

APPENDIX B

ANNOTATED BIBLIOGRAPHY

GENERAL TEXTS ON NATURAL RESOURCE DAMAGE ASSESSMENT AND ENVIRONMENTAL ECONOMICS

Freeman, A.M. III. 1993. The Measurement of Environmental and Resource Values: Theory and Methods. Washington, D.C.: Resources for the Future.

A general text on environmental and resource economics. Does not focus specifically on natural resource damage assessment, but does cover many pertinent topics, such as: the economic concept of value; welfare measures of value; nonuse values; and direct and indirect valuation methods.

Kopp, R.J. and V.K. Smith. 1993. Valuing Natural Assets: The Economics of Natural Resource Damage Assessment. Washington, D.C.: Resources for the Future.

Collection of 14 articles by 13 authors, grouped under four parts: statutes, rulemaking and practice; measuring natural resource damages; conceptual dimensions of damage assessment; and research implications of damage assessment. Particularly interesting are the articles that comment directly on preceding articles, providing a dialogue of alternative viewpoints. Generally accessible to the layperson, although some of the articles are technical and presume a familiarity with the subject.

Ward, K.M. and J.W. Duffield. 1992. Natural Resource Damages, Law and Economics. New York: John Wiley & Sons, Inc.

Includes 23 chapters divided between three topics: law, economics and case studies. Provides a good overview of the relevant legal frameworks and the various economic concepts and valuation methods. Generally accessible to the layperson.

SURVEY ARTICLES ON NATURAL RESOURCE DAMAGE ASSESSMENT POLICY AND LAW

DuBey, Richard A. and James M. Gualva. 1991/92. "The Assertion of Natural Resource Damage Claims by Indian Tribal Trustees." Environmental Claims Journal 4(2):175-185.

Concise overview of role of Indian tribal trustees in the natural resource damage process and their significant interests in protecting natural resources and environmental rights.

Kopp, R. J., P. R. Portney and V. K. Smith. 1990. "Natural Resource Damages: The Economics Have Shifted After Ohio v. United States Department of the Interior." Environmental Law Reporter 20(4).

Analyzes six issues in the 1989 Ohio decision from an economics perspective. Provides a helpful understanding of how the current regulations came about and how economists view related court decisions.

Kopp, Raymond J. and V. Kerry Smith. 1989. "Benefit Estimation Goes to Court: The Case of Natural Resources Damage Assessments." Journal of Policy Analysis and Management 8(4):593-612.

Evaluates the feasibility of performing natural resource damage assessments under CERCLA. Using the analyses developed for two cases, explains the sources of the substantial divergences between plaintiffs' and defendants' estimates of damages, focusing on three factors: 1) time horizon used and treatment of capitalization effects of past damages, 2) extent of the market assumed in estimating the effects of a release of hazardous wastes on the demand for the affected natural resource, and 3) character and availability of substitutes for the resource involved.

Landreth, Lloyd W. and Kevin M. Ward. 1990. "Natural Resource Damages: Recovery Under State Law Compared with Federal Laws." Environmental Law Reporter 10134-10142.

Provides a chart listing natural resource damage statutes in all 50 states. Also describes statutes in five states (Connecticut, Montana, North Carolina, Pennsylvania and Washington), and suggests procedures for states to develop better natural resource damage statutes.

Menefee, Mark. 1982. "Recovery for Natural Resource Damages Under Superfund: The Role of the Rebuttable Presumption." Environmental Law Reporter 15057-15064.

Provides an explanation of the rebuttable presumption concept and an assessment of its role in CERCLA natural resource damage claims.

Shutler, Sharon K. and Elinor Colbourn. 1994. "Natural Resource Restoration: The Interface Between the Endangered Species Act and CERCLA's Natural Resource Damage Provisions." Environmental Law 24:717-760.

Advocates the position that where injured natural resources include endangered or threatened species or their habitats, trustees are authorized to seek compensation for restoration activities that protect or conserve these species. Argues that courts should not find the costs of an "on-site, in-kind" restoration strategy to be "grossly disproportionate" to the value of the natural resources injured where such resources include Endangered Species Act-protected species or their habitats.

