RECREATION--ENIGMA OF MULTIPLE-PURPOSE WATER RESOURCE PLANNING

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CHAPTER I

INTRODUCTION

General

The Federal Government has been active in the development of water resources since it assumed responsibility for navigation improvements in the early 19th Century. A comprehensive framework for identification of appropriate goals and objectives and necessary planning procedures to achieve them did not evolve until the Flood Control Act of 1936. This act established the principle that total benefits of Federal projects should exceed total cost in the now famous words, "the benefits, to whomsoever they may accrue, are in excess of the estimated costs." Two very important techniques gained emphasis from this act--multiple-purpose planning and benefit-cost analysis--for evaluating public investments in natural resources, and the years since then have been devoted to perfecting and applying them. Many controversies have developed over the question of what the appropriate range of benefits and costs ought to be.

With the emphasis now on the, "integrated control and use of water, within the changing limits of technical feasibility and of economic and social justification" (18, p. 7), federal planners held that rivers should be developed for multiple rather than single purposes and that the relevant unit for multipurpose planning and development should be

the river basin rather than a single river sector. By "purposes" these planners meant products produced by a public investment, not its economic and social justification--not, as many incorrectly say, its objectives. Thus, the purposes of multipurpose planning included such products as flood damage reduction that is provided by levees or by reservoir space which is used to store flood runoff; water supplies for municipal, industrial, and irrigation uses that are provided by storage reservoirs; navigation, sport fisheries, and pollution abatement that are provided by control of low river flows, which are made possible, in turn, by storage reservoirs. These purposes could all be expressed as consumption purposes in that water storage was allocated to each for eventual consumption in fulfilling their individual missions.

The purposes of multipurpose planning remained generally unchanged through the Green Book (12) and Budget Circular A-47 (3). It was not until May 15, 1962, when President Kennedy approved for application by the Agencies of the Executive Branch a new set of evaluation standards called Senate Document (SD) 97 that a new non-consumptive purpose was added to multipurpose water resource planning. And that purpose was recreation. It is held that water is used generally in two non-consumptive ways for recreation. First, it is the medium in which or on which recreation experiences such as swimming, boating, water skiing, and fishing take place. Second, water is an esthetic complement to land-based recreation activities such as camping, picnicking, walking for pleasure, and the like. Standards for the evaluation of recreation benefits from the use of recreation resources were not

formally established until June, 1964, when Supplement No. 1 to Senate Document 97 was published.

The role of recreation in the economic scheme was firmly established in Supplement No. 1 to SD 97. In evaluating outdoor recreation as a project purpose it stated on Page 1, "it is necessary that it be viewed as producing an economic product, in the sense that a recreation opportunity has value and is something for which people are willing to pay." This same thesis has been carried through the latest evaluation standards published in September of 1973 entitled Principles, Standards, and Procedures for Water and Related Land Resources Planning (24).

While both Supplement No. 1 to SD 97 and the new 1973 Principles and Standards emphasize the virtues of recreation as an economic good, they speak very timidly on the quantitative measurement problems of that economic good. In speaking about the need for further studies to more clearly define various quantitative and qualitative inter-relationships of recreational uses of resources, Page 9 of Supplement No. 1 to SD 97 says, "Pending the development and practical application of such studies, primary reliance will be placed on informed judgement in applying the standards provided herein . . . ." In the 1973 Principles and Standards, this timidity is carried on by the statements: "In general, however, no one method is completely satisfactory to the exclusion of all others," and "In the interim, while recreation evaluation methodology is being further developed, the following schedule of monetary unit values may be used in the preparation of plans" (24, p. 52).

Since the birth of recreation as a project purpose in 1962 there has been a veritable "explosion" of outdoor recreation studies to heed the pleas of the framers of the evaluation standards. The subject has gone through the process of identification, classification, summarization, and analysis. It is the view of this author that much of this work has been worthless (2) in that the real world of multipurpose water resource project formulation is sometimes far different than the modeled world of project formulations (project formulation being defined as, "a series of steps starting with the identification of needs and problems and culminating in a recommended plan of action").

As the demands on the Federal Budget dollar constantly increase from all sectors of the economy, it becomes obvious that water resource development plans are going to be more and more subjected to the gaff of outside review scrutiny. The allocation of scarce resources will more and more depend on what budgetary items promise the best return on investment. It is imperative that present and potential conflicts in judgement between Federal Agency recreation planners and "vested" interests reviewers be determined, and steps taken to eliminate or minimize conflicts.

The information, analysis, and judgements presented in this thesis are drawn from the working experiences of the author who has been employed as a supervisory civil engineer and recreation planner by the Tulsa District, U.S. Army Corps of Engineers. They are presented to hopefully shed more light on some of the conflicts that the framers of the evaluation standards have alluded to. All of the judgements offered in this thesis are the author's and do not necessarily reflect official Corps of Engineers' doctrine.

Objectives of the Study

The general objective of this study is to bring together under one cover an analysis and review of some of the principal conceptual problems inherent in quantifying recreation output as an economic product in multiple-purpose water resource planning. Not withstanding all the published literature on recreation economics and general economic theory, this author has felt the need to bring together and relate some of the more important concepts and procedures from the perspective of a general practitioner. Deep sensitivity towards a subject matter usually evolves from spending a working life in it. This author, as a sensitive Federal recreation planner, has observed many of the riddles and shadows in evaluating recreation in water resource planning. The objective of this study stems from this vantage point.

This study may be used to aid Federal recreation planners in extending their learning curves. There is a lot that has not been discussed under the presumption of prior knowledge, but this should not be a handicap to semi-seasoned planners. Intellectual criticism presumes an alternative solution to a problem, so any critical review in this thesis is usually followed by a recommendation. Also, it is hoped that by shedding some light on these conceptual problems, Federal recreation planners may advance both the state of the art and the confidence of the allocators of Federal Budgetary Funds.

Justification of the Study

As the demands on the Federal Budget increase from all sectors of the economy, the allocation of the supply of funds becomes more and more subjected to intense scrutiny. The allocations of scarce funds will depend on what budgetary items promise the best returns on investment. If water resource development is to survive in this budgetary environment, it must strive for higher quantitative excellence.

This study has been undertaken to attempt to advance the art of quantitative analysis in recreation planning. In presenting this review and analysis, all Federal water resource planners should profit, not just Federal recreation planners. The results of this study should help: (1) Federal recreation planners better understand the various analytical tools and their shortcomings; (2) Federal interests outside the recreation planning field to better understand recreation economic concepts and recreation evaluation techniques; and, (3) develop an overall Federal thrust for higher quality work in project formulation.

