

# **Nancy Elaine Bockstael**

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Department of Agricultural and Resource Economics  
3200A Symons Hall  
University of Maryland  
College Park, Maryland 20742

## **Education**

Ph.D. - 1976, University of Rhode Island: Resource Economics

M.A. - 1973, Brown University: Economics (advanced to Ph.D. candidacy)

B.A. - 1971, Connecticut College: Economics (with honors, Summa Cum Laude)

## **Employment**

Assistant Professor, Department of Resource Economics, University of Rhode Island, Kingston, Rhode Island, with joint appointment in Department of Economics. December 1976 to August 1980

Assistant Professor, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland. August 1980 to July 1984

Associate Professor, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland. August 1984 to July 1988

Associate Dean for Research, Office of Graduate Studies and Research, University of Maryland, College Park, Maryland. August 1987 to August 1990

Professor, Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland. August 1988 to present

## **Honors and Awards**

National Merit Scholar, National Merit Finalist, 1967.

Phi Beta Kappa and Winthrop Scholar, Connecticut College for Women, 1970.

National Science Foundation Fellow, 1971-1974.

Outstanding Doctoral Dissertation Award, American Agricultural Economics Assoc., 1977.

Award for Excellence in Teaching/Advising, College of Agriculture and Life Sciences, University of Maryland, 1987.

Teaching Award of Merit, National Association of Colleges and Teachers of Agriculture, 1987.

Agricultural and Natural Resources College Alumni Award for Teaching, 2000.

Agricultural and Natural Resources College Alumni Award for Research, 2003.

Frederick V. Waugh Memorial Lecture, American Agricultural Economics Association, 1996.

Fellow, American Agricultural Economics Association, 2000.

### **Professional Activities**

Science Advisory Board, Economics SubCommittee, Environmental Protection Agency, 1992-2000.

President, Association of Environmental and Resource Economists, 1999 and 2000.

Editorial board of Journal of Marine Resource Economics, 1984-1990.

Associate Editor of Journal of Environmental Economics and Management, 1987-1988.

Editorial Board of Environment and Development Economics, 1994- present.

Editorial Council of Journal of Environmental Economics and Management, 1991-1993, 1995-2000.

Editorial Board of Land Economics, 1997-present.

Editorial Board, The International Yearbook of Environmental and Resource Economics, 2004-.

Steering Committee, Land Use-Land Cover Change Project of the International Geosphere-Biosphere Programme and the Human Dimensions of Global Environmental Change Programme. 1998 – 1999.

Review Team of the Nicholas School of the Environment, Duke University, 2000.

Invited Participant, National Center for Geographical and Information Systems, UC Santa Barbara, CA, 1998, 2000.

Invited Participant, National Center for Ecological Analysis and Systems, UC Santa Barbara, CA, 1999.

Member of Fellows Selection Committee, American Agricultural Economics Association, 2000-2003.

Invited Member of the Environmental Economics working group of the National Bureau of Economic Research, Cambridge, MA, 2002-2004 .

Invited Participant, Science Planning Group, DIVERSITAS (an international science program on biodiversity), Paris, 2003.

Visiting Faculty, University of Southern Denmark, Esbjerg, Denmark, June 2002. Taught short course in revealed preference methods in environmental valuation.

International Faculty, University of the Balearic Islands, Spain, 2005-present. Advise and teach intensive course in environmental valuation.

Expert Consultant, National Center for Environmental Economics, U.S. Environmental Protection Agency, 2006 -.

## **Reviewing Activities**

American Economic Review, Review of Economics and Statistics, Econometrica, Southern Economic Journal, American Journal of Agricultural Economics, Southern Journal of Agricultural Economics, Western Journal of Agricultural Economics, Northeast Journal of Agricultural and Resource Economics, Journal of Environmental Economics and Management, Land Economics, Journal of Economic Geography, Resource and Energy Economics, Journal of Urban Economics, Management Science, American Fisheries Society, Journal of Marine Resource Economics, Leisure Sciences, Ambio, Human Organization, Water Resources Research, Geographical Analysis, Environment and Development Economics.

Reviewer for National Science Foundation, Swiss National Science Foundation, University of Geneva, US Environmental Protection Agency, National Sea Grant College programs, National Center for Water Quality, and Resources for the Future.

## **Articles in Refereed Journals**

Bockstael, N. E. “Seafood Processing Capacity in Commercial Fisheries Management.” *American Journal of Agricultural Economics*, 60 (December 1978), 1026-1027.

Bockstael, N. E. and K. E. McConnell. “Calculating Equivalent and Compensating Variation for Natural Resource Facilities.” *Land Economics* 56 (February 1980), 56-63.

Bockstael, N. E. and K. E. McConnell. “Measuring the Worth of Natural Resource Facilities.” *Land Economics* 56 (November 1980), 487-490. (Reply)

Bockstael, N. E. and K. E. McConnell. “Theory and Estimation of the Household Production Function for Wildlife Recreation.” *Journal of Environmental Economics and Management* 8 (September 1981), 199-214.

Bockstael, N. E. and J. J. Opaluch. “Discrete Modelling of Behavioral Response Under Uncertainty: The Case of the Fishery.” *Journal of Environmental Economics and Management* 10 (June 1983), 125-137.

Bockstael, N. E. and K. E. McConnell. “Welfare Measurement in the Household Production Function Framework.” *American Economic Review* 73 (September 1983), 806-814.

Opaluch, J. J. and N. E. Bockstael. “Behavioral Modelling and Fisheries Management.” *Journal of Marine Resource Economics* 1 (January 1984), 105-115.

Bockstael, N. E. “Uncertainty About Consumption and Consumer Uncertainty.” *Journal of Marine Resource Economics*, 1 (January 1984), 67-76.