REFERENCES FOR NATURAL RESOURCE VALUES AND VALUATION METHODS

ARCHAEOLOGY

Hutt, S., E. W. Jones and M. E. McAllister. 1992. Archaeological Resource Protection. Washington, D.C.: Preservation Press.

Chapter 4 covers damage assessment in archeological violation cases, including: value and cost assessments (commercial value, archeological value, cost of restoration and repair), credibility and conservatism in value and cost assessments, and damage assessment reporting. The focus is on law and procedure, rather than economic theory or methodology.

BENEFITS TRANSFER

The following papers appeared in Water Resources Research 28(3), 1992; which was dedicated to issues in benefits transfer. These papers are of a relatively technical nature.

Atkinson, Scott E., Thomas D. Crocker and Jason F. Shogren. "Bayesian Exchangeability, Benefits Transfer, and Research Efficiency." 715-722.

Boyle, Kevin J. and John C. Bergstrom. "Benefit Transfer Studies: Myths, Pragmatism and Idealism." 657-663.

Brookshire, David S. and Helen R. Neill. "Benefit Transfers: Conceptual and Empirical Issues." 651-655.

Desvousges, William, Michael Naughton and George Parsons. "Benefit Transfer: Conceptual Problems in Estimating Water Quality Benefits Using Existing Studies." 675-683.

Loomis, John B. "The Evolution of a More Rigorous Approach to Benefit Transfer: Benefit Function Transfer." 701-705.

Luken, Ralph A., F. Reed Johnson and Virginia Kilber. "Benefits and Costs of Pulp and Paper Effluent Controls under the Clean Water Act." 665-674.

McConnell, Kenneth E. "Model Building and Judgement: Implications for Benefits Transfers with Travel Cost Models." 695-700.

Smith, V. Kerry. "On Separating Defensible Benefit Transfers from 'Smoke and Mirrors'." 685-694.

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Grigalunas, Thomas A. and James J. Opaluch. 1992. Use of Benefit Transfers in Natural Resource Damage Assessments.

Four-page letter to the NOAA General Counsel commenting on the development of Oil Pollution Act damage assessment regulations. Suggests three minimum conditions for the use of benefit transfer: 1) studies must meet minimum standards for quality assurance in terms of data, theory, and analysis, 2) activities considered in the transferred studies must accurately mirror those affected by the incident, and 3) methodologies used for transfer should conform with standards for benefit transfer.

Smith, V. Kerry and Yoshiaki Kaoru. 1990. "Signals or Noise? Explaining the Variation in Recreation Benefit Estimates." American Journal of Agricultural Economics 72:419-434.

Technical analysis which summarizes the benefit estimates derived from 77 travel cost recreation demand models. Evaluates the influence of variables describing site characteristics, activities undertaken at each site, behavioral assumptions and specification decisions.

Walsh, Richard G., Donn M. Johnson and John R. McKean. 1989. "Issues in Nonmarket Valuation and Policy Application: A Retrospective Glance." Western Journal of Agricultural Economics 14: 178-188.

Illustrates the many issues involved in benefits transfer through development of some tentative estimates of the recreational use value of Forest Service resources. Highly quantitative, but relatively accessible to the layperson.

BIRDS

Brown, Jr., Gardner M. 1992. "Replacement Costs for Birds and Mammals." Prepared for the National Oceanic and Atmospheric Administration, Damage Assessment Center, Rockville, MD.

Estimates values for bird species affected by the *Exxon Valdez* oil spill based on the costs of relocation, replacement and rehabilitation. Covers murre, seaducks, cormorants, procellariids, gulls, marbled murrelets, guillemots, grebes, loons, puffins, peregrine falcons, blacklegged kittiwakes, storm petrels and eagles.

Charbonneau, J. John and Michael J. Hay. 1978. "Estimating Marginal Values of Waterfowl for Hunting." Working Paper No. 8, prepared for Division of Program Plans, U.S. Fish and Wildlife Service.

A technical discussion of the theory and methodology used to derive marginal values of waterfowl for hunting. Also provides a simple table of marginal values for puddle ducks, diving ducks, geese and all waterfowl, broken out by the Atlantic, Mississippi, Central and Pacific flyways.

