Miscellaneous Literature Related to Recreational Demand

Adamowicz, Wiktor; Joffre Swait; Peter Boxall; Jordan Louviere; Michael Williams. 1997. "Perceptions Versus Objective Measures of Environmental Quality in Combined Revealed and Stated Preference Models of Environmental Valuation." Journal of Environmental Economics and Management. **Keywords**: Perceptions, Objective Measures, Combined Revealed and Stated Preference Models, conjoint analysis.

This paper examines perceptions and objective attribute measures in discrete choice models of recreation site choice behavior. These forms of attribute measurement are examined in individual and combined revealed preference/stated choice models.

Albers,-Heidi-J.; Fisher,-Anthony-C.; Hanemann, W.-Michael. "Valuation and Management of Tropical Forests: Implications of Uncertainty and Irreversibility" Environmental-and-Resource-Economics; 8(1), July 1996, pages 39-61.

American Sportfishing Association (1995). "An Economic Assessment of Marine recreational Fishing in Maine." Staff Report, ASA, 1033 N. Fairfax Street, Alexandria, VA, July, 7 pp.

The analysis in this report indicates the importance of marine recreational fishing to the economy of Maine. An industry valued at over $79 million supports about 200,000 anglers who make 576,000 trips seeking their favorite species. A large contingent of nonresident or tourist anglers are drawn to the quality fishing opportunities the state has to offer and bring over $9 million new dollars into the state's economy each year.

American Sportfishing Association (1995). "An Economic Assessment of Marine recreational Fishing in Massachusetts." Staff Report, ASA, 1033 N. Fairfax Street, Alexandria, VA, July, 12 pp.

The analysis in this report indicates the importance of marine recreational fishing to the economy of Massachusetts. An industry valued at over $442 million supports about 600,000 anglers who make 2.5 million trips seeking their favorite species. A large contingent of nonresident or tourist anglers are drawn to the quality fishing opportunities the state has to offer and bring over $50 million new dollars into the state's economy each year.

Anderson,-Lee-G. "Toward a Complete Economic Theory of the Utilization and Management of Recreational Fisheries" Journal-of-Environmental-Economics-and-Management; 24(3), May 1993, pages 272-95.

A model of individual behavior for recreational fisheries which considers both the participation decision and the activity level decision is developed. The model also distinguishes between the catch rate, which is a biologically determined parameter, and the landings rate, which is a control variable. Individual and fisherywide equilibria under open access are described for both homogeneous and heterogeneous participants. Optimal utilization is also described. Optimal

utilization differs from open access in terms of activity levels of participants and number and type of participants. Regulations to achieve optimal utilization are described. (c) 1993 Academic Press, Inc.

Arndorfer, D.J. and N.E. Bockstael. 1986. "Estimating the Effects of King Mackerel Bag Limits on Charter Boat Captains and Anglers."   Report of Environmental Resources Management-North Central, Inc. Palantine, IL.

Andrews, Elizabeth J. and James E. Wilen (1988). " Angler Response to Success in the California Salmon Sportfishery: Evidence and Management Implications." Marine Resource Economics, 5(2):125 138.

This paper examines effort responsiveness to success in the California salmon partyboat sport fishery. The management process in this important fishery involves setting target harvest levels for both commercial and sportfishing groups and then using closed seasons, restricted gear, and possession limits to dampen effective effort. An important component of the management process involves forecasting sportfishing effort and its effect on catch to advance plan management actions. For want of better information, simple proportionality rules of thumb are used currently and this paper examines the plausibility of these. Some simple models forecasting aggregate angler participation and aggregate partyboat catch on a weekly basis are estimated across several different ports. Our findings suggest that anglers are responsive to recent success in several ports (elasticities up to +.5) and that angler participation affects catch with an elasticity exceeding unity. These results indicate that the simple rules of thumb currently in use could be in substantial error.

Arndorfer, David J. and Nancy Bockstael (1986). "Estimating the Effects of King Mackerel Bag Limits on Charter Boat Captains and Anglers." Prepared under contract for the National Marine Fisheries Service, Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149 by Environmental Resources Management North Central, Inc., Suite 200, 835 Sterling Avenue, Palatine, Illinois 60067.

This report researches techniques for estimating the effects of bag limits on recreational anglers, and provides preliminary estimates for the recreational anglers in Panama City Beach and Destin, Florida as part of a pilot study of the charter boat industry in northwestern Florida.

Assane,-Djeto "Maximum Likelihood Estimation of a System of Share Equations with Binding Non Negativity Constraints: Application to Recreational Demand Analysis". University of Colorado, Ph.D. 1988

Bell,-Frederick-W. "The Economic Valuation of Saltwater Marsh Supporting Marine Recreational Fishing in the Southeastern United States." Ecological-Economics; 21(3), June 1997, pages 243-54.

