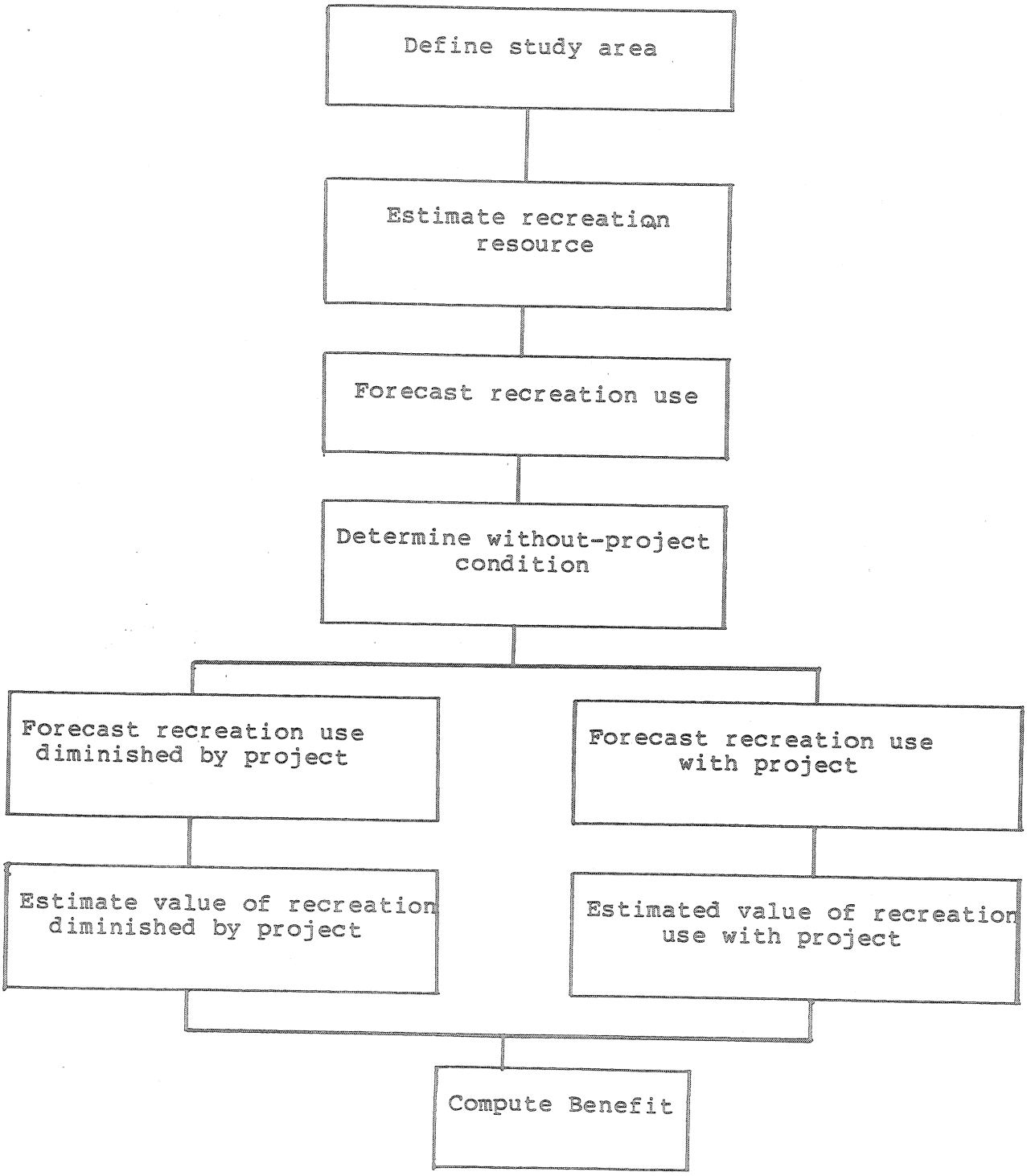
Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies

March 10, 1983

Figure 2.8.4 -- Flowchart of Recreation Benefit Evaluation Procedures



2.8.5 Evaluation procedure: Define the study area.

Determine changes in recreation use and value resulting from alternative plans through the analysis of without-project and with-project conditions in the study area over the prescribed period of analysis. The impacts should relate to the geographical recreation "market" defined by the location of actual and potential user populations. Definition of the study area should be justified with respect to the particular characteristics and quality of the site and the availability of similar alternative recreation opportunities. Reference to statistical evidence regarding the spatial distribution of trip generation is encouraged.