Cooper, Joseph and John Loomis. 1991. "Economic Value of Wildlife Resources in the San Joaquin Valley: Hunting and Viewing Values." in The Economics of Management of Water and Drainage in Agriculture. A. Dinar and D. Zilberman (eds.), Kluwer Academic Publishers.

Quantifies the effects of agricultural drainage on the recreational demand for wildlife resources in the San Joaquin Valley.

Huguenin, Michael T., James E. Neumann and Robert E. Unsworth. 1991. "Summary of Existing Unit Value Estimates for Selected Species Affected by the *Exxon Valdez* Oil Spill." Report by Industrial Economics, Incorporated prepared for the U.S. Department of Justice.

Summarizes existing estimates of the value of some species affected by the *Exxon Valdez* oil spill, presented on a per animal basis where possible. Species include bald eagle, eagle (general), pigeon guillemot, common murre, marbled murrelet, duck (general), migratory birds (general), waterfowl (general) and species that are endangered or threatened. Also includes a bibliography, species descriptions, and summaries of selected wildlife valuation literature.

CONTINGENT VALUATION

Bishop, Richard C. 1995. "Peer Review of 'Contingent Valuation of Natural Resource Damages Due to Injuries to the Upper Clark Fork River Basin'," prepared for State of Montana Natural Resource Damage Program.

Includes a draft paper (co-authored with Daniel W. McCollum) entitled "Assessing the Content Validity of Contingent Valuation Studies," which develops a 17-attribute, 100-point scale for assessing the quality of contingent valuation studies. Uses the 100-point scale to assess the contingent valuation studies of natural resources in the Clark Fork River basin, the *Exxon Valdez* oil spill and wilderness protection.

Carson, Richard T., Jennifer Wright, Aanna Alberini, Nancy Carson and Nicholas Flores. 1994. "A Bibliography of Contingent Valuation Studies and Papers." La Jolla, CA: Natural Resource Damage Assessment, Inc.

Provides 1,672 citations for contingent valuation studies and papers.

Cummings, Ronald G., David S. Brookshire and William D. Schulze, eds. 1986. Valuing Environmental Goods: An Assessment of the Contingent Valuation Method. Totowa, NJ: Rowman and Allanheld Publishers.

A critical review of the contingent valuation method, including four "reference operating conditions" for the accurate implementation of a contingent valuation study. Also includes a collection of papers and a concluding summary from a contingent valuation review conference.

Some material is highly technical, but the volume generally presents a helpful overview of the various aspects of contingent valuation.

Diamond, Peter A. and Jerry A. Hausman. 1993. "On Contingent Valuation Measurement of Nonuse Values." Paper prepared for presentation a symposium originated by Cambridge Economics, Inc., entitled "Contingent Valuation: A Critical Assessment." Washington, D.C., April 2-3.

This paper reports on the results of a group of surveys, funded by Exxon Company, USA, that were designed to test whether contingent valuation answers are consistent with consumer choice theory. This study concludes that contingent valuation surveys do not measure the economic values of natural resources, and describes other potential problems with the contingent valuation method.

Kahneman, Daniel and Jack L. Knetsch. 1992. "Valuing Public Goods: The Purchase of Moral Satisfaction." Journal of Environmental Economics and Management 22:57-70.

Smith, V. Kerry. 1992. "Arbitrary Values, Good Causes, and Premature Verdicts." Journal of Environmental Economics and Management 22:71-89.

Kahneman, Daniel and Jack L. Knetsch. 1992. "Contingent Valuation and the Value of Public Goods: Reply." Journal of Environmental Economics and Management 22:90-94.

Morrison, Glen W. 1992. "Valuing Public Goods with the Contingent Valuation Method: A Critique of Kahneman and Knetsch." Journal of Environmental Economics and Management 23:248-257.

Kahneman and Knetsch argue that responses to contingent valuation surveys do not reflect the economic value of public goods, but the willingness to pay for the moral satisfaction of contributing to these goods (i.e., the "warm glow" effect). Smith and Harrison provide replies to this argument, including alternative interpretations of the conclusions reached by Kahneman and Knetsch.

Mitchell, Robert C. and Richard T. Carson. 1990. Using Surveys to Value Public Goods: The Contingent Valuation Method. Washington, DC: Resources for the Future.

