Human Use and Economic Evaluation (HUEE)

104 ESM

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U.S. Fish and Wildlife Service
Department of the Interior
Washington, D.C.

Preface

Human Use and Economic Evaluation (HUEE) procedures provide means for determining both the extent of human uses of wildlife and the dollar values of these uses. These procedures were developed and are intended for use in conjunction with the Habitat Evaluation Procedures (HEP) (102 ESM). The HEP and HUEE together with the Habitat Suitability Index Models for Use with the Habitat Evaluation Procedures (103 ESM), provide a complete set of procedures for field staff making assessments that involve wildlife resources.

The HUEE procedures are designed for use by field staff, principally biologists, assigned to evaluate the impacts of water and non-water resource development projects. Procedures and criteria (Appendix A) issued as regulations by Water Resources Council (WRC) are briefly described to provide a general orientation on these methods. Specialists, such as economists or recreation planners, should apply the WRC methods in studies involving water resources.

The HUEE procedures designed for use in evaluating non-water resource development projects may be applied in field studies without the aid of economists or recreation planners. However, when conducting a monetary evaluation of a water resource development project, the assistance of a specialist, such as an economist or recreation planner is needed. This assistance may be obtained from the lead planning agency, other Federal or State agencies, specialists within the Fish and Wildlife Service, universities, or private consultants. Forms and instructions are provided for this purpose (Appendix B).

Regional models developed or promulgated by WRC will be incorporated or referenced in HUEE as they become available. The use of such models should significantly reduce the time required to perform an economic evaluation. The assistance of specialists may not be needed if these models are incorporated in computer software programmed for use by field staff.

The HUEE procedures incorporate a concern for wildlife in that special attention is given to the levels of use which wildlife can tolerate, regardless of the method or methods applied.

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1. Introduction

Changes in habitat may increase or reduce wildlife populations available for human consumptive or non-consumptive uses. HEP (102 ESM) is designed to display impacts on biotic resources and HUEE describes impacts on those resources which can be used to convert impacts on habitat and wildlife species into effects on projected human uses of these populations.

Data produced in a HUEE analysis are used primarily to compare the effects of proposed actions on human uses of wildlife. These data also may be utilized in benefit/cost (B/C) analyses developed by a lead planning agency.

2. Relationship of Biological Productivity to Human Uses

Use and economic evaluations start with consideration of a unit of use, such as a day of deer hunting. This unit of use is subject to two conditions: 1) a human desire (or demand) for this type of hunting; and 2) the availability or prospect of availability (supply) of deer for harvest. Demand, therefore, originates with a human desire to use wildlife in some fashion. Supply, on the other hand, depends on the harvestable or useable population of deer. The biological productivity of the species constrains the number of animals available for both consumptive and non-consumptive use. The population eventually will decline if the combination of consumptive (in this example, hunting) and non-consumptive uses (such as hikers observing deer) exceeds the capacities of the herd to sustain such uses. The capacity of the deer herd, to sustain the various human uses, constrains or limits the human uses.

Biological productivity (supply source) can be determined in various ways, including population data or prediction models. The most desirable method is to use sustainable yield numbers based on animal population data. In this case, the availability of harvestable animals can be determined directly from population data and the projected use calculated from information, such as the number of hunters per unit of animals or the number of fisherman days per unit of fish. Population data may be available for baseline conditions, but predictions of anticipated population levels are usually difficult to make. However, the same method for determining biological populations and harvest should be used for both baseline and future conditions because significant errors are otherwise likely to result, due to differing assumptions in population-predicting models.

Relatively few models are available for predicting animal numbers. An example is the National Reservoir Research Program which has developed predictive models for fish populations in warmwater reservoirs (Jenkins 1976) and these models can be used to estimate baseline and future population levels. State and Federal agencies may provide local predictive models for selected wildlife species.

Predictive models will not be available, in most instances, for all species of interest. It may be possible, however, to predict wildlife populations and harvest by use of Habitat Unit (HU) data derived from predictive habitat suitability index (HSI) models that are described in HEP (102 ESM). HU data must be converted to predicted supply before these data can be used in the economic analysis.

3. Procedures for Evaluating Uses of Wildlife at Water Resource Development Projects

Detailed procedures and criteria for selecting the method(s) that must be used to evaluate a water resource development project are specified in regulations issued by the Water Resources Council (WRC), and users should consult the WRC Regulations published in the Federal Register (Water Resources Council 1979). The following items also should be considered when proposing or developing a HUEE involving a water resource development project.

3.1 Approach. Specialized assistance, such as that of an economist, is generally needed to perform a HUEE for a water resource development project. This specialist (staff, contractor, or consultant) should be assigned to: 1) recommend a specific method(s) or range of alternatives from the methods specified by WRC, listing the pros and cons of each method; 2) justify that the recommended method(s) will meet WRC acceptability and selection criteria (Appendix A); 3) explain how the recommended method(s) will determine the supply of wildlife available for human use; and 4) prepare a plan to accomplish the study, including a list of staff specialities required, staff responsibilities, data needs, and methods to be used to collect and analyze the data. An estimate of costs and time required may be necessary for each of the proposed method(s).

3.2 Regional Models. WRC regulations encourage the use of regional economic models to economize on resources required for site-specific studies. A regional estimating model relates the recreational use of wildlife to the relevant determinants, such as income, by the application of regression analysis or other techniques to existing recreation sites in the study area. WRC periodically publishes a list of available models that may be used to evaluate proposed projects. The list indicates the types of project, kinds of recreation activity, and regions of the country for which each of the models is appropriate. Use-estimating models must be utilized if they are available for the region in which a proposed project is to be located. Where regional economic models do not exist, use can be estimated by one of the site-specific methods prescribed by WRC.

3.3 Water Resources Council Methods. Three methods for evaluating recreational uses in water resource projects are described in WRC's regulations: 1) the Travel Cost Method (TCM); 2) the Contingent Valuation Method (CVM), and 3) the Unit Day Value (UDV) Method. The use of any other method must be justified and conform to WRC's criteria for acceptability and selection (Appendix A). Detailed information about selecting and using alternative methods is provided in WRC's regulations.

A. Travel Cost Method (TCM). The TCM is based on observations of the travel behavior of users and the costs of travel. These two factors are combined to determine user willingness to pay for various recreational activities. The assumption is made that, when other considerations remain equal, per capita use of a recreation site decreases as time and

out-of-pocket costs of travel to the site increase. A demand curve is derived, using the variable costs of travel and the value of time as proxies for price, that reflects the willingness of users to pay for additional increments of recreational activity. This method may be used to develop a site-specific study or a regional economic model. However, the TCM may not be used if: 1) use is not estimated by a technique relating trip-generation to distance to the site; 2) there is insufficient variation in travel distances to allow parameter estimation (e.g., urban sites); or 3) the project site is typically only one of several destinations visited on a single trip.

B. Contingent Valuation Method (CVM). The CVM is used to estimate changes in the dollar value of recreation and is based on responses of users to various questions concerning resource use. Individual households are queried about their willingness to pay for changes in the quality and quantity of recreation opportunities at a proposed site. Individual values may be aggregated for all users in the study area. This method may be applied to a site-specific study or a regional model. Survey studies are expensive and regional CVM models should be developed, if possible, to make site-specific studies less costly. All survey forms used by Federal agencies are subject to the clearance procedures of the Office of Management and Budget.

C. Unit Day Value Method (UDV). The UDV relies on expert or informed opinion and judgment to estimate the average willingness of recreation users to pay for their activity. An approximation of the dollar value of recreation activities is obtained by applying, to estimated use, a carefully thought-out and adjusted unit day value. The UDV has the simplest conceptual basis of the three methods but from it one develops the least reliable values.

WRC's procedures differ significantly from the earlier unit value approaches and the Modified Unit Day Value Method (MUDVM) presented later in this manual for use on non-water resource development projects. The MUDVM does not meet WRC's criteria for use on water resource projects.

3.4 Biological productivity limits. The HUEE methods described above are utilized to determine baseline and future recreational uses of wildlife resources. Predicted uses cannot be sustained if they exceed the capabilities of the habitat and species to support that level of use. Environmental factors that can constrain use, e.g., habitat productivity, availability, and stability, and species tolerance to human activities, should be considered.

WRC's methods that are applicable to water resources do not specify techniques for determining sustainable use based on biological productivity of the wildlife species. Biological limits can, however, be calculated for use

with these methods from data generated in a HEP analysis. Potential use data, combined with biological limits, assures the development of valuations that reflect sustainable use in an area. The availability of wildlife for human uses on a sustained basis should be evaluated regardless of the method selected under the WRC criteria.

The method(s) proposed to determine the animal populations in the project area, and to predict the population changes that are induced by proposed actions, should be explained in detail. If the method(s) established under the WRC criteria does not address in detail the potential impacts on wildlife populations, the MUDVM may be used to determine total wildlife numbers, harvestable or usable populations, and wildlife population changes induced by each alternative. The latter use would be a limited application of MUDVM to determine wildlife population changes related to proposed actions that would affect human use. The MUDVM can be used, if needed, to supplement the use of the method(s) required by WRC.

4. Procedure for Evaluating Use at Non-water Resource Development Projects

The following methods may be selected for use on projects not covered by the Principles and Standards and regulations issued by the WRC. The water resource development project procedures (TCM, CVM, UDV) should be applied wherever possible in non-water resource development project studies instead of MUDVM because WRC procedures result in higher statistical precision. However, when constraints such as limited time, staff, or funds preclude the use of the WRC methods, the procedures described below may be used to compute use and dollar values. The forms and instructions are provided in Appendix B.

4.1 Modified Unit Day Value Method evaluation procedure. The MUDVM is designed to measure changes in uses of wildlife including recreational, commercial, scientific, and educational activities. Both consumptive and non-consumptive uses are included (Figure 4-1).

The recreational use benefits attributable to each proposed action are measured in terms of willingness to pay for each increment of output provided. The willingness to pay for recreation includes entry and use fees actually paid for site use plus the dollar value accruing to the recreationist. The MUDVM relies on expert or informed judgment to estimate the average willingness to pay for recreation. By carefully selecting a unit day value, project recreation values can be approximated. Project benefits can then be estimated by determining the number of projected use-days for a particular recreation activity and multiplying these data by the unit dollar value established for that activity (Appendix C).

The use of wildlife as "indicators" refers to the economic value of species used to measure change in environmental conditions (Wildlife Management Institute undated). Concepts pertaining to the determination of this economic value and the value of other uses (e.g., commercial) are discussed in Section 4.3.

There are two distinct "paths" or sequences in the MUDVM evaluation process (Figure 4-2). The left hand series of blocks in the diagram lead to the estimation of supply, or the uses that the animal population can sustain. The adjacent series of blocks, beginning with Existing Human Use, reflects the potential needs of humans for the various uses of the wildlife species.

HU's and animal population data are used as inputs in the MUDVM approach (similar data may be used by a WRC method). All potential human uses are summarized and compared with the potential use that is sustainable by the species. Each proposed action is compared to the future-without-project conditions.

The relationship between potential uses and biologically based limits is shown in Figure 4-3. This example represents one configuration of use and productivity curves; the actual shape of these curves will vary by species from project to project. The shaded area on Figure 4-3 represents the

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Figure 4-1. Categories and examples of uses of wildlife species.

