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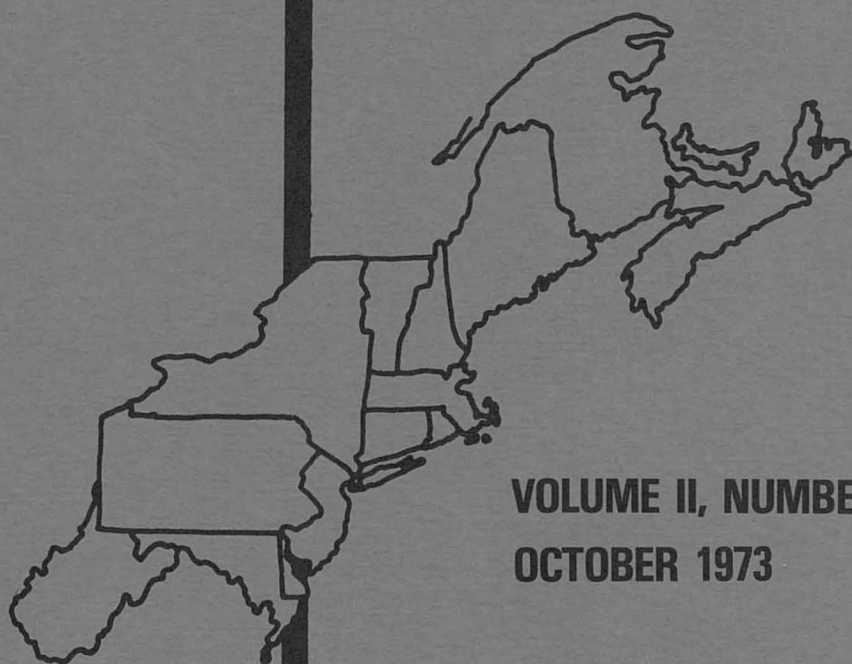
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VALUATION OF VISUAL-CULTURAL BENEFITS FROM
FRESHWATER WETLANDS IN MASSACHUSETTS*

Tirath R. Gupta and John H. Foster
Graduate Assistant and Professor of Resource Economics
Department of Agricultural and Food Economics
University of Massachusetts

Introduction and Objective

A commonly visualized benefit from natural resources is outdoor recreation including activities such as fishing, hunting, hiking, and nature study. Due to the extra-market nature of these activities, monetary measures of the benefits emanating from them require use of some kind of simulated prices. The procedure most widely used for this purpose has been that of estimating a demand function, using differential travel costs associated with the locational dispersion of the recreationists, as a proxy price variable. These methodologies may be labeled as "willingness to pay" approaches and have been used by a number of economists. A few familiar studies are [12, 4, 2, 16, 11, 8, 3].

These models are useful to the extent they bring home the fact that a complex set of factors such as general affluence, social and physical mobility, family size, standards of public service, availability of alternative recreational opportunities and work-leisure patterns, affect the demand for and, thus, benefits from natural resource based recreation. The techniques are essentially an outgrowth of neo-classical price theory and aim at producing figures of recreation benefits in a manner analogous to pricing of other products and services (movies, concerts, operas, etc.) which are traded through the market mechanism. This approach is unacceptable because it does not help in visualizing the intrinsic worth of a resource to the society.

The demand for outdoor recreation is both competitive with and complementary to the demand for other goods. Complementarity of demand for nature based recreation may be understood with the help of the concept of "quality of life". It may be easy to recognize that the demand for such recreation has constantly expanded proportionately more than the increases in personal incomes. Second, the nature of the regularly

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priced recreational opportunities such as movies appears to be essentially different from outdoor recreation. "Willingness to pay" approaches measure what a canoer is willing to spend in support of his activity but give no idea of the actual utility derived by him in the process. Third, valuations obtainable from these methodologies are those of individual consumption benefits. They do not reflect community benefits or those external to the user [17, p. 67]. In other words, they do not and cannot recognize that the existence of a certain resource is in some ways useful even to those who do not directly participate in their use.