2.8.6 Evaluation procedure: Estimate recreation resource.

(a) Include in estimates of the recreation resource capacity for the study area all sites (see 2.8.3(b)) that provide recreation activities similar to those displaced or provided by the project. The recreation resource in the study area is the system of water and related land recreation sites that influence the demand for the proposed project and are influenced in turn by the demand at the existing site.

(b) Include in the inventory of water and related land recreation sites in this study area those Federal, State, county, local, and private sites that are in varying stages of development or that are authorized and likely to be developed in the forecast period.

(c) Identify the ability of recreation alternatives to provide different recreation activities and assess the quality of the alternative recreation experiences.

2.8.7 Evaluation procedure: Forecast potential recreation use in the study area.

Potential use is the expected visitation at prevailing prices unconstrained by supply. Forecast of total recreation use in the study area should be made for each activity currently provided at the project site and for each activity proposed in the plan or project. The potential use for a specified outdoor water and related land recreation activity will depend on the size and characteristics of the study area population and the availability of the specified recreation activity and other types of recreation in the study area.

(a) The recreation use of the site's resources will depend not only on the attributes of the site and its proximity to population centers, but also on its location in relation to the location of other water and related land resources providing similar or complementary types of recreation within the study area.

(b) Forecasting potential future participation in recreation activities for the study area involves four steps: (1) Collect data on explanatory variables that influence the demand for recreation activities; (2) Relate potential use to these variables by means of some use estimating techniques as described in 2.8.9; (3) Forecast values of the explanatory variables over the period of analysis. Justify projections and explain any simplifying assumptions. Reference to statistical evidence on trends is encouraged; (4) Calculate expected use for the study area using the values obtained in Step (3) and the relationships determined in Step (2).

2.8.8 Evaluation procedure: Determine the without-project condition.

Determine the without-project condition for the study area on the basis of a comparison of the available recreation resources as specified in 2.8.6 and the recreation resource use as specified in 2.8.7 for each activity currently provided at the project site and each activity proposed in the plan or project. Compare the capacities of all sites, including the site without the proposed project, to produce recreation activities with the expected demand for each activity.

2.8.9 Evaluation procedure: Forecast recreation use with project.

(a) *General.* Forecast recreation use with the project as a basis for estimating project recreation values. Project use over time by calculating the change in use induced by anticipated changes in the variables that determine use. Explain values employed for projecting future demand and any simplifying assumptions. For the capacity method described in paragraph (b)(4) of this section, use is constant over time as determined by the capacity constraint. Explain use projections and any simplifying assumptions. Reference to statistical projections of recreation participation is encouraged.

(b) *Use estimating techniques.* Use one or more of the following approaches for estimating recreation use for the with-project and/or without-project conditions. The use of any other method should be justified as conforming to the characteristics listed in 2.8.2(b). References to statistical estimates are encouraged.

(1) *Regional use estimating models.* Regional use estimating models are statistical models that relate use to the relevant determinants based on data from existing recreation sites in the study area. The

use of regional models can economize on resources required for site-specific studies. In the absence of a regional model, estimate use by one of the site-specific methods described below. If a use estimating model has already been developed for the region in which a proposed project is to be located, use estimates should be obtained by the following procedure:

(i) Delimit the areas of origin for the proposed project (use of counties or parts of counties as origin areas will facilitate gathering of data in subsequent steps).

(ii) Compute measures of the explanatory variables in the use equation for each origin area and for each year for which an estimate is required.

(iii) Calculate use from each area for each year.

(iv) Aggregate use from each area to get estimated annual use.