- Bockstael, N. E. "The Welfare Implications of Minimum Quality Standards." *American Journal of Agricultural Economics*, 66 (November 1984), 466-471.
- Bockstael, N. E. "Valuing Natural Resource and Environmental Amenities: Can Economic Valuation Be Made More Defensible?" *Northeast Journal of Agricultural and Resource Economics*, 13 (October 1984), 129-137.
- McConnell, K. E. and N. E. Bockstael. "Aggregation in Recreational Economics: Issues of Estimation and Benefit Measurement." *Northeast Journal of Agricultural and Resource Economics*, 13 (October 1984), 181-186.
- Bockstael, N. E. and I. E. Strand. "Distributional Issues and Nonmarket Benefit Measurement." *Western Journal of Agricultural Economics*, 10 (December 1985), 162-169.
- Bockstael, N. E. and I. E. Strand. "The Effect of Common Sources of Regression Error on Benefit Estimates." *Land Economics*, 63 (February 1987), 11-20.
- Bockstael, N. E., W. M. Hanemann and C. L. Kling. "Modelling Recreational Demand in a Multiple Site Framework." *Water Resources Research*, 23 (May 1987), 951-960.
- Bockstael, N. E.; I. E. Strand; and W. M. Hanemann. "Time and the Recreational Demand Model." *American Journal of Agricultural Economics*, 69 (May 1987), 293-302.
- Bockstael, N. E. and C. L. Kling. "Valuing Environmental Quality Changes When Quality is a Weak Complement to a Set of Goods." *American Journal of Agricultural Economics* 70 (August 1988), 654-662.
- Bockstael, N. E., K. E. McConnell, and I. E. Strand. "Measuring the Benefits of Improvements in Water Quality: the Chesapeake Bay." *Journal of Marine Resource Economics* 6 (1989), 1-18.
- Bockstael, N. E., I. E. Strand, K. E. McConnell, and F. Arsanjani. "Sample Selection Bias in the Estimation of Recreation Demand Functions: An Adaptation to Sportfishing." *Land Economics* 69 (February 1990).
- Bockstael, N. E., K. E. McConnell, and I. E. Strand. "A Random Utility Model for Sportfishing: Some Preliminary Results for Florida." *Journal of Marine Resource Economics*, 6 (1990), 245-250.
- Strand, I. E., N. E. Bockstael, and R. Siegel. "Trade, Institutions, and Preferences for Living Marine Resources." *American Journal of Agricultural Economics*, (December 1992).
- Bockstael, N. E., I.E. Strand and D. W. Lipton. "Pulsed Generic Advertising: The Case of Common Property." *Marine Resource Economics*, 7(1992), 189-207.

- Bockstael, N. E. and K. E. McConnell. "Public Goods as Characteristics of Non-Marketed Commodities." *Economic Journal*, September, 1993.
- Barbier, E. B. Bockstael, N., Burgess, J.C. and Strand, I. "The Linkages Between the Timber Trade and Tropical Deforestation - Indonesia", *World Economy*, December 1994.
- Bockstael, N.E., W. Boynton, R. Costanza, I. Strand, and K. Bell. "Ecological Economic Modelling and Valuation of Ecosystems." *Ecological Economics*, 14 (1995), p. 143-159.
- Bockstael, N.E. "Economics and Ecological Modeling: The Importance of a Spatial Perspective". *American Journal of Agricultural Economics*, December, 1996, pp 1168-1180.
- Geoghegan, J., Wainger, L. and N. Bockstael. "Spatial Landscape Indices in a Hedonic Framework: An Ecological Economics Analysis Using GIS", *Ecological Economics*, 22(3),1997.
- Bockstael, N. "The Use of Random Utility Models in Modeling Rural Health Care Demand: Discussion." *American Journal of Agricultural Economics*, Vol 81, No. 3 August 1999, pp..
- Bockstael, N. "Valuing the Benefits of Microbial Food Safety Risk Reduction: Discussion". *American Journal of Agricultural Economics*, Vol 81, No. 5, 1999, pp 1200-1204.
- Bell, K. and N. Bockstael. "Applying the Generalized Moments Estimation Approach to Spatial Problems Involving Micro-Level Data", *Review of Economics and Statistics*, Vol 82, 2000, pp 72-82.
- Leggett, C. and N. Bockstael. "Evidence of Effects of Water Quality on Residential Land Prices", *J. of Environmental Economics and Management*, March, 2000.
- Bockstael, N., A. Freeman, R. Kopp, P. Portney, and V.K. Smith. "On Valuing Nature". *Journal of Environmental Science and Technology*, (the journal of the American Chemical Society), Vol. 34, No. 8, 2000, pp 1384-1389.
- Teisl, M., N. Bockstael and A Levy. "Measuring the Welfare Effects of Nutrition Information." *American Journal of Agricultural Economics*, Vol 83, No. 1, Feb. 2001, pp 133-149.
- Irwin, E. and N. Bockstael, "The Problem of Identifying Land Use Spillovers: Measuring the Effects of Open Space on Residential Property Values". *American Journal of Agricultural Economics*, 83(3) August, 2001. (This is the proceedings issue).
- Irwin, E. and N. Bockstael. "Interacting Agents, Spatial Externalities and the Evolution of Land Use Change." *Journal of Economic Geography*, 2(1), January 2002: 31-54.
- Palmer, M., G. Moglen, N. Bockstael, S. Brooks, J. Pizzuto, C.Wiegand, and R.VanNess. "The Ecological Consequences of Changing Land Use for Running Waters with a Case Study of

Urbanizing Watersheds in Maryland”, in *Yale Bulletin of Environmental Sciences*, Bulletin 107, 2002, pp 85-113. [www.yale.edu/environment/publications/bulletin/107pdfs/107Palmer.pdf](http://www.yale.edu/environment/publications/bulletin/107pdfs/107Palmer.pdf)

Bockstael, N. and E. Irwin. ”Public Policy and the Changing Landscape”, *Estuaries*, Vol 26(2A), 2003, pp 210-225.

Nilsson, C. J. Pizzuto, G. Moglen, M. Palmer, E. Stanley, N. Bockstael, and L. Thompson, “Ecological Forecasting and Running-Water Systems: Challenges for Economists, Spatial Analysts, Hydrologists, Geomorphologists, and Ecologists”, *Ecosystems*, Vol 6, 2003, pp 659-674.

Irwin, E. and N. Bockstael, “Land Use Externalities, Open Space Preservation, and Urban Sprawl,” *Regional Science and Urban Economics*, vol 34(6), Nov 2004.