The preceding paragraph does not imply that monetary measures of outdoor recreation benefits should not be developed. It emphasizes that in the process of developing such measurements, the role of (a) the quality of the physical resource and (b) its societal (as opposed to individual) value must be recognized more directly. Once this is accepted, economists can do a more satisfactory job when help and advice is available to them from other technical disciplines who can better identify and quantify those physical attributes of the resource which holds the key to its value to the society. The authors have had the privilege of working in close cooperation with landscape architects and the main objective of this paper is to show how the data generated by them can be used to arrive at monetary figures of visual-cultural values of wetlands. It may be appropriate to introduce a definition at this stage.

The term "visual-cultural" is defined to encompass scenic, recreational, educational and open space values. A wetland or some other natural resource may be valuable for one or more of these purposes and they are often intertwined. For instance, a wetland on a large stream may have a recreational value for canoeing, a scenic value for that seen while canoeing and educational value derived from the species of wild-life and plants that can be seen and identified while canoeing. To take a somewhat detailed look at one of these, as an illustration, let us choose scenic value.

Model for Scoring Scenic Values of Freshwater Wetlands

Scenic beauty has psychological impacts which are reflected in social and economic benefits. All of these benefits, however, are not easily discernible. According to the landscape architects cooperating with this study, scenic value of inland wetlands can be found by determining the degree of physical diversity and contrast of the wetland and its surroundings. The point is that a diverse natural physical environment is psychologically desirable and ecologically more stable. For instance, viewing a scenic wetland from a bluff, cliff, mountain or hill with a panoramic view; a sequential scenic tour on a meandering river from wetland to wetland; a sequential scenic tour on bicycle or hiking paths alongside a wetland; or views of wetlands as seen from a fast

moving automobile contribute to the scenic value of such lands to the society. Similarly, another kind of scenic value of a wetland lies in its role as a distinct or diverse component of the landscape in a region.

Based on this reasoning, contrast and diversity of the wetlands and their surroundings were evaluated by rating certain natural resource variables on a scale of 5 to 1 with 5 being assigned to areas with the highest scenic value. The next step was to arrive at "adjusted rating" points by ascribing a significance coefficient to each variable and multiplying the same with its initial rating. The significance coefficients were based on two criteria. First is the concept of immutability. A resource variable got higher significance if it was less susceptible to physical change than a variable which was easier to change. The second is the significance of the variable for different visual-cultural values. A variable which had positive relevance for scenic, recreational and educational values got the highest coefficient while a variable having relevance for only one of these values got the lowest. The variables studied included land form contrast, land form diversity, land use contrast, wetland type diversity, wetland size, water body size [18, pp. 126-168]. Examples contained in the preceding paragraph may show the significance of these variables in contributing to the scenic values of a wetland. Table 1 explains the rating method for two of these variables, i.e. land form contrast and wetland size.

Table 1*
Example of Rating Procedure of Physical Variables
for Scenic Values

Natural Resource Variables	Specification	Rating	Significance Coefficient	Adjusted Rating (3 x 4)
1	2	3	4	5
I. Land Form Contrast	Highest contour line on the land form from the wetland contour line:			
	800 feet and more	5	3	15
	600-800 feet	4	3	12
	400-600 feet	3	3	9
	200-400 feet	2	3	6
	Less than 200 feet	1	3	3
II. Wetland Size	500 acres and more	5	1	5
	250-500 acres	4	1	4
	100-250 acres	3	1	3
	50-100 acres	2	1	2
	10-50 acres	1	1	1

*Based on [18].

Land forms surrounding or bordering a wetland are rated by considering their elevation from the wetland contour line. The second example in the table, dealing with wetland size, appears to call for no explanation. It may also be noted from the table that a variable had a constant significance coefficient while its rating changed from one situation to another.

In addition to the natural resource variables, certain cultural resource variables were also identified. The cultural variables are essentially man's impact on the natural resource which can increase or decrease the social value of the resource. Prime examples in this category, in the context of the scenic value, are presence and extent of visual and noise pollution and location. Location is important as it affects accessibility. If, for example, a wetland is within an inner ring of a metropolitan area, i.e. within 15 minutes of traveling time from such an area, it received a rating of 5 while a similar wetland located at a distance of 50 minutes of traveling time got a rating of 2. Visual and noise pollution have negative impact and so a scale of -1 to -5 was relevant. The scale varied directly with the varying degree of pollutants such as extent of junked cars, dumped litter, traffic noise, raw sewage, etc. on or in the vicinity of a wetland [18].