(2) *Site-specific use estimating models.* The preferred site-specific method of estimating use is a use estimating model (UEM) that relates use per 1,000 of origin population to distance traveled, socioeconomic factors, and characteristics of the site and alternative recreation opportunities. Use estimating models yield regression coefficients estimated from data gathered at a comparable existing site or cross section of existing sites. The coefficients are used to estimate visitation at a proposed site in the same way as described for regional models. Factors that influence demand for recreation, such as characteristics of user populations and availability of alternative opportunities, are explicitly taken into account by variables in the model. Because of the influence of congestion during heavy use periods, it is desirable to distinguish use during summer weekends and holidays. If data limitations do not permit disaggregation, explain treatment of seasonal use variation and any simplifying assumptions.

(3) *Application of information from a similar project.* (i) If a UEM is not available and cannot be estimated because of data limitations, use may be estimated by the similar project method. This method assumes that recreation demand for a proposed project can be estimated from observations of visitation patterns at one or more existing projects with similar resource, operations, and use characteristics. The alternatives under study are compared with water resource projects and recreation resource areas for which trip generation and other statistics are known. It is important to obtain as close a match as possible in type, size, and quality of project; market area demographic and socioeconomic characteristics; existence and location of competing recreation opportunities; and other variables that influence demand.

(ii) The most efficient and technically sound similar project procedure is based on per capita use curves (i.e., regression curves relating per capita rate of use to travel distance) from which use estimates are derived. The similar project method involves the following steps:

(A) Evaluate the characteristics of a proposed project or other area under study.

(B) Select a similar project or area by comparing characteristics of the proposed project with available information for existing sites; include evaluation and comparison of the respective recreation market areas.

(C) Adjust the per capita use curve to account for the differences between the similar project and the proposed project.

(D) Determine the county populations within the market area for the years in question, and derive per capita use rates for each county population by measuring road mile distance from the project to the center of the most populated city within the county (proxy for centroid of county population).

(E) Multiply each county per capita rate by county population and sum to get total use.

(F) Determine the percentage of total use that the foregoing estimate represents; if 100 percent, use as is; if less, adjust accordingly.

(iii) Justify assumptions used to adjust or modify per capita use curves.

(4) *Capacity method of determining use.* If data on use determining variables are unavailable and are not cost effective to obtain, and if it can be demonstrated that sufficient excess demand exists in the market area to accommodate the additional capacity supplied by a proposed project, use may be assumed to be equal to capacity. Since this method provides no information on trip generation, willingness to pay cannot be evaluated by the travel cost method.

2.8.10 Evaluation procedure: Estimate value of use with the project.

As noted in 2.8.2, three alternative methods can be used to estimate recreation benefits:

(a) *Travel cost estimate of willingness to pay based on use estimating model or per capita use curves*—(1) *Conditions under which TCM may not be used.* (i) Use was not estimated by a technique relating trip-generation to distance to the site;

(ii) There is insufficient variation in travel distances to allow parameter estimation (for example, urban sites); or

(iii) The project site is typically only one of several destinations visited on a single trip.

(2) *Construction of a TCM demand curve.* The area under a demand curve based on travel costs to a site approximates the willingness to pay for access to the recreation opportunities there. This estimate involves the following calculations:

(i) Convert round-trip distance from each origin into monetary values by using the most recent U.S. Department of Transportation average variable costs in cents per mile to operate an automobile, plus the opportunity cost of leisure time spent in travel and on the site. Time costs vary according to the alternative uses of time available to visitors and are correlated with income, age, education, occupation, time of year, and day of week. Explain values assigned to time and any simplifying assumptions.

(ii) Construct a demand curve that relates "prices" to total visits. Given a relationship between travel costs and annual visitation from a use estimating model or a per capita use curve, construct a demand curve by gradually increasing travel cost and calculating the total visitation associated with each increase, until visitation falls to zero for all origins.

(iii) Compute the area under the demand curve plus any user charges or entrance fees. This value measures the annual total willingness to pay for recreation activities available at the site.

