VALUE OF WATER FOR RECREATION AND OTHER USES

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Those of you present who have had previous experiences with economists probably are bracing yourselves for a flood of values, trends, and curves. I am happy to report to you that these will be kept to a minimum. In making studies concerning recreational value of water, until recently economists have been divided into two groups -- highly qualified economists, those who wouldn't and less highly specialized economists who shouldn't. Perhaps I should be included in the latter group.

Historically economists have either (1) ignored recreation in analyses of water values and thus relegated it to a zero value, (2) paid lip service to it acknowledging its presence and then proceeded to ignore it, with the same result, (3) attempted to include recreational values only to have them partially eliminated by federal edict, or (4) taken the bull by the horns and provided us with some rough usuable measures. In multipurpose water development plans, these rough measures of recreational values must be refined and included in the overall plan before efficient allocations of our present water supplies can result.

Very recently the economists have bestirred themselves to the extent of agreeing to disagree concerning measurement techniques. Some of them have advanced to the point where studies are being made to measure different kinds of water values. An outstanding example of this advancement is a New Mexico study based on a Resources for the Future grant which resulted in "A Study of the Value of Water in Alternative Uses", to be released soon. The study deals with alternative uses to which San Juan River and Rio Grande River waters might be put under given sets of circumstances and the values which might be expected to result.

Why are we concerned specifically with water values in various uses? The answer is almost too easy. We want to use them for yardsticks in allocating water to the competing uses. A further question would be, why is a yardstick so important. The answer to this one is equally obvious--because we are experiencing serious water shortages. For example, it has been estimated that about one-quarter of our nation's population is faced with actual water shortages or poor quality of water or both. For this insufficient quantity or quality of water we are paying three billion dollars annually and we have invested a total of 50 billion dollars to use or control water. During the next 50 years it is estimated that we will invest an additional 75 to 100 billion dollars.[1] With this situation in prospect, the economist would say that the most efficient allocation of our money to water or any other resource would be to allocate water in such a way so that any change in allocation would result in a net value

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1 Frank, Bernard, "The Story of Water as the Story of Man", In Water, the Yearbook of Agriculture 1955, U.S. Department of Agriculture, Washington, D. C., House Document No. 32, 84th Congress, 1955. p. 7.

of product. We have now turned in a full circle and are up against that "value yardstick" once more.

Given a suitable yardstick to measure value, what use can be made of it by recreationists, irrigationists, industrialists, and others? Would the yardstick be of help particularly to the recreationists? To answer these questions we should understand the water situation in the West as it is right now. There are three general situations facing western water users: (1) By and large the presently usuable water in the West has been appropriated, allocated, or fixed by law as personal property. This cannot be changed to any great extent except by legislative action and compensatory payments --a very slow process; (2) There are very great hopes that in the future usuable supplies of water can be increased from the total falling on the land or is present under the land or in the seas; and (3) Some of the uses which originally were the most advantageous use are much less so now. Although the second and third situations offer most promise to recreationists, even the first situation is not hopeless. Very briefly, water can and is being purchased from the prior appropriators for various uses. As will be shown later, recreational use results in a rather high value for the amounts of water involved. As regards situation (2), we are using only very small proportions of the total water supply falling from the skies. Technological advances may make usuable huge reservoirs from fresh and salt water areas at any time. The third situation, changes in the future, appears to be extremely advantageous toward increased transfers of water to recreation. In all of these situations recreational values will be needed to fix allocations of additional water as it becomes available and to share in the costs and benefits of any reallocations of present supplies as they are made.

Following this brief introduction and presentation of the problem, I would like to discuss briefly with you the competitive and complementary uses of western water, the ways in which water values are measured, the results of these measurements in terms of present water values, and finally, some educated guesses on future western water values uses.

The use of the value yardstick for water is important mainly as water quantity or quality is in short supply and the uses of water are highly competitive. This assumes that varying quantities of water are prime requisites for recreational use of our natural resources. This is a safe assumption. The major uses of water in the West are irrigation, manufacturing, mining, hydroelectric, municipal consumption, production of vegetation other than irrigated crops, recreation and navigation. Flood control is a factor in many of our projects.

In general, recreational use of water is complementary or has little effect on water used in flood control projects, hydroelectric projects, production of vegetation other than irrigated crops, and navigational uses. Recreational use of water is highly competitive with irrigation industrial uses and manufacturing. The latter use, manufacturing, is competitive from the change-in-quality-of-water standpoint as well as consumption. Municipal water works may permit recreational use on the watershed, sewage systems will discourage recreational use if sewage is permitted to pollute streams below the municipalities. Special situations exist which may reverse these relationships. For example, irrigation may provide canals capable of producing game fish, or flood control projects may destroy natural habitats of wildlife. The relationships are not always clear cut. At best we can say that they are mostly competitive, mostly have effect, or are mostly complementary.

