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A Selected Annotated BIBLIOGRAPHY of Economic Values of Fish and Wildlife and Their Habitats

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FOREWORD

The compilation of this biliography was sponsored by the North Dakota Agricultural Experiment Station and the North Dakota Water Resources Research Institute. The authors wish to extend their thanks to those who assisted in the preparation of this report. Dr. Jerome E. Johnson and Dr. David W. Cobia, Department of Agricultural Economics, both provided invaluable assistance with computerized bibliographic searches. Mr. Ronald Erickson, U.S. Fish and Wildlife Service, and Mr. Keith Trego, North Dakota State Game and Fish Department, both offered their time and the available resources of their agencies. The staff of the North Dakota State University Library deserves special thanks for their efforts, especially the personnel in interlibrary loan, who made numerous sources available to the authors. Mrs. Bea Williams and the secretarial staff in the Department of Agricultural Economics also deserve recognition for their assistance in typing this report.

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HIGHLIGHTS

This selected annotated bibliography of economic values of fish and wildlife with 691 entries is organized into the following eight general categories:

1. Wetland Economics
2. Economics of Fish and Wildlife and Their Habitats
3. Miscellaneous Evaluation Techniques With Application to Fish and Wildlife
4. Socioeconomic Characteristics of Hunters and Fishermen
5. Outdoor Recreation Economics
6. Natural Resource Economics
7. Water Resource Economics Related to Fish and Wildlife
8. Bibliographies

An alphabetical author index is provided. Government document numbers and Ph.D. dissertation abstract numbers are given for many of the references.

A SELECTED ANNOTATED BIBLIOGRAPHY OF ECONOMIC VALUES OF FISH AND WILDLIFE AND THEIR HABITATS

by
Jay A. Leitch and Donald F. Scott*

Energy development, irrigation, drainage, and urban sprawl each has an impact on the quantity and quality of wildlife habitat. Decisions involving alternative uses of natural resources have generally been made with little substantive information on the values associated with the wildlife resource or its habitat. A limited information base is often the reason for this lack of consideration. This compilation of references to pragmatic and empirical studies on the economic aspect of wildlife value is intended to be an aid to the researcher who faces the problem of valuing wildlife resources, and as a source of reference for public decision makers and others who are concerned with problems associated with the allocation of natural resources.

The main objective of this bibliographic search was to compile a listing of literature references on methods and techniques that have been developed for estimating economic values of wildlife and wildlife habitat. Since a limited number of references were found, the scope of the bibliography was broadened to include literature in the general area of outdoor recreation. Selected references in this field were included that seemed applicable to the intent of this compilation. A number of references deal with techniques for estimating economic values of resources other than wildlife and techniques that do not result in economic values for wildlife that the authors felt have potential for application to wildlife economics.

Source of Data

Several bibliographic services were used in gathering sources for this report. Some of the more useful were:

Denver Public Library, Fish and Wildlife Reference Service;

Smithsonian Science Information Exchange, Inc., Current Research Information System;

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*Research Assistant and Assistant Professor, respectively, Department of Agricultural Economics.

National Agriculture Library, AGRICOLA (CAIN) computer search; and

National Technical Information Service, computer search.

In addition to the above sources, the usual library reference sources were screened. Some of the more useful of these were:

Journal of Economic Literature,

Index of Economic Articles,

Dissertation Abstracts, and

Wildlife Review.

Several bibliographies were reviewed in the process of gathering references. They are listed in Section VIII. The majority of references are journal articles, doctoral dissertations, and university research reports.

Organization

This bibliography is organized in eight sections. The first section, "Wetland Economics," includes references concerned primarily with the value of wetland as a unit. The second section, "Economics of Fish and Wildlife and Their Habitats," includes studies pertaining expressly to the economic values of fish and wilflife. The third section, "Evaluation Techniques With Application to Fish and Wildlife" presents a variety of evaluation techniques that could be applicable to fish and wildlife.

The fourth section, "Socioeconomic Characteristics of Hunters and Fishermen," lists references that generally serve as data sources for further economic analysis. It includes studies of the determinants of hunter and fishermen behavior, their expenditures, and their attitudes. Although many studies of this type have been reported on, only a representative group is included herein.

The fifth section, "Outdoor Recreation Economics," includes references on outdoor recreation in general. The methodologies developed can be or have been used to estimate wildlife values. This is by no means a complete bibliography of the literature on outdoor recreation, but only a sample of those considered relevant to fish and wildlife evaluation.

The sixth section, "Natural Resource Economics," lists literature on other natural resources, such as land, which are related to fish and wildlife. The seventh section, "Water Resource Economics Related to Fish

and Wildlife," lists literature on the economics of water resources related to fish and wildlife. The final section, "Bibliographies," contains a list of bibliographies that contain references to fish and wildlife economics. Some were reviewed for references to be included in this compilation.

An alphabetical author index follows the final section.

Annotation

The annotation presented for most of the references cited is intended to inform the reader of the general content of the source. It is not meant to convey the results, conclusions, or recommendations of the source's author(s) to the reader. It serves as an aid in the reader's determination of the usefulness of the reference for his own research needs.

Many abstracts presented herein were condensed from other sources, since it would be a monumental task to obtain, read, and abstract the volume of literature in this report in a timely manner. Dissertation Abstracts and some bibliographies were helpful in this respect. However, references were read by one of the authors whenever possible.

In some instances an author may be referenced more than once on the same topic. For instance, one author could have a Ph.D. dissertation listed and a published report with him as author where both are on the same topic. Both references are included to broaden the availability of sources available to the reader.

Standard bibliographic style is used throughout this report with two exceptions. First, Ph.D. dissertation citations are usually followed by their location in Dissertation Abstracts. Their source is noted with an asterisk (*). For example, a dissertation citation followed by *34(6):3407-A would be abstracted on page 3407-A, Volume 34, Issue 6, of Dissertation Abstracts. The other exception is that government documents are followed by their library call numbers as found in the Monthly Catalog of U.S. Government Documents. For example, a government document reference followed by "(I2.13:3/v.2)" could be located in a library government documents section under that number.

I. Wetland Economics

1. ANTHONY, Willis E. "Basic Economics of Farm Drainage." Minnesota Agricultural Economist No. 568:3-6, June 1975.

   Drainage aids farmers in one of three ways: (1) adds new land, previously unavailable for cropping, (2) provides assured access to cropland, or (3) increases yields on water saturated cropland. Sample data from six observed drainage projects showed a marked improvement in yields after drainage. Rates of return from investment in tile drainage were estimated to fall between 10 and 15 percent in a typical situation.

2. AUS, Philip B. "What is Happening to the Wetlands?" Transactions of the Thirty-Fourth North American Wildlife and Natural Resources Conference 34:315-322, 1969.

   A discussion of wetland drainage and some of the laws pertaining to drainage and the preservation of wetlands, especially in North Dakota.

3. BARSTOW, C. J. "Impact of Channelization on Wetland Habitat in the Obion-Forked Deer Basin, Tennessee." Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:362-375, 1970.

   A case study evaluation of a Corps of Engineer's project in the Obion-Forked Deer Basin in Tennessee. The author argued that loss of habitat and the resulting net economic loss to the region of $4 million annually were more than enough to halt the project and protect wetlands in the Basin. Recreational benefits were estimated using Senate Document 97 user-day values.

4. BELHOSE, F. C. "Relative Values of Drained and Undrained Bottomland in Illinois." Journal of Wildlife Management 9:161-182, 1945.

   Estimates of the relative values of undrained and drained bottomland in central Illinois are presented. The author suggests ways in which owners of bottomland may realize greater income by managing the land for wildlife production than by draining the land for agricultural production.

5. BENSON, Dirck and Robert F. Perry. "An Acre of Marsh is Worth---." The New York State Conservationist 19(6):30-33, 1965.

   A variety of values attached to marshland were aggregated to show the capitalized value of an acre of marsh in New York in 1965 to be $350 to $400. Some of the value components were: water values of $0.19; product values of $0.10; habitat values of about $11.48 (including a value for duck habitat ranging from $1.10 to $10); recreational values of $6.05; and $0.75 annual net value of educational returns. These values were estimated using various types of data that included expenditures and sales of bait. Duck values were estimated to be $5 per duck times a coefficient of 0.22 ducks per acre per year.

6. BONNEMA, Kenneth W. and M. S. Zschomler. "Drainage, Mitigation, and Land Treatment in a PL 83-566 Watershed." Wildlife Society Bulletin 2(4): 185-190, Winter 1974.

The authors discuss the Crane Creek Watershed project (Minnesota) regarding its effects on wildlife habitat, and review the success of mitigation in alleviating losses of wildlife habitat. The land treatment program established as part of the project is also analyzed.

7. BOYLE, Robert H. "How to Stop the Pillage of America." Sports Illustrated 27(24):40-53, December 11, 1967.

Author argues for increased federal legislation to protect U.S. natural resources. He particularly urges Congressional legislation on thermal pollution and the protection of coastal estuaries and wetlands.

8. BRAY, James O., Alexander Cole, and Richard J. Hammond. The North Dakota Wetlands Problem. Menlo Park, California: Stanford Research Institute, for the North Dakota State Water Conservation Commission, 60 pages + Appendices, April 1968.

An overview of the impasse between agricultural interests and wildlife interests in North Dakota and the Devils Lake Basin in North Dakota. The authors concluded that at the local level benefits may be greater from drainage than preservation of wetlands.

9. BRINK, C. Holden. A Comparison of Consumers' Surplus and Monopoly Revenue Estimates of Recreation Value for Two Utah Waterfowl Marshes. Logan: Utah State University, Ph.D. dissertation, 141 pages, June 1973. *34(12):7408-A

Demand curves are estimated following the Hotelling-Clawson procedure for waterfowl hunting and nonconsumptive recreational use from use rate and variable expenditure data collected at the Bear River Migratory Bird Refuge and the Farmington Bay Waterfowl Management Area during fiscal 1969. Consumers' surplus and monopoly revenue were estimated from the demand functions. Adjusted estimates of consumers' surplus for waterfowl hunting amounted to $7,260 per year at Bear River and $11,400 per year at Farmington Bay. For nonconsumptive recreation, annual consumers' surplus was estimated to be $18,700 at Bear River and $3,760 at Farmington Bay. Monopoly revenue estimates were one-half to one-fourth the corresponding consumers' surplus estimates.

10. BROWN, R. J. "A Study of the Impact of the Wetlands Easement Program on Agricultural Land Values." Land Economics 52(4):509-517, November 1976.

The effect of wetlands easements on the price of agricultural land is estimated. Multiple regression analysis of land sales, a capitalization method, and cost-benefit analysis were used to estimate the effects of easements. Land values in three regions in North and South Dakota were used to determine the extent to which a wetlands easement is reflected in the market value of land. It was concluded that the market does fully capitalize the effect of the easement in those cases where the net income forgone as a result of the easement is substantial.

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*Refers to abstract location in Dissertation Abstracts

11. CAIN, S. A. "Estuaries: A Neglected Resource Complex." Commercial Fisheries Review 28(10):27-34, October 1966.

Some of the values and current problems associated with estuaries are discussed. Estimates of the monetary benefits of salt marshes are given.

12. Canadian Wildlife Service. "Dollars from Wetlands." Ottawa, Ontario: Canadian Wildlife Service, undated leaflet.

Easement payments for wetlands in Canada are considered in this Canadian Wildlife Service leaflet.

13. CHOATE, Jerry S. "Effects of Stream Channeling on Wetlands in a Minnesota Watershed." Journal of Wildlife Management 36(3):940-9[illegible], 1972.

A case history of a federally assisted, stream-channeling project and resultant wetland loss in the Hawk Creek Watershed, Minnesota. The author concluded that the project may be good for individual farmers, but resulted in devastating effects on wildlife and public recreational use of the wildlife.

14. _____. "Wetland Drainage in the Hawk Creek Pilot Watershed, Minnesota." St. Paul: Minnesota Department of Natural Resources Division of Game and Fish Special Publication #19, 12 pages (mimeo), July 1971.

The incidence of wetland drainage for channeled and unchanneled portions of the Hawk Creek Watershed for a period of over 15 years is reported.

15. CLEMENT, Ronald C. "Marshes, Developers, and Taxes--A New Ethic for Our Estuaries." Audubon 71(6):34-35, November 1969.

The economic returns from converting wetlands to alternative uses are discussed.

16. COTTAM, Clarence. "Research Needs in Estuarine Areas of the Gulf Coast." Proceedings of the Marsh and Estuary Management Symposium, July, 19-20, 1967, Louisiana State University. Baton Rouge, Louisiana: Thos. J. Moran's Sons, Inc., pp. 227-240, 1968.

More research is needed on the economic, recreational, and sporting values of marsh and estuarine areas. Research is needed on how to restore and effectively manage the resources that remain. Nineteen specific research needs are listed.

17. CRISSEY, W. F. "Prairie Potholes from a Continental Viewpoint." Saskatoon Wetlands Seminar. Ottawa, Ontario: Canadian Wildlife Service Department of Indian Affairs and Northern Development Report Series No. 6, pp. 161-171, 1969.

The importance of the prairie potholes in the production of ducks is discussed and supported with some statistical evidence. The author argues that preservation of just a few potholes would suffice for non-consumptive users, while consumptive user needs can only be met by preservation of significant numbers of pothole habitats.

18. DAHLEN, J. H. and D. R. Thompson. "Wisconsin Wetlands and Their Importance." Wisconsin Conservation Bulletin 20(1):9-12, 1955.

The progress of a wetlands inventory in Wisconsin which was begun in the mid 1950's is reported. One Wisconsin county lost 87 percent of its wetlands in the 50-Year period prior to the inventory.

19. DARNELL, Rezneat M., et al. Impacts of Construction Activities in Wetlands of the United States. Corvallis, Oregon: U.S. Environmental Protection Agency Office of Research and Development, xxvii + 392 pages, April 1976. (EP1.23:600/3-76-045)

Basic biological, chemical, and physical properties of wetlands are identified and the ways that construction activities have altered these characteristics are discussed. Suggestions are made to establish wetland sanctuaries, curtail destructive types of construction, restore degraded environments, and improve the knowledge associated with wetlands ecosystems regarding their alterations by construction. A bibliography pertaining mainly to the biological, chemical, and physical properties of wetlands is included.

20: DAVIS, M. B. "Ecological History of Wetlands." Proceedings of First Wetlands Conference. Storrs: Connecticut University Institute of Water Resources Report No. 21, pp. 113-122, December 1973.

21. DEEVEY, Edward S., Jr. "In Defense of Mud." Bulletin of Ecological Society of America 51(1):5-8, 1969.

22. DEVANNEY, J. W., et al. Economic Factors in the Development of a Coastal Zone. Cambridge: Massachusetts Institute of Technology, 123 pages, 1970.

23. DEVENPORT, Stephen, Jr. "Pave the Wetlands or Let Them Be?" The New York Times Magazine, pp. 16-28, January 16, 1972.

24. Draft Environmental Statement, Initial Stage Garrison Diversion Unit. Billings, Montana: Department of the Interior, Regional Office, Upper Missouri Region, Bureau of Reclamation, viii + 282 pages, April 5, 1973.

A variety of information on the environmental impact of the Garrison Diversion Unit in North Dakota is presented. The impact of the project on wetlands and associated biota is discussed.

25. DUNDAS, Lester H. "Wildlife and Wetlands." Naturalist 13(2):20-25, 1962.

The values of wetlands to wildlife and to man are discussed in general terms.

26. "Estuaries: Irreplaceable Environments." Gulf Review 2(1):1-2, September 1967.

The economic importance of estuaries is emphasized and several comprehensive studies on estuaries and estuarine zones are identified.

27. FISCHER, David W. "An Economist Examines the Costs of Conservation." Rhode Island Resources 16(3):5-7, June 1970.

A discussion of the trade-offs regarding preservation of salt-water marshes.

28. FORTNEY, Charles T., Robert M. Dimit, Donald R. Field, and Howard M. Sauer. Attitudes of South Dakota Farm Operators Toward Wetlands and Waterfowl Production. Brookings: South Dakota State University Agricultural Experiment Station Bulletin 592, 11 pages, 1972.

Attitudes of farm operators toward particular wetlands related programs and the relationship of selected socioeconomic factors to these attitudes are presented. Of 292 farmers interviewed, those with more than 10 percent or less than 5 percent of their lands in wetlands had more favorable attitudes toward waterfowl production programs, as did those who hunted ducks or geese.

29. FRIED, Eric. "Priority Ratings of Wetlands for Acquisition." Transactions of the Northeastern Section of the Wildlife Society's Thirty-First Fish and Wildlife Conference 31:15-30, 1974.

30. GLOVER, F. A. "Wetlands for All." Proceedings of the Society of American Foresters, pp. 217-220, 1966.

The need to preserve wetlands is argued. The author notes that private wetland owners are becoming aware that wetlands have a monetary value for recreation, grazing, fur, fish, and water conservation and that people will pay for the opportunity of wetland recreation.

31. GOLDSTEIN, Jon H. Competition for Wetlands in the Midwest: An Economic Analysis. Washington, D.C.: Resources for the Future, Inc., 105 pages, 1971.

The Hotelling-Clawson travel costs technique is employed to evaluate waterfowl hunting. Variables included in the analysis were: days hunted; travel cost; income; hunting quality; and a gravity variable measuring the hunting quality near the same county. The results were not statistically significant. Although Type I wetlands that occur in isolated locations have no value to waterfowl, they do have value if they are near larger permanent marshes. Several aspects of wetland drainage in Minnesota are discussed and the author concludes there appears to be no economic justification for granting public assistance for wetlands drainage. Even if waterfowl are valued at zero, the drainage of permanent wetlands is not economically efficient to the land owner. Temporary wetlands can be economically drained.

32. GOLET, F. C. and J. S. Larson. Classification of Freshwater Wetlands in the Glaciated Northeast. Washington, D.C.: U.S. Fish and Wildlife Service Resource Publication 116, 56 pages, 1974. (I49.66:116)

A classification system involving ranking characteristics, which provides a base for evaluation of wetlands as wildlife habitat, is discussed. See also J.S. Larson (1976, 1975, 1973, 1971) and T.R. Gupta (1975, 1973, 1972).

33. GOLET. F. C. "Classification and Evaluation of Freshwater Wetlands as Wildlife Habitat in the Glaciated Northeast." Proceedings of the Northeast Fish and Wildlife Conference, Mt. Snow, Vermont 30:257-279, 1973.

An evaluation methodology for ranking wetland habitats is developed based on waterfowl values. The system includes ten criteria which are assigned "significance coefficients" according to the relative value of each criterion to the overall ecosystem. For each criterion, standardized components are established and ranked in terms of waterfowl benefits. The sampling sites are each evaluated and rated according to where each falls in the component range. Subscores are computed as products of significance coefficients and ranks and then summed to produce an evaluation rating for each site.

34. _____. Classification and Evaluation of Freshwater Wetlands as Wildlife Habitat in the Glaciated Northeast. Amherst: University of Massachusetts, Ph.D. dissertation, 179 pages, 1972. *33(11):5388-B

35. GOOSELINK, J. G., E. P. Odum, and R. M. Pope. The Value of the Tidal Marsh. Baton Rouge: Louisiana State University Center for Wetlands Resources Report No. LSU-SG-74-03, 30 pages, 1974.

Values of natural tidal marshes at four levels are estimated. They include: (1) by-product production (fisheries, etc.); (2) potential for aquacultural development; (3) waste assimilation; and (4) total life support value of natural functions in primary production.

36. GUPTA, Tirath R. and John H. Foster. "Economic Criteria for Freshwater Wetland Policy in Massachusetts." American Journal of Agricultural Economics 57:40-45, 1975.

The values of wildlife, visual-cultural benefits, water supply, and flood control benefits of wetlands in Massachusetts are estimated. Comparison of benefit value with opportunity cost of wetland preservation is the basis for decisions concerning permits for wetland alteration.

37. GUPTA, Tirath R. Economic Criteria for Decisions on Preservation and Alteration of Natural Resources with Special Reference to Freshwater Wetlands in Massachusetts. Amherst: University of Massachusetts, Ph.D. dissertation, 260 pages, 1973. *34(10):6221-A

An objective of this study was to develop methods of valuing inland wetland benefits and opportunity costs. The market price of wetlands was used as the basis for determining the opportunity cost of preserving wetlands. Prices were found to vary from $300 to $70,000 an acre in expanding urban areas. The problem of measurement of benefits was approached with the help of a multidisciplinary team of wildlife biologists, landscape architects, and geologists who developed models for scoring properties of different types of wetlands and provided point scores for a few specific situations.

38. GUPTA, Tirath R. and J. H. Foster. Institutional Framework Affecting the Use of Inland Wetlands. Amherst: University of Massachusetts Cooperative Extension Service Publication 91, 39 pages, 1973.

39. _____. "Valuation of Visual-Cultural Benefits from Freshwater Wetlands in Massachusetts." Journal Northeastern Agricultural Economics Council 2(2):262-273, October 1973.

40. GUPTA, Tirath R. "Economic Criteria for Decisions on Preservation and Use of Inland Wetlands in Massachusetts." Journal Northeastern Agricultural Economics Council 1(1):201-219, 1972.

41. HAIK, Raymond A. "Law of the Marsh." Naturalist 13(2):31-32, 1962.

A discussion of wetlands drainage in Minnesota and some of the costs of drainage in 1960.

42. HARMON, Keith W. "The Economics of Wetland Values." Watertown, South Dakota: U.S. Fish and Wildlife Service Wetland Symposium, June 8-9, 11 pages (mimeo), 1976.

The need for economic evaluation of wetlands is stressed in this paper. Several examples of wetland values that are higher than alternative uses which involve destruction of wetlands are presented. One method discussed by the author for determining dollar values is to calculate cash outlays required to provide a service--pollution control for instance--were it not provided by the wetland.

43. _____. "North Dakota's Water Bank Proposal." Transactions of the Thirty-Fourth North American Wildlife and Natural Resources Conference 34:323-330, 1969.

The water bank program proposal in North Dakota is discussed from the standpoint that there needs to be an attractive economic alternative to drainage for landowners.

44. HASLAM, S. M. "The Management of British Wetlands." Journal Environmental Management 1(3):303-320, July 1973.

The purpose of this paper is to show that wetlands in Britain are worth preserving, and that they should not be considered as having value only as rubbish dumps, or for drainage and conversion to dry grassland or arable land. Wetlands bear a variety of saleable products, including hay, craft materials, peat, and can be profitably leased for shooting, fishing, and grazing.

45. HEDLIN, Ralph. "Economic Values of Small Wetlands." Saskatoon Wetlands Seminar. Ottawa, Ontario: Canadian Wildlife Service Department of Indian Affairs and Northern Development, pp. 25-28, 1969.

The author argues that while it is near impossible to place a dollar value on a duck, the more logical approach is to examine ways and means of evaluating habitat areas since they can be bought and sold in the marketplace.

46. HERBISON, H. W. A Progress Report on Aspects of North Dakota Wetlands Use and Management. Fargo: North Dakota State University Department of Agricultural Economics Report No. 58, 35 pages, September 1967.

An overview of wetlands, drainage, and waterfowl in the Devils Lake Basin in North Dakota is presented. The author concluded that for each $1 invested in flood control, farmers would benefit by about $3 to $4, and that they may subsidize duck hunters by providing feed and habitat for ducks rather than draining wetlands.

47. HILL, Douglas. "A Modeling Approach to Evaluate Tidal Wetlands." Transactions of the Forty-First North American Wildlife and Natural Resources Conference 41:105-117, 1976.

The merits of modeling natural systems are discussed and a linear programming model for evaluating tidal wetlands is presented. The annual dollar value of an acre of salt marsh was determined by the extent to which it contributed to net income or reduced the need for costly alternatives by its users. The market value of preserved salt marsh was based on a typical rental of hunting rights: $35 per acre.

48. _____. Linear Programming Model for Managing the Economic, Social, and Environmental Uses of an Estuary. Bethpage, New York: Grumman Ecosystems Corporation, 1976.

49. HOFFMAN, L., Chairman. Proceedings of a Technical Meeting on Wetland Conservation/Ankara. Bursa, Istanbul: International Union for Conservation of Nature and Natural Resources Publication New Series No. 12, 273 pages, 1968.

Collection of papers presented at the 1967 IUCN meeting on wetlands. Papers vary in subject matter from technical to political. See also Project MAR.

50. HOLDER, Trusten H. Disappearing Wetlands in Eastern Arkansas. Little Rock, Arkansas: Planning Commission, 72 pages, 1971.

This study, commissioned by the Arkansas Planning Commission, examines the rate and extent of the loss of wetlands and associated woodlands in eastern Arkansas. The forces and trends affecting these losses are analyzed, and a plan of action for the preservation of some of the wetland and wooded remnants in the Delta portion of the state is presented.

51. International Union for Conservation of Nature and Natural Resources (IUCN). Proceedings of a Technical Meeting on Wetland Conservation. Morges, Switzerland: IUCN Publications New series No. 12, 273 pages, 1968.

Proceedings of a meeting to promote an ecological approach to the conservation problems of the Near and Middle East, with special reference to the key role of wetlands. The importance of wetlands for water sources, groundwater recharge, ecological values, wildfowl hunting, waterfowl breeding and migration, recreation, fishing, aesthetic values, and erosion control are discussed. This collection of reports emphasizes the concern for wetlands preservation in countries where agricultural land may be quite important. One basic argument presented is that the natural assets of wetlands be exploited rather than altering their use for agricultural production.

52. JARVENPA, Oliver M. "Multiple Purpose Marsh Management in Minnesota." St. Paul: Minnesota Department of Conservation, Division of Fish and Game Special Publication #48, 7 pages (mimeo), December 1967.

Some of the beneficial uses of Minnesota's marshlands are reported. The harvest of wild rice from some marshes can gross approximately $100 per acre annually.

53. KIPPERS, M. Eng. "Uncertainties with Regard to the Drainage of Wetlands." Project MAR, Volume I. International Union for Conservation of Nature and Natural Resources Publications New Series No. 3, Proceedings of the M.A.R. Conference at Les Santes-Maries-dela-Mer, November 12-16, pages 92-95, 1964.

The author discusses the fact that some of the unforseen side effects of drainage may make drainage uneconomical. Sepage, subsidence, drying up, and changes in agricultural technology are mentioned as areas of uncertainty in wetlands drainage.

54. Lake St. Clair Advisory Committee. "St John's Marsh: Saved or Paved?" Mt. Clemmens, Michigan: Lake St. Clair Adivsory Committee, 4 pages, 1976.

An informational brochure on the values of wetland areas along Lakes St. Clair and Erie (Michigan), and the Lake St. Clair Advisory Committee's efforts to save these marsh areas.

55. LARSON, J. S., ed. Models for Evaluation of Freshwater Wetlands. Amherst: University of Massachusetts Water Resources Research Center Publication 32, 95 pages, January 1976.

Four submodels for relative and economic evaluation of freshwater wetlands are presented within a single, three-phase eliminative model. The submodels treat wildlife, visual-cultural, groundwater, and economic values. (See R. C. Smardon, F. C. Golet, and T. R. Gupta.)

56. _____. "Evaluation Models for Public Management of Freshwater Wetlands." Transactions of the Fortieth North American Wildlife and Natural Resources Conference 40:220-227, 1975.

Wetlands are classified according to their value for wildlife, visual-cultural attributes, flood control, and groundwater recharge. Economic value is based on the market price of wetlands purchased by government agencies and using numerical criteria established for the above values.

57. _____, ed. A Guide to Important Characteristics and Values of Freshwater Wetlands in the Northeast. Amherst: University of Massachusetts Water Resources Research Center Publication 31, 35 pages, 1973.

Characteristics of freshwater wetlands which determine their value for groundwater supply, aesthetics, wildlife, flood control, and groundwater recharge are discussed.

58. _____. "Progress Toward a Decision-Making Model for Public Management of Freshwater Wetlands." Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:376-382, 1971.

An overview of the work on wetlands valuation done in Massachusetts is presented. See also Gupta (1973) and Golet (1973).

59. LEFOR, M. W., H. H. Ridgeway, and T. B. Helfgott. Proceedings of Wetlands Conference on Delineation of Wetlands (2nd). Storrs: University of Connecticut Institute of Water Resources, 133 pages, October 1975.

Under the theme of inland wetland conservation, seven edited and reviewed papers concerning environmental and political science aspects of delineation of wetlands are presented. The major topics covered are: the identification of freshwater wetland values; methods of delineating wetlands by means of soil surveys; considerations in the preparation of specialized maps; and other technical topics.

60. LEVENSON, Albert M. Evaluation of Recreational and Cultural Benefits of Estuarine Use in an Urban Setting. Hempstead, New York: Hofstra University Center for Business and Urban Research, August 1971.

61. LINDE, A, F. Techniques for Wetland Management. Madison: Wisconsin Conservation Department Research Report No. 45, 162 pages, 1969.

Techniques for maintaining and improving wetlands for use by wildlife are discussed. An area in Wisconsin was used as the study area, but the techniques are applicable to prairie potholes as well.

62. LODGE, R. W. "Agricultural Use of Wetlands." Saskatoon Wetlands Seminar. Ottawa, Ontario: Canadian Wildlife Service Report Series No. 6, pp. 11-15, 1969.

The impasse between agriculturists and wildlife interests in Canada's prairie pothole region is discussed. Statistics on agricultural production, drainage, and salinity of wetlands are presented.

63. LUKEN, R. A. "Preservation of Wetlands: The Case of San Francisco Bay." Natural Resources Journal 14(1):139-152, January 1974.

The aggregated impact of individual decisions regarding wetlands alteration may lead to less than optimal social welfare. Intervention strategies to deal with rental income of property owners and community gains from altered wetlands are discussed.

64. MANN, G. E. "Wetlands--Liquid Assets." Conservation Volunteer 29(166): 30-38, 1966.

The author discusses "Liquid Assets" (IUCN, 1962) in relation to Minnesota's wetlands.

65. "Marsh Has High Values." Michigan Out-of-Doors 19(2):10, February 1968.

66. Massachusetts, Commonwealth of. Report of the Department of Natural Resources Relative to the Inland Wetlands and Flood Plains of the Commonwealth with Respect to their Location, Ownership and Value for Purposes of Recreation, Wildlife, and Conservation of Natural Resources and Any Other Matters Related Thereto. Boston, Massachusetts: Senate Document No. 1273, 23 pages, 1967.

Wetlands in Massachusetts were rated in nine categories that included recreation, wildlife, public water supply, flood control, agriculture, development, nature study, aesthetic and historical value. Value ratings were "high," "medium," and "low." Economic values were not estimated for wetlands. However, outdoor recreation was estimated to be the second largest industry in the state--attributed in part to the activities associated with wetlands.

67. Massachusetts Water Resources Commission. Neponset River Basin Flood Plain and Wetland Encroachment Study. Boston, Massachusetts: Division of Water Resources, 61 pages, 1971.

68. METZGAR, Roy G. and David A. Wharton. "Planning the Management of Maryland Wetlands." Proceedings of the Twenty-Second Annual Conference Southeast Association of Game and Fish Commissioners 22:68-82, 1968.

69. Michigan Department of Natural Resources. Michigan "Everglades." Lansing: Water Development Services Division, 10 pages, February 1974.

An informational brochure on the value of wetland areas along Lakes St. Clair and Erie (Michigan).

70. Minnesota, State of. Miscellaneous Statutes (Watershed Management). St. Paul: Minnesota Session Laws, Chapter 644, 1957.

A one dollar surcharge was authorized to carry out the provisions of this act which permitted the Commissioner of Natural Resources to acquire wildlife lands. The purpose of purchasing these lands was for water conservation and wildlife development. Provision was made for payments in lieu of taxes from the surcharge on hunting license payments.

71. NEWSOM, John D., ed. Proceedings of the Marsh and Estuary Management Symposium, July 19-20, Louisiana State University. Baton Rouge, Louisiana: Thos. J. Moran's Sons, Inc., 250 pages, 1968.

This symposium was an effort to focus national attention on the value of marsh and estuarine areas. The report contains 26 papers on subjects such as industrial and domestic pollution, dredging, draining, channelization, mineral exploitation, urbanization, etc. Most values discussed are subjective although economic values are discussed in some of the papers.

72. NIERING, W. A. "The Ecological Role of Inland Wetlands." Proceedings of First Wetlands Conference. Storrs: Connecticut University Institute of Water Resources Report No. 21, pp. 100-109, December 1973.

One of the most significant roles of wetlands may be their ability to remove pollutants from the water flowing through them. Freshwater marshes and swamps are among the most productive biological systems. Wetlands also provide a significant recreational outlet.

73. _____. "The Dilemma of the Coastal Wetlands: Conflict of Local, National, and World Priorities." The Environmental Crisis, H. W. Helfrich, Jr., editor, New Haven: Yale University Press, pp. 143-156, 1970.