(iv) Discussion of travel cost method can be found in Appendix 1 of this section. Appendix 1 is provided for background information. Development and use of techniques more refined than those presented in this Appendix are encouraged.

(b) *Contingent valuation (survey) estimate of willingness to pay*—(1) *Use of contingent valuation method for daily or annual values.* CVM may obtain either daily or annual estimates of willingness to pay. Multiply daily estimates by annual use obtained previously. Annual estimates do not require use estimation except to demonstrate the net increase in recreation use in the market area.

(2) *Designing and using simulated markets to identify the value of recreational resources as if actual markets existed.* Five steps are involved:

(i) Establish a market to the respondent.

(ii) Permit the respondent to use the market to make trades and establish prices or values reflecting the respondent's individual evaluation of the recreation opportunities bought or sold.

(iii) Treat the values reported by the respondent of individual values for recreation, contingent upon the existence of the market.

(iv) Given willingness to pay bids from an unbiased sample of users in the market area, the socioeconomic characteristics of respondents, distance to the site, and available alternative recreation opportunities for each origin, obtain multiple regression estimates of average household value for the proposed change in recreation opportunities for households in each group.

(v) Multiply this value by the number of households in the group and sum the group values to estimate the aggregate willingness to pay if the average values are annual; multiply this value by estimated annual use if average values are daily.

(3) *Obtaining individual bids from personal interviews or mail surveys.* The preferred format is one in which the respondent is required to answer "yes" or "no" to questions if he or she is willing to pay a stated amount of money to obtain a stated increment in annual recreation opportunities. The value is increased gradually until the highest amount that the respondent is willing to pay is identified. Examples of question formats and further discussion of survey techniques can be found in Appendix 2 of this section. Appendix 2 is provided for background information. Development and use of techniques more refined than those presented in this Appendix are encouraged.

(4) *Developing regional contingent valuation models.* Regional models may be developed with CVM as well as use estimating models. All survey forms are subject to the clearance procedures of the Office of Management and Budget.

(c) *Unit day value approximation of willingness to pay*—(1) *Application of unit day values.* See 2.8.2(c)(3).

(2) *Selection of value.* (i) If the UDV method is used for economic evaluations, select a specific value from the range of values agreed to by Federal water resource agencies. The product of the selected value times the difference in estimated annual use over the project life relative to the without-project condition provides the estimate of recreation benefits.

(A) If evidence indicates that a value outside the agreed-to range is more accurate, a regional model or site-specific study should be conducted. Explain the selection of any particular value within the published range.

(B) To explain the selection of a specific value, a point rating method may be used to reflect quality, relative scarcity, ease of access, and esthetic features. Appropriate use should be made of studies of preferences, user satisfaction, and willingness to pay for different characteristics; particular efforts should be made to use estimates derived else-

where from applications of the TCM and CVM techniques.

(ii) Account for site transfers in choosing unit day values. An example of a point rating table that does this and further discussion of unit day value selection can be found in Appendix 3 of this section. Appendix 3 is provided for background information. Development and use of techniques more refined than those presented in this Appendix are encouraged.

2.8.11 Evaluation procedure: Forecast recreation use diminished with project.

Using the appropriate method described in 2.8.9, forecast the recreation resource uses that would be diminished due to physical displacement expected because of the plan or project.

2.8.12 Evaluation procedure: Estimate value of recreation use diminished with project.

Using the appropriate methods described in 2.8.10 and selected by the appropriate criteria described in 2.8.2, estimate the value of the recreation uses that would be diminished by the physical displacement expected to occur as a result of the plan or project. In determining project net benefits, account for changes in recreation use of an existing resource and/or project as a result of transfers to the plan or project under study.

2.8.13 Evaluation procedure: Compute net project benefits.

Compute the project benefit as the difference between the gross value of recreation use as estimated in 2.8.9 and the value of recreation use diminished as estimated in 2.8.12. However, if excess capacity for any activity exists in the study area, benefits are the user cost savings plus the value of any qualitative differences in recreation.

