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RPA Values for Recreation: Theory and Practice

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RPA VALUES FOR RECREATION: THEORY AND PRACTICE

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I. INTRODUCTION[2]

The principal law guiding planning on the National Forests is the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA),[3] as amended by the National Forest Management Act of 1976 (NFMA).[4] These statutes require the U.S. Forest Service to provide an assessment of the renewable resources on all the nation's forest and range lands every ten years and to provide a Program every five years describing a long range (50 year) plan.[5] The first assessment was completed in 1979 and the first RPA Program in 1985. The establishment of economic values of resource outputs (or so-called "RPA values") is central to this process in that it allows a comparison of alternative plans on a consistent net present value basis. Resources for which values must be estimated include timber, water, minerals, fish and wildlife and recreation.[6] In addition to planning at the national level, RPA values are to be used to develop long range plans at both the regional and forest level.[7]

The focus of this article is on the development of one category of RPA values, those for recreation and fish and wildlife. These resource uses are in general not allocated through market systems in the United States. Accordingly, the economic theory and methods available for defining these values lie in the area of non-market valuation. The following section briefly describes concepts of value, the primary available methodologies, and the standards that have been promulgated for application in various contexts. The next section provides an overview and critique of the RPA values developed in the most recent Program (1985). This is followed by a description of more recent empirical work and a general perspective on the problem. To anchor and limit the discussion, specific examples will generally be drawn from Forest Service Region 1.

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2. I am indebted to John Loomis and Terry Raettig for sharing background materials on the 1985 RPA process. They are, of course, not responsible for the interpretation provided here.

3. Pub. L. No. 93-378, 88 Stat. 476 (1974) (codified as amended at 16 U.S.C. §§ 1601-1614 (1982)).

4. Pub. L. No. 94-588, 90 Stat. 2949 (1976) (codified at 16 U.S.C. §§ 1600-1687 (1982)).

5. 16 U.S.C. § 1602 (1982).

6. 16 U.S.C. § 1604 g(3)(A).

7. 16 U.S.C. § 1604 f(1).

Before proceeding to the main body of this paper, several caveats are in order. The focus of the following discussion on identifying the appropriate recreational values for forest planning involves an acceptance of a general theoretical framework for the problem. Specifically, the basic RPA model is predicated on comparing the values of alternative combinations of forest outputs. Given this focus on the supply side, the appropriate task is to identify the marginal per unit of output values, otherwise known as the value of recreation days. However, it may well be that this focus on *quantity* changes is misguided. In fact, the major impact of alternative development and harvest schedules on fish, wildlife and forest recreation resources in general may well be in terms of changed *quality* of the recreational experience. Since the latter changes are measured by shifts in demand schedules, this view would suggest that the main working tool for evaluating the recreation resource in the context of forest planning is a set of functional demand relationships rather than a matrix of average values by region and activity.

There is a second basic implication to focusing efforts on identifying theoretically and empirically supportable recreation values: that the values actually make a difference in forest planning. Sensitivity analysis of the ranking of national alternatives in the most recent RPA Final EIS[8] suggests that recreational values do make a difference at the national level. However, at the regional and forest level, planning may be dominated by a linear programming approach. In this case, specification of objectives and constraints may dominate the effect of marginal values.

A related limitation of the RPA framework in general is the focus on direct use values. The theoretical basis for identifying the total value of fish, wildlife and related resources has been described by a number of analysts.[9] In addition to the direct (on site) recreational use, there are indirect uses associated with option, existence and bequest motives.[10] In practice, RPA values have ignored this category of values. A growing body of empirical literature indicates that these values may be substantial for a variety of resources.[11]

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8. U.S. DEP'T OF AGRIC., U.S. FOREST SERVICE, FINAL ENVIRONMENTAL IMPACT STATEMENT, 1985-2030 RESOURCES PLANNING PROGRAM F-13 (FS-403, 1986) [hereinafter RPA-FEIS].

9. *See, e.g.*, Randall & Stoll, *Existence Value in a Total Valuation Framework*, in MANAGING AIR QUALITY AND SCENIC RESOURCES AT NATIONAL PARKS AND WILDERNESS AREAS (R. Rowe & L. Chestnut eds. 1983); U.S. DEP'T OF AGRIC., FOREST SERVICE, GENERAL TECHNICAL REPORT RM-148, TOWARD THE MEASUREMENT OF TOTAL ECONOMIC VALUE (G. Peterson & C. Sorg eds. 1987).

10. Krutilla, *Conservation Reconsidered*, 57 AMERICAN ECON. REV. 777-86 (1967). For example, there may be considerable economic value associated with species preservation or knowing that a particular unique environment will be available for future generations to enjoy.

11. *See, e.g.*, Greenley, Walsh, & Young, *Option Value: Empirical Evidence from a Case Study of Recreation and Water Quality*, 96 QUARTERLY JOURNAL OF ECONOMICS 657-73 (1981); Brookshire, Eubanks & Randall, *Estimating Option Prices and Existence Values for Wildlife*

These issues will be reexamined at the close of the paper after reviewing the empirical literature and policy application.

II. Definitions of Value, Methods and Standards

A. *Concepts of Value*

Economic benefits or values are defined here for recreational services as net willingness to pay. This is the net difference between the maximum an individual would be willing to pay before foregoing the use of a resource or commodity and the amount they must actually pay. This measure is widely accepted by economists as the appropriate measure in applied welfare economics.[12]

In general, use of the net willingness to pay measure provides a theoretically consistent measure of the allocative impacts of policy choices. Recreational values developed on this basis can be used to evaluate tradeoffs with marketed commodities (such as timber) and to identify the net effect of a given resource allocation decision. Implicit in this formula is economic efficiency, maximizing the net present value of a given resource from the standpoint of society.

Net willingness to pay is distinct from recreation expenditures. The latter information is useful for defining the relationship between the recreation activity and the local or regional economy. For example, one might estimate the number of jobs or the personal income generated by a given recreation resource. This type of regional economic analysis may also be relevant for policy decisions, but only if one is willing to deviate from strict economic efficiency and include distributive or other social choice criteria.

With specific regard to planning on the national forests, Krutilla and Haigh support the application of basic applied welfare economics principles. They argued that the principal goal of the Forest Service, when viewed in the context of the politico-economic rationale for public intervention, is to manage the national forests and rangelands to achieve economically efficient resource allocations.[13] They also concluded in their review that the basic legislation governing the Forest Service (particularly RPA) is generally consistent with this goal.[14]

Resources, 59 Land Economics 1-15 (1983); Fisher & Raucher, *Intrinsic Benefits of Improved Water Quality: Conceptual and Empirical Perspectives* in 3 Advances in Applied Micro-Economics (V.Smith & A. Witte eds. 1984).

12. R. Just, D. Hueth & A. Schmitz, Applied Welfare Economics and Public Policy (1982).

13. Krutilla & Haigh, *An Integrated Approach to National Forest Management*, 8 Envtl. L. 373-415 (1978).

14. *Id.*

B. *Methods for Estimating Recreational Values*

The two most widely used methods for estimating net willingness to pay for outdoor recreation are the contingent valuation method (CVM) and the travel cost method (TCM).[15] The travel cost approach uses observations of travel distance and costs as a measure of price, and trips taken as a measure of quantity, to statistically identify a site demand function. The resulting first stage or per capita demand equation allows the analyst to calculate the additional amount recreationists would pay over and above their actual travel cost for site access.[16]

In the CVM approach, individuals are directly surveyed as to their willingness to pay for the services of a given resource contingent on the existence of a hypothetical market situation.[17] This is a very flexible technique, and it has been applied to a wide range of environmental and resource issues including air and water quality changes, scenic beauty, and wildlife.[18] The only limitation of the method is the ability of the researcher to frame understandable questions and the willingness and ability of the respondent to accurately value the good or service.