The most frequently referenced textbook on contingent valuation. Develops the theoretical basis for the method, examines potential sources of error and bias in estimates generated using this method, and provides guidelines for proper implementation of a contingent valuation study. Generally accessible to the layperson.

- Portney, Paul R. 1994. "The Contingent Valuation Debate: Why Economists Should Care." The Journal of Economic Perspectives 8(4):3-18.
- Hanemann, W. Michael. 1994. "Valuing the Environment Through Contingent Valuation." The Journal of Economic Perspectives 8(4):19-44.
- Diamond, Peter A. and Jerry A. Hausman. 1994. "Contingent Valuation: Is Some Number Better than No Number." The Journal of Economic Perspectives 8(4):45-64.

A set of papers that provide (1) an overview of contingent valuation and the debate surrounding it (Portney); (2) arguments in favor of the use of this technique (Hanemann); and (3) arguments against its use (Diamond and Hausman). These papers are generally accessible to individuals without formal training in economics.

FISH

- American Fisheries Society. 1990. "A Handbook of Monetary Values of Fish and Fishkill Counting Guidelines." Socioeconomics Section, Bethesda, MD.

Includes detailed tables for both replacement costs and economic values (the latter based upon measures of consumer and producer surplus). Highly accessible to the layperson, including guidance on how to choose between replacement costs and economic values.

GROUNDWATER

- Boyle, Kevin J. 1994. "A Comparison of the Contingent Valuation Studies of Groundwater Protection." Report 456, University of Maine.

Summarizes, compares, and contrasts eight contingent valuation studies of the benefits of protecting groundwater quality.

- McClelland, Gary H., William D. Schulze, Jeffrey K. Lazo, Donald M. Waldman, James K. Doyle, Steven R. Elliot and Julie R. Irwin. 1992. "Methods for Measuring Non-Use Values: A Contingent Valuation Study of Groundwater Cleanup." Draft report prepared by the Center for Economic Analysis, Department of Economics, University of Colorado, Boulder, for the Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency.

Comprehensive report on a 5,000-household contingent valuation survey of willingness to pay for groundwater cleanup. Builds the theoretical basis for estimating the benefits of groundwater cleanup, explores methodological issues in using contingent valuation to measure passive use values, covers surveys instrument design and testing issues, and analyzes results with an emphasis on different approaches to estimating passive use value.

Raucher, Robert L. 1986. "The Benefits and Costs of Policies Related to Groundwater Contamination." Land Economics 62(1):33-45.

Reviews and expands on a conceptual framework for measuring the benefits of groundwater protection, based on the premise that the probabilistic value of protection is at least as great as the expected costs of containment. Applies the framework to case studies of three waste disposal sites affecting vital aquifers. Indicates that preventing future contamination is not necessarily economically preferable to post-contamination corrective action.

Raucher, Robert L. 1983. "A Conceptual Framework for Measuring the Benefits of Groundwater Protection." Water Resources Research 19(2):320-326.

Establishes a framework for measuring the benefits of groundwater protection, based on the premise that the probabilistic value of protection is at least as great as the expected costs of contamination. Cost are sensitive to a variety of site-specific hydrogeologic and water use factors and general economic parameters. Relatively technical.

HABITAT EQUIVALENCY

National Oceanic and Atmospheric Administration, Damage Assessment and Restoration Program. 1995. "Habitat Equivalency Analysis, an Overview." 21 March.

NOAA's published guidance on the habitat equivalency method.

Unsworth, R.E. and R.C. Bishop. 1994. "Assessing Natural Resource Damages Using Environmental Annuities." Ecological Economics 11:35-41.

A paper proposing use of the habitat equivalency method for natural resource damage assessment. Includes an example of the application of the technique at the Great Swamp National Wildlife Refuge.

RECREATION

Bockstael, Nancy E., W. Michael Hanemann and Ivar E. Strand. 1986. "Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models." Report to the Economic Analysis Division, U.S. Environmental Protection Agency.

Highly technical and thorough exposition of recreational demand models in the context of measuring the benefits of water quality improvements.

Bergstrom, John C. and H. Ken Cordell. 1991. "An Analysis of the Demand for and Value of Outdoor Recreation in the United States." Journal of Leisure Research 23(1):67-86.