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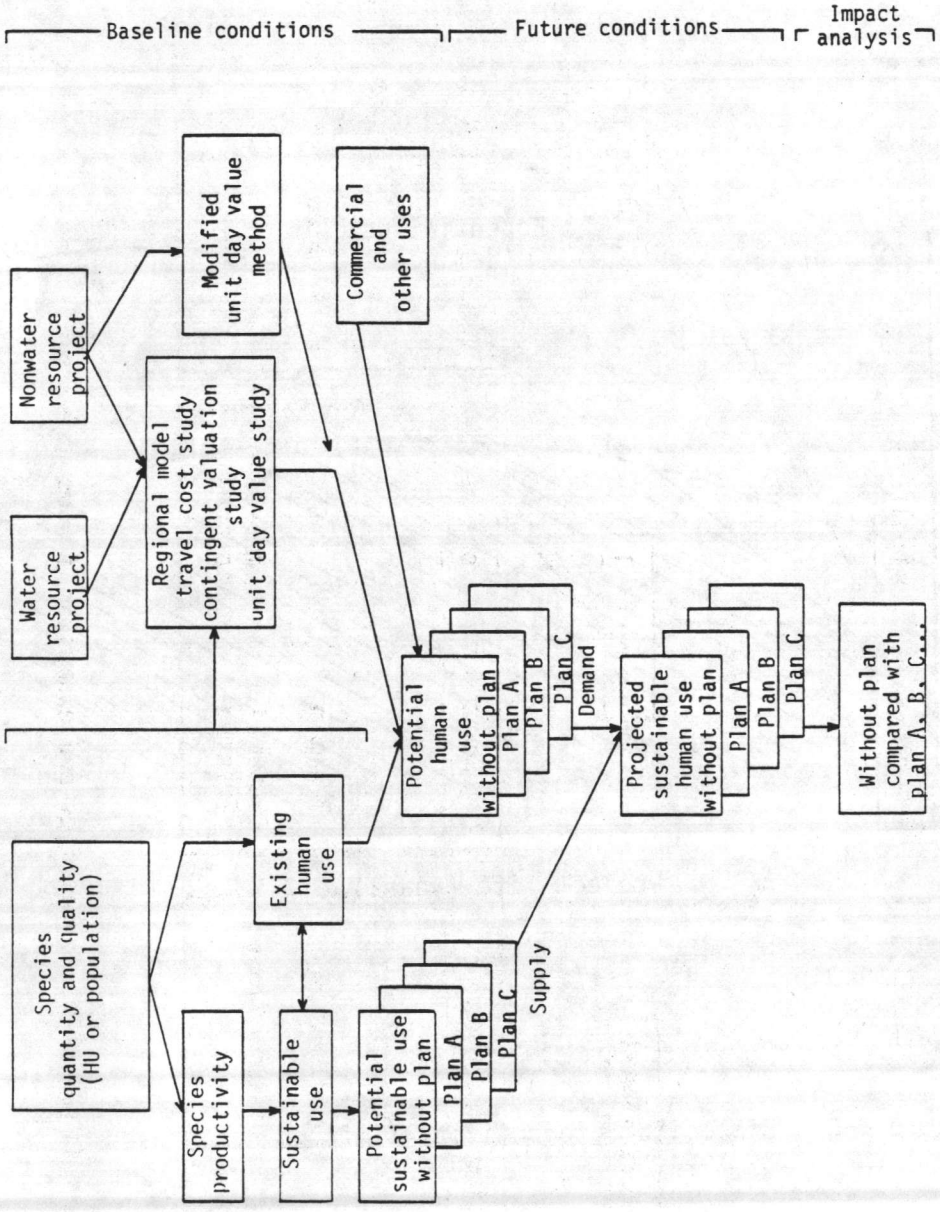

Figure 4-2. The modified unit day value method evaluation procedure.

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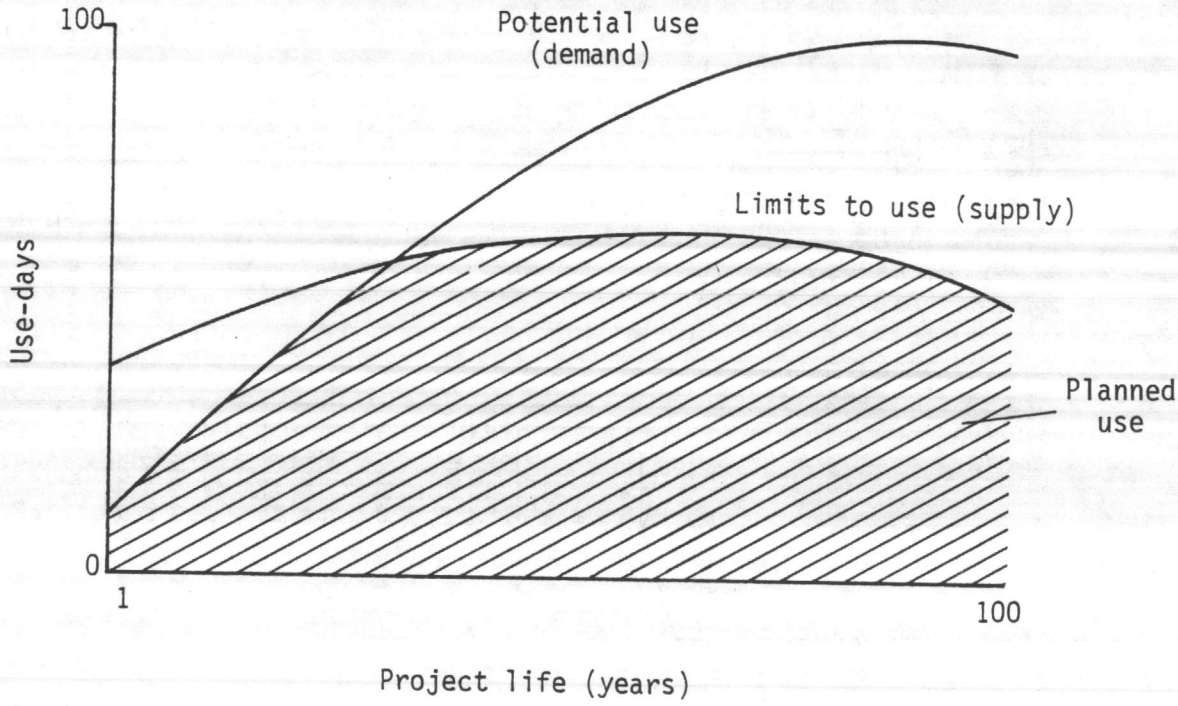

Figure 4-3. Biological productivity limiting human uses of wildlife.

amount of use that is sustainable during the life of the project. The important consideration is that after use and productivity are plotted, the data on use that will be projected or planned for the alternative and utilized in the valuation are represented by that area in Figure 4-3 defined by the lower limits of both use and productivity curves. Project related changes in unused resources (supply surplus), or in the demand above that is supported by the resource on a sustained basis, do not enter directly into the HUEE analysis.

A. Sustainable Use--Supply. The HU's derived from HEP can be used in conjunction with these procedures as one method for setting limits based on biological productivity (a population productivity model is another method). The first step in determining this biological limitation using HEP data is to convert the data obtained in a HEP analysis into use-days. The two types of information needed for this conversion are: 1) the number of HU's required per animal for the species; and 2) the relationship between the species population and sustainable use. Additional population data required to develop this information should be sought from any appropriate source, but particularly the State wildlife agency.

In the HEP analysis the Habitat Suitability Index (HSI) is multiplied by the area of available habitat to obtain HU's. The number of animals per HU is multiplied by the total number of HU's to obtain the estimated population size. The relationship between these values is illustrated for white-tailed deer in Table 4-1.

Table 4-1. The use of HEP data to estimate the number of white-tailed deer an area can sustain.

Cover Type	Target Year	Available Area (Hectares)	HSI Value	Total HU's	Deer/ HU	Total Population
Bottomland hardwoods	Baseline	1,000	0.75	750	.12	88
	1	500	0.75	375	.12	44
	20	500	0.15	75	.12	9
	100	500	0.15	75	.12	9

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The link between the total species population and the amount of consumptive use that can be supported is the sustainable harvest rate and the use-days per animal. The harvestable population multiplied by the number of use-days of effort per animal yields the total sustainable number of use-days. This relationship is shown in Table 4-2.

Table 4-2. The relationship of white-tailed deer harvestable populations to sustainable use.

Target Year	Total Deer Population	Harvestable Populations	Use-days Per Deer	Sustainable Use-days of Deer Hunting
Baseline	88	29	7.3	212
1	44	15	7.3	110
20	9	3	7.3	22
100	9	3	7.3	22

The population data is converted to sustainable use level for baseline conditions and for each target year for proposed actions and without-project conditions. Values for intervening years are extrapolated from the target year data. These data can be graphed to form a sustainable-use curve (Fig. 4-4). The area under the curve provides a measure of the total use that can be provided during the life of the project. The number of sustainable use-days that are generated by a given number of HU's should be determined by consulting with species specialists and by using data available from State wildlife agencies, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and other agencies.

The sustainable use curve (supply) limits the amount of use (demand) that an area can sustain for a given activity. The sustainable limits (use curve) should be used to constrain the projected uses if a model or method is utilized that does not consider biological limits (Fig. 4-5). The projected or planned use that should be considered in the analyses is shown by the shaded area.

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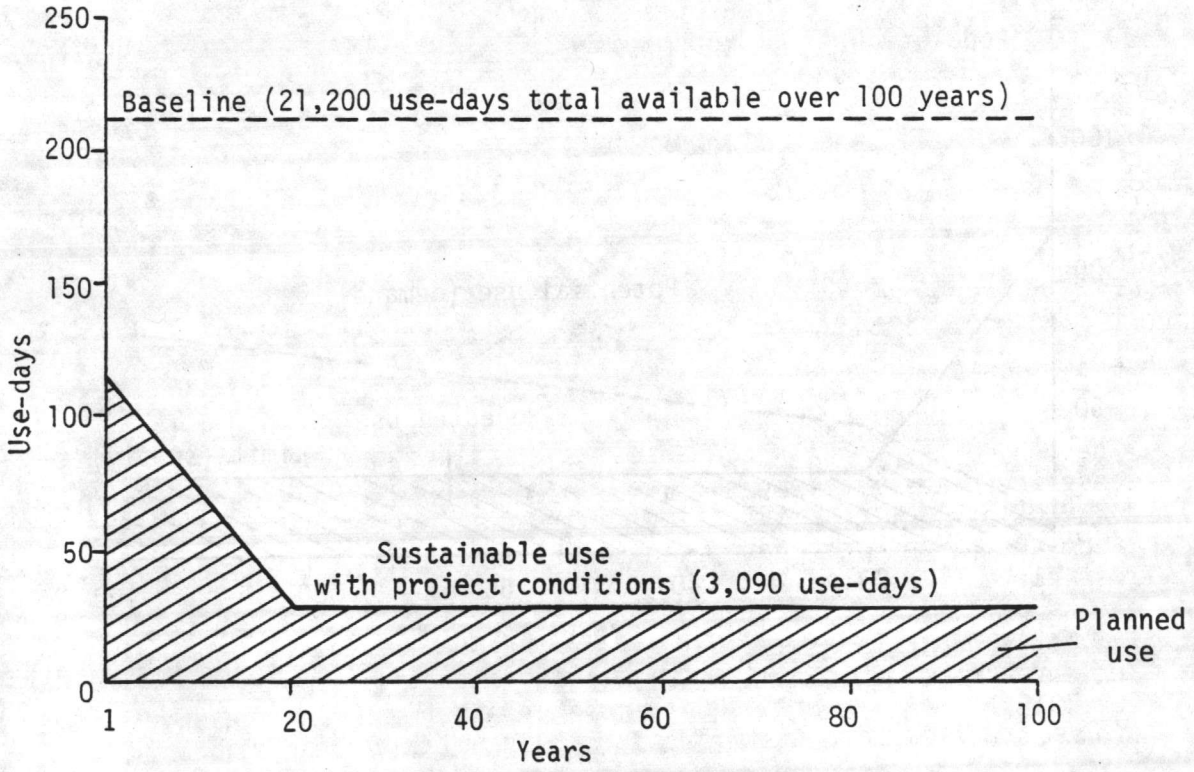

Figure 4-4. Number of use-days of deer hunting available (supply) during the project life. Without-project conditions are the same as baseline conditions in this example.