This paper is concerned with placing an economic value on the contribution of wetlands in supporting recreational fishing in the southeastern United States. A production function first links the recreational catch to angler fishing effort and wetlands. The parameters of the recreational fisheries production function are estimated using cross-sectional data by states. To simplify the mathematics, the estimated elasticities are substituted into a Cobb-Douglas production function. For simplicity, a linear demand curve for recreational fishing is postulated which shifts when there is an increase or decrease in the catch (success rate). Therefore, incremental changes in wetlands will via the production function provide incremental changes in the catch which will in turn shift the recreational demand curve, thereby increasing or decreasing consumer surplus. Using a discount rate of 8.125%, the perpetual flow of consumer surplus per incremental acre of wetlands has an estimated asset value of $6,471 and $981 on the East and West Coast of Florida respectively in 1984 dollars. If commercial fisheries and other economically useful functions of wetlands are added to recreational fisheries, it may be more efficient for the State of Florida to acquire more coastal land for preservation from development.

Bell, Frederick (1989). "Main Quarry Hypothesis and Salmon Angling." <u>Marine Resource Economics</u>, 6(1):71 82.

This article explores the main quarry hypothesis, which is a variant of the general fishing success hypothesis. It is argued that for some recreational fisheries it may be more important that the angler catch his target or main quarry than the quantitative number of fish caught in influencing the number of fishing days and the overall quality of the recreational experience. A theoretical function is specified to explain the length of the fishing trip to Ireland by anglers that have designated salmon as their main quarry. The empirical estimation of this function indicates that the length of the fishing trip is positively related to travel cost, but inversely related on site cost per day. Ceteris paribus, the length of the salmon trip to Ireland, is increased by nearly 23% when the angler gets his main quarry, stressing the importance of the quality of the catch rather than quantitative number of fish caught. This finding calls into question the traditional fishing success variables such as catch per day for many recreational fisheries.

Bell, Frederick W. ; Vernon R. Leeworthy. 1989. "Recreational Demand by Tourists for Saltwater Beach Days." <u>Journal of Environmental Economics and Management</u>, Volume: 18, Pages: 189-205. **Keywords**: tourists, saltwater beach.

Bell, Frederick W. ; Vernon R. Leeworthy. 1987. "Economic Demand for Marinas and Projected Impact on Wetlands." <u>Land Economics</u>, Volume: 63, Issue: No. 1, Pages: 79-91.

Ben-Akiva, Moshe and Steven R. Lerman. 1985. **Discrete Choice Analysis: Theory and Application to Travel Demand.** Cambridge: **MIT Press.**

Bergstrom, John C. and John R. Stoll (1993). "Value Estimator Models for Wetlands Based Recreational Use Values." <u>Land Economics</u>, 69(2):132 137.

Evaluation and implementation of policies affecting wetlands management may require measurement of the economic value of the policies to individuals and groups. A potentially powerful means for measuring changes in wetlands based recreational values is the use of value estimator models. The general specification and potential applications of value estimator models for wetlands based recreational use values are discussed in this paper. Future research needs are also identified.

Berkes,-Fikret "Management of Recreational Fisheries in Northern Quebec: Policies versus Tools." Canadian-Public-Policy; 4(4), Autmn. 1978, pages 460-73.

Bockstael, Nancy E. and Kenneth E. McConnell (1981). "Theory and Estimation of the Household Production Function for Wildlife Recreation." Journal of Environmental Economics and Management, 8:199 214.

The household production function is an intuitively appealing way to model man's interaction with nature. This paper models the interaction between the household's behavior and publicly provided inputs into wildlife recreation. The paper shows how to compute benefits, assuming that the household production function is known. The household production function approach collapses to the simple travel cost approach when households are unable to substitute their own inputs for publicly provided inputs. In addition, the paper demonstrates the conditions under which the parameters of cost an preference functions can be identified. The conditions for identification are quite restrictive when several choices are endogenous.

Bockstael, Nancy E. and Ivar E. Strand, Jr. (1987). "The Effect of Common Sources of Regression Error on Benefit Estimates." Land Economics, 63(1):11 20.

This paper explores how the assumptions about sources of error influence estimates of recreational benefits. A discussion of the various sources of error in demand estimation is first offered. The analysis is confined to omitted variables and measurement error or random preferences. These represent the primary explanations for the stochastic term in recreational demand analysis. Also, they can be treated with the same estimation technique and hence imply identical estimators.

Bockstael, N.E., K.E. McConnell, I.E. Strand (1989). "Measuring the Benefits of Improvements in Water Quality: The Chesapeake Bay." Marine Resource Economics, 6(1):1 18.