The importance of coastal wetlands is discussed. Dollar values are given for some uses while other uses are treated subjectively. Threats to coastal marshes are discussed along with recommendations to solve conflicts in use.

74. Our Waters and Wetlands: How the Corps of Engineers Can Help Prevent Their Destruction and Pollution. Washington, D.C.: Ninety-First Congress, 2nd Session, House Report No. 917, 18 pages, 1970.

75. PATTERSON, Karen W., Joel L. Lindsey, and Alvin L. Bertrand. The Human Dimension of Coastal Zone Development. Baton Rouge: Louisiana State University Agricultural Experiment Station Bulletin No. 679, 58 pages, June 1974.

The Louisiana coastal zone is defined. A demographic profile that includes size and density of population, and the residence, race, age, and cultural characteristics of the population is developed. Also included is an industrial and occupational overview and a description of the recreational setting and potential.

76. Prairie Agri-Management Consultants, Ltd. Sensitivity Analysis of the Estimated Opportunity Cost of Maintaining Wetlands. Edmonton, Alberta: Canadian Wildlife Service Report I: 43 pages, February 20, 1970; Report II: 36 pages, March 31, 1970.

A linear programming model to define the optimum farm enterprise combination for a representative farm in Western Canada is developed and tested for sensitivity of several variable changes. Sensitivity analysis was used to determine the opportunity cost of maintaining wetlands on a farm with the optimum farm enterprise combination when changes were made in grain yields, operating costs, quota bushels per acre, and drainage costs per acre. Draining wetlands in cultivated areas was very profitable while draining wetlands in native areas appeared much less profitable. Since the opportunity cost to preserve wetlands was less on farms with a combination that included a livestock enterprise, the authors suggest concentrating wetlands preservation programs in those regions where farming includes both cropland and livestock enterprises.

77. Prairie Agri-Management Consultants, Ltd. A Method of Estimating the Opportunity Cost of Maintaining Wetlands in Western Canada. Ottawa, Ontario: Canadian Wildlife Service, 1969.

78. Project MAR: The Conservation and Management of Temperate Marshes, Bogs and Other Wetlands. Vol. 2: List of European and North African Wetlands of International Importance. Compiled by P.J.S. Olney, International Union for the Conservation of Nature and Natural Resources, IUCN Publications New Series No. 5, 102 pages, 1965.

European and North African wetlands of international importance are listed. The IUCN compiled this list, with detailed information on the areas, as a foundation for an international convention on wetlands.

79. Project MAR: The Conservation and Management of Temperate Marshes, Bogs, and Other Wetlands. Proceedings of the MAR conference organized by IUCN, ICBP, and IWRB at Les Santes-Maries-de-la-Mer, November 12-16, 1972, IUCN Publications New Series No. 3, 475 pages, December 1964.

Recommendations of the International Union for Conservation of Nature and Natural Resources conference are reported and reprints of papers presented at the conference are provided. Papers were presented by persons from many countries, including the United States. Some of the papers pertaining to wetland economics are:

"The Value of Wetlands to Modern Society," pp. 57-63.
"Immediate Gain vs. Long Loss Through Marsh Destruction," pp. 80-86.
"The Economic and Recreation Values of Swampland," pp. 87-89.
"Notes on the Economic Value of Marshes and Wetlands in the Netherlands," pp. 96-101.
"The Draining of Lake Hornborgasjon in Sweden: A Financial Failure and the Reasons for It," pp. 109-115.
"Reserving Wetlands for Wildlife," pp. 147-150.
"Wildfowl and Agriculture in Britain," pp. 321-335.
"Restoration of Altered Wetlands," pp. 336-346.
"Restoration of Modified Wetlands in the Netherlands," pp. 347-349.
"The Conservation of Migratory Birds and Wetlands in the United States," pp. 450-460.
"International Wildfowl Research Bureau," pp. 461-468.
"Ducks Unlimited," pp. 469-472.

80. "Raising Manmade Marshland." Water Spectrum 8(2):35-37, Fall 1976.

A reprint of two accounts of manmade marshlands. "Slaughter Creek Solution" by Dick Whitaker, provides an example of marshland creation in Maryland. "Engineers Build Marsh on Mississippi," by Roy Reed, discusses the possibility of creating new coastal marshes along the Mississippi River in southern Louisiana.

81. RANWELL, D. S. "Coastal Marshes in Perspective." London: Nature Conservancy (typescript), 1968.

82. REDFORD, Polly. "Vanishing Tidelands." Atlantic Monthly 219(6):75-78, 83, June 1967.

The contamination of the Merrimack River north of Boston (and development of coastal estuaries in general) is discussed. Efforts by conservationists to buy sections of natural estuarine habitat are also discussed.

83. ROCKWELL, H. W. Importance of Wetlands as a Natural Resource in the Connecticut River Valley in Massachusetts. Amherst: University of Massachusetts, M.S. thesis, vii + 82 pages, 1970.

The objectives of this study were to: (1) describe a segment of the Connecticut River in Massachusetts and its adjacent wetlands; (2) determine changes in wetland acreage in a rural and urban area in the Connecticut River Valley over the last forty years; (3) assign wildlife values to wetlands in a sample stretch of the valley; and (4) determine recreational use, mainly by waterfowl hunters, of the Connecticut River Valley. Characteristics of human recreational use of wetlands are discussed using data from a mail survey as the basis for discussion.

84. ROUNDS, Burton W. "Some Aspects of Drainage in the Environment of Wildlife." The Engineer and the Environment. St. Paul: University of Minnesota Water Resources Research Center Bulletin No. 38, pp. 24-27, April 1971.

Commentary on the value of wetlands with particular reference to the Northern Prairie Region.

85. RULISON, Michael V. and Constance B. Martin. Evaluation of Planning for Wetlands Drainage Projects in the Southeastern Coastal Plains. Research Triangle Park, North Carolina: Research Triangle Regional Planning Commission, 128 pages, December 1972.

The planning process used to design flood control and drainage projects containing hardwood bottomland wetlands was investigated in this study of 12 small watershed projects located in the coastal plain of the Southeast U.S. Three topics were addressed: examination of benefit-cost procedures employed; potential effects of altered project objectives; and post construction review of project effects relative to what had been planned. It was concluded that if economic development is accepted as a project objective, it should dominate the planning process.

86. Saskatoon Wetlands Seminar. Ottawa, Ontario: Canadian Wildlife Service Report Series No. 6, 262 pages, 1969.

Transactions of a seminar (held February 20-22, 1967) on small water areas in the prairie pothole region to mark the opening of the Prairie Migratory Bird Research Centre in Saskatoon, Saskatchewan. Eighteen papers were presented under four headings: (1) "The Significance of Small Wetlands." (2) "Knowledge of and Research for Small Water Areas." (3) "Waterfowl and Small Water Areas." And, (4) "Assesssing Breeding Populations of Ducks by Ground Counts."

87. "Savings Our Wetlands." Boston Sunday Globe, page 6-A, September 10, 1972.

Discusses legislation in Massachusetts designed to preserve wetlands.

88. SCHRADER, T. A. "Waterfowl and the Potholes of the North Central States." Agriculture Yearbook 1955:596-604, 1955.

A report on the conflict between drainage of cropland and waterfowl production in the pothole areas of Minnesota, North Dakota, South Dakota, and Iowa.

89. SHAW, S. P. and C. G. Fredine. Wetlands of the United States, Their Extent and Their Value to Waterfowl and Other Wildlife. Washington, D.C.: U.S. Fish and Wildlife Service Circular 39, 67 pages, 1971.

90. SLOAN, C. E. "Biotic and Hydrologic Variables in Prairie Potholes in North Dakota." Journal of Range Management 23(4):260-263, July 1970.

Prairie potholes occupy a dynamic hydrologic environment characterized by wide spatial and temporal variation.

91. SMARDON, R. C. "Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts." Landscape Assessment: Values, Perceptions, and Resources, E. H. Zube, R. O. Brush, and J. G. Fabos, editors, pp. 4-9, 289-318, 1975.

92. _____. Assessing Visual-Cultural Values of Inland Wetlands in Massachusetts. Amherst: University of Massachusetts, M.S. thesis, 309 pages, October 1972.

The incorporation of the visual-cultural values of inland wetlands into governmental land-use decisions is explored for Massachusetts. Previous studies which have sought to identify, analyze, and classify workable inland wetland types and surrounding landscape types were reviewed and a general form was suggested for Massachusetts wetlands. Visual-cultural values included the visual, recreational, and educational values of wetlands to society. An inland wetland decision model, utilizing previously collected data, was developed to determine priorities for wetland preservation. The model was eliminative in that it eliminated a wetland from development if it received top priority in any of the three evaluation categories.

93. Soil Conservation Service, U.S. Department of Agriculture. Potential Benefits from Drainage--Devils Lake Watershed. Washington, D.C., December 1961.

94. SORENSON, Lee A. Alternative Uses of Wetlands. Fargo: North Dakota State University, M.S. thesis, 115 pages, March 1975.

The importance of wetlands to hunting activity in North Dakota and the impact of expenditures by hunters on the North Dakota economy are addressed in this study. A questionnaire was used to collect data on expenditures by hunters, and farm operators were surveyed to determine their attitudes toward wetlands. Using an input-output model, it was estimated that the gross business volume generated in the state by resident hunter expenditures was $54.3 million in 1973. The average annual expenditures for waterfowl, small game, and big game hunters were $181.45, $89.49, and $159.34, respectively. The average number of days spent hunting waterfowl, small game, and big game was 7.6, 8.5, 6.1, respectively. About 55 percent of the gross business volume generated by hunters was attributed to the existence of wetlands.

95. STEWART, R. E. and H. A. Kantrud. Vegetation of Prairie Potholes, North Dakota, In Relation to Quality of Water and Other Environmental Factors. Washington, D.C.: U.S. Geological Survey Professional Paper 585-D, iii + 36 pages, 1972. (I19.66:585-D)

96. _____. "Classification of Natural Ponds and Lakes in the Glaciated Prairie Region." Washington, D.C.: U.S. Fish and Wildlife Service Resource Publication No. 92, 57 pages, 1971. (I49.66:92)

97. SULLIVAN, Peter. "Versatile Wetlands--An Endangered Resource." Conservation News 41(20):2-5, October 15, 1976.

The author discusses some economic values of wetlands. It would cost at least $50,000 per acre to replace all of the functions that a wetland performs.

98. UHLIG, Hans G. "Survey of Leased Waterfowl Hunting Rights in Minnesota." Journal of Wildlife Management 25(1):204, 1961.

The economics of leasing wetlands to duck hunters are examined. In 1959, the highest priced leases gave the farmer approximately the same net profit as an acre of cropland in Minnesota.

99. U.S. Army Corps of Engineers. Charles River Massachusetts, Main Report and Attachments. Waltham, Massachusetts: New England Division, 76 pages, 1971.

A benefit-cost analysis of preserving wetlands along the Charles River (Massachusetts). Flood control benefits were determined by losses avoided and other benefits associated with conservation were estimated.

100. U.S. Department of Interior. "Wetlands Can Yield Dollars." 1965.

101. _____. "The Value of Wetlands to Modern Society." Project MAR, Volume I, IUCN Publication New Series No. 3, Proceedings of the MAR Conference at Les Santes-Maries-de-La-Mer, pp. 57-62, November 12-16, 1962.

102. U.S. Fish and Wildlife Service, U.S. Department of Interior. Wetlands Inventory, North Dakota. Billings, Montana: Office of River Basin Studies, 44 pages, March 1955.

The role wetlands in North Dakota play in producing of ducks and their value to other species of wildlife is discussed. The importance of the prairie pothole region in the nation's duck production is stressed.

103. _____. Your Stake in Wetlands: What Wetlands Are and Their Importance to You, What's Happening to Them. Washington, D.C.: Circular 140, 12 pages, 1967.

104. VERSALL, D. B. "Your Wetlands . . . Blue Chip Investment." Conservation Volunteer 26(152):4-7, 1963.

Minnesota's wetlands provide enjoyment for hunters, scientists, photographers, ecologists, and bird watchers because of their value to wildlife as habitat.

105. WAELTI, John J. "The Wetlands and Drainage Controversy." Minnesota Agricultural Economist 568:1-2, June 1975.

A review of the history, economics, and policy surrounding the wetlands and agriculture problem in Minnesota. The author argues for a wetlands acquisition program with fair compensation to the landowner to resolve problems in the allocation of wetlands which are privately owned but which exhibit certain public good characteristics.

106. WELLER, M. W. and C. S. Spatcher. Role of Habitat in the Distribution and Abundance of Marsh Birds. Ames: Iowa State University Agricultural and Home Economics Experiment Station Special Report No. 43, 31 pages, 1965.

107. WHARTON, Charles H. Southern River Swamp - A Multiple Use Environment. Athens: Georgia State University Bureau of Business and Economic Research, 48 pages, 1970.

Some multiple-use benefits of wetlands or swamplands are presented. Education and recreation benefits were estimated using daily expenditures and potential use-days. Water quantity values were estimated using the value of consumptive uses of water. Water quality values were estimated using the costs of alternative forms of treatment. Productivity values were estimated from the value of biological production, such as fish, and plant production, such as trees. The case study presented, the Alcovy River swamp ecosystem in Georgia, had an estimated annual aggregate value of $3,126. The author estimated the purchase price of this swampland at $300 an acre. The author concluded with recommendations for preserving the river swamp ecosystem.

108. WHITESELL, Dale E. "Providing Habitat for Migratory Birds Through Private Efforts." Transactions of the Forty-First North American Wildlife and Natural Resources Conference 41:513-516, 1976.

A discussion of maintaining wetlands under private ownership. Incentive is the key ingredient to retain private wetlands. Some incentives were suggested, such as a lower tax bill, fish as a cash crop, and drought and flood protection.

109. WHITMAN, Ira L. "Economic and Social Values of Estuarine Recreation." Economic and Social Importance of Estuaries, David C. Sweet, Project Director, Washington, D.C.: Environmental Protection Agency Water Quality Office, pp. A-1 to A-53, 1971. (Ep2.19:2)

The economic and social values of estuarine recreation in terms of supply, demand, conflicts in use, and evaluation techniques are considered. A general overview of the problems confronted in evaluation of the economic and social values of estuarine recreation is provided along with several examples of empirical measurements.

110. WILSON, Kenneth A. "Fur Production on Southeastern Coastal Marshes." Proceedings of Marsh and Estuary Management Symposium, July 19-20, 1967, Louisiana State University. Baton Rouge, Louisiana: Thos. J. Moran's Sons, Inc., pp. 147-162, 1968.

Discusses the management of marsh and estuarine areas for production of furbearers. In 1966, the estimated value of fur and meat harvested from marshes in the 12 coastal marsh states--from New Jersey to Texas--was $5 million, and values some years may range from $3 to $15 million.

111. WRIGHT, J. O. Swamp and Overflowed Lands in the United States. Washington, D.C.: Department of Agriculture Circular 76, 1907.

II. Economics of Fish and Wildlife and Their Habitats

112. ADAMS, Arthur W. "The Economics of the Fur Trade in North Dakota." Furbearers of North Dakota, Arthur W. Adams, Bismarck: North Dakota Game and Fish Department, pp. 6-14, 1961.

A discussion of the monetary aspects of the trapping industry in North Dakota.

113. ALEXANDER, Harold E. "Stream Values, Recreational Use and Preservation." Transactions of the Twenty-Fifth North American Wildlife and Natural Resources Conference 25:192-201, 1960.

Narrative on stream values stressing the need for an "Evaluation of the 'worth' of fish and wildlife resources, . . ."

114. ALLEN, Durward L. "The Need for a New North American Wildlife Policy." Transactions of the Thirty-Seventh North American Wildlife and Natural Resources Conference, 1972.

A discussion outlining the need for adopting new policies toward wildlife to prevent their disappearance in modern society with its expanding human population.

115. AMACHER, R. C., R. D. Tollison, and T. D. Willett. "The Economics of Fatal Mistakes: Fiscal Mechanisms for Preserving Endangered Predators." Public Policy 20(3):411-441, Summer 1972.

A market system for valuing eagles and the economic issues involved in such a system are discussed. The discussion centers around the fact that eagles are a public good; and, therefore, no effective market exists which would ensure the preservation of eagles.

116. ANDREWS, Austin K. "Estimates of the Value of the Fishery for a Portion of the Mountain Fork River, Oklahoma Before and After Impoundment." Annals of the Oklahoma Academy of Science 5:118-123, 1976.

A critique of post-construction and pre-construction estimates of an impoundment's value to a fishery is presented. There is a need for participating agencies to incorporate empirical observations of value per man-day and total fisherman use into project statements to determine relative resource value and to prepare better project documentation.

117. ARMSTRONG, W. W. The Economic Value of Hunting and Fishing in Arizona in 1956. Phoenix: Arizona Game and Fish Department Wildlife Bulletin No. 4, 1958.

118. BACHMURA, Frank T. "The Economics of Vanishing Species." Natural Resources Journal 11(4):674-692, October 1971.

Traditionally, resource economists consider the marginal change in the supply of a species in evaluating the effect of an action on the population of a species. This paper considers the consequences of species extinction.

119. BARCLAY, John and Karl E. Bednarik. "Private Waterfowl Shooting Clubs in the Mississippi Flyway." Transactions of the Thirty-Third North American Wildlife and Natural Resources Conference 33:130-142, 1968.

The authors discuss the role of private duck clubs in waterfowl management in the Mississippi flyway. A sample of 1,217 clubs was used to determine club characteristics, club types, acreage, hunting effort and harvest, costs of hunter participation, and to make comparisons with nonclub hunting.

120. BELL, Thomas A. A Study of the Economic Values of Wyoming's Wildlife Resources. Laramie: University of Wyoming, M.S. thesis, 140 pages, 1957.

A study comparing gross expenditures of recreationists in Wyoming with gross business volumes generated in agricultural sectors in the state of Wyoming. An 80 percent return rate on 3,263 mail questionnaires to both resident and nonresident hunters and fishermen and resident trappers was achieved.

121. BERRYMAN, Jack H. "Our Growing Need: A Place to Produce and Harvest Wildlife." Journal of Wildlife Management 21(3):319-323, 1957.

Landowner compensation is discussed as a method of wildlife habitat maintenance.

122. BIANCHI, Dennis H. The Economic Value of Streams for Fishing. Lexington: University of Kentucky Water Resources Institute Research Bulletin No. 25, 119 pages, 1969.

Economic value of streams for fishing was determined by fitting data to a gravity-type model for predicting annual fishing use from the magnitude and distribution of surrounding population. Also utilized was unit value of a fisherman-day, which was estimated from the willingness to travel and estimated cost of that travel. The method underestimated values associated with very desirable fishing sites, and overestimated values of sites made undesirable by adverse natural conditions or disruptive human activity.

123. BINNS, Niles Allen. An Inventory and Evaluation of the Game and Fish Resources of the Upper Green River in Relation to Current and Proposed Water Development Programs. Laramie: University of Wyoming Water Resources Research Institute, 212 pages, November 1972.

From 1967 to 1970, an inventory was made of wildlife resources of the Upper Green River in Wyoming with the objectives of evaluating the general quality of the wildlife resources and of predicting the effects of water development programs on these resources in the future. The results of a postcard survey indicated that the estimated total value of the fishery was $548,370 or $12,180 per river mile.

124. BISHOP, Richard C. "Conceptual Economic Issues in Conserving the California Condor." Proceedings of the Western Agricultural Economics Association, pp. 119-122, 1972.

Economic issues concerning conflicting land/resource uses involving the California condor are discussed. Difficulties in measuring the benefits of conserving the condor were discussed, while the costs were measured in terms of the costs of using alternative resources.

125. BOLLE, Arnold W. and Richard D. Taber. "Economic Aspects of Wildlife Abundance on Private Lands." Transactions of the Twenty-Seventh North American Wildlife and Natural Resources Conference 27:255-267, 1962.

A survey was conducted regarding leasing and purchase of land for hunting purposes. The value of leasing good waterfowl habitat ranged from $10 to $100 per acre per year in 1962. Farm operators can capture some economic benefits from the wildlife on their lands through proper management and marketing.

126. BOLLMAN, Frank H. "Economic Evaluation of Primary Benefits from Fishing and Hunting Based on the National Surveys of Fishing and Hunting--A Progress Report." Paper prepared for the Conference on the Demand for Fishing, Hunting, and other Outdoor Recreation Activities, sponsored by the Bureau of Sport Fisheries and Wildlife, Washington, D.C., February 27-28, 1967.

127. BOOKER, T. A. "Economics of Deer and Livestock Production." Austin: Texas Parks and Wildlife Department, 8 pages, 1967.

128. BOWDEN, G. and P. H. Pearse. Nonresident Big Game Hunting and the Guiding Industry in British Columbia. Victoria: British Columbia Department of Recreation and Conservation, Fish and Wildlife Branch Study Report 2, 72 pages, 1968.

A mail questionnaire obtained information on resident and nonresident big game hunting in British Columbia and the related guiding industry. Hunter expenditure data are also presented.

129. BRAUN, Clait E. "The Future of Public Hunting." Colorado Outdoors 16(6):13-14, 1967.

The problem of diminishing wildlife habitat on private lands might be alleviated to some extent by charging sportsmen a fee to hunt on private land.

130. _____. A Survey of Land Values Directly Attributable to Waterfowl Within the Contiguous United States. Missoula: Montana State University, M.S. Thesis, 1965.

This thesis reports on the results of a questionnaire which 247 duck and waterfowl clubs responded to. Information was also obtained from individuals in the fields of game and fish management and land assessment. Land values attributed to waterfowl were related to type of fowl, hunting potential, dependability of flights, nearness to population centers, cropland versus wetland, hunting regulations, potential harvest per acre, availability of free public lands, and alternative

land uses. Mean annual value per acre attributable to waterfowl for the period 1959-1963 ranged from $3.60 for ducks in the central flyway to $60.72 for geese in the Mississippi flyway. The value of good farmland with the potential for goose or duck hunting was much higher than the value of good farmland alone. Information on waterfowl clubs in the four flyways is also provided.

131. BROWN, G. M. and J. Hammack. "Dynamic Economic Management of Migratory Waterfowl." Review of Economics and Statistics 55(1):73-82, February 1973.

Transient and steady-state management conditions necessary to achieve a social optimum are identified through a Lagrange function incorporating a willingness-to-pay valuation function, a difference equation describing survival of waterfowl from one year to the next, a biological production function, and wetland opportunity costs. From the standpoint of economic efficiency this study lends no support to draining permanent North American wetlands.

132. BROWN, G. M. and Judd Hammack. "A Preliminary Investigation of the Economics of Migratory Waterfowl." Natural Environments: Studies in Theoretical and Applied Analysis, John V. Krutilla, editor, Baltimore: Johns Hopkins University Press for RFF, pp. 174-204, 1972.

This is a summary paper of Brown and Hammack's Waterfowl and Wetlands: Toward Bioeconomic Analysis, 1974.

133. BROWN, William G., Ashok K. Singh, and Jack A. Richards. Influence of Improved Estimating Techniques on Predicted Net Economic Values for Salmon and Steelhead. Corvallis: Oregon State University Agricultural Experiment Station, July 1972.

134. BROWN, William G., Farid H. Nawas, and Joe B. Stevens. The Oregon Big Game Resource: An Economic Evaluation. Corvallis: Oregon State University Agricultural Experiment Station Special Report No. 379, ii + 110 pages, March 1973.

A review and evaluation of various proposed methods for estimating net economic benefits of publicly owned recreational resources. Gross economic values of the big game resource were estimated using the impact of hunter expenditures on business sales as well as the effect on household income. Linear and exponential demand functions were estimated and estimates of net economic values to a nondiscriminating monopolist and consumer surplus were calculated. Nondiscriminating monopolist values were $5 million while consumer surplus values were $12 million based upon the linear function. Using the exponential demand function nondiscriminating monopolist values were $3.7 million and the consumer surplus value was $10 million for big game in Oregon in 1968.

135. BROWN, William G., Ajmer Singh, and Emery N. Castle. "Net Economic Value of the Oregon Salmon-Steelhead Sport Fishery." Journal of Wildlife Management 29:266-279, April 1965.

Demand functions for a sport fishery were estimated using data on income and distance traveled by anglers. Net economic value was estimated to be about $3 million in 1962. The net economic value, which was measured from the demand function, is the annual value of the sport fishery resource to a single owner if a market existed for the opportunity to fish for salmon and steelhead.

136. _____. An Economic Evaluation of the Oregon Salmon and Steelhead Sport Fishery. Corvallis: Oregon State University Agricultural Experiment Station Technical Bulletin 78, 47 pages, September 1964.

Gross and net economic values of the Oregon salmon-steelhead sport fishery were estimated from angler expenditure data obtained from a mail survey during 1962. The Clawson method was used.

137. BROWNLEE, W. C. Kerr Wildlife Management Area Research, Job No. 13: Economics of Deer and Livestock Production. Austin: Texas Parks and Wildlife Department Project No. W-76-11, 9 pages, November 25, 1968.

A continuation of work in Texas previously reported by C. W. Ramsey. Potential rancher profits per acre from deer during the study period were $11.23, as compared to $52.55 for cattle and $30.59 for sheep. The return for deer in the previous year was estimated to be $81.64.

138. BURRIS, O. E. Harvest of Fur Animals in Alaska. Juneau: Alaska Department of Fish and Game, 12 pages, 1967.

The economic value of the fur harvest in Alaska for the 1965-1966 season is presented.

139. BUTYNSKI, T. M. and W. von Richter. "In Botswana Most of the Meat is Wild." UNASYLVA 26(106):24-29, 1974.

Authors provide a detailed analysis of wildlife policies, administration, management, and the economics of utilization in one of the most game-bountiful countries in the world, Botswana. The importance of land-use policies based on the ecological constraints of the country are stressed. The policy of the country is to combine wildlife management and utilization for the benefit of the population as a whole. Annual income from wildlife was estimated to be $10 million in 1973.

140. CAPEL, R. E. "Wildlife: Economic Evaluation." The Allocative Conflicts in Water-Resource Management. Winnipeg: The University of Manitoba Agassiz Center for Water Studies, pp. 227-250, 1974.

Discusses the problems and urgency involved in making an economic evaluation of wildlife. The author suggests that alternative locations for activities that disrupt habitat be investigated as well as alternative levels of those activities.

141. CAPEL, R. E. and R. K. Pandey. "Evaluating Demand for Deer Hunting: A Comparison of Methods." Canadian Journal of Agricultural Economics 21(3):6-14, November 1973.

Two methods of estimating the demand for deer hunting in an area in southwestern Manitoba are applied and comparisons made. Benefits to hunters were calculated using the concept of consumer's surplus. Methods used to estimate demand were: (1) a trend cost approach and (2) an interview on hunters' willingness to pay.

142. _____. "Demand Estimation in Planning for Intensive Resource Management: Deer and Moose Hunting in Manitoba." Transactions of the Thirty-Eighth North American Wildlife and Natural Resources Conference 38:389-402, 1973.

Costs of travel were used to estimate demand for and consumer surplus associated with deer and moose hunting in Manitoba.

143. _____. "Estimation of Benefits from Deer and Moose Hunting in Manitoba." Canadian Journal of Agricultural Economics 20(2):7-16, July 1972.

Estimates of benefits from deer and moose hunting that can be used in benefit-cost analyses are presented. The benefits were derived from hunter demand functions. Distance and hunting site quality were independent variables.

144. CARLEY, D. H. Economic Analysis of the Commercial Fishery Industry of Georgia. Athens: University of Georgia Agricultural Experiment Station Research Bulletin No. 37, 1968.

145. CARLTON, R. L. "Economic Returns of Wildlife to the Landowner." Athens: Georgia University Cooperative Extension Service Leaflet No. 148, 4 pages, March 1974.

An extension service publication that describes some ways the landowner can benefit from wildlife.

146. CHAPMAN, D. W., et al. Sport Fishery Economics, A Report to the National Marine Fisheries Service. Moscow: University of Idaho, 100 pages, 1973.

Report interprets the contents of workshops at Moscow, Idado, and Madison, Wisconsin, July and September, 1972, respectively. The major goals of the workshops were to: (1) improve information available to economists, biologists and government administrators who evaluate fish resources through mutual exchange of ideas, evaluation of conflicting views, and discussion of present programs and future plans; (2) increase uniformity of methods used to evaluate fish resources; and (3) compare evaluation methods for fish resources and other water resource products to indicate comparability of values. Several popular techniques of fishery evaluation were discussed and compared.

147. CHRISTIANSEN, John R., R. B. Cooper, and S. D. Staniforth. Some Descriptive and Economic Facts Relating to Wisconsin Gun Clubs. Madison: University of Wisconsin College of Agricultural and Life Sciences Research Division Report R-2341, 11 pages, November 1971.

Investment, operating costs, and returns to owners of shooting preserves in Wisconsin are presented.

148. CHRISTIANSEN, John R., S. Stainforth, Aaron Johnson, Jr., and R. B. Cooper. An Economic Survey of Privately Owned Shooting Preserves in Wisconsin. Madison: University of Wisconsin College of Agricultural and Life Sciences Research Division Report 47, 11 pages, 1968.

The Wisconsin shooting preserve business is examined.

149. CIRIACY-WANTRUP, S. V. and William E. Phillips. "Conservation of the California Tule Elk: A Socioeconomic Study of a Survival Problem." Biological Conservation III(1): 23-32, October 1970.

A benefit-cost framework is used to evaluate the economics of maintaining and/or expanding the California Tule Elk resource. The social benefits from continuous use and management were larger than the social costs. At the time of the study the average social cost per elk was estimated to be $50, while the average cost per harvested elk was $340. Elk permits could be sold for a minimum of $500. The authors argued that the price of permits should be set in the market place rather than having the California taxpayer underwrite the windfall benefits which a few lucky hunters derive. Some unusual conditions with respect to opportunity costs and alternative uses were discussed.

150. CLARK, L. Howard and E. W. McCoy. "Hunting Preserves in Alabama." Highlights of Agricultural Research. (Alabama) 18(3):3, Fall 1971.

151. CLAWSON, Marion. Economic Aspects of Sport Fishing. Ottawa: Queen's Printer, Department of Fisheries of Canada Report No. 4, 1965.

152. CLEMENTS, Robert J. Virginia Game Investigations: Raccoon Study. Richmond: Virginia Commission of Game and Inland Fisheries Project No. W-40-18, 11 pages, 1971.

Raccoon hunters in southwestern Virginia spend a total of $5,340,000 each year. Raccoon hunting may provide almost 5 million man-hours of recreation in southwest Virginia.

153. CRUTCHFIELD, J. A. and D. MacFarlane. Economic Valuation of the 1965-1966 Salt-Water Fisheries of Washington. Olympia: Washington Department of Fisheries Research Bulletin No. 8, 1968.

154. CRUTCHFIELD, J. A. "Valuation of a Fishery." Transactions of the Twenty-Seventh North American Wildlife and Natural Resources Conference 27:335-346, 1962.

Some of the theoretical issues involved in valuing a fishery are discussed. Expenditures represent only part of the cost of providing a fishery. The market value of the fish taken represents a minimum value for sport fishing. What is really needed is a measure of what fishermen would be willing to pay for the right to fish. Another measurement is the value of a man-day spent in productive activity as a proxy for a man-day of sport fishing.

155. _____. "Can We Put an Economic Value on Fish and Wildlife?" Colorado Outdoors, pp. 1-5, March-April 1965.

156. _____. "Fish and Wildlife Values in Relation to Other Resources." Proceedings of the Forty-Fourth Annual Conference of the Western Association of State Game and Fish Commissioners 44:48-56, 1964.

The author stresses the use of user fees in determining the real value people place on recreation. Several other techniques for determining recreation values that are too expensive, too difficult to apply, soon outdated, or invalid are discussed.

157. _____. "Valuation of Fishery Resources." Land Economics 38(2): 145-154, May 1962.

158. DAMBACH, Charles A. and Ernest E. Good. "Profits for the Farmer." Soil Conservation 4(9):227-228, 1939.

Two systems of hunter control in Ohio are discussed. It was suggested that organizations of landowners and sportsmen be set up with part of the annual income collected as fees from hunters going to the community, and the remainder to the landowners.

159. DAVIS, Robert K., Steve H. Hanke, and Frank Mitchell. "Conventional and Unconventional Approaches to Wildlife Exploitation." Transactions of the Thirty-Eighth North American Wildlife and Natural Resources Conference 38:75-87, 1973.

Conventional preservationist approaches to wildlife management in African nations are being replaced by establishing wildlife as an economic resource. The African governments recognize the economic value of the American and European interests in wildlife. Values from tourism are better known, and frequently are greater than returns to the land from other uses in East Africa.

160. DAVIS, Robert K. "The Value of Big Game Hunting in a Private Forest." Transactions of the Twenty-Ninth North American Wildlife Conference 29:393-403, 1964.