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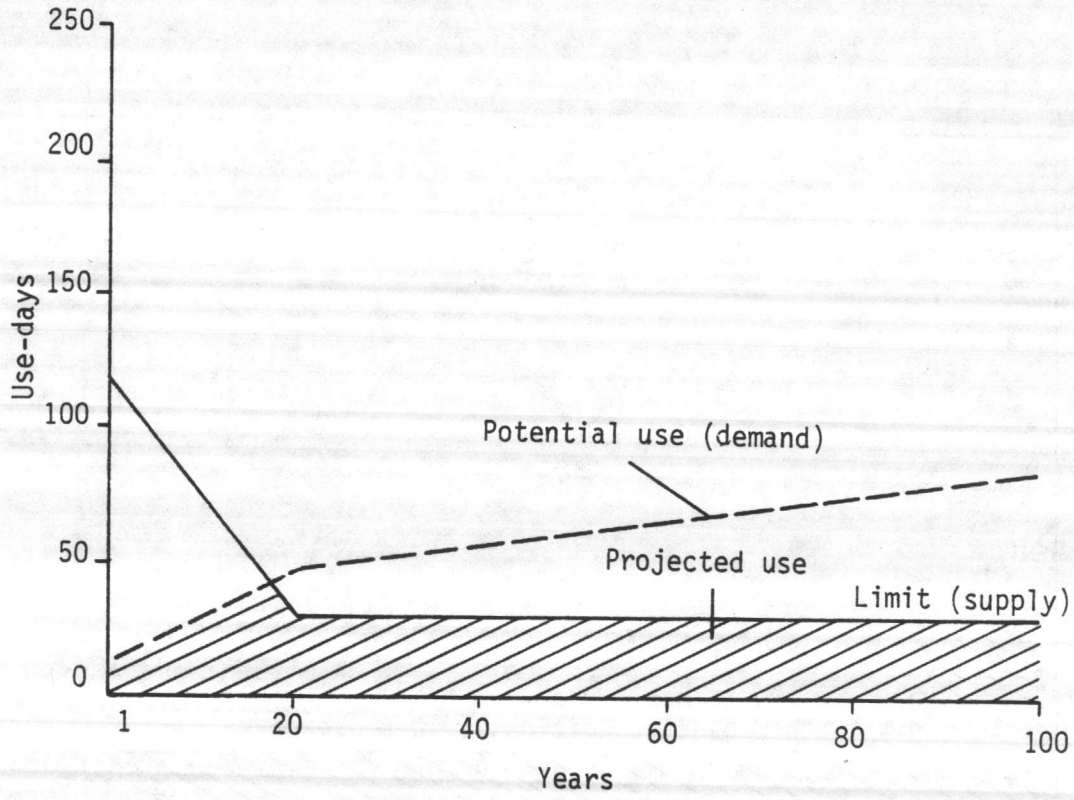

Figure 4-5. Determining projected use from potential deer use constrained by species productivity.

4. Procedure for Evaluating Use at Non-water Resource Development Projects

B. Potential Use--Demand. The potential use or demand curve for human use for each species must also be estimated for each target year. The same "Without Project" demand curve may be also used for all proposed actions since the desires for use of wildlife are unlikely to be significantly affected by most projects. A proposed action, however, may result in large population influxes or other demographic changes that would change the level of demand.

The potential use or demand curve estimates or projections of desired use days should be based on current and expected hunting trends in the project area, population trends and trends in other demographic variables (sex, age, income, etc.). Various approaches to projecting demand may be used including graphic techniques (drawing a line through historical data), or an electronic calculator.

C. Planned or Projected Use. The lessor of Sustainable Use and Potential Use in any given year is termed Planned Use. This Planned or Projected Use is carried forward for each proposed action in the remainder of the analysis.

4.2 Outputs. The use-days and dollar values estimated for the life of the project are utilized in MUDVM to produce four sets of output data:

1) Average Annual Use (AAU);
2) Average Annual Worth (AAW);
3) Present Worth (PW); and
4) Average Annual Equivalent Value (AAEV).

The terms "worth" and "value" have identical meaning in the context of these output data. Annual Worth is the dollar value of an activity that takes place during one year. Cost, benefit, and externality values, after the beginning of the project life, are assumed to occur at the end of each year, even though they may actually accrue throughout the year. Costs and benefits that occur during project construction are assumed to occur at the beginning of each year because facilities must be in service the entire year before benefits or investment costs can accrue for that year. The evaluation combines changes in use and values that occur during project construction with those that occur during the operational phase of the project.

A. Average Annual Use (AAU). The AAU is estimated by activity for each proposed action and for conditions without the project. Use-days are determined for selected target years during the life of the project and interpolated to develop use data for the remaining years (Table 4-3). Use data are summed for the life of the project to determine the total use-days. The AAU, throughout the life of the project, is determined by dividing the total use-days by the number of years. Average annual use-day calculations are not usually applicable to commercial uses of wildlife.

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B. Average Annual Worth (AAW). The AAU is multiplied by the unit value of one use-day for the activity to determine the AAW. For example, the AAW of 145 days of deer hunting, at $3.00 per use-day, equals $435.00 (Table 4-3). The $3.00 per use-day is selected from a range of values using weighted criteria and following the instructions for calculating unit dollar values for recreation (Appendix C).

The AAW also can be computed by summing annual worth data for the life of the project and dividing the sum by the number of years. Annual worth data are obtained by multiplying annual use by the unit value for one use-day for the activity.

The net annual profit for a commercial activity is considered the annual worth of the activity. Annual worth of commercial, recreational, or other activities are summed when corresponding uses, i.e., commercial and recreational fishing, occur for the same species. The combined annual worth is averaged over the life of the project to obtain the AAW. The combined annual worth data are used to calculate annual worth (see Commercial, Scientific, or Educational Uses Subsection).

C. Present Worth (PW). The PW is determined by discounting the annual worth for each year in the life of the project and then summing the discounted values. This calculation provides a value ($) for the activity that is directly comparable to values at the start of project operation. Annual worth is multiplied by a factor or factors from an Interest and Annuity Table (Appendix D) or discounted by use of a computer program to obtain PW data.

Table 4-4 illustrates the calculation of discounted annual values by using factors from an Interest and Annuity Table. Alternatively, annual values may be discounted by solving an equation such as:

$$PW = \sum_{t=1}^{n} AW_t \, (1+i)^{-t} \qquad (1)$$

where PW = Present Worth

n = number of years in the life of the project

t = year

AW = Annual Worth

$(1+i)^{-t}$ = discounting factor

i = discount rate

4. Procedure for Evaluating Use at Non-water Resource Development Projects

Table 4-3. Determination of Average Annual Use and Average Annual Worth from target year data and unit value.

	Year	Days of deer hunting	Annual worth $
Target year	1	100	300
Interpolated	2	105	315
Interpolated	3	110	330
Interpolated	4	115	345
Target year	5	120	360
Interpolated	6	140	420
Interpolated	7	160	480
Interpolated	8	180	540
Interpolated	9	200	600
Target year	10	220	660
Total	10 years	1,450 days x $ 3.00 =	4,350

Average Annual Use (AAU) = total days of hunting ÷ years = 1,450 ÷ 10 = 145 days of deer hunting per year during the life of the project.

Average Annual Worth (AAW) = AAU x Unit Value for one day of use = 145 days of use x $ 3.00 = $ 435.00.

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Table 4-4. Calculating Present Worth of deer hunting over 10 years by discounting annual worth data.

Year	Annual Worth $		Discount factor[a] $(1+i)^{-t}$		Discounted Annual Worth $
1	300	x	0.943396	=	283.02
2	315		0.889996		280.35
3	330		0.839619		277.07
4	345		0.792094		273.27
5	360		0.747258		269.01
6	420		0.704961		296.08
7	480		0.665057		319.23
8	540		0.627412		338.80
9	600		0.591898		355.14
10	660		0.558395		368.54
Total (Present Worth)					3,060.51

[a]Factors taken from 6% Interest and Annuity Table.

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The equation solved for the above example of deer hunting, assuming a 6% discount rate for the project, is:

$$i = 0.06,\ n = 10,\ AW_1 = 300,\ AW_2 = 315,\ AW_3 = 330,\ \text{etc.}$$

$$PW = \sum_{t=1}^{10} AW_t(1 + .06)^{-t} = \sum_{t=1}^{10} AW_t \times 1.06^{-t} = \$3,061$$

The discount rate used for the project will be the rate authorized by Congress (rate used for water resource projects is the authorized rate or the current rate set by WRC at the beginning of each fiscal year). The discounting process applies to costs or benefits incurred during the life of the project. Changes in the value of use that occur in the Prestart Period before project implementation are adjusted to PW by the addition of interest during the construction period (Appendix E - Prestart Analysis).

D. Average Annual Equivalent Value (AAEV). The AAEV is calculated by amortizing the PW over the life of the project; this spreads the project benefits evenly over time. The formula used to calculate the AAEV is:

$$AAEV = PW \frac{i(1+i)^n}{(1+i)^n - 1} \qquad (2)$$

where AAEV = Average Annual Equivalent Value

PW = Present Worth

i = discount rate

n = years

The AAEV for the deer hunting data in Table 4-4 is:

$$AAEV = \$\ 3,061 \frac{0.06\ (1.06)^{10}}{1.06^{10} - 1}$$

$$= 3,061\ (0.1359)$$

$$= \$416$$

The AAEV and the AAW are identical for any single year and will remain constant when the AAW, including commercial values, is projected as a

straight (horizontal) line for the life of the project. The AAW may be substituted for AAEV in a HUEE evaluation when the straight (horizontal) line projection exists. Values for the construction and operation phases of a project are summed when the PW or AAEV are used to evaluate monetary impacts for both time periods.

4.3 Commercial, scientific, or educational uses. The method for evaluating commercial uses presented in this section applies to non-water resource development projects where significant commercial or similar uses of wildlife occur or are expected to occur as a result of project implementation. Procedures provided by the WRC must be used for water resource development projects. The WRC procedures also may be used for non-water resource development projects if funding, time, and labor are adequate.

This method may be used to determine the dollar value of all commercial uses of wildlife, including consumptive uses such as fishing and trapping and non-consumptive uses such as photography or wildlife tours. Scientific or educational uses of wildlife also can be evaluated based on the net "profit", which is the difference between the amount that the users are willing to spend and the amount actually spent to use the wildlife.

The net value of the output (or harvest) to the user (that is, returns less associated costs of production or harvesting) for each alternative and for without-plan conditions is estimated in evaluating commercial uses. Costs considered in the analysis include both variable expenditures per unit of product (e.g., fuel costs) and fixed costs (e.g., equipment depreciation).

The present commercial use of wildlife should be based on actual use data or information on historical trends. This information can be used to project use throughout the life of the project, unless changes in patterns of use are expected. Commercial use data, including annual harvest rates, man-days of use, license sales, harvest and production costs, ex-vessel or other prices for goods, and resource productivity, may be available from appropriate Federal, State, and local agencies, universities, and private research organizations.

Adjustments may have to be made in commercial valuations when trapping animals for pelts is involved. Fur trapping often is pursued both for recreation and profit (the net return from the sale of pelts). Data on the recreational values associated with trapping may be found in study reports pertinent to the area, determined by a survey of area trappers, estimated using the MUDVM (Appendix B), or determined with the CVM. The recreational values of trapping are added to the net pelt values to obtain the total commercial value of trapping. The total trapping value is added to the total recreational value to provide the total dollar value of all uses of the species.

4. Procedure for Evaluating Use at Non-water Resource Development Projects

The economic value of using wildlife as environmental "indicators" may be estimated as the difference between the costs of using a species for this purpose and the cost of purchasing, installing, and operating machines to measure the changes in environmental conditions (e.g., fish used instead of machines to measure aquatic contaminants).

There may be harvestable populations of wildlife in a project area that are not currently being utilized. Project-related changes in this resource surplus may not have a measurable impact on commercial activities in the project area. When this occurs, there will be no net economic gain or loss associated with the project.

4.4 Externalities. The method for evaluating externalities presented herein applies only to non-water resource development projects.

Secondary effects of man's use of wildlife resources may occur due to project implementation. When applicable, these externalities should be added to recreational and commercial values. Externalities can occur as either technological or monetary effects and can accrue to individuals, groups, or industries.