Estimates the economic value of 37 outdoor recreational activities using a multi-site travel cost model. The model was developed using data from the Public Area Recreation Visitors Study (PARVS), which uses information collected through individual interviews conducted in public recreation areas throughout the U.S. from 1985 to 1987.

Cooper, Joseph and John Loomis. 1991. "Economic Value of Wildlife Resources in the San Joaquin Valley: Hunting and Viewing Values." in The Economics of Management of Water and Drainage in Agriculture. A. Dinar and D. Zilberman (eds.) Kluwer Academic Publishers.

Quantifies the effects of agricultural drainage on the recreational demand for wildlife resources in the San Joaquin Valley.

Freeman, A. Myrick. 1993. "The Economics of Valuing Marine Recreation: A Review of the Empirical Evidence." Economics Working Paper 93-102, Bowdoin College.

Addresses the question of whether the available economics literature provides a sufficient basis for estimating the benefits to marine recreation attributable to the water pollution control programs of federal, state and local agencies. Appendix provides summary descriptions of over 40 marine recreation studies.

Loomis, John, William Provencher and William G. Brown. 1988. "Evaluating the Transferability of Regional Recreation Demand Models." in R. Johnson and G. Johnson (eds.) Economic Valuation of Natural Resources: Issues, Theory, and Application. Boulder, CO: Westview Press.

Discusses the theoretical conditions that would be required for travel cost equations to be transferred between sites. Relatively technical.

Loomis, John B. and Cindy Sorg. 1983. "A Critical Summary of Empirical Estimates of the Values of Wildlife, Wilderness and General Recreation Related to National Forest Regions." Contract Report No. 40-82-FT-2-714, Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, Fort Collins, CO.

Critically evaluates and standardizes many different contingent valuation, travel cost and hedonic studies to derive value estimates for 17 outdoor recreation activities. Focuses on producing standardized values for a 12-hour recreation visitor day that can be generalized across each Forest Service region. Accessible to the layperson, but somewhat dated.

McCollum, Daniel W., George L. Peterson, J. Ross Arnold, Donald C. Markstrom and Daniel M. Hellerstein. 1989. "The Net Economic Value of Recreation on the National Forests: Twelve Types of Primary Activity Trips Across Nine Forest Service Regions." Prepared for the Rocky Mountain Forest and Range Experiment Station, U.S. Forest Service, Fort Collins, CO.

Estimates economic value of recreational activities at Forest Service sites based on data from the Public Area Recreation Visitors Study (PARVS), which uses information collected through individual interviews conducted in public recreation areas throughout the U.S. from 1985 to 1987. Estimates the average value per trip, by U.S. Fish and Wildlife Service region.

Olson, Darryll. 1990. Using the Contingent Valuation Method for Existence and Recreation Valuation Studies: An Annotated Bibliography of Key References. Monticello, IL: Vance Bibliographies.

Provides almost 50 pages of citations and relatively thorough summaries of a range of contingent valuation publications, divided into the areas of: theoretical and definitional context, institutional setting and welfare measures, contingent valuation method technology, survey instrument and research design, selected existence and option value studies.

Randall, Alan. 1994. "A Difficulty with the Travel Cost Method." Land Economics 70(1):88-96.

A review of potential limitations in the travel cost method. Concludes that the travel cost method should not be used as a stand-alone technique for estimating recreational benefits, but should be calibrated with information generated through other methods.

U.S. Department of Agriculture Forest Service. 1990. Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program. Washington, DC.

Provides "market-clearing prices" and "market-clearing prices plus consumer surplus values" per activity day for Forest Service recreational activities. Based on data from several studies that are in turn based upon an extensive literature review.

U.S. Department of the Interior Fish and Wildlife Service. 1993. 1991 National Survey of Fishing, Hunting and Wildlife-Associated Recreation. Washington, DC.

U.S. Department of the Interior Fish and Wildlife Service. 1989. 1985 National Survey of Fishing, Hunting and Wildlife-Associated Recreation. Washington, DC.

Separate volumes for each state providing extensive data on fishing, hunting and nonconsumptive recreational activities. National Survey for 1991 is also available on CD-ROM.

U.S. Department of the Interior Fish and Wildlife Service. 1988. Analysis of the 1985 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Washington, DC.