Towe, C., Nickerson, C. and Bockstael, N. “An Empirical Examination of the Timing of Land Conversion in the Presence of Farmland Preservation Programs”, forthcoming *American Journal of Agricultural Economics*.

Irwin, E. and N. Bockstael. ‘The Evolution of Urban Sprawl: Evidence of Spatial Heterogeneity and Increasing Land Fragmentation’, *Proceedings of the National Academy of Sciences*, December 19, 2007.

### **Papers in Progress:**

Towe, C. and N. Bockstael. “Testing the Effect of Neighboring Open Space on Development using a Real Options Model”

### **Books and Chapters in Books and Compendiums**

Bockstael, N. E. “Commercial Fisheries Management: The New England Groundfish Experience.” Proceedings of the International Symposium on Fishery Resource Allocation. Vichy, France, April 1980.

Bockstael, N. E. “Disequilibrium and Seafood Trade Modelling.” Proceedings of the International Seafood Trade Conference. Alaska Sea Grant Report 83-2 (January 1983), 447-460.

Strand, I. E., N. E. Bockstael, and C. L. Kling. “Chesapeake Bay Water Quality and Public Beach Use in Maryland.” Proceedings of Second Annual Conference on Economics of Chesapeake Bay Management. Annapolis, MD, 1986.

McConnell, K. E., N. E. Bockstael, I. E. Strand and B. Madariaga. “Recreational Boating and the Benefits of Improved Water Quality.” Proceedings of Second Annual Conference on Economics of Chesapeake Bay Management. Annapolis, MD, 1986.

- Bockstael, N. E. “Economic Efficiency Issues of Grades and Minimum Quality Standards” in Economic Efficiency in Agricultural and Food Marketing, ed. W. Armbruster, Iowa State Press, 1987.
- McConnell, K. E., I. E. Strand, and N. E. Bockstael. “Habit Formation and the Demand for Recreation” in Advances in Applied Microeconomics, ed. V. K. Smith, vol. 5. Greenwich, Conn: Jai Press, 1990.
- Bockstael, N. E., K. E. McConnell, and I. E. Strand. “Methods for Valuing Classes of Benefits: Recreation” in Measuring the Demand for Environmental Commodities, eds. J. Braden and C. Kolstad, North Holland Press, 1991.
- Just, R. E. and N. E. Bockstael (editors). Commodity and Resource Policies in Agricultural Systems, Springer Verlag, 1991.
- Just, R. E., N. E. Bockstael, R. G. Cummings, J. A. Miranowski, and D. Zilberman. “An Overview of the Interface of Agricultural and Resource Policy Problems Confronting the Joint Formulation of Agricultural and Resource Policies” in Commodity and Resource Policies in Agricultural Systems, eds. R. E. Just and N. E. Bockstael. Springer Verlag, 1991.
- Strand, I. E. and N. E. Bockstael. “Interaction Between Agriculture and Fisheries: Policy Implications and Empirical Evidence” in Commodity and Resource Policies in Agricultural Systems, eds. R. E. Just and N. E. Bockstael. Springer Verlag, 1991.
- Bockstael, N.E. and I.E. Strand. “Environmental Valuation and the American Experience” in Identification and Valuation of Public Benefits from Farming and Countryside Stewardship, eds. A. Dubgaard, I. Bateman, and M. Merlo. Proceedings of a Workshop Organized by The Agricultural Research Programme, Directorate General for Agriculture, Commission of the European Communities, June 1993.
- Bockstael, N.E., R.E. Just, and M.L. Teisl. “Food Safety and Inspection: An Overview,” in Re-Engineering Marketing Policies for Food and Agriculture, ed D. Padberg. Proceedings of the Food and Agricultural Marketing Consortium, Alexandria, VA, January, 1994.
- Bockstael, N.E. “Economic Concepts and Issues: The Social Benefits and Costs of Beach Nourishment Projects”, Beach Nourishment and Protection, National Academy of Sciences, 1995.
- Costanza, R., L. Wainger, and N. Bockstael. “Integrated Ecological and Economic Systems Modeling: Theoretical Issues and Practical Applications,” in Integrating Economics and Ecological Indicators, ed. W. Milan and J. Shogren. Westport, Conn: Praeger Publishing, 1995.
- Bockstael, N. E. “Travel Cost Methods” in Handbook of Environmental Economics, ed. D. Bromley. Oxford: Basil Blackwell, 1995.

- Reyes, E., R. Costanza, L. Wainger, E. Debellevue and N. Bockstael. "Integrated Ecological Economics Regional Modeling for Sustainable Development," in Models of Sustainable Development, eds. Faucheux, Pearce, and Proops. Edward Elgar, 1996.
- Costanza, R., L. Wainger, and N. Bockstael. "Integrating Spatially Explicit Ecological and Economic Models: Theory and Application in the Patuxent River Watershed," in Getting Down to Earth: Practical Applications of Ecological Economics. International Society for Ecological Economics, 1996.
- Geoghegan, J., N. Bockstael, K. Bell, and E. Irwin. "An Ecological Economics Model of the Patuxent Watershed: The Use of GIS and Spatial Econometrics in Prediction". In Geographic Information Systems in Environmental Resources Management: Proceedings of a Specialty Conference Sponsored by the Air and Waste Management Association. Reno, NV, March, 1996.
- Geoghegan, J., N. Bockstael, and D. Lipton. "The Economics of Land-Use Change." Land Use and Management in Maryland. Brown and Buniski (eds). March, 1996.
- Geoghegan, J. and N. Bockstael. Human Behavior and Ecosystem Valuation: An Application to the Patuxent Watershed of the Chesapeake Bay." In Ecosystem Function and Human Activities: Reconciling Economics and Ecology. Simpson and Christensen (eds.), 1997.
- Bockstael, N. and K. Bell. "Land Use Patterns and Water Quality: The Effect of Differential Land Management Controls". In International Water and Resource Economics Consortium, Conflict and Cooperation on Trans-Boundary Water Resources, Richard Just and Sinaia Netanyahu, editors. Kluwer Publishing, 1997.
- Bockstael, N. and K. E. McConnell. "The Behavioral Basis of Non-Market Valuation." In Herriges and Kling (ed), Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practice. Edward Elgar Press. 1999.
- Bockstael, Nancy and Elena Irwin, "Economics and the Land Use-Environment Link", The International Yearbook of Environmental and Resource Economics 2000/2001, Thomas Tietenberg and Henk Folmer, editors, Kluwer Publishing, 2000 (Edward Elgar, Cheltenham, UK), pp. 1-54.
- Irwin, Elena and Nancy E. Bockstael. "Interacting Agents, Spatial Externalities and the Evolution of Residential Land Use Pattern," Western Regional Research Publication. W-133 Benefits and Costs of Resource Policies Affecting Public and Private Land, 13th Interim Report, June 2000.
- Irwin, Elena and Nancy Bockstael, "Endogenous Spatial Externalities: Empirical Evidence and Implications for Exurban Residential Land Use Patterns." *Advances in Spatial Econometrics, Methodology, Tools and Applications*. L. Anselin, R. Florax and S. Rey (eds.) Springer Publishing, 2004, pg 359-380.