Technological externalities may arise when a new or improved technology is developed or employed as a direct result of the project. Increased profits to an industry or individuals producing an animal by-product (e.g., hide, oil, or scent), by means of a process not possible without the project, is one example of a technological externality. Benefits of this kind can be expressed as a reduced average production cost per unit of output or as increased gross output multiplied by a profit ratio for the industry. Technological externalities are rare when wildlife resources are involved, and benefits, if present, are likely to be relatively small.

Monetary externalities are project-induced price or cost changes. These changes generally reflect distributional shifts rather than increased use efficiency or output and are not included in the evaluation.

4.5 Impact analysis in non-water resource development projects. Changes in man's recreational, commercial, scientific, and educational use of wildlife resources, and the associated dollar values, can be measured with a variety of methods. Data from these various methods are converted into common terms that can be used to predict and compare impacts that result from project implementation.

The AAU in use-days, AAW in nondiscounted dollars, and PW and AAEV in discounted dollars can be displayed for each alternative project plan. The monetary impacts of any alternative can be obtained by comparing future conditions with and without the proposed action. This comparison reflects the relative monetary impact of a particular proposed action on man's use of wildlife resources.

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The AAU data provides the basis for comparing project impacts on recreational uses of species or species groups. The AAW, PW, and AAEV reflect the effects of proposed actions on the dollar values of recreational and other uses of a species.

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Appendix A. Selection of Method for Evaluating Water Resource Development Projects

This appendix outlines the criteria used in selecting an acceptable method for evaluating recreational activities at a water resource development project. These criteria are presented in more detail in regulations issued by the Water Resources Council (1979).

Selection of an evaluation method(s) for a water resource development study requires consideration of: 1) the WRC criteria for an acceptable procedure; 2) the evaluation methods promulgated by WRC; 3) the advantages and acceptability of these methods; 4) the WRC selection criteria; 5) the extent and significance of the anticipated specialized and general recreation affected by the project; 6) the availability and applicability of regional models; 7) the determination of project-induced changes in the quantity and quality of wildlife to sustain human recreation and other uses and the incorporation of these data into HUEE; and 8) cost considerations.

The WRC regulations specify that an acceptable procedure must meet the following criteria:

1) The evaluation must be based on an empirical estimate of demand applied to the particular project;

2) Estimates of demand must reflect the socioeconomic characteristics of market area populations, qualitative characteristics of the recreation resources under study, and characteristics of alternative existing recreation opportunities;

3) The evaluation must account for the value of losses or gains to existing sites in the study area affected by the project (without project condition); and

4) Willingness to pay projections over time must be based on projected changes in underlying determinants of demand.

The WRC regulations contain the following requirements for the selection of an evaluation method(s):

A method shall be selected for evaluating each of the following two categories of project-related use: 1) total or gross expected use of project facilities, including transfers of use from other sites; and 2) existing site use displaced or destroyed by project facilities. The criteria for selecting the appropriate method are set out in Figure A-1. Application of the criteria may result in selection of different methods for the two categories of project-related use. The criteria in Figure A-1 reflect several dimensions of projects, including three measures of the absolute and relative size (e.g., costs exceeding $750,000) of the recreation benefit created, displaced, or transferred by the proposed

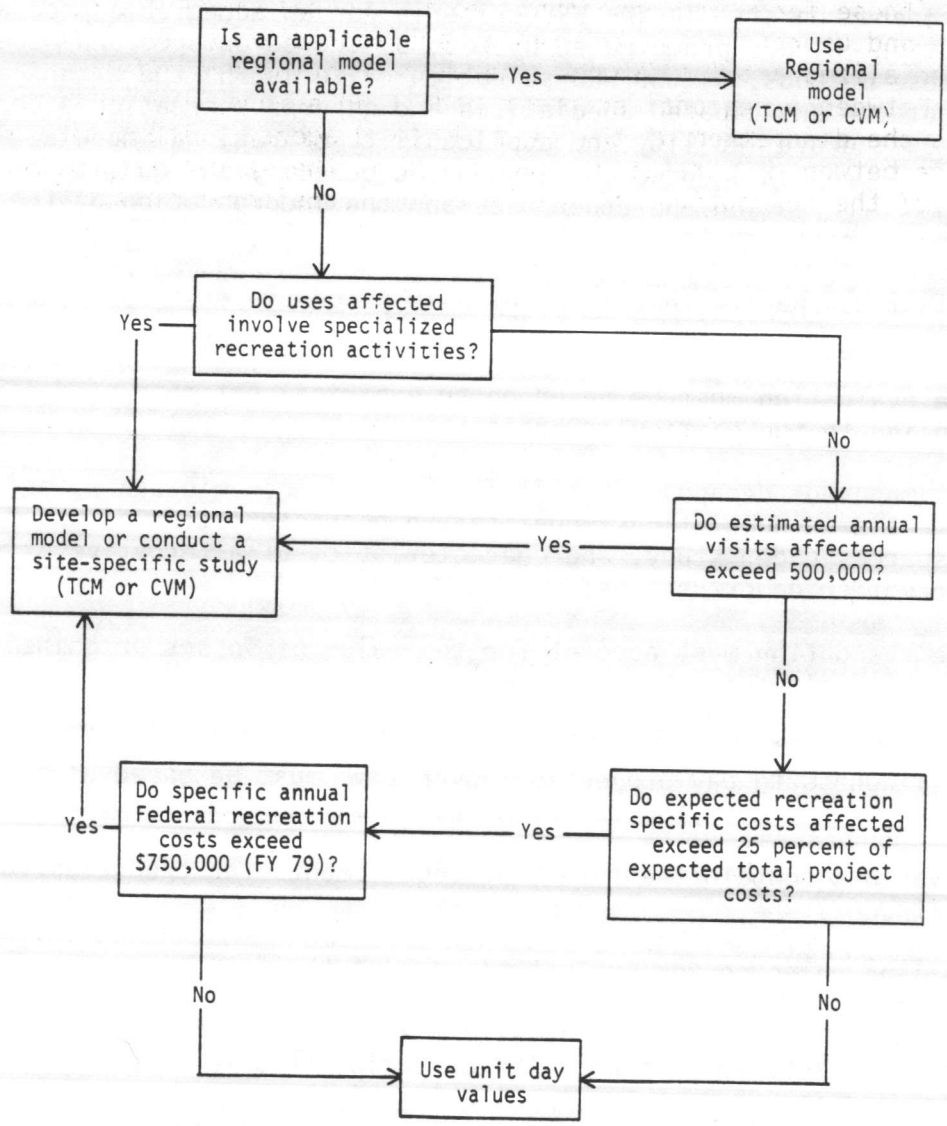


Figure A-1. WRC Criteria for selecting water resource project recreation evaluation methods.

project and the nature of the affected recreation activities. If the use category involves more than 500,000 annual visits, either a regional economic model or site-specific study shall be used to evaluate benefits.

Evaluation methods with greater accuracy are required if recreation is an important project component relative to other outputs and costs or if specialized activities (those for which opportunities in general are limited, intensity of use is low, and users' skill, knowledge, and appreciation are great) are affected. If both specialized activities and general recreation are affected by the project, the choice between a regional economic model and a more limited site-specific study is at the discretion of the lead planning agency. The choice will be based on a balance between the relative importance of the specialized activity, the advantages of the respective methods, and cost considerations.

Appendix B. Forms for Use in the Human Use and Economic Evaluation of Non-water Resource Development Projects

B.1 Introduction. This Appendix provides the forms and instructions for developing estimates of use-days and dollar values of recreational and other uses of wildlife associated with non-water resource project development. These procedures do not meet acceptability criteria for studies involving water resource development projects; therefore, procedures issued by the Water Resources Council must be used for water resource development studies. The WRC procedures were published as regulations in the Federal Register (Water Resources Council 1979).

A list of species must be developed for the Human Use and Economic Evaluation (HUEE). This list of species is used throughout the HUEE; each species on the list must be evaluated for each proposed action, and for without project conditions, even if no change in use occurs with a given proposed action. By evaluating the identical list of species for each proposal, the levels of use projected for each proposed plan can be compared with the levels of use for the same species evaluated under without-plan conditions.

If human use of a species is significantly changed by any alternative plan, that species should be entered on the list.

B.2 Form 3-1107. Estimate of use-day productivity by species.

A. Purpose. This form is used to develop estimates of use-days for each terrestrial or aquatic evaluation species. Both consumptive and non-consumptive uses are evaluated. The annual use that the species can sustain constrains or limits the demands (human needs) for the species.

B. Instructions. For each proposed action, Form 3-1107 must be completed for each evaluation species. Estimate the level of use that each terrestrial or aquatic species can sustain each year without reducing the available population in the future or reducing the quality of non-consumptive use. This estimate is the potential use level or supply available for hunting, fishing, trapping, and non-consumptive activities. The species and its harvestable population are dependent on habitat quantity and quality changes in population numbers will reflect habitat changes, including those changes induced by a project.

(1) Block 1. Enter name of study and date.

(2) Block 2. Enter name of the proposed action.

(3) Block 3. Enter name of evaluation species from common list (see Introduction).

(4) Columns 4-6. Enter uses, by cover type(s) if cover type(s) have been developed in the HEP analysis, and target years as shown in the following example for Canada geese:

Activity or Use 4	Cover Type 5	Target Year 6
Hunting	Corn field	1
		25
		50
		100
	Riparian hardwood	1
		25
		50
		100
Bird-watching	Riparian hardwood	1
		25
		50
		100

(5) Column 7. Enter estimates of HU's for the evaluation species. These numbers are produced by the Habitat Evaluation Procedures (102 ESM) (HEP Form B, Column 7 or HEP Form A-2, Column 9). Form A-2 is optional and is used only if data are needed by cover type. If animal population data are used instead of animals per HU, enter the number of acres or other geographic unit for the evaluation species.

(6) Column 8. Enter the number of animals per HU. This estimate is based on the productivity of the habitat for the evaluation species as measured by the habitat analysis. Data for species requiring more than one unit of area are entered as fractions. A deer, for example, that requires four HU's is entered as 0.25 or ¼. For aquatic species, standing crop is used rather than animals per HU. Standing crop data may be expressed in pounds per acres, or similar units.

If animal population data are used instead of animals per HU, enter the number of animals per acre or other geographic unit.

(7) Column 9. Calculate animal population by multiplying each entry in Column 7 by the corresponding entry in Column 8. For example, the fall population of terrestrial species prior to harvest or the standing crop of fish.

(8) Column 10. Enter the percent catchable size for aquatic species. Columns 10 and 11 also may be used for terrestrial species by entering in Column 10 the percent of the population represented by a given sex and age group when, for example, only bucks of a certain size are harvested.

(9) Column 11. Calculate aquatic catchable crop (or similar data for a terrestrial species) by multiplying each entry in Column 9 by the corresponding entry in Column 10. Where a species is used for both recreational and commercial purposes, estimate the proportion harvested by each method and enter prorated figures for recreational use in Columns 11-13. Enter prorated figures for commercial use on Form 3-1108.

(10) Column 12. Enter the estimated sustained harvest rate or use. This estimate is developed by members of the evaluation team utilizing hunting, fishing, trapping, or non-consumptive use records.

(11) Column 13. Calculate the annual harvest by multiplying each entry in Column 12 by the corresponding entry in Column 9 for terrestrial species or by the corresponding entry in Column 11 for aquatic species and those terrestrial species entered in Columns 10 and 11.

(12) Column 14. Enter use-days per kill or catch or non-consumptive use rate estimated from hunting, fishing, trapping, or non-consumptive use records. Data for species that require less than one day per catch or kill or other use are entered as fractions. For example, a catch of four trout per day would be entered as 0.25 or ¼ of a day per trout caught. Non-consumptive use rates should reflect the number of use-days the species can tolerate without significantly reducing the quality of the activity.

(13) Column 15. Enter the product obtained by multiplying the entry in Column 13 by the corresponding entry in Column 14. This provides an estimate of the annual use sustainable by the specified evaluation species.

Form 3-1107. Estimate of use-day productivity by species.