Organization

This study is organized into six chapters including an introduction. A review of literature used in the study is presented in Chapter II. Chapter III traces the history of and reviews the economic concepts inherent in multiple-purpose water resource planning. Chapter IV provides a review and analysis of the economic foundations of recreation evaluation. Chapter V presents a review of Federal Agency recreation evaluation procedures. And finally, Chapter VI presents conclusions and suggestions for future work.

The thrust of the thesis organization is built around a step by step process starting with the genesis of water resource planning, then moving from economic foundations to actual evaluation procedures, and culminating with a conclusion and suggestions for future work.

CHAPTER II

REVIEW OF LITERATURE

Traditions and concepts now emerging in the recreation field have a long and notable history. A landmark of single importance is the Outdoor Recreation Resources Review Commission (ORRRC), established by Congress in 1958, which published its report in 1962. This report reviews the trends and developments toward recognizing the value of recreation as a primary public purpose and provides perspective and foresight as to the evolution of this view. In the same year the ORRRC published its 27 study reports, a monumental output covering every conceivable aspect of recreation. Three of the study reports were used as references for this thesis. They are: Study Report 10, entitled Water for Recreation--Values and Opportunities; Study Report 24, entitled Economic Studies of Outdoor Recreation; and, Study Report 26, Prospective Demand for Outdoor Recreation.

A great deal of pioneering work in the field of recreation economics has come out of the Resources for the Future, Inc. Authors Marion Clawson and Jack L. Knetsch have provided great leadership. Clawson's Methods of Measuring the Demand for and Value of Outdoor Recreation, Report No. 10, published in 1958, is a classic in the field. Another classic was the 1966 Economics of Outdoor Recreation, a joint effort by both authors.

The Bureau of Outdoor Recreation (BOR), the U.S. Army Corps of Engineers, the U.S. Department of Agriculture, Economic Research Service, and the U.S. Forest Service, have all published and had published many studies and research efforts in the recreation economics field. Also these Federal Agencies have published the proceedings of sponsored recreation symposiums. Many of these agency publications were reviewed for the benefit of this study.

Recreation cannot stand in isolation from the other aspects of multiple-purpose water resource planning. To fully understand it, the Federal planner must understand it in its full context. This calls for broad comprehensive knowledge of the complete system. The following books are but a few that this author has studied to gain a total insight: Design of Water-Resource Systems by Maas, Hufschmidt, Dorfman, Thomas, Marglin, and Fair; Public Spending by McKean; Water Resource Development by Eckstein; and, Water Resources Systems Engineering by Hall and Dracup.

Recently published literature in a number of journals was reviewed and analyzed. The American Economic Review, Land Economics, and the Journal of Leisure Research, all provided information pertinent to this study.

Statewide Comprehensive Outdoor Recreation Plans (SCORP) of six states were extensively reviewed for the benefit of this thesis. These plans, funded under the 1964 Land and Conservation Fund Act, by the BOR, are an evaluation of the demand for and supply of outdoor recreation resources and facilities in each state.

There is no end to the literature that has been reviewed by this author, especially in line with his work as a recreation planner for

the Corps of Engineers. The above mentioned publications are the primary sources of information, but in no way exhaust the subject. This author has in hand many studies published by Universities and the Federal Government that were discovered in reviewing various indices to recreation, water resources, and economics literature.

CHAPTER III

ECONOMIC FOUNDATIONS OF RECREATION EVALUATION

Objectives and Efficiency

The prime objective of public water resource development is often stated as the maximization of national welfare. That this is a goal to be desired, few would question; that it cannot be translated directly into operational criteria for project design, few would deny. Translation would require not only agreement on a definition for the deceptively simple phrase "national welfare" but also some assurance that the defined concept is measurable.

One possibility is to define national welfare as gains to national income. This is generally defined as the total market value of all final goods and services produced in the economy in one year. The difficulty with national income alone is that it is too closely tied to market prices. Projects selection would be based on the highest market prices alone. A superior concept, economic efficiency, is a function of both gains to national income and attendant cost. This has led to the definition of the phrase "national welfare" into a more fundamental principle; namely, national economic efficiency.

The empirical method of benefit-cost analysis is the key dimension of national efficiency criterion and as such, the theoretical and

conceptual foundations of the analysis are well documented in numerous references and will not be repeated here (10) (13).

In setting out the objectives of water resource planning, the writers of the 1973 Principles and Standards, on Page 6, said the overall purpose is to, "promote the quality of life" which has essentially the same meaning as "maximization of national welfare." They go on to say the principal way to promote the quality of life is, "to enhance national economic development by increasing the value of the nation's output (benefits) of goods and services and improving national economic efficiency." Total value (benefits) was set out as the willingness of users to pay for each increment of output from a plan as determined from a demand curve representing quantity demanded by users at various prices. They recognized that it may be impossible for the planner to develop the actual demand curves of each output so three alternative techniques were offered--willingness to pay (same for all users), change in net income, and the most likely alternative (24, p. 39).

Estimation of efficiency outputs (benefits) forthcoming from the public provision of outdoor recreational services has generally entailed consideration of two factors. First, an estimate of the number of visitor days of recreation to be taken annually at the proposed facility during its economic life, and second, the assignment of simulated market values to the projected quantities of use in order to derive an estimate of total economic benefits. These two simply stated factors have generated volumes of published and unpublished literature. It is the purpose of the following discussion to critically examine the basic economic concepts fundamental to the

published literature in the field of recreation. The concepts will be presented under two headings: Total Revenue and Consumer's Surplus.

Total Revenue

In economics, the worth, or value, of a thing is determined simply by what a person is willing to pay for it. If a man is willing to pay $1 for each day he fishes a lake, it may be inferred that it is worth to him (in his own estimation) no less than $1. If that individual fisherman's demand curve could be constructed which would indicate the number of times he would be expected to go fishing at each possible price, it could be determined what the maximum amount he would buy (of fishing) at the price of $1. The amount he would buy, say in a year, multiplied times $1 would be a measure of total annual revenue, or total annual value to him. The market demand curve, being a horizontal summation of all the individual demand curves, could be regarded as the valuation curve for society (market area population). Thus total annual value (or revenue) for fishing would be price (as predetermined) multiplied by the total number of visits that would occur at that price. Total revenue is shown by the hatched area OPRQ of Figure 1 on Page 15 and can be accepted as a minimum estimate of the benefit.