Of the two approaches, the travel cost model has been the most widely used. However, to date, both procedures have been widely applied for recreational valuation. In a recent review of recreation economic demand studies, Walsh, Johnson and McKean identified 120 separate studies providing 285 site and/or activity specific estimates of recreational value. Of these, 156 were based on the TCM approach and 129 were CVM.[19] Smith and Kaoru identified 72 TCM studies providing 722 specific estimates.[20]

An appealing aspect of the TCM approach is that it is in part based on

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15. These are also the two general methods recommended by the U.S. Water Resources Council (1979, 1983) for valuing recreation in federal cost-benefit analysis.

16. This method was first suggested in 1947 by a Harvard economist, Harold Hotelling, in a letter to the director of the National Park Service. The first application was by M. CLAWSON, METHODS OF MEASURING THE DEMAND FOR AND VALUE OF OUTDOOR RECREATION (1959). The basic travel cost method is detailed in M. CLAWSON & J. KNETSCH, ECONOMICS OF OUTDOOR RECREATION (1966); and J. Dwyer, J. Kelly & M. Bowes, Improved Procedures for Valuation of the Contribution of Recreation to National Economic Development (1977) (unpublished technical report, Water Resources Center Report No. 128).

17. The contingent valuation method was first applied in 1963 in a study of recreational use of the Maine woods. R. Davis, The Value of Outdoor Recreation: An Economic Study of the Maine Woods (1963) (unpublished Ph.D. dissertation, Harvard University).

18. R. CUMMINGS, D. BROOKSHIRE & W. SCHULZE, VALUING ENVIRONMENTAL GOODS (1986).

19. R. Walsh, D. Johnson & J. McKean, Review of Outdoor Recreation Economic Demand Studies with Nonmarket Benefit Estimates 18 (Dec. 1988) (Colorado Water Resources Research Institute Technical Report No. 54, available from Colorado State University, Fort Collins, CO).

20. V.K. SMITH & Y. KAORU, SIGNALS OR NOISE? EXPLAINING THE VARIATION IN ENVIRONMENTAL BENEFIT ESTIMATES (1988).

actual observed behavior (trips taken). However, the recreationist's perceived price must be inferred from cost data and behavior. A persistent problem is identifying the value that should be associated with travel time. The usual approach is to value the opportunity cost of time at some fraction (usually one-third) of the wage rate.[21] The major potential limitation of CVM is that responses may be biased because of the hypothetical nature of the question, because of information or cues provided by the interviewer, or because of strategic behavior by the respondent. Researchers have addressed these and related issues, and the general consensus is that CVM is a workable method.[22] There is also a body of literature that has addressed the validity of these methods either through side by side comparisons[23] or through comparison to actual cash transactions.[24]

C. *Standards for Estimation of Nonmarket Values*

The early development of applied welfare economic procedures for natural resource issues was mainly in the water resources field. This is in part because Congress specified that benefits must exceed costs for a project "to whomsoever they may accrue."[25] This legislation required that projects meet a benefit-cost test for economic feasibility to be eligible for authorization.[26] As noted by Walsh, Johnson and McKean, specific benefit-cost procedures were first promulgated by the authorization of Congress in 1962.[27] The methods established were to be used in planning

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21. Cesario, *The Value of Time in Recreation Benefit Studies*, 52(2) LAND ECONOMICS 32-41 (1976).

22. *See, e.g.*, R. CUMMINGS, D. BROOKSHIRE & W. SCHULTZE, *supra* note 18.

23. *See, e.g.*, Knetsch & Davis, *Comparison of Methods for Recreation Valuation*, in WATER RESEARCH (A.Kneese & S. Smith eds. 1965); W. DESVOUSGES, V. SMITH, & M. MCGIVNEY, A COMPARISON OF ALTERNATIVE APPROACHES FOR ESTIMATING RECREATION AND RELATED BENEFITS OF WATER QUALITY IMPROVEMENTS (EPA-230-05-83-001, 1983); Thayer, *Contingent Valuation Techniques for Assessing Environmental Impacts: Further Evidence*, 8 J. OF ENVIRONMENTAL ECON. AND MANAGEMENT 27-44, (1981); Duffield, *Travel Cost and Contingent Valuation: A Comparative Analysis*, in 3 ADVANCES IN APPLIED MICRO-ECONOMICS (V. Smith & A. Witte eds. 1984); Seller, Stoll & Chavas, *Valuation of Empirical Measures of Welfare Change: a Comparison of Nonmarket Techniques*, 61 LAND ECONOMICS 156-75 (1985).

24. Bishop & Heberlein, *Measuring Values of Extramarket Goods: Are Indirect Measures Biased?* 61(5) AM. J. OF AGRICULTURAL ECONOMICS 926-30 (1979); M. Welsh, Exploring the Accuracy of the Contingent Valuation Method: Comparisons with Simulated Markets (unpublished Ph.D. dissertation, University of Wisconsin, 1986).

25. Flood Control Act of 1936, ch. 688 § 1, 49 Stat. 1570, (codified as amended at 33 U.S.C. 701-09 (1982)). Section 701(a) states in relevant part, "[T]he Federal Government should improve or participate in the improvement of navigable waters or their tributaries, including watersheds thereof, for flood-control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected."

26. *Id.*; *see, e.g.*, J. KRUTILLA & O. ECKSTEIN, MULTIPLE PURPOSE RIVER DEVELOPMENT (1958).

27. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 3 (discussing Sen. Doc. 97 (1962)).

water and related resource development by federal agencies. With regard to recreation, the first formally approved approach was the so-called "unit day value method."[28] Also in 1964, the Water Resources Council was established to administer the guidelines. The guidelines were revised in 1973 to allow the use of TCM and again in 1979 to include CVM.[29] Most recently, the U.S. Department of Interior has issued regulations governing natural resource damage assessments under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980[30] that utilize CVM and TCM methods as appropriate.[31]

Because the unit day value method is still widely applied by federal agencies, it is useful to briefly characterize this "official" approach. The unit day values were originally derived from a survey of entrance fees at private recreation areas undertaken in 1962.[32] Unit day values provided by the U.S. Water Resources Council since then have been adjusted for changes in the consumer price index.[33] The application of the method relies on expert judgement to select from a range of possible unit day values based on the characteristics of the site in question. The value range in the most recent U.S. Water Resources Council guidelines is $1.60 to $4.80 for general recreation, $2.30 to $4.80 for general fishing and hunting, $11.20 to $19.00 for specialized fishing and hunting, and $6.50 to $19.00 for other specialized recreation.[34] Since unit day values are prices, not consumer surplus or net willingness to pay, it is not surprising that they differ (are generally lower than) from the estimates derived from TCM and CVM. This may also in part reflect the average quality of priced recreational sites such as campgrounds, picnic areas or state parks rather than the potentially very valuable resource-based services of major wilderness areas, big game hunting sites, or fishing sites. In any case, the unit day values noted here are for July, 1982 price levels and can be contrasted with the average of TCM and CVM recreation studies identified by Walsh, Johnson and McKean for 1968-82 which is $32.76 (1982 dollars) based on 120

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28. S. DOC. NO. 97, 93D CONG., 1ST SESS., SUPP. NO. 1 (1964). This approach essentially identified fixed per day values for a variety of recreation activities, varying with somewhat casually defined quality criteria.

29. U.S. DEP'T OF AGRIC., WATER RESOURCES COUNCIL GUIDELINES (1973). Authorization of all three methods was reaffirmed in a 1983 edition of the guidelines. U.S. DEP'T OF AGRIC., WATER RESOURCES COUNCIL GUIDELINES (1983).

30. Pub. L. 98-80, 97 Stat. 485 (1980) (codified as amended in scattered sections of 42 U.S.C.).

31. U.S. DEPT. OF INTERIOR, REGULATIONS GOVERNING DAMAGE ASSESSMENT UNDER CERCLA (1986).

32. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 4.

33. *Id.* at 7.

34. U.S. DEP'T OF AGRIC., U.S. WATER RESOURCES COUNCIL GUIDELINES Table VII-3-1, 84 (1983).

studies.[35]

To conclude this section, travel cost and contingent valuation are widely accepted and applied methods for valuing recreational resources. These procedures are in fact required by federal standards for the evaluation of certain types of resource development actions.