1. Study	Date	2. Proposed action

3. Evaluation species

Activity or use	Cover type (optional)	Target year	Annual habitat capability							Utilization	
			HU's	Productivity per HU	Animal population	Fish: Percent catchable size	Fish: Catchable crop	Sustained harvest rate or use	Annual animal harvest. Blocks Fish: 11 x 12 Terr: 9 x 12	Use-days per kill or catch or non-consumptive use rate	Use-days (annual)
4	5	6	7 x	8 =	9 x	10 =	11	12	13 x	14 =	15

B.3 Form 3-1108. Summary of potential productivity by species for recreational and other uses.

A. Purpose. This form is used to develop estimates of the potential productivity, in use-days, for each recreational use. It also provides an estimate of, and the total dollar value of, these use-days, plus the dollar value of commercial or other uses. The summation must include a value for each target year for each activity so that the sum for a given target year will include values for all activities.

B. Instructions. Prepare a separate Form 3-1108 for each species under each alternative.

(1) Block 1. Enter the name of the study and date.

(2) Block 2. Enter name of the proposed action.

(3) Block 3. Enter name of the evaluation species.

(4) Column 4. Enter activity or use listed in Column 4 of the corresponding Form 3-1107 for the evaluation species.

(5) Column 5. Enter target years from Column 6 of the corresponding Form 3-1107.

(6) Columns 6-10. If HEP Form A-2 is used to enter HU's on Form 3-1107, list the cover types from Column 5 of the corresponding Form 3-1107 at the top of Columns 6-10. Enter the use-days for each target year for each cover type from the appropriate line in Column 15 of Form 3-1107. If additional columns are needed, the user must develop an expanded Form 3-1108 or use a blank Form 3-1108. If HEP Form A-2 is not used, Columns 6-10 are blank.

(7) Column 11. Enter data from Column 15, Form 3-1107, if HEP Form B is used to enter HU's on Form 3-1107. Otherwise, sum the entries in each line in Columns 6-10 and enter the total use-days in Column 11.

(8) Column 12. Enter the value per use-day for each activity listed in Column 4. These values can be developed and justified by following the Instructions for Calculating Unit Dollar Values for Recreation (Appendix C). Values also may be obtained from State files, consultants, Federal agency studies or surveys, or other sources. These values should be justified and explained when used.

(9) Column 13. Calculate total recreational value by multiplying the entry in Column 11 by the corresponding entry in Column 12.

(10) Column 14. Enter the annual commercial harvest (e.g., number of animals harvested) or scientific or educational usage (e.g., number of animals taken or number of visit-days).

(11) Column 15. Enter either the net value or profit per unit of commercial harvest (e.g., net value per pelt, lb or kg of fish, or animal) or the net scientific or educational value per use. Net scientific or education values may be estimated as the difference between the value that a user would be willing to pay to obtain an additional unit of use and the cost of obtaining that use.

Both variable costs per unit of use (e.g., fuel) and fixed costs (e.g., annual depreciation of additional equipment required to obtain increased output from a hatchery) should be deducted from gross return (income) received from the sale of commercial products.

The commercial or other use should be estimated for the geographic area pertaining to the cover type areas shown in Columns 6-10 or a more extensive area if appropriate for commercial or other uses.

(12) Column 16. Calculate total commercial harvest or other use by multiplying the entry in Column 14 by the corresponding entry in Column 15. If multiple uses occur (e.g., commercial and educational), calculate the value of each separately and enter the total of these values in Column 16.

(13) Column 17. Add each entry in Column 13 with the corresponding entry in Column 16 and enter this sum in Block 17. This sum is an estimate of the total value of recreational and commercial or other uses.

Form 3-1108. Summary of potential productivity by species for recreational and other uses.

1. Study	Date	2. Proposed action

3. Evaluation species

Activity or use	Target year	Use days by cover type[1] if HEP Form A-2 is used (list types)					Recreational uses			Commercial / other uses			Total value (13 + 16)
							Total[1] use-days	Value per use-day	Total value	Annual commercial harvest	Net value (per pelt, kg, etc.)	Total commercial or other value	
4	5	6 +	7 +	8 +	9 +	10 =	11	x 12	= 13	14	x 15	= 16	17

[1] From Form 3-1107 (Column 15).

B.4 Form 3-1109. Fish and wildlife supply and demand curves for the life of the project.

A. Purpose. This form is used to determine the projected or planned use that is both sustainable by the species and needed (or demanded) by humans for recreational, commercial, and other uses. The projected use for each proposed action and the future-without-project conditions is constrained by the use sustainable by the species.

B. Instructions. Complete a separate Form 3-1109 for each species under each proposed action. Construct separate supply and demand curves covering the life of the project for each of the uses listed on Form 3-1108 so that the availability (supply) and use (demand) of these resources can be annualized. The supply curves are developed from the potential sustainable use data developed on Forms 3-1107 and 3-1108. The demand curves are developed from appropriate sources (e.g., State wildlife agencies, hunting and fishing surveys, or other similar records). Demands should reflect the total use needed by humans, whether or not the wildlife can sustain this use. Example supply and demand curves (in use-days) are shown on Form 3-1110.

(1) Block 1. Enter the name of the study and date.

(2) Block 2. Enter name of proposed action.

(3) Block 3. Enter name of the evaluation species.

(4) Block 4. Enter use. A separate Form 3-1109 is completed for each use shown on Form 3-1108, Column 4.

(5) Block 5. Plot the supply curve using the use-days data in Column 11, Form 3-1108, for each target year. These data reflect the species' capability to sustain human recreational uses.

Develop and plot demand data obtained from appropriate sources (e.g., State wildlife agencies, hunting and fishing surveys, studies using travel cost or other models, or similar sources or records). Demand may be estimated based on the projected rate of population growth, income and other socioeconomic variables, preferences for certain species, and other factors. A statistical projection using regression techniques is desirable but not required. Plot the use-day demand curve with points (data) developed for each of the target years for "Without Project" conditions. The same "Without Project" demand curve is used for each proposed action, unless a proposed action induces changes in demand. Such changes are unlikely because human needs or demands exist independently of the project. A proposed action may, however, stimulate previously latent demand.

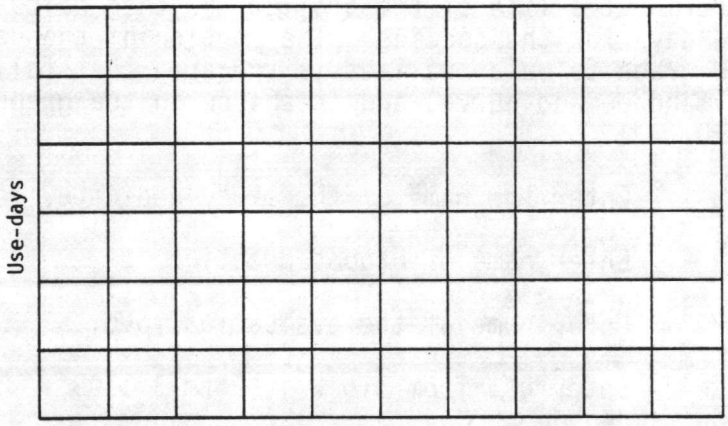
(6) Block 6. Plot the total value (Column 17, Form 3-1108) of recreational, commercial, and other uses in Block 6. These data reflect the capability, expressed in dollar values, of the species to supply harvestable populations.

Translate the demand data in Block 5 into dollar values using the values from Column 12, Form 3-1108. Combine these dollar values with estimated values of any commercial or other uses for the species and plot the totals in Block 6.

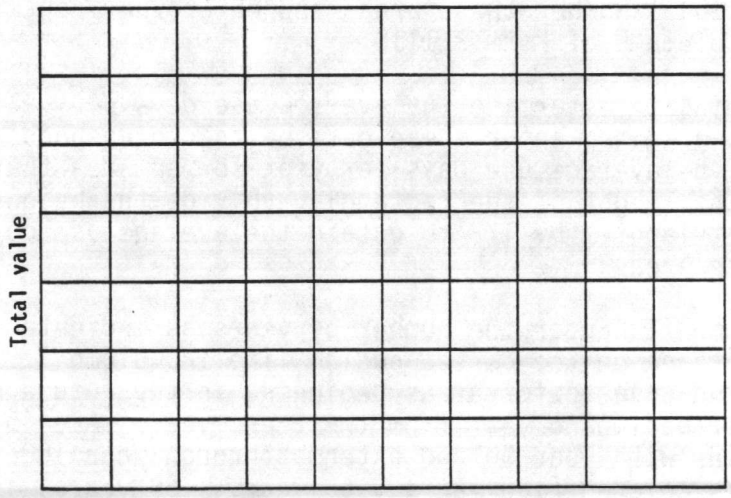
Form 3-1109. Fish and wildlife supply and demand curves for the life of the project.

1. Study	Date	2. Proposed action
3. Evaluation pecies		4. Use

Block 5



Block 6



B.5 Form 3-1110. Determination of average annual use.

A. Purpose. This form is utilized to: 1) determine the use that is sustainable by the species and needed (or demanded) by humans; and 2) to calculate the AAU of the species projected for an alternative study plan.

B. Instructions. Complete a separate Form 3-1110 for each species under each proposed action. Determine the use-days for each target year for each use during the life of the project and then calculate the average annual use-days for the species. The portion of the use-days supply and demand graph to be annualized is the area that falls under both the supply and demand curves and is shaded in the graph shown on Form 3-1110.

(1) Block 1. Enter the name of the study and date.

(2) Block 2. Enter name of proposed action.

(3) Block 3. Enter name of the evaluation species.

(4) Block 4. Enter use from Block 4, Form 3-1109.

(5) Column 5. Divide the area under the supply and demand curves in Block 5 on Form 3-1109 into rectangles or triangles in order to determine the areas under the curve (see example graph on Form 3-1110). Number these areas and enter the identification numbers in Column 5 of Form 3-1110.

(6) Column 6. Determine the average use-days per year for each identified area and enter these data on the corresponding line in Column 6. The average use-days per year for an area that is a rectangle is the height of the rectangle. Divide the height of areas that are triangles by 1/2 to obtain the average use-days per year for these areas.

(7) Column 7. Enter the number of years as indicated by the length of each area on the corresponding line in Column 7. Calculate the period covered for areas beginning in the future by subtracting their beginning year from their end year. Area 5, for example, begins with year 50 and extends through year 100. The number of years covered (100 years - 50 years = 50 years) is entered in Column 7.

(8) Column 8. Multiply each entry in Column 6 by the corresponding entry in Column 7 and enter the product in Column 8.

(9) Block 9. Sum the entries in Column 8 and enter in Block 9.

(10) Block 10. Divide the number in Block 9 by the number of years in the life of the project and enter in Block 10.

Form 3-1110. Determination of average annual use.

1. Study	Date	2. Proposed action
3. Evaluation species		4. Use

Area identification number 5.	Average use-days per year for the area 6.	Number of years 7.	Use-days over period 8.

9. Total use-days	
10. Average annual use (Block 9 ÷ life of project)	

B.6 Form 3-1111. Determination of average annual equivalent value and present worth.

A. Purpose. This form is used to discount the dollar values of the use required to meet human needs that can be sustained by the species for each proposed action and for the future-without-project conditions. The discounting process translates future values into dollars, expressed in terms of today's values, so that values for each proposed action and without-project conditions can be directly compared. The sum of the discounted future values is termed PW.

Form 3-1111 also is used to average the discounted values (PW) over the life of the project, taking account of the interest rate for the project. This average value is referred to as the AAEV.

Form 3-1111 may be used to evaluate effects, in dollar terms, occurring before project operation begins (see Appendix E, Prestart Analysis).

B. Instructions. A separate Form 3-1111 is prepared for each set of supply and demand curves entered in Block 6 of Form 3-1109. The area to be analyzed is the dollar value supply curve in Block 6 of Form 3-1109 unless the demand curve falls below the supply curve, in which case the demand curve is followed (see example graph on Form 3-1110). Only the dollar values under both the supply and demand curves, from Block 6 of Form 3-1109, are entered on Form 3-1111.