The total revenue concept is given currency in the 1973 Principles and Standards. The demand curve is implicit, but is not actually determined, because the writers of the 1973 Principles and Standards recognized that it may be impossible to develop the actual demand curves at each output so alternative techniques were offered (24, p. 39). All the outputs (project purposes) are evaluated by the total revenue concept. Flood control benefits are a function of a certain

amount of damage prevented multiplied by the value (cost) of that damage. Water supply benefits are a function of an alternative physical plant multiplied by the value (cost) of that plant. Recreation benefit evaluation procedures can follow the same pattern.

Cicchetti (6, p. 6) pointed out that Supplement No. 1 to SD 97 suggests, as does the 1973 Principles and Standards that:

> After estimating the number of users for a particular recreation site, as best as one is capable of doing . . . a group of experts choose an acceptable price which when multiplied by the estimated quantity of users would determine total tangible benefits in dollar terms . . . . The implicit rationale of this suggested approach appears to be that in the absence of empirical market price information, the planners are more able to estimate subjectively a single equilibrium price than to try to develop a complete demand curve.

Multiplication of a single price per day's recreation by any estimated quantity of recreation use will never produce, except by occasional accident, the same estimates of total economic value to users as those produced under the next concept to be taken up--consumer's surplus. Also, a discussion of the problems inherent in the quantification of price and quantity under the total revenue concept will be set out in the next chapter where Federal Agency procedures are discussed.

Consumer's Surplus

The concept of consumer's surplus occupies a controversial but important place in economic theory. At times it has lapsed into relative obscurity; at other times it has been the subject of heated debate. Some eminent economists have argued that it is one of the

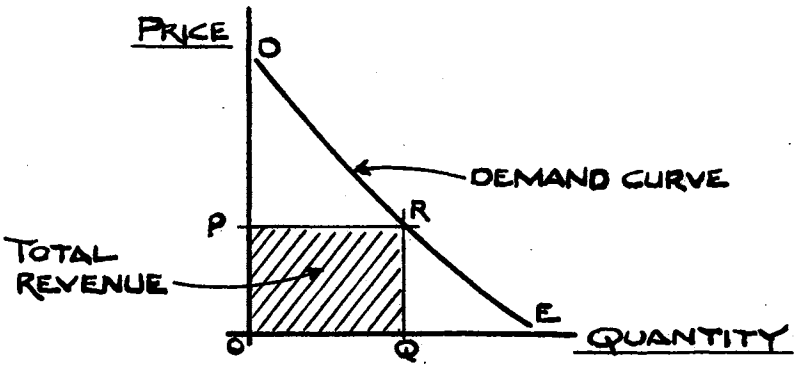

Figure 1. Total Revenue

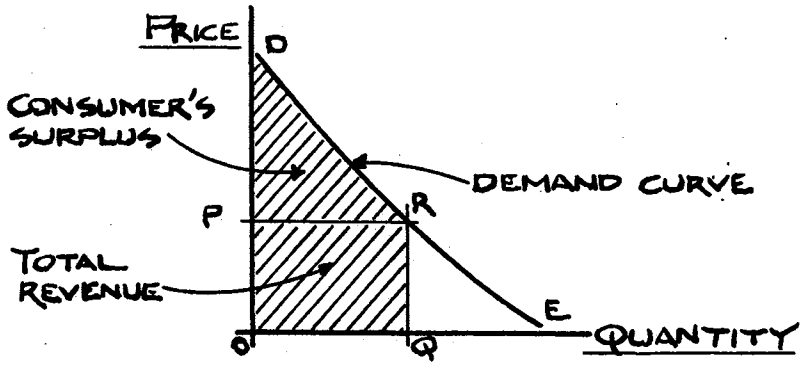

Figure 2. Consumer's Surplus (Nonzero Price)

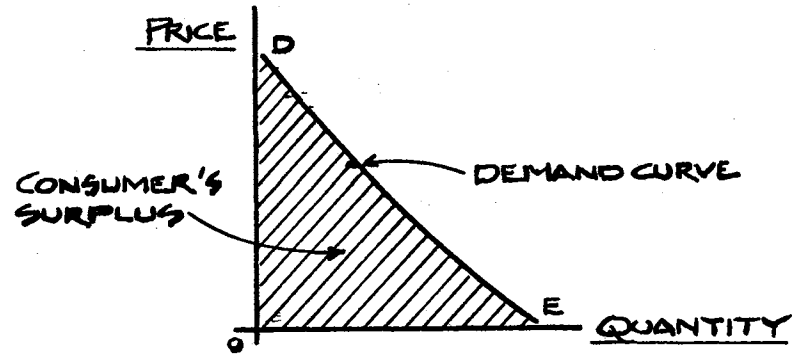

Figure 3. Consumer's Surplus (Zero Price)

most vital concepts in economic theory; others have lamented the enormous attention devoted to it (9).

Inherent in the argument over consumer's surplus as far as recreation is concerned is the position that market price could ignore much of recreation's value to the individual as well as most of its value to society, and that the price the least willing consumer would pay could easily represent only a small part of society's and the individual's marginal benefit derived from participation. Consequently, dollar or market value times a quantity of use (total revenue) cannot be used as the major criterion governing the allocation of resources into outdoor recreation.

The concept of consumer's surplus was popularized by Alfred Marshall (14). He claimed that a buyer may receive a surplus of utility from a transaction, and that surplus of utility is the difference between the sacrifice which the purchaser would be willing to pay for--say a given unit of recreational enjoyment--and what he actually had to pay. He proposed that this surplus can be measured by the triangle-like area below the demand curve and above the price line. This excess of price (total expenditure) over actual price (total revenue) is the measure of Marshall's true surplus. If recreation, like most other goods, was not zero priced, but priced at P, the triangle of consumer's surplus would be PDR in Figure 2 on Page 15. Total net economic value would then consist of the area under the demand curve (ODE) minus QRE (hatched area). Because recreation is normally zero priced, this formulation assumes the triangle of consumer's surplus would be the entire hatched area ODE under the

demand curve as shown by Figure 3 on Page 15. Total net economic value would then consist of the entire area under the demand curve (hatched area).

There does exist real controversy over the general usefulness by consumer's surplus, but there seems to be widespread agreement that it is, at least, useful as a vehicle to stimulate investigation (heuristically useful). E. J. Mishan is critical of statements made by prominent economists that have thrown doubt on the usefulness of the concept. He goes on to draw attention to the need for clarification of the concept itself, and the relationship between the concept and its measurable proxy, the demand curve (15). Although there is general controversy over the concept of consumer's surplus, there is indeed possible conceptual error in the specific use of consumer's surplus recreation benefits in multiple-purpose water resource benefit-cost analysis. Notwithstanding the many recreation researchers who have utilized the concept (7) (8) (11) (23) in the field of recreation as it pertains to multiple-purpose benefit-cost analysis, there is strong evidence of conceptual error in some of their reasoning. This error occurs when consumer's surplus derived recreation benefits are added to the total revenue benefits (value of final outputs) of other project pruposes.