2.8.14 Report and display procedures.

Tables 2.8.14-1 and 2 are suggested presentations for reports that include recreation as a purpose.

Table 2.8.14-1—Recreation Capacity and Use (19—) [1]

	Without project			With project		
	Capacity	Use	Surplus or deficit	Capacity	Gross use	Displaced use
Plan 1						
Plan 2						
Plan 3						
Plan X						

[1] Prepare for representative project years.

Table 2.8.14-2—Annualized Recreation Benefits, Recommended Plan

Recreational activity	Value of gross use	Value of displaced use	Net value
Specialized			
General			

Appendix 1 to Section VIII—Travel Cost Method

The basic premise of the travel cost method (TCM) is that per capita use of a recreation site will decrease as the out-of-pocket and time costs of traveling from place of origin to the site increase, other things remaining equal. The method consists of deriving a demand curve for a recreation site by using the variable costs of travel and the value of time as proxies for price. By use of data collected from users of existing sites, the travel cost method permits development of (1) estimated use of the proposed site; (2) a per capita demand function for recreation at the site; and (3) an estimate of the NED recreation benefits of the site. The travel cost procedure consists of two steps: estimating use and deriving a demand curve.

(a) *Estimating use*—(1) *Use estimating models.* (i) The preferred method for estimating use is a use estimating model (UEM) that relates use at a proposed site to distance traveled, socioeconomic factors, and characteristics of the site and alternative recreation opportunities. Use estimating models are based on data gathered at an existing site or on a cross section of existing sites with the resultant statistical coefficients used to estimate use at a proposed site. Factors that influence demand for recreation, such as characteristics of user populations and availability of alternative opportunities, are explicity taken into account by variables in the model.

(ii) Application of an existing UEM to a proposed site involves the following steps: (A) Identify the areas of origin for the proposed project (use of counties or parts of counties as origin areas facilitates gathering of data in subsequent steps); (B) compute measures of the explanatory variables in the use equation for each origin area and for each year an estimate is required; (C) calculate use from each area and for each year; and (D) aggregate use from each area to get estimated annual use.

(2) *Similar project use estimation.* (i) The similar project procedure is based on the concept that recreation demand for a proposed project can be estimated by observing the visitation patterns at one or more existing projects with similar resource, operation, and anticipated recreation-use characteristics. The procedure involves the graphic or statistical matching of the recreation site alternatives under study with existing water resource projects and recreation resource areas for which use statistics and other information are known. The objective of the similar project procedure is to obtain as close a match as possible in type, size, and quality of project; market area demographic and socioeconomic characteristics; the existence and location of competing recreation opportunities; and other demand influencing variables.

(ii) The most efficient and technically sound similar project procedure is based on per capita use curves (i.e., regression curve relating per capita rate of use to travel distance) from which use estimates are derived. Per capita use curves have been estimated for 52 existing reservoirs.[1] An overview of the methodology adapted from Brown, et al., is provided below.

(iii) Briefly stated, use of the similar project prediction method involves the following steps:

(A) Evaluate the characteristics of a proposed project or area under study.

(B) Select a similar project or area by comparing characteristics of the proposed project with available information for existing sites; include evaluation and comparison of the respective recreation market areas.

(C) Adjust the per capita use curve to account for the differences between the similar project and the proposed project.

(D) Determine the county populations within the market area for the year in question and derive per capita use rates for each county population by measuring road-mile distance from the project to the center of the most populated city within the county (proxy for centroid of county population).

(E) Multiply the contribution from each county per capita rate by county population, and sum to get total use.

(F) Determine the percentage of total use that the foregoing estimate represents. If 100 percent, use as is; if less, adjust accordingly.

(iv) A critical shortcoming of this similar project method is the subjectivity inherent in the manual adjustment of the per capita use curve required to account for demand factors other than travel distance. The reliability of the method can be enhanced through experience, but it cannot be expected to approach the reliability of the more sophisticated statistical models.