Bockstael, N and A. M. Freeman, "The Theory of Environmental Valuation." Chapter 5 in Handbook of Environmental Economics, K-G. Maler and J. Vincent (eds), 2005.

McConnell, K. and N. Bockstael, "The Environment as an Input in Production." Chapter 9 in Handbook of Environmental Economics, K-G. Maler and J. Vincent (eds), 2005.

Irwin, Elena G. and Nancy E. Bockstael (2003). "'Interacting Agents, Spatial Externalities, and the Endogenous Evolution of Residential Land Use Pattern.'" (Reprinted with permission). In Economics of Land Use, International Library of Environmental Economics and Policy, P.J. Parks and I.W. Hardie, eds. Aldershot: Ashgate Publishing Limited.

Irwin, E. and N. Bockstael "Patterns of Urban Land Use", in *A Companion to Urban Economics*, edited by Richard Arnott and Daniel McMillen, Blackwell Publishing, 2006.

Bockstael, N. Preface' in *Economics and Contemporary Land Use Policy: Development and Conservation at the Rural-Urban Fringe*, (eds) Robert J. Johnston and Stephen K. Swallow, Resources for the Future, Washington, D.C., 2006.

Bockstael, N. and K.E. McConnell, *Environmental and Resource Valuation with Revealed Preferences*, Springer Publishing, 2006.

## **Bulletins and Reports**

Davis, J.; N. Theberge; M. Strand; N. Bockstael; J. Gates. Alternative Management Schemes for the Surf Clam Fishery. Special Report in Applied Marine Science and Ocean Engineering No. 103, Virginia Institute of Marine Science, June 1977.

Bockstael, N. E. A Market Model for the New England Groundfish Industry. Department of Resource Economics, University of Rhode Island Agricultural Experiment Station Bulletin 422, July 1977.

Bockstael, N. E. "The Crisis in the Fishing Industry." Maritimes. Graduate School of Oceanography, University of Rhode Island, Narragansett, Rhode Island, August 1980.

Bockstael, N. E. "The Valuation of Alaskan Wildlife Resources." Report to the Alaskan Department of Fish and Game, August 1982.

Bockstael, N. E. and I. E. Strand, and A. Graefe. Economic Valuation of Artificial Reefs: An Assessment of Issues and Methods. Sportfishing Institute, Washington, D.C., Technical Report #5, 1985.

Bockstael, N. E., W. M. Hanemann and I. E. Strand. Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models. Environmental Protection Agency Cooperative Agreement CR-811043-01-0, 1987.

- Bockstael, N. E. and I. E. Strand. Economic Valuation of Artificial Reefs: A Case Study of South Carolina. Sportfishing Institute, Washington, D.C., 1986.
- Bockstael, N. E., I. E. Strand, A. Graefe and L. Caldwell. Economic Analysis of Artificial Reefs: A Pilot Study of Selected Valuation Methodologies. Sportfishing Institute, Washington, D.C., Technical Report No. 6, 1986.
- Arndorfer, D. J. and N. E. Bockstael. Estimating the Effects of King Mackerel Bag Limits on Charter Boat Captains and Anglers. Prepared for National Marine Fisheries Service, Miami, Florida, 1986.
- Hojjati, B. and N. E. Bockstael. "Modelling the Demand for Crop Insurance," in Risk Analysis in Agricultural Production. Oklahoma State University, 1987.
- Bockstael, N. E., K. E. McConnell, and I. E. Strand. Benefits from Improvements in Chesapeake Bay Water Quality. Environmental Protection Agency Cooperative Agreement CR-811043-01-0, March 1987.
- Bockstael, N. E., K. E. McConnell, and I. E. Strand. Marine Recreational Fishing in the Middle and South Atlantic: A Descriptive Study. Report on Cooperative Agreement #CR-811043-01-0, Environmental Protection Agency, National Marine Fisheries Service, and National Oceanic and Atmospheric Administration. 1991.
- Bockstael, N. E., I. E. Strand, and E. Lavan. Food from the Sea and Environmental Policy. Report for the National Fisheries Institute and the Japan Fisheries Association, 1991.
- Barbier, E., N.E. Bockstael, J. Burgess and I. Strand. "Timber Trade and Tropical Deforestation - Indonesia" in The Economic Linkages between the International Trade in Tropical Timber and the Sustainable Management of Tropical Forests. Report to the International Tropical Timber Organization. London Environmental Economics Centre, United Kingdom. 1992.
- Bockstael, N.E. and I.E. Strand. Free Trade and Global Resources: The Case of Protected Marine Species. Paper for United Nations Economic Commission for Latin America and the Caribbean, 1993.
- Lipton, D. and N. E. Bockstael. "Maryland Land Use: Assessing Policy Outcomes with Economics." *Economic Viewpoints*. Department of Agricultural and Resource Economics, U. Maryland. Fall 1997.
- Kirkley, J. E., N. E. Bockstael, K. E. McConnell and I. E. Strand, "The Economic Value of Saltwater Angling in Virginia," Virginia Marine Resource Report No 99-2 VSG-99-02. January 1999.