III. Development of 1985 RPA Values for Recreation and Fish and Wildlife

A. *Introduction*

This section addresses how the Forest Service developed the RPA values for recreation and fish and wildlife that are currently in use. The basic issues are whether the values are consistent with economic theory and an accurate reflection of the results of empirical literature.

The focus of the following discussion is on the most recently completed RPA program, that for 1985. However, as background, it should be noted that the initial 1980 RPA values were largely based on the U.S. Water Resources Council unit day values. For example, the value selected for general recreation was $3.50 and the value for wilderness recreation was $8.00.[36] While a review of the empirical literature was included in the RPA process that established these 1980 values, the final outcome was evidently dominated by the official unit day value schedules.[37] In 1985, the approach to developing RPA estimates shifted to a greater reliance on the empirical literature. This created a conflict in that values reported in the literature were largely derived from CVM and TCM studies and were substantially higher than the unit day values used by the agency.

The 1985 RPA values were specifically based on a review of the recreation valuation literature. Values were required for 17 types of recreation activities in each of nine Forest Service regions.[38] This discussion will begin by describing the methods and findings of the recreation literature review. Then, a description of the interpretation of these results in the RPA Program Final Environmental Impact Statement can follow.

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35. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 28. This average is obviously considerably above the range of even the specialized recreation unit day values. The range of values identified in the 120 studies is from $4 to $155. *Id.*

36. RPA-FEIS, *supra* note 8, at Appendix F.

37. *See*, Dwyer, Estimating Recreational Values for the 1980 RPA Program (unpublished paper presented at RPA Workshop of Resources Value, Washington, D.C., 1978).

38. The recreation activities include anadromous, cold water, warm water and salt water fishing; big game, small game, waterfowl and upland game hunting; motorized and nonmotorized boating; motorized travel, camping, picnicking, hiking, wilderness, downhill skiing and water sports. RPA-FEIS, *supra* note 8, at F-12.

B. *Loomis and Sorg Recreation Literature Review*

In order to identify RPA values for recreation and fish and wildlife, the Forest Service contracted with specialists in range, water, recreation and wildlife valuation to develop region and activity specific values. John Loomis, then at the Department of Economics of Colorado State University, and Cindy Sorg, an economist at the U.S. Forest Service Rocky Mountain Range and Experiment Station, took the lead responsibility in developing preliminary values. Their work resulted in a final project report[39] and a later technical report.[40]

To put the problem in perspective, it is useful to note that identifying values for the 17 specific activities for nine regions requires a matrix of 153 values. Based on the Loomis and Sorg bibliography, only about 36 activity specific estimates were available at the time Dwyer undertook his review in 1978.[41] Even in 1982, Loomis and Sorg were able to identify only 95 activity and region specific estimates based on 36 separate studies.[42] Additionally, available studies are not evenly distributed across types of recreation activities; they have been primarily conducted on fishing and hunting. For example, 30 of the 95 estimates identified by Loomis and Sorg were for either big game hunting or cold water fishing.[43] By contrast, values for certain activities had to be judgmentally identified for nine different regions based on a single study.[44] Both Dwyer and Loomis and Sorg explicitly note that surveys of the literature are not perfect substitutes for actual region and activity specific studies.[45]

The major tasks faced by Loomis and Sorg were to identify relevant studies, put the studies in comparable terms including updating to 1982 dollars and finally adjust older studies to make them consistent with current theoretical and empirical practice. To assist them in developing procedure and to review their results, a panel of formal reviewers was commissioned.[46]

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39. Loomis & Sorg, A Critical Summary of Empirical Estimates of the Values of Wildlife, Wilderness, and General Recreation Related to National Forest Regions (1982) (unpublished Rocky Mountain Forest and Range Experiment Station Report, available from Colorado State University, Fort Collins, CO).

40. C. SORG & J. LOOMIS, EMPIRICAL ESTIMATES OF AMENITY FOREST VALUES: A COMPARATIVE REVIEW, U.S. DEP'T OF AGRICULTURE, FOREST SERVICE GENERAL TECHNICAL REPORT RM-107 (1984).

41. *See*, Dwyer, *supra* note 37.

42. C. SORG & J. LOOMIS, *supra* note 40, at 1.

43. *Id.* at 7 and 11, Table 2 and Table 4.

44. Loomis & Sorg, *supra* note 39, at 44, 68, 84, 107. This was the case in 1982 for downhill skiing, salt water fishing, motorized travel and upland game hunting.

45. Dwyer, *supra* note 37; Loomis & Sorg, *supra* note 39, at 1.

46. The panel included William Brown, Oregon State University; David King, University of Arizona; Richard Walsh, Colorado State University; Elizabeth Wilman, Resources for the Future; and

Summarizing the specific adjustments, all values were first inflated to January 1982 price levels using the GNP price deflator.[47] Values that were on a trip basis were divided by days per trip so that values were consistently per activity day or occasion.[48] Additionally, because the Forest Service reports current and future recreational use on the basis of a 12-hour recreational visitor day (RVD), it was necessary to put values on a 12 hour basis.[49] Where a given study gave an estimate of the specific hours for the activity (say 6 hours per day) then the values were converted to a 12-hour RVD on that basis (multiplied by two for this example).[50]

The other adjustments applied only to specific methodologies. For example, travel cost model studies that did not include the value of travel time were increased by 30 percent based on results in the literature.[51] Similarly, travel cost studies that were restricted to in-state visitors were increased by 15 percent. Travel cost studies that utilized the individual observations model were adjusted downward by up to 30 percent to correct for changes in the probability of participation with increased travel cost.[52] Finally, contingent valuation studies that did not identify so-called "protest" responses (individuals not participating in the valuation exercise as a protest - for example, against fee fishing or hunting, etc.) were increased by 15 percent. In practice, most studies required at least one of these "methodological adjustments".[53]

To illustrate the development of specific values, it is useful to focus on several region and activity specific estimates. For example, hunting and fishing in Region 1 (Northern Idaho, Montana and North Dakota) are typical in that no region specific estimates were available for these activities. Instead, estimates from a similar region, the Intermountain Region (4) including Southern Idaho, Western Wyoming, Utah and

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Dennis Schweitzer, Gary Elsner and Don Rosenthal, all of the Forest Service.

47. Loomis & Sorg, *supra* note 39, at 5.

48. *Id.* at 6.

49. *Id.* Values related to fish and wildlife are in terms of a 12 hour wildlife and fish user day (WFUD). Since the RVD and WFUD are conceptually equivalent, for brevity, only the term RVD is employed in the following discussion.

50. *Id.*

51. *Id.* at 7; *see*, Ward, The Demand for Value of Recreational Use of Water in Southeastern New Mexico 1978-79 (1982) (unpublished Report No. 465, available from Agricultural Experiment Station, N. Mex. State University).

52. *See* W. Brown, F. Nawas, & J. Stevens, The Oregon Big Game Resource: An Economic Evaluation (1973) (unpublished Agricultural Experiment Station Special Report 379, available from Oregon State University).

53. Loomis, Unpublished Lecture Notes, U.C. Davis (1989). For example, of the 30 big game hunting and cold water fishing studies reported in Sorg and Loomis (1984), seven studies were adjusted to include either travel time or for an in-state sample, two studies were adjusted for both travel time and in-state sample, and no studies were adjusted for application of the individual observations model. C. SORG & J. LOOMIS, *supra* note 40, at 38.