A bidding game technique is developed and tested on big game hunters in Maine. The maximum prices which hunters would pay rather than be excluded from hunting, in a 5,000 acre area were aggregated for all hunters. The value of big game hunting was estimated to be 8.6 percent of the value of the land.

161. _____. "Recreation Planning as an Economic Problem." Natural Resources Journal 3(2):239-249, 1963.

162. _____. The Value of Outdoor Recreation: An Economic Study of the Maine Woods. Cambridge, Massachusetts: Harvard University, Ph.D. thesis, 1963.

A combination of interview and questionnaire techniques obtained data on willingness to pay and other variables from persons using the Maine woods for recreation. Willingness to pay was measured through a bidding game through which respondents could react to increased costs of visiting the area. Willingness to pay was regressed on income, years of experience with the area, and length of visit. From the information derived, net benefits and simulated demand curves were estimated for three separate Maine forest areas.

163. DEVOS, A. "Wildlife Management in Forests and Ranges for Aesthetic Purposes." Proceedings of the Society of American Foresters 1966:215-217, 1967.

164. DORIAN, Henry. "The Economic Value of the Chukar Partridge to Nevada." Proceedings of the Forty-Fifth Conference of the Western Association of State Game and Fish Commissioners 45:55-56, 1965.

Chukar partridge were introduced in Nevada to replace declining sage hen populations. The economic impact of chukar hunters was estimated as the sum of their expenditures plus the value of each bird bagged. Chukars were valued at $2 a bird.

165. DRUMAUX, L. "Forests, Hunting, and Fishing From the Economic Viewpoint in Belgium." Journal of Forestry 23:670-676, 1925.

The value of hunting to Belgium was estimated to be the sum of expenditures, custom duties, and the commercial value of game harvested. The value of fishing was estimated to be the sum of leasing income, permits and licenses, the commercial value of the catch, and custom duties.

166. DYER, Archie Allen. The Value of Trout Stream Fishery. Logan: Utah State University, M.S. thesis, 49 pages, 1968.

The capitalized values of a trout stream fisheries in Utah were estimated using consumers' surplus techniques. Variables considered were travel costs, length of stay, and time spent fishing.

167. EAGLES, D. "What is Our Wildlife Worth?" British Columbia Outdoors, pp. 33-36, December 1967.

An overview of the increasing concern of indiviuals, associations, and government agencies over wildlife values in Canada. The author suggests that nonconsumptive users spend several times more than hunters and fishermen. The agriculture-wetlands conflict is also discussed.

168. ELLEFSON, Paul V. and Gale C. Jamsen. Economic Appraisal of Michigan's 1970 Sport Fishery, January 1 - April 24. Lansing: Michigan Department of Natural Resources Research and Development Division Report No. 227, 1971.

169. _____. Economic Appraisal of Michigan's Salmon and Steelhead Sport Fishery, September 1 - December 31, 1970. Lansing: Michigan Department of Natural Resources Research and Development Report No. 244, 12 pages, June 1970.

An empirical example of Clawson's travel zone method is presented for the salmon and steelhead sport fishery in Michigan. Some findings were that fishermen spend an average of $9.76 each day they fish. This varied from a low of $8.19 per day for Lake Superior fishermen to a high of $10.01 for Lake Michigan fishermen. Very few fishermen reported spending more than $25 per day. The net economic value of this fishery for the last four months of 1970 was estimated to be $4.2 million, with a capitalized

value of $77.1 million (5.5%). The net value of an angler day during this time period was estimated to be $4.86. This represents the dollar value of the recreation that would be lost had a fisherman been denied an opportunity to fish one day for salmon and steelhead although allowed to partake of other recreation activities for one day. The authors caution readers on the use of these figures in decision making since they feel they are conservative estimates.

170. _____. Economic Appraisal of Michigan's Salmon and Steelhead Sport Fishery, April 25 - August 31, 1970. Lansing: Michigan Department of Natural Resources Research and Development Report No. 243, 21 pages, June 1970.

This report includes a discussion of the variables that affect participation in the salmon and steelhead sport fishery by recreationists. Simple correlations and regression analyses were used in an attempt to explain the amount of variation in salmon and steelhead angler days.

171. Environmental Research Group. Detailed Analysis--Economic Survey of Wildlife Recreation. Atlanta: Georgia State University, March 1974.

A statistical summary of Horvath's (1973, 1974) wildlife study is presented with computer output tables and data analysis. Tables are arranged under the topics: Socioeconomic, Fishing, Hunting, and Wildlife Enjoyment. Information on channelization is included in a separate section.

172. ERICKSON, R. E. and J. E. Wiebe. "Pheasants, Economics, and Land Retirement Programs in South Dakota." Wildlife Society Bulletin 1(1):22-27, Spring 1973.

Numbers of nonresident hunters in South Dakota were correlated significantly with pheasant populations, which in turn were correlated significantly with acres of cropland retired in vegetation cover. The authors argued that an increase in nonresident hunter expenditures of at least $10 million could be realized if one half of South Dakota's current (1971) 3.4 million acres of retired cropland contained suitable vegetative cover.

173. Farming and Pheasants in South Dakota. Brookings: South Dakota State University Pheasant Task Force Committee, FS 656, September 1976.

This Extension Service flyer provides information on pheasant farming relationships in South Dakota. Farming practices were divided into three categories: (1) positive agricultural practices that benefit both the pheasant and the farmer; (2) incentive practices that benefit pheasants but that either result in additional costs or restrict returns to the farmer; and (3) negative agricultural practices that benefit neither the farmer nor the pheasant.

174. FOG, J. "Game is Also a Crop." TOLVMANDSBLADET 46(10):487-491, October 1974.

175. FORESTER, Richard T. "Landowner Utilization of a Wild Pheasant Resource." California Fish and Game 57(4):298-306, 1971.

Seven percent of the landowners in Stanislaus County, California, leased their lands to pheasant hunters, while most landowners gave permission to hunt without charging a fee. Leasees' land averaged over $600 income per year. Pheasant hunting on leased land resulted in a much higher success ratio.

176. FORREST, Nathan K. Effects of Commercialized Deer Hunting Arrangements on Ranch Organization, Management, Costs, and Income--the Llano Basin of Texas. College Station: Texas A&M University, M.S. thesis, 135 pages, 1968.

Personal interviews with 86 Texas ranchers concerning four leasing methods for deer hunting on their land are discussed. Gross average income per acre ranged from $0.89 to $0.99 under the four leasing methods.

177. FORSHAGE, A. Cost/Benefit Analysis of a Catchable Rainbow Trout Fishery in Texas. Austin: Texas Parks and Wildlife Department, 18 pages, 1975.

178. FUCHS, Victor R. The Economics of the Fur Industry. New York: Columbia University Press, 1957.

179. GAMBLE, Hays B. and Ronald A. Bartoo. "Economic Returns From Timber and Wildlife on Northeastern Farmlands." Journal of Wildlife Management 27(3):457-466, 1963.

Income from timber and wildlife to the landowner on 18 sample Pennsylvania farms is compared. The returns for timber were much higher than from hunters. Although landowners had little reason to improve habitat, the expenditures of hunters were an asset to surrounding communities.

180. GARRETT, J. R., G. J. Pom, and D. J. Arosteguy. Economics of Big Game Resource Use in Nevada. Reno: University of Nevada Agricultural Experiment Station Bulletin No. 25, 22 pages, 1970.

The demand for hunting, the value of the habitat in improving hunting, and how to use this value in evaluating range improvement activities for livestock and deer are estimated. A consumer surplus model is presented based on hunter expenditures per trip.

181. GARTNER, F. Robert and Keith E. Severson. "Fee Hunting in Western South Dakota." Journal of Range Management 25(3):234-237, 1972.

Experiments form 1966 to 1970 on a 100 square-mile area suggest that landowners who defer hunting on their land for a couple of years to build up trophy deer might realize substantial income. Up to $45 per hunter-day could be charged for guide service, food, and lodging.

182. GILBERT, A. H. Determination of the Economic Demand and Values of Hunting and Fishing in Colorado. Fort Collins: Colorado State Univeristy, Ph.D. thesis, 281 pages, 1971. *32:5962-A

This dissertation estimates: (1) the total gross hunting and fishing expenditures in Colorado by activity in 1966 and 1968, (2) the income related demand for five resident and nonresident activities, and (3) the value of demand analysis in solving conventional resource management problems. Total gross expenditure was estimated through the development of a computer procedure which derived the average and total expenditures of a specific activity on the basis of the activity's association with other activities.

183. GORDON, D., D. W. Chapman, and T. C. Bjornn. "Economic Evaluation of Sport Fisheries--What Do They Mean?" Transactions of the American Fisheries Society 2:293-311, 1973.

The significance of economic evaluations of sport fisheries is discussed. An empirical study of the Idaho sport fishery in 1968 is presented and the results are compared with several other studies, including the National Hunting and Fishing Survey (1965). Results were found to vary considerably among studies. The authors suggest this inconsistency may be due to lack of consistency in data collections and analysis and suggest that this problem be considered in advance of designing future research projects.

184. GORDON, D. An Economic Analysis of Idaho Sport Fisheries. Moscow: University of Idaho Cooperative Fishery Unit, 60 pages, February 1970.

A questionnaire survey was conducted to estimate expenditures, net value, and distribution of effort for the Idaho fishery. Consumer surplus was estimated using the Clawson approach. Eight fisheries in Idaho were estimated to have a capitalized value of about $100 million in 1968. Results were compared with similar studies and found to vary considerably.

185. GOTTSCHALK, John S. "The German Hunting System, West Germany." Journal of Wildlife Management 36(1):110-118, 1972.

Under Germany's system of game management, which is geared to trophy hunting, hunting rights may cost up to $5,000 per year.

186. HAINES, Bruce. Cost-Benefit Ratio of Albuquerque-Belen Catchable Trout Fishery. Santa Fe: New Mexico Department of Game and Fish Project No. F-22-R-12, 12 pages, January 7, 1972.

A survey of Bernalillo County combination fishing and hunting and fishing license holders indicated 5,500 licensed anglers participate annually in the Albuquerque-Belen winter trout fishery. Over the two-year span of the study, 460,000 hours of recreation were generated by the fishery. The two-year cost of the fishery, based on $0.925 per pound of fish planted, was $20,000. The cost-benefit ratio was $0.04 per angler hour. Other fisheries in the state had per hour cost-benefit ratios of from $0.07 to $0.32.

187. HALLS, Lowell K. "Economic Feasibility of Including Game Habitats in Timber Management Systems." Transactions of the Fortieth North American Wildlife and Natural Resources Conference 40:168-174, 1975.

The trend in forest management in the southern part of the U.S. is to include game and to charge a fee for hunting. In 1972, Gulf States Paper Company charged the following fees for hunting on property the firm owned in Alabama: $1 to $3 per acre on upland sites; $2.50 to $6 per acre on bottonland hardwoods; and $10 to $20 per acre on especially good sites with special services. The pratice was profitable enough for the firm to adjust its timber management to accommodate game.

188. HAMMACK, Judd and Gardner Mallard Brown, Jr. Waterfowl and Wetlands: Toward Bioeconomic Analysis. Washington, D.C.: Resources for the Future, Inc., 95 pages, 1974.

The marginal value of a duck was estimated using data obtained from a nationwide survey of hunters in 1968. This value was estimated to be $3.29 per duck for 1968. Both willingness to pay and willingness to sell were discussed. The supply function of waterfowl was also investigated.

189. HAMMACK, J. Toward an Economic Evaluation of a Fugitive Recreational Resource: Waterfowl. Seattle: University of Washington, Ph.D. dissertation, 1969.

190. HAMOR, W. H. "Costs and Returns of Producing Wildlife on Farmland." Journal Soil Water Conservation 23(1):16-18, January - February 1968.

A method is suggested wherby a landowner can manage a portion of his land for waterfowl, lease it to hunters, and receive at least as much income as if he had farmed the area.

191. HARMEL, D. E. "Economics of Deer and Livestock Production." Austin: Texas Parks and Wildlife Department, 11 pages, 1968.

192. HART, Ray and George Veteto. Oak Woodland Wildlife Management Survey, Job No. 1: Deer-Cattle Relationship Study - Production and Economic Comparisons. Austin: Texas Parks and Wildlife Department, 9 pages, March 31, 1969.

A discussion of the economics of various production practices associated with cattle and deer.

193. HELLIWELL, D. R. "Priorities and Values in Nature Conservation." Journal of Environmental Management 1(2):85-127, April 1973.

This paper attempts to develop the ideas first published under the title "Valuation of Wildlife Resources" (Helliwell, 1969). The relevance of such evaluations to the conservation of habitats and species and to land-use planning is discussed. Methods are suggested for comparing one wildlife resource with another and for attaching monetary values to these resources.

194. _____. "Valuation of Wildlife Resources: Rejoinder to Critique, by M. D. Hooper." Regional Studies 4:393, 1970.

195. _____. "Valuation of Wildlife Resources." Regional Studies 3:41-47, 1969.

Presents a method of estimating production, potential production, education, and recreation values of wildlife resources in Great Britain. The principal parameters of assessment are the scarcity of the resource, its accessiblity, and the diversity of species within it. Possible applications of the method are cited. Monetary values were estimated by assumption or the cost of the next best alternative means of producing the factor evaluated.

196. HENDEE, John C. "Management of Wildlife for Human Benefits." Proceedings of the Fifty-Second Annual Conference of the Western Association of State Game and Fish Commissioners 52:175-181, 1973.

Some of the benefits of game management to hunters and ways to increase those benefits are discussed. The "game bagged" and "days afield" theories of benefits are critically evaluated.

197. HENDERSON, Upton B. An Economic Analysis of the Waterfowl Resource of the Swan Lake National Refuge and the Impact Upon the Rural Community. Columbia: University of Missouri, Ph.D. dissertation, 175 pages, 1965.

Major areas of inquiry of the Swan Lake National Refuge in Missouri were: determination of income generated from waterfowl hunting, demand for waterfowl hunting, and degree to which waterfowl hunting benefits have been capitalized into land values.

198. HOEKSTRA, Hayo H. "Towards Saving Europe's Wildfowl." Biological Conservation 3(3):217-219, April 1971.

Introduces the Hunting Rationalization Research Group as a part of the International Wildfowl Research Bureau. This group's goal is to preserve waterfowl from two main threats: the disappearance of wetlands because of drainage, pollution, and tourism; and the heavy pressure of shooting. Project MAR (see International Union for Conservation of Nature and Natural Resources) has been instrumental in preserving wetlands.

199. HOFFMAN, R. G. and H. Yamauchi. Recreational Fishing: Its Impact on State and Local Economics. Honolulu: Hawaii Division of Fish and Game Paper No. 3, 38 pages, 1972.

A survey obtained information on participation and expenditures on recreational fishing in Hawaii. Expenditure data for several years are presented and compared for each of the counties and the state as a whole. A local income multiplier model was used to estimate the economic impact. The model was designed to take into account both the direct and indirect income effects of fishermen expenditures and to correct for import leakages in the first and subsequent rounds of expenditures. Variables in the model were: (1) the initial expenditure remaining in the local area; (2) marginal propensity to spend disposable income locally, and (3) the proportion of expenditures of local people that accrues as local income.

200. HOOVER, Robert L. "Incorporating Fish and Wildlife Values in Land Use Planning." Transactions of the Forty-First North American Wildlife and Natural Resources Conference 41:279-288, 1976.

A report on work dealing with measuring the economic value of wildlife. Included are comments on federal and state efforts to evaluate wildlife; the work ongoing in Colorado is presented as an example of efforts at the state level. Some of the literature on methods of measuring wildlife values is reviewed. Methods discussed are: (1) expenditures, (2) input-output, (3) consumer surplus, (4) cost, (5) market value, (6) monopoly revenue, and (7) the Bayesian approach used in Colorado.

201. HORVATH, Joseph C. "Economic Survey of Southeastern Wildlife and Wildlife-Oriented Recreation." Transactions of the Thirty-Ninth North American Wildlife and Natural Resources Conference 39:187-194, 1974.

A household survey of a sample of residents in seven southeastern states was conducted in 1971 to obtain data on nine types of wildlife uses. Four value measurements were asked for: benefits received, benefits assigned, value demanded to give up, and days' pay lost. The average monetary benefit received for a day of fishing was $43; for hunting, $47; and for wildlife enjoyment, $71. Values to give up these activities were somewhat higher than the estimated value of benefits received.

202. _____. Detailed Analysis: Economic Survey of Wildlife Recreation, Southeastern States. Atlanta: Georgia State University Environmental Research Group, March 1974.

203. _____. Executive Summary: Economic Survey of Wildlife Recreation, Southeastern States. Atlanta: Georgia State University Environmental Research Group, March 1974.

204. HUNT, John D. "Utah's Economy and the Nonresident Deer Hunter." Utah Science 32(3):91-92, 1971.

A study conducted in 1971 of nonresident deer hunters in Utah indicated that they contribute little to the State's economy. The major contribution was their license fee which goes toward game management. Based on data collected, nonresident hunters spent only $4 per day per person while in Utah.

205. HUNTER, G. N. "Economic Value of Hunting and Fishing to the People of the State of Colorado." Denver: Colorado Game, Fish, and Parks Department (loose leaf, unpublished) 1960-1964.

206. JAMSEN, Gale C. and Paul V. Ellefson. "Economic Evaluation of Michigan's Salmon-Trout Fishery." Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:397-405, 1971.

The costs and benefits of Michigan's salmon and trout sport fishery are examined. Travel costs were used as an indicator of the willingness of fishermen to pay for salmon and trout resources. Demand curves for the entire sport fishing resource and for just the salmon and trout resources were estimated. The authors argued that consumer surplus is the appropriate measure of the economic value of the salmon and trout resources. Preliminary results indicated the net value of the salmon and trout resources to be between $5 and $7 million in 1970.

207. JOHNSON, L. L. Migration Harvest, and Importance of Waterfowl at Barrow, Alaska. College: University of Alaska, M.S. thesis, 99 pages, 1971.

The author argues that waterfowl hunting at Barrow, Alaska, has a stimulating effect on the village economy. At the time of the study the importance of waterfowl hunting for subsistence to Eskimos had declined in this area since the high cost of guns and ammunition outweighed any advantage of hunting over purchasing meat. Waterfowl hunting played a role in keeping native villages intact through the social and recreational benefits it provided.

208. JONES, Bernard R. "Game and Fish Values of the Mississippi River Between The Rum River at Anoka and The Chippewa River Below Lake Pepin." Paper presented at the Conference on Pollution of the Mississippi River between the Rum River and Chippewa River called by the Secretary, U.S. Department of Health, Education and Welfare and conducted by the Enforcement Branch, Division of Water Supply and Water Pollution Control, U.S. Public Health Service, February 7, 1964, St. Paul, Minnesota, 17 pages (mimeo), 1964.

The value of fish in a stretch of the Mississippi River is measured by the worth of the commercial catch and the expenditures of sport fishermen. An average annual expenditure of $50 per sport fisherman was used in this paper. No monetary statistics were presented for game values.

209. JONES, Lanny D. and Gene Coslett. "Evaluation of Utilization of Kansas Forestry, Fish, and Game Commission Lakes for Fishing and Recreation." Pratt: Kansas Forestry, Fish, and Game Commission, Dingell-Johnson Project F-15-R-8, Job No. J-1-3, 15 pages, January 21, 1974.

The third segment of a consecutive three-year recreational study was conducted at Barber State Fishing Lakes, Kansas. A summary of the recreational use and creel census survey for the three years is presented. Average annual cost to provide one man-day of recreation was about $0.50, but the cost to provide one man-day of fishing was $1.47 in 1970, $2.16 in 1971, and $1.43 in 1972. This three-year study was concerned mainly with the costs of providing recreation. Some techniques for data collection are explained as they relate to number of recreation days and number of fish caught.

210. _____. "Evaluation of Utilization of Kansas Forestry, Fish, and Game Commission Lakes for Fishing and Recreation." Pratt: Kansas Forestry, Fish, and Game Commission, Dingell-Johnson Project F-15-R-7, Job No. J-1-2, 13 pages, February 1, 1973.

211. KAPETSKY, James M. and James R. Ryckman. "Economic Implications from the Grand Traverse Bay Sport Fishery." Michigan's Great Lakes Trout and Salmon Fishery, (1969-1972). Lansing: Michigan Department of Natural Resources Fisheries Management Report No. 5, pp. 83-92, June 1973.

The economic impact of the Grand Traverse Bay Sport Fishery was measured in terms of income and employment generated by the spending of nonresident sport fishermen which could be attributed to the fishery. Total community income attributable to the fishing resource was estimated to be $204,000 annually. Full-time equivalent employment attributable to the fishery resource was estimated to be 21.5 jobs.

212. KHALILI, Abdolamir. Optimal Economic Management of Wildlife, Over Time, with Special Reference to Canadian Geese of the Swan Lake Wildlife Refuge. Columbia: University of Missouri, Ph.D. dissertation, 189 pages, 1969. *30(10):4104-A

This study provided an operational decision model to be used to determine the harvest levels, over time, that maximize the present value of expected net social benefits associated with any species of wildlife over a planning horizon. A stochastic programming model using demand for Canadian geese at the Swan Lake Wildlife Refuge, hunter visits, average cost per visit, geese population, and harvest levels is presented.

213. KING, William E., III. An Economic Analysis of the Spatial Behavior of Hunters. St. Louis: Washington University, Ph.D. dissertation, 159 pages, 1975. *36(9):6218-A

The purpose of this study was to improve the land use management decision making process. A model was developed that incorporated utility theory and gravity potential analysis. The behavior of the individual hunter was accounted for as well as the activities of all hunters at a given destination. The model was tested using data on small game hunters in Missouri in 1970-1971 and deer hunters in Michigan from 1961-1969.

214. KLEIN, David R. "Waterfowl in the Economy of the Eskimos on the Yukon-Kuskokwim Delta, Alaska." Arctic 19(4):319-336, 1966.

215. KOUBA, Leonard J. "Controlled Shooting Preserves: Integrating Recreation and Sound Land Management." Journal of Soil Water Conservation 27(4): 156-159, 1972.

Data are presented on shooting preserves in a number of states for the period 1954 to 1970.

216. LACAILLADE, H. C. Annual Harvest and Economic Value of Furbearers - Five-Year Summary. Concord: New Hampshire Game and Fish Department State-Wildlife Survey, Project No. W-9-R-20, 8 pages, August 31, 1966.

A discussion of ongoing research in New Hampshire to evaluate the economic value of furbearers.

217. LAMPIO, T. "Foreign Hunters in Finland." Suomen Riista 21:22-26, 1969.

218. _____. "Moose Hunting in Finland." Suomen Riista 20:71-86, 1968.

219. LEITCH J. A. Application of Five Methods for Measurement of Wildlife Value: Lower Sheyenne River Basin, North Dakota. Fargo: North Dakota State University, M.S. thesis, 133 pages, 1975.

The wildlife community of the Lower Sheyenne River Basin in North Dakota is described and the value of that wildlife community is estimated. Five techniques were applied: (1) utility value, (2) expenditures, (3) the value of comparative private recreation, (4) wildlife land value, and (5) the priority evaluator technique, a photo choice game simulating the marketplace.

220. LEITCH, J. A. and William C. Nelson. Economic Value of Wildlife in the Lower Sheyenne River Basin: Comparison of Four Measurement Techniques. Fargo: North Dakota State University Department of Agricultural Economics Report No. 114, 25 pages, July 1976.

The economic value of the wildlife community in the Lower Sheyenne River Basin (LSRB) in North Dakota is estimated and four techniques frequently used to estimate the economic value of wildlife are compared. An estimate of the species composition of wildlife was determined from the literature and personal communications with State Game and Fish Department personnel. To determine the value of wildlife, four techniques were applied to the LSRB: (1) utility value, (2) expenditures, (3) the value of comparative private recreation, and (4) wildlife land value.

221. LEITE, Edward A. Economics of Game Production in Ohio. Columbus: Ohio Department of Natural Resources Division of Wildlife, Project No. W-103-R-17, 17 pages, February 12, 1974.

The costs to private landowners of lost profits due to establishing wildlife habitat on presently cultivated land are examined. Four farm units were evaluated with respect to farm profits and game harvested.

222. LEOPOLD, A. Starker. "Quantitative and Qualitative Values in Wildlife Management." Natural Resources: Quality and Quantity, S. V. Ciriacy-Wantrup and James J. Parsons, editors, Berkeley: University of California Press, pp. 127-136, 1967.

A general discussion of wildlife values including aesthetic values related to management.

223. LEWIS, Harrison F. "The Cash Value of the Wildlife of Canada." Proceedings of the Twenty-Second Conference of the International Association Game, Fish, and Conservation Commissioners 22:79-82, 1930.

A summary of the value of purchases associated with outdoor recreation in Canada.

224. LINEAR, Marcus. "The Economics of Wildlife: Marginal Land Often Yields Profits When Left Alone." Ceres 3(3):51-54, 1970.

The potential for exploiting the commercial uses of wildlife in African nations is discussed.

225. LORD, William B. "Economic Aspects of Lake Trout Management In Lake Superior." Annual Report. Madison: Wisconsin Conservation Department, 6 pages, 1970.

Fisherman expenditures are discussed as they relate to an analytical model which can be used to evaluate alternative policies for management of the Lake Superior lake trout fishery.

226. MCCURDY, Dwight R. and Herbert Echelberger. "The Hunting Lease in Illinois." Journal of Forestry 66(2):124-127, 1968.

Leasing provisions for the purpose of hunting in Illinois are discussed.

227. MCINTOSH, Kenneth D. Privately-Owned Hunting Lands in West Virginia: Supply, Quality, and Access Arrangements. Madison: University of Wisconsin, Ph.D. dissertation, 324 pages, 1966. *28:852-A

The potential for including recreation in the form of hunting on private land for increased income in West Virginia is examined. The potential for increasing the income of private landowners in West Virginia by charging for hunting rights is examined.

228. MALLET, J. and T. C. Bjornn. Sport and Commercial Fisheries. Subproject Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers. Moscow: Idaho Water Resources Research Institute, 30 pages, November 1970.

229. Manitoba Department of Renewable Resources and Transportation Services. Summary of File Reports on Recreation, Commercial and Subsistence Uses of Fish and Wildlife in Manitoba. Winnipeg, Manitoba, 1976.

230. MARSHALL, Thomas L. Trout Populations, Angler Harvest and Value of Stocked and Unstocked Fisheries of the Cache La Paudre River, Colorado. Fort Collins: Colorado State University, Ph.D. dissertation, 105 pages, 1973. *34(9):4146-B

Angler expenditures were used as a proxy for user values in this evaluation of trout programs in Colorado.

231. MARTS, M. E. and W. R. D. Sewell. "The Application of Benefit-Cost Analysis to Fish Preservation Expenditures: A Neglected Aspect of River Basin Investment Decisions." Land Economics 35(1):48-55, February 1959.

Preservation of fish and generation of power are two conflicting interests that delay river basin development. This conflict is discussed in terms of mutually interdependent alternatives rather than as two mutually exclusive alternatives.

232. MATHEWS, Stephen B. and Garner S. Brown. Economic Evaluation of the 1967 Sport Salmon Fisheries of Washington. Olympia: Washington Department of Fisheries Technical Report No. 2, 1970.

An economic evaluation of the Sport Salmon Fisheries of Washington based on a survey of salmon license holders in 1967. Gross annual fishing expenditures by all anglers were estimated to be $20 million. Nonresident anglers accounted for $4.5 million. The amount anglers would be willing to pay in order to continue fishing was $65 million. Net value per fishing trip was estimated.

233. MATSON, Arthur J. An Analysis of Economic Factors and Institutions Affecting the Productivity of South Dakota Land and Water Resources for Upland Game Birds and Migratory Waterfowl. Brookings: South Dakota State University Agricultural Economics Pamphlet No. 123, 249 pages, September 1964.

The author examines the role of state government in the allocation of land and water resources which provide recreational benefits. Attention was given to (1) the jurisdiction of a state over the factors that determine the supply of game birds and (2) the demands for alternative recreational products which affect the economic development of a region. The study was limited to the production and the harvest of game birds which affect levels of income in South Dakota. A major conclusion was that the personal income of the state could be increased by appropriate changes in the institutions affecting nonresident hunting in the state.

234. _____. Improving Productivity of South Dakota Land Resources for Upland Game, Birds and Waterfowl Through Adjustments in Institutions. Ames: Iowa State University of Science and Technology, Ph.D. dissertation, 350 pages, 1964. *26:5604

This study considered the allocation of recreational resources for the purpose of economic development of a state. Analysis was made of interrelationships between demand and supply which influence income from investments in game birds.

235. MEYER, Philip A. Recreational and Preservation Values Associated With the Salmon of the Fraser River. Vancouver, British Columbia: Fisheries and Marine Service, Environment Canada, Information Report Series No. PAC/N-74-1, 49 pages, 1974.

The recreational and preservation values associated with the salmon of the Fraser River in British Columbia and Alberta, Canada are estimated. The measurement technique used was to present respondents with the range of public service purchases made on their behalf by their local municipal government, and then ask them to assign a "relative value" to the various salmon oriented recreational activities identified. Consumer's surplus, nondiscriminating monopolist, and nonparametric measurements of the value of salmon to the user are presented. A case study of the potential reduction in numbers of salmon at a damsite is presented.

236. MICHAEL, H. T. "Extra Profits from Wildlife." Soil Conservation 23(9): 190-192, 1958.

Farmers and ranchers on the Texas Gulf Coast obtain a substantial income from hunting and fishing rights on their rice fields and ranges. Some were charging from $3 to $5 per day for goose hunting.

237. MINSNER, W. G., III. "Fee Dove Hunting." The Tennessee Conservationist 40:(11):13, November 1974.

Farmers are beginning to realize the income potential of fees for hunting access as an additional source of farm income. The average income for Tennessee landowners from fee dove hunting in 1974 was estimated to be $12 per acre.

238. MITCHELL, Frank. "The Economic Value of Wildlife Viewing as a Form of Land Use." East African Agricultural and Forestry Journal. Special Issue, June 1968.

The value of wildlife viewing as a form of land use in East Africa is discussed. The objects, methods, and problems involved in the economic analysis of land-use alternatives are considered along with data requirements.

239. MONTGOMERY, V. E. and L. F. Thompson. Trout Fishing in the Black Hills of South Dakota. Pierre: South Dakota Department of Game, Fish, and Parks Bulletin No. 100, 55 pages, 1969.

240. MOYLE, John B. "Review of Approaches and Methods for Estimating Values of Fish and Game and of Hunting and Fishing." St. Paul: Minnesota Department of Natural Resources Special Publication No. 14, 12 pages (mimeo), January 1962.

A review of methods for estimating the value of fish and game resources.

241. MYERS, G. T. and R. M. Hopper. Grand Mesa Project. Denver: Colorado Game, Fish, and Parks Department Project No. W-37-R-19, 27 pages, April 1966.

A discussion of the dollar value of wildlife losses due to construction of an irrigation project in Colorado. Losses included the loss in license revenues, the loss in income to people of Colorado (fewer hunter expenditures), revenue lost as a result of increased deer damage to crops, and loss of meat produced. The total loss over 50 years was the amount the Game, Fish, and Parks Department should be paid out of project funds for wildlife improvements and development.

242. National Academy of Sciences, National Research Council. Land Use and Wildlife Resources. Washington, D.C.: National Academy of Sciences, 1970.

The impact of agricultural practices on wildlife resources are analyzed. The interrelations of agricultural land use and the protection and production of wildlife and other natural resources are evaluated. Areas of apparent conflict between the objectives of agriculture and wildlife management are examined. Wetlands and other habitats are discussed in this report as they are affected by land-use practices. Chapter 2, "Wildlife Values in a Changing World," touches on the economic values associated with wildlife resources. Chapter 5, "Special Problems of Waters and Watersheds," contains a discussion of drainage of wetlands and the prairie pothole region.

243. NAWAS, Farid. The Oregon Big Game Resource: An Economic Evaluation. Corvallis: Oregon State University, Ph.D. dissertation, 166 pages, 1971. *33(1):45-A

The gross economic value of the Oregon big game resource was estimated on the basis of information obtained from two questionnaires mailed to a random sample of Oregon big game hunters in 1968. Net economic value was defined as the potential value of the resource if the opportunity to hunt big game animals were a marketable commodity. Estimation of values was based on individual observations as compared to traditional distance zone estimation procedures. Using the concept of consumer surplus, an estimated net economic value of $11 million was calculated for the Oregon big game resource in 1968.

244. NELSON, D. C. and L. G. Blaufuss. An Economic Analysis of Existing Markets for Commercial Fish from the Upper Midwest. Fargo: North Dakota State University Agricultural Economics Report No. 59, 41 pages, 1968.

The commercial value of North Dakota's fishery is discussed.