(1) Block 1. Enter the name of the study and date.

(2) Block 2. Enter the name of the proposed action.

(3) Block 3. Enter the name of the evaluation species.

(4) Block 4. Enter use from Block 10, Form 3-1109.

(5) Block 5. Enter the interest rate set on October 1 of the current year by the Water Resources Council or the rate authorized for the project; include the source of the authorized rate if it is not the regular WRC rate.

(6) Column 6. Divide the entire area under the supply and demand curves (Block 6 of Form 3-1109) into a series of rectangles and triangles (see example graph on Form 3-1110). Number each rectangle or triangle as in the example on Form 3-1110.

(7) Column 7. Enter the number of each rectangle or triangle in Block 6 of Form 3-1109 in the appropriate line of Column 7 of Form 3-1111. Select the appropriate line according to the type of area. For example, Type C represents a rectangle beginning in a future year. Types D and F represent triangles that begin in a future year while Types A, B, and E are areas that begin with the base year. Enough lines are provided for two or three entries for each type of rectangle or triangle.

(8) Column 8. Enter the maximum vertical height, in dollars, of each rectangle or triangle listed in Column 7. Data for Types A and C (rectangles) are entered in Column 10. The maximum vertical height is indicated by a bracket for each type of area listed in Column 6.

(9) Column 9. Enter number of years covered by each rectangle or triangle listed in Block 8 and Types A and C rectangles if data are entered in Column 10.

(10) Column 10. Divide the entry in Column 8 by the corresponding entry in Column 9 and enter the result in Column 10 for Type B, D, E, and F areas. Enter the maximum vertical height for Type A and C areas if not already entered.

(11) Columns 11-13. Obtain an Interest and Annuity Table (I and A Table) for the discount rate listed in Block 5 (see example in Appendix D). Enter discount factors from the I and A Table into the corresponding Columns 11-14 for each entry in Column 10. For example, all discount factors entered in Column 11 are taken from the "Present Worth of 1 Per Period" column of the I and A Table. Select the appropriate column and number of years covered (Column 9 above) in the I and A Table. For example, an entry of 25 in Column 9 of Form 3-1111 specifies the factor at line 25 in the respective column of the I and A Table.

(12) Column 14. Enter discount factors from the "Present Worth of 1" column of the I and A Table for each entry in Column 10 for Types C, D, and F areas. These discount factors are selected for the number of years between the beginning of the project and the period covered. For example, discount factors for a Type C area covering years 75 to 100 would come from the year 75 line of the "Present Worth of 1" column of the I and A Table.

(13) Column 15. Multiply each entry in Column 10 by the corresponding entry or entries in Column 11-14. A second multiplication is necessary for Types C, D, and F areas.

(14) Block 16. Enter the sum of the entries in Column 15. This is the Present Worth of the use specified in Block 4 for this proposed action (Block 2) and species (Block 3).

(15) Block 17. Enter the discount factor from the "Partial Payment" column of the I and A Table for the interest rate specified in Block 5. The discount factor from the Partial Payment column is selected based on the number of years in the life of the project. For example, the discount factor to be used in a project with a 100-year life would be obtained from the 100 year row in the Partial Payment column.

(16) Block 18. Multiply the entry in Block 16 by the entry in Block 17. This product is the Average Annual Equivalent Value.

Appendix B. Forms for Use in the Human Use and Economic Evaluation of Non-water Resource Development Projects

Form 3-1111. Determination of average annual equivalent value and present worth.

1. Study — Date
2. Proposed action — 3. Evaluation Species
3. Use — 5. Interest and annuity table (%)

Type	6. Area evaluated (from supply/demand curve)	7. Area No.	8. Maximum annual dollar value of area	9. No. of years covered	10. Calculation base	Values from Interest and Annuity Table: 11. Present worth of 1 per period	12. Pres. value of annuity decrease by 1 (1/N) per year	13. Pres. value of annuity increase by 1 per year	14. Present worth of 1	15. Present worth per area
A	Max.		Enter in Column 10			X				=
						X				=
B	Max.			÷	=			X		=
				÷	=			X		=
C			Enter in Column 10			X			X	=
						X			X	=
D				÷	=			X	X	=
				÷	=			X	X	=
E				÷	=		X			=
				÷	=		X		X	=
F				÷	=		X		X	=
				÷	=		X		X	=

16. Total of Column 15 (Present Worth) X ---------
17. Partial payment factor from I and A Table ———
18. Average Annual Equiv. Value =

B.7 Form 3-1112. Summary of proposed actions and future-without project.

A. Purpose. This form is used to compile data on: 1) Average Annual Use (in use-days); 2) Average Annual Worth (non-discounted dollars); 3) Present Worth (discounted dollars); and 4) Average Annual Equivalent Value (discounted dollars) for the uses of all the species for each proposed action and the future without-project conditions. The difference between the without-project condition and each proposed action can then be calculated. This difference is the total impact on all evaluation species of each proposed action compared with the future without-project conditions.

The Average Annual Use and Average Annual Worth show impacts on recreational human uses (such as hunting and fishing) of the species listed, whereas the Average Annual Equivalent Value and Present Worth reflect the impacts, in discounted dollars, on direct recreational uses (hunting, fishing, and non-consumptive uses) and the value of commercial or other uses.

B. Instructions.

(1) Block 1. Enter the name of the study and date.

(2) Blocks 2-4. Enter the names of the proposed actions. Use additional Forms 3-1112 if needed.

(3) Column 5. List the evaluation species for each proposed action and without-project conditions. List the uses for each species after the species name. For example:

Geese - Hunting
- Birdwatching

(4) Column 6. Enter Average Annual Use from Block 10 of Form 3-1110 for each use listed in Column 5.

(5) Column 7. Multiply the Average Annual Use (Column 6) by the corresponding dollar value per use-day (from Column 12 of Form 3-1108) for each use in Column 5.

(6) Column 8. Enter the Present Worth (from Column 16 of Form 3-1111) for the future without-project for each use listed in Column 5.

(7) Column 9. Enter the Average Annual Equivalent Value (from Block 18 of Form 3-1111) for the future without-project for each use listed in Column 5.

(8) Columns 10-21. Enter data for each plan listed in Blocks 2-4, following the instructions for Columns 6-9, above, and using data from the appropriate forms for each proposed action.

(9) Block 22. Sum the entries in Columns 6-21.

(10) Block 23. Subtract the totals in Block 22 for the future without-project (Columns 6-9) from the corresponding data for each proposed action. Negative results from this subtraction are entered with a minus (-) sign. The minus sign indicates a decrease attributable to the proposed action. For example, a without-project entry of 80 subtracted from a proposed action entry of 60 is -20 which reflects a reduction (impact) attributable to the proposed action.

Form 3-1112. Summary of proposed actions and future-without-project

1. Study Date

5. Evaluation species and use(s)	Future without project				Proposed actions: 2. Plan name				3. Plan name				4. Plan name			
	6. Avg. annual use	7. Avg. annual worth	8. Avg. annual equiv. value	9. Present worth	10. Avg. annual use	11. Avg. annual worth	12. Avg. annual equiv. value	13. Present worth	14. Avg. annual use	15. Avg. annual worth	16. Avg. annual equiv. value	17. Present worth	18. Avg. annual use	19. Avg. annual worth	20. Avg. annual equiv. value	21. Present worth
22. Totals																
23. Difference																

Appendix C. Instructions for Calculating Unit Dollar Values for Recreation

C.1 Introduction. The following instructions provide a method for determining dollar values to be entered in Column 12 of Form 3-1108. These instructions are designed for use on non-water resource development projects and are based on the guidance issued by the Water Resources Council for water resource development projects.

C.2 Instructions. These instructions provide a point rating system that can be used to select a unit dollar value from the range of values issued by the WRC or any other range of values that may be used. Modifications should be documented or explained. The point system takes such transfers into account.

The choice of unit day value should consider transfers of recreation from existing projects to the proposed project to avoid double counting of recreational benefits. The point rating system reflects quality, relative scarcity, ease of access, and aesthetic features. The criteria and weights used in the point system can be modified as appropriate for project conditions. The use of the point rating system is illustrated below:

A. Step 1. Decide whether the activity is "General" or "Specialized", according to the categories of activities shown in Table C-1.

"Specialized" activities are those for which opportunities in general are limited, intensity of use low, and users skill, knowledge, and appreciation great. "General" refers to activities primarily attractive to the majority of outdoor users and that generally require the development and maintenance of convenient access and adequate facilities.

Hunting and fishing affected by non-water resource development projects may be considered either general or specialized recreation, depending whether they are associated with developed areas or back country areas. As examples, most activities associated with water resource development projects including swimming, picnicing, boating, and most warm water fishing, are included in the general recreation category. Activities less often associated with water resource development projects, such as big game hunting and salmon fishing, are included in the specialized category. Likewise, activities associated with non-water resource development projects may be specialized or general.

The value of specialized recreation activities generally will be lowered, or even excluded, by the type of development that enhances activities in the general recreation category. Thus, activities involving low density use and development, such as big game hunting and wilderness pack trips, constitute the higher end of the range of values for specialized recreation. Also included in the upper end of the specialized range are relatively unique experiences, such as the following examples involving water resources: fishing for salmon and steelhead, white water boating and canoeing, long-range boat cruises, and other

Appendix C. Instructions for Calculating Unit Dollar Values for Recreation

Table C-1. Conversion of points to dollar values.

Activity categories	Point values										
	0	10	20	30	40	50	60	70	80	90	100
General Recreation (Points from Table C-2)	1.07	1.25	1.44	1.68	1.93	2.30	2.48	2.67	2.85	3.04	3.22
General Fishing and Hunting (Points from Table C-2)	1.57	1.74	1.90	2.07	2.28	2.51	2.73	2.94	3.06	3.17	3.20
Specialized Fishing and Hunting (Points from Table C-3)	7.50	7.69	7.88	8.08	8.27	9.01	9.80	10.57	11.34	12.10	12.97
Specialized Recreation Other than Fishing and Hunting (Points from Table C-3)	4.29	4.65	5.00	5.36	5.72	6.44	7.15	8.58	10.01	11.44	12.87

activities in areas of outstanding scenic value. Examples of activities to which values at the lower end of the range would be assigned include bird hunting and specialized nature photography.

B. Step 2. Determine points by judging each activity according to the judgment factors for criteria shown in Table C-2 (general recreation) or Table C-3 (specialized recreation).

When hunting or fishing is evaluated (general or specialized), the recreation experience (criterion "a" in Tables C-2 and C-3) should be assigned points according to the additional consideration of the chances of success; the midpoint of the value range is associated with the region's average catch or bag. Other criteria may be modified based on available evidence about the preferences and willingness of hunters and fishermen to pay for different recreational quality factors.

C. Step 3. Calculate total points by adding the points for each criterion listed in Table C-2 or C-3 for the respective activity.

D. Step 4. Convert the total points for each activity to dollar values by selecting a dollar value for each activity from Table C-1. Values may be interpolated, if necessary, between those provided.

The values in Table C-1 cannot be exceeded for water resource development projects. However, other (higher) values can be used for non-water resource development projects if justified and documented.

E. Step 5. Enter the dollar value for each activity in Column 12 of Form 3-1108.

Appendix C. Instructions for Calculating Unit Dollar Values for Recreation

Table C-2. Guidelines for assigning points for general recreation.