(b) *Deriving demand in the travel cost method.* (1) The travel cost method is based on the correspondence between increasing the distance from areas of origin to the site and increasing the cost or price of recreation at the site. The second step of the procedure consists of calculating total use at different incremental distances (prices); it is based directly on use estimator models or per capita use curves. The result is a demand curve for the site being evaluated that relates "prices" to total visits. Distances are converted to dollar values using per mile conversion factors reflecting both time and out-of-pocket travel costs. The area under the demand curve plus any user charges or entrance fees measure the recreation benefits attributable to the site. The procedure is described in detail below.

(2) The estimate of recreation use for a project derived from application of a per capita use curve or UEM model yields an initial point on a resource's demand curve. This point is the quantity of use that would be demanded at a zero price. For example, assume that the appropriate per capita use rates have been estimated as follows:

Origin	Population	Distance	Visits per capita	Estimated visitation
A	10,000	10	3	30,000
B	1,000	20	2	2,000

[1] Brown, R. et al., *Plan Formation and Evaluation Studies: Recreation, Vol. II, U.S. Army Engineer Institute for Water Research, 1974.*

Origin	Population	Distance	Visits per capita	Estimated visitation
C	3,000	30	1	3,000
Total				35,000

(3) This estimate of 35,000 yields an initial point on the resource's demand curve. To find sufficient points to determine the entire demand curve, it is necessary to make small incremental increases in the price of participation and to measure the quantity of use that would be demanded given these chances. This is equivalent to moving the project farther and farther from the potential users, requiring them to pay more and more in travel costs. As the simulated distance increases, use decreases, and for each increment in distance a new use estimate is computed using either the use estimating model or the per capita use curve. The new use estimates are the various quantities of recreation that would be demanded at increasing prices.

(4) For example, assume that an increment of 10 miles in travel distance is used to simulate an increase in cost for the proposed project described above. The use estimate of use would then be:

Origin	Population	Simulated distance (Actual10)	Visits per capita	Estimated visitation
A	10,000	20	2	20,000
B	1,000	30	1	1,000
C	3,000	40	0	0
Total				21,000

(5) This would be a second point on the resource's demand curve; the quantity demanded (21,000 visits) at a price equivalent to the travel cost associated with an increment in distance of 10 miles. (A discussion of the proxy for price used to assign a dollar value to this increment is in paragraph (6)(i) of this appendix.)

(6) Remaining points on the resource demand curve are then estimated by making continued increments in the price (simulated increases in distance) until the anticipated visitation from all areas of origin is zero. In the example above using 10-mile increments, the visitation expected with simulated increases in distance would be:

Estimated Visitation

[Simulated increase in mileage]

Origin	0	10 miles	20 miles	30 miles
A	30,000	20,000	10,000	0
B	2,000	1,000	0	0
C	3,000	0	0	0
Total	35,000	21,000	10,000	0

(i) *Proxy for price.* (A) To determine the price at which the various quantities of use are demanded, the incremental increases in distance are simply converted into the costs that would be incurred by the recreation users if they were required to travel the additional mileage. The variable or out-of-pocket travel costs are used as the proxy for price, since these are the costs that potential users would be most aware of when making a decision about whether to visit a particular resource area.

(B) The conversion of mileage to price should use the most current published results of studies conducted periodically by the U.S Department of Transportation concerning the average cost of operating an automobile. As an example, average variable cost estimates for 1976 are summarized below (U.S. Department of Transportation, 1977).

Average Variable Costs, in Cents Per Mile, to Operate an Automobile

Variable cost category	Automobile type			
	Standard	Compact	Subcompact	Average
Maintence, accessories, parts, and tires	4.2	3.4	3.1	3.6
Gasoline and oil	3.3	2.5	1.8	2.5
Taxes on gasoline, oil, and tires	0.9	0.6	0.5	0.7
Total	8.4	6.5	5.4	6.8

(C) The variable cost reflects the average out-of-pocket cost per mile to operate various types of automobiles. It does not include such fixed costs as depreciation, insurance, and registration, since those costs would generally not affect the potential user's decision to travel the additional mileage for recreation purposes.