245. NEVERS, H.P. The Value of Harvested Furbearers. Concord: New Hampshire Fish and Game Department Project No. W-9-R-26, 6 pages, January 1973.

Research in New Hampshire to evaluate the economic value of furbearers is discussed.

246. NOBE, K. C. and H. W. Steinhoff. "Values of Wildlife." Wildlife and the Environment, E. Decker and G. A. Swanson, editors, Proceedings of Governor's Conference, Fort Collins: Colorado State University Environmental Resources Center Information Ser. No. 7, pp. 33-37, 1973.

The authors present a discussion of the many types of wildlife values, show how those values can be measured, and stress the implications for the planning and decision making processes.

247. NOBE, K. C. "Introduction to Economics of Game and Fish Resources." A Manual of Wildlife Conservation, Richard D. Teague, editor, Washington, D.C.: The Wildlife Society, pp. 24-27, 1971.

Game and fish managers will have to use economics to maintain wildlife numbers. The values of wildlife should not be assumed to accrue entirely to recreationists. Only by reflecting all public interests can these resources be elevated to the role of a full partner in the sharply competitive game of streching scarce natural resources to fulfill rapidly expanding and competitive demands.

248. NORMAN, Richard L., Laren A. Roper, Perry D. Olson, and Robert L. Evans. Using Wildlife Values In Benefit-Cost Analysis and Mitigation of Wildlife Losses. Denver: Colorado Division of Wildlife Report No. DOW-M-D-3, 18 pages, 1976.

A method for estimating dollar values of wildlife and wildlife habitat is presented. The basic assumption is that the real value of wildlife losses is equal to the value of land required to totally replace the wildlife lost. Product data files are established for each wildlife resource including nongame species. The value of one bighorn sheep was estimated to be $11,200; an antelope $234; a black bear $6,400; a duck $20.79; a goose $168.72; and a skunk $2.02. An acre of pan fish water was estimated to be worth $520, while an acre of water habitat for three species of trout was valued at $10,000 each. A 6 percent capitalization rate was used to determine the value of a wildlife resource in perpetuity. If a wildlife resource could not be replaced in some other geographic area, the proposed project should be opposed. Wildlife value data from Ashton et al. (1974) and Horvath (1974) were used as the basis for estimating product values.

249. PATTISON, W. S. and W. E. Phillips. "Economic Evaluation of Big Game Hunting: An Alberta Case Study." Canadian Journal of Agricultural Economics 19:72-85, 1971.

Questionnaires were sent to Alberta moose hunters to determine the extra-market value of the moose hunting experience. A willingness to pay approach was used. The value of the hunting experience was estimated at $115 per hunter, while the value of the moose resource was estimated at $43 per hunter. Indirect or secondary benefits to Northern Alberta were estimated by applying an impact multiplier to the expenditures of nonresident hunters. The authors concluded that net social benefits resulting from public expenditures on habitat improvement must be compared with returns from alternative uses of limited public funds.

250. PATTISON, W. S. Moose Hunting Activity in Northern Alberta: A Case Study in Wildlife Economics. Edmonton: University of Alberta, M.S. thesis, 1970.

251. PAYNE, B. R. and R. M. Degraff. "Economic Values of Recreational Trends Associated with Human Enjoyment of Nongame Birds." Proceedings of the Symposium on Management of Forest and Range Habitats for Nongame Birds (May 6-9, 1975, Tucson, Arizona). Washington, D.C.: U.S. Forest Service General Technical Report WO-1, pp. 6-10, 1975.

252. PEARCE, James W. "A Statewide Economic Demand Analysis of the Au Sable River Sport Fishing Resource." Michigan's Great Lakes Trout and Salmon Fishery (1969-1972). Lansing: Michigan Department of Natural Resources, Fisheries Management Report No. 5, pp. 71-82, June 1973.

The Clawson method is used in an investigation of the economic value to the State of Michigan of resident sport fishing on the Au Sable River during the years 1970 and 1971.

253. PEARSE, Peter H. and M. Laub. The Value of the Kootenay Lake Sport Fishery: An Economic Analysis. Victoria, British Columbia: Department of Recreation and Conservation Fish and Wildlife Branch, 60 pages, 1969.

254. PEARSE, Peter H. "An Economic Evaluation of Nonresident Hunting and Guiding in the East Kootenay." Canadian Journal of Agricultural Economics 16(2): 100-111, June 1968.

This study attempts an evaluation of the economic contribution of nonresident hunting and the associated guiding industry in a region of British Columbia. The net economic gain from nonresident hunting was calculated, as were the private profits of guiding. The procedure involves assessing all the benefits (expenditures) that accrue to residents of British Columbia as a result of nonresident hunting and guiding, and subtracting from this the costs incurred by British Columbians in providing these benefits. The net benefit was estimated to be $66,151 in East Kootenay in 1964. Included is a brief discussion of the incidence of the benefits and costs of nonresident hunting and guiding, and some indirect implications.

255. PEARSE, Peter H. and Gary Bowden. "Economic Evaluation of Wildlife Development Projects Through Benefit-Cost Analysis." Paper prepared for the Thirty-Second Federal-Provincial Wildlife Conference, Whitehorse, Yukon Territory, July 9-11, 1968.

256. _____. Big Game Hunting in the East Kootenay. Vancouver: University of British Columbia, 39 pages, 1966.

Socioeconomic characteristics of resident and nonresident hunters and licensed guides in British Columbia are presented.

257. _____. Big Game Hunting in the East Kootenay: A Statistical Analysis. Vancouver: Price Printing Ltd., 1966.

258. PELGEN, D. E. "Economic Values of Striped Bass, Salmon, and Steelhead Sport Fishery in California." California Fish and Game 41:5-17, 1955.

Average expenditures per angler day for striped bass, salmon, and steelhead in California in 1953 were estimated from data obtained from a mail survey of fishermen in California. Striped bass anglers spent an average of $9 per day and the estimated value of this fishery was $18 million. Salmon anglers spent $16 per day, and steelhead anglers spent $18 per day.

259. PERRY, Bill. "Waterfowl Season Profitable." The Star-Democrat, Easton, Maryland: Easton Publishing Company, pp. B1-B2, October 28, 1976.

The revenues generated by waterfowl hunters in Talbot County, Maryland are presented. This tourist oriented business could bring as much as $5 million into the county each fall.

260. PFEIFFER, Peter W. Monetary Values of Fish. The Pollution Committee, Southern Division, American Fisheries Society, 18 pages, 1975.

This is a revision of a 1970 publication compiled and prepared by recognized experts in the field of fishery biology. The revision reflects production cost increases over the five-year interval. The revised values were determined by a survey of commercial hatcheries in 1974 to determine the price of large-mouth bass, bluegill, channel catfish, carp, trout, and bait fishes. The values presented represent the average purchase price of each fish at the hatchery, and do not include transportation costs or expenses incurred in assessment and restocking procedures. A walleye over 15 inches was worth $4.56 per pound, a northern pike over 14 inches was worth $3.99 per pound, and a muskellunge over 14 inches was worth $11.40 per pound.

261. PHILLIPS, Paul H. The Economic Impact of the Louisiana Deer Hunter on the Communities Surrounding the Chicago Mill Game Management Area. Baton Rouge: Louisianna State University, M.S. thesis, 43 pages, 1965.

Expenditures by deer hunters who hunted in a selected area in Louisiana are given. Data include costs of transportation, lodging, clothing, and equipment. Local hunters spent an average of $13.55 per hunting effort, while nonlocals spent $45.59 per hunting effort. It was concluded that hunting could become the primary cash crop of the local area.

262. PRATO, Anthony A. "Economic Value of Wildlife." Proceedings of the Forty-Fifth annual meeting of the Western Agricultural Economics Society, 8 pages (mimeo), 1975.

The author argues that the value of wildlife in wildlife recreation is less than the value of the total wildlife recreation experience, particularly for consumptive forms of wildlife recreation such as hunting and to a certain extent for nonconsumptive forms. If this relationship can be demonstrated, then valuation methods that equate the economic value of wildlife to the economic value of wildlife recreation are inappropriate. A utility production function model of recreation behavior is used to support this argument.

263. RAMSEY, C. W. Kerr Wildlife Management Area Research Job No. 13: Economics of Deer and Livestock Production. Austin: Texas Parks and Wildlife Department, 7 pages, April 24, 1967.

Continuation of a series of research studies to compare the economics of deer and livestock production under selected grazing systems.

264. _____. Kerr Wildlife Area Research: Job No. 2: Wildlife-Livestock Relationships. Austin: Texas Parks and Wildlife Department Project No. W-76-R-9, 6 pages, November 28, 1966.

Relates findings in the early stages of research on the economics of livestock and deer production under various management practices.

265. _____. "Potential Economic Returns From Deer as Compared with Livestock in the Edwards Plateau Region of Texas." Journal of Range Management 18:(5)247-249, 1965.

The net return per animal unit of deer harvested under optimum harvest conditions compares favorably with the return from livestock. 1955-1959 average gross return per deer harvested was $42. The best net return for deer was $38, while livestock in the best single year was $29. It is suggested that as hunting demand grew over the five-year period so did the economic value of the deer herd.

266. RAY, Johnny and Gene Coslett. Evaluation of Utilization of Kansas Forestry, Fish and Game Commission Lakes for Fishing and Recreation. Topeka: Kansas Forestry, Fish, and Game Commission, Dingell-Johnson Project F-15-R-6, Job No. J-1-1, 26 pages, January 1972.

Report describes the first annual recreational census at Barber County (Kansas) State Lake. Research techniques are described for this three-year project with the objective of determining the cost of the provision of recreation at a state lake. The final report was authored by Lanny D. Jones.

267. Recreation and Fishery Values in the San Francisco Bay and Delta. Menlo Park, California: Stanford Research Institute, 1966.

This study used a fixed value for a user day or participation day of a variety of recreational activities. The range of values selected were representative of the amount that users would be willing to pay for particular recreation activities. Net benefits for general recreation activities on San Francisco Bay, by this method, ranged from $0.50 to $1.50 per user day. Specialized activities were valued higher, however.

268. REED, Jim. "Wildlife is Wealth." Florida Wildlife 14(9):11-13, 1961.

The economic and recreational value of Florida's wildlife is estimated, including nonconsumptive use.

269. RICHARDS, J. An Economic Evaluation of Columbia River Anadromous Fish Programs. Corvallis: Oregon State University, Ph.D. dissertation, 286 pages, 1968. *29:1013-A

Study evaluates the benefits and costs of the continuing public programs aimed at maintaining Columbia River anadromous fish runs. Transfer costs were used as a proxy for nonexistent market values to estimate the value of sport-fish caught.

270. RODRIGUEZ, B. Economic Rent Values for Pheasant Hunting in Utah. Logan: Utah State University, M.S. thesis, 1970.

The primary objective was to develop a conceptual model to value recreation activity using the concept of economic rent. A secondary objective was to test the model empirically. The model incorporated the relationship between the distance traveled by recreationists and number of trips taken from origins and the quality implication of the sites. The total economic rent for 16 selected counties in Utah in 1966 was $5.8 million, of which $1 million corresponded to location rent and $4.8 million to the quality rent values. A review and summary of literature is presented.

271. ROMAIN, M. "Forest, Wildlife and Recreation as Competitors for Land Use." Paper presented at the Fifty-Fourth Annual Meeting and Conference of Agricultural Institute of Canada, August 4-8, Quebec, Canada, 1974.

272. ROOTS, Clive. Wild Harvest: A Look at Man's Association with Wild Animals. London: Lutterworth Press, 236 pages, 1970.

Man's desire for wildlife products and his desire to eliminate wildlife from competition with domestic stock has resulted in serious imbalances in nature. The economic importance of some wildlife species is evidenced by the lengths people go to obtain them, even after such taking is made illegal. Suggestions are made on how to stop man from causing this imbalance. One suggestion is to "farm the wild" in a way that will not destroy the resource. Raising muskrats in the wild could produce as much as $10,000 dollars annually (1967 dollars) from a previously unused 500-acre marsh. Wild ungulates are better suited for farming in such areas as the semi-arid regions of Africa than are many domesticated forms. Many nations commercially harvest wildlife while in the United States and Canada most of the harvest of surplus wildlife is done by hunters.

273. ROYALL, W. C. Wildlife Values with Special Reference to Idaho Wildlife as a Recreational Resource. Ithaca: Cornell University, M.S. thesis, June 1954.

274. RUTHERFORD, W. H. Beaver in Colorado, Its Biology, Ecology, Management, and Economics. Denver: Colorado Division of Wildlife Technical Bulletin No. 17, 49 pages, 1964.

275. RYCK, Francis M., Jr. Fish Kill Investigations, 1972. Columbia: Missouri Department of Conservation Annual Report, Project S-1-R-22, Study W-3, Job No. 2, 11 pages, June 27, 1973.

Investigations were conducted to determine the cause of fish kills, the extent of stream or lake that was affected, the numbers of fish of the various species, and the monetary value of fish killed in 1972. A petroleum products spill caused an estimated 22,000 fish kill, valued at $16,820. An acid mine fish kill of 8,998 fish was valued at $1,463. Another acid mine fish kill resulted in 114,733 fish killed with a value of $8,800. Other examples are provided but no mention is made of the method used to value the fish lost.

276. SALO, L. J. Comparison of Management Practices and Economic Importance of Moose, Muskrat, Hare and Ptarmigan in Alaska and Finland. College: University of Alaska, M.S. thesis, 138 pages, 1970.

The values of moose, muskrat, hare, and ptarmigan in Alaska and Finland were compared. The values estimated were meat, hide, and license sales taken from secondary sources. If the value of recreation and other secondary benefits were included, the total value of these wildlife resources would have been much higher. The use of these resources by tourists and recreationists is increasing while wildlife utilization for subsistence is stable or declining.

277. SAMPSON, Frank W. Survey of Coyote and Bobcat County Bounties (1969). Columbia: Missouri Department of Conservation, Project No. 13-R-24 (1970), 13 pages, April 16, 1970.

278. SCHEFFER, Paul M. "Farming for Waterfowl in the Pacific Flyway." Transactions of the Twenty-Fourth North American Wildlife Conference 24:238-244, 1959.

The author describes the development and management of tillable lands for waterfowl. Data from the Pacific Coast indicated that lands of marginal agricultural value could profitably be used for waterfowl. At a cost of $36 per acre, waterfowl leasing returned from $75 to $100 per acre per year.

279. SCHEFTEL, Zane. "An Economic Evaluation of the Sport Fishery in Minnesota." Transactions of the Twenty-Third North American Wildlife Conference 23:262-268, 1958.

The objective of this study was to obtain an estimate of the economic benefits accruing to various sectors in Minnesota due to sport fishing. Expenditures of resident and non-resident fishermen are listed.

280. SCHERMERHORN, Richard W. and William K. Starkey. An Economic Feasibility Study--Shooting Preserves in Maryland. Annapolis: University of Maryland Agricultural Experiment Station Miscellaneous Publication No. 584, 34 pages, 1966.

281. SCHUPP, Dennis. "Economic Survey of Mille Lacs Lake Sport Fishery, 1961-1962. St. Paul, Minnesota: Department of Conservation Investigational Report No. 288, October 1965.

282. SCHUSTER, Ervin G. "Investment Analysis: Problems and Prospects in Recreation, Wildlife, and Fishery Management." Outdoor Recreation, Advances in Application of Economics. Washington, D.C.: U.S. Department of Agricultural Forest Service General Technical Report WO-2, pp. 133-139, March 1977.

The complexities of investment analysis are viewed as the major problem areas relative to decision making in recreation, wildlife, and fishery management. The valuation process is considered to be the primary area of difficulty. Concepts of social output and cost of acquisition are argued to be legitimate components of an analysis. The overriding necessity is to develop a method of analyzing investments compatible with other methods accepted in current use.

283. SCOTT, Anthony D. The Valuation of Game Resources: Some Theoretical Aspects. Ottawa: Queen's Printer, Department of Fisheries of Canada Report No. 4, 1965.

The author examines the theory underlying the travel costs method of valuing recreational resources with special emphasis on game resources. The author concluded that for fish and game resources, the best way to resolve valuation problems is to actually impose a toll. Various shortcomings of using travel zones are discussed.

284. SEWELL, Granville H. "Economic and Social Value of Estuarine Wildlife." The Economic and Social Importance of Estuaries, Appendix C, David C. Sweet, Project Director, Washington, D.C.: Water Quality Office, U.S. Environmental Protection Agency, pp. C-1 to C-10, April 1971. (EP2.19:2)

The author reports that the principal value of estuarine wildlife lies within the social realm, and is not readily convertible into monetary terms. He does, however, present values for the simplest and clearest case of wildlife values of estuaries--fur production.

285. SHAFER, Elwood L. and George H. Moeller. "Wildlife Priorities and Benefits: Now, 2000, and Beyond." Transactions of the Thirty-Ninth North American Wildlife and Natural Resources Conference 39:208-215, 1974.

The application of techniques, such as PATTERN and DELPHI, which can be employed to help register and quantify some subjective judgments of resource managers regarding wildlife is discussed.

286. SINGH, Ajmer. An Economic Evaluation of the Salmon-Steelhead Sport Fishery in Oregon. Corvallis: Oregon State university, Ph.D. dissertation, 176 pages, 1965.

Data for the 1962 fishing year in Oregon are presented and a market pricing mechanism is simulated to estimate net economic values.

287. SKOW, John. "Joe Horvath is Adding Up Your Dollars of Happiness." Outdoor Life 66-67, 188, 190-192, March 1977.

A biographical sketch of Joe Horvath (see Horvath in this report) with examples of his work.

288. SMITH, Robert I. and Roy J. Roberts. "The Waterfowl Hunters' Perceptions of the Waterfowl Resource." Transactions of the Forty-First North American Wildlife and Natural Resources Conference 41:188-192, 1976.

Reports on a study of waterfowl hunter behavior still underway. Respondents were asked how high the price of a duck stamp had to be to make them stop hunting. About half the hunters claimed they would not participate if the price of a duck stamp were $12.

289. SMITH, R. J. and N. J. Kavanaugh. "The Measurement of Benefits of Trout Fishing: Preliminary Results of a Study at Grafham Waters, Great Ouse Water Authority, Huntingdonshire." Journal of Leisure Research 2(4): 316-332, 1969.

The benefits of trout fishing at Grafham Waters were estimated using the Clawson method.

290. SPARGO, R. A. "Evaluation of Sport Fisheries: An Experiment in Methods." Ottawa: Department of Fisheries of Canada Economics Service (unpublished manuscript), June 1964.

291. SPILLET, Juan J. "Economic Aspects of Wildlife Conservation: Values of Consumptive and Nonconsumptive Uses of Wildlife Species." Morges, Switzerland: International Union for the Conservation of Nature (IUCN) New Series Publication 17:121-129, 1970.

292. STEINHOFF, Harold W. "Communicating Complete Wildlife Values of Kenai." Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:428-439, 1971.

The author attempts to value all aspects of wildlife. A catalog of values including recreational, aesthetic, educational, biological, social, and commercial is presented. A 1968 survey of managers, citizen leaders, and company representatives and rangers of the Kenai National Moose Range, Alaska, was the basis for this analysis. The land value for wildlife was computed by determining consumer's surplus from wildlife and capitalizing at some logical rate.

293. _____. Values of Wildlife and Related Recreation on the Kenai National Moose Range. College: University of Alaska Department of Wildlife Management, 33 pages (mimeo), 1969.

294. STEVENS, Joe B. "Measurement of Economic Values in Sport Fishing; An Economist's Views on Validity, Usefulness, and Propriety." American Fisheries Society Transactions 98(2):352-359, 1969

The author discusses the propriety, validity, and usefulness of economic values of sport fishing. He argues that in spite of imperfections, the measurement of recreation values can help in moving in the direction of optimum natural resource use.

295. _____. "Recreation Benefits from Water Pollution Control: A Further Note on Benefit Evaluation." Water Resources Research 3(1):63-64, 1967.

The author discusses the concept of consumer surplus as used in his earlier paper (WRR 2(2):167-182, 1966).

296. _____. "Angler Success as a Quality Determinant of Sport Fishery Recreational Values." American Fisheries Society Transactions 95(4): 357-362, 1966.

Regression analysis is used to estimate the changes in fishing efforts brought about by increased or decreased success due to changes in the level of pollution.

297. _____. "Recreation Benefits from Water Pollution Control." Water Resources Research 2(2):167-182, 1966.

Demand equations were estimated for salmon, bottomfish, and clam fisheries in Oregon using angling effort as the dependent variable and transfer costs per angler day, income, distance, and angling success as independent variables. Success and effort models were estimated for each fish to obtain estimates of success elasticity. Results of the demand analysis were used to estimate the value of the recreational experience associated with each fishery. A framework for estimating direct recreational benefits of water pollution control that integrates the demand analysis and success effort models is suggested and an example provided.

298. STRANSKY, John J. and Lowell K. Halls. "Small Forest Holdings Could be Combined for Hunting Leases." Proceedings of the Twenty-Second Conference of the Southeastern Association of Game and Fish Commissioners 22:125-127, 1968.

Small landowners could get together and lease their lands cooperatively for hunting, thereby providing hunting recreation and a source of income.

299. STREET, Donald R. The Fee Fishing Lakes as a Business in Pennsylvania. University Park: Pennsylvania State University Agricultural Experiment Station Bulletin No. 755, 24 pages, 1969.

300. STUART, R. W. "Surface Mining and Wildlife." North Dakota Outdoors 37:2-7, 1974.

This article discusses some of the implications of the development of the Northern Great Plains coal resources on wildlife.

301. SWIFT, E. "Strained Resources. Conc." Florida Wildlife 21(11):29-31, April 1968.

302. TABER, Richard D., Richard Cooley, and William Royce. "The Conservation of Fish and Wildlife." No Deposit-No Return, Man and His Environment: A View Toward Survival, H. D. Johnson, editor, Massachusetts: Addison-Wesley, pp. 143-151, 1970.

303. TALHELM, Daniel R. Evaluation of the Demands for Michigan's Salmon and Steelhead Sport Fishery of 1970. Lansing: Michigan Department of Natural Resources Fisheries Research Report 1797, 1973.

The first section presents the nature of the demand and supply of angling and the significance of those concepts to management decisions. The second section describes the cost of angling as related to travel distance and other factors. Section three examines several attributes of salmon-steelhead angling and describes the different kinds of angling in terms of those attributes. In the fourth section, estimates of the demand for each of these kinds of salmon-steelhead angling and the willingness of anglers to substitute one kind of angling for another are presented. In the last section, an estimated total value of the fishery to anglers is presented along with a discription of a simulation model with which many hypothetical changes in the fishery may be evaluated.

304. _____. "Defining and Evaluating Recreation Quality." Transactions of the Thirty-Eighth North American Wildlife and Natural Resources Conference 38:183-191, 1973.

The value of the opportunity for salmon-steelhead angling in Michigan was estimated at about $30 million annually, using fishermen expenditures for estimating demand curves.

305. TALHEM, Daniel R. and Paul V. Ellefson. "Michigan's Great Lakes Trout and Salmon Fishery (1969-1972)." Lansing: Michigan Department of Natural Resources Fisheries Management Report No. 5, pp. 45-62, June 1973.

A summary of the economic research done in Michigan on that state's salmon and steelhead sport fishery is presented.

306. TALHELM, Daniel R. Analytical Economics of Outdoor Recreation: A Case Study of the Southern Appalachian Trout Fishery. Raleigh: North Carolina State University, Ph.D. dissertation, 1971. *33(8):3904-A

Recreation resource evaluation procedures and a general theory of time allocation, and the demand for and supply of outdoor recreation are presented to provide a rigorous framework for evaluating nonmarket recreational use of natural resources. The trout fisheries of two southern Appalachian areas were examined. Observations for demand equations were computed using the estimated price functions and geographic coordinates of all streams and population centers. Computer programs for estimating use and demand functions are presented.

307. TAYLOR, Paul C. The Economics of Wildlife Management. Lawrence: University of Kansas, Ph.D. dissertation, 57 pages, 1975. *36(7):4635-A

This thesis is an application of economic analysis to the problem of the interaction of wild and domestic species and the impact on the profitability of agriculture. A model was developed to describe the activities of agriculture and hunting separately and taken together. The results of these models were then compared with the results of a model of optimal state regulations in order to devise a tax-subsidy schedule which would provide a means of maintaining this social optimum with a decentralized decision-making process.

308. TEAGUE, Richard D. "Wildlife Enterprises on Private Land." A Manual of Wildlife Conservation, Richard D. Teague, editor, Washington, D.C.: The Wildlife Society, pp. 140-143, 1971.

Eighty percent of the game harvested in the U.S. comes from private land while the majority of the public money spent for wildlife is on public land. Economic incentives are suggested as ways to improve the wildlife habitat on private land. Examples of some 1968-1970 fees are: deer--$50 to $200 per year, up to $3,000; rabbits--$25 per season; ducks--$75 to $500 per blind, up to $10,000; and quail--$60 to $100 per year, up to $1,000 (all are California fees).

309. TISDELL, C. "The Economic Conservation and Utilization of Wildlife Species." South African Journal of Economics 40(3):235-248, September 1972.

The author draws on the contributions of Gordon, Scott, Vernon, Smith, Turvey, and others to outline economic inefficiencies which arise from the common property nature of wildlife. Policies designed to utilize and conserve wildlife species in an optimal manner are examined. The author disaggrees with Turvey's dictum that Pigovian tax-subsidy measures are inherently superior to direct controls and argues in favor of direct controls plus the market for allocating aggregate quotas for harvest. Besides the case in which wildlife must be harvested for economic utilization, other cases, e.g., those in which wildlife gives visual enjoyment, are considered.

310. U.S. Fish and Wildlife Service, U.S. Department of Interior. Conserving Our Fish and Wildlife Heritage. Washington, D.C.: Annual Report FY1975, 96 pages, 1976. (I49.1:975)

The first annual report issued by the U.S. Fish and Wildlife Service. It presents a summary of the Service's work in fiscal year 1974. Some of the topics presented that have economic implications include: the effect of inflation on land acquisition, revenue and expenditures patterns of Federal Aid in Wildlife Restoration Act monies, depredation by several varieties of wildlife and research underway concerning depredation, and a review of legislation enacted in FY75 concerning the nation's fish and wildlife resources.

311. _____. 1970 National Survey of Fishing and Hunting. Washington, D.C.: Bureau of Sport Fisheries and Wildlife Resource Publication 95, 108 pages, 1972. (I49.66:95)

Statistical data on socioeconomic characteristics of individuals participating in hunting and fishing activities in the United States. In 1970, hunters spent an average of $10.52 each recreation day and fishermen spent $7.02 each day. This survey has been conducted at five-year intervals since 1955.

312. VETETO, G. H. Deer-Cattle Relationship Study--Production and Economic Comparisons. Austin: Texas Parks and Wildlife Department, 11 pages, 1969.

313. "Value of Game." Forestry Quarterly 6(1):104, 1908.

Estimates of the revenue from sale of game meat and hunting leases in several European countries are presented.

314. VOLK, A. A. and V. E. Montgomery. Economic Impact of Sport Fishing in South Dakota, 1972, with Notes on Angler Traits. Pierre: South Dakota Department of Game, Fish, and Parks, 68 pages, 1973.

The economic effect on sport fishing in South Dakota resulting from the flood of 1972 is presented.

315. WALDEN, F. A. "Public Use of Forest Wildlife--Economic Aspects." Forest Chron 44(2):17-19, April 1968.

316. WEEDEN, R. B. "Economic Evaluation of Recreational Resources: Problems and Prospects--A Reaction." Transactions of the Thirty-Fourth North American Wildlife and Natural Resource Conference 34:293-296, 1969.

The author argues against the use of economics in decisions regarding wildlife and outdoor recreation.

317. WENNERGREN, Boyd. Demand Estimates and Resource Values for Resident Deer Hunting in Utah. Logan: Utah State University Agricultural Experiment Station Bulletin 469, 1967.

318. WENNEGREN, Boyd, Herbert H. Fullerton, and Jim C. Wrigley. Estimates of Quality and Location Values for Resident Deer Hunting in Utah. Logan: Utah State University Agricultural Experiment Station Bulletin 488, 24 pages, August 1973.

The objectives of this study were to develop a conceptual model which establishes a logical basis for the analysis of recreation quality and to present an analytical technique for segregating recreation site quality values from those associated with site location. The primary assumption underlying the model is that recreation sites generate both location and quality values. To separate the location portion of the total site value, a system is proposed whereby the observed activity for each origin to each site is redistributed by a least-cost programming technique. The site value calculated on the basis of the least-cost distribution of activity yields a value attributable only to location. The quality value is expressed as a residual of the total value and the location value. The empirical estimates in this study are based on the concept of economic rent, but the analytical procedures of the model are equally applicable to other valuation measures such as consumer surplus. Data for the analysis were obtained from a survey of 1970 resident deer hunters in Utah and from published reports of the Utah Division of Widlife Resources. Variation in quality value estimates among sites was investigated using regression analysis.

319. What is Hunting Worth in New Jersey? Trenton: New Jersey Division of Fish and Game, 27 pages, 1970.

Results of a mail survey conducted in New Jersey to obtain data on hunter expenditures for determining the value of the state's wildlife resources are presented. Some values estimated were: deer, $736.50; rabbits, $15.18; squirrels, $15.28; pheasants, $19.85; and ducks, $44.53 each.

320. WHITE, D. L. "How New Hampshire Attached a Dollar Sign to its Fish and Wildlife." Concord: New Hampshire Fish and Game Department Management and Research Division Circular 11, 1955.

A survey of sportsmen in New Hampshire in 1952 revealed that hunters and fishermen spent $22.5 million annually. Residents spent approximately $138 each for hunting and fishing. Nonresident sportsmen spent an average of $193 each in 1952.

321. Report to the Western Association of State Game and Fish Commissioners on Nonresident Hunting and Angling. Washington, D.C.: Wildlife Management Institute, 16 pages, 1971.

An examination of resident and nonresident fees for hunting and fishing and expenditures in 13 western states, including Alaska and Hawaii, resulted in several recommendations regarding license administration. On the average, it cost a nonresident 5.5 times as much to hunt as a resident in the study area.

322. WILKINS, Bruce T. and Eugene C. Erickson. "Private Lands Available for Wildlife in Central New York." Transactions of the Thirty-Eighth North American Wildlife and Natural Resources Conference 38:322-327, 1973.

The results of a study on posting land against hunting are summarized. The authors found that economic returns are not the major interest of those now acquiring land. Recent owners (1973) usually hold land for recreation, privacy, and isolation, and to enjoy wildlife and other forms of natural life.

323. WILLIAMS, L. E. "Pine Monoculture Versus Wildlife Values." Florida Naturalist 45(1):25-26, February 1972.

The author argues that the profit motive in tree farming excludes consideration of wildlife values.

324. WINTON, J. Martin. "Easements for Maintaining Environmental Values." Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:89-96, 1971.

A land-use plan for Merced County, California, for the coexistence of waterfowl habitat and private farm oriented use of the land is discussed. Easements in the form of reduced water rates for irrigation are used to encourage private landowners to maintain habitat valuable to waterfowl.

325. WORTHINGTON, Virginia. "Getting the Nonconsumptive User Involved." Conservation News 41(21):6-7, November 15, 1976.

The attempts by several states to persuade nonconsumptive users of wildlife resources to pay part of the cost of managing those resources are discussed.

326. WRIGLEY, J. C., H. H. Fullerton, and E. B. Wennergren. "Empirical Estimation of Quality Values for Outdoor Recreation Land Use." Intermountain Economic Review 5(1):58-71, Spring 1974.

A model for segregating estimated quality values from location site values of outdoor recreational resources is presented. The 1966 pheasant hunting season in Utah is used as a case study. Site characteristics which explain the variation in quality value as estimated by the model are statistically analyzed.

III. Evaluation Techniques With Application to Fish and Wildife

327.. ASHTON, P. M. Economic Survey of Hunting and Fishing: Optimum Supplies of Recreation Days Under Conditions of Uncertainty--A Case Study Application to Wildlife Resources. Denver: Colorado Division of Wildlife, 93 pages, 1974.

328. BOLSTERLI, M. J. Bedford Park: A Practical Experiment in Aesthetics. St. Paul: University of Minnesota, Ph.D. dissertation, 141 pages, 1967. *28(12):5007-A

The social values of Bedford Park, a suburban community rich in history and culture are estimated.

329. BYERLEE, D. R. "Option Demand and Consumer Surplus: Comment." Quarterly Journal of Economics 85(3):523-527, 1971.

The author argues that option demand is captured in measurement of consumer surplus and to include both option demand and consumer surplus in benefits would be double counting.

330. COOMBER, N. H. and A. K. Biswas. Evaluation of Environmental Intangibles. New York: Genera Press, 77 pages, 1973.

A selected review of quantitative techniques dealing with the evaluation of the intangible benefits and costs of the physical environment. The evaluation techniques are separated into monetary and nonmonetary models. An extensive list of references is provided.