Benefits to multiple-purpose water resource projects are normally calculated by estimating income generated by a project or the economic losses prevented by its construction. An example of the former is the calculation of irrigation benefits, and of the latter, flood control benefits. All project purposes except recreation are functions of real market prices, recreation having an imputed market value, and

specified quantities of consumption. Thus, the derived benefits from all project purposes, including recreation when so computed, stem from the total revenue concept. Since project purpose benefits are measures of net increase to National Income, they are, or should be, in conformity with the rationale of our entire economic organization. And the economic organization of our country is reflected in the Gross National Product (GNP) of which National Income (NI) is a derivative. Since the definition of GNP is defined as the total market value of all final goods and services produced in the economy in one year, and NI is determined by subtracting out capital consumption allowance and indirect business taxes from GNP, then project benefits are measures of the values of final goods and services--total revenue.

When recreation benefits are derived from the concept of consumer's surplus they reflect a vague utility (satisfaction) surplus, not a value of final output. Samuelson, in arguing that the concept of consumer's surplus is superfluous, wrote:

> Even if consumer's surplus did give a cardinal measure of the change in utility from a given change, it is hard to see what use this could serve. Only in the contemplation of alternative movements which begin and end in the same point could this cardinal measure have any significance and then only because it is an indicator of ordinal preference. (22, p. 210)

What he was saying is that only in the contemplation of different recreation development alternatives at the same site (location) could the cardinal measures of benefits have any significance and then only as an indicator of one alternative being better than others (ordinal preference). In other words, the actual cardinal benefit values have no meaning in comparison with any other non-consumer's surplus derived

benefits. Their value lies only in the comparing of similar alternatives in an ordinal manner.

Burns (4, p. 340) notes that, "Specifically we note that such areas [consumer's surplus area under demand curve] do not refer to a utility gain achieved solely through the additional consumption of a specific good, and further that the ceteris parebus [other things being equal] condition precludes the straight-forward addition of such areas associated with different goods." He goes on to say, "our primary concern is to obtain a useful monetary evaluation of the utility difference between alternative situations . . . ." Also on the same and next page he says, "It requires that we recognize the impossibility of associating a unique evaluation in money terms with the utility difference between any two situations." Paul Samuelson formally stated, ". . . the Marshallian concept of consumer's surplus does not refer to any one thing, but to at least a half a dozen interrelated expressions" (22, p. 197-202).

The discussion to this point has only touched lightly on the two components that make up the demand curve, the backbone of consumer's surplus. They are: X axis values--quantity (number of visits), and Y axis values--price (what visitors will pay).

Under the consumer's surplus concept where the derivation of the demand curve is explicit, the use of travel cost data can be a proxy for the price the user would be willing to pay (Y axis). This does not mean that recreational benefits at a reservoir equal travel cost to that reservoir, but rather that charging reservoir entrance fees would logically cause visitation to decline. The decline in visitation resulting from fees can be considered similar to that resulting from

the increased travel costs associated with greater distances between recreationists and reservoirs. Travel costs from a zone or area such as a county can be used with varying fee schedules to establish points on a demand curve for recreational services provided by a reservoir. The entire demand curve can be estimated by estimating a sufficiently large number of individual points in the curve.

To complete the construction of the demand curve, the X axis values of quantity (number of visits) have to be established. This entails forecasting the number of recreationists who will visit the project under consideration. The principal technique used by researchers using the consumer's surplus concept is called regression analysis. This technique functionally relates a dependent variable such as number of visits to other economic, competitive, or internal variables, all called independent variables. It estimates an equation using the least-squares technique. Relationships are primarily analyzed statistically, although any relationship should be selected for testing on a rational ground. Its accuracy is considered to be good to very good up to about two years, after which its forecasting ability is considered to be poor (5, p. 55-58).

The purpose of this discussion is not to probe deeply into visitation equations, but as a rule they all involve relationships between various socio-economic factors. The Outdoor Recreation Resources Review Commission (20) went as far as breaking down total visitation into a series of equations for each recreation activity such as swimming, boating, etc. The quantity of use (visitation) cannot be ideally divorced from the supply of existing recreation resources. This has been a big stumbling block in visitation forecasting. Given

the limitations on what can be done with a single regression equation, a number of researchers have suggested the use of econometric models (6) which entails the use of a series of interdependent regression equations solved simultaneously. The statistical techniques discussed here are very time consuming and expensive. They require not only consumer preference surveys to get basic data, but also extensive literature data search.

Consumer's surplus could be a useful but limited tool, but not in multiple-purpose water resource planning. Adding consumer's surplus derived recreation benefits to total revenue derived benefits is like adding apples and oranges. It is the belief of this author that the mistake most researchers make in using consumer's surplus as additive to total revenue is one of accepting at face value a somewhat limited definition of consumer's surplus. The usual definition seen (1) (7) (8) (11) (23) goes as follows: Consumer's surplus benefits are the difference between the amount the consumer would have been willing to pay and the amount actually paid. This is a classical understatement of the definition of the concept; a definition that omits completely all reference to the utility nature of the dollar valued benefits.

CHAPTER IV

FEDERAL AGENCY RECREATION PROCEDURES

Corps of Engineers' Procedures

Federal Agency recreation evaluation standards were first set out in Supplement No. 1 to SD 97. They were set out again in almost identical form in the 1973 Principles and Standards. An analysis and critical review is presented of one Agency's, the Army Corps of Engineers, evaluation methods. An in-depth understanding of the Corps' methods will provide an overview of other Federal Agency evaluation methods, since they all follow the total revenue concept. Also, the Corps' evaluation methods will be contrasted with another total revenue concept of recreation benefit evaluation as prescribed in the Federal Water Project Recreation Act, PL 89-72, 1965.

Corps of Engineers ER (engineering regulation) 1120-2-403, dated 26 March 1970, entitled "Procedure for Estimating Recreation Use" sets out its avowed purpose as, "to prescribe a standardized recreation use prediction procedure for multiple-purpose projects to be used in all general investigation and advanced planning project formulation." It goes on to say, "Procedures for projecting such use over the project life and deriving applicable average annual equivalent benefits will be consistent with sound economic and project formulation practices." In Paragraph 3, the ER specifies, "The recreation use prediction procedures

described in Technical Report No. 2, 1969, Estimating Initial Reservoir Recreation Use, will be used as a basis for predicting recreation use levels on multiple-purpose projects in all stages of project planning requiring such use estimates."