Separate reports are available based on the 1985 survey for the following topics: black bass fishing in the U.S.; hunting on wetlands; net economic values of nonconsumptive wildlife-related recreation; net economic recreation values for deer, elk and waterfowl hunting and bass fishing; trout fishing in the U.S.; wildlife related recreation on public lands.

U.S. Department of the Interior Fish and Wildlife Service. 1994. 1980-1990 Fishing, Hunting, and Wildlife-Association Recreation Trends. Washington, DC.

Provides state trend information on the number of anglers, hunters and nonconsumptive wildlife-related recreation participants from 1980-1990.

Walsh, Richard G., Donn M. Johnson and John R. McKean. 1988. "Review of Outdoor Recreation Economic Demand Studies with Nonmarket Benefit Estimates, 1968-1988." Technical Report No. 54, Colorado Water Resources Research Institute.

Extensive review of 120 outdoor recreation demand studies. Provides standardized summaries of net economics values per activity day, statistical analysis of important explanatory variables across different studies, and summaries of existing studies for 10 different categories of recreation.

Walsh, Richard G., Donn M. Johnson and John R. McKean. 1992. "Benefit Transfer of Outdoor Recreation Studies, 1968-1988." Water Resources Research 28(3):707-713.

Provides 287 estimates of net economic value per day reported by 120 outdoor recreation demand studies for 19 recreation activities. Also performs statistical tests for the relationship of recreation benefits to selected explanatory variables.

WETLANDS

Douglas, Aaron J. 1989. "Annotated Bibliography of Economic Literature on Wetlands." U.S. Department of Interior, Fish and Wildlife Service, National Ecology Research Center. Washington, DC.

Covers 90 citations with relatively comprehensive summaries. Also includes an 11-page conceptual introduction. Highly accessible for the layperson.

King, Dennis M. 1990. "Summary of Literature Review of Wetland Values." King and Associates, Washington, DC.

Provides an extensive 13-page table with wetland values generally expressed in terms of dollars per acre, with information on state, wetland type, basis of estimate and citation.

Scodari, Paul F. 1990. Wetlands Protection: The Role of Economics. Washington, DC: Environmental Law Institute.

Monograph covering the science of wetland valuation, the economic principles and methods for valuing wetland services, the implementation of wetland valuation, and the relevant natural resource damage assessment regulations. Excellent overview for the layperson.

Unsworth, R.E. and R.C. Bishop. 1994. "Assessing Natural Resource Damages Using Environmental Annuities." Ecological Economics 11:35-41.

A paper proposing use of the habitat equivalency method for natural resource damage assessment. Includes an example of the application of the technique at the Great Swamp National Wildlife Refuge.

WILDLIFE

Boyle, Kevin J. and Richard C. Bishop. "The Economic Valuation of Endangered Species of Wildlife." in R.E. McCabe (ed.), Transactions of the Fifty-first North American Wildlife and Natural Resources Conference.

Develops a conceptual framework for examining the monetary values that members of the current generation assign to the preservation of endangered species of wildlife; reports on the results of two applications of the conceptual framework.

Brown, Jr., Gardner M. 1992. "Replacement Costs for Birds and Mammals." Prepared for the National Oceanic and Atmospheric Administration, Damage Assessment Center, Rockville, MD.

Estimates values for various mammal species based on the costs of relocation, replacement and rehabilitation for some of the marine and terrestrial mammals that may have suffered injury in the *Exxon Valdez* oil spill. Covers otters (sea and river), whales (killer and humpback), stellar sea lions, harbor seals, deer (white-tailed), bears (brown and black) and mink.

Huguenin, Michael T., James E. Neumann and Robert E. Unsworth. 1991. "Summary of Existing Unit Value Estimates for Selected Species Affected by the *Exxon Valdez* Oil Spill." Report by Industrial Economics, Incorporated, prepared for the U.S. Department of Justice.

Summarizes existing estimates of the value of some species affected by the *Exxon Valdez* oil spill, presented on a per animal basis where possible. Includes sea otter, otter (general), harbor seal, marine mammal (general) and species that are endangered or threatened. Also includes a bibliography, species descriptions, and summaries of selected wildlife valuation literature.