331. _____. Evaluation of Environmental Intangibles: Review of Techniques. Vancouver, Canada: Environment Canada, Policy, Planning, and Research Service, 1972.

332. DANIEL, C. and R. Lamaire. "Evaluating Effects of Water Resource Developments on Wildlife Habitat." Wildlife Society Bulletin 2:114, 1974.

A system is presented for evaluating the effects of water resource development projects on wildlilfe habitat, based upon existing habitat values rather than on man's utilization of wildlife. Effects of water resource projects on wildlife habitat are summarized numerically, and unique habitat types and endangered fauna or flora are considered. The basic philosophy of the system is that all land has an existing wildlife habitat value that can be expressed numerically.

333. DANIEL, Terry C., Lawrence Wheeler, Ron S. Boster, and Paul R. Best, Jr. "Quantitative Evaluation of Landscapes: An Application of Signal Detection Analysis to Forest Management Alternatives." Man-Environment Systems 3:330-344, 1973.

334. DARLING, Arthur H. "Measuring Benefits Generated by Urban Water Parks." Land Economics 49(1):22-34, February 1973.

Two techniques are used to measure benefits from urban parks in the form of increased property values. The first is an econometric model using distance and quality of the park as important variables. The second method is similar to that used by Davis (R. K. Davis, 1963) where respondents are asked at what point in a series of increasing prices they would quit participating. The property value method generally gave a higher estimate of benefits than did the Davis method. The author claims these techniques can be used to estimate other hard-to-measure values, such as beautification and recreation projects, views, safety, noise, and pollution.

335. DAVID, E. L. "The Use of Assessed Data to Approximate Sales Values of Recreation Property." Land Economics 44(1):127-129, Spring 1968.

Different methods of estimating average market values of lakeshore property in Wisconsin are discussed.

336. DEVINE, E. J. "The Treatment of Incommensurables in Cost-Benefit Analysis." Land Economics 42:383-387, August 1966.

The applicability and the limitations of cost-benefit analysis when some benefits or costs are not expressible in a common unit of measurement are discussed. A hypothetical case is considered where a government agency has a fixed budget and makes investment in water related resource development. The example considers the costs of providing different mixtures of products and considers the trade-offs involved.

337. FABOS, Julius G. "An Analysis of Environmental Quality Ranking Systems." Recreation Symposium Proceedings. Upper Darby, Pennsylvania: Northeastern Forest Experiment Station, pp. 40-55, 1971.

A review and analysis of the quantitative ranking systems that have been developed during the past decade for measuring environmental quality.

338. FUHRIMAN, Jerry W. and Edward S. Crozier. Planning for Wildlife and Man. Washington, D.C.: U.S. Department of the Interior Fish and Wildlife Service, 56 pages, September 1974. (I49.2:W64/8)

A handbook intended for use by wildlife area managers for designing land use in wildlife areas. Wildlife area land-use and landscape architecture are blended to develop design criteria to ensure maximum wildlife values from the land while allowing human uses.

339. GRAY, G. G. Nonconsumptive Demand for Wildlife by Municipal Conservation Commissioners in Massachusetts. Amherst: University of Massachusetts, M.S. thesis, xi + 94 pages, 1975.

Relative preferences of municipal conservation commissioners in Massachusetts for several nonconsumptive wildlife uses are presented and analyzed. Results indicated that preference and relative demand were greatest for viewing wildlife, for hobby nature study, and wildlife photography. A demand intensity score and a relative demand index were developed for use in the evaluation procedure. Management recommendations are made on the basis of the study results.

340. HARTLEY, J. Cost Benefit Analysis: A Method for Evaluating Land-Uses. University of London, thesis, 1966.

341. HELLIWELL, D. R. "The Amenity Value of Trees and Woodlands." Journal of the Arboriculturists Association 1(5):128-131, 1967.

Factors involved in determining the amenity value of a tree are assigned values from 1 to 4. The ratings are then multiplied together and multiplied by a monetary constant to estimate the dollar value of amenities associated with trees and woodlands.

342. HENDEE, John C., Thomas H. Steinburn, and William R. Catton, Jr. "Wilderism--The Development, Dimensions, and Use of an Attitude Scale." Paper presented at National Resources Section, Rural Sociology Society meeting, San Francisco, August 26, 1967.

343. HOINVILLE, G. "Evaluating Community Preferences." Environment and Planning 3:33-50, 1971.

A method of research developed by Social and Community Planning Research (London) to arrive at measurements of community preferences so that priority values can be quantified is described. The method relies on interviews with groups of people who have differing experiences with the variables under study. During the course of the interview, respondents are asked to play a priority evaluation "game". This approach extends traditional attitude survey measurements by allowing and ensuring that respondents understand the concept of trade-off preferences.

344. HOWE, P. and P. D. Patterson, Jr. "An Environmental Gaming Simulation Laboratory." Journal of the American Institute of Planners 35(6):383-388, 1969.

345. LEITCH, J. A. and William C. Nelson. Environmental Trade-Offs in the Lower Sheyenne Valley. Fargo: North Dakota State University Agricultural Economics Report No. 116, 33 pages, August 1976.

The priority evaluator technique is used to estimate preferences of residents for the Lower Sheyenne Valley in North Dakota toward: scenic view, water recreation, floods, wildlife habitat, and land recreation. Three levels of each of the five environmental categories were involved along with prices of each level, a limited budget, and a requirement to purchase one level of each of the five categories.

346. LEOPOLD, Luna B. Quantitative Comparison of Some Aesthetic Factors Among Rivers. Washington, D.C.: U.S. Geological Survey, 16 pages, 1969. (I19.412:620)

An attempt to numerically quantify some elements of aesthetic appeal of rivers while eliminating, insofar as possible, value judgments or personal preferences. Quantitative evaluation of river and valley characteristics was made for 12 sites in Idaho. Hells Canyon of the Snake River was shown to be unique, and its evaluated rank or position was approximated only by the wilderness reaches of the main Salmon River.

347. LEWIS, Philip H., Jr. Regional Design for Human Impact, Appendix B: Aesthetic and Cultural Values. Upper Mississippi River Basin Coordinating Committee, 1969.

348. _____. "Quality Corridors for Wisconsin." Landscape Architecture, January 1964.

A numerical evaluation system is developed which places a range of number values on visual and environmental aspects of the landscape. Alternative areas for development can be chosen on the basis of the one with the lowest numerical sum, or the one with the least impact on the landscape.

349. LINDSAY, C. M. "Option Demand and Consumer's Surplus." Quarterly Journal of Economics 83:344-346, 1969.

The concept of option demand is defended in this essay.

350. MICHALSON, E. L. and J. R. Hamilton. "A Methodology for Evaluating Development-Environmental Conflicts on Wild and Scenic Rivers." Water Resources Bulletin 11(6):1149-1156, December 1975.

A methodology is developed for examining the environmental and development conflicts inherent in the classification process of a wild river. The Salmon River in Idaho was used as an example. Final comparisons showed that hydroelectric development had greater net benefits than outdoor recreation at up to a 3 percent recreation growth rate. When recreation grew at a faster rate, recreation had a considerable margin of net benefits in its favor.

351. MITCHELL, James Paul. A Study of Aesthetic Preferences. Laramie: University of Wyoming, M.S. thesis, 126 pages, December 1974.

Effects of specific socioeconomic variables upon the preferences of Wyoming citizens towards outdoor water related scenery were investigated. A sample of 237 respondents from various areas of Wyoming was interviewed. Preferences were measured by ranking color photographs representing outdoor water related scenes common to the state of Wyoming from best-liked to least-liked.

352. OLIN, P., et al. "Vermont Scenery Classification and Analysis." Amherst, Massachusetts: Research, Planning, and Design, Inc., 1971.

353. PAUL, M. E. "Can Aircraft Noise Nuisance be Measured in Money?" Oxford Economics Papers 23(3):297-322, November 1971.

354. PENDSE, Dilip and J. B. Wyckoff. "Measurement of Environmental Trade-Offs and Public Policy: A Case Study." Water Resources Bulletin 12(5):919-930, October 1976.

The priority evaluation technique is discussed and applied.

355. _____. "Environmental Goods: Determination of Preferences and Trade-Off Values." Journal of Leisure Research 6:64-76, 1974.

The purpose of this paper is threefold: first, to assess the current status of considering environmental goods in public investment decisions; second, to consider the priority evaluator technique developed by Social and Community Planning Research, London, as a viable technique for valuation of environmental goods; and third, to present and discuss empirical findings on preferences and trade-off values with regard to environmental goods. The example presented evaluated preferences of different groups on the Oregon State University campus concerning the use of space formerly occupied by a building.

356. _____. "Scope for Valuation of Environmental Goods." Land Economics 50:89-92, February 1974.

357. RANDALL, Alan, Berry Ives, and Clyde Eastman. "Bidding Games for Valuation of Aesthetic Environmental Improvements." Journal of Environmental Economics and Management 1:132-149, Fall 1974.

358. _____. Benefits of Abating Aesthetic Environmental Damage from the Four Corners Power Plant, Fruitland, New Mexico. University Park: New Mexico State University Agricultural Experiment Station Bulletin 618, 40 pages, May 1974.

The bidding-game technique is used to estimate the benefits of environmental damage abatement associated with the Four Corners Power Plant. Compensation games and willingness to pay games were tested and the results compared. Four separate willingness to pay methods were applied. They were a sales tax, an electricity user fee, a monthly fee, and other user fee games.

359. SHAFER, Elwood L., Jr., John F. Hamilton, And Elizabeth A. Schmidt. "Natural Landscape Preferences: A Predictive Model." Journal of Leisure Research 1(1):1-19, 1969.

The purpose of this study was to identify what quantitative variables in photographs of landscapes were significantly related to public preference for those landscapes. Using factor and multiple-regression analyses, an equation was developed that used six variables and accounted for 66 percent of the variation in preference scores for photographs of landscapes. It was concluded that it seems possible to quantify aesthetics through the methods described.

360. SINDEN, J. A. "A Utility Approach to the Valuation of Recreational and Aesthetic Experiences." American Journal of Agricultural Economics 56(1):61-72, February 1974.

A method for valuing extra-market benefits is proposed and tested. The method rests on the empirical derivation of utility functions and indifference maps. Demand schedules were obtained from the indifference maps to provide specific benefit values. The method was compared to the conventional travel-cost method for valuing recreational benefits. It was argued that the utility approach is conceptually superior. Also, the utility data comprised both the benefit values from the indifference maps and direct survey responses as surrogates for utility. These data proved better predictors of consumption than the usual travel-cost variables.

361. SOLOW, R. M. "What Do We Owe the Future." Nebraska Journal of Economics and Business 13(1):3-16, Winter 1974.

The author considers how we should consume our "lollipop" of natural resources. He discusses what the current consumption rate should be given the uncertainties about the future availability of resources that exist.

362. TUBBS, C. R. and J. W. Blackwood. "Ecological Evaluation of Land for Planning Purposes." Biological Conservation 3(3):169-172, April 1971.

A simple method of evaluating land in terms of the relative rarity and species-diversity of the habitats present is described. Evaluation exercises have been applied in Hampshire County, England. (See Philip H. Lewis for a similar technique.)

363. U.S. Department of Agriculture. Open Space, Its Use and Preservation. Washington, D.C.: U.S. Department of Agriculture Economic Research Service Miscellaneous Publication No. 1121, 1968.

364. WILLIAMS, H. L. and W. D. Davis. "Effect of Scenic Easements on the Market Value of Real Property." Appraisal Journal 36(1):15-24, January 1968.

The difference recognized by buyers and sellers in the market value of land subject to scenic easements in North Carolina is examined. Buyers and sellers indicated there was a loss in land value from 5 percent to 84 percent depending on the type of land under easement.

365. WYCKOFF, J. B. "Measuring Intangible Benefits: Some Needed Research." Water Resources Bulletin 7(1):11-16, February 1971.

A brief review of some of the methods available for valuing aesthetic and recreational resources.

366. ZELLNER, Arnold. An Introduction to Bayesian Inference in Econometrics. New York: Wiley, 1971.

Bayesian inference has been used to estimate wildlife values. This book is an introduction to that technique.

IV. Socioeconomic Characteristics of Hunters and Fishermen

367. ASHCROFT, William H. The Socioeconomics of Recreational Use of the Cache Elk Herd. Logan: Utah State University, M.S. thesis, 77 pages, 1967.

Expenditures of consumptive and nonconsumptive users of a Utah elk herd are presented. Nonconsumptive use of this resource, such as viewing and photography, generates a sizable amount of personal income in the study area.

368. BEVINS, Malcolm I., Robert S. Bond, Thomas J. Cororan, Kenneth D. McIntosh, and Richard J. McNeil. Characteristics of Hunters and Fishermen in Six Northeastern States. Burlington: University of Vermont Agricultural Experiment Station Bulletin 656, 76 pages, October 1968.

Socioeconomic characteristics of hunters and fishermen in Vermont are presented. The analysis was based on a 69 percent return of 10,000 questionnaires.

369. BOSTER, M. A., R. L. Gum, and D. E. Monarchi. "A Socioeconomic Analysis of Colorado River Trips with Policy Implications." Journal of Travel Research 12(1):7-10, 1973.

370. BRIDGES, Conton H. and Paul E. Sendak. Fish and Wildlife: $110,000,000 a Year in Massachusetts. Boston: Massachusetts Division of Fisheries and Game, 10 pages, 1968.

Expenditures by sportsmen in Massachusetts in 1966 are presented. The data were gathered through the use of mail and personal surveys. A breakdown of expenditures for various items by fishermen and hunters is presented.

371. COX, Rex W., Stanley E. Foss, and Gerald L. Horner. Outdoor Recreation in North Dakota. Fargo: North Dakota State University Agricultural Experiment Station Bulletin No. 475, 53 pages, April 1968.

Results of a 1966 survey to determine the socioeconomic characteristics of various types of recreationists using North Dakota facilities are presented. Future demand and supply for North Dakota outdoor recreation were estimated.

372. DAVIS, William C. Values of Hunting and Fishing in Arizona in 1965. Tucson: University of Arizona College of Business and Public Administration, 91 pages, 1967.

Socioeconomic data and expenditures by hunters and fishermen in Arizona in 1965 are presented. The information updated data obtained from a survey conducted in 1960. Total expenditures were 50 percent higher in 1965 than in 1960.

373. _____. Values of Hunting and Fishing in Arizona in 1960. Tucson: University of Arizona, Bureau of Business and Public Research, 1962.

The results of 1,600 interviews with hunters and fishermen in Arizona in 1960 are discussed. An estimated $40 million was spent annually by Arizona's sportsmen compared with $2 million by the public sector for activity associated with the provision of recreational resources.

374. DE GRAAF, R. M. and Brian R. Payne. "Economic Values of Nongame Birds and Some Urban Wildlife Research Needs." Transactions of the Fortieth North American Wildlife and Natural Resources Conference 40:281-285, 1975.

A sample of businessmen in the U.S. was surveyed to determine expenditures by birdwatchers for such items as birdseed, birdfeeders, binoculars, and field guides. The total direct expenditures attributable to the enjoyment of nongame wildlife in 1974 appeared to be about $500 million in the U.S. Waterfowl hunting expenditures were approximately $300 million that year.

375. DOLL, G. Fred and Clynn Phillips. Wyoming's Hunting and Fishing Resources 1970. Laramie: University of Wyoming College of Commerce and Industry, Division of Business and Economic Research, 116 pages, August 1972.

A summary of the socioeconomic characteristics of hunters and fishermen in Wyoming in 1970, and a comprehensive breakdown of expenditures by hunters and fishermen. Annual expenditures by resident hunters ranged from $37.09 for antelope to $282.45 for sheep. All fishing expenditures averaged $183.87 annually. Nonresident hunter expenditures ranged from $152.10 for antelope to $829.83 for sheep on an annual basis.

376. FINE, I. V. and E. E. Werner. "Economic Significance of Hunters in Wisconsin." Madison: University of Wisconsin Bureau of Business Research and Services 1(6), 16 pages, 1960.

Socioeconomic data related to several types of hunters in Wisconsin were collected through the use of mail questionnaires. Expenditure data were used to estimate the significance of hunters in Wisconsin.

377. _____. "Economic Significance of Fishing in Wisconsin." Madison: University of Wisconsin Bureau of Business Research and Services 1(10), 10 pages, 1960.

Socioeconomic data on resident and nonresident fishermen in Wisconsin were collected through the use of mail questionnaires. Estimates of gross expenditures by fishermen in Wisconsin are presented.

378. GARRETT, James R. Characteristics of Nevada Hunters. Reno: University of Nevada Agricultural Experiment Station Bulletin No. B22, 66 pages, June 1970.

The objective of this study was to determine characteristics of Nevada hunters. Socioeconomic data are presented along with expenditures data. Expenditures by Nevada residents averaged $86.08 per deer hunting trip compared to $270.24 for nonresident deer hunters.

379. GILBERT, Alphonse H. Expenditure Patterns of Resident Sportsmen in Vermont, 1970. Burlington: University of Vermont Agricultural Experiment Station Research Report MP82, 52 pages, January 1975.

Expenditure and socioeconomic data on resident sportsmen in Vermont obtained in a mail survey conducted in 1971 are presented.

380. GILBERT, Alphonse H. and K. C. Nobe. Annual Gross Hunting and Fishing Expenditures in Colorado. Fort Collins: Colorado State University Department of Economics, June 1969.

381. GORDON, Douglas. Report of a Preliminary Socioeconomic Analysis of Hunting in the Salmon River Basin. Moscow: Idaho University Water Resources Research Institute, 50 pages, October 1971.

In alternate use debates concerning the use of natural resources, economic evaluations and benefit-cost analyses may form an important basis for decision making. The results of a personal interview survey of hunters in Idaho's Salmon River Basin for the 1969 hunting season are reported and deemed useful in assessing the impact of various levels of Basin development and in optimizing resource allocation. It was concluded that hunter expenditures associated with wildlife resources are economically significant to the Basin and the state.

382. _____. A Socioeconomic Analysis of Idaho Sport Fisheries. Moscow: University of Idaho, Ph.D. dissertation, 127 pages, 1970. *31(7):3787-B

Gross annual expenditures of Idaho sport fishermen, the net value of selected high-quality Idaho fisheries, and the distribution of fishing effort within Idaho are discussed. An estimated $8.5 million was spent in 1968 for durable fishing equipment. Variable costs were estimated to be $11.1 million and another $1.4 million was spent on licenses and fees. Consumer surplus was used to estimate the net annual benefit of eight selected Idaho fisheries.

383. GORDON, S. "A Sampling Technique for the Determination of Hunters Activities and the Economics Thereof." Journal of Wildlife Management 5(3):260-278, 1941.

Hunter expenditure data are presented in this report.

384. GREENE, Jeffrey C. "Characteristics of Some Michigan Shooting Preserve Users." Journal of Wildlife Management 34(4):813-17, October 1970.

An analysis of the socioeconomic characteristics of Michigan shooting preserve users.

385. GUM, Russell L., William E. Martin, Arthur H. Smith, and C. Duane Depping. Participation and Expenditures for Hunting, Fishing and General Rural Outdoor Recreation in Arizona. Tucson: Arizona Agricultural Experiment Station Research Report No. 270, 27 pages, August 1973.

Socioeconomic and expenditure data were collected as part of a total effort to estimate total economic value of hunting, fishing, and general rural outdoor recreation activity in Arizona.

386. HARTMAN, Fred E. "In Pennsylvania . . . Hunting is Big Business." Pennsylvania Game News 44(9):26-31, 42, September 1973.

Hunter expenditures in Pennsylvania in 1972, which amounted to $223 million, are presented.

387. HENDEE, John C. and Dale R. Potter. "Human Behavior and Widlife Management: Needed Research." Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:383-395, 1971.

The authors identify wildlife management issues that need additional research. They include hunting satisfaction, nonconsumptive uses of wildlife, the hunter population, access and hunting opportunity, and wildlife economics.

388. HOGDON, Kenneth W. "Wildlife and Hunting on Commercial Forests in Maine." Transactions of the Thirty-First North American Widlife and Natural Resources Conference 31:280-288, 1966.

The potential for increasing expenditures by hunters in Maine through increased forest management for game habitat is discussed.

389. KIRKPATRICK, Thomas O. The Economic and Social Values of Hunting and Fishing in New Mexico. Albuquerque: University of New Mexico Bureau of Business Research, 94 pages, 1965.

Expenditures and other socioeconomic characteristics of hunters and fishermen in New Mexico are reported.

390. KLESSIG, Lowell L. and James B. Hale. A Profile of Wisconsin Hunters. Madison: Wisconsin Department of Natural Resources Technical Bulletin No. 60, 26 pages, 1972.

Socioeconomic characteristics of Wisconsin hunters are presented.

391. KUCK, Lonn. Characteristics of Mountain Goat Hunting in Idaho. Boise: Idaho Fish and Game Department, 18 pages, April 1973.

Questionnaires were sent to all mountain goat hunters in Idaho in 1960 and again in 1970. This report compares the responses from the two years. Expenditure data are given for 1970.

392. LACAILLADE, Harold C., Jr. New Hampshire Hunter Preference Survey 1964. Concord: New Hampshire Fish And Game Department Technical Circular No. 22a, 18 pages, 1968.

Data are presented on hunter income and expenditures in New Hampshire and the number of hunters seeking various game species in that state.

393. LOBDELL, Charles H. Socioeconomic Characteristics of Maine Sportsmen. Orono: Universtiy of Maine, M.S. thesis, 95 pages, 1967.

Socioeconomic characteristics of Maine sportsmen are presented. Data were obtained from a mail survey of resident and nonresident sportsmen.

394. MYERS, James E. and Sidney E. Feld. "The Hunters and Their Habitat." Rhode Island Resources 17(1):5-6, 1971.

Results of a hunter survey conducted in Rhode Island in 1968-1969 are presented. Twenty-seven percent of those surveyed would not pay anything for one day's hunting on a privately managed area, and 41.5 percent were prepared to expend no more than $1.50.

395. MYRES, M. T. "A Sample Survey of the Expenditure of Naturalists." Canadian Audubon, pp. 12-20, January-February 1968.

The average annual expenditure per member of the Calgary Bird Club was estimated to be $367 in 1966. The author argued that the expenditures of naturalists were between two and three times greater than what hunters and fishermen spent on their sports.

396. NOBE, Kenneth C. and Alphonse H. Gilbert. A Survey of Sportsmen Expenditures for Hunting and Fishing in Colorado, 1968. Denver: Colorado Division of Game, Fish, and Parks, Technical Publication No. GFP-R-T24, 93 pages, 1970.

Expenditures by hunters and fishermen in Colorado for a variety of game species are presented. In 1968, Colorado sportsmen spent $237,374,143 on goods and services in connection with hunting and fishing. Fishermen had the highest per capita expenditure among resident sportsmen ($370.50); among nonresidents, elk hunters had the highest ($415.21).

397. PETERLE, Tony J. "Characteristics of Some Ohio Hunters." Journal of Wildlife Management 31(2):375-389, April 1967.

An analysis of the socioeconomic charactersitics of Ohio hunters and a review of other studies of this type are presented.

398. ROHDY, D. D. and R. E. Lovegrove. Economic Impact of Hunting and Fishing Expenditures in Grand County, Colorado, 1968. Fort Collins: Colorado State University Experiment Station in cooperation with the Colorado Department of Natural Resources. Division of Game, Fish, and Parks, 36 pages, 1970.

399. ROSS, Lee Ann, D. M. Blood, and K. C. Nobe. A Survey of Sportsman Expenditures for Hunting and Fishing in Colorado, 1973. Fort Collins: Colorado State University Department of Economics, 102 pages, 1975.

400. RYEL, L. A. Deer Hunter Participation Survey. 1972. Lansing: Michigan Department of Natural Resources Surveys and Statistical Services Report No. 130, 17 pages, September 1973.

The results of a mail questionnaire used to obtain demographic information about deer hunters in Michigan are reported.

401. SCHEFTEL, Zane. "An Economic Evaluation of the Sport Fishery in Minnesota." Transactions of the Twenty-Third North American Wildlife and Natural Resources Conference 23:262-267, 1958.

Mail and personal surveys were conducted to estimate fisherman expenditures in Minnesota in 1957. Fifteen man hours per acre of water per year statewide were expended for fishing. It was estimated that $50 was spent by fishermen per acre of fishing water in Minnesota's 2 million acres of inland fishing water. The 1956-1957 fishing season resulted in gross expenditures of nearly $100,000,000 in Minnesota.

402. SCHOLE, Bernhard J. A Literature Review on Characteristics of Hunters. Denver: Colorado Division of Wildife Special Report No. 33, 15 pages, November 1973.

Socioeconomic characteristics of hunters are discussed including attitudes and comparisons with other recreationists. A selected bibliography is included.

403. SENDAK, P. E. and R. S. Bond. A Consumer Analysis of Licensed Hunters and Fishermen in Massachusetts. Amherst: University of Massachusetts Agricultural Experiment Station Planning and Resource Development Series No. 14, 43 pages, 1969.

An understanding of the socioeconomic, demographic, and participation characteristics of hunters and fishermen may provide those persons responsible for fish and game management with knowledge that will aid in satisfying the wants of the recreationists. This bulletin describes a study designed to acquire this information and the data and results of the analysis are presented. Characteristics of the licensed Massachusetts hunter and fisherman are discussed, results of an attempt to describe the level of hunting and fishing activity are presented, and an analysis of marketing opportunities for hunting and fishing is considered. A brief discussion on willingness to pay by hunters and fishermen is presented.

404. SHERWOOD, Glen A. "Characteristics of North Dakota Goose Hunters." North Dakota Outdoors 33(3):8-11, 1970.

Attitudes, behavior, and expenditure characteristics of goose hunters in North Dakota are presented. The information was based on personal interviews with 100 goose hunters. The average hunter spent about $75 per year hunting geese in North Dakota in 1968.

405. STOEVENER, H. H. and L. J. Guedry. "Sociological Characteristics of the Demand for Outdoor Recreation." An Economic Study of the Demand for Outdoor Recreation: Conference Proceedings of the Cooperative Regional Research Technical Committee, San Francisco, pp. 65-74, 1968.

406. THOMPSON, Emmett F., James M. Gray, and Burd S. McGinnes. Estimated Hunting Expenditures in Virginia. Blacksburg: Virginia Polytechnic Institute Department of Forestry and Wildlife Research Report 116, 8 pages, 1967.

Results of a mail questionnaire of hunters in Virginia in 1965 indicated that the average hunter spent $233 for his hunting activity and gross expenditures in the state were $87 million.

407. WALLACE, Robert F. An Evaluation of Wildlife Resources in the State of Washington. Pullman: Washington State University Bureau of Economic and Business Research Bulletin No. 28, 63 pages, 1956.

Fishing and hunting expenditures in Washington in 1954 are reported and comparisons are made between those expenditures and the amounts paid for crops, products, and services during a similar period. Evaluation of wildlife resources in other states is discussed.

408. Washington State Game Department. Dollars and Recreation Use of Wildlife Resources in Washington State. Olympia, 21 pages, December 1969.

A brief report on the expenditures of Washington sportsmen and a comparison with some other states.

409. WOODS, John W., Larry Shanks, and Dale Walker. "Florida's Fishing Future." Florida Wildlife 23(7):22-26, 1969.

Expenditure data for fishing in Florida in 1968 are presented.

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410. ADAMS, Robert L., Robert C. Lewis, and Bruce Drake. Outdoor Recreation, A Legacy for America: Appendix A, An Economic Analysis. Washington, D.C.: Department of the Interior Bureau of Outdoor Recreation, 1973. (I66.2:0u8/2)

411. ALDEN, Howard R. Comprehensive Outdoor Recreation Planning to Facilitate Decision Making for the State of Idaho. Ann Arbor: University of Michigan, Ph.D. dissertation, 229 pages, 1969. *37(5):2395-B

Net values of recreation visits are needed in the decision making process as illustrated by this report of outdoor recreation planning in Idaho.

412. ANDERSON, Robert W. "Estimating the Recreation Benefit from Large Inland Reservoirs." Recreational Economics and Analysis, G.A.C. Searle, Editor, Thetford, Norfold: Lowe and Brydone, Ltd., pp. 75-88, 1975.

413. ARTHUR D. LITTLE, INC. Tourism and Recreation: State-of-the-Art Study. Washington, D.C.: U.S. Department of Commerce, 301 pages, 1966. (C46.2:T6412)

A survey of the research done in the field of travel and outdoor recreation prior to 1966. A broad data base is assembled to aid in planning and promoting a wide variety of outdoor recreation and travel activities and in measuring their impact on a regional economy. An annotated bibliography of some representative research efforts is presented.

414. BADGER, Daniel D. "Contributions to the U.S. Economy from Recreational Development in the Great Plains: A Discussion." Stillwater, Oklahoma: Great Plains Agriculture Council Publication 49:79-89, 1970.

415. BARKLEY, P. W., editor. "The Development of Research in the Economics of Recreation." An Economic Study of the Demand for Outdoor Recreation. A collection of papers presented at the annual meeting of the Cooperative Regional Research Technical Committee for Project No. WM-59, San Francisco, 1964, pp. 1-14 (Report 1), 1968.

416. BEARDSLEY, W. "Bias and Noncomparability in Recreation Evaluation Models." Land Economics 47(2):175-180, 1971.

Three techniques for measuring market value of recreation benefits--consumer's surplus, monopoly revenue, and visitor survey methods--are critically examined. Examples were used from a case study of a portion of the Cache La Poudre River in Colorado.

417. _____. "The Economic Impact of Recreation Development: A Synopsis." Recreation Symposium Proceedings, Upper Darby, Pennsylvania: Northeast Forest Experiment Station, pp. 28-32, 1971.

Economic impacts per dollar of tourist expenditure have generally been found to be low compared to expenditures in other economic sectors in less-developed areas where recreation development is often proposed as a stimulus for economic growth. Tourism, however, can be economically important where potential or existing recreation attractions can encourage tourist spending in amounts large enough to offset these lower per-dollar impacts. In addition to definitions useful in interpreting the results of impact studies, findings from several investigations of local effects of recreation spending using input-output analysis are discussed.

418. _____. Economic Value of Recreation Benefits Determined by Three Methods. Ogden, Utah: USDA Department of Agriculture Forestry Service Research Note RM-176, 4 pages, 1970. (A13.79:RM-176)

Three methods of valuing recreation are applied to measure the recreation benefits of a portion of a Colorado River in 1966. The methods used were consumer's surplus, monopoly revenue, and a visitor survey utilizing the willingness-to-pay or bidding game method.

419. _____. Evaluation of Recreation Benefit: The Cache La Poudre River, Colorado. Logan: Utah State University, Ph.D dissertation 99 pages, 1968. *30(8):3446-B

Consumer surplus, monopoly revenue, and consumer survey models for estimating recreation values were tested for a seven-mile portion of the Cache La Poudre River in Colorado.

420. BOYET, W. E. and G. S. Tolley. "Recreation Projection Based on Demand Analysis." Journal of Farm Economics 48(4):984-1,001, November 1966.

Two methods of estimating the demand for outdoor recreation are developed and tested for an area of North Carolina. The methods are modifications of the Hotelling-Clawson model.

421. BROMLEY, Daniel, W., et al. Public Water Resource Planning and Evaluation: Impacts, Incidence, and Institutions. Madison: University of Wisconsin, School of Natural Resources, 39 pages, 1971.

Water resource investments and the role of economic logic and method for analyzing the consequences of such investments are discussed. A number of issues related to water resource investments are identified for which research is required. A brief discussion is included on recreation benefits of water resource projects.

422. BROWN, Gardner M., Jr. "Pricing Seasonal Recreation Services." Western Economic Journal 9(2):218-225, June 1971.

The author suggests marginal cost pricing to effectively ration recreation at resource oriented recreation areas. He argued that user fees provide a more suitable framework for analyzing demand than do the travel-cost-expenditure techniques.

423. BROWN, William G. and Farid W. Nawas. "Impact of Aggregation on the Estimation of Outdoor Recreation Demand Functions." American Journal of Agricultural Economics 55(2):246-249, 1973.

An empirical estimation of demand for Oregon hunting illustrates the contention that the use of disaggregated data may help overcome specification problems in models designed to estimate the demand for outdoor recreation.

424. _____. "Effect of Aggregation Upon the Evaluation and Specification of Outdoor Recreation Demand Functions." Proceedings of the Forty-Fifth Annual Meeting of the Western Agricultural Economics Association, Logan, Utah, 1972.

425. BURNA, Joe. The Development and Field Testing of Statistical and Other Inventory Techniques for Measuring the Present Recreational Use of Two Kentucky Streams and Adjacent Habitats. Frankfort: Kentucky Department of Fish and Wildlife Resources, 19 pages, August 1971.