Federal, state, and local government agencies have joined forces in the ambitious and expensive task of improving the water quality of the Chesapeake Bay. Clean up efforts will be devoted to three major problems: nutrient over enrichment, toxic substances, and the decline of submerged aquatic vegetation. Although the beneficiaries are ultimately human, criteria for judging the Bay's water quality have been primarily biological and physical. This paper addresses the question of the human values from the Bay. How do people use the Bay and how much are

they willing to pay for the changes in water quality that improve their use: With a variety of methods and data sources, we estimate the annual aggregate willingness to pay for a moderate improvement in the Chesapeake Bay's water quality to be in the range of $10 to $100 million in 1984 dollars.

Bockstael,-Nancy-E. et-al. "Sample Selection Bias in the Estimation of Recreation Demand Functions: An Application to Sportfishing." Land-Economics; 66(1), February 1990, pages 40-49.

The method of sampling and the nature of recreational behavior create truncated or censored errors for recreational demand models. This paper explores the sensitivity of parameter estimates and welfare estimates to three approaches to handling censored or truncated recreational trips when the trip error is assumed normal. The approaches are the Tobit, the Heckman sample selection model, and the Cragg model. These approaches are applied to a data set of striped bass fishing in Maryland. For empirical and theoretical reasons, the authors support the Cragg model as the most appropriate of the three approaches for recreational demand estimation; and for the particular dataset they used, it gives the lowest estimate of aggregate benefits for access to fishing. Coauthors are Ivar E. Strand, Jr.; Kenneth E. McConnell; and Firuzeh Arsanjani.

Bockstael, N.E., A.B. Graefe, I.E. Strand and L.L. Caldwell. 1986. **Economic Analysis of Artificial Reefs: A Pilot Study of Selected Valuation Methodologies.** Artificial Reef Development Center, Technical Report Series, No.6, 90 pp.

Bockstael, N.E., W.M. Hanemann, and I.E. Strand. 1986. **Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models.** Environmental Protection Agency. Cooperative Agreement CR-8l 143-01-I, Vol. III.

Bockstael, N.E., K.E. McConnell and I.E. Strand. 1991. "Marine Recreational Fishing in the Middle and South Atlantic: A Descriptive Study." Unpublished mimeo. Department of Agricultural and Resource Economics, University of Maryland, College Park, MD. 205 pp.

Bockstael, Nancy E. ; Kenneth E. McConnell. 1980. "Calculating Equivalent and Compensating Variation for Natural Resource Facilities." Land Economics, Volume: Vol. 56, Issue: No. 1, Pages: 56-63.

Braden, John B.; Charles D. Kolstad (Eds). 1991. Measuring the Demand for Environmental Quality. North-Holland, New York. Number of Pages: 370. **Keywords**: Hedonic Methods, Contingent Valuation, Travel Cost Method

This book contains revised versions of contributions that were presented in a workshop at the Bismarck Hotel in Chicago on November 18, 1988. A survey of the state of the art methods for measuring the demand for environmental quality.

Cicchetti, Charles J. ; Anthony C. Fisher; V. Kerry Smith. 1976. "An Econometric Evaluation of A Generalized Consumer Surplus Measure: The Mineral King Controversy." Econometrica, Volume: 44, Issue: 6, Pages: 1259-1276. **Keywords**: household production model, recreational skiing.

Cook,-B.-A.; McGaw,-R.-L. "Sport and Commercial Fishing Allocations for the Atlantic Salmon Fisheries of the Miramichi River." Canadian-Journal-of-Agricultural-Economics; 44(2), July 1996, pages 165-71.

The Atlantic salmon has been harvested by both commercial and recreational fishers for many years on the river systems of the province of New Brunswick on Canada 's Atlantic coast. The commercial fisheries were closed and controls were placed on the recreational fisheries following the 1983 collapse of the salmon stocks. This management policy remains in effect. A preliminary analysis using a linear control model showed this to be an economically efficient harvest allocation policy on New Brunswick's Miramachi River. The analysis is extended to the more realistic nonlinear framework here to determine whether the harvest allocation decision would be significantly changed. Both fisheries are found to generate positive economic benefits, although the recreational fishery is determined to be more valuable than the commercial fishery. Permanent closure of the commercial fishery is not indicated.

Cragg, John G. (1971). "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods." Econometrica, 39(5):829 844.

Several models for limited dependent variables are examined. Estimation in and discrimination among the various models are considered, followed by a small sampling experiment into the procedures and an example of their application.

