested parties whose values are being considered and it is not possible to say that what one party loses is offset by what another gains without the danger of incurring great inequities. Consequently, reliance on a technique such as cost benefit analysis, which seeks to collapse all values of open space into dollar terms and which lumps all interested parties into one homogeneous group, is often inappropriate.

The nature of these multidimensionalities can be clarified by the following simple example. Suppose several hundred acres of privately owned woodland in a middle class suburb are proposed as the site for low income housing. The suburban residents living near the woodland demonstrate a willingness to pay sufficient to buy the land and preserve it as open space and present arguments showing the recreational and ecological values of the woodland. Let us assume away any ulterior motives to exclude low income families on racial or other discriminatory grounds. The low income housing is needed to provide adequate housing for citizens now living in the central city. Because the aggregate utility value of open space to the suburban residents is great enough to bring about the purchase of the woodland in the land market does not mean it should be retained as open space, however. Table I summarizes the problem showing benefits as a plus and costs as a minus.

TABLE I

	Suburban residents advocating open space (based on utility, recreational, and other values)	Low income families	Plants and animals living in the woodland
Policy 1: undertake low income housing program	-	+	-
Policy 2: keep land as open space	+	-	+

One paradigm for arriving at a fair solution to this problem is a maximin policy which endeavors to make the least advantaged party best off (17). Thus each party is guaranteed a security level below which it will not be forced to go by any public policy and hence the losers' subsidization of the gainers is minimized. The question is, then, who is worst off: sub-

urban residents under Policy 1, plants and animals under Policy 1, or low income families under Policy 2?

As this approach requires us to concentrate on the costs under each policy, a closer look at the disadvantages incurred under Policy 1 by the suburban residents advocating open space and the plants and animals living in the woodland is necessary. These costs contain losses of both existing benefits and potential new benefits. Specifically, the ecological values and possibly part of the utility values are currently being enjoyed but most of the recreational values and possibly part of the utility values will be created only when the woodland is transferred from private to public ownership, thus allowing public recreational uses. Moreover, there is no common scale to unite recreational, utility, and ecological values into a single index of value and forcing them into such a scale will necessarily lose information.

An objective courtroom or legislative debate, where all parties and viewpoints are adequately represented, may result in the following decision and justification: "Our chief concern is the relative disadvantage of each of the interested parties under the proposed policies as represented by the minus signs in Table I. We conclude that the disadvantage of continued living in substandard housing (by low income families under Policy 2) is greater than the disadvantage of the plants and animals or the suburban residents under Policy 1. In this particular case we feel that the loss of recreational, ecological, and utility values of the open space puts the suburban residents at less of a disadvantage than the inadequate housing puts the low income families. Therefore, we vote to build the new housing." Obviously, it is not an easy matter to impartially determine which party is least advantaged and the decision must ultimately be an intuitive and subjective one.

In reality many conflicts are more complex than this because of the multidimensional nature of the claims of some of the interested parties and the possibility for a compromise solution fairer than the extreme solutions like those just outlined. Nonetheless, the reasoning toward a fair solution is the same.

By a similar argument in a more general case, under circumstances where willingness to pay to preserve land as open space (its utility value for preservation) is less than the market price of the land, one cannot conclude that the land should be developed. Nonutility values of open space must be considered as must policies in which the desired open space is preserved by less than market value compensation to land owners (one of the interested parties). A framework for formulating an equitable policy in terms of relative disadvantage can be employed here as well (18).

IV

CONCLUSIONS—OPEN SPACE AND LAND ECONOMICS

IN CONCLUSION, the traditional reliance upon the consumer's utility function as the source of justification for preserving open space (or environmental protection in general) seems off center. Economic analysis which derives the benefits of open space from the notion of trade-offs within a utility function will of necessity be incomplete and may very well be founded upon nothing more than uncritical adoption of an idea based on an after-the-fact rationalization of observable market behavior having no ethical or explanatory content. We have endeavored to show that the reasons for preserving open space are quite diffuse and that the economic notion of trade-offs (and hence of a utility function) as an indicator of value does not completely encompass these reasons. To justify the preservation of open space requires a more realistic model of human reasoning than utility theory.

As a descendant, although an aberrant one, of traditional consumer theory, cost benefit analysis is also frequently an unsound basis for justifying open space preservation or not justifying open space preservation in a particular location. Unlike values cannot be added together. Moreover, since benefits and costs often fall on different parties, summing them falsely assumes some homogeneous group will shoulder both the benefits and costs and come out with a net benefit. In short, the traditional scope of land economics must be widened to include the variety of people's reasoning to provide outdoor recreation, environmental protection, and scenic amenities under conditions of conflict over land use.

Regional Science Research Institute
Philadelphia, Pa. 19104

1. See William Frankena, *Ethics* (Englewood Cliffs, N.J.: Prentice Hall, 1963) for a more general classification of values.