## **Presentations at Professional Meetings**

“Hedonic Pricing: A Discussion.” Eastern Economic Association Meetings, Boston, MA, May 1979.

“Discrete Choice Models of Investment Decisions.” Northeastern Agricultural Economics Association Meetings, Catonsville, MD, June 1981.

“The Welfare Implications of Minimum Quality Standards - A Market Distortion or Pareto Improvement?” Eastern Economics Association Meetings, Washington, D.C., July 1982.

“Measuring the Benefits of Hazardous Waste: A Discussion,” Southern Economics Association, Washington, D.C., November 1983.

“Random Disturbance in Recreation Demand and Its Influence on Welfare Measures,” with I.E. Strand. American Fisheries Society Annual Meeting, Cornell University, August 1984.

“Environmental Monitoring and the Choice of Regulatory Instruments: A Discussion.” American Economic Association Meetings, Dallas, TX, December 1984.

“The Viability of Aquaculture in the Presence of Capture Fisheries,” with L. E. Erickson and I. E. Strand. Eastern Economic Association Meetings, Pittsburgh, PA, March 1985.

“Issues in the Use of the Travel Cost Model,” with C. L. Kling and I. E. Strand. American Economic Association Meetings, New York, December 1985.

“The Role of Sportfishing Benefit Estimates in Fishery Management,” with I. E. Strand. American Fisheries Society Meetings, Providence, RI, 1986.

“Methods for Wildlife Valuation.” American Agricultural Economics Association Meetings, Reno, NV, 1986.

“Willingness to Pay for Improvements in Chesapeake Bay Water Quality: A Synopsis,” with I. E. Strand, K. E. McConnell, and D. Larson. Chesapeake Bay Management Conference III, Annapolis, MD, 1987.

“Measuring Benefits Associated with Changes in Environmental Quality,” with K. E. McConnell and I. E. Strand. Association for Public Policy Analysis and Management, Bethesda, MD, October 1987.

“Sample Selection Bias and Its Effect on Sportfishing Benefit Estimate,” with I. E. Strand and F. Arsanjani. Annual Conference of Operations Research Society of America, St. Louis, MO, October 1987.

“A Comparison of Alternative Demand Models for Valuation of Water Quality Improvements,” with I. E. Strand. Eastern Economics Association Meeting, Boston, Mass, March, 1988.

- “A Random Utility Model for the Middle and South Atlantic Sport Fishing: Preliminary Results,” with K. E. McConnell and I. E. Strand. Association for Environmental and Resource Economics Workshop on Marine Recreational Fishing, Seattle, Wash., June 1989.
- “Trade and the Management of Living Marine Resources,” with I. E. Strand. American Agricultural Economics Association, Baltimore, MD, 1992.
- “Some Issues Related to Ecological and Economic Modeling of Ecosystem Landscapes”, with J. Geoghegan. Invited paper, Association of Environmental and Resource Economists Workshop, Boulder, Co., June 1994.
- “Economic Analysis of Spatially Disaggregated Data: Explaining Land Values in a Regional Landscape”, with J. Geoghegan. Invited Paper, Allied Social Sciences Meetings, Washington, DC, January 1995.
- “Human Behavior and Ecosystem Valuation: An Application to the Patuxent Watershed of the Chesapeake Bay”, with J. Geoghegan. Paper presented at the Renewable Natural Resources Foundation Workshop on Human Activities and Ecosystem Function: Reconciling Economics and Ecology. Spring, 1995.
- “Spatial Landscape Indices in a Hedonic Framework: An Ecological Economics Analysis Using GIS”, with J. Geoghegan and L. Wainger. Presented at the American Agricultural Economics Association Meetings, Indianapolis, Indiana, August 1995.
- “Economics and Ecological Modeling: The Importance of a Spatial Perspective”. Waugh Lecture, American Agricultural Economics Association Meetings, San Antonio, TX, August 1996.
- “Spatial Economic Modeling: Land Use Conversion in Howard County, MD,” with K. Bell. Allied Social Sciences Association Meetings, New Orleans, LA. January, 1997.
- “A Spatially Explicit Econometric Model of Land Use Change: Suburbanization of the Patuxent Watershed, Maryland, USA.” Jacqueline Geoghegan and Nancy Bockstael. Presentation at The Earth's Changing Land. GCTE-LUCC Open Science Conference on Global Change, Barcelona, Spain, March 1998.
- “Interacting Agents, Spatial Externalities, and the Endogenous Evolution of Land Use Pattern.” Elena Irwin and Nancy Bockstael. Presentation at the National Bureau of Economics Research Summer Institute, Workshop on Public Policy and the Environment, Cambridge, MA, August, 1998.
- “Measuring the Welfare Effects of Nutrition Information.” Mario Teisl and Nancy Bockstael. Presentation at New Economic Approaches to Consumer Welfare and Nutrition. Proceedings of the Food and Agricultural Marketing Workshop, Alexandria, VA, January 1999.

“Interacting Agents, Spatial Externalities and the Evolution of Land Use Pattern”, Irwin, E. and N. Bockstael, Presentation at the 12<sup>th</sup> W-133 Research Meeting, Hawaii, February, 2000.

“Smart Growth and the Supply of Sprawl”, J. Geoghegan and N. Bockstael, paper presented at Association of Environmental and Resource Economists Annual Workshop: “Effectiveness of Resource and Environmental Regulation”, La Jolla CA, June 11-13, 2000.

Discussant, Workshop on Public Policy and the Environment, National Bureau of Economic Research, Summer Institute, August, 2000.

“The Problem of Identifying Land Use Spillovers: Measuring the Effects of Open Space on Residential Property Values”, Irwin, E. and N. Bockstael, presented at the 2001 Allied Social Sciences Association Meeting, New Orleans, January 5-7, 2001 as part of the AAEA selected paper session “Spatial Modeling in Environmental and Resource Economics.”

“Preservation or Development: Competing Uses over the Future of Farmland in Urbanizing Areas”, Nickerson, C. and N. Bockstael, presented at the American Agricultural Economics Association meetings, Atlanta, August, 2002.