Past efforts in.measuring the value of water were made largely by the Bureau of Reclamation to justify to Congress their requests for large appropriations for water developments. The Bureau used and still uses a system called benefit-cost ratio. This was simply to estimate the benefits, compute the expected costs, and express the result as a ratio. The proposed construction with highest ratios were supposed to have received priority. No construction was considered with an unfavorable ratio, i.e. costs exceed benefits. Originally the Bureau included some aspects of indirect benefits along with direct benefits in the computation. Direct benefits are the values of increased crop production, hydroelectric power, decreased flood damage, reduced transportation costs, etc. which would result if the development were built. Indirect or secondary benefits were the values which would result from this increased activity indirectly by other industries (including recreation). The Bureau classed these benefits into two subcategories -- local and national. A ruling by the Bureau of the Budget required elimination of most secondary benefit calculations from the quantitative benfit-cost ratio. Economist at present are split into two groups concerning the advisability of including secondary benefits in the benefit-cost ratio. The major arguments against inclusion are that the measurement is difficult and should dam development not take place in one area, business and social investments would be made in another area and these benefits would occur anyway.

Recently, we have had several of our western states' Fish and Game departments conduct surveys to determine what recreationists have spent in various activities. This type of a study assumes that cash expenditure approximates value, or in the language of the Bureau of Reclamation, it assumes that the benefit-cost ratio is 1. Some of these fish and game commission reports are open to question because groups of expenditures are included that would occur even if those using the recreational resource stayed at home. Also, comparisons were made with other industries to indicate the value of recreation; in the comparison the expenditure for recreation was at retail value. The values of comparative industries were at manufacturers' prices. Refinements in techniques would tend to lower the comparative values of recreation.

Just as serious in the cash expenditure effort is the underestimation of recreation value by assuming that value to the consumer is synonymous with the price he pays. Surely an avid fisherman would be willing and able to pay several times the present fee for a fishing license. This difference is called consumer surplus. The exclusion of consumer surplus results in a grossly undervalued estimate..

The next measure of recreational value to be presented, the value-added technique, attempts to include at least a part of this surplus. So far, the value added technique has been the most successful in that the technique has been applied to various areas and it is a more accurate tool than the cash expenditure technique. We do have values of water for various uses available which include cash expenditures for the various uses of water as well as the direct and indirect benefits that result. The primary weakness in the technique lies in the estimation of indirect or secondary benefits.

The final technique that I wish to discuss today is a rather complex treatment devised by Clawson.[2] For brevity it is called the demand curve analysis. Clawson has applied a portion of the technique to data compiled by the National Park Service. In its simplest form it is a series of schedules of prices that recreationists have paid and would have to pay to visit one or another of our national parks. In his bulletin Clawson gives a six-step procedure to measure the demand for and value of outdoor recreation. Briefly and I am quoting directly in some cases, these are:

(1) Physical alternatives of the resource being measured should be considered and described.

(2) Social and economic setting of the proposed recreational area should be considered, such as number of people at various distances from the area, their income levels, alternative recreational likes and dislikes of these people, etc.

(3) Cost of actually using the proposed new area for different types of uses by people living at various distances should be estimated, with costs in terms of money, time, and other benefits.

(4) Demand curves should be estimated for the most nearly similar other areas that can be found. The demand curves may be constructed in two ways -- directly by survey of expenditures per recreationist, or indirectly by cost of various facilities in the recreation area, including transportation.

(5) On the basis of these studies for the various sample areas, estimate two types of demand curves -- one a demand curve for local residents obviously making a trip for the sole purpose of using the recreation area, and the second curve for distantly-located visitors who use the area as a part of their overall vacation trip.

(6) For each major method of developing and managing the proposed new recreation area, and for a considerable range in fees, calculate the number of visits by zone of origin, probable expenditures for all persons, value added locally and within the state by their expenditures, and the total fee revenue.

Clawson's technique not only will provide values, but it is an ideal instrument for recreation planning.

To present values of recreation and value of water for recreation and other purposes, we must employ mainly the second and third techniques, the cash expenditure and value added techniques. This section will present findings of various studies in various parts of the country.

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2 Clawson, Marion, "Methods of Measuring the Demand for and Value of Outdoor Recreation", Resources for the Future Reprint No. 10, February, 1959.

The Tennessee Valley Authority increased its investment in recreational facilities from $13 million in 1947 to $61 million in 1956. The gross receipts (cash expenditures) increased from $1.8 million in 1947 to $6.9 million in 1956.[3] Approximately 600 thousand surface acres of water were involved. In 1956 the gross return per surface acre was approximately $11. The gross return was about 11 percent on investment.