2. Chiefly in David Berry, "The Image of Urban Open Space," paper prepared for the Northeastern Anthropological Association meetings, April 1975, Potsdam, New York; also M. Silberfein, ed., "The Preservation of Open Space in the New Jersey Pinelands," Philadelphia: Regional Science Research Institute Discussion Paper Series No. 73, 1974; and Ursula Scherer and Robert E. Coughlin, "A Pilot Household Survey of Perception and Use of a Large Urban Park" (Philadelphia: Regional Science Research Institute Discussion Paper Series No. 59, 1972).

3. Clawson has used travel costs as a measure of willingness to pay for visits; see Marion Clawson and Jack Knetsch, *Economics of Outdoor Recreation* (Baltimore: Johns Hopkins, 1966). Hammer *et al.* have estimated the location rent generated by an urban park; see Thomas Hammer *et al.*, "The Effect of a Large Park on Real Estate Value," *Journal of the American Institute of Planners*, July 1974, pp. 274-77. Berry discusses a household survey to determine willingness to pay to preserve open space in Philadelphia; David Berry, "Open Space Values: A Household Survey of Two Philadel-

phia Parks" (Philadelphia: Regional Science Research Institute Discussion Paper Series No. 76, 1974).

4. The trade-off is usually phrased in terms of utility maximizing behavior subject to a budget constraint when the value of the open space is assumed to be due to a private goods aspect of the open space such as visits but is analyzed with respect to a prespecified level of utility when the open space is considered as a public good such as acres of open space.

5. For a more detailed discussion see Percy Cohen, "Economic Analysis and Economic Man," in Raymond Firth, ed., *Themes in Economic Anthropology* (London: Tavistock, 1967).

6. See, for example, G. A. Hills and R. Portelance, *A Multiple Land-Use Plan for the Glackmeyer Development Area* (Maple, Ontario: Ontario Department of Lands and Forests, 1960); or G. A. Hills, *The Ecological Basis for Land-Use Planning* (Maple, Ontario: Ontario Department of Lands and Forests Research Report 46, 1961). Hills refers to "use-capability" of land rather than "compatibility" and often considers economic factors albeit implicitly in most cases.

7. Ian McHarg, *Design with Nature* (Garden City, N.Y.: Natural History Press, 1969).

8. Under the umbrella of functional values one might also include applied scientific knowledge gained from study of plant and animal life in areas protected as open space.

9. Clawson and Knetsch, *op. cit.*

10. See, for example, Philip Lewis, "Quality Corridors for Wisconsin," *Landscape Architecture*, 1964, pp. 100-107.

11. Kevin Lynch, *The Image of the City* (Cambridge, Mass.: MIT Press, 1960).

12. J. Calvin, J. Dearing, and M. Curtin, "An Attempt at Assessing Preferences for Natural Landscapes," *Environment and Behavior*, 1972, pp. 447-70.

13. K. Craik, "Appraising the Objectivity of Landscape Dimensions," and R. B. Litton, "Aesthetic Dimensions of the Landscape," both in J. Krutilla, ed., *Natural Environments* (Baltimore: Johns Hopkins, 1972).

14. For example, see Clawson and Knetsch, *op. cit.*; N. Scott, "Toward a Psychology of Wilderness Experience," *Natural Resources Journal*, 1974, pp. 231-37; E. Shafer and J. Mietz, "Aesthetic and Emotional Experiences Rate High with Northeast Wilderness Hikers," *Environment and Behavior*, 1969, pp. 187-97; and R. Wurman *et al.*, *The Nature of Recreation* (Cambridge, Mass.: MIT Press, 1972).

15. For arguments based on ecological values see the testimony of J. McComb and E. Leopold in Hearings before the Subcommittee on Public Lands of the Committee on Interior and Insular Affairs: *Colorado Wilderness Areas*, U.S. Senate, 1973, pp. 236-41, and 306-10.

16. C. L. Stevenson, *Ethics and Language* (New Haven, Conn.: Yale, 1944).

17. This approach has become well known since the publication of John Rawls' *Theory of Justice* (Cambridge, Mass.: Harvard, 1971). For a discussion of application of the maximin approach to planning problems see David Berry and Gene Steiker, "The Concept of Justice in Regional Planning: Justice as Fairness," *Journal of the American Institute of Planners*, November, 1974, pp. 414-21.

18. In attempting to incorporate multidimensional values and several interested parties into a principle of equitable public policy, it is also necessary to take account of future generations as interested parties. Clearly, they will be affected by land use policies of the 1970s. The procedure of discounting future "consumption" of open space against the present gains from alternative uses of the land may do great injustice to these people—why should they count for so little and we for so much? Discounting seems a device for justifying the current emphasis on land development. It is not likely that the six kinds of values we have described will fade away in the next century, at least assuming that Western civilization does not drastically and suddenly change in response to a social or natural calamity. Therefore, equity requires of us a cautious disposition toward technological and market incentives to destroy still more open space.