Expenditure data are presented for some recreational activities in Kentucky. Total costs to recreationists include the opportunity costs of time for travel and time spent in the recreational pursuit.

426. BURT, Oscar R. and Durward Brewer. "Estimation of Net Social Benefits from Outdoor Recreation." Columbia: University of Missouri Agricultural Experiment Station, 40 pages (mimeo), 1967.

A procedure for estimating social benefits from outdoor recreation using consumer's surplus is presented. Transportation costs form the basis for estimating consumer's surplus. An operational model is developed for evaluation of the social benefits associated with development of an additional recreational site. There is a section on statistical estimation of demand equations and consumption costs. An empirical example is presented using the State of Missouri as the sampling region. Primary data were collected through a cluster random sample of households interviewed directly. Information was obtained on (1) number of days spent at each site, (2) expenditures, (3) mileage driven to the site, and (4) family income.

427. BURTON, T. L. and G. P. Wibberly. Outdoor Recreation in the British Countryside. London: Wye College, University of London, 54 pages, 1965.

428. BURY, Richard L. and Neil J. Stout. "A Thesaurus of Keywords for Indexing and Retrieval of Recreation Literature." Journal of Leisure Research 2(3):171-204, 1970.

A vocabulary of 2,200 keywords for indexing, storage, and retrieval of information on recreation literature is described. A rotated array of descriptive terms is given.

429. CAIN, Stanley A. "What is the Place of Fish and Wildlife in Outdoor Recreation Programs?" Proceedings of the Forty-Fifth Conference of the Western Association of State Game and Fish Commissioners, 45:4-9, 1965.

430. CESARIO, Frank J. and Jack L. Knetsch. "Time Bias in Recreation Benefit Estimates." Water Resources Research 6(3):700-704, 1970.

A major problem underlying the travel cost method of estimating demand for recreation is a conservative bias in the estimates due to the time constraint. That bias is examined and corrections are suggested that could improve the estimates. The degree of ultimate improvement seems to depend on better data and/or an understanding of the trade-off function between time and cost outlays.

431. CESARIO, Frank J. "Value of Time in Recreation Benefit Studies." Land Economics 52(1):32-41, February 1976.

432. _____. "Operations Research in Outdoor Recreation." Journal of Leisure Research 1(1):33-51, Winter 1969.

Discusses research that has been conducted to effectively predict recreation travel flow from population centers to recreation sites, and to estimate the primary economic benefits of outdoor recreation. The point is made that although researchers in each of these areas have been working more or less independently, these are not separate problems and must be considered jointly. A critical review of research methodologies is given, and the conclusion is made that more sophisticated research is required. Suggestions for further research are offered.

433. CESARIO, Frank J., S. E. Goldstone, and J. L. Knetsch. Final Report on Outdoor Recreation Demands and Values to Middle Atlantic Utility Group. Columbus, Ohio: Battelle Memorial Institute, 1969.

434. CHAPMAN, Duane. Ecology I and II, Resource Economics and Water Resource Development. Ithaca, New York: Cornell University, Agricultural Economics Staff Paper No. 41, 14 pages, 1971.

Willingness to pay and recreation day values were used to estimate the value of restoring Hetch-Hetchy Valley in California. The annual social value was estimated to be 33 percent greater than the annual social cost of reclaiming the valley. Costs included power and water lost. Value estimates included recreation days with an annual estimated value of 29 cents to all people in the U.S.

435. CICCHETTI, Charles J. and V. Kerry Smith. The Costs of Congestion: An Econometric Analysis of Wilderness Recreation. Cambridge, Massachusetts: Ballinger Publishing Company, xi + 112 pages, 1976.

A review of alternative methods for measuring the effects of congestion, and a general framework for modeling and measuring the quantitative effects of congestion are presented. Several potential models of consumer behavior are reviewed, each of them implying a general relationship between an individual's willingness to pay for the recreational services provided by a given area and congestion. The empirical analysis focused on wilderness recreation including hiking, camping, and the viewing of wildlife and scenery in a pristine, undeveloped setting.

436. CICCHETTI, Charles J., A. C. Fisher, and V. K. Smith. "An Economic and Econometric Model for the Valuation of Environmental Resources with Application to Outdoor Recreation at Mineral King." Annual Meeting, American Economic Association, Toronto, Canada, December 1973.

A modified Clawson approach to evaluate a proposed ski area in California is presented. The modification included variables for alternative or substitute sites and socioeconomic variables of the respondent population.

437. CICCHETTI, Charles J. Forecasting Recreation in the United States: An Economic Review of Methods and Applications to Plan for the Required Environmental Resources. Lexington, Massachusetts: Lexington Books, 1973.

438. CICCHETTI, Charles J., V. K. Smith, J. L. Knetsch, and R. A. Patton. "Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem." Water Resources Research 8(4):840-850, August 1972.

Several representative approaches to modeling the recreation market are discussed. The effects of available data on these models and the resulting estimators are discussed, along with the advantages and disadvantages of each model.

439. CICCHETTI, Charles J. and A. M. Freeman, III. "Option Demand and Consumer Surplus: Further Comment." Quarterly Journal of Economics 85(3):528-539, 1971.

An expansion of Lindsay's (1969) defense of the existence of option demand by developing a model of a perfectly discriminating monopolist who can sell options to a good in the future.

440. CICCHETTI, Charles J., Joseph J. Seneca, and Paul Davidson. The Demand and Supply of Outdoor Recreation, an Economic Analysis. New Brunswick, New Jersey: Rutgers University Bureau of Economic Research, 301 pages, 1969.

The first three chapters offer a theoretical framework for considering such issues as the public goods nature of recreation, the role of government in providing such facilities, the rate at which these facilities should be provided, and pricing policies that should be implemented. Chapter IV presents an econometric model based on the 1965 Survey of Outdoor Recreation Activities and other Bureau of Census data. Chapter seven provides a review of literature dealing with estimating recreational benefits that would stem from provision of various facilities.

441. CLAWSON, Marion and Jack L. Knetsch. Economics of Outdoor Recreation. Baltimore, Maryland: Johns Hopkins University for Resources for the Future, 328 pages, 1966.

A review of outdoor recreation in the United States with particular concern for estimating demand and the value of outdoor recreation facilities is presented. Some references to wildlife values are made. This book is an excellent review of Marion Clawson's contributions to the area of outdoor recreation economics.

442. CLAWSON, Marion. "Recreation." Problems of the Potomac Estuary, Washington, D.C.: Interstate Commission on the Potomac River Basin, pp. 19-22, January 1964.

A general discussion of estimating the value of recreational benefits as a result of public works projects is presented.

443. CLAWSON, Marion and Jack L. Knetsch. "Outdoor Recreation Reseach: Some Concepts and Suggested Areas of Study." Natural Resources Journal 3(2):250-275, October 1963.

Several areas where research is needed on outdoor recreation are identified. Areas include methdology, analytical models, data collection, recreation research organizations, and a clearinghouse of recreation research.

444. CLAWSON, Marion. Methods of Measuring the Demand for and Value of Outdoor Recreation. Washington, D.C.: Resources for the Future, Inc., Reprint No. 10, 36 pages, 1959.

A method of estimating the demand curve for outdoor recreation facilities is developed. For each concentric time-travel zone surrounding a recreation facility, separate attendance data are collected over a period of time. The travel cost from each zone is also calculated. Multiplying these costs by the actual per capita visits from each zone produces a demand schedule, from which the demand curve for a particular facility can be derived with the help of two limiting assumptions. The first assumption is that users of the recreation facility would view an increase in entrance fees in the same way as an equal increase in the total travel cost of a visit. The second is that the visitors from one zone would behave similarly to people in other zones if costs in time and money were equal. The effect of an increase in user fees can be predicted by postulating increments in travel cost and reading off the per capita rate of visits which would then be expected from each concentric zone. These new per capita rates, multiplied by the populations of the zones, would yield an estimate of the total number of visits which could be expected. From similar calculations of the estimated number of visits at each level of increased fees, a new point can be plotted; and linking these points together approximates the true demand curve for the recreational opportunity.

445. _____. "Statistical Data Available for Economic Research on Certain Types of Recreation." Journal of the American Statistical Association 54(285):281-309, March 1959.

The data that are available for researchers on outdoor recreation that have been collected by various agencies are discussed.

446. _____. Statistics on Outdoor Recreation. Washington, D.C.: Resources for the Future, 1958.

Data on outdoor recreation in the United States. A section on hunting and fishing (pp. 93-103) presents examples of the types of statistical data available on these activities.

447. COLE, Gerald L. Toward the Measurement of Demand for Outdoor Recreation in the Philadelphia-Baltimore-Washington Metropolitan Region with Implications for Agricultural Resource Use. East Lansing: Michigan State University, Ph.D. dissertation, 198 pages, 1967. *28:1583-A

Hunting and fishing activities are included in an analysis of participation in a variety of outdoor recreation activities in the Philadelphia-Baltimore-Washington metropolitan region. The author suggests that farmers close to those cities should consider leasing hunting rights on their farms as alternative revenue sources.

448. COMMON, M. S. "A Note on the Use of the Clawson Method for the Evaluation of Recreation Site Benefits." Regional Studies 7:401-406, December 1973.

449. CONNOLLY, James B., Chairman. Tourism and Recreation. Bismarck: North Dakota Economic Development Commission, 21 pages, April 1964.

Outlines goals, objectives, and recommendations for promoting North Dakota's recreation and tourism industry. Tourists in North Dakota in 1963 spent an average of $6.71 daily, for a total value added to North Dakota's economy of $25.6 million.

450. COX, R. W. and J. E. Johnson. Outdoor Recreation Activities of North Dakota Residents. Fargo: North Dakota State University Department of Agricultral Economics Report No. 72, 27 + (54) pages, November 1970.

A mail questionnaire survey was conducted to analyze participation in outdoor recreation in North Dakota and the influence of socioeconomic factors. One finding was that very few farmers charge hunters a fee for hunting on their land; however, a small number said they expected to charge a fee in the future.

451. DAUITE, Robert J. "Methods for Determination of Demand for Outdoor Recreation." Land Economics 42:327-338, August 1966.

Results of a survey of methods for determining demand for outdoor recreation are presented. Much of the discussion involves reports of the Outdoor Recreation Resources Review Commission.

452. DAVIS, L. S. and W. R. Bentley. "The Separation of Facts and Values in Resource Policy Analysis." Journal of Forestry 65(9):612-620, 1967.

An examination of the process of public resource policy analysis and decision at the governmental agency level for situations where the major policy effects cannot be measured in monetary terms. A social account is proposed as a policy making tool. An investment analysis of recreation opportunities is developed to illustrate this approach. Other examples demonstrate diverse potential applications of the social account format.

453. DWYER, John F., John R. Kelly, and Michael D. Bowes. "Estimating Recreation Demand: Needed Improvements in Recreation Benefit Estimation." Paper presented to the Spring 1977 Meeting of the North Central Regional Strategy Committee on Natural Resources Research (NCRS-2), Chicago, Illinois, 31 pages, April 21, 1977.

Improved procedures are presented for evaluating the contribution of recreation to national economic development. Desirable criteria for valuation procedures are specified. It is recommended that models be developed to predict individual willingness to pay for many types of recreation as functions of site characteristics, the characteristics of the individual user, the availability of substitute activities and sites, and the location of the individual in relation to the resources under study. Examples of the desired models are provided along with guidelines for their development and use.

454. EDWARDS, J. A., K. C. Gibbs, L. J. Guedry, and H. H. Stoevener. The Demand for Nonunique Outdoor Recreational Services: Methodological Issues. Corvallis: Oregon State University, 60 pages, May 1976.

The Clawson approach is reviewed and an alternative approach is suggested. The alternative approach is directed primarily at the recreationist's decision of how long to stay at a given site after he has made the trip to it. "Either-or" and "more-or-less" demand curves are discussed. Both methods were applied to a common data base: the recreational use of the Bend Ranger District in the Deschutes National Forest in Oregon.

455. _____. "The Demand for Outdoor Recreation in the Bend Ranger District, Deschutes National Forest, Oregon." Presented at the Natural Environments Workshop sponsored by Resources for the Future, Inc., at Missoula, Montana, August 5-6, 1971.

456. ELLEFSON, Paul V. Estimating User Benefits of Public Recreation Areas by Demand Curve Analysis. Lansing: Michigan Department of Natural Resources Research and Development Report No. 228, 14 pages, March 1970.

The Clawson travel zone method is used in a hypothetical case in Michigan.

457. Emerging Role of Outdoor Recreation in the Economic Environment of Arkansas. Fayetteville: Arkansas Agricultural Experiment Station Special Report 18, 23 pages, 1972.

The role of outdoor recreation in Arkansas and its contributions--past, present, and future--to the state's economy are examined. Several factors inhibiting the growth of outdoor recreation in Arkansas are discussed. Recommendations are made to stimulate outdoor recreation since such activity provides an overall stimulus to the economy.

458. FREUND, R. J. and R. R. Wilson. "Example of a Gravity Model to Estimate Recreation Travel." Journal of Leisure Research 6(3):241, 1974.

Discusses the development and use of a gravity model to explain recreational travel and participation in Texas. The model was tested using data from the Texas Outdoor Recreation Plan.

459. FREY, John D. and Hays B. Gamble. "Policy Issues and Problems in Outdoor Recreation." Canadian Journal of Agricultural Economics 15(2):1307-1320, 1967.

The authors show the necessity for a market mechanism in outdoor recreation if resource allocation, firm efficiency, and consumer welfare objectives are to be met.

460. FRICK, G. E. and C. T. K. Ching. "Generation of Local Income from Users of a Rural Public Park." Journal of Leisure Research 2(4):260-263, Fall 1970.

The hypothesis that income generated in the local area by park users is nominal was investigated on both logical and empirical grounds. The empirical results, although only related to Pawtuckaway State Park in Southern New Hampshire, supported this hypothesis. Local income generated by 125,000 park users was equivalent to that which would be expected from 12 permanent resident families.

461. FUSSELL, James R. and Richard G. Silvernail. "The Impact of Recreation on Coastal South Carolina." Business and Economic Review 13(1):3-7, October 1966.

The results of a tourism survey conducted in the rapidly developing recreation area of coastal South Carolina are presented. The average tourist spent $81.87 over a 5.85-day vacation period on South Carolina's coast.

462. GAMBLE, Hays B. "Community Income from Outdoor Recreation." A paper presented to the Maryland Governor's Recreation Conference, Ocean City, Maryland, May 1965.

463. GIBBS, Kenneth C. and John F. McGuire, III. Estimation of Outdoor Recreational Values. Gainesville: University of Florida, Food and Resource Economics Department Report 53, 1973.

464. GIBSON, J. G. and R. W. Anderson. "The Estimation of Consumer's Surplus from a Recreational Facility with Optimal Tariffs." Applied Economics 7(2):73-79, June 1975.

465. GILLESPIE, Glen and Durward Brewer. Econometric Model for Predicting Water-Oriented Outdoor Recreation Demand. Washington: U.S. Department of Agriculture, Economic Research Service Report No. 402, iv + 15 pages, 1969. (A93.21.402)

466. _____. "Effects of Nonprice Variables Upon Participation in Water-Oriented Recreation." American Journal of Agricultural Economics 50(1):82-90, 1968.

A model is developed that allows appraisal of nonprice information needed by private and government decision makers in planning for recreational uses of land and water. Projections of recreation participation for a population of a metropolitan area can be made by utilizing changes in the socioeconomic composition of the population, as well as its size.

467. GRAY, James R. and L. Wayne Anderson. Recreation Economics in South Central New Mexico. University Park: New Mexico State University Agricultural Experiment Station Bulletin 488, 22 pages, May 1964.

Visitors to the Ruidoso Ranger District of the Lincoln National Forest in New Mexico were surveyed regarding their actual expenditures and the amounts they would be willing to spend. Demand curves were estimated from these data and applied to the total number of visitor-days spent in the district for the year.

468. GUM, Russell L. and William E. Martin. "Problems and Solutions in Estimating the Demand for and Value of Rural Outdoor Recreation." American Journal of Agricultural Economics 57(4):558-566, November 1975.

An improved methodology for estimating demand functions for outdoor recreation and evaluating the outdoor recreation resource by use classification is presented. The illustrative framework was a large-scale empirical study of all outdoor recreation activities in all areas of Arizona.

469. HAUGEN, Arnold O. "Conservation of Outdoor Resources for Recreation." Journal of Outdoor Education 4(1):10-12, 1969.

470. HENDEE, J. C. and C. Schoenfeld, editors. Human Dimensions in Wildlife Programs. Seattle: The People/Natural Resources Research, 193 pages, 1973.

A collecton of 18 papers describing applied studies of people-resource problems. The papers are divided into 4 categories: 1) wildlife and outdoor recreation experiences, 2) hunting satisfactions and values, 3) anti-hunting sentiment, and 4) applying human dimensions.

471. HENLEY, Robert J. "The Recreation Impact." Colorado Outdoors 18(1):4-7, 1969.

Increasing recreation demand and use in Colorado are discussed along with suggested action needed to meet future demand. Recreation benefits were expressed in terms of expenditures by recreationists which generate local income. The average tourist trip expenditure in Colorado in 1967 was estimated to be $75 per vacationer.

472. HINMAN, Robert C. The Economic Impact of Reservoir Recreation on the Whitney Point Microregion of New York State. Ithaca, New York: Cornell University M.S. thesis, 280 pages, 1967.

473. HOPEMAN, Alan R., Jr. An Economic Analysis of Flood Damage Reduction Alternatives in the Minnesota River Basin. St. Paul: University of Minnesota Water Resources Research Center Bulletin No. 58, 77 pages, May 1973.

Recreation day values are used in a benefit/cost analysis of a reservoir on the Minnesota River.

474. HOTELLING, Harold. "The Economics of Public Recreation." The Prewitt Report. Washington, D. C.: Land and Recreation Planning Division National Park Service (mimeo), 1949.

Source of the travel zone concept. See Clawson and Knetsch (1966) for a discussion.

475. HUGHES, Jay M. and R. Duane Lloyd, compilers. Outdoor Recreation, Advances in Application of Economics. Washington, D.C.: U.S. Department of Agriculture, Forest Service General Technical Report WO-2, iii + 163 pages, March 1977.

The papers (21) in this publication were selected from among those presented at a National Symposium on the Economics of Outdoor Recreation held at New Orleans in November 1974, sponsored jointly by the U.S. Forest Service and the Louisiana Tech University School of Forestry. The report is presented in four parts: Setting the Stage, The Demand for Outdoor Recreation, Applications of Economics to Outdoor Recreation, and A Sociologist Among the Economists.

476. HUGHES, Jay M. Forestry in Itasca County's Economy: An Input-Output Analysis. St. Paul: University of Minnesota Agricultural Experiment Station Miscellaneous Report 95, 94 pages, 1970.

An input-output study of forestry in Itasca County, Minnesota. The economic impact of the resort industry on the various sectors in the county is discussed.

477. JAMES, L. D. "Evaluating Recreation Benefits from Visitation Prediction Equations." American Journal of Agricultural Economics 50(2):437-442, 1968.

A comment and reply concerning the use of travel zone variables in application of the Clawson model.

478. JAMSEN, Gale C. "Michigan's Mail Creel Census Methodology." Lansing: Michigan Department of Natural Resources Research and Development Report No. 252, 5 pages + appendix, November 1971.

The steps and procedures used in determining the kinds and amount of fishing recreation being provided on Michigan's lakes and streams are presented.

479. JONES, G. "Contributions of Tourism to Regional Economic Development: A Case Study of Puerto Rico." Research Review, March 1968.

480. KALTER, Robert J. The Economics of Water-Based Outdoor Recreation: A Survey and Critique of Recent Developments. Springfield, Virginia: National Technical Information Service, 192 pages, 1971.

A report submitted to the U.S. Army Engineer Institute for Water Resources in which the author surveys and critiques the literature and existing procedures used for estimating the use of and the benefits from outdoor recreation. A variety of methodologies used to evaluate recreational facilities are described.

481. KALTER, Robert J. and Lois E. Grosse. "Recreation Demand Functions and the Identification Problem." Journal of Leisure Research 2:43-53, Winter 1970.

The identification problem which arises in estimating recreation demand functions is discussed. The importance of using structural demand equations rather than reduced form equations and user response models to obtain information for making rational public decisions on recreation policy is emphasized. The factors which have complicated the

identification of structural demand equations in studies of outdoor recreation are discussed and a possible solution to the problem is presented. It is suggested that a traditional market demand equation be estimated for each activity rather than one which is site specific.

482. _____. Outdoor Recreation in New York State: Projections of Demand, Economic Value, and Pricing Effects for the Period 1970-1985. Ithaca, New York: Cornell University Special Series No. 5, 57 pages, 1969.

Projections of recreation demand and economic value are made for a variety of outdoor recreation activities in New York state. The economic benefits are estimated using both transfer cost, or expenditures, and willingness to pay, or consumer surplus, approaches. A discussion of the theory and methodology underlying outdoor recreation economic evaluation is presented.

483. KALTER, Robert J. and W. Lord. "Measurement of the Impact of Recreation Investments on Local Economy." American Journal of Agricultural Economics 50(2):243-256, 1968.

A from-to type of interindustry model is formulated and empirically implemented to quantify local economic impacts arising from outdoor recreation. Direct, indirect, and induced sales; income; and employment impacts are derived and multiplier values are calculated. Relationships among the from-to model; supplemental studies, and the analysis of regional benefits for governmental investment decisions are discussed.

484. KERN, E. E. and L. S. Driscoll. "A Marketing of Outdoor Recreational Services in Rural Areas." Journal of Soil and Water Conservation 21(4): 141-143, 1966.

The feasibility and profitability of outdoor recreational facilities is analyzed.

485. KNETSCH, J. L., Richard E. Brown, and William J. Hansen. "Estimating the Expected Use and Value of Recreation Sites." Planning for Tourism Development, Quantitative Approaches, Charles Gearing, William W. Swart, and Turgat Var, editors, New York: Praeger Publishers, Inc., 1976.

486. KNETSCH, J. L. "Outdoor Recreation Demands and Benefits." Land Economics 39:387-396, November 1973.

Some approaches to the problem of providing information on demand relationships and values for outdoor recreation are discussed. Some topics are: the Clawson method, willingness-to-pay, fee collections for recreational sites, and the time variable in travel to the recreation site.

487. _____. "Interpreting Demands for Outdoor Recreation." The Economic Record 48(123):429-32, September 1972.

A discussion related to interpreting the demands for outdoor recreation to provide insights for explaining recreational preferences and behavior.

488. KNETSCH, J. L. and Robert K. Davis. "Comparisons of Methods for Recreation Evaluation." Economics of the Environment, Robert and Nancy S. Dorfman, editors, New York: W. W. Norton and Company, Inc., pp. 384-402, 1972.

Evaluation methods based on willingness to pay are compared. Results of the interview method and imputation methods did not vary considerably. An empirical example is provided.

489. KNETSCH, J. L. "Forest Recreation: A Case of Nonmarket Resource Use." Journal of Forestry 65(1):102-106, 1967.

A discussion of some of the problems with economic evaluations of outdoor recreation.

490. KNETSCH, J. L. and R. K. Davis. "Comparison of Methods for Recreation Evaluation." Water Research edited by A. V. Kneese and S. C. Smith, Baltimore: Johns Hopkins University Press, pp. 125-142, 1966.

491. KNETSCH, J. L. "Economics of Including Recreation as a Purpose of Eastern Water Projects." Journal of Farm Economics 46(5):1148-1157, 1964.

The Clawson method is used to derive demand curves and estimate user benefits for a hydropower and flood control project along the Virginia-North Carolina border.

492. KRUTILLA, John V. and Jack L. Knetsch. "Outdoor Recreation Economics." Annals of the American Political Science Society 389:63-70, May 1970.

493. KURTZ, William B. The Demand for Motorboat Use of Large Reservoirs in Arizona. Tucson: University of Arizona, Ph.D. dissertation, 1972.

494. LAUB, Michael E. "Economic Evaluation of Outdoor Recreation." The Allocative Conflicts in Water-Resource Management, Winnipeg: University of Manitoba Agassiz Center for Water Studies, pp. 203-226, 1974.

A systems approach to incorporate demand interdependencies that occur due to competitive and complementary sites is presented. The approach expands the Clawson-Hotelling technique to include interdependencies and incorporates a quality index. A discussion of option demand is also included.

495. _____. The Economic Evaluation of Nonmarketed Recreational Resources. Vancouver: University of British Columbia, Ph.D dissertation, 1972. *34(2):478-A

The validity and feasibility of a number of techniques that attempt to value recreational benefits by simulating markets for access to recreational sites are investigated.

496. LERNER, Lionel. "Quantitative Indices of Recreation Values." Economics in Outdoor Recreation Policy. Western Agricultural Economics Research Council Committee on Water Resources and the Economic Development of the West Report No. 11, 1962.

Investigates using GNP per capita or the value of a working day to value recreation days.

497. MCCONNELL, K. E. and Virginia A. Duff. "Estimating Net Benefits of Recreation Under Conditions of Excess Demand." Journal of Environmental Economics and Management 2:224-230, February 1976.

498. MCCONNELL, K. E. "Some Problems in Estimating the Demand for Outdoor Recreation." American Journal of Agricultural Economics 57(2):330-334, May 1975.

Three specific issues in outdoor recreation demand are considered: (1) the appropriate measure of the value of time as a cost of participating in outdoor recreation; (2) the logical units of measurement for a recreation activity when estimating demand functions via the travel cost method; and (3) the appropriate functional form of the outdoor recreation demand function, particularly the relationship between the price and income variables.

499. MCCOY, Edward W. Analysis of the Utilization of Outdoor Recreation in Tennessee. Knoxville: University of Tennessee, Ph.D. dissertation, 125 pages, 1966. *27(9):2,677-A

An analysis of outdoor recreation in Tennessee. The objectives of the study were to: (1) determine the nature of outdoor recreation, (2) establish a quantitative measurement of outdoor recreation, and (3) identify variables that influence participation in outdoor recreation.

500. _____. "Summary of Past Seminars in Outdoor Recreation." Outdoor Recreation Research in the South. Blacksburg: Virginia Polytechnic Institute Department of Agricultural Economics, Southern Land Economics Research Committee Publication No. 5, April 1967.

501. MACK, Ruth P. and Sumner Myers. "Outdoor Recreation." Measuring Benefits of Government Investments. Washington, D.C.: The Brookings Institute, pp. 71-110, 1963.

The authors investigate various techniques for measuring the value of recreational benefits and conclude that the techniques investigated do not measure, or uncover certain important aspects of recreation benefit. The authors suggest calibrating recreational benefit directly along a utility scale in "merit-weighted user-days." A brief example is given to illustrate the merit-weighting scheme that is envisioned.

502. MAPP, Harry P., Jr., and Daniel D. Badger. "Input-Output Analysis of the Economic Impact of Outdoor Recreation in a Low Income Area." Proceedings of the Western Agricultural Economics Association 1970:118-121, 1970.

The results of a study to determine the potential impact of recreational expenditures on output, income, and employment in a region in Oklahoma are presented. An input-output model was used. The results indicated that development in sectors other than recreation may be more useful in lowering the level of unemployment due to relatively lower multipliers in the recreation sector.

503. MARTIN, William E., Russell L. Gum, and Arthur H. Smith. The Demand for and Value of Hunting, Fishing and General Rural Outdoor Recreation in Arizona. Tucson: University of Arizona Agricultural Experiment Station Technical Bulletin, 56 pages, 1974.

The Clawson-Hotelling approach is used to estimate nondiscriminating monopolist and consumer surplus values of hunting, fishing, and general rural outdoor recreation in Arizona. The value of hunting, using the nondiscriminating monpolist procedure, was $14 million in 1970. For fishing it was $30 million. When total values were converted to values per square mile of huntable range, it was found that the values of the natural resources when used for recreation purposes were quite comparable to the values of the same resource when used for purposes such as cattle ranching.

504. MILAM, R. L. and E. C. Pasour, Jr. "Estimating the Demand for an On-Farm Recreational Service." American Journal of Agricultural Economics 52(1):127-131, February 1970.

The authors show that opportunity costs cannot be ignored in studying the demand for on-farm recreational goods, as in conventional demand analysis. The example presented is the market demand for the recreational services of on-farm golf courses in North Carolina. Since golf courses are immobile, consumption must occur at the point of supply. Golf also takes a considerable amount of time, making the opportunity cost of time an important variable. The authors raise some points that could be applied to wildlife oriented outdoor recreation research.

505. MONCUR, James E. T. "Estimating the Value of Alternative Outdoor Recreation Facilities Within a Small Area." Journal of Leisure Research 7:301-311, Autumn 1975.

506. MUSGRAVE, R. A. "Maximim, Uncertainty, and Leisure Trade-Off." Quarterly Journal of Economics 88(4):625-632, 1974.

The concepts of risk and uncertainty are discussed in a philosophical context in relation to leisure.

507. North Dakota Economic Development Commission. A Study of the Vacation and Recreation Industry in North Dakota to Determine Opportunities for Small Business. Bismarck, North Dakota, April 1963.

A combined local and general travel and tourism bibliography for North Dakota is given on pages 227-233.

508. North Dakota State Highway Department. North Dakota Tourist Survey of Out-of-State Visitors, Technical Report, 1971. Bismarck: North Dakota State Highway Department, Planning and Research Division, 56 pages, March 1972.

A survey of nonresident tourists was conducted to determine (1) the benefits of tourism to the North Dakota economy, (2) the reason the tourist visited North Dakota, (3) his activities while visiting the state, and (4) how North Dakota might best encourage tourism. Out-of-state tourists spent $46 million in North Dakota in 1971.

509. Northeastern Forest Experiment Station. Recreation Symposium Proceedings. Upper Darby, Pennsylvania: U.S. Department of Agriculture Northeastern Forest Experiment Station, 211 pages, 1971. (A13.42/2:R24)

A collection of 26 papers presented at the Recreation Symposium held in October, 1971 at Syracuse, New York, bringing together present knowledge about the forest recreation resource and forest recreation research. The Symposium was designed to help meet the needs of the planner and the manager in both public and private areas of the forest recreation resource.

510. NORTON, G. A. "Public Outdoor Recreation and Resource Allocation: A Welfare Approach." Land Economics 46(4):414-422, November 1970.

A method of evaluating public outdoor recreation to aid natural resource allocation decisions is proposed which, unlike consumers' surplus approaches, is based on the revealed preferences of recreation visitors. Applying the indifference concept to recreation activity and distinguishing between the resource and nature of the trip components of the visit, an estimation of the lower order value of the former is derived from the facilitative costs incurred. Such higher order values as the distribution of resource benefits over specific income and locational groups are discussed.

511. O'CONNELL, Paul F. "Economic Evaluation of Nonmarket Goods and Services." Outdoor Recreation, Advances in Application of Economics, Washington, D.C.: U.S. Department of Agriculture Forest Service General Technical Report WO-2, pp. 82-90, March 1977.

Several approaches to evaluating economic values of outdoor recreation are discussed. They are the opportunity cost method, gross expenditure method, cost method, market value comparisons, visitor survey method, single value method, willingness to pay, and monopoly revenue.

512. Outdoor Recreation Research. Proceedings of a Seminar - April 5-6, 1965, Texas A&M University, Kingsville: Texas A&M University, Department of Agricultural Economics and Sociology, 66 pages, 1965.

Five papers, two of which are related to wildlife economics, are presented. "Some topics of interest in outdoor recreation economics" pp. 8-24, by Jack L. Knetsch discusses in general, some problems associated with valuing recreational resources.

"Evaluation of recreation benefits on small watersheds" pp. 25-38, by Donald R. Street, discusses the need for better methods of evaluating recreation benefits on small watersheds, as compared to large water resource developments. He argues that the marketplace should be given more consideration as a basis for arriving at values of recreation benefits. Certain activities occur on both public and private land with similar benefits, but the private owner collects a fee for use.

513. Outdoor Recreation Resource Review Commission. Economic Studies of Outdoor Recreation. Washington, D.C., 1962.

This set of 27 volumes on outdoor recreation contains an excellent source for bibliographic reference for literature prior to 1962. Three study reports of significance to wildlife are:

Vol. 6: Hunting in the United States - Its Present and Future Role
7: Sport Fishing - Today and Tommorrow
27: Outdoor Recreation Literature: A Survey

514. PEARSE, Peter H. "Toward a Theory of Multiple Use: The Case of Recreation Versus Agriculture." Natural Resources Journal 9(4):561-575, 1969.

A theoretical approach to evaluating the recreational value of deer and the value of cattle using the same rangeland is presented. Technical and economic relationships are discussed with the major drawback being the economic value of deer.

515. _____. "A New Approach to the Evaluation of Nonpriced Recreational Resources." Land Economics 42:87-99, February 1968.