Nevada, were judgmentally adjusted.[54] The Region 4 estimate for big game hunting is $50 per activity day.[55] The original values ranged from $9.34 for Utah deer hunting in 1970 to $32.73 for all species big game hunting in Idaho in 1976. Adjusted for inflation and methodology, the revised values ranged from $18.81 to $65.00.[56] Because the lowest values were for antelope hunting only, while the upper value was for all big game species in the highest quality sites (Idaho), a value of $50 was judgmentally chosen.[57] Because big game hunting quality and scarcity were judged to be similar for Region 1 and 4, the big game value for Region 1 was also set at $50.[58]

The approach for cold water fishing was similar, with no specific estimates available for Region 1, but in this case there were three specific estimates for Region 4 available.[59] The original values ranged from $3.65 to $12.93 per day and the adjusted from $11.57 to $15.69. Because these studies were largely for Idaho, Loomis and Sorg felt that the scarcity of cold water fishing in Nevada and Utah called for adjusting the regional value upward to $17.[60] For cold water fishing, there were additionally two national level studies which reported adjusted values as respectively $24.17 and $16.50 per activity day.[61] Based on these findings, Loomis and Sorg's discussion of Region 1 is as follows: "Montana possesses some very high quality cold water fishing, however, North Dakota's quality is not as good. As a whole, the region is probably comparable with the national average. Since this region has a large supply relative to the population, a lower bound to the national average seems appropriate."[62] The suggested value was $17.00.[63]

Loomis and Sorg did a careful and highly professional job in their

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54. Loomis and Sorg, *supra* note 39, at 20.

55. *Id.* at 34. This figure is derived from the following four studies: Wennergren, Estimation of Quality and Location Values for Resident Deer Hunting in Utah (1973) (unpublished bulletin, Utah Agricultural Experiment Station, No. 448, available from Utah State University); Hansen, A Report on the Value of Wildlife (1977) (unpublished report, U.S. Dep't of Agriculture, U.S. Forest Service, Intermountain Region, Ogden, Utah); Brown & Plummer, An Economic Analysis of Nontimber Uses of Forestland in the Pacific Northwest (1979) (unpublished report, Forest Policy Project, Washington State University); Loomis, *Use of Travel Cost Models for Evaluating Lottery Rationed Recreation: Application to Big Game Hunting*, 14(2) JOURNAL OF LEISURE RESEARCH 117-124 (1982).

56. C. SORG & J. LOOMIS, *supra* note 40, at 7, Table 2.

57. Loomis & Sorg, *supra* note 39, at 32.

58. *Id.* at 34.

59. Hansen, *supra* note 55; U.S. DEP'T OF INTERIOR, FISH AND WILDLIFE SERVICE, NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE ASSOCIATED RECREATION, (1980) [hereinafter USFWS].

60. Loomis & Sorg, *supra* note 39, at 57.

61. Vaughan & Russell, *Valuing a Fishing Day: An Application of a Systematic Varying Parameter Model*, 58(4) LAND ECONOMICS 450-63 (1981); USFWS, *supra* note 59.

62. Loomis & Sorg, *supra* note 39, at 59.

63. *Id.*

literature review and additionally enlisted the help of a competent review panel. Nonetheless, it is clear that considerable judgment was required to make up for the lack of specific empirical estimates. The narrative with regard to cold water fishing in Region 1 is particularly telling. The net result of regional aggregation, lack of site specific estimates and judgment as to the relative quality (and quantity) of cold water fishing in Montana and North Dakota has left some of the country's premier trout streams, such as the Big Hole, Beaverhead, Gallatin, and Madison valued at "the lower bound to the national average."[64] As discussed below, the availability of Montana-specific estimates should provide some correction to this situation in the 1990 RPA, but this ignores a fundamental problem, whether it is appropriate to use regional values where considerable variation may exist across the region.

C. *Interpretation of RPA Values by the U.S. Forest Service*

This section addresses how the Forest Service utilized region and recreation activity specific values derived by Loomis and Sorg in the development of the final RPA values. The general picture appears to be one of resistance on the part of upper level administrators in the Forest Service and Department of Agriculture to adopting recreational value estimates that were higher than those historically derived from the unit day value method. Specifically, Loomis and Sorg's estimates were revised downward by inconsistent use of the conversion to 12-hour RVD's and by what seem to be arbitrary revisions to the original adjustments for inflation and methodology described above.[65]

Loomis and Sorg completed the initial draft of their 1982 document in the summer of 1982. A preliminary draft using a full conversion to 12 hour RVD's was rejected by Forest Service staff in Washington, D.C. as unacceptable and not subject to further review.[66] As will be recalled from the preceding discussion, the value of a 12-hour RVD is the value of 12 hours of the given activity. Accordingly, if an activity such as hunting takes 6 hours per day, and the value per activity day or occasion is $20, an RVD value of $40 is implied. Similarly, if the length of stay is even shorter, say two hours per day for an activity like swimming, then even at $10 per occasion, the RVD value is $60. Apparently RVD values in this range were rejected out-of-hand as being too high since the Forest Service had previously been using values more in the range of $3.50 per RVD based on

64. C. SORG & J. LOOMIS, *supra* note 40, at 5.

65. This narrative is in part based on a personal communication with John Loomis in 1989, though he is in no way responsible for the interpretation provided here.

66. *Id.*

the unit day value method.[67]

Based on this response and other reviewer comments, Loomis and Sorg revised their estimates and presented them in a report in December 1982.[68] Their approach, taken with regard to conversion to RVD's, was to do the full conversion when specific information on hours per day for the activity for the particular study was available.[69] After reviewing the 1982 document, it appears that this specific information was seldom available. Instead, Loomis and Sorg used a common convention to judgmentally determine whether the activity was likely to make up the better part of a day (7 hours or more). If the latter held, they assumed that activity days were equivalent to RVD's. For activities taking a half day or less (1-6 hours), the value was doubled.[70] These conventions, of course, result in a conservative value per RVD. For example, for the specific big game and cold water fishing values used for Region 1 as discussed above, the original estimates are for activity days at around $50 and $17 respectively. These were assumed to be activities which took up the better part of the day, and accordingly, RVD's for this particular example were also valued at $50 and $17.[71]

This is an important error. The current research specific to Montana indicates that the average day of cold water lake and stream fishing in Montana is 3.5 hours and the average day of elk and deer hunting is 6.4 hours long.[72] Other things equal, the rejection by the Forest Service of the "full conversion" to 12-hour days results in an underestimate of the value of cold water fishing in the 1985 RPA by a factor of 3.4 and an underestimate of big game RVD's by a factor of 1.9. In other words, based on Loomis and Sorg, the Region 1 RVD's for cold water fishing and big game hunting should have been valued at $58 and $94 respectively.

Continuing the narrative on development of the final 1985 RPA values, the 1982 Loomis and Sorg report was circulated to Forest Service and EPA offices between April and August 1983. In October, 1983, the Forest Service circulated draft "adjusted" 1985 RPA values in a memo from the Chief, Max Peterson; all values had been reduced by 37.5 percent from the Loomis and Sorg estimates.[73] In January, 1984, the Draft RPA

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67. *Id*

68. Loomis & Sorg, *supra* note 39.

69. *Id.* at 5.

70. *Id.* at 6.

71. *Id.* at 34, 59.

72. Duffield, Loomis, & Brooks, The Net Economic Value of Fishing in Montana (1988) (unpublished report available from Montana Dep't of Fish, Wildlife and Parks); Brooks, The Net Economic Value of Deer Hunting in Montana (1988) (unpublished report, Montana Dep't of Fish, Wildlife and Parks); Duffield, The Net Economic Value of Elk Hunting in Montana (1988) (unpublished report, Montana Dep't. of Fish, Wildlife and Parks).

73. Personal communication from John Loomis to John Duffield (1989).

EIS was published and distributed and included both the original Loomis-Sorg estimates and estimates with a reduction by 37.5 percent.[74]

The explanation for the 37.5 percent reduction was that willingness to pay values had been reduced to be comparable to market prices.[75] This was based on a study which estimated that nationally a five-percent increase in price will result in a one-percent decrease in quantity demanded.[76] The Forest Service explained:

> It was assumed, therefore that a one-percent increase in the supply of recreation opportunities would result in a five-percent decrease in price to clear the market. In the DEIS, a five percent decrease in the willingness to pay values was calculated for each one percent of the 7.5 percent share of the RVD and WFUD market supplied by the Forest Service, resulting in a total reduction of 37.5 percent.[77]

This adjustment is inappropriate in that the recreation "supplied" by the Forest Service was already largely in place at the time the studies reviewed by Loomis and Sorg were undertaken. Additionally, this use of the elasticity measure implies a perfectly inelastic supply, which is unlikely. More fundamentally, dispersed recreational use on a given forest is largely demand driven and more or less unconstrained by the availability of Forest Service recreational facilities.