(D) Two adjustments are required, however, before this cost can be used as the proxy for price. The first is an adjustment for round-trip mileage. The distance measure used in the per capita use curve or regional estimator is one-way mileage, while the recreation user must incur the variable

costs while traveling to and from the project, so the cost per mile is doubled. Since more than one user may arrive in each vehicle, a second adjustment must be made to distribute the travel costs of the trip between the number of users traveling in each vehicle. This is readily accomplished by using the average number of users per vehicle determined from the survey of the existing sites used to develop the per capita use curve or regional estimator.

(E) The variable travel costs are the proxy for price associated with the simulated increase in distance used to derive the resource demand curve. Using the average variable cost for all three types of automobiles (6.8 cents per mile) and using a hypothetical average of 2.7 persons per vehicle, the proxy for price for a simulated increase in distance of 10 miles in the above example would be equal to $0.50 (6.8 cents per mile times 2 for round-trip mileage, divided by 2.7 persons per vehicle, times 10-mile increment).

(ii) *An adjustment for the opportunity cost of time.* (A) The use of variable travel costs alone in the development of the demand schedules ignores the effects of time on recreation decisions. If time is ignored, the demand schedules are constructed under the hypothesis that increasing distance decreases use only because of higher money cost. However, the additional time required to travel the increased distance would seem to be a deterrent equal to or greater than the out-of-pocket money costs. The exclusion of the time factor introduces a bias into the derived demand schedule, shifting it to the left of the true demand schedule and resulting in an underestimation of the recreation benefits.

(B) The opportunity cost of time is the value of work or leisure activities foregone to travel to and recreate at the site. The opportunity cost for a person whose work time is variable is measured as income foregone during the recreation visit and associated travel. Most people, however, are constrained by a fixed work week and receive paid vacation days. Recreation occurring during periods where no working time is lost incurs only leisure time costs. This value may range between 0 (if the recreationist would not have engaged in any other leisure activity in the absence of the observed recreation) and the wage rate (if the alternative leisure activity was valuable enough to forego earnings, given that opportunity).

(C) Where direct survey data on time costs are not available, published statistics or studies of work-leisure choices and wage rates may be used to justify particular assumed values. One procedure that may be used to accommodate the disutility of time is to assume a known tradeoff between time and money; however, but no universally accepted formulation of this tradeoff has been established and empirically tested. In one proposed formulation, time is valued as one-third the average wage rate in the county of origin for adults and one-fourth of the adult value (one-twelfth of the wage rate) for children. Any method used to value time should be supported by documenting evidence. Both travel and onsite time costs should be included in the derivation of total willingness to pay for access to the site.

(iii) *Benefit computation.* (A) The final computational step in the travel cost approach is to measure the area under the demand curve. This area is equal to the amount users would be willing to pay but do not have to pay for the opportunity to participate in recreation at the resource being evaluated. Any user charges or entrance fees should be added to this value to determine the gross value of the resource associated with the specified management option.

(B) The travel cost approach can be used for evaluating either the with-project or without-project conditions as long as a use estimating model or a per capita use curve is available for estimating use under the specified condition. To evaluate the without-project condition, estimate the value of the recreation that would be lost at a site if a water resource development project were developed. To evaluate a with-project alternative, estimate the value of the new recreation opportunities that would be created. If a use estimator is not available for evaluating either the without-project conditions or one of the with-project conditions, the techniques described in other portions of this manual should be used.

(C) The procedure described above is applicable to any type of activity or groups of activities for which use can be described by a use estimating equation or per capita use curve. The separation of day use from overnight use or sightseeing from other day use activities, for example, is dependent upon the specificity of the survey data and the model formulation.

(c) *Data requirements.* (1) The development of use estimator models as described above requires that data from existing areas be systematically collected. The major requirement is that the data on use and users of a range of facility types and locations span the proposed types and locations for which estimates are to be made. A series of surveys at existing sites can provide such basic data, which would normally include total use, timing and patterns of use, characteristics or users, and users' areas of origin.