In brief, the procedure revolves around a "most similar project" concept, i.e., an existing reservoir that is most comparable in size, operation, and anticipated recreation-use characteristics. Relating recreation-use information from an existing reservoir to a reservoir under study provides the basis for the number of initial users. Once the number of initial users has been estimated, projections of future use are to be estimated on the basis of population growth. A single unit value per recreation day from the 1973 Principles and Standards can then be assigned to each user. All future annual benefits are discounted to present worth, thusly providing the recreation planner with the average annual recreation benefits of his study project.

Technical Report No. 2 contains pertinent project information and recreation use data for 52 existing Corps of Engineers' reservoirs. This information includes data on size and quality, accessibility, reservoir fluctuation, alternative outdoor water-oriented recreation opportunities, recreation facilities, and activity limitation. These data are basic to the selection of the "most similar project."

Recreation use surveys were conducted on the 52 nation-wide reservoirs. From these surveys such data were gained as: number of people surveyed; average party size per surveyed vehicle; percent of participation in each of the major recreation activities; and point of origin of people surveyed. Zones of travel distance were constructed

around each project up to a radius of 250 mi. The first five zones were 10 mi deep and the last eight were 25 mi in depth. The population was computed for each of these doughnut-shaped zones for comparison with the number of surveyed users who originated in them. From this exercise, per capita use rates were developed for each zone. The rates were plotted on semi-logarithmic paper and a best fit regression curve was drawn. These per capita use rate curves of the 52 operational projects become the basis for determining initial use of the study project.

An inherent problem in the whole procedure is that just one "most similar project" cannot be selected, rather, two or three end up being "most similar projects." These dissimilarities will have an effect upon the magnitude and the slope of the curves of any one of the two or three "most similar projects," so a value judgement has to be made in trying to average them out into one final per capita use rate curve. Once this final curve is constructed, rates are taken off and imputed to each zone of the study project. Multiplying the known populations of each zone by its per capita use rate will give the recreation planner his estimate of initial use. There are other details in Technical Report No. 2 concerning market area, day use, camping use, i.e., that do not affect the recreation use concept we have been discussing, so nothing will be said about them.

Corps Procedures Critique

Main criticism of the Corps' methodology is that it is site orientated and considers only the demand for reservoir orientated recreation. The survey of users took place on Corps reservoirs so the

sample has a strong bias towards users rather than being a random sample of the market population. Per capita use rates are developed using a sample of site users that is in turn imputed to a market population. The survey sample, to be conceptually correct, should be from the market population not the site users. Possible double counting can take place if estimation methods are exclusively site orientated and fail to account for overall market demand.

The most likely alternative means that would be utilized in the absence of the project does not necessarily mean another reservoir project. If water is used in a non-consumptive way for recreation as an esthetic complement to land-based recreation activities such as camping, picnicking, walking for pleasure, and the like, then the demand for such activities can be satisfied at state or local parks where surface water is available.

It is to the Corps' credit that no where in Technical Report No. 2 does the word "demand" appear because demand is definitely not what is being determined. What is being determined is use or consumption--gross attendance at facilities. Consumption (use) depends on demand and the availability of supply. Demand and supply are conceptually and statistically distinct from each other. Outdoor recreation resource projects used in the sample surveys of the Corps are customarily available at zero prices or charges. Consumption (use) that is cited for outdoor recreation refers to the consumption (use) at such prices. The millions of days of outdoor recreation consumed (used) at these 52 operational projects are being consumed at the prevailing zero price for these resources. If prices were raised substantially by the imposition of user fees, a very different quantity would be consumed.

And this is what the Corps methodology does, consumption (use) is imputed to a study project from basic consumption data of similar operational projects that are zero priced. Then a unit value representing what a user would be willing to pay is introduced into the benefit calculus producing a value that could be highly inflated.

All water resource plans are formulated with due regard to all pertinent benefits and costs, both tangible and intangible. They are formulated initially to include all purposes which satisfy the following criteria from SD 97 in quantitative economic terms: (a) Tangible benefits exceed economic costs; (b) Each separable purpose provides benefits at least equal to its costs; (c) There is no more economical means of accomplishing the same purpose which would be precluded from development if the plan were undertaken. Each project purpose is analyzed to meet this criteria on the presumption that it may or may not end up being a project purpose. If a project is being considered in an area with already abundant water supplies--surface or ground water--then water supply will not be a project purpose because there is no definable need for it--it will not stand the test of the criteria. The same can be true for recreation.

If a project is being considered in an area of already abundant water-based recreation resources, recreation, in theory, could also <u>not</u> be a project purpose. A rigorous economic demand and supply study would signal the planner that the existing recreation resources (supply) were ample to fulfill the demands of the market population. Since there was no need for a new recreation resource, there could be no recreation benefit flows to offset the cost of recreation facility

development. The cost would exceed the benefits (zero in this case) so the criteria could not be met and recreation would not be a project purpose.

All of the above is brought out to show the fallacy of computing recreation visitation on the basis of consumption (use). And that is, when project benefits are computed on the basis of estimated initial use and future growth, like the Corps' methodology, all projects will have recreation as a project purpose on some scale because they will all be used regardless of the existing supply. All 52 of the "similar projects" are being used but that use is not synonymous with need for those projects as a recreation resource. The best example of this thesis is the highway turnpike example. Another turnpike could be built right along side the Turner Turnpike between Tulsa and Oklahoma City; the new road would obviously be used, but would not be needed. The essence of feasibility for any investment is whether it is needed, not whether it is used.

It is not the purpose of this discussion to be unduly critical of the Corps of Engineers. It just happens they, as a Federal Agency, have done much to advance the art of recreation planning so are the most vulnerable. Again, to their credit, they say in the Summary page of Technical Report No. 2:

> While the methodology eliminates much of the 'guess work' previously associated with estimating the recreation use and benefits for Corps reservoir projects, it is emphasized that it is by no means the 'last word' or final solution. There are inherent deficiencies in the method.

Not withstanding all of the aforementioned criticisms of the Corps of Engineers' methodology, another major controversy centers around an apparent contradiction between the Corps' methodology, and the

provisions of Section 6(a) of the Federal Water Project Recreation Act, PL 89-72, 1965.