“Farmland Preservation Programs: Implications for the Spatial Pattern of Preserved, Privately-Owned Farmland”, Nickerson, C. and N. Bockstael, presented at the Regional Science Association International Meetings, Charleston, SC, November 2001.

Irwin, E. and N. Bockstael, “Urban Sprawl as a Spatial Economic Process”. Paper presented at the World Congress of Environmental Economists, Monterey, CA, June 2002.

Irwin, E. and N. Bockstael, “Urban Sprawl as a Spatial Economic Process”. Paper presented at the Lincoln Land Institute Conference on Urban Sprawl, Boston, MA, July 2002.

Geoghegan, J. and N. Bockstael, “Testing for the Effect of Growth Control Measures Using Quasi-Experimental Design”, Paper presented at AERE Workshop, June 2003.

Towe, C., C. Nickerson, and N. Bockstael. “An Empirical Examination of Real Options and the Timing of Land Conversions”, Paper to be presented at the AAEA meetings, August 2005.

Towe, C. and N. Bockstael. “Testing the Effect of Neighboring Open Space on Development using a Real Options Model”, Workshop on The role of open space and green amenities in the residential decentralisation hosted by L’Institute National de la Recherche Agronomique (INRA) at Dijon, France, December 2005.

Goetz, S. C. Jantz, C. Towe, and N. Bockstael. ‘Modeling the Urbanization Process Across Maryland in the Context of Chesapeake Bay Restoration.’ Presented at Smart Growth @ 10: A Critical Examination of Maryland’s Landmark Land Use Program, College Park, MD, October 2007.

## **Invited Seminars**

- “Fisheries Management: Are We Asking the Right Questions?” Center for Ocean Management Studies Seminar Series, University of Rhode Island, November 1979.
- “Logit Analysis of Discrete Investment Decisions in Fisheries.” Oregon State University, Department of Agricultural and Resource Economics Seminar Series, December 1979.
- “Principal Types of Uncertainty in Fish Consumption.” Workshop on Uncertainty and Fisheries Economics, Kingston, RI, November 1981.
- “Positive and Normative Aspects of The Household Production Function.” Oregon State University, Department of Agricultural and Resource Economics Seminar Series, January 1982.
- “Measuring Non-Market Benefits - An Overview.” Department of Agricultural Economics, University of Alaska, Anchorage, Alaska. September 1982.
- “Conceptual Developments in Valuation of Non-Market Benefits Using Market Techniques.” Invited Scholar Series, University of Rhode Island, Kingston, Rhode Island, November 1983.
- “Household Production Theory and Economic Benefit Analysis.” Environmental Law Institute Seminar Series on Environmental Economic Benefit Analysis, Washington, D.C., December 1983.
- Keynote Speaker for Northeast Agricultural Economics Association, at joint meetings with American Agricultural Economics Association and Association of Environmental and Resource Economists, August 1984.
- “Recreational Demand Modelling and the Value of Time.” Department of Agricultural and Resource Economics, University of Wisconsin, Madison, Wisconsin. November 1984.
- “The Implications of Both Time and Money Constraints for Modelling Individual's Behavior.” Department of Economics, University of Washington, Seattle, Washington. November 1984.
- “The Use of Recreational Demand Models in Valuing Water Quality Changes.” Office of Cost Assessment Environmental Protection Agency. November 1984.
- “Advances in Recreational Demand Modelling for Non-Market Benefit Estimation.” Environmental Law Institute Seminar Series, March 1985.
- “Bias in the Estimation of Consumer Surplus Measures.” Department of Agricultural and Resource Economics, Texas A&M University, February 1985.

“Modelling Multiple Good Demand in the Presence of Corner Solutions.” Department of Agricultural and Resource Economics, University of California, Davis, May 1985.

“Welfare Measurement of Quality Changes: Theory and Methodology.” Department of Economics, Iowa State University, Ames, September 1986.

“The Welfare Economics of Quality Changes.” Department of Agricultural Economics, University of California, Davis, May 1987.

Conference Evaluation Speaker, Chesapeake Bay Conference III, Annapolis, MD, May 1987.

“Value of Improvements in Chesapeake Bay Water Quality.” Environmental Law Institute, Washington, DC, July 1987.

Learning Workshop, Empirical Issues in Environmental Economics, American Agricultural Economics Association, Vancouver, BC., August 1990.

“Environmental Issues in Agricultural in the U.S.”. The Danish Royal Veterinary and Agricultural College, Copenhagen, Denmark, June, 1991.

“Valuing Environmental Quality Improvements in the Chesapeake Bay.” Maryland Department of Natural Resources and EPA Regional Office, Annapolis, MD, 1991.

“Environmental Valuation from Oil Spills, the U.S. Experience.” The Danish Royal Veterinary and Agricultural College, Copenhagen, Denmark, June, 1992.

Environmental Valuation Workshops, NOAA, Dept of Commerce. November 1991 - Washington, D.C.; August, 1992 - U. New Hampshire; November, 1992 - Washington, D.C.

“Natural Resource Damage Assessment”, Southwest Fisheries Center, National Marine Fisheries Service, NOAA, Jan. 1993.

“Environmental Valuation Using Revealed Preference Methods.” Harvard University, Economics Department and Kennedy School Joint Seminar, March 1993.

“The Protection of Dolphins and the U.S. Tuna Market.” North Carolina State, Dept. of Agricultural Economics, April, 1993.

“Environmental Valuation in the U.S.: History and Applications to Policy”. Presentation to the Agricultural Research Programme, Directorate-General for Agriculture, Commission of the European Community, Brussels, Belgium. June 1993.

“Integrating Economics and Ecology Using a 'Landscape' Perspective”. Presentation at the Environmental Institute sponsored by Bowdoin College's Bicentennial Celebration, April 1994.