Between the release of the Draft EIS in early 1984 and publication of the final EIS in 1986, there was considerable interaction between the RPA staff in Washington, D.C. and reviewers (including Sorg and Loomis) concerned that the 37.5 percent reduction was incorrect. In response, the Director of RPA had Charles Palmer, a Forest Service economist, develop new "adjustment" criteria. His findings were that a 45 percent reduction was appropriate.[78] These findings were circulated to Loomis and Sorg in August, 1984. They responded with a letter in September indicating that several adjustments were in error and others did not follow accepted practice.[79] Following further interaction of reviewers and Forest Service staff, final RPA values were published in 1986 reflecting Palmer's 45 percent reduction.[80]

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74. U.S. DEP'T OF AGRICULTURE, U.S. FOREST SERVICE, DRAFT ENVIRONMENTAL IMPACT STATEMENT, 1985-2030 RESOURCES PLANNING PROGRAM, (1984) [hereinafter DEIS].

75. Loomis, *supra* note 73.

76. Lewis, *Policy Formation and Planning for Outdoor Recreation Facilities*, in OUTDOOR RECREATION - ADVANCES IN APPLICATION OF ECONOMICS (U.S. Dep't of Agriculture, Forest Service, General Technical Report WO-2, 1977). The study estimated the price elasticity of demand at -.2.

77. RPA-FEIS, *supra* note 8, at F-10.

78. *Id.*

79. Letter from John Loomis and Cindy Sorg to Charles Palmer, Sept. 1984.

80. RPA-FEIS, *supra* note 8, at F-10, F-11.

Palmer's reductions included a ten percent reduction based on the demand elasticity factor (down from 37.5 percent). The economist reasoned:

> For the FEIS, a correction was made to apply the demand elasticity factor only to those RVDs and WFUDs added between the time of the valuation studies and the RPA initial year of 1986. From 1972 to 1986, RVDs and WFUDs on National Forests are expected to increase from 184 million to 248 million. This sixty-four million increase is two percent of the total outdoor recreation visitor days provided by all sources. A five-percent decrease in price for each one percent of this two-percent supply change resulted in a ten-percent decrease in values, instead of the 37.5 percent decrease in the DEIS.[81]

Even accepting the implicit assumptions of this analysis, the choice of 1972 as a beginning year is arbitrary for studies that were actually reviewed up to 1982.

Looking more closely at the assumptions, this simple, comparative, static model suggests that the average of net willingness to pay results from CVM and TCM studies is an indicator of a national recreational market price level. This market price is further assumed to have dropped by ten percent between 1972 and 1986 due to an increase of two percent in overall recreational supply.[82] As noted above, this model assumes perfectly inelastic supply, which is untenable. Additionally, no other comparative static events are assumed to have occurred. For example, it is possible that the demand side shifts in the same period in response to increased population and changed preferences could easily outweigh the Forest Service supply change and justify overall price level changes in a positive direction. All this ignores the fact that the elasticity estimate is based on a single study reported in 1977. In short, the suggested change appears to be arbitrary and without substantive basis.

The other reductions reported by the Forest Service are minus 15 percent because "market price for recreation has not increased as fast as general inflation."[83] No evidence for a price index for recreation is provided, and it is doubtful that a valid one exists given that the bulk of the recreation activities at issue are unpriced (which is the motivation for the Loomis-Sorg exercise in the first place). Finally, the FEIS includes an additional minus 20 percent reduction to correct for "concerns about the impacts of opportunity costs for travel time and out-of-state users."[84] On

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81. *Id.* at F-10.
82. *See* DEIS, *supra* note 74.
83. RPA-FEIS, *supra* note 8, at F-9.
84. *Id.* at F-10.

these issues, the FEIS essentially argues that these corrections are inappropriate for national forest recreation. There is no evidence provided for this assertion, and it is contrary to the findings of the empirical literature. Additionally, the gross minus 20 percent correction is done across the board and reduces the values of all studies - whether or not they were TCM and whether or not the particular study had a travel time or in-state correction.

The arbitrariness of the specific 20 percent reduction can be illustrated for the original Region 4 cold water fishing estimates. There were three studies in this group, two of which were CVM. In the original Loomis and Sorg review, the TCM study was adjusted up by 30 percent for travel time and there were no in-state adjustments.[85] If one strictly averaged the three estimates, the average increase due to travel time and in-state adjustments is plus ten percent. The effect of the FEIS adjustment is to reduce the estimate by minus 20 percent, for a net (arbitrary) change of minus 10 percent. It would have been easy enough, if travel time and in-state corrections were deemed inappropriate, to merely go back to the original and remove these specific increases.

As further example, a comparison of final RPA values and the original Loomis and Sorg values is provided in Table 1 for Region 1 fishing and hunting activities. As described above, the original RVD values were reduced by a total of 47 percent. This is reflected in the change for big game hunting, for example, from $50 to $29 and cold water fishing from $17 to $9. Recall that the original Loomis and Sorg RVD values reported here were actually based on activity days as the Forest Service administrators would not allow "full conversion". Accordingly, the Loomis and Sorg RVD values are equivalent to the Loomis and Sorg original activity day values also shown in Table 1.

Also in Table 1 are the final RPA values by outing (or activity day). It appears that agency staff in Washington, D.C. derived these from the final RPA RVD values by taking the fraction of a 12-hour day that these activities usually consume. For example, the activity day value for big game hunting is $13.60. This reflects an estimate of 5.6 hours of hunting per day (which is 47 percent of a 12 hour day; accordingly, 47 percent of the RVD value of 29 equals 13.60).

This is an interesting and indefensible inconsistency. The original study estimates cited by Loomis and Sorg are all in terms of activity days.[86] Recall that the agency refused to base its estimate of 12-hour RVD values on the fact, that (for example) a day of big game hunting worth $50 only

85. Loomis & Sorg, *supra* note 39, at 9.
86. *See* text accompanying *supra* notes 47-49.

takes around six hours (implying an actual 12-hour RVD value of around $100). However, in going the other direction, the agency converts RVDs to activity or outing values using the full conversion; as a result, the official "outing" value for big game hunting in Region 1 is $13.60. Similarly (because of an apparent estimate of a 4.8 hour cold water activity day), cold water fishing days are worth only $3.22.[87] The net result of all the adjustments and legerdemain here is that the official RPA value for a cold water fishing outing is $3.22, while the original value on which it is based is five times higher, or $17. It would seem that the agency can't have it both ways and should at least have been consistent with something as mechanical as converting from a 6 hour to a 12 hour day value.[88]

To summarize, the adjustments to the results of Loomis and Sorg's empirical literature review by Forest Service staff as reflected in the FEIS appear to be generally arbitrary, incorrect and at odds with the empirical literature. The overall picture appears to be one of higher echelon administrators determined to reduce the values assigned to recreation.[89]

IV. 1990 RPA AND RECENT EMPIRICAL ESTIMATES OF RECREATIONAL VALUE

A. *1990 RPA Review*

Analogous to the 1980 and 1985 RPA process, a comprehensive review of the current empirical literature was undertaken to inform the selection of recreation values for the 1990 RPA.[90] As indicated in Table 2, there has been a considerable increase in the number of studies and estimates available since 1982. Compared to the 95 region and activity specific estimates identified by Loomis and Sorg in 1982, Walsh, Johnson

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87. The actual hours per day for a given recreational activity used by the Forest Service in the 1986 FEIS are similar to those found for Montana. Specifically, the Forest Service estimate of 5.6 hours per day compares with 6.4 hours per day as found by Montana studies. Duffield, *supra* note 72; Duffield, Loomis & Brooks, *supra* note 72. For fishing, the agency estimate is 4.8 hours per day while the Montana studies indicate 3.5 hours per day. *Id.*

88. For comparison, a "consistent" RVD estimate is also included in Table 1. These numbers are based on the Loomis and Sorg activity day values (such as $17 for cold water fishing) and converted to 12-hour RVD values using the hours per outing implicit in the final EIS (for example, 4.8 hours for fishing implying an RVD value of $42). *See* Loomis & Sorg, *supra* note 39, at 6, 36.