The discussion in this section has attempted to illustrate the main strings of the model used by the landscape architects for scoring wetlands for their visual-cultural values. The discussion has been carried out in the context of scenic values of such lands. It may, however, be repeated that scenic value is just one of the components that make up visual-cultural benefits. Points scored by a few specific wetlands will be presented below. In using this model, the best wetlands, in terms of their visual-cultural values, would score a maximum of 175 points.^{1/}

Use of Point Scores to Arrive at Dollar Values of Visual-Cultural Benefits

The next step is to use this physical base to establish monetary values of visual-cultural benefits from preserved wetlands of different types. Since these benefits are of public nature, it was clear that the established market mechanism could not be of help in achieving this goal. The approach, therefore, was that the political system, acting through appropriate institutions, can sometimes provide such measures. Wetlands (as well as other lands) have been and are being purchased by the Conservation Commissions (CC's) in almost every city and town in Massachusetts. Since the land purchases by a CC have to be approved by an open town meeting, the town representatives, or the city council, as the case may be, it can be assumed that this money is spent in politically acceptable ways and the amount spent is an indication of the values seen

^{1/} For details on the working of the model, see [18].

by the constituency. Before going into the working of the CC's and presenting the data of the land purchases made by these organizations, it may be mentioned that the approach was to look for a "maximum" price that the constituency has agreed or may agree to pay for lands as a measure of the visual-cultural values recognized by the constituency. The reason for using the maximum purchase price rather than an average may be explained with the help of the concept of "purchaser's surplus". This implies, in the present context, that the price paid for a piece of land may not always be as much as an individual or an organization is willing to pay. The use of the "maximum" prices is not likely to eliminate this surplus but will minimize it.

It is recognized that the price a town would be willing to pay for conservation lands is a function of many factors including the economic status of the community, the impending pressures on land use and the community's ability to recognize the same, physical location of the town, and the educational and professional characteristics of the town population. Even though no two towns may be similar in respect of these variables, yet in the aggregate, the concept of a maximum purchase price for the state as a whole was considered acceptable for use in this study.

Some lands are being developed for "active" recreation while others are being kept almost in their natural state. It may be noted that the CC's receive federal and state subsidies for the lands purchased by them. Federal money subsidizes up to 50 percent of the purchase price of lands to be developed for "active" recreation. The subsidy from the state is, again, 50 percent of the price of land but is restricted to those purchases where no "active" recreation is planned. Since the essential issue for wetland valuation is to look at how people have taken to purchases of open space lands for non-active recreation, purchases using state funds were of primary interest here.^{2/} Moreover, it is the total price paid for a parcel of land rather than the portion paid by a local CC which appeared to be the relevant price to be used. The former rather than the latter figure represents the total social investment.

During the years 1962-72, 123 towns in Massachusetts received state aid under this "self-help" program and bought a total of 14,120 acres of open space lands at an overall average price of \$942 per acre (not adjusted for inflation). These towns also bought some land for which they received no state help and other towns also bought lands for conservation purposes. The CC's have also received land as gifts. An informed estimate was that by the middle of 1972 the total land area under the control of CC's in Massachusetts stood in the vicinity of 20,000 acres and that nearly 50 percent of these lands were wet. This means that approximately 10,000 acres of wetlands, i.e. about 3 percent of the total wetland area of the state may have already come under conservation

^{2/} For all purchases studied, the local town paid 50 percent or more of the purchase price with funds raised by local taxation.

protection. This may provide the reader with a feeling of the relevance of using the CC's data as the basis for arriving at visual-cultural benefits of preserved wetlands. The methodology, however, does not require this high proportion of wetlands. It is the open space value of land, wet or dry, which is considered by the voters in approving these purchases and which is used as a measure of the visual-cultural values of wetlands.^{3/}

In the present context, data on land purchases made by the CC's during the fiscal year 1972 appeared to be most pertinent. Such data were collected for 29 municipalities which received "self-help" assistance from the Division of Conservation Services, Massachusetts Department of Natural Resources. The data pertained to purchase of 42 parcels of open space lands totaling 1,567 acres. The average price was \$1,608 per acre and the range of prices varied from \$100 to \$69,324 per acre. Omitting the one extreme case where some special use was anticipated for the parcel because its size was 0.577 acre, Table 2 presents the five highest and five lowest purchase prices per acre.