Users of a recreational area are stratified on the basis of some factor or factors other than recreational costs, in this case, income. The person with the largest costs within a stratum was considered a marginal user who had received no net benefits from his recreational trip. The total net benefits were dependent upon the number of strata defined.

516. PEARSE, Peter H. and Gary K. Bowden. "Economic Evaluation of Recreational Resources: Problems and Prospects." Transactions of the Thirty-Fourth North American Wildlife and Natural Resource Conference 34:283-293, 1969.

An introduction to the problem of valuing nonmarket resources and a critique of the expenditures and willingness-to-pay methods of evaluating nonpriced resources.

517. POPE, R. M., Jr. "Evaluation of Recreational Benefits Accruing to Recreators on Federal Water Projects." American Economist 16(2):24-29, Fall 1972.

518. RAJENDER, G. R., Floyd K. Harmston, and Dwight M. Blood. A Study of the Resources, People, and Economy of Teton County, Wyoming. Laramie: University of Wyoming College of Commerce and Industry Division of Business and Economics, 66 pages, 1967.

Basic data on the population and economy of Teton County, Wyoming, are presented, and the impact of tourism on the county's economy is estimated through the use of an input-output model. Multipliers were estimated to be highest in tourist-oriented sectors of the economy.

519. ROBINSON, Warren C. "The Simple Economics of Public Outdoor Recreation." Land Economics 43:71-83, February 1967.

Several economic aspects of outdoor recreation are explored including: (1) the economic rationale for the public provision of outdoor recreation, (2) the resource management problems encountered in supplying such services, and (3) optimum financing policies for publicly supplied recreation.

520. SAWYER, Thomas G. and Robert N. Shulstad. Economic Feasibility of Developing Additional Public Outdoor Recreation Areas at Beaver Lake, Arkansas. Fayetteville: University of Arkansas Agricultural Experiment Station Bulletin 813, 27 pages, November 1976.

Individual demand curves are developed for each party of recreationers at Beaver Lake, Arkansas. Consumer surplus is estimated to determine the net willingness to pay or net benefits of the recreational experience. A series of multiple linear regression models were estimated, using survey data to estimate the demand curves and consumer surplus.

521. SEARLE, G. A. C. Recreational Economics and Analysis. Thetford, Norfold, England: Lowe and Brydone Lts., 1975.

522. SECKLER, D. W. "On the Uses and Abuses of Economic Science in Evaluating Public Oudooor Recreation." Land Economics 42:485-494, November 1966.

The author argues statistical demand curves do not measure the utility function of recreational facilities, but rather they reflect the diminishing marginal utility of income. He goes on to discuss income distribution and recommends ways to improve recreation evaluation and policy making.

523. SEIFERT, Arndt. The Time Price System--Its Application to the Measurements of Primary Outdoor Recreation Benefits. East Lansing: Michigan State University, Ph.D. dissertation, 265 pages, 1972. *33(1):491-A

The purpose of this study was to present a method for measuring primary outdoor recreation benefits. The author suggests adding the value of foregone wages, the money price of outdoor recreation, the value of externalities, entrance fees, and the value of travel to arrive at the total value of recreation to the user.

524. SENECA, Joseph J. A Generalized Approach to Estimating Recreation Benefits. University Park: University of Pennsylvania, Ph.D. dissertation, 210 pages, 1968.

A theoretical model is introduced to estimate both demand and supply input elasticities through the pooling of cross-section and time series data. The overall result was a general methodology that could be applied to estimate demand, use, and supply responses for water-oriented recreation investments at any geographic level for given time spans.

525. SHABMAN, Leonard A. and Robert J. Kalter. The Effects of New York State Administered Outdoor Recreation Expenditures on the Distribution of Personal Income. Ithaca, New York: Cornell University Department of Agricultural Economics Research Report No. 298, v + 71 pages, September 1969.

The income redistribution effects of the state of New York's spending on outdoor recreation is considered. The source of the state's revenue, expenditure patterns, and the impact on various income groups are considered. The authors concluded that spending on outdoor recreation by the state of New York has the effect of redistributing income from the higher income groups to the lower groups.

526. SHAFER, E. L. "Photo-Choice Method for Recreation Research." Upper Darby, Pennsylvania: Northeast Forestry Experiment Station Research Paper NE-29, 10 pages, 1964. (A13.78:NE-29)

527. SMITH, Robert J. "The Evaluation of Recreation Benefits: The Clawson Method in Practice." Urban Studies 8(2):89-102, June 1971.

The Clawson approach is examined and the author concludes that if used with appropriate care, it will provide valuable information for the planning of recreation facilities. The sensitivity of the analysis to different assumptions regarding travel costs, forms of demand equations, and time values makes this apparently simple approach subject to misleading results if consideration is not given to these assumptions. Some of the preliminary estimates of the benefits of trout fishing at Grafham Water (Smith and Kavanaugh, 1969) are revised.

528. _____. "The Evaluation of Recreation Benefits: Some Problems of the Clawson Method." England: University of Birmingham Faculty of Commerce and Social Science Discussion Paper B18, 1970.

529. _____. The Measurement of the Economic Benefits of Recreation: A Theoretical and Empirical Study. England: University of Birmingham, Ph.D. dissertation, 1969.

530. _____. Measurement of the Economic Benefits of Recreation: A Critical Survey of the Literature. England: University of Birmingham Faculty of Commerce and Social Science Discussion Paper Series 19, No. A101, October 1968.

531. STOEVENER, Herbert H. and William G. Brown. "Analytical Issues in Demand Analysis for Outdoor Recreation." Canadian Journal of Agricultural Economics 15(2):1295-1306, 1967.

Economic evaluation and pricing of outdoor recreation are defined as necessary tools to aid policy makers in the optimal allocation of resources to outdoor recreation. The implications of income redistribution brought about by public spending for outdoor recreation are discussed.

532. STOEVENER, Herbert H. and A. A. Sokoloski. "Estimation of the Magnitude and Distribution of Benefits from Recreational Resource Management in the Economy of a Small Area." Economic Research in the Use and Development of Range Resources: Conference Proceedings of the Committee on Economics of Range Use and Development, Western Agricultural Economics Research Council, San Francisco, pp. 65-86, August 2-3, 1966.

533. STRANG, William A. Recreation and the Local Economy, An Input-Output Model of a Recreation-Oriented Economy. Madison: University of Wisconsin Graduate School of Business, ix + 79 pages, 1970.

This study examines the short-run impact of tourism on the economy of Door County, Wisconsin, using input-output analysis. The tourist multiplier in terms of gross dollars generated was estimated to be 2.17.

534. SUBLETTE, Werner J. and William E. Martin. Outdoor Recreation in the Salt-Verde Basin of Central Arizona: Demand and Value. Tucson: University of Arizona Agricultural Experiment Station Technical Bulletin 218, 41 pages, June 1975.

A modified Clawson-Hotelling approach based on individual's responses to costs, rather than on group means, was used to investigate the demand for and value of outdoor recreation in the Salt-Verde Basins in Arizona. Hunting was excluded from the analysis. The nondiscriminating monopolist value was estimated at $36 million and the value of consumer surplus estimated at $78 million in 1972. Representative recreation sites were valued and the value for the total basin was determined by matching all sites with representative sites.

535. SUBLETTE, Werner J. Demand for and Value of Outdoor Recreation in the Salt-Verde Basin of Arizona. Tucson: University of Arizona, Ph.D. dissertation, 241 pages, 1974. *34(12):7419-A

536. SYDNEYSMITH, Sam. Economic Benefits and Market Areas for Outdoor Recreation: Some Theoretical Aspects. Durham, North Carolina: Duke University, Ph.D. dissertation, 218 pages, 1966. *28(2):383-A

The author presents a historical review and critique of recreation evaluation methods and uses the travel-cost-proxy thesis of recreation research to analyze recreation market areas. The emphasis is on theoretical determinants of the visits-distance relationship, rather than estimation of derived market demand schedules. The market area for summer camping at Cape Halteras National Seashore, North Carolina, in 1965 was identified using an iso-visitation rate contour map.

537. TRICE, Albert M. and Samuel E. Wood. "Measurement of Recreational Benefits." Land Economics 34(3):196-207, 1958.

The authors describe two methods used to value recreation benefits which they believe to be unacceptable. They reject the gross expenditures method as a measure of value and also the cost of provision of recreation facilities. They propose using a travel cost method which uses the average costs of travel for the most distant 10 percent of visitors to compute the total consumer's surplus. An empirical example of the Upper Feather River area in California is presented.

538. TUSSEY, Robert C., Jr. Analysis of Reservoir Recreation Benefits. Lexington: University of Kentucky Water Resources Institute Research Report No. 2, 158 pages, 1967.

A modified Hotelling-Clawson procedure is used to estimate reservoir recreation benefits. Regression analysis was used to estimate the demand for Kentucky reservoirs by residents of the other 47 contiguous states and the counties in Kentucky. Distance and population explained most of the variation in visitation.

539. U.S. Forest Service. Outdoor Recreation Research: Applying the Results. Papers from a workshop held by the USDA Forest Service at Marquette, Michigan, June 19-21, 1973. St. Paul, Minnesota: North Central Forestry Experiment Station, 113 pages, 1974. (A13.88:NC-9)

Contains 15 papers presented at a Recreation Research Application Workshop held in June 1973 at Marquette, Michigan. Subjects range from the social and esthetic considerations in recreation management through the economic problems to questions of design and development of sites.

540. VICKERMAN, R. W. "The Evaluation of Benefits from Recreational Projects." Urban Studies 11(3):277-288, October 1974.

The Clawson method is critically reviewed with suggestions for an alternative approach through a more general model of recreation travel behavior. Empirical evidence was drawn from the National Travel Survey. It was found that total net benefits would likely be much lower than those estimated using the Clawson method.

541. WALKER, J. A. "Tourism and Recreation Give New Turn to Planning Resource Use." Soil Conservation 35(N1):223, 1970.

The impact of tourism in Sevier County, Tennessee is discussed. County income from tourism was estimated to be about $70 million a year, 10 times that from farming.

542. WALSH, Richard G. "Effects of Improved Research Methods on the Value of Recreational Benefits." Outdoor Recreation, Advances in Application of Economics. Washington, D.C.: U.S. Department of Agriculture Forest Service General Technical Report WO-2, pp. 145-153, March 1977.

A number of proposals that have been made in recent years to improve methods of research on the value of recreation benefits are explored. Topics discussed include transfer costs, travel time cost, substitution effects, public investment and operating costs, investment costs, money time price, equity adjustment, and preservation value.

543. WENNERGREN, Boyd. "Surrogate Pricing of Outdoor Recreation." Land Economics 43(1):112-116, 1967.

Which costs to use in estimating demand for outdoor recreation are discussed. Regression analysis of data on Utah hunters revealed that the variable travel and on-site costs were statistically related to the number of trips taken.

544. _____. Value of Water for Boating Recreation. Logan: Utah Agricultural Experiment Station Bulletin 453, 27 pages, 1965.

Travel costs and expenditures were used in a regression model to evaluate boating in Utah in 1963.

545. WHALEY, R. S. "Multiple Use Decision Making--Where Do We Go From Here?" National Resource Journal 10(3):555-565, July 1970.

A brief overview of approaches to resource valuation schemes used in multiple use decisions is presented.

546. WILSON, Robert. "Values and Marine Recreation." Marine Industries: Problems and Opportunities, Ninth Annual Conference, Marine Technology Society, Washington, D.C., September 1973.

547. _____. "Demand Theory: Time Allocation and Outdoor Recreation." Southern Journal of Agricultural Economics 3:103-108, December 1971.

A comparative summary of several extensions of contemporary theory that investigate restrictions imposed by available time and the assembly of commodities from time and goods. Some implications of these theories for the evaluation of outdoor recreation facilities and activities are discussed.

VI. Natural Resource Economics

548. ARROW, K. J. and A. C. Fisher. "Environmental Preservation, Uncertainty, and Irreversibility." Quarterly Journal of Economics 88(2):312-319, 1974.

The implications of uncertainty surrounding estimates of the environmental costs of some economic activities are explored. It is shown in particular that the existence of uncertainty will, in certain important cases, lead to a reduction in net benefits from an activity with environmental costs.

549. BEARDSLEY, Wendell, Dennis Schweitzer, and Douglas Ljungren. "Measuring Economic Costs of Wilderness Land Allocation." Outdoor Recreation, Advances in Application of Economics. Washington, D.C.: U.S. Department of Agricultural Forest Service General Technical Report WO-2, pp. 140-144, March 1977.

The costs of creating wilderness areas are investigated. The authors argue that cost analysis of potential land reallocation decisions may be more useful than benefit analysis to the decision maker. Three techniques of estimating the cost of wilderness preservation are explored. They are opportunity cost, replacement cost, and community economic studies, such as input-output or economic base studies.

550. BEAZLEY, Ronald. "Conservation Decision-Making: A Rationalization." Natural Resources Journal 7(3):345-360, 1967.

A discussion presenting the idea that all present and expected future costs and benefits should be considered when making decisions regarding natural resource use.

551. BLODGETT, Richard. "The Voice of the Wilderness." The American Way, pp. 13-18, August 1971.

552. BREWER, M. F. "Should Economics Dictate Resource Allocation Decisions?" Transactions of the Thirty-Sixth North American Wildlife and Natural Resources Conference 36:32-37, 1971.

The author argues that economics has a role in decisions on resource allocation.

553. BURTON, Ian and Robert Kates. Readings in Resource Management and Conservation. Chicago: University of Chicago Press, 1965.

A collection of papers on resource management and conservation under eight chapter headings: (1) The Human Denominator, (2) The Limits of the Earth, (3) The Growth of a Movement, (4) The Conservation Ethic, (5) The Managerial Experience, (6) Resources and Economic Development, (7) Scientific and Technological Change, and (8) The Choice of Alternatives.

554. CIRIACY-WANTRUP, S. V. and James J. Parsons, editors. Natural Resources: Quality and Quantity. Berkeley, California: University of California Press, 217 pages, 1967.

A collection of papers on the quality and quantity of natural resources presented before faculty seminars at the University of California, Berkeley between 1961-1965. Contributors include S.V. Ciriacy-Wantrup and A. Starker Leopold. Topics covered vary from "Value of the Landscape" to "Living Resources of the Sea" and "Administration of Resources."

555. CLAWSON, M. "Economic Trade-Offs in Multiple-Use Management of Forest Lands." American Journal of Agricultural Economics 56(5):919-926, December 1974.

A subjective discussion of economic trade-offs in multiple-use of forest lands.

556. _____. "How Much Economics in National Forest Management?" Journal of Forestry 72(1):13-16, January 1974.

The author encourages the use of economics in determining multiple-use alternatives for national forests.

557. CONNER, J. Richard and Edna Loehman, editors. Economics and Decision-Making for Environmental Quality. Gainesville: University Presses of Florida, 299 pages, 1974.

The spectrum of environmental decision-making problems from the theoretical social choice issues to the practical problems of measurement are explored.

558. CUSICK, Patrick J., Jr. "Valuing, Paying For, and Providing Open Space in Urban Fringe Areas." Journal of Farm Economics 44(5):1697-1704, December 1962.

The author stresses the need for a broad program of research, experimentation, and demonstration of the costs and benefits of urban open space.

559. DEAN, Lillian F. The Value and Vulnerability of Coastal Resources: Background Papers for Review and Discussion. Atlanta: Georgia Department of Natural Resources, 326 pages, May 1975.

Identification of the values and vulnerabilities of natural resources was an important first step in resource planning. Policies and programs for managing and utilizing resources should be based on such information. The purpose of these background papers is to highlight important characteristics of Georgia's coastal resource features and systems including resource values and vulnerabilities.

560. DOWNE, Charles E. Land Use/Cost Revenue Analysis. Pembroke: Massachusetts Conservation Commission, 13 pages, 1972.

The costs and revenues of three land use alternatives for an assumed 100-acre tract of land in Pembroke, Massachusetts, are analyzed. The first alternative involved a minimum residential lot size of 40,000 square feet, the second a lot size of 25,000 square feet, and the third no residential development at all by maintaining open space. The authors concluded that further residential development, unless it was at a somewhat higher assessed valuation than had been the case in the recent past would cause further increases in the local property tax rate. Rentention of 100 acres as open space, in five years, would save the town approximately $127,420 over the first residential alternative.

561. ERICKSON, L. E. An Approach to Valuing Visual Pollution From Western Electricity Production. Richland, Washington: Battelle Pacific Northwest Laboratories, v + 35 pages + Appendicies, February 1977.

An approach to valuing visual pollution from electric power plants is outlined. The approach is similar to an earlier application of bidding games to estimate people's willingness to pay for abatement of emissions from the Four Corners power plant in northwestern New Mexico (Randall). Visual pollution damages from electric power plants to residents of and recreational visitors to these western regions were estimated to total more than $100 million annually by 1985. The study area encompassed the states of Montana, Wyoming, Colorado, New Mexico, and all states to the west coast.

562. FARMER, B. H. "The Environmental Science and Economic Development." Journal of Developmental Studies 7(3):257-269, April 1971.

The author considers one aspect of the relationship between the environmental sciences and economic development; namely, the relationship between studies of natural resources and the appraisal of agricultural development projects.

563. "Fish and Wildlife: Appendix XI." Comprehensive Study of Water and Related Land Resources, Puget Sound and Adjacent Waters, State of Washington, Olympia, Washington: Pacific Northwest River Basins Commission, 239 pages, 1970.

The uses of the Puget Sound Area by fish and wildlife are described, and the locations of greatest importance and overall utilization are defined. A plan to conserve and enhance the short and long range needs of fish and wildlife in this area is presented.

564. FISHER, A. C., J. V. Krutilla, and C. J. Cicchetti. "The Economics of Environmental Preservation." American Economic Review 62(4):605-619, September 1972.

The authors propose a model for the allocation of natural environments between preservation and development and show that in general it would be optimal to refrain from some development indicated by current benefits and costs if, in the relatively near future, undevelopment, which is impossible, would be indicated. Hells Canyon, an empirical example was used to substantiate their hypothesis in that

the area is likely to yield greater benefits if left in its natural state since benefits from development are decreasing over time relative to benefits from preservation. Consumers' surplus was used to measure recreation benefits, which the authors felt provided a conservative estimate of such benefits.

565. FISHER, A. C. "The Economics of Environmental Preservation." Natural Environments: Studies in Theoretical and Applied Analysis, J. V. Krutilla, editors. Baltimore: The Johns Hopkins Press for Resources for the Future, Inc., pp. 18-53, 1972.

566. GADSBY, Dwight M. Current Procedures Used in Evaluating Resource Conservation and Development Projects. Washington, D.C.: U.S. Department of Agricultural Miscellaneous Publication No. 117744-49, August 1970.

567. GREGORY, G. Robinson. Forest Resource Economics. New York: The Ronald Press, 548 pages, 1972.

Part IV ("Non-timber Products Economics") provides a discussion of issues related to the economics of recreation, water, and wildlife.

568. GROSSE, Robert N. "Some Problems in Economic Analysis of Environmental Policy Choices." Proceedings of Symposium on Human Ecology, Warrenton, Virginia: U.S. Department of Health, Education and Welfare, pp. 40-53, 1968.

569. GROVES, D. L. Method of Utilizing Personal Value Information for Increasing Administrative Efficiency and Effectiveness in Managing Public Forested Lands. University Park: Pennsylvania State University, D.ED. thesis, 281 pages, 1973.

The purpose of this case study of game lands in Pennsylvania was to develop and test a method of utilizing personal value information of users and the general population as a guide to increasing the administrative efficiency and effectiveness of public land management. The methods developed were measurement systems which indicate personal values through a 13-point, like-dislike ordinal scale.

570. HERFINDAHL, Orris C. and Allen V. Kneese. Economics and Natural Resources. Washington, D.C.: Resources for the Future, 384 pages, 1974.

The relation between economic theory and natural resources is developed. Benefit evaluation is discussed and the Clawson travel zone concept is reviewed.

571. _____. Quality of the Environment: An Economic Approach to Some Problems in Using Land, Water, and Air. Washington, D.C: Resources for the Future, 96 pages, 1965.

The authors demonstrate that economic analysis can be useful in analyzing problems involving the quality of the environment associated with natural resource use despite the fact that many of the benefits and costs cannot be measured monetarily.

572. IRONSIDE, R. G. "Agricultural and Recreational Land Use in Canada: Potential for Conflict or Benefit?" Canadian Journal of Agricultural Economics 19(2):1-12, October 1971.

The central conflicts and benefits of agriculture and rural outdoor recreation are reviewed. Public controls are necessary to avert such conflicts. A number of multiple-use alternatives for rural land that include vacation farms, shooting preserves, and camping sites are presented.

573. JOHNSON, Hugh A. and Jesse R. Russell. "Economics of Natural Beauty." Soil and America's Future: Proceedings of the Twenty-Second Annual Meeting of the Soil Conservation Society of America, pp. 177-182, 1967.

The costs and benefits of incorporating natural beauty in land use planning are discussed and several examples of development outcomes are cited.

574. JOHNSON, Hugh A. and Judith M. Huff. "Toward Measuring the Intangible Values of Natural Beauty." Proceedings of the Annual Meeting of the Soil Conservation Society of America, pp. 68-72, 1966.

The concept of natural beauty is discussed and Lewis' linear corridor theory for inventorying environmental values of landscapes is presented.

575. KNETSCH, Jack L., R. H. Haveman, C. W. Howe, John V. Krutilla, and M. F. Brewer. Federal Natural Resources Development: Basic Issues in Benefit and Cost Measurement. Washington, D.C.: George Washington University Natural Resources Policy Center, 1969.

576. KRUTILLA, John V. and Anthony C. Fisher. The Economics of Natural Environments: Studies in the Valuation of Commodity and Amenity Resources. Baltimore: Johns Hopkins University Press, 292 pages, 1975.

Amenity resources of natural environments are placed into an analytical framework comparable to that for extractive resources. Operational models for making quantitative estimates of the amenity value of environmental resources are presented. Conventional analysis of commodity resources is extended to take into account the effects of technical advance on extractive industries as well as the natural environment. The models and theoretical background are illustrated by case studies which include the Hells Canyon Dam, the Mineral King Ski Resort, and the prairie potholes.

577. KRUTILLA, John V., editor. Natural Environments: Studies in Theoritical and Applied Analysis. Baltimore: Johns Hopkins University Press, viii + 252 pages, 1972.

This collection of nine papers represents an attempt to consider the difficult allocation problems associated with management of natural resources and proposed changes in the natural environment. Included is a summary paper of Brown and Hammack's work on the economics of migratory waterfowl.

578. KRUTILLA, John V., C. J. Cicchetti, A. M. Freeman, III, and C. S. Russell. "Observations on the Economics of Irreplaceable Assets." Environmental Quality Analysis: Theory and Method in the Social Sciences, A. V. Kneese and B. T. Bower, editors, Baltimore: The Johns Hopkins Press for Resources for the Future, Inc., 1972.

579. KRUTILLA, John V. and C. J. Cicchetti. "Evaluating Benefits of Environmental Resources with Special Application to the Hells Canyon." Natural Resources Journal 12(1):1-29, January 1972.

The choice between developing a scenic river for hydro-electricity or preserving it is addressed. There are no close substitutes for the scenic area and no possibility of reproducing the natural environment if altered. By taking environmental impacts into account along with changing relative values, the study departs substantially from typical benefit-cost analyses.

580. KRUTILLA, John V. "Balancing Extractive Industries with Wildlife Habitat." Transactions of the Thirty-Third North American Wildlife and Natural Resources Conference 33:119-130, 1968.

Similar to Krutilla's other works that discuss the irreversibility of decisions regarding natural resources. Wetlands in the prairie pothole region are mentioned briefly.

581. _____. "Conservation Reconsidered." American Economic Review 57(4):777-786, September 1967.

The author considers the irreproducibility of natural resources. He argues that if natural environments are irreproducible and the demand for them in catering to collective consumption wants can be expected to grow--i.e., the marginal trade-off between fabricated goods and natural amenities tends increasingly to favor the latter--natural environments become assets of appreciating value.

582. LINTON, D. L. "The Assessment of Scenery As a Natural Resource: Scottish Geographic Magazine 84:218, 1968.

583. LONG, Robert W. "Agriculture and Wildlife: Opportunities and Conflict." Transactions of the Forty-First North American Wildlife and Natural Resources Conference 41:494-499, 1976.

A discussion of several areas where conflicts between agriculture and conservation may be reduced through cooperation.

584. MOLLER, J. "Trends in Nature Conservation in South Africa: Tourism." Trends in Parks and Recreation 5(1):6-8, January 1968.

585. MOORE, N. W. "The Heaths of Dorset and Their Conservation." Journal of Ecology 50:369-391, 1962.

586. ODUM, E. P. and H. T. Odum. "Natural Areas as Necessary Components of Man's Total Environment." Transactions of the Thirty-Seventh North American Wildlife and Natural Resources Conference 37:178-189, 1972.

The authors argue that the national environment operates without appreciable economic cost to man. The economic value of that environment is what the services it provides at no cost would cost in a developed environment. The economic value of the natural environment's waste recycling capacity is provided as an example.

587. ODUM, H. T. Environment, Power, and Society. New York: John Wiley and Sons, 331 pages, 1971.

The author discusses power, or energy, as it relates to man's activities and the environment. A chapter on economics is included.

588. PEARSE, P. H. "Principles for Allocating Wildland Among Alternative Uses." Canadian Journal of Agricultural Economics 17(1):121-131, 1969.

The author draws on elementary economic principles to define the optimum use or combinations of uses of a fixed resource base under a variety of conditions. Problems encountered in applying these criteria are discussed, as well as some implications for public policy of attempting to maintain the highest economic use of public wetlands. The most serious obstacle in applying these principles lies in the shortage of appropriate data.

589. PHILLIPS, William E. Regional Development of Owens Valley, California: An Economic Base Study of Natural Resources. Berkeley: University of California, Ph.D. dissertation, xi + 255 pages, 1968.

An examination of current and alternative use patterns of land, water, and associated natural resources of Owens Valley, the source for over half of the water used by the city of Los Angeles. The area provides outdoor recreation and supports a variety of wildlife.

590. PLOURDE, C. G. "A Simple Model of Replenishable Natural Resource Exploitation." American Economic Review 60(3):518-522, 1970.

The author considers maximum sustained yield programs of replenishable natural resource exploitation and questions the validity of these programs in satisfying social goals.

591. PRENZLOW, Edgar J., Peter M. Ashton, and Ronald A. Wykstra. "Identifying Optimal Wildlife Resource Supply Quantities Which Maximize Public Use Benefits." Transactions of the Thirty-Ninth North American Wildlife and Natural Resources Conference 1974:195-207, April 1974.

Costs of the Colorado Division of Wildlife by product--type of wildlife oriented recreation--are compared to estimated benefits generated by recreational use of each product. Estimates of the value of recreation days by product were obtained from questionnaires completed by Division Managers who were asked to assume the role of a typical hunter and estimate the value of a recreation day by type of game sought. Estimates were fairly close to expenditure data collected in Colorado by Nobe and Gilbert (1968).

592. Proposed Wilderness, Theodore Roosevelt National Memorial Park, North Dakota: Final Environmental Impact Statement. Washington, D.C.: National Park Service, 62 pages, July 27, 1973.

The National Memorial Park Service recommended that 28,335 acres of Theodore Roosevelt National Park be designated by Congress as wilderness. Environmental impacts that are discussed include ecological, social, and economic.

593. RANDALL, Alan. "Quantifying the Unquantifiable: Benefits from Abatement of Aesthetic Environmental Damage." A contributed paper presented at the annual conference of the American Agricultural Economics Association, College Station, Texas, August 1974.

A theoretical framework for benefit-cost analysis of the provision of abatement of aesthetic environmental damage is presented. A number of alternative benefit valuation tehcniques are considered and evaluated, and a case study using the bidding game technique is summarized. Three general classes of methods of empirical estimation of benefits of environmental improvements discussed are (1) direct costing methods, (2) revealed demand techniques, and (3) survey techniques involving questioning of consumers.

594. SCHNEIDER, Phillip W. "Fish and Wildlife as Related to Other Resources and Values." What's Ahead for Our Public Lands?" Hamilton K. Pyles, editor, Washington, D.C.: Natural Resources Council of America, pp. 58-74, 1970.

595. STOKES, James D., Glenn E. Delisle, and James B. McCormick. Fish and Wildlife Resource Planning Guide. 3rd edition. Sacramento: California Department of Fish and Game, 124 pages, 1969.

The demand and value of fish and wildlife resources in a planning context are discussed.

596. STREETER, Carroll P. "New Land--Right Under Our Noses." Farm Journal 92(9):30-31, 34, 46, September 1968.

Ways in which farmers can benefit by "improving" their land through such practices as clearing trees and drainage are discussed. Several examples of the economic benefits of improving poor land are cited.

597. SUKHOTIN, I. "Concerning Evaluation of Natural Resources." Problems of Economics 11(2):29-39, June 1968.

The problems of evaluation of natural resources for alternative uses in the USSR are considered.

598. THOMPSON, Emmett F. and Douglas P. Richards. "Evaluating Total Forest Resource Management." Journal of Forestry 68(8):624-627, October 1970.

Focuses on problems which arise in forest resource management in the implementation of multiple-use objectives. Current approaches to solving the problems are reviewed. Part of the problem in choosing among alternatives is the lack of dollar values assignable to forest recreation.

599. TISDELL, C. "Provision of Parks and the Preservation of Nature: Some Economic Factors." Australian Economic Papers 11(19):154-162, December 1972.

The provision of parks should be the responsibility of the private sector. If governments fail to supply an optimal quantity of parks, so does the market. The market may undersupply parks because of monopoly factors, favorable externalities, and because of uncertainty and irreversibility elements. Each of these factors is discussed in the essay along with the alternative of public provision. Mechanisms do not seem to exist in either case to ensure an optimal supply of parks and the optimal preservation of nature.

600. TOMBAUGH, Larry W. "External Benefits of Natural Environments." Recreation Symposium Proceedings, Upper Darby, Pennsylvania: Northeastern Forest Experiment Station, pp. 73-77, 1971.

Existing methods of assessing economic benefits arising from certain physical environments left in a relatively natural condition do not include estimates of external benefits. Existence value is one such external benefit that accrues to individuals who have no intention of ever visiting the area in question. A partial measure of the existence value of national parks is estimated. Option value is also discussed.

601. WENNERGREN, E. B. and H. H. Fullerton. "Estimating Quality and Location Values of Recreational Resources." Journal of Leisure Research 4:170-183, Summer 1972.

602. WENNERGREN, E. B. and N. K. Roberts. "Managing State Lands: Some Legal-Economic Considerations." Natural Resources Journal 7(2):252-265, April 1967.

A framework is proposed which incorporates the legal and economic aspects considered pertinent to a properly constituted management program. A singular, revenue-oriented goal is designated for state lands. Decision criteria which would permit realization of such a goal are set forth in a general model. Specific revenue sources are defined and combined with a discounting procedure to derive estimates of the present value of expected net revenues over time. Derivation of such values for alternative land uses provides the decision criteria for choosing among such alternatives. The general framework and decision criteria are illustrated by application to a hypothetical situation involving the sale or hold alternative of a parcel of state land.

VII. Water Resource Economics Related to Fish and Wildlife

603. ABEL, Fred H., Dennis P. Tihansky, and Richard G. Walsh. "National Benefits of Water Pollution Control." Washington, D.C.: U.S. Environmental Protection Agency, Office of Research and Development, 59 pp. (mimeo), 1976.

The current state-of-the-art regarding benefit theory and empirical methods that have been applied to water quality benefit estimation are reviewed and evaluated. Estimates of nationwide water pollution damages in 1970 were derived for the following: human health, materials damage, production cost, property value, recreation activities, and psychic experiences.

604. BOLLMAN, Frank H. "On the Demand for Water in its Natural Environment." California Water: A Study in Resource Management, D. Seckler, editor, Berkeley: University of California Press, pp. 84-108, 1971.

605. BROWN, Leonard R. "Social Well-Being and Water Resources Planning." Water Resources Bulletin 12(6):1181-1190, December 1976.

The state-of-the-art in analyzing and evaluating aspects of social well-being related to Federal water resources projects is discussed. The author examines current short-falls and advocates a direction for further efforts.

606. BURT, O. R. "The Economics of Conjunctive Use of Ground and Surface Water." Hilgardia 36(2):31-111, 1964.

607. COPPEDGE, R. O. and J. R. Gray. "Recreational Use and Value of Water in Elephant Butte and Navajo Reservoirs." University Park: New Mexico Agricultural Experiment Station, B-535, 24 pages, 1968.

The value of water in two New Mexico reservoirs is estimated using recreational expenditures as the recreational value of water. The recreational value per acre foot of water used by recreationists was $394 in the early season period and $562 in the late season period for Elephant Butte reservoir in 1966. Elasticities of demand were also estimated for these two reservoirs.