Desvousges, William H., V. Kerry Smith, and Matthew P. McGivney (1983). A Comparison of Alternative Approaches for Estimating Recreation and Related Benefits of Water Quality Improvements. EPA Contract No. 68 01 5838, U.S. Environmental Protection Agency, Economic Analysis Division, Washington, D.C. 20460.

The results of this project strongly support the feasibility of measuring the recreation and related benefits of water quality improvements. Moreover, the benefits measurement approaches several contingent valuation formats and the travel cost method   show consistent results for comparable changes in water quality. Indeed, the range of variation is generally less than that expected in models used to translate the effects of effluents in a water body into the corresponding water quality parameters. In addition, the results also clearly show that the

intrinsic benefits of water quality improvements, especially option values, can be measured and that they are a sizable portion (greater than half) of the total recreation and related benefits total.

Ditton, R.B. and Mark R. Fisher (1990). "Characteristics, Behavior, Attitudes, Expenditures, Harvest, and Management Preferences of Billfish Tournament Anglers." Final report prepared for the Billfish Foundation, Miami, Florida. Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843.

A mail survey of 1,984 billfish anglers was completed in 1989 1990 based on 27 tournaments held in the U.S. western Atlantic Ocean with a response rate of 62%. Sociological analysis is presented that identify the user groups and describe their characteristics, such as age, income level, and education level. A technical appendix is also included under separate cover.

Ditton, R.B., D.A. Gill, and C.L. MacGregor (1991). "Understanding the Market for Charter and Headboat Fishing Services." Marine Fisheries Review, 53(1):19 26.

Published and unpublished research findings regarding charter and headboat fishing customers from 11 studies were reviewed to provide a marketing data base for operators and to guide further research efforts. Generally charter/headboat fishing is a male oriented activity. Customers were between 30 and 55 years of age. Although both groups of anglers considered themselves to be experienced, charter boat anglers had fished for more years. Charter anglers fished more often with their families and headboat anglers more often with their friends. Charter boat anglers reported higher incomes than headboat anglers. Relaxation, having fun, and escaping from daily pressures were generally more important to both groups of anglers than motives relative to catching fish. Most anglers indicated that the skills and performance of the captain and crew contributed heavily to the overall evaluation of their fishing experience. Anglers were more heavily influenced to choose a particular captain or boat by informal advertising methods (i.e. word of mouth recommendations, reputation, and visits to the marina) than formal methods (i.e. advertisements, brochures, ratio, and television). Charter anglers relied more on word of mouth recommendations and headboat customers were more influenced by previous experiences. Implications for further research are discussed.

Ditton, Robert B., Stephen M. Holland, and Duane A. Gill (1991). "The U.S. Gulf of Mexico Party Boat Industry: Activity Centers, Species Targeted, and Fisheries Management Opinions." Paper submitted to the Marine Fisheries Review, February 25.

In addition to providing an overview of the party boat fishery in the U.S. Gulf of Mexico, a management oriented methodology is presented that can be used elsewhere to assess regulatory impacts. Party boat operators were interviewed to determine species targeted, percent time committed to targeting each species, and opinions of current catch restrictions. Over two thirds of the fleet was located on the west coast of Florida. Overall, most boats targeted less than 5

species. Four species accounted for 90 percent of the estimated effort by party boats in the U.S. Gulf of Mexico: snapper, grouper, amberjack, and king mackerel. Party boat effort in texas was devoted primarily to snapper whereas in Florida most effort was devoted to snapper and grouper collectively. Party boat operators were diverse in their opinions of management regulations in force when interviewed. Results revealed why major opposition would be expected from texas party boat operators for red snapper bag limits and other restrictions proposed by the Gulf of Mexico Fishery Management Council.

Ditton, Robert B., Stephen M. Holland, and Duane A. Gill (1992). "The U.S. Gulf of Mexico Party Boat Industry: Activity Centers, Species Targeted, and Fisheries Management Opinions." Marine Fisheries Review, 54(2):15 20.

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Ditton, Robert B., David K. Loomis, Alan D. Risenhoover, Seungdam Choi, Maury F. Osborn, Jerry Clark, Robin Riechers, and Gary C. Matlock (1990). "Demographics, Participation, Attitudes, Expenditures, and Management Preferences of Texas Saltwater Anglers, 1986." Management Data Series No. 18, Texas Parks and Wildlife Department, Fisheries Division, 4200 Smith School Road, Austin, Texas 78744.

Results of a survey of Texas saltwater fishermen concerning demographics, attitudes toward management tools, fishing motivations, species preferences and annual expenditures.

Domencich, T.H. and D. McFadden. 1975. **Urban Travel Demand.** Amsterdam: North Holland.

Fisher, Mark R. and Robert B. Ditton (1993). "A Social and Economic Characterization of the U.S. Gulf of Mexico Recreational Shark Fishery." Marine Fisheries Review, 55(3):21 27.