(2) Methods of data collection that have proved fairly satisfactory involve a short handout questionnaire or interviews of a small sample of randomly

selected users of the different recreation areas. It is important that reliable total visit statistics be obtained for each existing area being investigated. This can usually be done satisfactorily with judicious use of traffic counters at most water-based recreation areas. If totals are collected throughout the season, samples for questionnaires or interviews need be drawn only on a few days—on both weekends and weekdays, as patterns are likely to vary greatly between them.

(3) The number of questions asked may also be limited. The major concerns are the origin and purpose of the trip and limited information about the users. A representative range of areas, facilities, and locational proximities should be covered in such surveys. Fully adequate methods that are relatively inexpensive, entail a minimum of difficulty at the site and to the user, and yield meaningful results are available.

Appendix 2 to Section VIII—Contingent Valuation (Survey) Methods

(a) *Overview.* (1) Contingent valuation methods (CVMs) obtain estimates of changes in NED benefits by directly asking individuals about their willingness to pay (WTP) for changes in quantity of recreation at a particular site. Individual values may be aggregated by summing the WTPs for all users in the area.

(2) Contingent valuation methods consist of designing and using simulated markets to identify the value of recreation just as actual markets would, if they existed. Three basic steps are involved: (i) The analyst establishes a market to the respondent; (ii) he permits the respondent to "use" the market to make "trades" and to establish prices or values that reflect the respondent's individual valuation of the recreation opportunities "bought" or "sold"; and (iii) the analyst treats the values reported by the respondent as individual values for the recreation, contingent upon the existence of the described market. The respondent's bids are used with the data contained in the market description (step i) to estimate the aggregate value of the recreation being studied.

(3) Contingent valuation methods are particularly appropriate for evaluating projects likely to be one of several destinations on a single trip and projects that will result in a relatively small change in the quality of recreation at a site. Contingent value results may be adversely affected unless questions are carefully designed and pretested to avoid several possible kinds of response bias. Several techniques are available for obtaining the individual bids, which are the basic data for CVM.

(b) *Iterative bidding formats.* (1) Iterative bidding surveys ask the respondent to react to a series of values posed by the enumerator. Following establishment of the market and a complete description of the recreational good, service, or amenity to be valued, the respondent is asked to answer "yes" or "no" to whether he is willing to pay the stated amount of money to obtain the stated increment in recreation. The enumerator iteratively varies the value posed until he identifies the highest amount the respondent is willing to pay. This amount is the respondent's "bid" for the specified increment in recreation.

(2) Iterative bidding techniques are most effective in personal interviews. Mail survey formats have also been used in research studies. These typically ask the respondent to answer "yes" or "no" to a small number of specified values in iterative questions and, finally, ask an open-ended question: "Now, write down the maximum amount you will be willing to pay. $————." At present, mail survey applications of the iterative bidding technique have not been adequately tested and cannot be recommended.

(3) The recreation facilities to be evaluated will be described in quantity, quality, time, and location dimensions. These descriptions should be hypothetical in the sense that they do not precisely describe features of actual sites or proposed projects, but they should be precise enough to give the respondent adequate information on which to base a valuation. To permit estimation of regional models, quantity, quality, and location dimensions should be varied and the iterative bidding exercise repeated. Verbal descriptions should be precise, and, when practicable, pertinent aspects of the facilities should be displayed or depicted nonverbally (e.g., with photographs, drawings, motion pictures, scale models).

(4) In most cases, the good to be valued is "the right to use (the recreation facility) for one year." The responses obtained are thus *annual* measures of the individual's willingness to pay for a given increment or decrement in recreation opportunities. Bidding formats that define the good in some other terms (e.g., day of use, trip) can also be used in some applications as long as appropriate estimates of numbers of days of use and trips are available to permit calculation of annual values.

(5) The institutional rules pertaining to the hypothetical market will be described in sufficient detail so that the respondent knows his rights and the rights of all others in the market. These rules should be realistic and credible, they should place the respondent in a role and encourage market behavior with which he is familiar, and they should be of a kind generally viewed as just, fair, and ethically