608. COWAN, C. Michael. Ecological Impact of Surface Water Impoundments in the Great Plains Area. Lincoln, Nebraska: University of Nebraska Water Resources Research Institute, 52 pages, October 1972.

The proposed location of the Corps of Engineers Platte River Dam was analyzed from the standpoint of its environmental impact. A technique was developed which offers an objective approach to environmental analysis of water resources projects and an alternative to the more subjective cost-benefit ratio. The philosophy behind the method is based on statements of relative truth while the actual technique is based on probalities of occurrence of resources and the desires or demands for the resources. Application of the method to this project covered such categories as agriculture, recreation, bird habitat, mammal habitat, and fish habitat.

609. CRANE, Dale A. "A Discussion on Estimating Water Oriented Recreation Use and Benefits." Ninth Annual Environmental and Water Resources Engineering Conference, Vanderbilt University, Nashville, Tennessee, June 1970.

610. DALES, J. H. "Land, Water, and Ownership." The Canadian Journal of Economics 1(4):791-804, 1968.

The author discusses the problem of ownership of water and proposes a government-owner market as an administrative tool to allocate water resources efficiently.

611. DAVID, E. J. L. "The Exploding Demand for Recreational Property." Land Economics 45(2):206-217, May 1969.

The findings of a study of riparian property values around 60 artifical lakes in Wisconsin are discussed.

612. DAVIDSON, P., F. G. Adams, and J. Seneca. "The Social Value of Water Recreational Facilities Resulting from an Improvement in Water Quality: The Delaware Estuary." Water Research. A. V. Kneese and S. C. Smith, editors, Baltimore: The Johns Hopkins Press for Resources for the Future, Inc., pp. 175-211, 1966.

613. DORNBUSCH, David M. and Caj O. Falcke. A Generic Methodology to Forecast Benefits from Urban Water Resource Improvement Projects. Washington, D.C.: Office of Water Research and Technology, 183 pages, November 1, 1974.

A model expressing the relationship between benefits, measured by changes in real property values, and water quality improvement was estimated using econometric techniques and data from opinion surveys. An index measuring respondents' perception of water quality changes was constructed to reflect the relative valuation of each category and the sensitivity of benefit gains to threshold and leveling-off effects.

614. DUSHINSKE, R. L., Chairman. Water Resource Development: North Dakota Economic Conference. Bismarck: North Dakota Economic Development Commission, Report on Water Recreation Development, 13 pages, April 1964.

Goals, objectives, and recommendations for managing North Dakota's water resources are presented. A brief section on fish and wildlife is included.

615. DUTTA, Manoranjan and Peter Asch. The Measurement of Water Quality Benefits. New Brunswick: Rutgers University Bureau of Economic Research, 130 pages, 1966.

616. Environment Canada. Economic Damages Resulting from Water Pollution. Ottawa, Unpublished, June 1974.

617. EPP, D. J. The Economic Impact of Recreational Water Reservoir Development on Land Use, Business Enterprises, and Land Values. University Park: Pennsylvania Agricultural Experiment Station, B-764, 24 pages, June 1970.

The impact that recreational reservoirs have on the housing and business activity of local areas and the impact of such reservoirs on the real estate tax base are analyzed and tested. Twenty-seven reservoirs were analyzed to determine the amount of housing and business activity that occurred within one mile of the reservoir property.

618. ERICSON, Raymond. Valuation of Water Quality in Outdoor Recreation. Fort Collins: Colorado State University, Ph.D. dissertation, 1974.

619. FULCHER, Glen D. Methods of Economic Evaluation of Outdoor Recreational Use of Water and A Case Study of Their Application. Madison: University of Wisconsin, Ph.D. dissertation, 133 pages 1961. *22(2):451

Various methods that might be used in economic evaluation of recreation are analyzed. The methods are analyzed in relation to their usefulness for application under various types of ownership. Water use on Pyramid Lake Indian Reservation in western Nevada was selected for a case study.

620. GARRISON, Charles B. "A Case Study of the Local Economic Impact of Reservoir Recreation." Journal of Leisure Research 6(1):7-19, Winter 1974.

The effect of reservoir recreation on the economy of local areas in Tennessee is estimated using economic base theory to estimate induced and secondary income and employment multipliers.

621. GAUGER, Stephen E. and J. B. Wyckoff. "Aesthetic Preference for Water Resource Projects--An Application of Q Methodology." Water Resources Bulletin 9(3):522-528, June 1973.

Investigates whether aesthetic preferences related to water projects can be determined, and whether they differ among different groups of people. A Q sort of 44 photographs of a wide variety of water development projects was conducted. The test revealed that people do not necessarily equate only naturalness with aesthetic appeal, but will accept development as aesthetic, provided that it is designed to complement the natural landscape.

622. GAUGER, Steven E. The Evaluation of Intangible Benefits of Water Resource Projects. Amherst: University of Massachusetts, M.S. thesis, 130 pages, 1972.

623. GIBBS, Kenneth C. The Estimation of Recreational Benefits Resulting From an Improvement in Water Quality in Upper Klamath Lake: An Application of a Method for Evaluating the Demand for Outdoor Recreation. Corvallis: Oregon State University, Ph.D. dissertation, 163 pages, 1969.

The objectives of this study were to: (1) develop and test methodology that would be appropriate to determine the economic benefits from a proposed recreational facility, (2) determine the relationship between water quality and recreational use, and (3) determine the economic benefits accruing to society from a postulated improvement in water quality.

624. GROVER, Richard W. Fishing Creek: General Recreation Development Plan. Cape May, New Jersey: County Planning Board, 37 pages, November 1969.

This general recreation development plan for Fishing Creek attempts to capitalize on the area's potential by providing a wide variety of benefits to meet the needs of a wide variety of interests. Being the first Cape May County Regional Park, it would provide a basis for future decisions regarding other regional parks, resource management concepts, and social and economic development.

625. GRUBB, Herbert W. and James T. Goodwin. Economic Evaluation of Water Oriented Recreation in the Preliminary Texas Water Plan. Austin, Texas: Texas Water Development Board, Report No. 84, 1968.

626. HINOTE, Hubert. Benefit-Cost Analysis for Water Resource Projects: A Selected Annotated Bibliography. Revised Edition, Knoxville, Tennessee: Center for Business and Economic Research, University of Tennessee, 148 pages, 1969.

An annotated bibliography on major works in benefit-cost analysis that appeared during the period 1958-1967. The following areas are emphasized: (1) flood control, (2) navigation, (3) water quality, (4) recreation, and (5) water supply.

627. HOLMAN, M. A. and J. T. Bennett. "Determinants of Use of Water-Based Recreational Facilities." Water Resources Research 9(5):1208-1218, October 1973.

A model is developed to explain the use of 15 activities of water-based recreation. The results were used to rank factors that contribute to the use of water-based recreation facilities. Regression analysis was used as an analytical method.

628. Improved Federal Efforts Needed to Equally Consider Wildlife Conservation with Other Features of Water Resource Developments. Reports to the Subcommittee on Fisheries and Wildlife Conservation and the Environment Committee of Merchant Marine and Fisheries, House of Representatives, Comptroller General of the U.S., March 8, 1974.

629. International Garrison Diversion Study Board. Report to the International Joint Commission - 1976. Washington, D.C., xiv + 253 pages, October 1976.

This report and its five appendix volumes--water quality, water quantity, biology, uses, and engineering--discuss the transboundary implications of the completion and operation of the Garrison Diversion Unit. The impacts on recreational activity are reported. An annual loss of 35,500 ducks in Manitoba as a result of drainage and alterations of wetlands in North Dakota was predicted, with an estimated loss in expenditures of $54,000 or $20 per duck hunter day. Sport fishing losses by the year 2000 were estimated to total $130,000 in on-site expenditures by fishermen in Manitoba.

630. _____. Report to the International Joint Commission - 1976. Appendix D: Uses Report. Washington, D.C., xx + 311 pages, December 1976.

The impacts of the Garrison Diversion Unit on major water uses in the Red, Assiniboine, and Souris River Basins and on Lakes Winnipeg and Manitoba are discussed. Some water uses included in the analysis are: recreational, fish and wildlife, agricultural, and others. The effects upon these impacts of various alternatives and modifications to the authorized GDU project are also analysed. The loss of ducks, hunter man-days, and associated expenditures is discussed. The wetland restoration alternative could offset these losses, however. The cost to replace enough wetlands to offset the duck loss in Manitoba was estimated to be $6.46 million. Also discussed are commercial fishery losses, sport fishery losses, loss of fish for subsistence, and waterfowl losses in Alberta and Saskatchewan. The expenditures method was used to assign dollar values to fish and wildlife resources.

631. JANSMA, John D. Secondary Effects of Upstream Watershed Development: Roger Mills County, Oklahoma. Stillwater: Oklahoma State University, Ph.D. dissertation, 101 pages, 1964.

The author develops and applies a model for estimating the local secondary benefits of watershed development. Nearly all the income resulting from recreational expenditures by nonresidents accrued to local retail business establishments in the study area.

632. KALTER, Robert J. A Model to Estimate the Economic Effects of Water-Based Recreation Projects on Local Political Subdivisions. Madison: University of Wisconsin, Ph.D. dissertation, 232 pages, 1966. *28(2):344-A .

The objectives of this study were to: (1) provide a method of measuring the economic effects of state and federal water-based recreation projects on local political subdivisions, and (2) begin empirical testing of the methodology developed and to illustrate its potential use. The model used is a modification of the interindustry technique known as from-to analysis. Wisconsin counties were used as the study area.

633. KAVANAGH, N. J. "The Economics of the Recreational Uses of Rivers and Reservoirs." Water and Water Engineering 72:401, 1968.

634. KITE, Rodney C. and William D. Schutz. Economic Impact on Southwestern Wyoming of Recreationists Visiting Flaming Gorge Reservoir. Laramie: University of Wyoming Agricultural Experiment Station Research Journal 11, 24 pages, 1967.

The economic impact of expenditures by recreationists visiting Flaming Gorge Reservoir in Southwestern Wyoming in 1965 is analyzed. Information on the impact of expenditures on the economy was provided through an input-output framework. The overall recreation multiplier was estimated to be 2.067.

635. KITE, Rodney C. The Impact in Southwestern Wyoming of Spending by Recreationists Visiting Flaming Gorge Reservoir. Laramie: University of Wyoming, M.S. thesis, 1967.

636. KNEESE, Allen V. The Economics of Regional Water Quality Management. Baltimore: The Johns Hopkins Press for Resources for the Future, Inc., 215 pages, 1964.

The author argues that economic criteria be employed in water quality management decisions. A model is developed in which water quality is treated as a problem in cost minimization subject to specific constraints.

637. KNETSCH, Jack L. "Value Comparisons in Free-Flowing Stream Development." National Resources Journal 11(4):624-635, October 1971.

A discussion of the elasticity of two recreation demand curves--free flowing rivers and flatwater recreation--and the use of such demand curves in measuring recreational benefits of water management.

638. KUIPER, Edward. Water Resources Project Economics. London: Butterworths, 447 pages, 1971.

Chapter 11--"Tangibles and Intangibles"--presents a unique method of assigning dollar values to units of "well-being." Units of "well-being" represent the personal value of heretofore intangible elements in water resource development, such as outdoor recreation opportunities.

639. LONG, Burl F. "Some Conceptual Problems in the Evaluation of Water Pollution Damages." Southern Journal of Agricultural Economics 2(1):133-137, December 1970.

The author argues that the distribution of use rights is an often neglected aspect in evaluating pollution damages. A case study is examined in which Pennsylvania state law requires quality standards be met for protecting specific uses of Cordorus Creek (York County). The treatment costs to meet state criteria seem to be considerably higher than the benefits received from treatment.

640. LORD, William B., Susan K. Tubbesing, and Craig Althen. Fish and Wildlife Implications of Upper Missouri Basin Water Allocation, A Research Assessment. Boulder: University of Colorado Institute of Behavioral Science Monograph #22, 114 pages, 1975.

Major water allocation changes are occurring in the Upper Missouri Basin because of urban expansion, energy development, and irrigation. Some water can come from existing supplies and some may be transferred from irrigation. Much of the water will come from existing and new reservoirs. Direct fish and wildlfe impacts will occur through streamflow reduction, reservoir construction, water pollution, and through habitat changes caused by reduced water supplies to land areas. Existing decision-making institutions frequently fail to give adequate weight and protection to fish and wildlife values. Two complementary means of improving this situation are (1) modification of water allocation and decision-making institutions, and (2) provision of more information on potential fish and wildlife impacts in ways that facilitate information use. In both cases, research can help improve the current situation.

641. MEGLI, L. D. and H. B. Gamble. An Analysis of the Relationship Between Stream Water Quality and Regional Income Generated by Water-Oriented Recreationists. University Park: Pennsylvania State University Institute for Research on Land and Water Resources Research Publication No. 69, 1971.

642. MEREWITZ, Leonard. "Recreational Benefits of Water Resources Development." Water Resources Research 2(4):625-640, 1966.

A demand curve for recreation at the Niangua Arm, Lake of the Ozarks, was estimated. Using distance as a proxy for price, the consumer's surplus implied by the demand curve was measured. Cross-sectional variations of associated costs were used to simulate price variations for recreation.

643. MILLIKEN, J. Gordon and H. E. Mew, Jr. "Recreational Impact of Reclamation Reservoirs." Washington, D.C.: U.S. Department of the Interior Bureau of Reclamation, 18 pages, 1969. (I27.2:R24/20)

The economic impact of three Colorado reservoirs is measured in terms of the increase in property value, the increase in tax revenue, and the increase in sales of retail goods to recreationists.

644.. MOSS, Frank E. The Water Crisis. New York: Frederick A. Praeger, Publisher, pp. 135-151, 1967.

A discussion of pollution and fish and wildlife resources for both commercial and recreational uses. The importance of the prairie potholes to the nation's waterfowl is discussed.

645. National Academy of Sciences--National Research Council. Alternatives in Water Management. Washington, D.C.: National Academy of Sciences, pp. 26-35, 1966.

Current methods fail to measure all values associated with water development. Inability to identify or assess beneficiaries does not indicate an absence of benefits.

646. NORTH, R. M., A. S. Johnson, H. O. Hillestad, P. A. Maxwell, and R. C. Parker. Survey of Economic-Ecologic Impacts of Small Watershed Development. Washington, D.C.: Office of Water Resources Research, 138 pages, June 1974.

Water resources project evaluation methodology is examined in order to identify values and procedures that will more fully account for positive and negative project induced changes to the economy and ecology of an area. A detailed case study of two small projects was used to compare actual with pre-estimated benefits and costs, to estimate other ecologic and economic changes induced by the projects, and to suggest methods for better prediction of impacts from future projects.

647. PENDSE, Dilip and J. B. Wyckoff. A Systematic Evaluation of Environmental Perceptions, Optimum Preferences, and Trade-Off Values in Water Resource Analysis. Corvallis: Oregon State University Department of Agricultural Economics, 86 pages, September 1974.

A methodology to value intangible benefits by determining intensity of satisfaction of users of water resource projects is developed, and procedures for incorporation of such values in the benefit-cost analysis of water resource projects are presented. The Priority Evaluator Technique was developed and tested in the Santiam Valley, Oregon. Trade-off values for five environmental variables were estimated: safety from floods, water recreation, scenic beauty, wilderness, and historical site.

648. _____. Water Reservoir, Natural Beauty, and Public Policy. Corvallis: Oregon State University Cooperative Extension Service, 17 pages (mimeo), 1974.

An application of a methodology to estimate the dollar value of landscape and riverscape with and without a reservoir. The study objective was to ascertain trade-off values for five environmental features relevant to the study area: safety from floods, water recreation, scenic beauty, wilderness, and historical site.

649. REETZ, Gene R. Water Resources Development and Wilderness Values: A Study of the Upper Hudson River. Ithaca, New York: Cornell University, Ph.D. dissertation, 191 pages, 1975. *36(11):7,641-A

The controversy over the proposed Gooley Dam on the Upper Hudson River provided a basis for a case study to examine the planning-evaluation-decision making processes as they relate to preservation-development conflicts. Preservation interests, working through political processes, appear to have been more instrumental in preserving the Upper Hudson than were the planning agencies' attempts at environmental analysis.

650. REILING, S. D., K. C. Gibbs, and Herbert H. Stoevener. Economic Benefits from an Improvement in Water Quality. Washington, D.C.: U.S. Environmental Protection Agency, 128 pages, January 1973. (EP1.23/3:73-008)

A new methodology for estimating the economic benefits accruing to society from an improved recreational facility is introduced and empirically tested. The facility under consideration is Upper Klamath Lake, Oregon, which had low water quality at the time of the study. The methodology draws upon previous work done in the evaluation of recreational demand; however, it focuses upon the individual recreationist and separates the traditional price variable into on-site costs and travel costs. The model was used to estimate the number of days per visit the recreationist would stay at the site as the water quality improves. Data collected at three other lakes with varied characteristics were used to derive a relationship between the number of visits to Klamath Lake that would be forthcoming with an improvement in water quality. The impact of expanded recreational use of Klamath Lake upon the local economy was also estimated through the use of an input-output model.

651. REILING, S. D. The Estimation of Regional Secondary Benefits Resulting from an Improvement in Water Quality of Upper Klamath Lake, Oregon: An Interindustry Approach. Corvallis: Oregon State University, M.S. thesis, 120 pages, 1971.

652. ROMM, Jeffrey M. The Value of Reservoir Recreation. Ithaca, New York: Cornell University Water Resources and Marine Sciences Center and Department of Agricultural Economics Research Bulletin 296, 102 pages, August 1969.

Recreation benefits at Whitney Point Reservoir, Broome County, New York, are estimated using several techniques and comparisons are made. The relative advantages and limitations of the different techniques are discussed. Some of the techniques tested are (1) the Clawson approach, (2) the consumer surplus approach, (3) willingness to pay, (4) a government payment technique, (5) a consumers preference approach, (6) a social preference approach, and (7) the requirements approach. Each technique emphasizes certain segments of the recreationist's spectrum of benefits. Results varied according to each technique's range of sensitivity to different kinds of benefits.

653. _____. Benefit Estimation for Water-Based Recreation Facilities. Ithaca, New York: Cornell University, M.S. thesis, 159 pages, 1968.

654. ROOSE, J. B. "Economic Aspects of Widlife and Recreation as They Relate to Water Resources." Proceedings of the International Association of Game, Fish, and Conservation Commissioners Convention 59:81-83, 1969.

Some aspects of recreation and fish and wildlife benefit evaluation leave much to be desired. The real benefit from project construction is seriously underestimated. Fish and wildlife may be an area where mitigation is not adequately defined. Where the value of fish and wildlife losses cannot be quantified, they must be expressed as clearly as possible so that all pertinent information is before decision-makers. Four national objectives for water and related land resource development are proposed: national income account, regional development account, environmental account, and well-being-of-people account.

655. SCHMID, A. Allan. "Nonmarket Values and Efficiency of Public Investments in Water Resources." American Economic Review 57(2):158-169, May 1967.

The author discusses intangibles, public goods, externalities, and new environmental goods.

656. _____ and William Ward. A Test of Federal Water Project Evaluation Procedures with Emphasis on Regional Income and Environmental Quality: Detroit River, Trenton Navigation Channel. East Lansing: Michigan State University Department of Agricultural Economics Report No. 158, 88 pages, April 1970.

New evaluation procedures suggested by a Task Force of the Water Resources Council are tested by application to a U.S. Army Corps of Engineer's project which would extend an existing 28-foot navigation channel of the Detroit River, Trenton Channel, Michigan. The effects to be accounted for included the transport savings and the indirect incomes attributed to project construction and maintenance and to the activity related to water service users. The primary benefits were examined. Next, the indirect effects on unemployed resources were noted followed by those on employed resources. Finally, an analysis was made of the environmental impacts of the project. The report is written primarily to illustrate concepts and methods. One aspect of channel construction is the impact on waterfowl.

657. SCHUTJER, W. A. and M. C. Hallberg. "Impact of Water Recreational Development on Rural Property Values." American Journal of Agricultural Economics 50(3):527-583, August 1968.

Public investment in water-based recreation facilities is made to increase the recreation potential of an area and to improve the economic resource base of the area. Estimates of the impact of one such investment on the structure of the land market and on property values were made for a rural area in Pennsylvania. The findings of the study supported the general hypothesis that investment in water-based recreation facilities does significantly influence the value of rural property and the structure of the rural land market.

658. STOEVENER, H. H. and E. N. Castle. "Input-Output Models and Benefit-Cost Analysis in Water Resources Research." Journal of Farm Economics 47(5): 1572-1579, 1965.

The use of input-output models in combination with benefit-cost analysis in water resources research is discussed. Interindustry models can reveal relationships that occur as a result of water resource development that are not obvious using benefit-cost analysis.

659. STOEVENER, H. H. "Water Use Relationships as Affected by Water Quality on the Yaquina Bay." Western Resources Conference's New Horizons for Resources Research: Issues and Methodology. Boulder: University of Colorado, pp. 87-99, 1964.

660. SWEET, D. C. The Economic and Social Importance of Estuaries. Washington, D.C.: Environmental Protection Agency, Water Quality Office, v + 61 pages, and appendicies (609 pages), 1971. (EP2.19:2)

One of several concurrent efforts to assemble information for the Department of Interior's study of the United States Estuarine Zone. The literature and state of the art in describing the economic and social importance of these estuaries is examined. The main report is a summary of seven appendices analyzing the following social and economic activities: (1) recreation, (2) commercial fishing, (3) wildlife habitation, (4) extractive industries, (5) waste assimilation, (6) land reclamation, and (7) transportation. Additional appendices were prepared on: the Chesapeake Bay region, the use of cost-benefit analysis in estuarine economic research, and an annotated bibliography of estuarine economics literature. The bibliography contains 468 annotated entries, many of which are applicable to wildlife and wetlands economics. The report is based primarily on published source material.

661. TADROS, Mahfouz E. and Robert J. Kalter. "Spatial Allocation for Projected Water Based Recreation Demand." Water Resources Research 7(4):798-811, August 1971.

The authors present a model designed to distribute spatial recreation use estimates derived from "structural demand" equations of a recreation market. To illustrate the model's operation, a description of its empirical implementation for a regional case study area is given. Data needs and sources are specified, empirical results are set forth, and policy implications are drawn. The ability to use the model to simulate policy actions is discussed.

662. TIHANSKY, Dennis P. "Recreational Welfare Losses from Water Pollution Along U.S. Coasts." Journal of Environmental Quality 3(4):335-342, 1974.

A conceptual methodology is developed to assess the benefits of beach cleanup. Recreation losses are only a portion of total damages attributable to contaminated marine waters. The willingness-to-pay concept was used to derive national estimates of coastal swimming losses. The total economic value of marine recreation was assessed, after which published damage estimates were surveyed and critiqued. A methodology was developed to estimate recreation losses along a typical shoreline, and economic losses for 1970 were calculated along all public beach areas of the continental U.S.

663. TOWELL, W. E. "Texas' 'String of Pearls'." American Forests 74(5):62-63, May 1968.

The author discusses the social values of the Big Thicket National Monument in Southeast Texas.

664. ULMAN, Edward L. "A Measure of Water Recreation Benefits: The Meramec Basin Example." Water Resouces Management for the Needs of an Expanding Society, Seattle: University of Washington Department of Civil Engineering, 1964.

665. U.S. Environmental Protection Agency. The Economics of Clean Water - 1973. Washington, D.C.: U.S. Environmental Protection Agency, 120 pages, December 1973. (EP2.14:973)

The sixth chapter of this report covers benefit analysis of pollution control. Water related recreation is discussed in this chapter which also includes an extensive bibliography.

666. U.S. Water Resources Council. "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources." Water Resources Project Economics, E. Kuiper, editor. London: Butterworths, pp. 404-417, 1971.

Guidelines that are to be used in assessing recreation and fish and wildlife benefits in water and related land resource development plans are described. "In the general absence of market prices, values for specific recreational activities may be derived or estimated on the basis of a simulated market giving weight to all pertinent considerations, including charges that recreationists should be willing to pay and to any actual charges being paid by users for comparable opportunities at other installations or on the basis of justifiable alternative costs."

667. _____. "Water and Related Land Resources, Establishment of Principles and Standards for Planning." Federal Register 38(174): 24803-24805, September 10, 1973.

A discussion of outdoor recreation related to water resources planning. The Clawson travel cost approach and willingness to pay approach are discussed. The value of a specialized recreation day (hunting and fishing activities) was estimated to be between $3 and $9. The monetary values applicable to fish and wildlife recreation would ordinarily be larger than those applied to other types of recreation.

668. WETZEL, J. N. "Evaluation of Recreational Benefits Accruing to Recreators on Federal Water Projects--A Review Article: A Comment." American Economics 18(2):129, Fall 1974.

669. WOLLMAN, Nathaniel, et al. The Value of Water in Alternative Uses. Albuquerque: University of New Mexico Press, 1962.

A study of water use patterns and their effects on the development of a drainage basin. Eight different schemes for water use, based on varying degrees of agricultural, industrial, domestic, and recreational use were analyzed with respect to the optimum economic benefits that could be obtained.

670. YOUNG, R. A. and S. L. Gray. The Economic Value of Water: Concepts and Empirical Estimates. Fort Collins: Final Report to the National Water Commission, Colorado State University Department of Economics, August 1972.

VIII. Bibliographies

671. ARTHUR, Louise M. and Ron S. Boster. Washington, D.C.: Measuring Scenic Beauty: A Selected Annotated Bibliography. Fort Collins, Colorado: U.S. Forest Service General Technical Report RM-25, 34 pages, May 1976. (A13.88:RM-25)

Citations covering 167 papers on measuring scenic beauty are divided into four categories: literature reviews, inventory methods, public involvement, and miscellaneous. Methods described include both monetary and ordinal evaluation schemes.

672. Benefit-Cost Analysis for Water Resource Projects: A Selected Annotated Bibliography. Knoxville, Tennessee: Tennessee Valley Authority, October 1967.

The bibliography is divided into six major subject categories: basic works, flood control, navigation, pollution control, recreation, and land value enhancement. Within each subject category the abstracts are placed under the following headings: definition, forecasting demand, benefit measurement and/or cost determination, evaluation techniques, and decision criteria.

673. Bureau of Outdoor Recreation. Index of Selected Outdoor Recreation Literature. Volumes I - IV. Washington, D.C.: U.S. Department of the Interior, (approx. 200 pages each), 1967, 1968, 1969. (I66.15:L7/v.__)

These indexes reference articles, books, dissertations, directories, conference proceedings, documents, reports, speeches, and bibliographies dealing with outdoor recreation and environmental quality. The first three volumes contain abstracts of citations, but in volume four, items are described only by keywords. References are indexed by subject, name, and geographic area.

674. COCHRAN, Anita. A Selected, Annotated Bibliography on Fish and Wildlife Implications of Missouri Basin Water Allocation. Boulder: University of Colorado Institute of Behavioral Science, 71 pages, 1975.

Prepared as part of a research assessment of the implications to fish and wildlife resources of changes in water allocation to serve energy and other developments in the Upper Missouri River Basin. The bibliography contains a list of 62 bibliographies and other secondary reference materials. It also lists and describes 100 publications on the social and economic effects of energy development, rehabilitation of mined land and disposal of wastes, questions of water supply and demand, studies that deal with energy development in a comprehensive manner, and alternative energy policy studies. Most of the references to fish and wildlife resources reflect biological considerations.

675. CROOK, Charles B., compiler. Drainage of Agricultural Land: An Annotated Bibliography of Selected References, 1956-1964. Washington, D.C.: U.S. Department of Agriculture, Agricultural Research Service, 524 pages, July 1968.

The history, economics, needs, designs, applications, use, and problems of drainage are covered in this bibliography with 5,186 entries. Items 5,037-5,092 are concerned with wildlife aspects of drainage.

676. European Centre for Leisure and Education. Annotated Bibliography on Leisure: German Democratic Republic (1960-1971). Prague, 1972.

677. GUILLAUME, Marilynn G. An Annotated Bibliography of Bibliographies in English on Leisure Recreation, Parks and Related Topics and an Analysis of Bibliographic Control. Urbana: University of Illinois, M.S. thesis, 190 pages, 1967.

The general inadequacy of bibliographic control as related to the field of recreation is analyzed. Several recommendations are made to correct this shortcoming.

678. HALL, Linda C. Bibliography of Freshwater Wetlands Ecology and Management. Madison: Wisconsin Department of Natural Resources Report No. 33, 222 pages, 1968.

679. HAMILTON, H. R. et al. Bibliography on Socioeconomic Aspects of Water Resources. Washington, D.C.: U.S. Department of the Interior Office of Water Resources Research, xii + 453 pages, March 1, 1966. (I1.89:W29)

An annotated bibliography of 770 entries published between 1955 and 1965 dealing with socioeconomic aspects of water resources including methods of determining economic values of sport fisheries, wildlife, and other aquatic outdoor recreation resources. An author and subject index are provided.

680. JOHNSON, Hugh A. Outdoor Recreation: Publications and Articles by the Economic Research Service, 1962-1969. Washington, D.C.: U.S. Department of Agricuture Economic Research Service, 10 pages, 1970. (A93.21:442)

A compilation of articles, reports, and speeches on outdoor recreation in the United States by personnel of the Economic Research Service, USDA, that were published separately or in proceedings, journals, congressional documents, and other usually retrievable forms during 1962-1969. In general, the material discusses outdoor recreation from the point of view of economics and covers a wide range of ERS resource-management concerns.

681. KIPP, P. R. Annotated Bibliography on the Economic Evaluation of Outdoor Recreation and Related Subjects. Washington, D.C.: U.S. Department of the Interior, 1958.

682. MCCOOL, Stephen F. Outdoor Recreation, an Index to the Literature in the Publications of Society of American Foresters, 1902-1967. St. Paul: University of Minnesota School of Forestry, 32 pages, 1968.

A bibliography of the literature on outdoor recreation that appeared in publications of the Society of American Foresters from 1902 to 1967.

683. MORRISON, Denton E., Kenneth E. Hornback, and Keith W. Warner. Environment: A Bibliography of Social Sciences and Related Literature. East Lansing: Michigan State University, 870 pages, February 1974.

A comprehensive bibliography containing nearly 5,000 items covering literature related to the fields of anthropology, communications, economics, education, design, geography, history, human ecology, landscape architecture, management, planning, politics, and social psychology and sociology.

684. NAPIER, Ted L., Dean Yoesting, and Joseph O'Leary. Bibliography of Outdoor Recreation and Leisure: A Decade of Research. Columbus: Ohio State University, North Central Research Strategy Committee on Natural Resource Development, 66 pages, 1975.

Most references in this bibliography deal with outdoor recreation in general while several are concerned with fish and wildlife resources.

685. POTTER, Dale R., Kathryn M. Sharpe, and John C. Hendee. Human Behavior Aspects of Fish and Wildlife Conservation: An Annotated Bibliography. Portland, Oregon: USDA Forest Service General Technical Report PNW-4, 288 pages, 1973.

This bibliography covers nonbiological aspects of fish and wildlife conservation including sportsman characteristics, safety, law enforcement, professional and sportsman education, nonconsumptive uses, economics, and history. There are 995 references.

686. POTTER, Dale R., et al. Questionnaires for Research--An Annotated Bibliography on Design, Construction, and Use. Portland, Oregon: U.S. Forest Service Research Paper PNW-140, 80 pages, 1972.

An annotated bibliography that includes an evaluation by the authors of 193 references related to the design, construction, and use of mail questionnaires.

687. ROSENTHAL, Elaine P. "Outdoor Recreation: A Bibliography." Journal of *Soil* and Water Conservation 18(2):73-76, March 1963.

References to materials published from 1960 to 1962 are included in this partial bibliography of outdoor recreation.

688. SCULL, Roberta A. A Bibliography of United States Government Bibliographies 1968-1973. Ann Arbor, Michigan: Pierian Press, 353 pages, 1975.

Contains a section on recreation and leisure and another on wildlife.

689. U.S. Department of the Interior, Bureau of Outdoor Recreation. Outdoor Recreation Research Register. Washington, D.C.: annual since 1968.

Active or recently completed research projects regarding outdoor recreation are listed and described. The title varies somewhat for different years.

690. U.S. Forest Service, U.S. Department of Agriculture. Bibliography of Forest Service Outdoor Recreation Research Publications, 1942-1966. Washington, D.C., 1967.

Publications are listed by author. Addresses for obtaining the publications listed are given. There have been seven annual supplements since this publication.

691. VAN DER SMISSEN, Betty and Donald V. Joyce. Bibliography of Theses and Disertations in Recreation, Parks, Camping, and Outdoor Recreation. Washington, D.C.: National Recreation and Park Association, 555 pages, 1970.

A partially annotated bibliography with subject index.

AUTHOR INDEX