SCORP Procedures

Section 6(a) of PL 89-72 says in effect:

> The views of the Secretary of the Interior with respect to the outdoor recreation aspects shall be set forth in any report of any project within the purview of this Act. Such views shall include a report on the intent to which the proposed recreation development conforms to and is in accord with the State comprehensive plan developed pursuant to subsection 5(d) of the Land and Water Conservation Fund Act of 1965.

The contradiction is as follows: Corps of Engineers' ER 1120-2-403 establishes initial recreation visitation on the basis of use only. The contention appearing to be that projects are used regardless of the supply of existing projects in the population market area. On the other hand, Section 6(a) of PL 89-72 sets out the State Comprehensive Outdoor Recreation Plan (SCORP) as the final arbiter of recreation "need." The definition of need being the excess of demand over supply as expressed in physical units (facilities, activity occasions or activity days). Demand in this sense is not demand in the economic sense of quantity demanded at various prices. Rather it means "recreation participation surveys" which realistically reflect the nature of the data--an implication of only the discretionary behavior of people taking advantage of opportunities to participate in outdoor recreation.

Supply side of the equation is determined by inventory of existing recreation resources. The demand participation rates developed from the survey for each recreational activity are converted

to physical units that can be directly compared with the results of the supply inventory for final determination of need. Once recreation need has been established for a study project, it can be converted into recreation days and then into recreation benefit flows by utilizing the unit values set out in the 1973 Principles and Standards. Thus we again have a total revenue concept of recreation benefits. It can be said about the SCORP technique that without initial recreation need, recreation can rarely, if ever, be justified as a project purpose.

Birth of the SCORP was subsection 5(d) of the Land and Water Conservation Fund Act of 1965. Subsection 5(d) set out the requirements that a SCORP shall be required prior to consideration of financial assistance by the Federal Government. It went on to say that the plan shall include an evaluation of the demand for and supply of outdoor recreation resources and facilities in the State. This aspect of the plan has been discussed above. What it means is that capital investment in facilities and land acquisition is thus based on actual data and not on the subjective judgement of individuals. The approach is sound, but after 10 years of recreation planning under the demand survey concept, it is reasonable to ask some questions.

The next chapter will be devoted to examining some issues involved in the use of the SCORP to derive recreation benefit flows. Also to be examined is the role of recreation benefit flows in system (or project) operation optimization studies.

CHAPTER V

ISSUES IN RECREATION PROCEDURES

Other Agency Review

All Federal multiple-purpose water resource projects, including those of the Corps of Engineers, that will have recreation as a project purpose fall under the purview of PL 89-72. This act sets out certain policies for recreation benefit flows. The principal one being that if full recreation benefits are to be used in project formulation, all recreation development costs are subject to cost-sharing with a non-Federal public body. The act also sets out, as discussed in the previous chapter, that all plans under its purview are subject to review by the Bureau of Outdoor Recreation (BOR), acting as agent for the Secretary of the Interior. And this review is based on conformance with the State Comprehensive Outdoor Recreation Plan (SCORP).

Since the law makes the SCORP the final arbiter of recreation "need," it behooves Federal recreation planners to examine it very carefully and critically. The approach is sound, but it is certainly reasonable to offer critical analysis when needed because the SCORP can be a life or death proposition to recreation in project formulation. What it boils down to is that the quality of the SCORP can make or break a proposed multiple-purpose water resource project. It is this question of quality that will be examined.

In the course of this author's work, six State Comprehensive Outdoor Recreation Plans (SCORP's) representing the states of Oklahoma, Kansas, Texas, Missouri, Arkansas, and Louisiana have been examined in depth and utilized in recreation planning. Coordination and review procedures for this planning were carried off with the BOR and the Bureau of Sport Fisheries and Wildlife (BSFW) of the U.S. Fish and Wildlife Service as required by PL 89-72. The following findings are based on the author's experiences with these SCORP's:

1. Number of recreation activities analyzed varied in each SCORP from a minimum of 12 to a maximum of 38. No two SCORP's had the same number.

2. Survey data used to develop participation rates were based on actual general population surveys that had wide disparity in sample size to population size ratios. One state had participation rates based on "adjusted" ORRRC values (20), rather than actual population surveys.

3. Size of the actual populations used in determining initial and future demand varied from state to state. One state excluded all persons under 6 years of age. Two states excluded all persons under 12 years of age. Three states considered 100 percent of the population.

4. None of the SCORP's provided a county by county breakdown of data--it was all by planning regions only.

5. SCORP's were not consistent in the way demand, supply, and need values were presented. One SCORP published need values in physical units of development only, i.e., so many camping sites, and so many picnic tables. Two SCORP's published demand, supply, and need in

terms of activity occasions and physical units. Three SCORP's published only demand in activity occasions, and supply and need in physical units.

6. All the SCORP's published future needs that were developed using initial participation rates times projected population figures. All the SCORP's varied in how far out projections were carried.

7. Participation rates were not consistent between states. For example, counties contiguous to each other but separated by a state line, have participation rates that vary as much as 75 percent.

8. None of the SCORP's shed any bright light on the recreation use patterns of out-of-state visitors. Data outputs were not consistent between SCORP's.

9. Formats, style, presentation, and concept were completely different in all the SCORP's except for two that had a degree of commonality because they were both done by the same contractor.

Water resource basins and projects are indifferent to state lines and planning area sizes and locations. It is imperative that data be on a county by county basis so the recreation planner can build his own market population area. The demand, supply, and need data must be supplied in the form of both activity occasions and physical units so recreation days of visitation can be determined along with physical units. Once recreation days are known then benefits can be computed. Given all the discrepancies and lack of continuity, the SCORP's become almost impossible to utilize. This quality aspect has become most damaging to the Corps of Engineers because the Corps is mandated by law to "somehow" muddle through the SCORP process.

This muddling through process has been the cause of much disagreement between the Corps and its duly appointed outside reviewers. The Bureau of Outdoor Recreation (BOR) is the reviewer by law of all Corps recreation plans involving project formulation of multiple-purpose projects. The Bureau of Sport Fisheries and Wildlife (BSFW) has, by partial default of the BOR, and certain provisions of the 1958 Fish and Wildlife Coordination Act, reviewing rights over various aspects of Corps recreation plans.

Supplement No. 1 to SD 97 and the 1973 Principles and Standards both set out two classes of outdoor recreation days, general and specialized. General includes the majority of all recreation activities associated with water projects, including warm water fishing and small game hunting. The special class includes activities less often associated with water projects, such as big game hunting and salmon fishing. The BOR has the legal mandate under PL 89-72 to review all general recreation aspects, but does not, as a matter of policy, review fish and wildlife activities of any sort. They defer this to the BSFW, even though the activities are warm water fishing and small game hunting. This review process plus the questionable quality of the SCORP's, are the basis for much of the disagreement between the three Federal Agencies.