89. While beyond the scope of this paper to develop and demonstrate, there is a large body of literature which has examined the goals, behavior and incentive structure of the Forest Service. The conclusion of much of this literature is that the Forest Service is dominated by commodity interests, particularly timber, and will attempt to maintain these interests in the face of competing uses (such as recreation). The picture of the agency created by the recreation RPA value development is certainly consistent with this hypothesis. This finding of agency bias distorting analytical procedures is certainly not a new one. As noted previously, the longest standing application of benefit-cost analysis has been in the water resources field. That is also where one finds the longest standing history of low discount rates, long time horizons, and incomplete and erroneous benefit and cost estimates.

90. R. Walsh, D. Johnson & J McKean, *supra* note 19.

and McKean reviewed 287 estimates in their 1988 paper.[91] This increased availability of estimates is also reflected in the specific recreation categories of big game hunting (up to 56 estimates from 15 in 1982) and cold water fishing (up from 15 to 40 estimates).[92] While previous reviews for Region 1 found no estimates for big game hunting or cold water fishing, by 1988 (Table 2), 10 such estimates were identified (8 of these for hunting).[93]

While there has been a substantial increase in the number of studies available, there are still a number of blanks in the full matrix of activity by region values required by the RPA process. For the 1990 RPA, there are 19 activity types or a total of 171 specific values, but values for certain cells are still not available because studies are not evenly distributed across activity or region. For example, while Region 2 (Rocky Mountain) has 56 specific estimates, Region 1 has only a total of 15, the fewest of any region.[94] Within Region 1, 10 of the 15 are for cold water fishing and big game hunting. There is only one available estimate in Region 1 for each of five other activities and no estimates for 12 other types of recreation activities.

The fact that Region 2 has had a large number of studies may be partly because the Forest Service's lead experiment station for recreational research (the Rocky Mountain Station) is located in Fort Collins. The current distribution of studies should have some implications for the allocation of future recreation research support by the Forest Service. There is a need to undertake studies in areas outside Region 2 and for recreation activities besides hunting and fishing, such as non-consumptive fish and wildlife enjoyment. Of course many past studies have been supported by state fish and game agencies, rather than federal sources; the preponderance of fishing and hunting studies reflects this sponsorship.

Walsh, Johnson and McKean did not attempt to provide estimates for all cells in the RPA region-activity matrix. Rather, they reported averages of the available estimates. In addition, these authors provided an innovative statistical test of the adjustments undertaken by Loomis and Sorg in 1982 that were an issue in the 1985 RPA final EIS. Specifically, they developed a regression model that examines the relationship of 287 estimated values from their literature review to descriptive variables that might explain differences across estimates.[95] The variables investigated have to do with method (a dummy variable for CVM versus TCM), type of site (national forest or other), location (region) and activity type (big game

91. *Id.* at 8.

92. *Id.* at 64-7 and 79-82.

93. *Id.*

94. *Id.* For a comparison of recreation studies available for RPA review by year, see table 2.

95. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 18-24. *Compare*, Smith & Kaoru, *supra* note 20.

hunting).[96] Of primary interest are their "method variables" that relate to the three adjustments undertaken by Loomis and Sorg: omission of travel time, use of individual observations, and use of only instate samples at sites with out-of-state users. They reported that the increase in original values by 30 percent for omission of travel time appears about right because the statistically significant coefficient for the dummy variable representing this method indicates that TCM benefits are about 34 percent less for the 30 studies omitting travel time cost.[97] Similarly, the 15 percent increase for omission of out of state visitors is supported by the statistical results.[98] However, the individual observation adjustment used by Loomis and Sorg of minus 15 percent seems quite conservative because the statistically significant coefficient estimated by Walsh, Johnson and McKean indicates that benefits are 46 percent greater for the 52 TCM studies using individual observations.[99]

The authors also note an insignificant coefficient on the dummy variable for Forest Service administered sites. This supports use of recreation estimates that are not specific to the national forests.[100] The study also indicates other possible adjustments for TCM, such as for the incorporation of substitute measures.[101] Given their finding that CVM estimates are persistently lower than TCM by an average of 25 percent, there may be a case for adjusting the entire set of CVM estimates upward to be consistent with the behavior-based TCM results.

The basic conclusion of Walsh, Johnson and McKean on these issues is that their research tends to support the Loomis and Sorg approach. In any case, they reported that average benefits are nearly identical between adjusted and unadjusted results because of offsetting effects.[102]

Turning to specific results for Region 1, Walsh, Johnson and McKean identified four studies that provide eight specific Region 1 big game hunting estimates.[103] As is typical of more recent studies (which are likely to be using current methodological conventions), no adjustments to the original estimates were necessary (except for a slight price index adjustment to 1987 dollars). The average value based on these studies is

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96. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 5-9.

97. *Id.* at 20.

98. *Id.*

99. *Id.*

100. *Id.* at 22.

101. *Id.* at 21-4.

102. *Id.* at 109.

103. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 65, Table 15 (citing Brooks, *supra* note 72); Duffield, *supra* note 72; Loomis & Cooper, The Net Economic Value of Antelope Hunting (1988) (unpublished report, Montana, Mont. Dep't. of Fish, Wildlife and Parks); and Hay, Net Recreation Value for Deer, Elk and Waterfowl Hunting and Bass Fishing (1988) (U.S. Fish and Wildlife Service, Report 85-1).

$41.72.[104] Similarly, one Region 1 cold water fishing study was identified.[105] The two estimates average $42.46.

These averages can be compared to the Loomis and Sorg estimates after they are corrected to 1987 dollars. The big game values differ by about 40 percent ($59 for Loomis and Sorg versus $42), while the Loomis and Sorg fishing value estimate of $20 is less than half the region 1 average of $42 identified in the Walsh, McKean and Johnson review.[106]

It is not known at this point how the 1990 RPA values will be derived. However, presuming that the Walsh, Johnson and McKean Region 1 averages are accepted and a conversion to 12-hour RVDs is made on the same assumed hours per activity occasion as the 1985 RPA (Table 1), Region 1 RVD values of $117 for cold water fishing and $90 for big game hunting would be indicated.

B. *Recent Empirical Estimates For Region 1*

The Region 1 estimates noted in Walsh, Johnson and McKean may well be the basis of that region's 1990 RPA values for recreation. With the exception of a paper by Hay,[107] Walsh, Johnson and McKean referenced papers that are all part of a larger study, the Montana Bioeconomics Project.[108] The project was undertaken between 1985 and 1988 and cost $306,000. A primary and explicit objective of this project was to provide estimates of net willingness to pay consistent with federal guidelines and suitable for use by the U.S. Forest Service and the Bureau of Land Management in resource planning and evaluation on lands in Montana.[109] Since the project represented a major investment by the State of Montana, there is considerable interest in seeing its application in federal planning for fish, wildlife and recreation. The remainder of this section provides a brief overview of the project, a summary of major findings, and comments on the estimates selected by Walsh, Johnson and McKean.

The Montana Bioeconomics project entailed five major mail or phone surveys of anglers and hunters with a total sample of approximately 50,000 completed surveys. Five regional (multi-site) travel cost models were

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104. M. Walsh, Exploring the Accuracy of the Contingent Valuation Method: Comparisons with Simulated Markets (1986) (unpublished Ph.D. dissertation, University of Wisconsin, Madison).

105. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 81, Table 18 (citing Duffield, Loomis & Brooks, *supra* note 72).

106. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 81, Table 18; *see* Loomis & Sorg, *supra* note 39.

107. Hay, *supra* note 103.

108. This project was a major assessment of Montana fishing and hunting resources that was undertaken as a cooperative project of Montana Department of Fish, Wildlife and Parks and the University of Montana.