Table 2
Highest and Lowest Prices Per Acre of Parcels of Land
Purchased by Conservation Commissions in Massachusetts, 1972

Purchase Number	Purchase Price Per Acre \$
	(a) High Prices*
1	5,769
2	5,476
3	4,162
4	4,000
5	3,684
	(b) Low Prices
1	100
2	124
3	125
4	130
5	133

*The highest figure of \$69,324/acre has been omitted from the table because of its unique characteristics.

^{3/} Note that the terms "open space" and "visual-cultural" are being used synonymously.

Since the approach is to look for a maximum price that the society has agreed or will agree to pay for high quality open space land, a figure of \$5,000 per acre, arrived at by "eyeballing" the five highest prices in the preceding table, has been used for this study. The dollar figure for each wetland is the same percentage of \$5,000 as the point score for that wetland is of 120. This means that the best wetlands in terms of their visual-cultural values were worth \$5,000 per acre in 1972 for these values. If 5.375 percent is used as the capitalization rate of interest, the public is willing to pay approximately \$270 per acre per year to produce visual-cultural benefits on this type of wetland.^{4/} Based on the maximum willingness reasoning above, this figure of \$270 has been accepted as a value measure of the annual productivity per acre of visual-cultural values of high quality wetlands in the judgment of the majority of voters in the state.

It could be assumed that a wetland scoring the top rating of 175 points in the model would be productive of this level of visual-cultural values. As may be observed from Table 3, Column 2, however, no actual wetland is likely to score these maximum points. The maximum working score of the best visual-cultural wetland has been judged to be about 120 points by our landscape architecture colleagues and thus a wetland scoring 120 points is assumed to have visual-cultural values worth \$270 per acre per year or a capitalized value of \$5,000 per acre. Table 3 demonstrates the use of this methodology.

The last column in Table 3 shows the prices per acre that the society may be willing to pay for different types of wetlands to preserve them for their visual-cultural values. These figures are not firm but they provide a feeling of what the political system says the wetlands are worth for that purpose. This also applies to the per acre dollar values of annual benefits from these wetlands.

Some Probable Objections to the Approach Used

One possible objection to the logic used is related to the method of determining the maximum price that the society is or may be willing to pay for open land. Since prices per acre were found to vary from \$100 to \$69,000, a reader may question the validity of \$5,000 maximum. The authors do not claim the accuracy of a market determined price but, given the evidence available, feel that it is a reasonable figure.

^{4/} Public's estimate of visual-cultural benefits will, obviously, be a function of the rate of interest used. If, for example, 7 percent is used as the capitalization rate, the figure will change from \$270 to \$350/acre/year. The discount rate of 5.375 has, however, been chosen as it was used by the Federal agencies in the fiscal year 1972 [20, p. 3].

Table 3
Point Scores of Some Sample Wetlands for Visual-Cultural Values
and the Comparative Dollar Value Estimates of Annual
Visual-Cultural Benefits, Massachusetts, 1972

Name of the Wetland	Point Scores for Visual- Cultural Values*	Per Acre Dollar Values of Annual Benefits	Per Acre Capital- ized Value at 5.375 Percent for Open Space Alone
Otis Fresh Marsh	33	74	1,377
Bear Meadow	64	144	2,679
Hoosic River Swamp	68	153	2,847
Moore's Pond	69	155	2,884
Hyannis Wooded Swamp	74	167	3,107
Chicopee River Swamp	102	230	4,279
Wenham Swamp	112	252	4,688

*Information in this column was provided by Richard Smardon of the Department of Landscape Architecture, University of Massachusetts, Amherst. Cultural variable omitted when scoring these wetlands.

It may also be mentioned that, as an alternative to this approach of arriving at the maximum price for estimating visual-cultural values, an attempt was made to study the purchase proposals that have been rejected by the voters as being too expensive. This methodology was discarded because of the small number and individual nature of the cases found.