Sorg, Cindy F. and John Loomis. 1985. "An Introduction to Wildlife Valuation Techniques." Wildlife Society Bulletin 13:38-46.

Introduces wildlife valuation methodologies (gross expenditures, travel cost, and contingent valuation), explains adjustments that make economic values derived from the various techniques comparable, and presents illustrations of adjusted values from several studies on big game hunting. A helpful and accessible introduction for the layperson, though somewhat dated.

The following are examples of legally prescribed restitution values for game birds, big game, small game, endangered and threatened species, and game fish. Talhelm draft documents the theoretical basis and construction of the Minnesota values.

Texas Parks and Wildlife Department. 1986. Guidelines for the Determination of Values for Fish and Wildlife Illegally Killed, Taken, Possessed, or Injured. Austin, TX.

State of Minnesota. 1991. Proposed Rules Prescribing Restitution Values for Fish and Wildlife Illegally Killed, Injured, or Possessed: Statement of Need and Reasonableness. Department of Natural Resources, Division of Wildlife and Enforcement. St. Paul, MN.

State of Minnesota. 1991. In the Matter of the Proposed Adoption of Rules Prescribing Restitution Values for Fish and Wildlife Illegally Killed, Injured, or Possessed: Statement of Need and Reasonableness. Department of Natural Resources, Division of Wildlife and Enforcement. St. Paul, MN.

Talhelm, Daniel R. 1990. "Recommended Values for Computing Fair Restitution to the Citizens of Minnesota for Fish and Wildlife Illegally Killed, Injured, or Possessed." Prepared for Minnesota Department of Natural Resources. Resource Econometrics. East Lansing, MI.

U.S. Department of Agriculture. 1987. "Estimating Prices for Access to Opportunities for Hunting, Viewing, Fishing, and Viewing Wildlife on Public and Private Lands. Final Report of Natural Resources and Environment Steering Committee on Wildlife and Fish Access Prices. Washington, DC.

Qualitative overview and assessment of market price appraisal, contingent valuation, hedonic pricing and household production, and travel cost method.

EXAMPLE ASSESSMENTS

Bishop, Richard C. 1992. "The Potential Natural Resource Damages from the Asbestos Dump Sites in the Dietzman Tract, Great Swamp National Wildlife Refuge, New Jersey." Prepared for the U.S. Fish and Wildlife Service and the U.S. Department of Justice.

This report "is not intended to substitute for a full natural resource damage assessment," but instead its goal is "to explore the potential magnitude of the damages at the Great Swamp National Wildlife Refuge." Estimates on-site damages resulting from closure of recreational trails due to two hazardous waste dumps and applies a habitat equivalency based approach for valuing lost wetland services.

Carson, Richard T., Robert T. Mitchell, W. Michael Hanemann, Raymond J. Kopp, Stanley Presser and Paul A. Ruud. 1992. "A Contingent Valuation Study of Lost Passive Use Values Resulting from the *Exxon Valdez* Oil Spill." Prepared for the Attorney General of the State of Alaska.

Contingent valuation study of passive use value loss from injuries to natural resources arising from the March 1989 *Exxon Valdez* oil spill. Survey injury description includes oiled shoreline, bird and mammal deaths, and effects on fish.

Carson, Richard T., W. Michael Hanemann, Raymond J. Kopp, Jon A. Krosnick, Robert C. Mitchell, Stanley Presser, Paul A. Ruud, and Kerry Smith. 1994. "Prospective Interim Lost Use Value Due to DDT and PCB Contamination in the Southern California Bight." Natural Resource Damage Assessment, Inc., La Jolla, California.

Contingent valuation study of economic damages resulting from injuries to the natural resources of the Southern California Bight. Survey injury description includes impacts on fish and birds, including endangered species.

Division of Policy and Directives Management. 1988. "Damages to the Lake Michigan Sport Fishery from PCBs in Waukegan Harbor." U.S. Fish and Wildlife Service. Washington, DC.

Measures the economic value of the difference between the number of sport fishing days with and without the PCBs contamination at the site.

Freeman, A. Myrick III, Michael T. Huguenin and Douglas A. Rae. 1990. "Natural Resource Damages from the Charles George Landfill." Prepared for the Commonwealth of Massachusetts.