A mail survey of tournament shark anglers and party boat shark anglers was completed to examine their fishing activity, attitudes, trip expenditures, and consumer surplus. A sample of 700 shark anglers was selected from tournaments in the Gulf of Mexico during 1990, and a sample of party boat shark anglers was drawn from Port Aransas, Texas party boat anglers during the summer of 1991. A response rate of 58% (excluding non deliverables) was obtained from tournament anglers. The sample of party boat shark anglers was too small to provide useful results. Tournament shark anglers reported fishing an average of 58 days per year and targeted sharks and other large marine species. Tournaments occupy a small portion of their fishing effort. If this group of anglers were not able to fish for sharks, one third indicated no other species would be an acceptable substitute, while others were willing to substitute other large marine species. Shark trip expenditures averaged $197 per trip with a consumer surplus of $111 per trip. Based on MRFSS estimates of the number of shark fishing trips, we estimate a total of $43 million was spent by shark anglers in the Gulf of Mexico with a consumer surplus of $24 million for a gross value of the shark fishery of $66 million. MRFSS estimates of the number of sharks landed indicate an equivalent use value of $183 per shark.

Freeman, A. Myrick III (1995). "The Benefits of Water Quality Improvements for Marine Recreation: A Review of the Empirical Evidence." Marine Resource Economics, 10(4):385 406.

This paper reviews the empirical literature on the economic value of marine recreation fishing, beach visits, and boating. Questions addressed include: What values do people place on changes in the attributes of recreation sites and activities? What do we know about how water pollution control policy affects these attributes? And, is it feasible to use the value information obtained for specific sites and/or activities to estimate the benefits of improving marine water quality? The literature establishes that some measures of pollution reduce the values of trips to beaches and that improved fishing success is valued by recreational anglers. However, there is substantial variation in value measures across studies. Welfare estimates can be sensitive to model specification and estimation. In the case of marine recreational fishing, the links between pollution control policy and the attributes of the activity that people value (catch rate) have not been established.

Freeman. A.M. 1993."The Economics of Valuing Marine: A Review of Empirical Evidence." Economics Working Paper 93-102. Bowdoin College, Brunswick, ME.

Easley,-J.-E., Jr. "Selected Issues in Modeling Allocation of Fishery Harvests." Marine-Resource-Economics; 7(2), Summer 1992, pages 41-56.

This paper examines selected issues that are likely to be important in improving economists' models of allocation of fishery harvests between commercial and recreational harvesters. Valuation in the commercial sector is emphasized, with harvests of a species subject to allocation viewed as an input into production of consumer fishery goods. Substitution possibilities in production of these consumer goods, and data generally available to economists are

discussed as motivations for application of the general equilibrium derived demand to valuation in the commercial sector. Conceptual and empirical problems in applying the function are discussed.

Feather,-Peter; Hellerstein,-Daniel; Tomasi ,-Theodore "A Discrete-Count Model of Recreational Demand." Journal-of-Environmental-Economics-and-Management; 29(2), September 1995, pages 214-27.

Discrete choice models generate welfare measures resulting from environmental quality changes on a per trip basis instead of over a longer, more policy-relevant time period. Seasonal or annual welfare measures resulting from a quality change are often computed by multiplying each individual's per trip welfare measure by the number of trips the individual is forecasted to take at the new quality level. These models are typically formulated so that increases in the quality of any site causes every individual to increase his or her participation. This paper presents an alternative method of linking the discrete choice model to a demand model, enabling welfare changes to be estimated in a conventional manner. (c) 1995 Academic Press, Inc.

Flegg,-A.-T. "Methodological Problems in Estimating Recreational Demand Functions and Evaluating Recreational Benefits." Regional-Studies; 10(3), 1976, pages 353-62.

Hanemann, W.M. 1982. "Applied Welfare Analysis with Qualitative Response Models," California Agricultural Experimental Station Working Paper No. 241.
Hansen,-LeRoy-T.; Hallam,-J.-Arne. "Single-Stage and Two-Stage Decision Modeling of the Recreational Demand for Water." Journal-of-Agricultural-Economics-Research; 42(1), 1990, pages 16-26.

Past rivalry over access to water has usually been between the farmers who irrigate and new agricultural, industrial, and municipal demands. Recently, the recreational demand for water has become another consideration in water allocation decisions. We examine the significance of the recreational demand for water as a fishery resource by applying two different frameworks to the decision to fish. The consistency of the estimated responses to changes in fishery resources across both decision frameworks testifies to the importance of streams as a recreational fishery resource. Modeling behavior within the household production framework allows all downstream effects to be estimated, not just impacts at particular sites. Marginal values of water as a recreational fishery resource are estimated based on day values of fishing derived in prior research.