- “Environmental Valuation - an Overview”. Presentation at the The Royal Veterinary and Agricultural University, Copenhagen, Denmark, June 1995.
- “The Economic and Ecological Configuration of the Landscape: Some Ideas on Modeling and Valuation,” with J. Geoghegan. Presentation at the Workshop on Nonmarket Valuation of Rural Amenities, Skjoldenaesholm, Denmark, June 1995.
- “First Steps in Valuing an Ecological/Economic Landscape”, with J. Geoghegan. Presentation at the Joint European-American Conference on Non-Market Valuation, Oslo, Norway, June 1995.
- “Land Use Conversion Models and Their Link with Landscape Ecology Models.” Department of Environmental Economics and Environmental Management, University of York, United Kingdom, February, 1996.
- “Economic Modeling and Econometrics Practices When Using Spatial Data.” Week long course at University of Graz, Graz, Austria. March, 1996.
- “Land Use Conversion Models and Their Link with Landscape Ecology Models.” Beijer Institute, Royal Swedish Academy of Sciences, Stockholm, Sweden. June, 1996.
- “Ecological-Economics Modeling.” Swedish Agricultural University, Uppsala, Sweden. June, 1996.
- “Land Use Conversion and Spatial Modeling: Testing the Monocentric City Model”. Department of Economics, Georgia State University, Atlanta. February 1997.
- “Modeling Change in the Pattern of Land Use: A Discussion of Spatial Models and Models of Spatial Processes.” Symposium on Spatial Modeling in Economics. Duke University. May, 1997.
- “Integrating Economics and Ecosystems.” University of Wyoming, September 1999.
- “New Patterns of Land Use Change”. Forest Fragmentation Workshop, U. S. Forest Service, Annapolis, MD, November, 1999.
- “Changing Land Use Patterns”. COASTES Workshop, Maryland Academy of Natural Sciences, November 1999.
- “Interacting Agents and Spatial Externalities.” Economic Analysis for Land Use Policy Workshop, EPA, December, 1999.
- “Modeling Land Use Change in Maryland”, N. Bockstael. Presentation to MSGIC (Maryland State Geographical Information Consortium), July 2000.
- “Economics of Land Use: What Causes Land Use Patterns?” Paper presented at the Smart Growth Seminars, Department of Natural Resources, Maryland. April 19, 2001.



“From McFadden’s First Random Utility Model to Mixed Logits”. Seminar presented at AKF Research Institute, Copenhagen, Denmark, June 2002.

“The Role of Economics in The Spatial Patterning of Land Use Conversion: Linking Economics, Hydrology, and Ecology to evaluate the Effects of Alternative Future Growth Scenarios on Stream Ecosystems”, EPA sponsored, 2002.

“Land Use Change Modeling”, Department of Geography, University of Maryland, April, 2002.

“Valuing Access to National Parks in the U.S. Southwest Using Data on Multiple Destination Trips”, Department of Economics, University of the Balearic Islands, February, 2005.

“Land Preservation and the Value of Open Space”, Presentation sponsored by Sa Nostre Bank, Palma, Mallorca, February, 2005.

Irwin, E., N. Bockstael and H.J. Cho. “Measuring and Modeling Urban Sprawl: Data, Scale and Spatial Dependencies”, Invited paper prepared for the Urban Economics Sessions, 53rd Annual North American Regional Science Association Meetings of the Regional Science Association International, November 16-18, 2006, Toronto, Canada.

## **Contracts and Grants**

New England Regional Fisheries Management Council Contract. “Organization, Documentation, and Statistical Description of New England Fishing Firm Data.” Budget: \$12,000 (1978).

Sea Grant Project. “Analysis of Changes in Capital Stock in New England Fisheries.” Budget: \$59,000 (1978-1980).

Sea Grant and the State of Maryland, Department of Natural Resources. “Economics of Marketing of Maryland Oysters.” Budget: \$22,192 (1981-1982). Co-principal investigator: I. E. Strand.

Alaska Sea Grant. “Economic Aspects of the Allocation of Fishing Resources.” Budget: \$26,000 (1986-1989). Co-principal investigator: D. Larson.

Environmental Protection Agency Cooperative Agreement. “Benefit Analysis Using Indirect or Imputed Market Methods.” Budget: \$475,000 (1983-1984). Co-principal investigator: K. E. McConnell.

Environmental Protection Agency Cooperative Agreement. “Benefit Analysis Using Indirect or Imputed Market Methods.” Budget: \$455,000 (1985-1987). Co-principal investigator: K. E. McConnell.

Environmental Protection Agency Cooperative Agreement. “Economic Damages of Pollution to Recreational Fishing on the Atlantic Coast.” Budget: \$400,000 (1987-1989). Co-Principle Investigator with I. E. Strand and K. E. McConnell.

Agricultural Experiment Station, Competitive Grants. “Beef Trade Liberalization with Japan: Implications for Maryland's Agriculture and Fisheries.” Budget: \$24,000 (1992-1993). Co-Principle Investigator with I. E. Strand.

Department of Commerce, Saltonstall Kennedy Funds. “Commercial Fisheries Harvesting, Conservation and Pollution: Preferences and Conflicts.” Budget: \$147,000 (1992-1994). Co-Principle Investigator with I.E. Strand.

Environmental Protection Agency. “Ecological Economic Modelling and Valuation of Ecosystems.” Budget allocated to economics part of project: \$468,000 (1993-1998). Co-Principle Investigator with R. Costanza (ecologist).

National Science Foundation. “Marine Species Protection Policies: Consequences for Trade and the Environment.” Budget: \$112,000 (1992-1994). Co-Principle Investigator with I. E. Strand.

U. S. Department of Agriculture, “Food Safety and Product Labeling.” Budget: \$18,000 (1994-1995).

Agricultural Experiment Station, Competitive Grants. “An Ecological-Economic Model of Landuse Change in the Patuxent Watershed.” Budget: \$76,000 (1995-1997).

Sea Grant. “Predicting Land Use Changes for Ecological Modeling in the Patuxent Watershed.” \$120,000. 1997-1999.

National Science Foundation/EPA: Water and Watersheds Program.). “Integrated Ecological Economic Modeling of Watersheds.” (Costanza: principal investigator). Budget allocated to economics part of project: \$58,000 (1996-1999).

EPA/NSF Joint Project. Subcontract to Clark University. Budget: \$ 18,000 (1997-1999).