109. *See, e.g.*, Duffield, Loomis & Brooks, *supra* note 72 at 1-2.

estimated including cold water lake and stream fishing and deer, elk and antelope hunting. The travel cost models covered all sites in the state for a given use. Two detailed contingent valuation studies were undertaken that focused on 17 "blue-ribbon" trout streams and on the state's major elk hunting districts.[110] In terms of the scope and techniques employed, this study may well represent the most comprehensive assessment of a single state's fish and wildlife resources to date.

Of the study's many findings, only those that directly relate to the assessment by Walsh, Johnson and McKean will be discussed. For big game estimates in Region 1, two papers were cited.[111] Walsh, Johnson and McKean reported two estimates for each of these studies. For example, the values for deer per activity day are listed as $20.88 and $54.94.[112] One estimate is based on the U.S. Water Resources Council "standard" procedures for converting distances to travel costs,[113] and the other is based on hunter reported travel costs.[114] The standard cost is based on the variable costs of travel for a new car estimated by the U.S. Department of Transportation in 1984 plus the travel time adjustment based on a 1976 study.[115] A strong case can be made that the U.S. Water Resources Council procedures are outdated and inappropriate.[116] A better approach is to use the recreationist's reported travel costs (which include all variable out of pocket costs including food and lodging). There is in fact, some precedent in the literature for use of reported costs.[117] In any case, Walsh, Johnson and McKean chose to average the two estimates ("standard" and "reported") for Region 1 big game hunting.

With regard to fish, Walsh, Johnson and McKean again reported estimates from the multi-site travel cost models,[118] but in this case they reported only standard costs (for cold water lake and stream respectively at $32 and $48 per day respectively).[119] For some reason (and unlike the treatment of the big game estimates), the actual "reported" cost estimate

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110. *Id.*

111. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 65, Table 15 (citing Brooks, *supra* note 72); Duffield, *supra* note 72; Loomis & Cooper, *supra* note 103. These are the regional TCM studies for deer, elk and antelope, using a 1985 data base.

112. *See* Brooks, *supra* note 72.

113. The standard conversion used by Water Resources Council (1983) was 13 cents per mile. U.S. DEP'T OF AGRIC., *supra* note 29.

114. 37 cents per mile found by Brooks, *supra* note 72.

115. Cesario, *supra* note 21.

116. For a general discussion of this issue, see Duffield, Loomis & Brooks, *supra* note 72.

117. *See e.g.*, Burt & Brewer, *Estimation of Net Social Benefits from Outdoor Recreation*, 39 ECONOMICS 813-27 (1971).

118. Duffield, Loomis & Brooks, *supra* note 72.

119. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 81, Table 18.

is not included.[120] If treatment of fishing had been symmetrical to that for hunting, the cold water fishing estimate average would be $63 (original estimates) or $67 using the Walsh, Johnson and McKean adjustment to 1987 dollars.[121] Obviously, an estimate for Region 1 hunting or fishing is sensitive to selection of the basis for converting distance to travel cost. With fishing, it could range from $42 (based on standard cost minus the estimate selected by Walsh, Johnson and McKean) to $67 (using the average of standard and reported) to $91 (reported costs).

Unfortunately, the Walsh, Johnson and McKean review was evidently completed before the contingent valuation results for elk and cold water stream fishing were available.[122] The contingent valuation studies provide additional estimates and an opportunity for comparison and validation of the two approaches. With regard to elk hunting, the TCM value per trip was $185 and the value per day was $66.[123] The CVM estimate is $262 per trip and $40 per day.[124] Additionally, nonresident consumer surplus associated with the big game combination license was estimated at $155 to $180.[125] Because nonresidents make on average only one hunting trip per year to Montana, license fees have a convenient "per trip" interpretation. The similarity of these findings for very different methods and data bases provides some credibility for the estimates.

A more detailed site-level comparison of contingent valuation and travel cost estimates was undertaken for the set of 17 "blue-ribbon" trout streams modeled in both approaches. The average contingent valuation estimate for the rivers was $126 per trip, which compares to the travel cost model reported cost estimate of $121 per trip.[126] Perhaps of more interest is the extent to which the methods agree across sites. In fact there was considerable agreement for the set of 17 rivers. The Pearson product-

120. These reported costs were found to be $70 and $103 respectively for lake and stream. Duffield, Loomis & Brooks, *supra* note 72, at 49.

121. R. Walsh, D. Johnson & J. McKean, *supra* note 19, at 81.

122. *See*, Loomis, Cooper & Allen, The Montana Elk Hunting Experience: a Contingent Valuation Assessment of Economic Benefits to Hunters (1988) (unpublished report, Mont. Dep't. of Fish, Wildlife and Parks); Duffield & Allen, Contingent Valuation of Montana Trout Fishing by River and Angler Subgroup (1988) (unpublished report, Mont. Dep't. of Fish, Wildlife and Parks).

123. Duffield, *supra* note 72, at iv.

124. Loomis, Cooper & Allen, *supra* note 122, at ii.

125. Brooks & Duffield, *The Worth of Hunting*, 20(2) MONTANA OUTDOORS 6-9 (March/April 1989). This model was based on the actual observed market demand for nonresident license sales in Montana from 1970 to 1978. Fees for these licenses have increased from $151 in 1970 to $450 at present. Because the number of licenses sold have responded dramatically to fee changes, a robust estimate of the market demand for licenses could be derived.

126. These estimates are for specific methodologies and assumptions (dichotomous choice rather than open-ended CVM question format; truncation of logistic means at $500; truncated mean rather than median as a measure of central tendency; etc.). Duffield & Allen, *supra* note 122.

moment correlation coefficient[127] for the sample of 17 rivers is .73; this indicates that the contingent valuation and travel cost model values for these sites are highly and positively correlated. Similarly, a relatively high value for the nonparametric Spearman's correlation coefficient (.71) indicates that the two methods tend to provide a consistent ranking of sites according to net value per trip. When sites with possibly inadequate CVM samples (less than 80 observations per river) were excluded, the correlations for the remaining 12 rivers were even higher at .80 and .82 for Pearson and Spearman correlation coefficients respectively.

These results are very encouraging in that they indicate that the TCM and CVM models employed in these studies were able to consistently measure differences in value across sites. The differences across sites are significant, ranging from $38 per trip on the Kootenai River to $228 on the Madison. The models appeared to consistently place high values on the most outstanding fisheries (as indicated by success rates and total fishing pressure) with the Bighorn, Madison, Gallatin, Big Hole and Upper Yellowstone all valued at around $200 per trip.[128]

There are several implications to these findings. While there is certainly potential for considerable methodological improvements, it appears that current nonmarket valuation techniques are able to generate more or less consistent and reliable estimates of recreation values. The average values established by the recent Montana studies (for example $70 to $100 per day for cold water fisheries) are in stark contrast to the 1985 Region 1 RPA value of $3.22. Additionally, the considerable differences across sites indicates that disaggregation of values to at least a river basin level may be necessary. Balancing the qualities (and quantities) of Montana and North Dakota waters (as Loomis and Sorg did in 1982) is difficult enough. But these interstate differences are probably no more than those across sites within Montana.

C. *Alternative Approaches to the Problem*

The preceding discussion has focused on the important and difficult task of deriving region-specific recreational values from the empirical literature. Several alternative views of the problem will be briefly summarized.

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127. Correlation coefficients show the relationship between two sets of variables, with a coefficient of 1.0 indicating identical values, and a coefficient of 0.0 indicating no relationship. For a general overview of correlation coefficients, see SNEDECOR & COCHRAN, STATISTICAL METHODS (1980).

128. It is interesting to note that these are clearly "destination" fisheries, with a high share of use by nonresident, highly specialized anglers. For example, on the Madison, nonresidents are 66 percent of total users and 70 percent of all anglers were fly fishing only. Allen, Results of the Trout Stream Angler Preference Survey (1988) (unpublished report, Mont. Dep't. of Fish, Wildlife and Parks).