Criteria	Judgment factors				
a) Recreation Experience	Two General activities[1]	Several General activities	Several General activities; one high quality value activity[2]	Several General activities; more than one high quality high activity	Numerous high quality value activities; some general activities
Total Points: 30					
Point Value:	0-4	5-10	11-16	17-23	24-30
b) Availability of Opportunity[3]	Several within 1 hr. travel time; a few within 30 min travel time	Several within 1 hr. travel time; none within 30 min travel time	One or two within 1 hr travel time; none within 45 min travel time	None within 1 hr travel time	None within 2 hr travel time
Total Points: 18					
Point Value:	0-3	4-6	7-10	11-14	15-18
c) Carrying Capacity[4]	Minimum facility development for public health and safety	Basic facilities to conduct activity(ies)	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activity at site potential	Ultimate facilities to achieve intent of selected alternative
Total Points: 14					
Point Value:	0-2	3-5	6-8	9-11	12-14
d) Accessibility	Limited access by any means to site or within site	Fair access poor quality roads to site; limited access within site	Fair access fair road to site; fair access, good roads within site	Good access, good roads to site; fair access, good roads within site	Good access, high standard road to site; good access within site
Total Points: 18					
Point Value:	0-3	4-6	7-10	11-14	15-18
e) Environmental Quality	Low esthetic factors[5] exist that significantly lower quality[6]	Average esthetic quality; factors exist that lower quality to minor degree	Above average esthetic quality; any limiting factors can be reasonably rectified	High esthetic quality; no factors exist that lower quality	Outstanding esthetic quality; no factors exist that lower quality
Total Points: 20					
Point Value:	0-2	3-6	7-10	11-15	16-20

[1] General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.

[2] High quality value activities include those that are not common to the region and/or Nation and that are usually of high quality.

[3] Likelihood of success at fishing and hunting.

[4] Value should be adjusted for overuse.

[5] Major esthetic qualities to be considered include geology and topography, water, and vegetation.

[6] Factors to be considered in lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

Appendix C. Instructions for Calculating Unit Dollar Values for Recreation

Table C-3. Guidelines for assigning points for specialized recreation.

Criteria	Judgment factors				
a) Recreation Experience[1]	Heavy use or frequent crowding or other interference with use	Moderate use, other users evident and likely to interfere with use	Moderate use, some evidence of other users and occasional interference with use due to crowding	Usually little evidence of other users rarely if ever crowded	Very low evidence of other users, never crowded
Total Points: 30					
Point Value:	0-4	5-10	11-16	17-23	24-30
b) Availability of Opportunity[2]	Several within 1 hr. travel time; a few within 30 min travel time	Several within 1 hr. travel time; none within 30 min travel time	One or two within 1 hr travel time; none within 45 min travel time	None within 1 hr travel time	None within 2 hr travel time
Total Points: 18					
Point Value:	0-3	4-6	7-10	11-14	15-18
c) Carrying Capacity[3]	Minimum facility development for public health and safety	Basic facilities to conduct activity(ies)	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activity at site potential	Ultimate facilities to achieve intent of selected alternative
Total Points: 14					
Point Value:	0-2	3-5	6-8	9-11	12-14
d) Accessibility	Limited access by any means to site or within site	Fair access poor quality roads to site; limited access within site	Fair access fair road to site; fair access, good roads within site	Good access, good roads to site; fair access, good roads within site	Good access, high standard road to site; good access within site
Total Points: 18					
Point Value:	0-3	4-6	7-10	11-14	15-18
e) Environmental Quality	Low esthetic factors[4] exist that significantly lower quality[5]	Average esthetic quality; factors exist that lower quality to minor degree	Above average esthetic quality; any limiting factors can be reasonably rectified	High esthetic quality; no factors exist that lower quality	Outstanding esthetic quality; no factors exist that lower quality
Total Points: 20					
Point Value:	0-2	3-6	7-10	11-15	16-20

[1] Intensity of use for activity.

[2] Likelihood of success at fishing and hunting.

[3] Value should be adjusted for overuse.

[4] Major esthetic qualities to be considered include geology and topography, water, and vegetation.

[5] Factors to be considered in lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

Appendix D. Example Discount Factors for a 7.125% Interest and Annuity Table

D.1 Introduction. This Appendix provides example discount factors for use on Form 3-1111. These factors may be used on either water or non-water resource development projects. The Water Resource Council establishes a new discount rate for each fiscal year applicable to water resource development project studies. A different I and A Table is required for each discount rate. The 7.125% I and A Table shown is applicable only to projects with a 7.125% discount rate.

Appendix D. Example Discount Factors for a 7.125% Interest and Annuity Table

Table D-1. Example discount factors for a 7.125% interest and annuity table.

	Present worth of 1 per period	Present value of annuity decr. by 1 (1/N) per year	Present value of annuity Incr. by 1 per year	Present worth of 1	Partial payment
1	0.93349	0.93349	0.93349	0.93349	1.07125
2	1.80489	2.73838	2.67629	0.87140	0.55405
3	2.61833	5.35671	5.11662	0.81344	0.38192
4	3.37767	8.73439	8.15399	0.75934	0.29606
5	4.08651	12.82090	11.69817	0.70884	0.24471
6	4.74820	17.56910	15.66831	0.66169	0.21061
7	5.36588	22.93498	19.99208	0.61768	0.18636
8	5.94248	28.87746	24.60486	0.57660	0.16828
9	6.48073	35.35819	29.44909	0.53825	0.15430
10	6.98318	42.34137	34.47358	0.50245	0.14320
11	7.45221	49.79358	39.63291	0.46903	0.13419
12	7.89004	57.68362	44.88693	0.43783	0.12674
13	8.29876	65.98238	50.20020	0.40871	0.12050
14	8.68029	74.66266	55.54162	0.38153	0.11520
15	9.03644	83.69910	60.88393	0.35615	0.11066
16	9.36890	93.06800	66.20337	0.33247	0.10674
17	9.67926	102.74726	71.47937	0.31035	0.10331
18	9.96897	112.71623	76.69417	0.28971	0.10031
19	10.23941	122.95564	81.83257	0.27044	0.09766
20	10.49187	133.44751	86.88166	0.25245	0.09531
21	10.72753	144.17504	91.83060	0.23566	0.09322
22	10.94752	155.12255	96.67036	0.21999	0.09134
23	11.15288	166.27543	101.39359	0.20536	0.08966
24	11.34457	177.62000	105.99436	0.19170	0.08815
25	11.52352	189.14353	110.46809	0.17895	0.08678
26	11.69057	200.83410	114.81131	0.16705	0.08554
27	11.84651	212.68060	119.02159	0.15594	0.08441
28	11.99207	224.67268	123.09741	0.14556	0.08339
29	12.12795	236.80063	127.03802	0.13588	0.08245
30	12.25480	249.05543	130.84338	0.12685	0.08160
31	12.37321	261.42864	134.51406	0.11841	0.08082
32	12.48374	273.91238	138.05112	0.11053	0.08010
33	12.58692	286.49931	141.45612	0.10318	0.07945
34	12.68324	299.18255	144.73096	0.09632	0.07884
35	12.77316	311.95571	147.87790	0.08991	0.07829
36	12.85709	324.81280	150.89947	0.08393	0.07778
37	12.93544	337.74823	153.79842	0.07835	0.07731
38	13.00858	350.75681	156.57770	0.07314	0.07687
39	13.07685	363.83366	159.24040	0.06827	0.07647
40	13.14058	376.97425	161.78973	0.06373	0.07610
41	13.20008	390.17433	164.22900	0.05949	0.07576
42	13.25562	403.42994	166.56157	0.05554	0.07544
43	13.30746	416.73740	168.79084	0.05184	0.07515
44	13.35586	430.09326	170.92023	0.04840	0.07487
45	13.40103	443.49429	172.95317	0.04518	0.07462
46	13.44320	456.93749	174.89307	0.04217	0.07439
47	13.48257	470.42006	176.74332	0.03937	0.07417
48	13.51932	483.93938	178.50724	0.03675	0.07397
49	13.55362	497.49301	180.18816	0.03430	0.07378
50	13.58565	511.07865	181.78929	0.03202	0.07361

Appendix D. Example Discount Factors for a 7.125% Interest and Annuity Table

Table D-1. Example discount factors for a 7.125% interest and annuity table.

	Present worth of 1 per period	Present value of annuity decr. by 1 (1/N) per year	Present value of annuity incr. by 1 per year	Present worth of 1	Partial payment
51	13.61554	524.69419	183.31383	0.02989	0.07345
52	13.64344	538.33764	184.76487	0.02790	0.07330
53	13.66949	552.00713	186.14545	0.02605	0.07316
54	13.69381	565.70094	187.45852	0.02432	0.07303
55	13.71651	579.41744	188.70696	0.02270	0.07290
56	13.73770	593.15514	189.89355	0.02119	0.07279
57	13.75748	606.91262	191.02100	0.01978	0.07269
58	13.77594	620.68856	192.09193	0.01846	0.07259
59	13.79318	634.48173	193.10886	0.01724	0.07250
60	13.80927	648.29100	194.07425	0.01609	0.07242
61	13.82429	662.11528	194.99045	0.01502	0.07234
62	13.83831	675.95359	195.85973	0.01402	0.07226
63	13.85139	689.80499	196.68428	0.01309	0.07219
64	13.86361	703.66860	197.46621	0.01222	0.07213
65	13.87502	717.54362	198.20753	0.01141	0.07207
66	13.88566	731.42928	198.91020	0.01065	0.07202
67	13.89560	745.32488	199.57607	0.00994	0.07197
68	13.90488	759.22976	200.20693	0.00928	0.07192
69	13.91354	773.14330	200.80449	0.00866	0.07187
70	13.92162	787.06493	201.37039	0.00808	0.07183
71	13.92917	800.99410	201.90619	0.00755	0.07179
72	13.93622	814.93031	202.41341	0.00704	0.07176
73	13.94279	828.87310	202.89346	0.00658	0.07172
74	13.94893	842.82203	203.34773	0.00614	0.07169
75	13.95466	856.77669	203.77751	0.00573	0.07166
76	13.96001	870.73670	204.18406	0.00535	0.07163
77	13.96500	884.70171	204.56856	0.00499	0.07161
78	13.96966	898.67137	204.93215	0.00466	0.07158
79	13.97402	912.64539	205.27590	0.00435	0.07156
80	13.97808	926.62347	205.60086	0.00406	0.07154
81	13.98187	940.60534	205.90799	0.00379	0.07152
82	13.98541	954.59074	206.19824	0.00354	0.07150
83	13.98871	968.57946	206.47248	0.00330	0.07149
84	13.99180	982.57126	206.73157	0.00308	0.07147
85	13.99468	996.56593	206.97631	0.00288	0.07146
86	13.99736	1010.56330	207.20745	0.00269	0.07144
87	13.99987	1024.56317	207.42574	0.00251	0.07143
88	14.00222	1038.56539	207.63184	0.00234	0.07142
89	14.00440	1052.56979	207.82642	0.00219	0.07141
90	14.00644	1066.57623	208.01011	0.00204	0.07140
91	14.00835	1080.58458	208.18348	0.00191	0.07139
92	14.01013	1094.59471	208.34709	0.00178	0.07138
93	14.01179	1108.60650	208.50149	0.00166	0.07137
94	14.01334	1122.61983	208.64717	0.00155	0.07136
95	14.01478	1136.63462	208.78460	0.00145	0.07135
96	14.01613	1150.65075	208.91424	0.00135	0.07135
97	14.01739	1164.66815	209.03653	0.00126	0.07134
98	14.01857	1178.68672	209.15185	0.00118	0.07133
99	14.01967	1192.70639	209.26060	0.00110	0.07133
100	14.02070	1206.72708	209.36315	0.00103	0.07132

Appendix E. Prestart Analysis

E.1 Purpose. Significant modifications in wildlife use, that are attributable to project development but occur before project operation, should be evaluated. Examples are wildlife uses affected by land clearing by private landowners in anticipation of a water resource development project or an extremely long construction period which significantly affects hunting or fishing. The effects of impacts that occur before the beginning of project operation should be evaluated in a separate analysis and combined with those that occur during the project life.

E.2 Instructions. Forms 3-1107 through 3-1111 are used for evaluating prestart effects with the following change: Instead of discounting future values and reducing them to present worth, the values estimated for the proposed action (Column 10, Form 3-1111) are increased to reflect the accrual of interest before Year 1. The accrual of interest before Year 1 is comparable in concept to the discounting of future values for the period after Year 1. Thus, dollar value in the future is worth less in the present, whereas value obtained in the past will increase as interest accrues.