Heckman, James (1974). "Sample Selection Bias as a Specification Error." Econometrica, 47(1):153 162.

This paper discusses the bias that results from using nonrandomly selected samples to estimate behavioral relationships as an ordinary specification error or omitted variables bias. A simple consistent two stage estimator is considered that enables analysts to utilize simple

regression methods to estimate behavioral functions by least squares methods. The asymptotic distribution of the estimator is derived.

Heckman, James (1976). "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models." <u>Annals of Economic and Social Measurement</u>, 5:475 492.

This paper presents a unified treatment of statistical models for truncation, sample selection and limited dependent variables. A simple estimator is proposed that permits estimation of those models by least squares, and probit analysis. In an empirical example, it is shown that the estimator yields estimates close to the maximum likelihood estimates.

Hof,-John-G.; King,-David-A. "Recreational Demand by Tourists for Saltwater Beach Days: Comment." <u>Journal-of-Environmental-Economics-and-Management</u>; 22(3), May 1992, pages 281-91.

Kling, Catherine L. (1987). "A Simulation Approach to Comparing Multiple Site Recreation Demand Models Using Chesapeake Bay Survey Data." <u>Marine Resource Economics</u>, 4:95 109.

This paper's purpose is to implement a methodology that can be used to suggest a model (or models) appropriate for valuing quality improvements in the Chesapeake Bay. To compare these approaches, a series of outdoor recreation user populations is constructed by choosing a utility function, its parameter values and an error distribution. This information is combined with the characteristics of individuals and recreation sites from a Chesapeake Bay recreation demand survey to solve the individual's maximization problem. Each of the models is estimated using these data, and the compensating variation of a quality change is calculated. Benefit estimates are compared with simulated welfare change to evaluate the models.

Kling, Catherine L. (1988). "The Reliability of Estimates of Environmental Benefits from Recreation Demand Models." <u>Journal of Agricultural Economics</u>, 70(4):892 901.

Recreation demand models are commonly employed tools of economists interested in valuing improvements in environmental amenities. Despite their importance, little comparative work has been undertaken to examine the ability of the models to accurately estimate welfare changes. A simulation study designed to compare the reliability of estimated welfare measures (compensating variation and consumer surplus) from several commonly employed recreation demand models is presented. Results of the study indicate that choice of functional forma nd model specification are important determinants of the resulting estimates of benefits.

Kling, Catherine L. (1988). "Comparing Welfare Estimates of Environmental Quality Changes from Recreation Demand Models." <u>Journal of Environmental Economics and Management</u>, 15:331 340.

This paper presents a procedure for examining the reliability of welfare estimates resulting from the estimation of multiple site recreation demand models. A simulation approach is suggested where a utility function is combined with observations of individual and site characteristics to generate simulated data sets. Welfare measures associated with an improvement in site quality are calculated. Recreation demand models are estimated using the simulated data sets. Estimated welfare measures resulting from the recreation demand models are then compared to the true welfare measures calculated from the simulated data. The procedure is demonstrated using two commonly employed recreation demand models.

LaFrance,-Jeffrey-T. "Consumer's Surplus versus Compensating Variation Revisited." American-Journal-of-Agricultural-Economics; 73(5), December 1991, pages 1496-507.

Lee,-Mary-J. "Non-market Valuations of Recreational Demand in California Using Bootstrap GMM Estimation." University of Colorado, Ph.D. 1996

Liu,-Jin-Long. "Essays on the Valuation of Marine Recreational Fishing along Coastal North Carolina." North Carolina State University, Ph.D. 1995.

McConnell, Kenneth E., Ivar E. Strand, S.K. Valdes, and Q.R. Weninger (1992). "The Economic Value of Mid and South Atlantic Sportfishing." Volume 2 of a report on Cooperative Agreement #CR 811043 01 0 between the University of Maryland, the Environmental Protection Agency, the National Marine Fisheries Service, and the National Oceanic and Atmospheric Administration.

This projects goal is to document the value of marine resources derived from recreational fishing from New York to Florida. Sportfishing has economic value in that anglers would be willing to pay more for their opportunities than they actually have to pay. The value of opportunities for recreational fishing will depend on many aspects of the opportunities the quality of fishing, the weather, the skill of the angler, and so forth. There are two kinds of economic values of interest: a) the access value, what anglers would pay rather than do without access to the resource; and b) the value of a change in the quality of fishing, what anglers would pay for increments in fishing characteristics, such as the catch rate.

McConnell, Kenneth E. and Jon G. Sutinen (1979). "Bioeconomic Models of Marine Recreational Fishing." Journal of Environmental Economics and Management, 6:127 139.