EPA/NSF STAR Grant. “The Impact of Farmland Preservation Programs.” Budget: \$80,860 (1998-2000) with Cynthia Nickerson.

EPA/NSF STAR Grant. “Land Development over Time and Space: Economic and Hydrologic/Geomorphic Drivers of Ecological Structure and Function in Urbanizing Watersheds” with Margaret Palmer (Zoology) and Glen Moglen (Engineering). Budget: approximately \$1,250,000 for three years for all participants (2000-2002), approximately \$340,000 for my part of work.

Participant in “Integrated Modeling of the Complementarities and Conflicts Between Ecological Systems and Economic Activities in the Land-Water Interface in North Carolina”, NSF

Biocomplexity Incubator Grant, North Carolina State University, V. Kerry Smith, Principal Investigator.

Participant in “GIS Analysis of Land Use on the Rural-Urban Fringe”, Northeast Regional Center for Rural Development Grant, Pennsylvania State University, Richard Ready, Principal Investigator.

NASA Grant. “Spatial Predictive Modeling and Remote Sensing of Land Use Change in the Chesapeake Bay Watershed” with Scott Goetz (Geography). Budget: \$465,000 for three years split between two participants (9/2001-8/2004).

EPA Grant. “Jointly Changing Climate and Land Use in the Mid-Atlantic: Modeling Drivers and Consequences in Economics, Hydrology, Geomorphology, and Ecology”, with Glenn E. Moglen (Engineering), Margaret A. Palmer (Zoology), and James E. Pizzuto (Geology, U. of Delaware). Budget: \$300,000 for 18 months (10/2000 – 3/2004).

USDA Cooperative Agreement. “Testing Aggregate Models Against Parcel Level Models of Development and Preservation Decisions”, with Cynthia Nickerson (ERS, USDA). Budget: \$32,500 for 12 months (2003-2004).

NASA. “Urban Growth Impacts on Surface Hydrology in Mid-Atlantic and New England Watersheds”, with Scott Goetz (Woods Hole Oceanographic Institute). Approx. \$40,000 share of budget. 2006-2008.

### **Advising and Consulting**

Office of Ocean Management, NOAA. 1977.

New England Regional Fishery Management Council, 1977-1979.

National Marine Fisheries Service, NOAA 1979-1982.

National Sea Grant Task Force, Fisheries Development Program, 1979.

Charles River Associates, Boston, Mass.: Consultant on commercial fisheries study, 1979.

Cambridge Systematics, Cambridge, Mass., 1982.

Department of Fish and Game, State of Alaska, 1984-1985.

Department of Economic and Community Development, State of Maryland. 1986-87.

Marine Minerals, Department of Interior. Oil Spill/Damage Assessment Model Evaluation, 1987-1988.

Penny and Edmonds, Law Firm, New York City, 1989.

U. S. Department of Justice., Exxon Valdez oil spill 1989-1992.

SØM Project on Valuation of Landscape Amenities, Denmark. 1991- 1995.

National Environmental Research Institute, Ministry of the Environment and Ministry of Agriculture, Denmark, 1991.

National Oceanic and Atmospheric Administration, Dept. of Commerce, 1991-1992.

National Academy of Sciences, National Research Council, Marine Board, 1992-95.

Agricultural Research Programme, Directorate-General for Agriculture, Commission of the European Community, Brussels, Belgium. June 1993.

London Environmental Economics Centre, International Institute for Environment and Development, 1993- 1996.  
National Oceanic and Atmospheric Administration, Natural Resource Damage Assessment Center, 1994- present.  
Department of Interior and Department of Commerce, Review of Type A Damage Assessment Model, 1995.  
Center for Research on the Economics of Environment and Development, London, UK. 1996.  
National Park Service, Utah Parks Study, Industrial Economics Inc., 1999-2003.  
Center for Disease Control, Consultant for University of Maine on Food Safety project, 1999-2003.  
National Oceanic and Atmospheric Administration, Analysis of Fiber Optics Cable in Marine Sanctuary, 2000.  
Patton-Boggs Law Firm, Expert Witness on Oil Spill Case, 2001.

### **Ph. D. Students:**

#### Ph. D. Students completed and Current Positions

Behjat Hojjatti, 1986, IFPRI  
Catherine Kling, 1987, Professor, Iowa State University  
Douglas Larson, 1989, Professor, University of California, Davis  
Mario Teisl, 1996, Associate Professor, University of Maine  
Kathleen Bell, 1997, Associate Professor, University of Maine  
Elena Irwin, 1998, Associate Professor, Ohio State University  
Cynthia Nickerson, 2000, Economic Research Service, USDA  
Christopher Leggett, 2000, Industrial Economics, Cambridge, MA  
Mark Fleming, 2003, Economist and Spatial Analyst in private sector  
Katja Vinha, 2005, Economics Faculty, University of Los Andes, Bogota, Colombia  
Jyotsna Puri, 2006, United Nations Development Program, New York, NY

#### Current Ph. D. Students:

Shannon Allen, passed prospectus defense  
Paramita Sinha, passed prospectus defense  
Charles Towe, passed prospectus defense

### **MS Students, Completed**

Jeffrey Cunningham, 1983, Faculty Research Associate, University of Maryland  
Marla Markowski, 1994, Industrial Economics Inc, Boston, MA

### **Courses Taught at University of Maryland**

AREC 250 (Introduction to Agricultural and Resource Economics)  
ENG 391 (Technical Writing)  
AREC 455 (Economics of Land Use)  
AREC 484 (Research Methodology and Introduction to Econometrics)

AREC 499 (Special Topics in Agricultural and Resource Economics)  
AREC 615 (Applied Econometrics)  
AREC 623 (Applied Econometrics I)  
AREC 624 (Applied Econometrics II)  
AREC 625 (Economic Welfare Analysis)  
AREC 689C (Applied Microeconomics)  
AREC 825 (Advanced Economic Welfare Analysis)  
AREC 852 (Natural Resource Policy and Applied Welfare Economics)  
AREC 883 (Research Techniques for Agricultural and Resource Economists)