A second possible objection can be that a community, while voting on the purchase of conservation lands is, in reality, voting for only 50 percent of the total purchase price and, thus, the logic that the total purchase price is an indication of the values seen by the constituency may not necessarily be true. Although this may create an element of ambiguity, it is still the total price which reflects the public expenditure of preserving the wetland and is, therefore, a measure of the value seen by the voters.

A third possible objection may be that a mixture of motivations such as non-active recreation (open space), active recreation, conserving sources of water supply, etc. may be behind a CC's purchase of land and so the price paid does not reflect only the visual-cultural values. This criticism has been taken care of to a considerable extent by the fact that, in arriving at the maximum price that a constituency may be willing to pay, only those purchases of land which were made under the "self-help" program were considered. To some extent, the element of a mixture of motivations may still be present in the purchase of such lands

but the authors could not conceive of a method to separate them. To this extent, a somewhat higher than true value may have been placed on visual-cultural benefits.

A fourth objection, that the land purchases made by the CC's do not reflect realistic prices of open space, may be made by arguing that the members of the CC's are, usually, economically well-off people and may, thus, be interested in placing more and more lands that are buildable under conservation protection so that the market value of their own property could be boosted. Such a motive on the part of members of a CC cannot be important for a number of reasons. Firstly, ample evidence emerged from discussions with wetland owners, administrators at various levels and the people in general, that the persons who sit on CC's are, to a great extent, believers in the social value of open space. As such, they did not seem to be interested in land development and/or speculation for personal gain. Secondly, as already mentioned, a CC does not have the final authority to make a land purchase. This point is important in the Bay State where most of the towns are governed by town meetings which have the prerogative to turn down or approve a recommendation of the CC. In fact, a prerequisite for the success of the conservation programs is the backing of a large and well-informed public opinion. Cases were not hard to find where some moderate proposals of CC's were turned down due to lack of public support [1, p. 4].

The fifth possible objection is that some towns might be buying lands in the name of conservation but their real purpose might be to check the immigration of certain minority groups. Field work done for this study identified a few towns which used the slogan of open space to perpetuate so-called "snob zoning". It must, however, be emphasized that the purpose did not seem to be to check immigration of any particular population group but to keep development in general at a distance and to maintain their "small community atmosphere". As one leading conservationist in the state put it, the people in these towns were primarily interested in keeping their tax rates from rising through holding down the (a) need for new public buildings and (b) school budgets.^{5/} This paper did not attempt study of this question, and the answer will differ from town to town or from situation to situation.

One of the primary objectives of the conservation programs is to guide development through initiation of coordinated planning. "The public is unlikely to lend support to a commission which merely attempts to acquire land as it becomes available. The voters expect that proper consideration shall be given to greenbelts, contingent parcels, and to resource planning for the future." [1, p. 5 emphasis added] It may be satisfying to note that, according to one observation in 1971, nearly

^{5/} A reader interested in the question of tax benefits and costs of putting land under conservation may like to consult, besides many others, [1, 9, 14, 19].

65 percent of the CC's in Massachusetts had developed or were in the process of developing "viable and imaginative programs designed to improve their local environment" [Ibid]. Yet another study found out that "while the pressures and accomplishments are greatest in the suburbs," CC's in "both cities and small towns have demonstrated imagination and results" [5, p. 3]. The study also estimated that 80 percent of the CC's in Massachusetts were effective. The situation appears to have changed for the better since then and may further convince the reader of the viability of the approach used in this study.

Summary

The study has suggested an alternative to the "willingness to pay" approaches to measuring the social value of natural open space and recreational resources. The method combines determination and measurement of the physical qualities of the resource by landscape architects with the measurement of value as expressed by the political system. It is illustrated by application to freshwater wetlands in Massachusetts.

Wetlands with the highest visual-cultural values have a value, for this public purpose alone, of about \$5,000 per acre. Based on a rating system developed by landscape architects, other wetlands will have a lower value for this purpose. Although this approach has certain weaknesses, it seems to produce valid dollar figures on which public purchase or other preservation decisions can be based.

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