Two Federal Agencies like the Corps and the BOR with obviously different self interests will almost naturally disagree on the interpretation of documents like the six SCORP's previously discussed. But, both agencies recognize the status of the SCORP and now are utilizing it more and more (even though the Corps' ER 1120-4-403 is still on the books). The BSFW does not utilize the SCORP in preparing their

analysis of the fish and wildlife aspects of the project. Their concept of demand is based on the biological carrying capacity of the reservoir. A storage reservoir has the ability to sustain so much fish life and the average fisherman will catch so many fish. This same concept is also used in the activity of hunting. This concept of demand is completely incorrect and has no bearing on what a fisherman or hunter would be willing to pay.

The ultimate solution to the whole problem lies in the development of superior SCORP's that embody the needed quality features that have been discussed. Along with the superior SCORP's, the BSFW must be convinced that they must utilize the SCORP concept.

System Optimization Studies

Water resource systems may be created in almost infinite variety through different combinations of system units, levels of output, and allocations of reservoir capacity to various uses. The aim of system design is to select the combination of variables that maximizes net benefits in accordance with the requirements of the design criterion. This criterion itself is a function of the objectives which, as discussed in Chapter III, are to enhance the national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency.

This seemingly unlimited freedom of selection among system components can be circumscribed by using techniques that enable us to identify readily those combinations of variables that will best accomplish the overall objective. When we talk about "systems," we are talking about a set of variables (flood control, water supply,

irrigation, recreation, etc.) which interact in a regular, interdependent manner.

The principal techniques of system design involve mathematical methods which proceed automatically to the optimal solution. In water resource system design the requirement is to find in a single operation that combination of size of structure, operating procedure, and output of a system that would maximize the value of an objective function. The objective function is a statement by which the output of any system can be determined. And that output is measured in "net benefits." In other words a water resource system optimal design is the one in which the objective function is at a maximum.

The role of the purpose of recreation in system optimization design is open to question. Recreational use of water is essentially a nonwithdrawal-nonconsumptive use, while all the other project or system pruposes are withdrawal-consumptive uses. In searching for that output of a system to maximize the value of the objective function, we try to translate the output into terms of storage which has a definite per unit volume value. That is, with the exception of recreation where there is no storage involved.

Various techniques have been used by researchers to build recreation into the system design, but they are conceptually incorrect. One method has been to equate recreation use to storage by the indirect manner of making benefits a function of a volume-area relationship. This is done by utilizing area-capacity curves to determine the surface areas of different capacities--the assumption being made that the more surface area, the more use, and conversely, less surface area, less use.

Marglin says that, "Expressing recreation output as a function of reservoir capacity alone is patently unrealistic" (13, p. 42r).

Another technique that has been used is the one where recreation use is tied to pool level fluctuations--the thesis being that fluctuations above and below the "normal" pool detract from the recreation experience. This technique provides researchers with a qualitative instead of a quantitative evaluation. On the basis of many statistical studies on the subject of recreation use versus pool fluctuation, no statistically significant relationship has ever been shown to exist between water level and recreation attendance (1) (13) (21).

The techniques attempt to make recreation benefits a function of the physical nature of the reservoir instead of the population's willingness to pay (or its proxy). In recreation, the population's consumption of the product is achieved by their going to the product. All of the other project purposes are the reverse--the product goes to the consuming population.

As a general statement, this author would exclude recreation from system design. Only in a rare instance where "need" would exceed the carrying capacity of a project (or series of projects) could a case be made for building recreation into system optimization design.

CHAPTER VI

CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK

General Conclusions

Increased income and leisure, combined with advances in transportation technology, have made outdoor recreation an important consumption commodity in the United States, much of which is provided by the public sector of the economy. The need for objective, quantitative criteria to evaluate investments in outdoor recreation is acute and recognized by most researchers and water resource public agencies with responsibility for allocation of public funds among such investments. Specific projects have been and are being chosen for development whether good recreation investment decision criteria are available or not, and it would appear that decisions made under current Federal Agency and independent research methods are not of the highest quality.

There can be little doubt that much of the present interest in the evaluation of outdoor recreation benefits stems from the overall problems and questions in water resource development. Hundreds of artificial lakes (reservoirs) have been built across the nation with benefits arising from flood control, power, irrigation, water supply, and recreation. Recreation has only in recent time (SD 97, 1962) been recognized as a major component of value in federally sponsored developments.

Mere recognition of the importance of recreation in water resources projects was probably delayed because of obvious difficulties in measurement of benefits. Thus far, only modest progress has been made in overcoming difficulties, even though there has been a veritable "explosion" of published studies, most of which in the view of this author, are functionally worthless. Although water resources development has added impetus to the evaluation of recreation benefits, the measurement problem is just as pressing today as it was in 1962 when recreation was first recognized in federal water resource planning.

Total Revenue Conclusions

The concept of total revenue basically means multiplying the quantity expected of users (or visitors) times some single imputed value of what all the users would be willing to pay to find the maximum revenue (benefits) obtainable. A number of models of this concept are in use, some good and some not so good.

The Corps of Engineers has developed an initial use measurement model (or methodology) for estimating recreation benefits that is based on a similar project concept. It would appear that the model is conceptually incorrect because it measures use rather than need. The contention being that since projects are used regardless of the supply of existing recreation resources in the area, recreation benefits may be predicated on this use. On this basis, all projects would have recreation as a project purpose on some scale, because they are used. This could not possibly be true because there are situations where a new project is being proposed in an area where there are many competing

recreation resources that already fulfill all the needs of the planning area.

Although the Corps' methodology is set out as Corps policy in ER 1120-2-403, it is to the Corps' credit that it is falling into disuse because of the overriding mandate of PL 89-72. This act sets out the Statewide Comprehensive Outdoor Recreation Plan (SCORP) as the final arbiter of recreation need. Need is defined as the excess of demand over supply in physical units of measurement.

The SCORP procedure of measuring need brings the supply component into the evaluation process in a direct manner. They are inventoried and directly related to demand as established from population surveys. Unlike the Corps' technique, the SCORP process will show a negative need (idle resources) where there is an excess of existing recreation resources.