The only change required in the HUEE forms and procedures, to account for prestart effects, is the use of a different set of factors in Form 3-1111. Instead of using discount factors, use Prestart Factors (Example Factors provided in Table E-1). Thus, for Prestart Analysis, enter factors for the appropriate years from a Prestart Factor Table for the appropriate interest rate in the respective Columns 11 through 14 of Form 3-1111. The following columns show the difference in column headings for Prestart and Discount Factors to be entered in the Columns 11 through 14 of Form 3-1111:

Form 3-1111 Column	Prestart Factors (before Year 1)	Discount Factors (following Year 1)
11	Amount of 1 Per Period	Present Worth of 1 Per Period
12	Amount of 1 Decreasing by 1 (1/N) Per Year	Present Value of Annuity Decreasing by 1 (1/N) Per Year
13	Amount of 1 Increasing by 1 Per Year	Present Value of Annuity Increasing by 1 Per Year
14	Amount of 1	Present Worth of 1

Following entry of these different factors from the appropriate Prestart Factor Table in Columns 11 through 14 on Form 3-1111, Present Worth and Average Annual Equivalent Values are calculated following the instructions

Appendix E. Prestart Analysis

Table E-1. Example factors used in prestart analysis (7.125%).

	Amount of 1 per period	Amount of 1 decreasing by 1 (1/N) per yr	Amount of 1 increasing by 1 per year	Amount of 1
1	1.00000	1.00000	1.00000	1.07125
2	2.07125	3.14250	3.07125	1.14758
3	3.21883	6.58523	6.29008	1.22934
4	4.44817	11.50260	10.73824	1.31693
5	5.76510	18.08726	16.50334	1.41076
6	7.17586	26.55184	23.67921	1.51128
7	8.68714	37.13080	32.36635	1.61896
8	10.30610	50.08247	42.67245	1.73431
9	12.04041	65.69126	54.71287	1.85788
10	13.89829	84.27005	68.61116	1.99025
11	15.88854	106.16284	84.49970	2.13206
12	18.02060	131.74754	102.52031	2.28397
13	20.30457	161.43913	122.82488	2.44670
14	22.75127	195.69294	145.57615	2.62103
15	25.37230	235.00836	170.94845	2.80778
16	28.18008	279.93278	199.12853	3.00783
17	31.18791	331.06590	230.31644	3.22214
18	34.41005	389.06439	264.72648	3.45172
19	37.86176	454.64699	302.58824	3.69765
20	41.55941	528.60000	344.14766	3.96111
21	45.52052	611.79327	389.66818	4.24334
22	49.76386	705.13669	439.43204	4.54567
23	54.30953	809.68721	493.74157	4.86955
24	59.17909	926.55651	552.92065	5.21651
25	64.39560	1056.96926	617.31625	5.58819
26	69.98378	1202.26210	687.30003	5.98634
27	75.97013	1363.89341	763.27016	6.41287
28	82.38300	1543.45381	845.65316	6.86979
29	89.25279	1742.67768	934.90595	7.35926
30	96.61205	1963.45552	1031.51800	7.88361
31	104.49566	2207.84738	1136.01365	8.44532
32	112.94097	2478.09748	1248.95463	9.04704
33	121.98802	2776.64994	1370.94264	9.69165
34	131.67966	3106.16591	1502.62231	10.38218
35	142.06184	3469.54207	1644.68415	11.12191
36	153.18375	3869.93069	1797.86789	11.91434
37	165.09809	4310.76134	1962.96598	12.76324
38	177.86133	4795.76441	2140.82731	13.67262
39	191.53395	5328.99657	2332.36125	14.64679
40	206.18074	5914.86832	2538.54199	15.69038
41	221.87112	6558.17380	2760.41311	16.80832
42	238.67943	7264.12312	2999.09254	18.00591
43	256.68534	8038.37723	3255.77789	19.28883
44	275.97417	8887.08579	3531.75206	20.66316
45	296.63733	9816.92798	3828.38939	22.13541
46	318.77274	10835.15685	4147.16214	23.71256
47	342.48530	11949.64707	4489.64744	25.40208
48	367.88738	13168.94681	4857.53482	27.21198
49	395.09936	14502.33362	5252.63418	29.15083
50	424.25019	15959.87508	5676.88436	31.22783

Appendix E. Prestart Analysis

Table E-1. Example factors used in prestart analysis (7.125%).

	Amount of 1 per period	Amount of 1 decreasing by 1 (1/N) per yr	Amount of 1 increasing by 1 per year	Amount of 1
51	455.47801	17552.49419	6132.36237	33.45281
52	488.93082	19292.04022	6621.29319	35.83632
53	524.76714	21191.36522	7146.06033	38.38966
54	563.15680	23264.40680	7709.21713	41.12492
55	604.28172	25526.27750	8313.49885	44.05507
56	648.33679	27993.36156	8961.83564	47.19400
57	695.53079	30683.41937	9657.36643	50.55657
58	746.08736	33615.70035	10403.45379	54.15872
59	800.24608	36811.06509	11203.69968	58.01753
60	858.26362	40292.11709	12061.96349	62.15128
61	920.41490	44083.34533	12982.37839	66.57956
62	986.99446	48211.27815	13969.37385	71.32336
63	1058.31782	52704.64953	15027.69067	76.40514
64	1134.72296	57594.57877	16162.41363	81.84901
65	1216.57197	62914.76448	17378.98560	87.68075
66	1304.25272	68701.69417	18683.23832	93.92801
67	1398.18073	74994.87061	20081.41905	100.62038
68	1498.80111	81837.05625	21580.22016	107.78958
69	1606.59069	89274.53719	23186.81084	115.46959
70	1722.06027	97357.40824	24908.87112	123.69679
71	1845.75707	106139.88064	26754.62818	132.51019
72	1978.26726	115680.61440	28732.89544	141.95154
73	2120.21880	126043.07697	30853.11424	152.06559
74	2272.28439	137295.93060	33125.39863	162.90026
75	2435.18465	149513.45030	35560.58328	174.50691
76	2609.69156	162775.97519	38170.27484	186.94052
77	2796.63208	177170.39551	40966.90693	200.26004
78	2996.89212	192790.67831	43963.79904	214.52856
79	3211.42068	209738.43482	47175.21973	229.81372
80	3441.23441	228123.53270	50616.45413	246.18795
81	3687.42236	248064.75677	54303.87649	263.72884
82	3951.15120	269690.52188	58255.02769	282.51952
83	4233.67072	293139.64229	62488.69841	302.64904
84	4536.31976	318562.16156	67025.01817	324.21278
85	4860.53254	346120.24812	71885.55072	347.31294
86	5207.84549	375989.16128	77093.39620	372.05899
87	5579.90448	408358.29350	82673.30068	398.56819
88	5978.47267	443432.29459	88651.77336	426.96618
89	6405.43885	481432.28443	95057.21221	457.38752
90	6862.82637	522597.16106	101920.03858	489.97638
91	7352.80275	567185.01153	109272.84133	524.88720
92	7877.68994	615474.63354	117150.53127	562.28541
93	8439.97535	667767.17654	125590.50662	602.34824
94	9042.32360	724387.91146	134632.83022	645.26556
95	9687.58915	785688.13930	144320.41937	691.24073
96	10378.82988	852047.24911	154699.24925	740.49163
97	11119.32151	923874.93712	165818.57076	793.25166
98	11912.57317	1001613.59956	177731.14393	849.77084
99	12762.34400	1085740.91252	190493.48793	910.31701
100	13672.66101	1176772.61354	204166.14895	975.17710

provided for completing each column on Form 3-1111. The Present Worth and Average Annual Equivalent Value of the prestart period are added to the Present Worth and Average Annual Equivalent Values, respectively, calculated for the period of project operations (following Year 1). The sum of Present Worth and Average Annual Equivalent Values is posted in the appropriate columns of Form 3-1112 for each alternative plan.

The table of factors used in the Prestart Analysis is selected for the same rate specified for discounting. Table E-1 shows an example set of prestart factors reflecting a 7.125 percent rate.

Appendix F. Glossary

Amount - The sum that a payment or series of payments will be worth at some future time.

Annual Value - The monetary value of an activity, such as hunting, taking place during a year. For monetary valuations, values are assumed to occur at the end of the year. This assumption is consistent with agency practice and the assumptions underlying the Interest and Annuity Tables.

Annuity - A series of fixed, periodical payments, such as payment of $10.00 per year for 100 years.

Average Annual Equivalent Value - The amortized value of the cumulative present worth values of the undiscounted benefits or losses. The benefits (or losses) due to the project are brought to present worth effective in the base year and then amortized over the entire project life.

Average Annual Use - The man-days of use of recreational activities, such as hunting or fishing, associated with a particular project alternative plan, averaged over the life of the project. The difference between the "without project" or "no project" activities and the levels of activity projected for a plan constitutes the loss or gain from the plan.

Base Year - The first year in which the recommended plan is expected to be operational. The base year will usually be designated by the construction agency. The base year encompasses 12 calendar months.

Consumptive Uses - The use of fish and wildlife where species are taken or harvested for sport or commercial purposes (see Non-consumptive Uses).

Contingent Valuation Method (CVM) - WRC method for evaluating recreational uses in water resource development projects. Based on the willingness of users to pay for changes in quality and quantity of recreational opportunities at a proposed site as determined by a detailed survey of potential users.

Discount Factor - The factor for any specific discount rate which translates the expected benefit (or loss) in any specific future year into its present value. The discount factor is equal to $1/(1 + r)^t$, where r is the discount rate and t is the number of years since the date of initiation of the project.

Discount Rate - The interest rate used in calculating the present value of the expected yearly benefits (which may be negative if losses are projected) attributable to the project.

Discounting - The mathematical procedure used to determine the present value or worth of amounts that will occur at some future time.

Externality - synonymous with external effect. An effect on parties other than users of the outputs of a plan.

Appendix F. Glossary

Harvest - For consumptive uses, the number or pounds of an animal population killed or harvested per year for sport or commercial purposes. For non-consumptive uses, the harvest may be evaluated in terms of "sight-seeing days," "encounters," or other appropriate units.

Non-consumptive Uses - The use of fish and wildlife for activities, such as sight seeing or photography, where species are not taken or harvested (see Consumptive Uses).

Period of Analysis - For evaluation purposes, the time period (or specified portion thereof) during which benefits or losses of a proposed plan accrue, generally 50 or 100 years.

Potential Use - The maximum number of man-days of use a particular habitat or segment can sustain without having an adverse effect on the brood stock of the animal species being evaluated. This is the concept of "supply" as used in the Human Use and Economic Evaluation.

Present Worth - Present Worth (PW) is the value of the annual series of hunting, fishing, or other recreational activity summed at Year 1 (the beginning of the project) (see Prestart Period).

Prestart Period. The number of years prior to Year 1 during which project impacts occur.

Travel Cost Method (TCM) - WRC method for evaluating recreational uses in water resource development projects. Based on the willingness of users, as determined by the travel behavior of users and the costs of travel, to pay for various recreational activities.

Unit Day Value Method (UDV) - WRC method for evaluating recreational uses in water resource development projects. Based on expert or informed opinion or judgment to estimate the average willingness of recreation users to pay for their activity.

Use-Day - The presence of one person on an area of land or water for the purpose of engaging in one or more recreation activities during all or part of a calendar day, synonymous with recreation day and man-day.

Value - The value of human use of fish and wildlife expressed in monetary units (dollars).

Appendix G. Abbreviations and Symbols

Abbreviations

AAEV	Average Annual Equivalent Value
AAU	Average Annual Use
AAW	Average Annual Worth
CVM	Contingent Valuation Method
ESM	Ecological Services Manual
HEP	Habitat Evaluation Procedures
HSI	Habitat Suitability Index
HU	Habitat Units
HUEE	Habitat Use and Economic Evaluation
MUDVM	Modified Unit Day Value Method
PW	Present Worth
TCM	Travel Cost Method
UDV	Unit Day Value Method
WRC	Water Resources Council

Symbols

Σ	Summation (sum of a series)

*U.S. GOVERNMENT PRINTING OFFICE : 1980 0-625-325/1396