Assesses economic damages arising from contamination of the aquifer lying beneath the Charles George Landfill in Tyngsboro, Massachusetts, which rendered private wells unsuitable for both residential and non-residential use.

Hay, Michael J., Elizabeth W. Snell and Robert E. Unsworth. 1993. "Estimating Damages from PCBs to the Valley Creek Fishery in Valley Forge National Historic Park." Prepared for U.S. Fish and Wildlife Service.

Assesses economic damages due to PCB contamination originating from the Paoli Rail Yard Superfund site. Estimates use value damages due to lost fishing trips. Also reviews existing literature on passive use values for recreational fishing and fresh water resources, concluding that passive use losses could be significant and even exceed the use value losses.

McConnell, Kenneth E. and Industrial Economics, Incorporated. 1986. "The Damages to Recreational Activities from PCBs in the New Bedford Harbor." Prepared for the National Oceanic and Atmospheric Administration.

Measures reductions in willingness-to-pay for access to substitute beaches near this PCB contaminated harbor, and the increase in costs incurred by recreational fisherman who must travel further to avoid contaminated areas.

Meade, Norman and Robert Unsworth. 1990. "Preliminary Economic Damage Assessment of the January 2nd Exxon Oil Spill in the Arthur Kill Waterway/ Estimated Value of Selected Settlement Components." Prepared for the National Oceanic and Atmospheric Administration.

Estimates lost intertidal services. Lost value of the Arthur Kill as a transportation corridor, existence values and total losses.

Mendelsohn, Robert and Industrial Economics, Incorporated. 1986. "Assessment of Economic Damages: Analysis of Residential Property Values in the New Bedford Area." Prepared for the National Oceanic and Atmospheric Administration.

Estimates damages inflicted on residents in the area of New Bedford harbor from the PCB contamination of the harbor by using a hedonic price model and repeat sale data.

Natural Resource Damage Assessment, Inc. 1994. "Prospective Interim Lost Use Value Due to DDT and PCB Contamination in the Southern California Bight." Prepared for the National Oceanic and Atmospheric Administration.

Comprehensive contingent valuation study of prospective interim lost use value from natural resource injuries due to chemical contamination off the coast of Los Angeles. Survey injury

description includes two species of fish and two species of birds. Includes extensive advanced econometric analysis of survey data.

RCG/Hagler Bailly. 1995. "Assessment of Damages to Angles and Other Recreators from Injuries to the Upper Clark Fork River Basin." Prepared for State of Montana Natural Resource Damage Program.

Uses a travel cost model to estimate annual use value losses from reduced fishing quality at this site (for both Montana residents and nonresidents). Uses data from a postcard survey and unit value estimates from a literature review to estimate annual use value losses from nonfishing recreation (for both Montana residents and nonresidents).

RCG/Hagler Bailly. 1995. "Contingent Valuation of Natural Resource Damages Due to Injuries to the Upper Clark Fork River Basin." Prepared for State of Montana Natural Resource Damage Program.

Contingent valuation study of Montana households' willingness to pay for restoration of natural resources injured by four Superfund sites in the Clark Fork River Basin.

RCG/Hagler Bailly. 1991. "Contingent Valuation of Natural Resource Damage due to the *Nestucca* Oil Spill." Prepared for State of Washington Department of Wildlife, British Columbia Ministry of Environment, and Environment Canada.

Contingent valuation study of economic value to residents of Washington state and British Columbia of natural resource injuries from the December 1988 *Nestucca* 231,000 gallon oil spill. Injuries included oiled beaches, substantial seabird deaths, possible sea otter mortality, and effects on fisheries and other aquatic life.

Unsworth, Robert E., Elizabeth W. Snell and Richard C. Bishop. 1994. "Preliminary Economic Evaluation of Natural Resource Damages to Fish Creek: Final Memorandum Reporting on the Preliminary Economic Evaluation." Prepared for U.S. Department of the Interior Fish and Wildlife Service.

Preliminary assessment of the economic damages to natural resources injured by the September 1993 spill of about 30,000 gallons of diesel fuel into Fish Creek, a high quality stream in Indiana and Ohio. Estimates ecological and passive use values of the Fish Creek resource prior to the spill for Indiana and Ohio households.