Consumer's Surplus Conclusions

One of the basic economic concepts fundamental to many published recreation benefit evaluation studies is the concept of consumer's surplus. The concept roughly represents the amount of willingness to pay over and above actual expenditures, and is understood to be an indication of the excess utility which consumers derive from the quantity obtained. When admission fees are zero and consumer's surplus is included, the measure of benefits is the area under the demand curve. Not withstanding the many recreation researchers who have utilized the consumer's surplus concept, there is evidence of conceptual error in some of their reasoning. The error occurs when they try to add consumer's surplus recreation benefits to the final outputs

(benefits) of other project purposes in multiple-purpose benefit-cost analysis. It is the conclusion of this author that they are not additive because the two types of benefits are unrelated to each other in meaning and concept.

The construct of the statistical demand curve is basic to the consumer's surplus concept. The curve being a schedule of quantities demanded of recreation at various prices. Quantity of a particular recreation activity demanded by an individual depends upon the price he must pay, the prices of alternative recreational pursuits, his income level, his time limitations, and other social-economic factors. Determining the dependent variable of quantity is tremendously difficult and costly if it is to be done with any degree of accuracy. Most of the models presented in the literature are single equation multiple-regression equations. A model is an abstraction of reality and a single equation model of quantity (visitation) is a "high" abstraction of reality. There are just too many independent variables that enter into the computing of quantity demanded.

It is the conclusion of this author that most researchers set up situations that are so simple that they are unworldly. This is convenient to the use of simple analytical tools like single regression equation models. In other words the situation to be analyzed is either designed around the limitations of the researchers' analytical tools, or a complicated situation is analyzed by tools too simple in concept to give anything but a "forced" answer.

A real world situation (project) to be studied by a Federal recreation planner would probably consist of a proposed multiple-purpose project located less than 50 miles from an urban area. It

would be competing with existing recreation resources within a 50-mile radius of the project. The competing recreation resources could be comprised of local, state, and/or federal projects. They could be lakes, reservoirs, public parks, and even private recreation facilities. The basic question the planner wants answered is whether his proposed project is needed as a new recreation resource, or, are the existing recreation resources ample to fulfill the needs. If the proposed new project is needed, how much is it needed? These questions involve broad socio-economic aspects of the population, and how that population is utilizing the existing supply (competing recreation resources).

A simple version of the real world that finds currency in the literature is a single-purpose (recreation) project located in an area that for all extent and purposes has no competition from existing recreation resources. The difficult issue of whether the project is needed or not is not a factor because obviously it is needed for there are no other reservoirs to satisfy the need. The only question is, how many visitors (quantity) will use the project?

Both the real world project and the simple version project require some form of a recreation visitation equation--a model. Both models are dependent upon consumer preference field surveys of the population. The real world model requires independent variables involving the competing resources (supply). Even the simple version model is extremely time consuming and expensive, plus not being appropriate for usage in the real world project. It is no wonder that practitioners of recreation planning in Federal Agencies shy away from the concept of consumer's surplus and all its attendant problems.

Most of the published literature does not address itself to the real world situations that Federal planners have to deal with. And those publications that do try to, are something less than adequate, especially in trying to model the effects of competing recreation resources. Federal recreation planners are utilizing more "practical" techniques under the economic concept of total revenue.

General Suggestions

Recreation is still the enigma of multiple-purpose water resource planning. The quantification of recreation outputs as an economic product has advanced very little since Supplement No. 1 to SD 97 in 1964 stated on Page 9, "Further studies are needed to more clearly define various quantitative and qualitative inter-relationships of recreational uses of resources." Some nine years later in the new 1973 Principles and Standards the following statement on Page 52 bears out this lack of advancement: "In the interim, while recreation evaluation methodology is being further developed, the following schedule of monetary unit values may be used in the preparation of plans." The two documents, written some nine years apart, are basically identical in their statements on recreation.

The issue of whether the whole population or just that part over 6 years of age, or over 12 years of age, should be considered in the calculus of benefit estimation is still unreconciled. Another population issue is, how big should a project market area be? This goes back to how far should a recreationist have to travel to fulfill his recreation needs (or meet his demands)? Market area determinations have usually been predicated on surveying actual users to see how far

they are willing to drive. But this method is "existing supply" oriented--the supply creates the users' driving preferences. Market areas differ tremendously using this concept. It should be a matter of national policy that a recreationist, no matter where he lives in the nation, should not have to travel over one to one and one-half hours' driving time. This would set a standard to strive for in the allocation of recreation resources.

Given the conceptual problems and large cost of using the consumer's surplus concept, it is recommended by this author that Federal Agencies not use it. In theory each project requires a completely independent analysis. This means that the demand curve and recreation visitation model are unique to each project. But in real life there is a tendency to take one model and adapt it to many other situations making for a decision tool that cannot be any better than many much simpler techniques.

The Corps of Engineers' technique was really developed to fill a void that existed until the procedure set out in PL 89-72 could get off the ground. The Corps' technique is conceptually incorrect, in the judgement of this author, when utilized to determine initial use for computation of recreation benefits in new project formulation. It is a useful tool in forecasting use of operational projects where the only information desired is how many recreationists will use the site or project. It should be continued to be used for this purpose in the future.

The soundest analytical tool in terms of theory and cost of implementation is the SCORP technique as set out in PL 89-72. This total revenue concept is founded on a non-economic definition of demand.

Demand in the SCORP context is the extent of current participation in various recreational activities by a sample of the population. This demand is compared to current supply (as inventoried by survey) and subsequent need or idle capacities are determined. The major drawback to using the SCORP is one that can be and is being overcome. And that is the quality of the survey and inventory processes underlying the basic output of the SCORP's.

In conclusion, this author suggests all future SCORP recreation demand surveys be based on random, stratified samples of the general population. Also, carefully prepared interview schedules must be developed with adequate pretesting of both the data collection and analytic procedures. In addition to social and demographic variables, a broad range of outdoor recreation and other leisure activities must be covered including data on where and when it occurs. These suggestions pertain to all SCORP's because uniformity of quality has to be the major goal.

Out-of-state visitors must be sampled separately. Studies should be coordinated among all public and private suppliers of outdoor recreation to check for double counting in the inventory process. As a last suggestion, the outside review processes of the Bureau of Outdoor Recreation (BOR) and the Bureau of Sport Fisheries and Wildlife (BSFW) must be improved and coordinated. The BOR, as administrator of the funds that help pay for the SCORP's, must be the prime mover in upgrading their quality.

Finally, there is a great deal more suggested research to better understand recreation than what this author has offered. This study touches on some of the basic problems, but still leaves quite a bit

unsaid. Other researchers have examined the many issues that are not in the scope of this thesis (17). Federal recreation planners are obligated to themselves to examine all of these issues, so it is suggested that a broad reading program is in order.

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