Sorg and Loomis prefaced their review with the observation that "surveys of the literature are not perfect substitutes for region specific estimates."[129] The McCollum study provides an alternative: estimation of region specific values using the same model and the same data source for a variety of forest sites across the nation.[130] This innovative approach was developed explicitly for the RPA process and would seem to provide a potential solution to the methodological differences encountered in literature surveys. However, the success of using a single model will rest heavily on not only the model chosen but on the quality and quantity of data available.

The McCullom study utilized a 1985-86 data set based on sampling at 57 specific ranger districts from the 786 total ranger districts on all national forests. A total of 3072 interviews were used with an average of about 55 interviews per district.[131] As documented by the McCollum study, the limitations of the data set both in extent and quality (for example, the time of year sampling was done vis-a-vis an activity such as hunting) may explain considerable variations in the estimated values. For example, the Region 1 cold water fishing value is $24.08 per day, but the big game hunting value is $4.61. The total Region 1 sample was 311 interviews for three Idaho and three Montana ranger districts.[132] While this is a promising approach, the available data set appears to limit the reliability of the results.

Still another perspective on the problem is provided in two case studies of the Siuslaw and Gallatin National Forests.[133] These studies compare the valuation of changes in recreational resources using two different approaches. The first approach that Loomis outlined for each case study was the analysis undertaken by the administering agency. For example, on the Gallatin the issue is basically timber versus wilderness use of a roadless area (Hyalite-Porcupine Buffalo Horn) that is in the headwaters of the Gallatin and Yellowstone Rivers south of Bozeman, Montana. The Gallatin National Forest showed little change in total recreational use among the two alternatives, with use mainly being reclassified from

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129. Loomis & Sorg, *supra* note 39, at 3.

130. McCollum, Peterson, Arnold, Markstrom & Hellerstein, Recreation Values in Nine Forest Service Regions for Twelve Types of Primary Activity Trips 13-17 (Feb. 1989) (unpublished paper presented at annual meeting of Western Regional Research Project W-133, Benefits and Costs in Natural Resource Planning, San Diego, CA).

131. *Id.*

132. *Id.* at table 10.

133. Loomis, *The Economic Effects of Timber Harvesting on Recreational and Commercial Fisheries and Municipal Watersheds: a Case Study of the Suislaw and Gallatin National Forests*, (U.C. Davis, 1988); Loomis, *A More Complete Accounting of Costs and Benefits from Timber Sales*, 87(3) JOURNAL OF FORESTRY 19-23 (1989).

wilderness to nonmotorized dispersed.[134] Since both uses were valued about the same (values of around $8 per day for each based on 1980 RPA values), there was little change measured in recreation values among the two alternatives.[135]

The second approach described by Loomis measures the change in quality of the fishing and hunting experience associated with timber harvest and roading. Given a demand function that includes a site-level quality variable (such as trout catch), standard procedures can be used to estimate changes in net willingness to pay associated with changes in quality.[136] Such a model was available for the Yellowstone and Gallatin.[137] Changes in trout populations and catch due to increased sediment loads had been previously estimated by the agency. Timber harvesting and roading also would impact the security of elk habitat, hunter access and hunter chances of bagging mature bull elk.[138] The value of the latter type of quality change had been previously estimated by Loomis, Cooper and Allen for a hunting district including the wilderness study area.[139] The net result of measuring quality changes was that the recreational value associated with the wilderness alternative was substantially higher than that for the timber harvest alternative.

The second method described by Loomis amounts to measuring benefit changes associated with shifts in demand curves.[140] The implication of this approach is that recreation valuation requires demand models, not average values *per se*.

V. CONCLUSION

The recreational values selected for the 1985 RPA program were inconsistent with the literature review undertaken by Loomis and Sorg in 1982. The latter, while necessitating considerable judgment, was done to high professional standards. The procedures used by the Forest Service staff to establish the final RPA values included simple but major mechanical errors as well as *ad hoc* adjustments. The adjustments were unsupported and appear to be at odds with basic economic theory and practice. The outlook for identification of more appropriate values in the 1990 RPA is brighter, buttressed by the considerable acceleration in outdoor recreation research as documented by Walsh, Johnson and McKean in 1988.

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134. *Id.*
135. *Id.*
136. *See* McCollum, *supra* note 136.
137. Duffield, *supra* note 72.
138. U.S. DEP'T OF AGRICULTURE, FOREST SERVICE, GALLATIN NATIONAL FOREST PLAN (1985).
139. Loomis, Cooper & Allen, *supra* note 122.
140. Loomis, *supra* note 134.

A basic concern in analyzing RPA valuation is that the broad outline of the RPA methodology for comparing market and nonmarket values may be misdirected. One aspect is the level of aggregation. In Region 1 as an example, regional values must be appropriate for areas as diverse as Montana and North Dakota. Recent research indicates considerable variation in values across sites within a state, let alone across states.

Even more fundamentally, agency modeling is predicated on measuring changes in output. The comparative static analogy is to constant demand and shifting (possibly inelastic) supply. This framework justifies identifying marginal values like the RPA recreational value estimates. However, the major impact of alternative commodity output supply plans on fish and wildlife resources may be more accurately represented by shifts in the demand for these commodities. Less technically, the major impacts of resource development may be on the *quality* of fishing and hunting experiences, rather than on the number of days *per se*. If this perspective is correct, what is needed for forest planning are not average values, but models of demand for non-market services that incorporate measures of quality (such as measures of hunting or fishing success). Rather than only a matrix of average values, a revised RPA process should additionally provide a set of working models and the professional expertise to utilize them. Since available estimates of RPA average values are generally derived from demand functions, this may not be an especially burdensome change.

Similarly, resource development initiatives may have considerable implications for not only direct, but also indirect uses of fish and wildlife resources. To date the RPA process has focused exclusively on on-site use and ignored a possibly substantial option, existence and bequest values.[141] For example, given that mature old growth stands in many regions are becoming increasingly scarce, there may be substantial existence and bequest values associated with these resources.

A last comment: life (and economic analysis) is already complicated enough. Why not abolish the 12-hour RVD and report, forecast and analyze all recreational services on an activity day basis?

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141. *See* Krutilla & Haigh, *supra* note 13.

Table 1

Comparison of Empiracal Estimates and 1985 RPA Recreational Values per Day and per 12-hour RVD for Region 1 (Northern Region)

Activity Loomis	12-Hour RVD Value RPA[142]	Loomis[143]	Consistent[144]	Activity Day Value RPA	Loomis
A. *Fishing*					
Anadromous	21	36	112	6.73	36
Cold Water	9	17	42	3.22	17
Warm Water	8	15	37	3.22	15
B. *Hunting*					
Big Game	29	50	107	13.60	50
Small Game	12	21	23	6.14	21
Waterfowl	21	39	41	6.14	39
Upland Game	21	39	41	6.14	39

Table 2

Recreation Studies Available for Forest Service RPA Reviews by Year

Year	Total Studies	Number of Specific Estimates Total	Big Game	Trout Fishing	Region 1*
1978[145]	15	34	7	5	0
1982[146]	36	95	15	15	0
1988[147]	120	287	56	40	10

* Region 1 big game hunting and cold water fishing combined.

142. "RPA' refers to final 1985 RPA value as reported in the RPA-FEIS, *supra* note 8.

143. Loomis & Sorg, *supra* note 39.

144. "Consistent' refers to 12-hour RVD that would derive from the Loomis and Sorg activity day values (as listed) and the hours per activity day implicit in the RPA conversion of 12-hour RVD's to activity days (3.8 hours for anandromous fish, 4.8 hours for cold and warm water fish, 5.6 hours for big game, and 6.1 hours for other).

145. 1978 corresponds to review by Dyer, *supra* note 37, for 1980 RPA (studies available based on bibliography in Loomis & Sorg, *supra* note 39).

146. 1982 refers to Loomis & Sorg's review for 1985 RPA, *supra* note 39.

147. 1988 figures are base on the Walsh, Johnson & McKean (1988) review for 1990 RPA. See R. Walsh, D. Johnson & J. McKean, *supra* note 19