One of the major efforts in attempting to place a value on water was the value added approach of New Mexico workers in a Resources for the Future grant of the past few years.[4] Briefly, eight different models (levels of allocations to the uses in two river basins) were used. When a high allotment was made to irrigation of about 473 thousand acre feet of San Juan and Rio Grande water, and 37 thousand acre feet to recreation, the value added per acre foot was estimated at an agricultural value of $29 for San Juan water and $46 for Rio Grande water; a municipal and industrial value of $2,800 and $3,600 per acre foot for water in the two basins, $212 for recreation using Rio Grande water only, and $185 for San Juan water and $1,054 per acre foot using Rio Grande water for combined uses. Shifting the allocation to a relatively heavier municipal and industrial use resulted in a lower range in values for water for this purpose and the same values for agriculture and recreation.

With a different allocation of water the recreation allotment was cut to about 19 thousand acre feet. The values added per acre foot were estimated at $28 for agriculture in the San Juan basin, $1,800 for municipal and industrial use in the San Juan basin and $3,658 in the Rio Grande basin, and $307 for recreational use in the Rio Grande basin.

The cash expenditure technique referred to previously has been used by our sister state, Arizona, and by our own state. The Arizona study indicated that $43 million was spent for hunting and fishing in 1956 compared to $1.3 billion in retail sales in the state, $50 million in rental income, $114 million in restaurant sales, and $264 million cash sales of agricultural products.[5] No estimates were given for recreation other than hunting and fishing and the amount of water involved in each use was not indicated.

The New Mexico Department of Game and Fish made similar estimates for the state for 1956. They found cash expenditures for hunting and fishing were about $31 million, versus $1.1 billion in retail sales, $479 million

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3 Clawson, Marion, "Statistics on Outdoor Recreation", Resources for the Future, Washington D. C., April, 1958, p. 52.

4 New Mexico Special Project Committee, "Report to Resources for the Future on the Value of Water in Alternative Uses", New Mexico Agricultural Experiment Station and others, University of New Mexico, in cooperation with Resources for the Future, Washington D. C., preliminary draft, 1959.

5 Armstrong, W. V., "Economic Value of Hunting and Fishing in Arizona in 1956", Wildlife Bul. No. 4, State of Arizona Game and Fish Department, February 1958, pp. 26-28.

in value of minerals, $202 million in cash sales of agricultural products, and $129 million in retail values of personal and professional services.[6]

Before leaving these estimates of values or expenditures, I would like to voice a short objection to (a) the inclusion of food as an item of expenditure for hunting and fishing as hunters and fishermen buy food whether they hunt and fish or not, and (b) comparisons of retail values in some cases with manufacturer's prices in other cases tend to inflate the comparative values for the former. Even the rather careful study by the Resources for the Future Committee in estimating hunting and fishing values made the mistake of including all food costs as a recreational value-added item.

Finally, what are the prospects in the future concerning use of water for recreational purposes. We are anticipating a continued increase in population, income, leisure, and industrial growth. With present supplies of water, uses would be even more competitive than they are today. But we are also anticipating an increase in our usable supplies of water. The rate of increase in each of these two groups of items becomes important.

Johnson has indicated that the demand for farm products by 1975 is likely to increase by 30 to 40 percent over 1950.[7] From another study the demand increase was estimated to require about a 69 percent increase in water for irrigation.[8] The demand for public water supplies for industrial use were expected to increase by about 111 percent while the increase in self-supplied water was estimated at a 151 percent increase. Steam-electric power requirements were estimated to require about a 241 percent increase in water presently allocated to this use. The overall U. S. increase in use of water expected was 123 percent. This compares to an expected increase in use of water of 140 percent for the Western states. Undoubtedly, New Mexico's needs will be in the forefront of those of the Western states because of our comparatively high rate of population increase.

We do not have estimates of the increased need of water for recreation, but we do have estimates of both future number of recreationists demanding western resources and changes in the factors which affect their demands. Clawson estimated that the trend in use of western recreational resources in recent years has been upward by about 10 percent per year. By the year 2000 he expects the use to increase by about 20 to 40 times over the present--this is a 2000 to 4000 percent increase.[9] His estimate is based on a U. S.

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6 Campbell, Howard, "The Economic Value of Hunting and Fishing in New Mexico," Bul. No. 7, New Mexico Department of Game and Fish, 1958, pp. 26 and 35.

7. Johnson, Sherman E., "Prospects and Requirements for Increased Output", In Journal of Farm Economics, Vol. 34, No. 5, December 1952, pp. 682-697.

8 Federal Reserve Bank of Kansas City, "Water Availability, A District Problem", In Monthly Review, February 1959, pp. 4-5.

9. Clawson, Marion, "The Future Demand for Western Resources for Recreational Purposes", In Proceedings, Western Farm Economics Association, 1959 (In manuscript).

population of 310 million people, a real per capital income of double the present level, a work week of about 28 to 30 hours, and a per capital travel average at double the present 5,000 miles per year.[10]

These future estimates point to a very heavy increase in the pressure on our water supplies unless technological developments result in at least a doubling of our present usuable supply. Competitively, recreationists are in a very favorable position for an increased share of the nation's water supply because of the expected astronomical increase in demand for recreational facilities expected in the future.

10 Ibid., p. 7.