The theory of recreational fishing is developed and conditions are derived for optimal management policy, with special attention given to functional relationships that must be empirically verified. Determinants of the optimal allocation between commercial and recreational fishing effort are derived. The theory is extended to include selected peculiar features of recreational fishing: Some anglers sell their catch; a small proportion of the fishing population

accounts for a large proportion of the catch; and anglers throw back a fraction of what they catch. Optimal policies are derived under these more realistic conditions.

Manski, Charles F. and Daniel McFadden (eds.) (1981). Structural Analysis of Discrete Data with Econometric Applications. The MIT Press, Cambridge, Massachusetts.

This volume deals with parametric statistical inference on structural conditional probability models in which some or all of the endogenous variables are discrete valued. Taken together, these chapters provide a methodological foundation for the analysis of economic problems involving discrete data and chart the current frontiers of this subject.

Milon, J. Walter, Eric Thunberg, Charles M. Adams, and C.T. Jordan Lin (1994). "Recreational Anglers' Valuation of Near Shore Marine Fisheries in Florida." Report prepared for the Florida Marine Fisheries Commission under Contract No. C 705 from the Florida Department of Natural Resources by the Food and Resource Economics Department, University of Florida, Gainesville, FL, Technical Paper 73, Florida Sea Grant College Program, University of Florida, P.O. Box 110409, Gainesville, FL, January.

This report describes and summarizes the results from a state wide survey of Florida resident saltwater anglers. The survey was designed to provide estimates of the economic value anglers place on marginal changes in management of selected near shore marine species using the contingent valuation method.

Morey, E.R. 1994. "What is Consumer Surplus…" **Journal of Environmental Economics and Management.** 26(3):257-271.

Morey,-Edward-R. "What Is Consumer's Surplus Per Day of Use, When Is It a Constant Independent of the Number of Days of Use, and What Does It Tell Us about Consumer's Surplus?" Journal-of-Environmental-Economics-and-Management; 26(3), May 1994, pages 257-70.

An individual's consumer's surplus per day of use for a change in the price of recreational site is the price change, so it is a constant, independent of the number of days of use. Consumer's surplus per day of use for a change in a site's characteristics is not, in general, a constant. When a constant compensating variation per day of use exists, it multiplied by the number of days at the site in the original state (proposed state) bounds the compensating variation, CV, from below (above). The average of these two approximations is an almost second-order approximation to the CV. Simulations indicate the approximation biases can be large. (c) 1994 Academic Press, Inc.

Morey, Edward R., Donald Waldman, Djeto Assane, and Douglass Shaw (1995). "Searching for a Model of Multiple Site Recreation Demand that Admits Interior

and Boundary Solutions." <u>American Journal of Agricultural Economics</u>, 77(!): 129
140.

> For most recreation demand data sets, different individuals visit different subsets of the
available sites. Interior solutions (i.e., individuals who visit all recreational sites) are not the
norm. Boundary solutions (i.e., individuals who do not participate, or who visit some, but not all,
of the sites) predominate. We critique eight demand models in terms of their ability to
accommodate boundary solutions. Three models are recommended for consideration when there
are multiple sites and the data set includes a significant number of boundary solutions: a repeated
nested logit model, a multinomial share model, and a Kuhn Tucker model.

Roe,-Brian; Boyle,-Kevin-J.; Teisl,-Mario-F. "Using Conjoint Analysis to Derive Estimates of
Compensating Variation." <u>Journal-of-Environmental-Economics-and-Management</u>; 31(2),
September 1996, pages 145-59.

> We use several approaches to derive estimates of Hicksian compensating variation from
conjoint ratings data. The different estimation approaches produced mixed results with respect to
consistency with utility theory, statistical significance of key variables, magnitude of welfare
estimates, and confidence bounds on welfare estimates. These findings suggest conjoint analyses
are not a panacea for the problems being debated regarding contingent-valuation and travel-cost
methodologies, and conjoint questions appear to share many of the advantages and disadvantages
associated with dichotomous-choice, contingent-valuation questions. (c) 1996 Academic Press,
Inc.

Rowe, Robert D., E. Morey, A. Ross and W. Shaw. "Valuing Marine Recreation Fishing on the
Pacific Coast." Report prepared by Energy and Resource Consultants for National Marine
Fisheries Service (NOAA Contract NA83ABC00205), March 1985.

Sellar, C., J.R Stall and J.P. Chavas. 1985. "Validation of Empirical Measures of Welfare
Change: A Comparison of Non-market Techniques." **Land Economics.** 61:156-175.

Shaw,-W.-Douglass. "Recreational Demand by Tourists for Saltwater Beach Days: Comment."
<u>Journal-of-Environmental-Economics-and-Management</u>; 20(3), May 1991, pages 284-89.

Smith, V. Kerry; Kaoru, Yoshiaki. 1990. "Signals or Noise? Explaining the Variation in
Rereation Benefit Estimates." <u>American Journal of Agricultural Economics</u>, Volume: 72,
Pages: 419-433. **Keywords**: consumer surplus, meta analysis, recreation demand.

> This paper uses meta analysis (statistical methods that combine similar studies) to
characterize the benefit estimates derived from travel cost recreation demand models. Using data
from 77 studies, the paper evaluates the influence of variables describing the site characteristics,
the activities undertaken at each site, the behavioral assumptions, and the specification decisions.

Steinback, Scott and Jon O'Neil (1996). "Summary Report of Methods and Descriptive Statistics for the 1994 Northeast Region Marine Recreational Economics Survey." Social Sciences Branch, NOAA, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA and Department of Marine Affairs, University of Rhode Island, Kingston, RI.

Two sportfishing surveys were conducted during 1994 in the Northeast Region (Maine to Virginia). Data from the surveys provided demographic and economic information on marine recreational fishing participants from Maine to Virginia. The purpose of this report is to document the socio economic characteristics of these participants and to identify their marine recreational fishing preferences and their perceptions of current and prospective fishery management regulations. This information will be used to estimate statistical models of the demand for marine recreational fishing for eight important recreational species in a subsequent phase of the research.

Strand, Ivar E., K.E. McConnell, and Nancy E. Bockstael (1991). "Marine Recreational Fishing in the Middle and South Atlantic: A Descriptive Study." Cooperative Agreement #CR 811043 01 0, University of Maryland, Environmental Protection Agency, National Marine Fisheries Service, and National Oceanic and Atmospheric Administration, University of Maryland, College Park, August.

This report is the descriptive phase of a research project on the economics of marine recreational fishing along the middle and south Atlantic coast of the U.S. It describes the data from three large surveys on sportfishing, surveys that will form the basis of a subsequent phase of the research project. This first phase provides a broad brushed picture of saltwater fishing during the 1980's and serves as a foundation for a more comprehensive economic study yet to come.

Teisl, Mario F., and Kevin J. Boyle (1997). "Needles in a Haystack: Cost Effective Sampling of Marine Sport Anglers." Marine Resource Economics, 12(1):1 10.

An obstacle to conducting economic studies of marine sport anglers is the difficulty and expense in drawing a representative sample. Unlike inland fishing, where licenses are required in all states, only selected states require a marine sport fishing license and these license usually only cover selected marine fishing activities. Currently, there are no low cost methods of obtaining a representative sample of marine anglers because they are generally not licensed, use multiple access points, and represent a small proportion of the general population. The difficulty and expense of drawing a representative sample may have stifled attempts to study marine anglers. We test alternative sampling strategies by comparing the characteristics of a representative sample of experienced marine anglers with the characteristics of two other samples using multivariate and univariate analysis techniques. We conclude a sample of marine anglers drawn from the population of licensed inland anglers is not significantly different from the representative sample of experienced marine anglers.

Vaughan, W.J. and C.S. Russell. 1982. "Valuing a Fishing Day: An Application of a Systematic Varying Parameter Model." **Land Economics.** 58:450-463.

Walsh, Richard G.; Donn M. Johnson; John R. McKean. 1990. "Nonmarket Values from Two Decades of Research on Recreation Demand." in Advances in Applied Micro-Economics, JAI Press Inc. Volume: 5, Pages: 167-193.

   This paper addresses some of the issues in past application of non-market value analyses and there relative importance from the perspective of future policy decisions. This paper evaluates the effectiveness of a recent attempt to review the reported values and adjust them not only for inflation but for some of the important variations in method.

Walsh, Richard G.; Donn M. Johnson; John R. McKean. 1992. "Benefit Transfer of Outdoor Recreation Demand Studies." Water Resources Research, Volume: 28, Issue: 3, Pages: 707-713.

   This paper is part of a special issue that examines the conceptual and empirical issues associated with benefit transfer applications.

Walsh, Richard G. ; Donn M. Johnson; John R. McKean. 1988. "Review of Outdoor Recreation Economic Demand Studies with Nonmarket Benefit Estimates, 1968-1988." Colorado Water Resources Research Institute, December 1988. Report Number: 54.

   This report illustrates how past studies can be adjusted to develop some tentative estimates of the recreation use value of Forest Service resources. This study uses meta-analysis to develop an understanding of the variables that explain the observed difference in benefit estimates from studies on demand for outdoor recreation with nonmarket benefit estimates from 1968-1988.